EUROCODE 7 prEN 1997-1:2017

GEOTECHNICAL DESIGN

PART 1 GENERAL RULE

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EUROCODE prEN 1997-1:2017
AGENDA

Agenda:
1. General assessment, prEn 1997
2. Geotechnical Complexity Class and classification
3. Partial factors and importance factor KI
4. Material parameters
5. Ground water
6. Ground properties
7. Conclusion
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GENERAL ASSESSMENT

- Eurocode 7 – Geotechnical Design
  - Part 1: General Rule
  - Part 2: Ground Investigations and Testing (Pending)
  - Part 3: Geotechnical Structures (Pending)

- “Political” & “Legal” document
  - requirement to design, check, supervision, reporting and documentation

- Time consuming and costly
  - new requirement and little distinction between large and small projects

- Partial factors and importance factor KI
  - increased partial factors and K-factors

- Groundwater
Classification of design based on:
- Consequence class
- Geotechnical complexity class

**Table 4-1: Preliminary selection of Geotechnical Complexity Class**

<table>
<thead>
<tr>
<th>Geotechnical Complexity Class</th>
<th>Complexity Level</th>
<th>General characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCC 1</td>
<td>Low</td>
<td>All the following apply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• uniform ground conditions and standard construction technique</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• isolated direct foundations are systematically applied in the zone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• well established design methods available for the local conditions and the planned construction technique</td>
</tr>
<tr>
<td>GCC 2</td>
<td>Medium</td>
<td>One of the following applies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• uniform ground conditions and standard construction techniques based on efficient local experience</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• uniform ground conditions and advanced construction techniques, related local experience available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>And the following applies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• moderate thickness of made ground</td>
</tr>
<tr>
<td>GCC 3</td>
<td>High</td>
<td>Any of the following applies</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• difficult soils (e.g. bogs, peat, marshes, quick clay)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• high thickness of made ground</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• sliding ground</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• steeply sloping ground</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• high geometric variability (e.g. residual granular profiles, cavities)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• high sensitivity to ground water conditions e.g. expansive soils</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• high complexity of the ground-structure interaction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• little experience with calculation models for the current situation</td>
</tr>
</tbody>
</table>

**Table B1: Definition of consequence classes**

<table>
<thead>
<tr>
<th>Consequences Class</th>
<th>Description</th>
<th>Examples of buildings and civil engineering works</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC3</td>
<td>High consequence for loss of human life, or economic, social or environmental consequences very great</td>
<td>Grandstands, public buildings where consequences of failure are high (e.g. a concert hall)</td>
</tr>
<tr>
<td>CC2</td>
<td>Medium consequence for loss of human life, economic, social or environmental consequences considerable</td>
<td>Residential and office buildings, public buildings where consequences of failure are medium (e.g. an office building)</td>
</tr>
<tr>
<td>CC1</td>
<td>Low consequence for loss of human life, and economic, social or environmental consequences small</td>
<td>Agricultural buildings, buildings where people do not normally enter (e.g. storage buildings), greenhouses</td>
</tr>
</tbody>
</table>
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GEOTECHNICAL COMPLEXITY CLASS

Classification of:
Consequence Class, CC
Geotechnical Complexity Class, GCC

Ground investigation class, GIL
Validation Level, VL
Design Quality Level, DQL
Design Supervision Level, DSL
Characteristic Assessment Level, kAL
Execution class, EXC

Supervision level, SL
Inspection Level, IL
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GEOTECHNICAL COMPLEXITY CLASS AND CLASSIFICATION

• Execution Class and Inspection level

• Supervision and Inspection:
  EXC2 – SL2: Independent supervision 2
  EXC2 – IL2: Independent inspection 2
  -> no involvement by Employers or Contractors designer

Table 11-1: Selection of Execution Class (EXC) according to the Consequence Class and Geotechnical Complexity Class

Table 11-2: Supervision and Inspection Levels for different Execution Classes

Table B1 - Definition of consequences classes
Example:

- Ordinary piled foundation, and
- Limited made ground and 1 m gytje/organic soil

KI < 1: Allowed in DK?
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**PARTIAL FACTORS AND IMPORTANCE FACTOR KI**

**DS/EN 1997-1**

**prEN 1997-1:2017**

**DS/EN 1997-1**

**DK-NA:2015**

**NA:2015**

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**Parameter/Factor/symbol**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expression from EN 1990 to use</td>
<td>1.35 KI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Porous action**
- **Geotechnical**

**Soil strength (drained)**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td></td>
</tr>
</tbody>
</table>

- **Bearing capacity**
- **Axial capacity**

**General failure (FEM/FDM/slide way)**

- **All geotechnical structures**

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**Further guidance given in EN 1997-3**

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**Table of partial factors for geotechnical structures**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Symbol</th>
<th>Definition</th>
<th>Value</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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MATERIAL PARAMETERS

Material parameters

- Relevant for EN 1997-1?
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GROUNDWATER

Groundwater

- Rules and recommendations
- Characteristic and design

6 Groundwater
6.1 General
6.1.1 Design consideration
6.1.2 Density
6.1.3 Chemistry
6.2 Water levels
6.3 Groundwater pressures
6.3.1 General
6.3.2 Characteristic values of groundwater pressures
6.3.3 Design values of groundwater pressures for ultimate limit state design
6.3.4 Design values of groundwater pressures for serviceability limit state design
6.4 Groundwater in freezing conditions
Ground properties – Annex F

- Not a part of codes such as EN 1997
- Might end as the guidelines (read “correct” values as in Teknisk Ståbi)
- Derives ground properties:
  - publish by national geotechnical societies
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CONCLUSION

Conclusion:

- Many new sections and changes/updates
- Difficult to evaluate when part 2 and 3 not known
- Geotechnical Complexity Class
- Partial factors and importance factor KI
- Groundwater included / updated
- Time consuming and costly

- New Danish National Annex necessary
Thank you