

Chapter 1 Introduction	21
Chapter 2 Monte Carlo Simulation	25
2.1 Basic terms	25
2.1.1 Simulation	25
2.1.2 Random variables	28
2.1.3 Probability theory	28
2.1.4 Statistics	29
2.2 Random variables	31
2.2.1 Classification of random variables	31
2.2.2 Representation of variables	32
2.2.3 Histograms	34
2.2.3.1 Relationship between the histogram and the probability density function	35
2.2.3.2 Truncated histograms	35
2.3 The Monte Carlo method	37
2.3.1 History	38
2.3.2 Basic structure of Monte Carlo simulation.	38
2.3.3 Uncertainty of results	41
2.3.4 Variance reduction techniques	42
2.3.5 Typical problems – what can be calculated using Monte Carlo methods	43
2.3.5.1 Solution of an example deterministic problem – definite integral estimation	44
2.3.5.2 Solution of an example stochastic problem – pdf evaluation	44
2.4 The precision of simulation results	46
2.5 The “tail problem” in simulation	50
2.6 Random number generators	54
2.6.1 Primary generators	54
2.6.1.1 Natural generators	54
2.6.1.2 Tables of random numbers	55
2.6.1.3 Pseudorandom generators	55
2.6.1.4 Testing the quality of generators	57
2.6.2 Transformations	58
2.6.2.1 Generation of theoretical distributions	58
2.6.2.2 Generation of general distributions	60
2.6.2.2.1 Discrete distribution	60
2.6.2.2.2 Piecewise uniform distribution	62
2.6.3 Random generator used in SBRA programs	62
2.7 Programs used for SBRA	63

2.7.1 LoadCom	63
2.7.2 LoadCom for Windows	63
2.7.3 ResCom	64
2.7.4 DamAc	64
2.7.5 M-Star	64
2.7.6 Anthill	64
2.7.7 Anthill for Windows	65
2.8 Examples	65
2.8.1 Example 1. Direct use of a histogram – Normal distribution $N(0,1)$	66
2.8.2 Example 2. Simple transformation – Normal distribution $N(3,2)$ generation.	67
2.8.3 Example 3. Sum of two random variables – $N(3,2)+N(0,1)$	68
2.8.4 Example 4. Sum of two binomial variables	70
2.8.5 Example 5. Sum of three loads.	72
2.8.6 Example 6. Simple functional transformation – Exponential distribution generation	73
2.8.7 Example 7. Sum of more random variables – demonstration of Central Limit Theorem ...	74
2.8.8 Example 8. Simple structure reliability example	76
Chapter 3 Simulation-based Reliability Assessment	80
3.1 “Rules of the game”	80
3.1.1 Probabilistic interpretation of the Limit States philosophy	80
3.1.1.1 Deterministic methods	81
3.1.1.2 Basic interpretation of Limit States philosophy	81
3.1.1.3 From a deterministic to probabilistic concept	82
3.1.2 Probabilistic reliability assessment procedure	82
3.1.2.1 Load effect	84
3.1.2.2 Reference value	84
3.1.2.3 Special conditions	85
3.1.2.4 Ultimate and serviceability Limit States	85
3.1.3 Ultimate (safety) Limit States	85
3.1.3.1 Common situations	85
3.1.3.2 Tolerable damage	86
3.1.3.3 Interaction of S and RV	87
3.1.3.4 Time factor	87
3.1.4 Serviceability Limit States	87
3.2 Variables, reliability functions and reliability assessment	88
3.2.1 Random variables	88
3.2.1.1 Basic, compound and resulting variables	88
3.2.1.2 Single- and multi-component random variables	89
3.2.1.3 Correlation of variables	89
3.2.2 Reliability functions and formal expression of reliability conditions	90
3.2.3 Transformation model and reliability assessment scheme	91
3.2.4 Durability	93
3.3 Loading	93
3.3.1 Basic terms and definitions	93
3.3.1.1 Introduction	93
3.3.1.2 Loading as a time dependent random variable	94

24.4 Reliability of a steel frame computed by stochastic FEM	CD
24.5 An example of the application of a direct determined probabilistic solution in the framework of SBRA method	CD
25 Extension of SBRA Method from Components to Systems. Pilot Studies (2nd edition)	CD
26 Starting a Data-base of Steel Properties Applicable in SBRA Based Design (2nd edition) .	CD
Appendix A Histograms	423
A.1 Introduction	423
A.2 General distributions	423
A.2.1 Discrete distribution	423
A.2.2 Exponential distributions	423
A.2.3 Gamma distributions	424
A.2.4 Normal distributions	425
A.2.5 Uniform distributions	426
A.3 Loads	427
A.3.1 Crane loads	427
A.3.2 Dead loads	428
A.3.3 Earthquake load	429
A.3.4 Explosion load	429
A.3.5 Long lasting loads	429
A.3.6 Short lasting loads	430
A.3.7 Snow loads	431
A.3.8 Wind loads	431
A.4 Wind distributions	432
A.5 Material properties	432
A.5.1 Steel A36	433
A.5.2 Steel A572	433
A.5.3 Steel DUAL	434
A.6 Mechanical properties	434
A.6.1 Area	434
A.6.2 Initial imperfections	435
A.7 Miscellaneous distributions	435
Appendix B Manuals	436
B.1 Overview	436
B.1.1 Hardware requirements	436
B.1.2 Software requirements	436
B.1.3 Files	437
B.1.4 Installation and starting the program	437
B.1.5 Configuration file	437
B.1.6 Histogram file	438
B.1.7 Hot keys	439
B.2 LoadCom™	440
B.2.1 Input file	441

B.3 ResCom™	442
B.3.1 Input file	443
B.4 DamAc™	443
B.4.1 Input file	445
B.5 M-Star™	445
B.5.1 Input file	448
B.6 Anthill™	449
B.6.1 Input file	450
B.7 Tips and tricks	451
B.7.1 Computation acceleration	451
B.7.1.1 Histogram file modification	451
B.7.1.2 Constant evaluation	452
B.7.1.3 Expression simplification	453
B.7.2 Distribution generation using Monte Carlo simulation	453
B.7.3 Combination of distributions	454
B.7.4 Logical operations and conditional expressions	454
B.7.5 Generation of statistically dependent distributions	455
B.7.6 Multidimensional distributions	455
B.7.7 Real number arithmetic	456
Appendix C Metric conversion table	457
References	458
B – Books	458
P – Papers, Reports, Proceedings	463
C – Codes, Standards, Regulations and similar	469

CD ROM Content

Full text of the first edition of the Textbook	CD
Full text of the second edition of the Textbook	CD
List of authors	CD
Computer programs, histograms and input files	CD
PowerPoint presentations	CD
Outline of courses	CD
Proceedings of the Euro-SiBRAM'2002 colloquium	CD
List of publications documenting the SBRA development in the period 1988 to 2003	CD
Off-line version of the SBRA web page	CD

3.3.1.3 Properties of loading and time history	94
3.3.1.4 Independent and dependent loads	94
3.3.1.5 Simultaneity (combinations) of loads	95
3.3.1.6 Supplementary classifications and comments	96
3.3.2 Characteristic values of actions	96
3.3.3 Design values of actions	97
3.3.3.1 Partial Factors Design	97
3.3.3.2 Representation of load effects and analysis of combinations according to SBRA	97
3.4 Transformation models	99
3.4.1 From loading to load effects	100
3.4.2 Static and/or dynamic models	100
3.4.2.1 General review of models	100
3.4.2.2 Static models	103
3.4.2.3 Dynamic models	103
3.4.2.4 Quasi-dynamic models	105
3.4.2.5 Use of a dynamic or static model	105
3.4.3 Elastic and elasto-plastic models	106
3.4.4 1 st and 2 nd order analysis transformation models	106
3.4.5 Models related to the accumulation of damage	107
3.4.6. Complex models	107
3.5 Load effects	107
3.5.1 Response of the structure to loading	107
3.5.2 Types of responses	108
3.5.2.1 Static and dynamic response	108
3.5.2.2 Elastic and elasto-plastic behavior	109
3.5.2.3 Response resulting from 1 st and 2 nd order analysis	111
3.5.2.4 Combination of different kinds of responses	111
3.5.3 Single- or multi-component response	112
3.5.3.1 Single-component variable response	112
3.5.3.2 Multi-component variable response	112
3.5.4 Response history	112
3.5.5 “Feedback” response evaluation	113
3.6 Reference values	115
3.6.1 Significance and definition of reference (limiting) values	115
3.6.2 Resistance	115
3.6.2.1 Elementary reference values	115
3.6.2.2 RV based on mechanical properties of the material.	117
3.6.2.3 Compound reference values	118
3.6.3 Serviceability reference values	119
3.6.3.1 General comments	119
3.6.3.2 RV related to human comfort	120
3.6.3.3 RV referring to proper function of machinery and others	120
3.6.3.4 RV related to prevention of damage of non-structural components	120
3.7 Reliability assessment	121
3.7.1 Limit States design philosophy	121
3.7.1.1 Limit States – reliability and durability assessment	121

3.7.1.2	Definition of Limit States	122
3.7.1.3	Probability-based reliability assessment	123
3.7.2	Assessment formats	124
3.7.2.1	Over-load approach	124
3.7.2.2	Accumulation of damage approach	124
3.7.3	Which reliability condition controls design?	125
3.7.4	Carrying strength (safety) reliability assessment	126
3.7.5	Serviceability reliability assessment	128
3.7.5.1	Conventional approach	128
3.7.5.2	“Sharp” and “blurred” approach	128
3.7.6	Codified SBRA method	128
3.8	Ultimate Limit States referring to structural safety	128
3.8.1	How is “structural safety” defined?	128
3.8.2	Analysis of the reliability function	129
3.8.3	Time-dependent interaction of RV and S	129
3.8.4	Performance-related definition of safety	129
3.8.5	Safety of components vs. safety of systems	130
3.8.6	Safety assessment – examples	131
3.8.6.1	Loading, resistance and safety assessment of elements and components	131
3.8.6.2	Safety assessment of retaining walls and of slopes	132
3.8.6.3	Prestressed concrete	132
3.8.6.4	Accumulation of damage.	132
3.8.6.5	Reliability of structures considering selected special situations	132
3.8.6.6	Dimensioning and safety assessment	132
3.8.6.7	SBRA vs. Eurocode	133
3.9	Serviceability Limit States	133
3.9.1	Importance of serviceability conditions	133
3.9.2	Serviceability reference values	133
3.9.3	Load effects, load effect combinations and serviceability criteria	134
3.9.3.1	Load effects	135
3.9.3.2	Serviceability requirements	135
3.9.4	Simulation-based serviceability assessment	136
3.9.5	Serviceability assessment – examples	136
Chapter 4	Examples: Loading and Loading Effects	138
4.1	Single component load effect combination	138
4.2	Dead load effects for single-storey building	140
4.3	Analysis of principal stresses at a point in a beam	143
4.4	Load effect combination	145
4.5	Single component load effect combination	148
4.6	Single component load effect combination, dead and live load	150
4.7	Dead load, wind load and snow load combination effects for single-storey building	153
4.8	Load effects on a truss-girder	155
4.9	Dependent load effects	157
4.10	Load effect combinations: three-component variable	CD
4.11	Analysis of principal stresses and max. shear stress in a structural component	CD

4.12 Analysis of maximum normal stress in simply supported beam	CD
4.13 Single-component load effect combination: wind and snow	CD
4.14 Analysis of the maximum shear stress at a point in a beam	CD
4.15 Two-component load effect combination	CD
4.16 Three-component load effect combination	CD
4.17 Analysis of principal stresses in a steel beam (2 nd editon)	CD
4.18 Sensitivity analysis of principal stresses in a steel beam (2 nd editon)	CD
4.19 Analysis of principal stresses and max shear stress in a structural component (2 nd editon) . .	CD
4.20 Single component load effect combination, dead and live loads (2 nd editon)	CD
4.21 Analysis of maximum normal stress in simply supported beam (2 nd editon)	CD
4.22 Single component load effect combinations – parametric study (2 nd editon)	CD
4.23 Load effect combination: four-component variable (2 nd editon)	CD
4.24 Two component wind rosette application (2 nd editon)	CD
4.25 Dynamic response of roadway composite bridges (2 nd editon)	CD
4.26 Horizontal and vertical loads of bells by ringing (2 nd edition)	CD
4.27 Load effect combination: steel bar exposed to all-direction wind (2 nd edition)	CD

Chapter 5 Examples: Resistance of Structural Elements and Components 160

5.1 Resistance of a built-up bar	160
5.2 Ultimate bearing capacity of a reinforced concrete cross-section subjected to bending and compression	162
5.3 Resistance of a short composite column	164
5.4 Variability of the strength of a steel-concrete composite beam	166
5.5 Post buckling resistance of a compressed rectangular plate	170
5.6 Tension resistance of a bolted beam to beam connection	174
5.7 Shear resistance of a bolted beam to beam connection	176
5.8 Torsional resistance of a channel section	CD
5.9 Safety of a cross-section of a column in a steel frame	CD
5.10 Determination of the lateral torsional buckling resistance of a beam	CD
5.11 Determination of the buckling resistance of a column	CD
5.12 Application of SBRA concept for prediction of ultimate elongation of a reinforced concrete element	CD
5.13 Elastic lateral-torsional buckling moment of a rectangular solid beam	CD
5.14 Buckling resistance of a square hollow column	CD
5.15 Resistance of a built-up bar (2 nd edition)	CD
5.16 Masonry column strengthening (2 nd edition)	CD
5.17 Reliability assessment of a timber-concrete composite beam (2 nd edition)	CD
5.18 Application of database of geometrical and material properties for dimensioning of steel structures (2 nd edition)	CD

Chapter 6 Examples: Safety of Structural Elements 179

6.1 Use of probabilistic failure assessment diagram for a concrete pipe under internal pressure .	179
6.2 Reliability of a nailed timber-to-timber joint	181
6.3 Safety of dowelled steel-to-timber joint	183
6.4 Stability of position of a continuous girder exposed to several variable loads and to a moving variable load	186

6.5 Brittle fracture of a pipe	189
6.6 Probability of the brittle fracture of a concrete wall in tension	192
6.7 Safety of a concrete joint exposed to compression	193
6.8 Safety of a concrete joint exposed to shear	198
6.9 Safety of carpentry tenon joint	202
6.10 Safety of a butt weld under static load	205
6.11 Safety of a reinforced concrete slab	209
6.12 Design of reinforced concrete cross-section subjected to bending	211
6.13 Reliability of a reinforced concrete beam in shear	CD
6.14 Safety of a bolted connection under tension	CD
6.15 Selecting an amount of reinforcing steel at the critical cross-section of short column design for bending and axial force	CD
6.16 Cracking: reliability of a reinforced concrete element in tension	CD
6.17 Basic bond anchorage length	CD
6.18 Anchors to concrete in tension	CD
6.19 Safety of a fillet weld under static load	CD
6.20 Safety of a bracket-to column bolted connection	CD
6.21 Determination of the safety of a rectangular hollow section	CD
6.22 Analysis of a steel beam exposed to multi-component load effects	CD
6.23 Analysis of a steel beam exposed to multi-component load effects (2 nd editon)	CD
6.24 Stress distribution and reliability verification of composite cross section of roadway bridges (2 nd editon)	CD
6.25 Optimization study of beam with sudden profile change (2 nd editon)	CD
6.26 Failure safety check of the folding staircase (2 nd editon)	CD
 Chapter 7 Examples: Safety of Structural Components – 1st Order Theory Problems	213
7.1 Reliability of a steel beam	213
7.2 Assessment of a cantilever beam	215
7.3 Assessment of a simple steel beam with dynamic loading	217
7.4 Application of a two-component wind rosette	220
7.5 Stresses in a bridge subjected to impact by flood-drifted articles	226
7.6 Dimensioning of a steel bar	229
7.7 Assessment of a steel frame exposed to N and M_y	231
7.8 Probability of failure of a steel-concrete composite beam	238
7.9 Safety of a steel bar	239
7.10 Dimensioning of a cantilever	CD
7.11 Assessment of tension member in timber truss	CD
7.12 Safety of a continuous beam	CD
7.13 Reliability of a steel plate	CD
7.14 Reliability of a steel pipe	CD
7.15 Safety of a welded lap joint subjected to tension	CD
7.16 Safety of a truss-girder bar subjected to tension	CD
7.17 Determination of the safety of a tee joint of a welded I section	CD
7.18 Safety of a simply supported beam	CD
7.19 Safety of a column in a frame	CD
7.20 Application of a two-component wind rosette (2 nd edition)	CD

7.21 Reliability of a steel beam (2 nd edition)	CD
7.22 Safety of a welded lap joint subjected to tension (2 nd edition)	CD
7.23 Safety of a truss-girder bar subjected to tension and compression (2 nd edition)	CD
7.24 Assessment of a steel arc (2 nd edition)	CD
7.25 Safety of a steel bar (2 nd edition)	CD
7.26 Assessment of a steel frame exposed to N and M_y (2 nd edition)	CD
Chapter 8 Examples: Safety of Structural Components – 2nd Order Theory Problems	242
8.1 Stochastic deflection of a reinforced concrete strip foundation	242
8.2 Bar exposed to tension and compression	244
8.3 Safety of a steel frame	247
8.4 Buckling of a steel column	252
8.5 Stability of a timber column	257
8.6 Reliability of a slender bar subjected to bending and axial force	259
8.7 Deflection of a steel beam with regard to second order theory	261
8.8 Probability of failure of a solid timber column	CD
8.9 Assessment of a pin supported steel bar subjected to compression and tension	CD
8.10 Safety of a column in a frame	CD
8.11 Buckling of a steel column (2 nd edition)	CD
8.12 Two component load effect combination (2 nd edition)	CD
8.13 Safety of steel column subjected to three component load effect combination (2 nd edition)	CD
8.14 Reliability of a steel column exposed to horizontal and vertical forces (2 nd edition)	CD
8.15 Bar exposed to tension and compression (2 nd edition)	CD
Chapter 9 Examples: Reliability of Retaining Walls and of Slopes	263
9.1 Safety of a cantilever retaining wall against overturning and sliding	263
9.2 Column footing	266
9.3 Reliability of a cantilever retaining wall considered as a system	270
9.4 Probability of overturning for a cantilever retaining wall	273
9.5 Probability of horizontal sliding for a cantilever retaining wall	278
9.6 Probability of a bearing capacity failure for the foundation of a cantilever retaining wall ...	CD
9.7 Stability of slope excavated in a clay layer	CD
9.8 Variability of load capacity of a ground anchor	CD
9.9 Reliability of a gravity retaining wall	CD
9.10 Reliability of a concrete friction pile	CD
Chapter 10 Examples: Prestressed Concrete	282
10.1 Safety of a prestressed concrete beam	282
10.2 Variability of prestress loss due to friction between tendons and surrounding concrete	286
10.3 Variability of prestress loss due to instantaneous deformation of a post-tensioned (draped) concrete element	290
10.4 Variability of prestress loss due to anchorage draw-in during post-tensioning of a concrete element	293
10.5 Variability of total immediate prestress losses of a pre-tensioned concrete element	CD
10.6 Variability of total immediate prestress losses of a post-tensioned concrete element	CD

10.7 Compensation of a part of immediate losses in the case of pre-tensioning	CD
10.8 Compensation of a part of immediate losses in the case of post-tensioning	CD
10.9 Variability of time-dependent prestress loss due to creep of concrete	CD
10.10 Variability of time-dependent prestress loss due to shrinkage of concrete	CD
10.11 Variability of time-dependent prestress loss due to relaxation of steel	CD
10.12 Variability of total prestress loss in a post-tensioned concrete element	CD
10.13 Variability of prestress loss due to instantaneous deformation of a pre-tensioned concrete element	CD
10.14 Probability of cracking for a prestressed concrete beam	CD
10.15 Design of end-zone reinforcement for a post-tensioned concrete element	CD
Chapter 11 Examples: Accumulation of Damage	298
11.1 Remaining fatigue life	298
11.2 Safety assessment of a timber beam – application of the Madison curve	300
11.3 Application of the SBRA concept for shrinkage strain prediction of a concrete beam	305
11.4 Durability of a concrete beam	307
11.5 Durability of a steel component	312
11.6 Fatigue life of a tubular post exposed to wind	317
11.7 High cycle fatigue	320
11.8 Probabilistic verification of fatigue using equivalent stress for concrete	CD
11.9 Probabilistic verification of fatigue using damage equivalent stress range for prestressing steel	CD
11.10 Influence of corrosion on the durability of a cantilever	CD
11.11 Timber column reliability assessment (2 nd edition)	CD
11.12 Reliability assessment of a timber element with influence of duration of load combination (2 nd edition)	CD
11.13 Durability of a timber bar exposed to weathering (2 nd edition)	CD
11.14 Durability of a steel beam affected by corrosion (2 nd edition)	CD
11.15 Reliability assessment of composite roadway bridges (2 nd edition)	CD
Chapter 12 Examples: Serviceability	324
12.1 Beam deflection analysis	324
12.2 Admissible vibrations of a machine on a block-foundation	326
12.3 Assessment of a steel beam using tolerable permanent deflection as a limit value	328
12.4 Serviceability of wood floor	330
12.5 Serviceability of a TV tower loaded by wind	333
12.6 Plastic deformation of a vertical bar in tension	336
12.7 Rotation of a channel section in torsion	339
12.8 Serviceability of a dowelled steel-to-timber joint	CD
12.9 Deflection of a wooden beam	CD
12.10 Inclination of a cylindrical antenna due to transverse vibrations in wind	CD
12.11 Limitation of a crack to acceptable width	CD
12.12 Beam deflection analysis (2 nd edition)	CD
12.13 Assessment of a steel beam using tolerable permanent deflection as a limit value (2 nd edition)	CD
12.14 Time – dependent timber beam deflection (2 nd edition)	CD

Chapter 13 Examples: Special Situations	342
13.1 Safety of an elastic cord	342
13.2 Analysis of a steel column in a fire situation	344
13.3 Fire resistances of concrete protected steel columns:	
box protected and massive-protected columns	348
13.4 Pressure on the wall of an elevated water tank due to earthquake	352
13.5 Distribution of floor area loss due to fire in a building	356
13.6 Reliability of a spatial truss	362
13.7 Formation of a plastic hinge in a frame during an earthquake	CD
13.8 Frequency (annual probability) of structural failure due to extreme wind effects	
described by a hazard function	CD
13.9 Distribution of parameters of a blast load generated by an accidental vapour cloud explosion ..	CD
13.10 Operating – characteristic function for the probability of acceptance of products	CD
13.11 Influence of human errors on the reliability of single-column footing	CD
13.12 Effect of load variation on the fundamental period and base shear	
of an eight-story building	CD
13.13 Distribution of floor area loss due to fire in a building	CD
13.14 Acceleration of a roof beam due to sinusoidal ground motion	CD
13.15 Bouncing and trajectory of dropped ball (2 nd edition)	CD
13.16 Serviceability of cable truss (2 nd edition)	CD
13.17 Probability of failure of steel component exposed to fire (2 nd edition)	CD
13.18 Safety of an elastic cord (2 nd edition)	CD
Chapter 14 Examples: From Components to Systems	365
14.1 Assessment of coupled steel beams	365
14.2 Determination of the safety of a bolted lap joint	369
14.3 Determination of the safety of a bolted web plate joint	371
14.4 Safety of a bolted splice	374
14.5 Assessment of coupled steel beams (2 nd edition)	CD
14.6 Assessment of coupled steel beams using tolerable permanent	
deflection as a limit value (2 nd edition)	CD
Chapter 15 Examples: SBRA vs. Eurocodes and Multi-component Loads	377
15.1 Study on load combination rules	377
15.2 Safety of a rectangular hollow section exposed to multicomponent loads	
according to Eurocode 3	388
15.3 Classification of a welded I-section according to Eurocode 3	391
15.4 Classification of a square hollow section according to Eurocode 3	395
15.5 Assessment of the buckling safety of a hot rolled beam-column according to Eurocode 3 ...	398
15.6 Effective cross-section of a square hollow section according to Eurocode 3	401
15.7 Determination of the reference level related to the definition of safety	CD
15.8 Buckling resistance of a column according to Eurocode 3	CD
15.9 Classification of an I-section according to Eurocode 3	CD
15.10 Buckling safety of a rectangular hollow beam-column according to Eurocode 3	CD
15.11 Lateral-torsional buckling of a hot rolled beam under biaxial bending	
according to Eurocode 3	CD

15.12 Coupled buckling of a welded I-section beam-column according to Eurocode 3	CD
15.13 Tension resistance of an angle connected by one leg according to Eurocode 3	CD
15.14 Determination of the safety of a welded connection under tension according to Eurocode 3	CD
15.15 Determination of the safety of the tee joint of a welded I-section according to Eurocode 3	CD
15.16 Reliability of cantilever beam according to Eurocode 3 (2 nd edition)	CD
15.17 Dimensioning of a steel bar according to LRFD, EC3 and SBRA (2 nd edition)	CD
15.18 Comparison of the fatigue life prediction on the welded part according SBRA method and Eurocode 3 (2 nd edition)	CD
15.19 Steel beam with an overhang: stability of position (2 nd edition)	CD
15.20 Steel beam with an overhang: assessment of shear capacity (2 nd edition)	CD
15.21 Steel beam with an overhang: bending safety assessment (2 nd edition)	CD
15.22 Steel beam with an overhang: serviceability assessment (2 nd edition)	CD
Chapter 16 Bayesian Approach and Other Updating Techniques	405
16.1 SBRA and histograms	405
16.2 Pilot example	406
16.3 Changes in tensile strength	408
16.4 Bayes theorem and its use for evolution of specimens	411
16.5 Steel beam exposed to corrosion	415
16.6 Steel component exposed to corrosion	417
16.7 Extension of examples 16.3 and 16.6	419
16.8 Concluding remarks	422
17 Comments on the Background of SBRA Method (2nd edition)	CD
18 Reliability Assessment Using Simulation Samples Generated from Nonparametric Density Estimates (2nd edition)	CD
19 Load Effect Combinations Analysis: Arbitrary Point-in-Time and Maximum Load Effect Concepts (2nd edition)	CD
20 Durability and Performance-Based Design Using SBRA (2nd edition)	CD
21 Application of the SBRA Method in Case of a Dynamic Response of Structures to the Loading (2nd edition)	CD
22 Reliability Assessment of Semi-rigid Joints Using SBRA Method (2nd edition)	CD
23 Direct Monte Carlo Method vs. Improved Methods Considering Applications in Designers Every Day Work (2nd edition)	CD
24 Assessment of a Steel Frame, a Comparative Study (2nd edition)	CD
24.1 Preface	CD
24.2 Reliability assessment of an unbraced frame with leaning columns	CD
24.3 Reliability assessment of an unbraced frame with leaning columns using the stochastic finite element method	CD