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**National Annex to: Eurocode 7 – Geotechnical design –
Part 2: Ground properties**

**Nationalt Anneks til: Eurocode 7 – Geoteknik –
Del 2: Jordegenskaber**

Foreword

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This National Annex (NA) to EN 1997-2:2024 forms part of the national annexes to the second generation of Eurocodes.

This NA supersedes DS/EN 1997-2 DK NA:2013 when this NA is implemented in the Building Regulation (Bygningsreglementet 2018 – BR18) as an appendix.

During the transition period stated in the Building Regulations, both the first generation and the second generation of the Eurocodes and NAs may be applied.

This NA cannot be used in conjunction with the first generation of Eurocodes.

This NA lays down the conditions for the Danish implementation of EN 1997-2:2024 for construction works in conformity with the Danish Building Regulations; Bygningsreglement 2018 (BR 18). Other parties may bring this National Annex into force by reference.

The Eurocodes establish the principle that certain parameters are left open for national determination. These parameters are referred to as *Nationally Determined Parameters* (NDP) and specifies the nationally applicable values, classes or methods. Furthermore, the NA may provide *Non-Contradictory, Complementary Information* (NCCI), i.e. additional guidance and alternative methods or values that support the application of the Eurocode without altering or contradicting its provisions.

Further, this National Annex includes NOTES. Notes have the status of guidance and provides additional information intended to assist the understanding or use of text of the national annex.

In conformity with the Danish Building regulations, the verbal forms used in this Eurocode and NA are to be understood as follows:

- “shall” expresses a requirement to be followed
- “should” expresses a recommendation. Alternative approaches could be used if technically justified
- “may” expresses permission within the limits of the Danish Building Regulations
- “can” expresses a possibility or capability
- “is/are” expresses a statement of certainty or a fact.

This NA includes:

- Foreword
- An overview of clauses with possible Nationally Determined Parameters (NDPs) and of Non-Contradictory Complementary Information (NCCI);
- National choice of Nationally Determined Parameters (NDP), and Non-Contradictory Complementary Information (NCCI)

Valid versions of the NAs, as well as previous versions and addenda can be found at www.bygningsreglementet.dk.

Overview of possible Nationally Determined Parameters (NDPs) and Non-Contradictory Complementary Information (NCCI)

The list below identifies the clauses where Nationally Determined Parameters (NDPs) are possible, and whether a national choice has been made, and if an informative annex is applicable or not applicable. Furthermore, clauses providing complementary information (NCCI) are identified in the list below.

Clause	Subject	Nationally Determined Parameters	Non-Contradictory Complementary Information
5.4.3(3)	Minimum extent of field investigation and spacing of investigation locations		Complementary information
6.1(2)	Description and classification of the ground - General		Complementary information
6.1(3)	Description and classification of the ground - General		Complementary information
8.1.1(4)	Strength envelopes and parameters for soils and rocks – General		Complementary information
8.1.2(2)	Strength envelopes and parameters for soils and rocks - strength envelopes for saturated soils and rock		Complementary information
Annex A	Ground Investigation Report	Informative	
Annex B	Suitability and applicability of test methods	Informative with changes in annex B NA	
Annex B NA	Suitability and applicability of test methods	Informative	
Annex C	Desk study and site inspection	Informative	
Annex D	Information to be obtained from ground investigation	Informative	
Annex E	Methods for determining density index and strength properties	Informative with change in annex E NA	
Annex E NA	Methods for determining density index and strength properties	Informative	
Annex F	Methods for determining stiffness and consolidation properties of soils	Informative with change in annex F NA	
Annex F NA	Methods for determining stiffness and consolidation properties of soils	Informative	

Clause	Subject	Nationally Determined Parameters	Non-Contradictory Complementary Information
Annex G	Indirect methods for determining cyclic, dynamic and seismic properties of soils	Informative with change in annex G NA	
Annex G NA	Indirect methods for determining cyclic, dynamic and seismic properties of soils	Informative	
Annex H	Spacing and number of investigation locations	Not applicable	
Annex H NA	Spacing and number of investigation locations	Informative	
Bibliography	References given in permissions (i.e. “may” clauses)		Complementary information
NOTE Unchanged: Recommendations in the Eurocode to be followed. National choice: A National Determined Parameter is chosen and defined. Complementary information: (Non-contradictory) complementary information on how to use the Eurocode. Normative: The Annex shall be used. Informative: The Annex may be used. Not applicable: The Annex cannot be used. No further information: The Eurocode allows further information. No further information is given.			

Nationally Determined Parameters (NDPs) and Non-Contradictory Complementary Information (NCCI)

5.4.3(3) Minimum extent of field investigation and spacing of investigation locations

(NCCI)

NOTE 1 The investigation should normally extend at least down to firm, Late Glacial or older deposits. If this is not feasible, the investigation must reach a depth where deeper soil layers cannot significantly affect the structural safety against failure, nor influence its movement or deformation.

Deposits located beneath firm Late Glacial or older layers are often characterized by favourable strength and deformation properties. Important exceptions include:

- Late Glacial Allerød deposits;
- Interglacial marine and marsh deposits;
- Fissured clay with slickensides (glossy cutting surfaces);
- Clay types with a plasticity index $I_p > 15\%$;
- Calcareous deposits with “sinkholes” (disintegrated/dissolved by percolation of surface water).

NOTE 2 During the geological assessment of collected soil samples or soil layers inspected on site, it shall be ensured that the investigation has identified all significant soil strata, particularly:

- Highly compressible deposits such as topsoil, uncontrolled fill, gyttja, peat, and postglacial clay;
- Highly expansive clay deposits;
- Landslide-prone deposits.

6.1(2) Description and classification of the ground - General

(NCCI)

In both standards EN ISO 14688-1 and EN ISO 14688-2, Section 1 “Scope” states that a detailed subdivision and description may be relevant, which is taken into account here. However, certain provisions in the standards are phrased as “should,” and therefore the following supplements to EN ISO 14688-1 and EN ISO 14688-2 in table 6.a NA and table 6.b NA are provided in accordance with Danish practice for description and classification of the ground as specified in “*A guide to engineering geological sample descriptions*”, DGF-Bulletin 1, Revision 2, 2025, Danish Geotechnical Society.

Table 6.a NA — Complementary information for the application of EN ISO 14688-1

Clause/Ref	Subject	Complementary information
5.1.1, Table 1	Symbols in the “Particle size fractions” column	The symbols indicated (in parentheses) are not commonly used in soil descriptions in Denmark.
5.1.1, Table 1	“Particle size fractions” column	In Danish borehole logs, the main soil type is always listed first and written in capital letters. Furthermore, the terms FILL as well as CLAY TILL, SILT TILL, SAND TILL, and GRAVEL TILL is permitted as main soil type designations in Danish soil descriptions, see [1]
5.1.2.3	Sequence of terms in the description	In Danish borehole logs, the main soil type is always listed first and written in capital letters, see [1].
5.1.3 and A.3.4	Plasticity	For soil descriptions in Denmark, a more detailed classification of plasticity is used than that provided in Table A.1. This includes the categories: “very high plasticity”, “high plasticity”, “medium plasticity”, “low plasticity”, “very low plasticity”, and possibly “non-plastic” cf. [1], Section 6.3.5.
5.1.4	Organic Content	Organic deposits are widespread and exhibit considerable variation in the ratio between inorganic and organic components in the sediment, as well as in the degree of decomposition of the organic material. Therefore, Danish soil descriptions apply a classification of organic soils, cf. [1], Section 7, which should be considered a more detailed version of the system outlined in Section 5.1.4.
5.9.1	Origin of Deposit – General	In Danish soil descriptions, the geological depositional

		environment and geological age should always be specified.
6.1.2	Particle Shape	Due to the typical characteristics of sand and gravel deposits in Denmark, it is only exceptionally necessary to describe particle shape as suggested in Section 6.1.2. Therefore, it is not a mandatory requirement to include these parameters in Danish soil descriptions.
6.1.4	Mineralogy	Similarly, due to the nature of commonly occurring sand and gravel deposits in Denmark, it is only exceptionally necessary to describe their mineralogy as suggested in Section 6.1.4. Thus, these parameters are not mandatory in Danish soil descriptions.
6.1.6	Determination of Consistency	In Danish soil descriptions (in laboratory), consistency of individual samples is generally not reported, as the consistency may have been altered during sampling (typically by cup or auger drilling). Instead, consistency/firmness is assessed based on in-situ strength tests performed in the borehole, with results presented in the borehole log. If high-quality sampling methods are used, where the sample material remains undisturbed, the Danish scale for assessing soil consistency must be applied, cf. [1], Section 2.3.2.2.
[1] A guide to engineering geological sample descriptions, DGF-Bulletin 1, Revision 2, 2025, Danish Geotechnical Society		

Table 6.b NA — Complementary information for the application of EN ISO 14688-2

Clause/Ref	Subject	Complementary information
4.4	Plasticity	In Danish soil descriptions, alternative terminology and a more detailed classification based on the plasticity index (rather than the liquid limit) are used, see Table 6.7 in [1].
4.5	Organic Content	Organic deposits are widespread and exhibit considerable variation in the ratio between inorganic and organic components in the sediment, as well as in the degree of decomposition of the organic material. Therefore, Danish soil descriptions apply a classification of organic soils, cf. [1], Section 7, which should be considered a more detailed version of the system outlined in Section 4.5
[1] <i>A guide to engineering geological sample descriptions</i> , DGF-Bulletin 1, Revision 2, 2025, Danish Geotechnical Society		

6.1(3) Description and classification of the ground - General

(NCCI)

The description and classification of rock must be carried out in accordance with EN ISO 14689. However, certain provisions in the standard are phrased as “should,” and therefore the following to EN ISO 14689 in table 6.c NA are provided in accordance with Danish practice.

Table 6.c NA — Complementary information for the application of EN ISO 14689

Clause/Ref	Subject	Complementary information
5.3	Unconfined Compressive Strength (Table 2)	In Danish core logging, the degree of induration is described using a simplified five-level scale (H1–H5) with corresponding indicative compressive strengths, as specified in [1], Table 2-3.
6.4.3	Discontinuity Spacing (Table 8)	In Danish core logging, fracture spacing is described using a modified six-level scale with revised terminology, as specified in [1], Table 8-1.
[1] <i>A guide to engineering geological sample descriptions</i> , DGF-Bulletin 1, Revision 2, 2025, Danish Geotechnical Society		

8.1.1(4) Strength envelopes and parameters for soils and rocks – General

(NCCI)

Fully developed (plastic) failure may be associated with such large deformations that the corresponding strength parameters can only be defined using strain-dependent failure criteria, taking strain compatibility and the shape of the stress-strain curve into account.

NOTE 1 The guidelines above are particularly relevant for normally consolidated deposits under loading conditions (bearing capacity or passive earth pressure).

NOTE 2 The interpreted strength from geotechnical laboratory tests should be determined with consideration of the strain level. For triaxial tests, a strain range of 0 to 10 % axial strain is commonly used, while for shear tests (Direct Simple Shear), a strain range of 0 to 15 % shear strain should be applied.

8.1.2(2) Strength envelopes and parameters for soils and rocks – Strength envelopes for saturated soils and rock

(NCCI)

Under unloading conditions (e.g., excavation slopes and active earth pressure), an effective cohesion of zero ($c' = 0$) must be assumed for clays of Paleogene origin and for other high plasticity or very high plasticity fissured clays with slickensides (shiny shear surfaces).

With the exception of the above-mentioned clays, effective cohesion in the soil ($c' > 0$) may be considered under unloading conditions, provided that the effective normal stress on the failure plane is positive (i.e., tensile stresses must not be assumed in the drained condition), and the effect of unloading on the effective cohesion is properly evaluated.

Annex B NA Suitability and applicability of test methods

This informative Annex B NA provides following changes to the informative annex B for suitable methods of test in investigation.

B.5 National standard for investigation and laboratory tests: (Adding clauses)

- (2 NA) The Field Handbook (*"Felthåndbogen"*, DGF-Bulletin 14, 1999, Danish Geotechnical Society) describes Danish practice for field investigation.
- (3 NA) The Laboratory Handbook (*"Laboratoriehåndbogen"*, DGF-Bulletin 15, 2001, Danish Geotechnical Society) describes Danish practice for laboratory testing.
- (4 NA) Reference sheet for static plate loading tests (*"Referenceblad for statiske pladebelastningsforsøg"*, 2005, Danish Geotechnical Society) describes Danish practice for static plate loading tests.

Annex E NA Methods for determining density index and strength properties

This informative Annex E NA provides following changes to the informative annex E.

E.2 Scope and field of application (Adding clause):

(2 NA) The empirical formulas given in E.3–E.6 may be applied in Denmark, provided that their assumptions are valid for Danish soil conditions or that their applicability is verified by laboratory and/or field testing on Danish soils.

E.4 Peak effective angle of friction (Correcting clause)

E.4.1 From CPT results

(NCCI)

NOTE Change due to error in Formula (E.1), which is expected to be corrected in a later amendment. (E.1 NA) corrects the error.

(1) Provided the conditions given in (2) are satisfied, the angle of peak effective friction (φ'_p in degrees) may be determined from the results of cone penetration tests (CPTs) using:

$$\varphi'_p = \min \left\{ 11^\circ \log_{10} \left(\frac{q_t/p_a}{\sqrt{\sigma'_{v0}/p_a}} \right) + 17,6^\circ; 45^\circ \right\} \quad (\text{E.1 NA})$$

where

- q_t is the corrected cone resistance as per EN ISO 22476-1 [MPa];
- σ'_{v0} is the vertical effective stress at the measurement location [MPa];
- p_a is atmospheric pressure (approximately 0,1 MPa).

NOTE The relation (E.1 NA) is originally given by Kulhawy, F.H. and Mayne, P.W. (1990) *Manual on Estimating Soil Properties for Foundation Design*. Electric Power Research Institute, Report EL-6800, Project 1493-6, Palo Alto, California.

(2) Formula (E.1 NA) should only be used if the:

- fine content of the soil is less than 20 %;
- soil D₅₀ is less than 40 mm;
- soil mineralogy is consistent mostly of quartz; and
- vertical effective stress σ'_{v0} is less than 1 MPa.

NOTE 1 The standard error associated with Formula (E.1 NA) is 3,2°.

NOTE 2 The data supporting this relationship derive from triaxial compression tests by Ching et al. 2017.

E.4.5 Plane angle of friction (Adding clause):

(1 NA) For plane strain conditions, the angle of effective friction (φ'_{pl} in degrees) of coarse soil may be determined by increasing the triaxial angle of friction using:

$$\varphi'_{pl} = (1 + 0,1 I_D) \varphi'_{tr} \quad (\text{E.a NA})$$

where

I_D is the density index of the coarse soil [-] (see 7.1.6);

φ'_{tr} is the triaxial angle of friction [°];

NOTE This relationship is given by Mortensen, N. (2024) *Drained failures, stress dependency and plane strain effects*. 19th Nordic Geotechnical Meeting, Göteborg.

E.5.5 From FVT results (Adding clause):

(3 NA) In clay and silt, the peak undrained shear strength, c_{up} is often determined by measuring the field vane strength c_{fv} (FVT-F according to DS/EN ISO 22476-9). However, for fissured clay and organic deposits, vane tests generally yield overly high strength values.

(4 NA) In Clay Till $c_{up} = c_{fv}$ can be assumed.

(5 NA) For fissured clay, the strength should typically be determined by other methods (e.g., triaxial tests or plate loading tests), although the peak undrained shear strength is generally not less than $c_{up} \approx \frac{1}{3} c_{fv}$

NOTE This relationship is given by Christensen, N.H. et. al (1959) *Shear strength properties of Skive Septarian clay*, The Danish Geotechnical Institute, Bulletin No 7.

(6 NA) For organic clay and gyttja, the peak undrained shear strength, c_{up} can be approximated by

$$c_{up} = m c_{fv} \quad (\text{E.b NA})$$

where

$$m = \frac{1,2}{1 + 0,01 I_p} \leq 1,0 \quad (\text{E.c NA})$$

c_{up} is the peak undrained shear strength [kPa]

c_{fv} is the field vane strength [kPa]

I_p is the plasticity index [%]

NOTE 1 m is a correction factor based on back-calculations on stability failures of embankments on soft clays that showed, that the mobilized shear strength at failure in general was less than the measured field vane strength, c_{fv} and that m was correlated to the plasticity index, I_p .

NOTE 2 The data supporting this relationship is given by Bjerrum, L. (1972) *Embankments on soft ground* ASCE Specialty Conference on Performance of Earth and Earth-Supported Structures, Purdue University.

(7 NA) For estimating vane strength c_{fv} in clay till based on cone penetration testing (CPT), reference is made to *Correlation of CPT and Field Vane Tests for Clay Tills*, DGF Bulletin 7, 1991, Danish Geotechnical Society.

Annex F NA Methods for determining stiffness and consolidation properties of soils

This informative Annex F NA provides following changes to the informative annex F.

F.2 Scope and field of application (Adding clause):

(2 NA) The empirical formulas given in F.5 may be applied in Denmark provided that their assumptions are valid for Danish soil conditions or that their applicability is verified by laboratory and/or field testing on Danish soils.

Annex G NA Indirect methods for determining cyclic, dynamic, and seismic properties of soils

This informative Annex G NA provides following changes to the informative annex G.

G.2 Scope and field of application (Adding clause):

(2 NA) The empirical formulas given in G.3 and G.4 may be applied in Denmark provided that their assumptions are valid for Danish soil conditions or that their applicability is verified by laboratory and/or field testing on Danish soils.

Annex H NA Spacing and number of investigation locations

This informative Annex H.3 NA provides supplement guidance to 5.4.3 for spacing and number of investigation locations.

H.3 NA Spacing and number of investigation locations

- (1) It is not possible to establish specific minimum requirements for the number of geotechnical investigation points ($N_{\min}$) or the maximum spacing between them ($X_{\max}$).
- (2) For detailed investigations related to structures such as buildings and bridges, the maximum spacing between investigation points ($X_{\max}$) should generally not exceed 15 to 30 meters, depending on the geological and topographical conditions of the area.
- (3) For large individual foundations, such as those for bridges, tanks, silos, wind turbines, and masts, a minimum of 2 to 3 investigation points ($N_{\min}$) per structure should be carried out to allow for assessment of variations in bearing capacity and deformation characteristics.
- (4) For linear infrastructure constructions, such as roads, railways, tunnels, embankments, retaining structures, dams, canals, and pipelines, the spacing between investigation points ($X_{\max}$) should generally range from 20 to 100 meters, depending on the specific structure and the geological and topographical conditions of the area. For this type of construction, the investigation points should be placed sufficiently offset from the centreline, depending on the total width of the structure, to ensure coverage of the zone of influence.
- (5) Reference is also made to EN 1997-1, Section 4.1.2.1 “Zone of influence”, EN 1997-2, Section 5.4 “Planning of preliminary and design investigations”, and EN 1997-3 for guidance on the “Minimum extent of geotechnical investigation” for specific structures and ground water control measures.

Bibliography

(NCCI)

References given in permissions (i.e. “may” clauses)

A guide to engineering geological sample description, DGF-Bulletin 1, revision 2, 2025, Danish Geotechnical Society

Field Handbook, DGF-Bulletin 14, 1999, Danish Geotechnical Society

Laboratory Handbook, DGF-Bulletin 15, 2002, Danish Geotechnical Society

Reference sheet for static plate loading tests. Danish Geotechnical Society, April 2005.