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Consultants AB

# IMPLEMENTERING AV 2:A GENERATIONENS EUROKOD INOM BERG

Catrin Edelbro, Itasca Consultants AB

## Introduktion (I)

EN 1990

Eurocode Basis of structural design

- EN 1991 Actions on structures
- EN 1992 Concrete structures
- EN 1993 Steel structures
- EN 1994 Composite structures
- EN 1995 Timber structures
- EN 1996 Masonry structures
- EN 1997 Geotechnical design
- EN 1998 Earthquake resistance
- EN 1999 Earthquake resistance

~~Säkerhetsfaktor, SF~~

Gränstillstånd – Bruks- och brottgräns

1:a generationen Eurokod 7



**Europa**
(European Committee for Standardization Technical Committee)
CEN TC

Subcommitte Geotechnical design
CEN/TC 250/SC7

## 2:a generationen av Eurokod

**Gällande Eurokod** → **2:a generationen Eurokod**

**EN 1997-1:2004** → **EN 1997-1:202X Geotechnical design – Part 1: General rules**

**EN 1997-2:2007** → *Ground Model* → **EN 1997-2:202X Geotechnical design – Part 2: Ground properties**

**EN 1997-3:202X Geotechnical design – Part 3: Geotechnical structures**



## Vägen framåt?



40 YEARS ANNIVERSARY

# Introduktion (I)

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1:a generationen Eurokod 7

# Introduktion (II)

I Eurokoden generaliseras:

Last som effect of actions

Hållfasthet/bärförmåga som resistance

Gränstillstånd –
Bruks- och brottgräns




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# Introduktion (III)

EN 1990

Eurocode Basis of structural design

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- EN 1997 Geotechnical design
- EN 1998 Earthquake resistance
- EN 1999 Earthquake resistance


1:a generationen Eurokod 7

# Introduktion (IV)

EN 1990

Eurocode Basis of structural & geotechnical design

EN 1997 Geotechnical design → ?

2:a generationen Eurokod 7

**Europa**
(European Committee for Standardization Technical Committee)
CEN TC

Subcommitte Geotechnical design
CEN/TC 250/SC7

Joint Research centre (JRC)

**Europa**
(European Committee for Standardization Technical Committee)
CEN TC

Subcommitte Geotechnical design
CEN/TC 250/SC7

Rock Engineering Platform

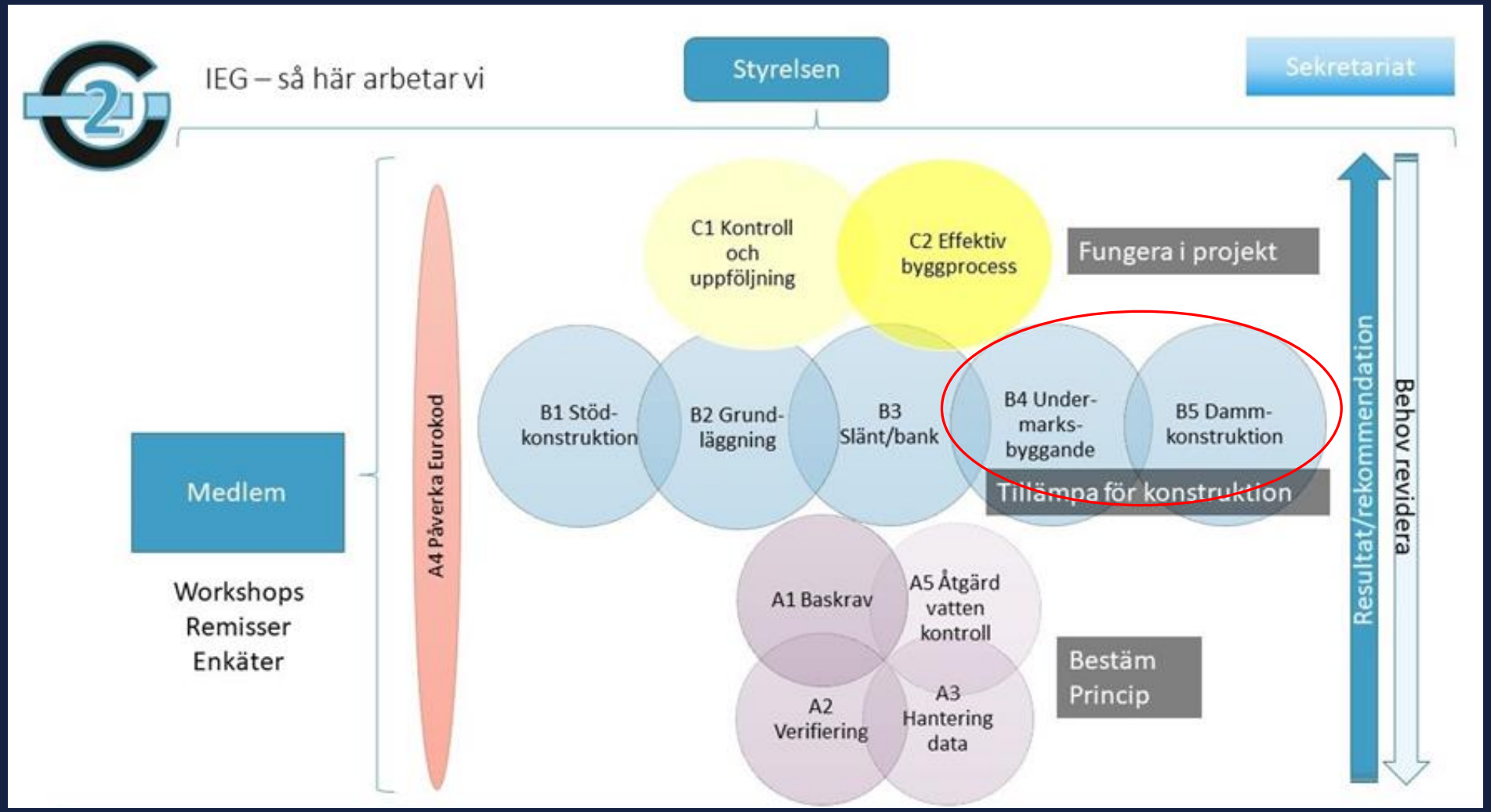
**Europa**
(European Committee for Standardization Technical Committee)
CEN TC

Subcommitte Geotechnical design
CEN/TC 250/SC7

**Sverige**
Implementeringskommission för Europastandarder inom Geoteknik (IEG) 2.0

**Sverige**
Svensk standardisering
(SIS TK183)

# IEG 2.0



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# 2:a generationen av Eurokod

**Gällande Eurokod** → **2:a generationen Eurokod**

**EN 1997-1:2004** → **EN 1997-1:202X Geotechnical design – Part 1: General rules**

**EN 1997-2:2007** → *Ground Model* → **EN 1997-2:202X Geotechnical design – Part 2: Ground properties**

**EN 1997-3:202X Geotechnical design – Part 3: Geotechnical structures**

# 2:a generationen av Eurokod

**Gällande Eurokod** → **2:a generationen Eurokod**

*including temporary geotechnical structures*

*Zone of influence, Geotechnical Complexity Class, Consequence of failure*

**EN 1997-1:2004** → **EN 1997-1:202X Geotechnical design – Part 1: General rules**

*Ground Model*

**EN 1997-2:2007** → **EN 1997-2:202X Geotechnical design – Part 2: Ground properties**

*Ground water control*

**EN 1997-3:202X Geotechnical design – Part 3: Geotechnical structures**

# 2:a generationen av Eurokod

**2:a generationen Eurokod**

| | |
|---|---|
| *Risk model* | **EN 1997-1:202X Geotechnical design – Part 1: General rules** |
| *Ground Model*<br>*Ground investigation report*<br>*Geotechnical design report*<br>*Parameter derivation* | **EN 1997-2:202X Geotechnical design – Part 2: Ground properties** |
| *Specific rules*<br>*Caclulation models* | **EN 1997-3:202X Geotechnical design – Part 3: Geotechnical structures** |

# 2:a generationen av Eurokod

**2:a generationen Eurokod**

**EN 1997-1:202X Geotechnical design – Part 1: General rules**

*Risk model*

**Table 4.1(NDP) – Selection of Geotechnical Complexity Class**

| Geotechnical Complexity Class | Complexity | General features |
|---|---|---|
| GCC 3 | Higher | Any of the following apply:<br>• considerable uncertainty regarding ground conditions<br>• highly variable or difficult ground conditions<br>• significant sensitivity to groundwater and surface water conditions<br>• significant complexity of the ground-structure interaction |
| GCC 2 | Normal | GCC2 applies if features of GCC 1 and GCC3 are not applicable |
| GCC 1 | Lower | All the following conditions apply:<br>• negligible uncertainty regarding the ground conditions<br>• uniform ground conditions<br>• low sensitivity to groundwater and surface water conditions,<br>• low complexity of the ground-structure-interaction |
| NOTE: The terms 'considerable', 'significant', 'highly' etc. are relative to any comparable experience that exists for the particular geotechnical structure, design situation, and ground conditions. | | |

**Table 4.2(NDP) – Relationship between Geotechnical Category, Consequences Class, and Geotechnical Complexity Class**

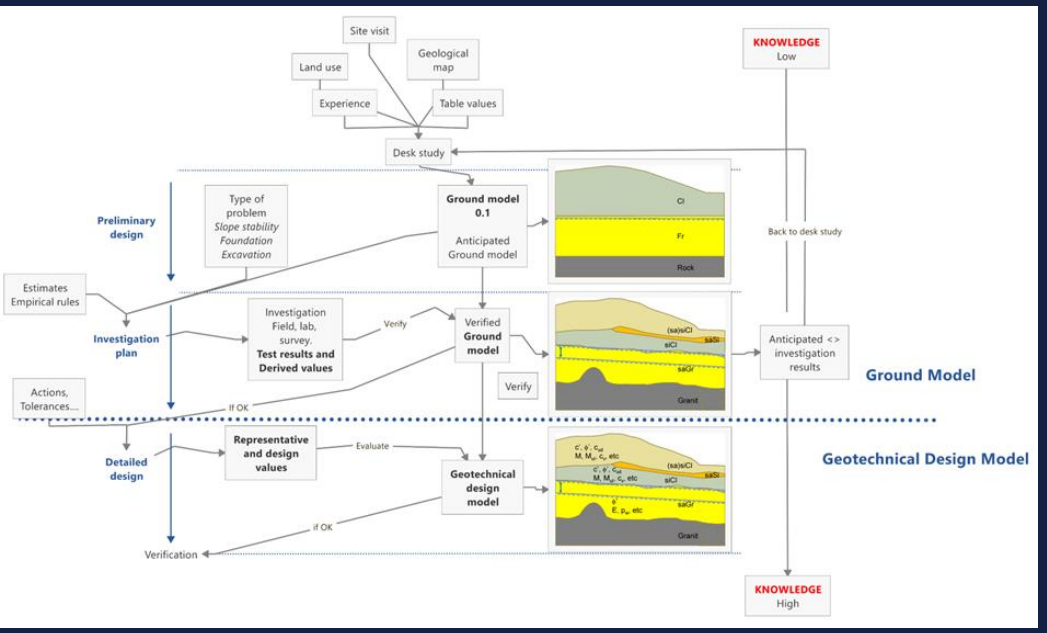
| Consequence Class (CC) | Geotechnical Complexity Class (GCC) | | |
|---|---|---|---|
| | Lower (GCC1) | Normal (GCC2) | Higher (GCC3) |
| Higher (CC3) | GC2 | GC3 | GC3 |
| Normal (CC2) | GC2 | GC2 | GC3 |
| Lower (CC1) | GC1 | GC2 | GC2 |

**Table 4.3(NDP) – Examples of geotechnical structures in different Consequence Classes**

| Consequence class | Description of consequence | Examples |
|---|---|---|
| CC4 | Highest | – Critical infrastructures;<br>– Geotechnical structures whose integrity is of vital importance for civil protection;<br>– Areas with significant landslide hazards. |
| CC3 | Higher | – Retaining walls and foundations supporting public buildings, with high exposure;<br>– Man-made slopes and cuts, retaining structures with high exposure;<br>– Major road/railway embankments, bridge foundations that can cause server interruption of service in emergency situations;<br>– Geotechnical structures with a primary navigational function;<br>– Underground constructions with large occupancy. |
| CC2 | Normal | All geotechnical structures not classified as CC1, CC3, or CC4 |
| CC1 | Lower | – Retaining walls and foundations supporting buildings with low occupancy;<br>– Man-made slopes and cuts, in areas where a failure will have low impact on the society;<br>– Minor road/railway embankments not vital for the society;<br>– Underground constructions with occasional occupancy. |
| CC0 | Lowest | Not applicable for geotechnical structures |

Relevanta exempel för berg?

# 2:a generationen av Eurokod




Continuously evolved as design and construction proceeds

**2:a generationen Eurokod**

**Table 5.1. Minimum amount of Ground Investigation for different Geotechnical Categories**

| Geotechnical Category | Minimum amount of Ground Investigation |
|---|---|
| GC3 | All items given below for GC1, GC2 and, in addition:<br>– sufficient investigations to capture the variability of the ground;<br>– sufficient investigations to capture the relevant properties for all geotechnical units using more than one ground investigation method;<br>– sufficient investigations to capture the scatter of the properties of each geotechnical unit |
| GC2 | All items given below for GC1 and, in addition:<br>– sufficient investigations to identify all geotechnical units in the zone of influence;<br>– determination of relevant ground properties by field and laboratory testing and by monitoring. |
| GC1 | All items given below:<br>– desk study of the site, review of comparable experience;<br>– site inspection. |

*Ground Model*
*Ground investigation report*
*Geotechnical design report*
*Parameter derivation*

**EN 1997-2:202X Geotechnical design – Part 2: Ground properties**



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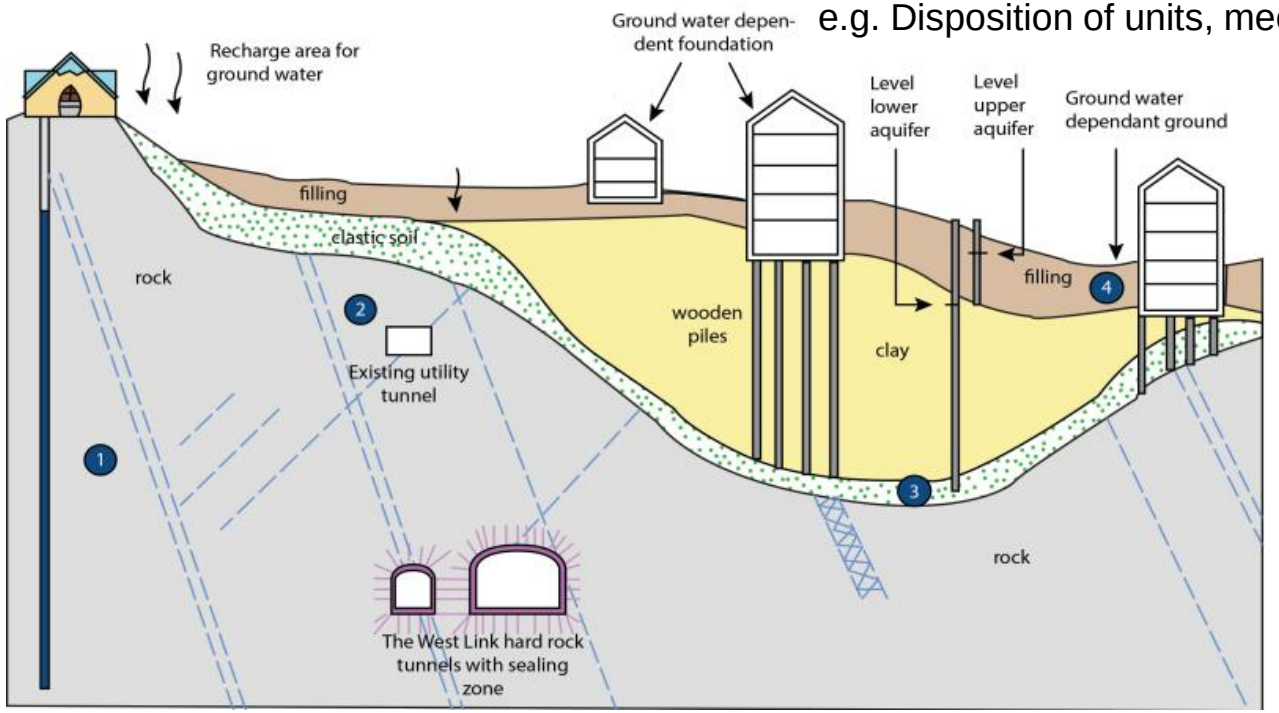
# Ground model

- Considers:

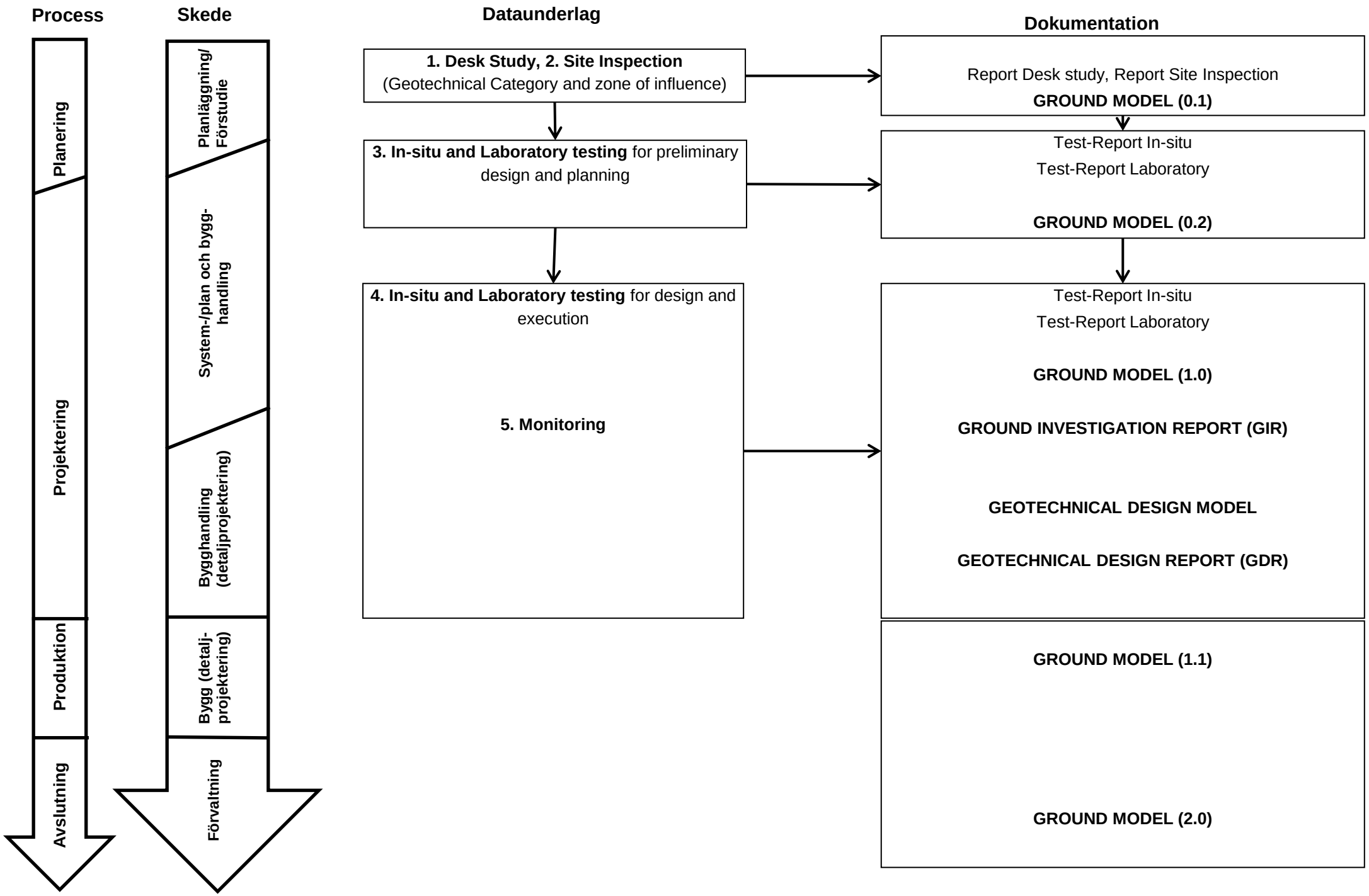
Hydrogeological condition
e.g. surface, groundwater and piezometric levels, variation with time.




Geotechnical condition
e.g. Disposition of units, mechanical behaviour

Geological condition
e.g. site geomorphology, the lithology of the geotechnical units, rockhead, geometrical and geotechnical properties of discontinuities and weathered zones

- Includes derived values of relevant ground properties and consider variability and uncertainty of properties.


Process
Skede
Dataunderlag
Dokumentation
Planering
Projektering
Produktion
Avslutning
Planläggning/ Förstudie
System-/plan och bygg-handling
Bygghandling (detaljprojektering)
Bygg (detalj-projektering)
Förvaltning
1. Desk Study, 2. Site Inspection
(Geotechnical Category and zone of influence)
3. In-situ and Laboratory testing for preliminary design and planning
4. In-situ and Laboratory testing for design and execution
5. Monitoring
Report Desk study, Report Site Inspection
GROUND MODEL (0.1)
Test-Report In-situ
Test-Report Laboratory
GROUND MODEL (0.2)
Test-Report In-situ
Test-Report Laboratory
GROUND MODEL (1.0)
GROUND INVESTIGATION REPORT (GIR)
GEOTECHNICAL DESIGN MODEL
GEOTECHNICAL DESIGN REPORT (GDR)
GROUND MODEL (1.1)
GROUND MODEL (2.0)

# 2:a generationen av Eurokod

**2:a generationen Eurokod**

Giltig för bergslänter men inte för undermarksbyggande.
Finns inget om bergtunnlar ännu i den reviderade koden.

*Specific rules*
*Caclulation models*

**EN 1997-3:202X**
**Geotechnical design – Part 3: Geotechnical structures**



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# 2:a generationen av Eurokod

**2:a generationen Eurokod**

Ska kunna fungera på alla typer av bergkonstruktioner

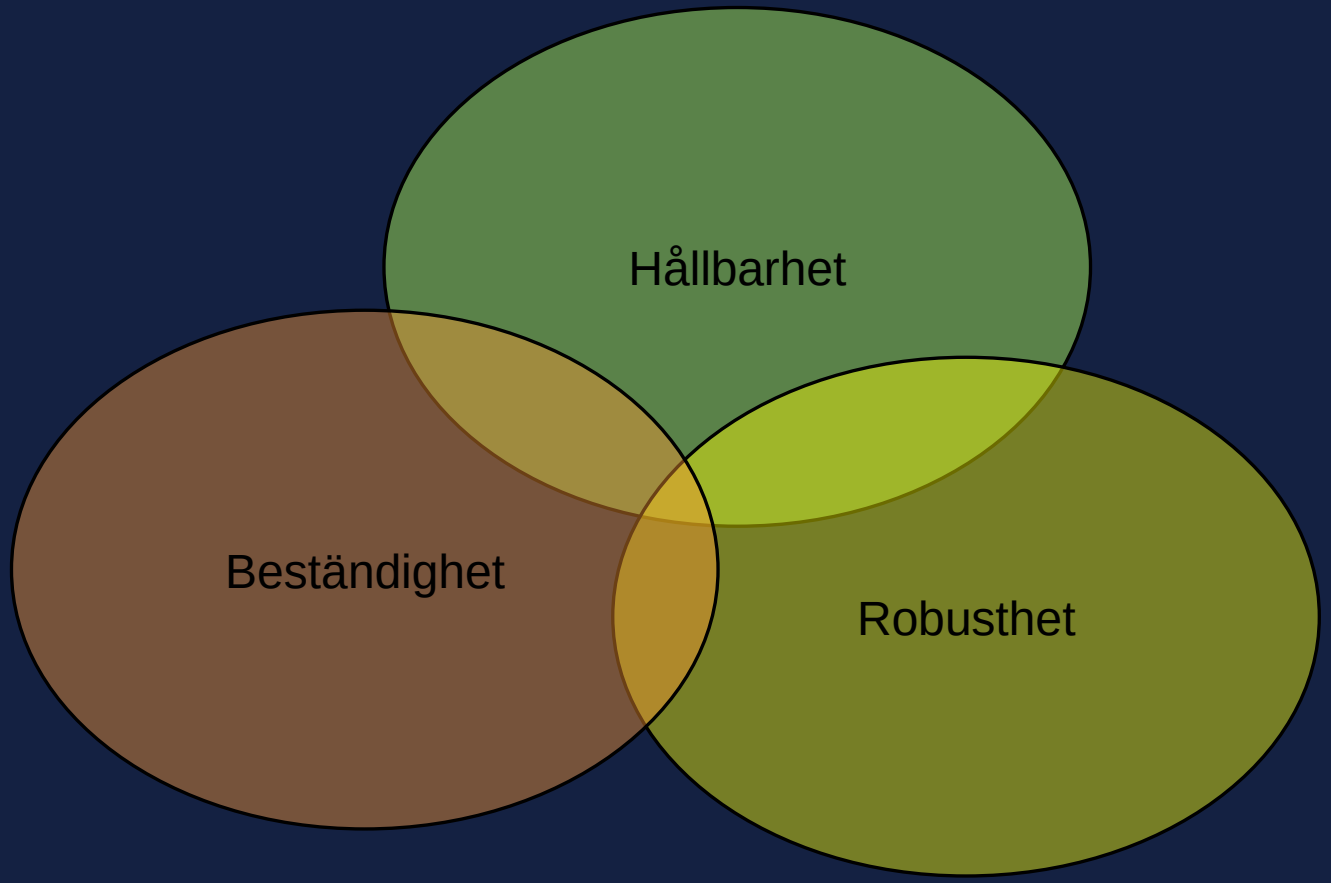
**EN 1997-1:202X Geotechnical design – Part 1: General rules**

**EN 1997-2:202X Geotechnical design – Part 2: Ground properties**

Ska kunna fungera på bergslänter men inte bergtunnlar och bergrum.

**EN 1997-3:202X Geotechnical design – Part 3: Geotechnical structures**

# Fokus och nya begrepp i 2:a generationens Eurokod



# Omgivningspåverkan

## Fiskar varnas via sms om sprängningar

Av: TT

PUBLICERAD: 8 FEBRUARI | UPPDATERAD: 9 FEBRUARI

# Vägen framåt?

# Varför engagera sig i revideringen av Eurokod?

- På Europanivå driver man på implementeringen av Eurokod för bergtunnlar.

- Om det nationellt beslutas att vi ska använda koden – vill vi då inte ha varit med och påverkat den?

# … och då blir frågan

- Hur tar sig bergbranschen som helhet an implementeringen av Eurokod?
  - På vems bord? Flera stafettpinnar med olika mål?
  - Alla kunniga eller ett fåtal (kanske subjektiva) bergexperter?
  - Obetald arbetsuppgift?! Finns det en vilja att ställa upp? Finns det då samma förutsättning för små till stora företag att påverka implementeringen?
  - Bara jordfrågor som stärks inom IEG2.0 arbetet? Så varför ska bergare vara med?
  - Ska vi bergare främst påverka på Europanivå eller Sverigenivå?
  - Kan forskning underlätta implementeringen?
  - Gruva och energi – räknas det till Eurokodens infrastruktur?

# Tack för mig!

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