

DS/EN 1997-2 DK NA:2013

National Annex to Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing

Foreword

This national annex (NA) is a revision of EN 1997-2 DK NA:2011 and replaces the latter on 2013-05-15. During a transition period until 2013-09-01, this National Annex as well as the previous National Annex are applicable. Technical changes have been made in clause 5.5.1(1)P.

Previous versions, addenda and an overview of all National Annexes can be found at www.eurocodes.dk

This NA lays down the conditions for the implementation in Denmark of EN 1997-2 for construction works in conformity with the Danish Building Act or the building legislation. Other parties can put this NA into effect by referring thereto.

The national choices may be in the form of nationally applicable values, an option between methods given in the Eurocode, or the addition of complementary guidance.

This NA includes:

- an overview of possible national choices and clauses containing complementary information;
- national choices;
- complementary (non-contradictory) information which may assist the user of the Eurocode.

The numbering refers to the clauses of the Eurocode containing choices and/or complementary information. The heading is identical to the heading of the clause in the Eurocode, followed by a clarification, as appropriate.

EN 1997-2 differs from other Eurocodes by not stating where national choices are to be made.

Overview of possible national choices and clauses containing complementary information

The overview below identifies the clauses where national choices are possible and the applicable/not applicable informative annexes. Furthermore, clauses giving complementary information are identified. Complementary information is given at the end of this document.

Clause	Subject	National choice	Complementary information
3.4.2(1)P	Soil identification		Complementary information
3.5.2(1)P	Rock identification		Complementary information
4.3.4.1(1)P, NOTE	Cone penetration tests (CPT) – Bearing resistance and settlement of spread foundations		Complementary information
4.4.4.2(2), NOTE	Pressuremeter tests (PMT) – Bearing resistance of spread foundations		Complementary information
4.6.4.2(1), NOTE	Standard penetration test (SPT) – Bearing resistance of spread foundations in sands		Complementary information
4.7.4(4), NOTE 1	Dynamic probing tests (DP) – Use of test results and derived values		Complementary information
4.8.4(2), NOTE	Weight sounding test (WST) – Use of test results and derived values		Complementary information
4.10.4.1(2), NOTE	Flat dilatometer test (DMT) – Bearing resistance and settlement of spread foundations		Complementary information
4.11.4(4), NOTE 1	Plate loading test (PLT) – Use of test results and derived values		Complementary information
5.5.1(1)P	Tests for classification, identification and description of soil - General		Complementary information
5.8.6.2(3), NOTE	Consolidated triaxial compression test. Evaluation and use of test results		Complementary information
5.8.7.2(2), NOTE	Consolidated direct shear box tests. Establishment and use of values		Complementary information
Annex A, Table A.1	Laboratory tests		Complementary information
Annex B, Table B.1	Fine soil		Complementary information
Annex D	Cone and piezocone penetration tests		Complementary information
Annex E	Pressuremeter test (PMT)		Complementary information
Annex F	Standard penetration test (SPT)		Complementary information

Clause	Subject	National choice	Complementary information
Annex G	Dynamic probing test (DP)		Complementary information
Annex H	Weight sounding test (WST)		Complementary information
Annex I	Field vane test (FVT)		Complementary information
Annex J	Flat dilatometer test (DMT)		Complementary information
Annex K	Plate loading test (PLT)		Complementary information
Annex L	Detailed information on preparation of soil specimens for testing		Complementary information
Annex X.3.1	Cone penetration test		Complementary information
Annex X.3.3	Standard penetration test		Complementary information
Annex X.3.6	Field vane test		Complementary information
Annex X.3.8	Plate loading test		Complementary information
Annex X.4.1	Tests for classification, identification and description of soil		Complementary information
Annex X.4.4	Strength testing of soil		Complementary information
Annex X.4.5	Compressibility testing of soil		Complementary information
Annex X.4.9.1	Classification testing of rock materials - General		Complementary information

National choices

National choices in the form of values and classes are not possible in EN 1997-2.

Complementary (non-conflicting) information

3.4.2(1)P Soil identification

Soil identification is carried out in conformity with EN ISO 14688-1. Account has been taken of EN ISO 14688-1, Clause 1, Scope, which states that more detailed subdivision and description may be appropriate. In some clauses "should" is applied in this standard and complementary information is therefore given below. Furthermore, Danish practice has been taken into consideration as historical drill samples are often applied.

Complementary information for the application of EN ISO 14688-1

Clause/Ref.	Subject	Complementary information
4.1	"...any common names and the geological classification should all be indicated..."	The geological origin and the geological age should be indicated when evaluating samples in Denmark, see [1].
4.2, Table 1	Abbreviations in the column "Symbols"	This system is not generally applied for sample descriptions used for the elaboration of specific borehole logs.
4.2, Table 1	The column "Sub-fractions"	Danish borehole logs always state the main designation first, written in capital letters. Furthermore, the designations FILL as well as MORaine CLAY, MORaine SILT, MORaine SAND and MORaine GRAVEL are used as main designations in sample descriptions in Denmark, see [1].
4.3.3	Order of terms in the description	Danish borehole logs always state the main designation first, in capital letters, see [1].
4.4	Low or high plasticity	For sample descriptions in Denmark, a more detailed division of low, medium, high and very high plasticity is used, cf. [1].
4.5	Organic content	Organic deposits are widely distributed with a considerable range of variation in terms of the ratio between inorganic and organic matter in the sediment and the degree of decomposition of the organic matter. Therefore, a more detailed division of the organic soils are used for sample descriptions in Denmark, cf. [1], which is to be understood as an elaboration of the system specified in clause 4.5.
4.10	Origin of deposit	The geological origin and the geological age should always be stated when evaluating samples in Denmark.
5.2	Particle shape	In sample descriptions in Denmark, for the sand/gravel deposits of common occurrence it is necessary only in exceptional cases to describe the particle shape as suggested in clause 5.2; it is therefore not an essential requirement that these parameters shall be included in Danish sample descriptions.

Clause/Ref.	Subject	Complementary information
5.3	Mineral composition	In sample descriptions in Denmark, for the sand/gravel deposits of common occurrence it is necessary only in exceptional cases to describe the mineral composition as suggested in clause 5.3; it is therefore not an essential requirement that these parameters shall be included in Danish sample descriptions.
5.8	Determination of plasticity	In sample descriptions in Denmark, the guide provided in DGF Bulletin 1 is used for the determination of plasticity, see [1].
5.14	Determination of consistency	Sample descriptions in Denmark do not include consistency descriptions of individual samples taken, as the consistency of the samples may have changed during sampling. Instead, the firmness/consistency is assessed on the basis of the classification tests performed in boreholes, the results of which are given in the borehole log. Thus, the procedure differs from the procedure suggested in clause 5.14.

[1]: *Vejledning i Ingeniørgeologisk prøvebeskrivelse*, DGF-Bulletin 1, rev. 1, 1995, Dansk Geoteknisk Forening. (Exists in English as "A guide to engineering geological soil description, DGF Bulletin 1E, rev. 1, 1995, Danish Geotechnical Society).

3.5.2(1)P Rock identification

Rock identification is carried out in conformity with EN ISO 14689-1. In some clauses "should" is applied in this standard and complementary information is therefore given below. Furthermore, a number of Danish practices have been taken into consideration, as historical borehole samples are often applied.

Complementary information for the application of EN ISO 14689-1

Clause	Subject	Complementary information																		
4.2.7	Unconfined compressive strength	<p>The following strength scale is applied in Denmark for core analysis:</p> <table border="1"> <thead> <tr> <th>Degree of induration</th> <th>ISRM Rock Grade</th> <th>Compressive strength σ_c (MN/m²)</th> </tr> </thead> <tbody> <tr> <td>H1</td> <td>R0</td> <td>0,25-1</td> </tr> <tr> <td>H2</td> <td>R1</td> <td>1-5</td> </tr> <tr> <td>H3</td> <td>R2</td> <td>5-25</td> </tr> <tr> <td>H4</td> <td>R3+R4</td> <td>25-100</td> </tr> <tr> <td>H5</td> <td>R5+R6</td> <td>100-500</td> </tr> </tbody> </table>	Degree of induration	ISRM Rock Grade	Compressive strength σ_c (MN/m ²)	H1	R0	0,25-1	H2	R1	1-5	H3	R2	5-25	H4	R3+R4	25-100	H5	R5+R6	100-500
Degree of induration	ISRM Rock Grade	Compressive strength σ_c (MN/m ²)																		
H1	R0	0,25-1																		
H2	R1	1-5																		
H3	R2	5-25																		
H4	R3+R4	25-100																		
H5	R5+R6	100-500																		

Clause	Subject	Complementary information																		
4.3.3.3	Discontinuity spacing and block shape	<p>The following fissuring scale is applied in Denmark for core analysis:</p> <table border="1"> <thead> <tr> <th>Degree of fissuring</th> <th>Designation</th> <th>Criterion</th> </tr> </thead> <tbody> <tr> <td>Unfissured</td> <td>S.1</td> <td>No fissures seen</td> </tr> <tr> <td>Slightly fissured</td> <td>S.2</td> <td>Fissure spacing larger than 10 cm. No vertical fissures</td> </tr> <tr> <td>Fissured</td> <td>S.3</td> <td>Fissure spacing between 6 cm and 10 cm.</td> </tr> <tr> <td>Highly fissured</td> <td>S.4</td> <td>Fissure spacing between 2 cm and 6 cm.</td> </tr> <tr> <td>Crushed</td> <td>S.5</td> <td>Fissure spacing smaller than 2 cm</td> </tr> </tbody> </table>	Degree of fissuring	Designation	Criterion	Unfissured	S.1	No fissures seen	Slightly fissured	S.2	Fissure spacing larger than 10 cm. No vertical fissures	Fissured	S.3	Fissure spacing between 6 cm and 10 cm.	Highly fissured	S.4	Fissure spacing between 2 cm and 6 cm.	Crushed	S.5	Fissure spacing smaller than 2 cm
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4.3.4.1(1)P, Cone penetration tests (CPT) – Bearing resistance and settlement of spread foundations

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

4.4.4.2(2), Pressuremeter tests (PMT) – Bearing resistance of spread foundations

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

4.6.4.2(1) NOTE, Standard penetration test (SPT) – Bearing resistance of spread foundations in sands

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

4.7.4(4) NOTE 1, Dynamic probing tests (DP) – Use of test results and derived values

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

4.8.4(2) NOTE, Weight sounding test (WST) – Use of test results and derived values

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

4.10.4.1(2) NOTE, Flat dilatometer test (DMT) – Bearing resistance and settlement of spread foundations

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

4.11.4(4) NOTE 1, Plate loading test (PLT) – Use of test results and derived values

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

5.5.1(1)P Tests for classification, identification and description of soil - General

The principles for classification of soil are described in EN ISO 14688-2, and classification is to be made in accordance with EN ISO 14688-2. Account has been taken of EN ISO 14688-2, Clause 1, Scope, which states that more detailed subdivision and description may be appropriate. In some clauses "should" is applied in this standard and complementary information is therefore given below. Furthermore, Danish practice has been taken into consideration, as historical borehole samples are often applied.

Complementary information for the application of EN ISO 14688-2

Clause/Ref.	Subject	Complementary information								
4.3	Particle size distribution (grading)	In Denmark, the following U scale applies to sample descriptions: <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><i>U</i></td> <td style="text-align: center;"><i>Designation</i></td> </tr> <tr> <td style="text-align: center;">> 15</td> <td style="text-align: center;">Well graded</td> </tr> <tr> <td style="text-align: center;">6-15</td> <td style="text-align: center;">Graded</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">Poorly graded Sorted</td> </tr> </table>	<i>U</i>	<i>Designation</i>	> 15	Well graded	6-15	Graded	3	Poorly graded Sorted
<i>U</i>	<i>Designation</i>									
> 15	Well graded									
6-15	Graded									
3	Poorly graded Sorted									
4.4	Plasticity	For sample descriptions in Denmark, a more detailed division of low, medium, high and very high plasticity is used.								
4.5	Organic content	Organic deposits are widely distributed with a considerable range of variation in terms of the ratio between inorganic and organic matter in the sediment and the degree of decomposition of the organic matter. Therefore, the division of the organic soils used for sample descriptions in Denmark according to DGF Bulletin 1 is to be understood as an elaboration of the system specified in clause 4.5, see [1].								
Annex A	Principles of soil classification	Is not usually applied for sample descriptions in Denmark								
Annex B	Example of classification of soils, based on grading alone	Is not usually applied for sample descriptions in Denmark								

[1]: *Vejledning i Ingeniørgeologisk prøvebeskrivelse*, DGF-Bulletin 1, rev. 1, 1995, Dansk Geoteknisk Forening. (Exists in English as "A guide to engineering geological soil description, DGF Bulletin 1E, rev. 1, 1995, Danish Geotechnical Society.")

5.8.6.2(3) NOTE, Consolidated triaxial compression test. Evaluation and use of test results

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

5.8.7.2(2) NOTE, Consolidated direct shear box tests. Establishment and use of values

When using EN 1997-1, Annex D, Annex D in DS/EN 1997-1 DK NA shall also be applied.

Annex A, List of test results of geotechnical test standards

Table A.1, Laboratory tests

Direct simple shear tests should be added. Tests results are as defined for the consolidated triaxial test, except that the deformation properties are replaced by the shear modulus, G .

Annex B, Planning of geotechnical investigations

Table B.1, Fine soil

Augers can be used in fine soils.

Field vane tests may also be used during preliminary investigations and control investigations, cf. *Referenceblad for vingeforsøg, rev. (Reference sheet for field vane tests, rev.) 3*, Danish Geotechnical Society, 1999.

Annex D, Cone and piezocone penetration tests

Cone penetration tests can be used only to identify layering and to derive soil characteristics. Application of clauses D.1, D.2, D.4 and D.5 is to be documented by further tests (laboratory and/or field tests), cf. *Correlation of CPT and Field Vane Tests for Clay Tills*. DGF Bulletin 7, 1991, Danish Geotechnical Society.

Annex E, Pressuremeter test (PMT)

In Denmark the method has been applied only in dense to very dense ground or soft rock. Application of the results of pressuremeter tests is to be documented by further testing (laboratory and/or field tests).

Annex F, Standard penetration test (SPT)

In sand, SPT can be applied only to derive the density index, cf. *Referenceblad for SPT-forsøg (Reference sheet for SPT tests)*. Danish Geotechnical Society, 1995.

Annex G, Dynamic probing test (DP)

In Denmark, use of the dynamic probing test to derive ground parameters is not allowed, unless the method has been calibrated against local experience.

Annex H, Weight sounding test (WST)

In Denmark, use of the weight sounding test to derive ground characteristics is not allowed, unless the method has been calibrated against local experience.

Annex I, Field vane test (FVT)

See also *Referenceblad for vingeforsøg, rev. (Reference sheet for field vane tests, rev.) 3*. Danish Geotechnical Society, 1999.

Annex J, Flat dilatometer test (DMT)

In Denmark, the method has not been generally used. The results of flat dilatometer tests are to be verified by further tests (laboratory and/or field tests).

Annex K, Plate loading test (PLT)

See also *Referenceblad for statiske pladebelastningsforsøg (Reference sheet for static plate loading tests)*. Danish Geotechnical Society, April 2005.

Annex L, Detailed information on preparation of soil specimens for testing

The preparation of test specimens is to be carried out according to the selected standard describing the laboratory test.

Annex X, Bibliography

X.3.1 Cone penetration test

Add:

Correlation of CPT and Field Vane Tests for Clay Tills. DGF Bulletin 7, 1991, Danish Geotechnical Society.

X.3.3 Standard penetration test

Add:

Referenceblad for SPT-forsøg (Reference sheet for SPT tests). Danish Geotechnical Society, 1995.

X.3.6, Field vane test

Add:

Referenceblad for vingeforsøg, rev. (Reference sheet for field vane tests, rev.) 3, Danish Geotechnical Society, 1999.

X.3.8 Plate loading test

Add:

Referenceblad for statiske pladebelastningsforsøg (Reference sheet for static plate loading tests). Danish Geotechnical Society, April 2005.

X.4.1, Tests for classification, identification and description of soil

Add:

A guide to engineering geological soil description, DGF Bulletin 1E, rev. 1, 1995, Danish Geotechnical Society.

X.4.4 Strength testing of soil

Add:

Laboratoriehåndbogen (Laboratory manual), DGF Bulletin 15, 2001, Danish Geotechnical Society.
Felthåndbogen (Field manual), DGF Bulletin 14, 1999, Danish Geotechnical Society.

X.4.5 Compressibility testing of soil

Add:

Laboratoriehåndbogen (Laboratory manual), DGF Bulletin 15, 2001, Danish Geotechnical Society.

X.4.9.1 Classification testing of rock materials - General

Add:

A guide to engineering geological soil description, DGF Bulletin 1E, rev. 1, 1995, Danish Geotechnical Society.

Ingeniørgeologiske forhold i København (Engineering geological conditions in Copenhagen), DGF Bulletin 19, 2002, Danish Geotechnical Society.