

Contents

Preface	v
Aims and objectives of this guide	v
Layout of this guide	v
Acknowledgements	vi
 Foreword	 1
The Eurocode programme	1
The development of Eurocode 7	2
The content of Eurocode 7	3
The three Design Approaches	3
National implementation of Eurocode 7	5
Application of informative annexes	7
The schedule	8
Packages of EN Eurocode parts	8
National tasks for implementation	9
 Chapter 1. General	 11
1.1. Scope	11
1.1.1. Scope of Eurocode 7 – Part 1	11
1.1.2. Designs not fully covered by Eurocode 7 – Part 1	12
1.1.3. Contents and organization of Eurocode 7 – Part 1	12
1.1.4. Eurocode 7 – Part 2	13
1.2. References	13
1.3. Assumptions	14
1.4. Distinction between Principles and Application Rules	16
1.5. Definitions	16
1.5.1. Definitions common to all Eurocodes	16
1.5.2. Definitions specific to Eurocode 7	16
1.6. Symbols	17
 Chapter 2. Basis of geotechnical design	 19
2.1. Design requirements	19
2.2. Design situations	20
2.3. Durability	21
2.4. Geotechnical design by calculation	23
2.4.1. General	23
2.4.2. Actions	24

2.4.3.	Ground properties	24
2.4.4.	Characteristic values of geotechnical parameters	24
2.4.5.	Ultimate limit states	30
2.4.6.	Serviceability limit state design	37
2.5.	Design by prescriptive measures	39
2.6.	Observational method	39
2.7.	Geotechnical Design Report	39
Example 2.1: selection of a characteristic value using statistical methods		41
Appendix: an example of the use of statistical methods to assess characteristic values		44
Chapter 3.	Geotechnical data	53
3.1.	Introduction	53
3.2.	Geotechnical investigations	53
3.3.	Evaluation of geotechnical parameters	54
3.3.1.	General	54
3.3.2.	Characterization of soil and rock type	55
3.3.3.	Procedure for evaluating geotechnical parameters	55
3.3.4.	Characteristic values	58
3.4.	Ground Investigation Report	58
Chapter 4.	Supervision of construction, monitoring and maintenance	61
4.1.	Introduction	61
4.2.	Supervision	62
4.3.	Checking ground conditions	63
4.4.	Checking construction	63
4.5.	Monitoring	64
Chapter 5.	Fill, dewatering, ground improvement and reinforcement	65
5.1.	General	65
5.2.	Fundamental requirements	65
5.3.	Fill construction	66
5.4.	Dewatering	66
5.5.	Ground improvement and reinforcement	66
Chapter 6.	Spread foundations	69
6.1.	Design methods	70
6.2.	Overall stability	70
6.3.	Direct method: ULS design	72
6.3.1.	Bearing resistance	72
6.3.2.	Sliding resistance	78
6.3.3.	Loads with large eccentricities	80
6.3.4.	Structural failure due to foundation movement	81
6.4.	Direct method: SLS design by settlement calculations	82
6.5.	Indirect method: simplified SLS method	84
6.5.1.	General	84
6.5.2.	Indirect method based on limiting the mobilization of bearing resistance	84
6.6.	Prescriptive method	85
6.7.	Structural design	85
Example 6.1: square pad foundation on soft clay		86

Example 6.2: ULS design of spread foundation for a tower	93
Example 6.3: design based on the indirect method using pressuremeter test results	99
Chapter 7. Pile foundations	101
7.1. General	101
7.2. Limit states	102
7.3. Actions and design situations	102
7.4. Design methods and design considerations	103
7.5. Pile load tests	104
7.6. Axially loaded piles	105
7.6.1. General	105
7.6.2. Compressive ground resistance (ULS)	106
7.6.3. Ground tensile resistance	112
7.6.4. Vertical displacements of pile foundations	114
7.7. Transversely loaded piles	114
7.8. Structural design of piles	114
7.9. Supervision of construction	115
Example 7.1: design of a pile in compression from static load test results	115
Example 7.2: design of a pile in compression from <i>in situ</i> test results	118
Example 7.3: design of a pile in compression from laboratory test results	121
Example 7.4: design of a pile subject to downdrag	125
Example 7.5: uplift of piled structures	128
Chapter 8. Anchorages	133
8.1. General	133
8.2. Ultimate limit state design	134
8.2.1. Design of the anchorage	134
8.2.2. Design value of the anchorage load	134
8.2.3. Design value of the anchorage resistance	138
8.3. Structural design of anchorages	139
8.4. Load testing of ground anchorages	140
8.4.1. Acceptance tests	140
8.4.2. Suitability tests	140
8.4.3. Investigation tests	141
8.4.4. Proof load as an action to the structure	141
Example 8.1: assessment of proof load for suitability and acceptance tests	141
Chapter 9. Retaining structures	145
9.1. General	146
9.2. Limit states	146
9.3. Actions, geometrical data and design situations	147
9.3.1. Actions	147
9.3.2. Geometrical data	148
9.4. Design and construction considerations	148
9.5. Determination of earth pressures	149
9.6. Water pressures	151
9.7. Ultimate limit state design	151
9.8. Serviceability limit state design	160

9.8.1. General	160
9.8.2. Displacements	161
Example 9.1: ULS design of a stem (gravity) wall	161
Example 9.2: ULS and SLS design of an embedded sheet pile wall	173
Chapter 10. Hydraulic failure	185
10.1. General	185
10.2. Failure by uplift (UPL)	186
10.2.1. General	186
10.2.2. Submerged structures	187
10.2.3. Design against uplift of an impermeable layer	188
10.2.4. Worked example of a design against uplift	188
10.3. Failure by heave (HYD)	189
10.3.1. General	189
10.3.2. Design using total stresses	189
10.3.3. Design using submerged weight	190
10.3.4. Determination of the relevant pore water pressure	190
10.3.5. Worked example of a design against failure by heave	191
10.3.6. Discussion on failure by uplift and failure by heave	191
10.4. Internal erosion	191
10.4.1. Filter criteria and hydraulic criteria	191
10.4.2. Effects of material transport	192
10.5. Failure by piping	192
10.5.1. General	192
10.5.2. Design against failure by piping	192
Chapter 11. Overall stability	195
11.1. General	195
11.2. Limit states	195
11.3. Actions and design situations	196
11.4. Design and construction considerations	196
11.5. Ultimate limit state design	196
11.6. Serviceability limit state design	201
11.7. Monitoring	202
Example 11.1: overall stability of a cutting in stiff clay	202
Chapter 12. Embankments	207
12.1. General	207
12.2. Limit states	207
12.3. Actions and design situations	208
12.4. Design and construction considerations	208
12.5. Ultimate limit state design	208
12.6. Serviceability limit state design	208
12.7. Supervision and monitoring	208
References	211
Index	213