General principles on reliability for structures

Contents

Page

6 Uncertainty representation and modelling 25
6.1 General 25
6.1.1 Types of uncertainty 25
6.1.2 Treatment of uncertainty 26
6.1.3 Interpretation of probability 26
6.1.4 Probabilistic models 26
6.1.5 Population/outcome space 26
6.1.6 Hierarchical modelling of uncertainty 27
6.2 Models for structural analysis 27
6.2.1 General 27
6.2.2 Actions and environmental influences 28
6.2.3 Geometrical properties 30
6.2.4 Material properties 30
6.2.5 Responses and resistances 31
6.3 Models for consequences 33
6.4 Model uncertainty 34
6.5 Experimental models 34
6.6 Updating of probabilistic models 35

7 Risk-informed decision making 35
7.1 General 35
7.2 System identification 35
7.3 System modelling 36
7.4 Risk quantification 36
7.5 Decision optimization and risk acceptance 36

8 Reliability-based decision making 37
8.1 General 37
8.2 Decisions based on updated probability measures 38
8.3 Systems reliability versus component reliability 38
8.4 Target failure probabilities 39
8.5 Calculation of the probability of failure 39
8.5.1 General 39
8.5.2 Time-invariant reliability problems 40
8.5.3 Transformation of time-variant into time-invariant problems 40
8.5.4 Out-crossing approach 40
8.6 Implementation of probability-based design 41

9 Semi-probabilistic method 41
9.1 General 41
9.2 Basic principles 41
9.3 Representative and characteristic values 42
9.3.1 Actions 42
9.3.2 Resistances 43
9.4 Safety formats 43
9.4.1 General 43
9.4.2 Partial factor method 44
9.4.3 The design value method 46
9.5 Verification in case of cumulative damage 47

Annex A (informative) Quality management 48

Annex B (informative) Lifetime management of structural integrity 55

Annex C (informative) Design based on observations and experimental models 62

Annex D (informative) Reliability of geotechnical structures 71

Annex E (informative) Code calibration 79

Contents Page Annex F (informative) Structural robustness 88

Annex G (informative) Optimization and criterion on life safety 100

Bibliography 110