Present and Future of the Eurocodes

Gerhard Breitschaft
Vice-Chairman
CEN/TC 250
Agenda

1. Introduction
2. Present Situation
3. Structure of CEN/TC 250
4. Evolution of Structural Eurocodes
5. Future developments
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Introduction

- **Objective today is to provide an overview on the present situation about the Eurocodes, on recent developments and future plans**
- **To support the adoption and implementation of the Eurocodes in the Balkan Region**
- **Non-technical presentation**
Introduction

• The construction industry is hugely significant to the European economy. It is generally accepted that it accounts for some 6-7% of total European Gross Domestic Product and employs approaching 15 million people.

• Analysis reported by the European Commission in impact assessment SEC (2008) 1900 has identified the total annual value of the European construction market as over 1,800 €Billion, with design services making up 75 €Billion
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Present situation

- Agreed on all over Europe
- technically up-to-date
- comprehensive

Uniformity in working procedures shall be made possible for planners, performers and building owners in Europe.

The best available design standards
Present situation

Harmonized European product standards (hENs) shall bindingly be respected via the Construction Products Regulation

Whether the Eurocodes must be applied, will have to be decided by the Member States, because they are responsible for the erection of safe construction works.

Legal implementation of Eurocodes in some Member States.
National standard bodies withdraw conflicting national standards
Present situation since 20 years

The ENV versions of the Eurocodes have been applied for concrete construction, steel construction, composite construction and timber construction for years in parallel with the national standards.

Sony Center in Berlin, Designed in the 1990th according to Eurocodes (ENV) Opening 2000
Present situation \textit{EN1990, EN1991, EN1998}

Basis of structural Design

\textit{EN 1990,}

Actions on Structures


Design of structures for earthquake resistance

Present situation

Concrete Structures

EN 1992-1-1,
EN 1992-1-2,
EN 1992-2,
Present situation

Steel structures

EN 1993-1-1,
EN 1993-1-2,
EN 1993-1-3,
EN 1993-1-4,
EN 1993-1-5,
EN 1993-1-6,
EN 1993-1-7,
EN 1993-1-8,
EN 1993-1-9,
EN 1993-1-10,
EN 1993-1-11,
EN 1993-1-12,
EN 1993-2,
EN 1993-3-1,
EN 1993-3-2,
EN 1993-4-1,
EN 1993-4-2,
EN 1993-4-3,
EN 1993-5,
EN 1993-6.
Present situation

Composite Structures

EN 1994-1-1,
EN 1994-1-2
Present situation

Timber Structures
EN 1995-1-1,
EN 1995-1-2,
EN 1995-2
Present situation

Masonry Structures

EN 1996-1-1,
EN 1996-1-2,
EN 1996-2
EN 1996-3
Present situation

Geotechnical Design
EN 1997-1,
EN 1997-2
Present situation

Aluminium Structures
EN 1999-1-1,
EN 1999-1-2,
EN 1999-1-3,
EN 1999-1-4,
EN 1999-1-5.
Present situation

- EN 1990, 1 part, 76 pages
- EN 1991, 10 parts, 779 pages
- EN 1992, 4 parts, 477 pages
- EN 1993, 20 parts, 1471 pages
- EN 1994, 3 parts, 339 pages
- EN 1995, 3 parts, 247 pages
- EN 1996, 4 parts, 276 pages
- EN 1997, 2 parts, 374 pages
- EN 1998, 6 parts, 595 pages
- EN 1999, 5 parts, 585 pages

∑ 58 parts, 5219 pages

(without National Annexes)
### Present situation

Sometimes a little tricky
Present situation

**Ease of Use**

- *Is it a matter of number of pages only?*
- *How much simplification should be made in the standards without important methods and insights getting lost?*
- *Shall only basics and principles be stated in the standards?*
- *How many (textbook-like) explanations are necessary in standards?*
- *Can complicated coherences also be presented simpler?*
- *Are constructive and arithmetical details required in standards - and, if so, for each special case?*
- *Do we have sufficient creative freedom for well-trained engineers?*
- *Shall the standard cover every complicated construction or is it enough if only 80% of the constructions can be calculated with that?*
Present situation

- Are, in principle, several alternative design possibilities to be provided for?
- Will another (an old) safety concept be required, in order to make the Eurocodes easier?
- Are all specifications really already state of the art or have some been taken over from the research sector without sufficient practical experience?
- Are calculated results stable in respect to the rough reality on site?
- Do we need easy formulas for calculations without computer programs?
- Is it necessary to see the mechanical background behind formulas?
- How many NDPs are really required in order to consider national characteristics?
Present situation

All in all approx. 1500 parameters to be determined nationally (NDP)

24% for Eurocode 1,
15% for Eurocode 2 and
28% for Eurocode 3

Many of the NDPs and the many alternatives when calculating, are justified by lacking harmonization.

But they allow to guarantee any possible safety level for each country.

The big number of NDP was necessary to get acceptance to this first generation of the Eurocodes in all countries implementing them.
Present situation

Comparison of NDPs in EN 1992-1-1
done by A Ignatiadis, DAfStb
Present situation

Potential of harmonization of NDPs in EN 1992-1-1 (27 countries analysed)

- **E**: 5 (4%)
  - Harmonization very difficult

- **A**: 8 (6%)
  - Harmonization with classes possible

- **B**: 23 (18%)
  - Good chance for harmonization

- **C**: 48 (38%)
  - Harmonization by fixing value

- **D**: 44 (34%)
  - Harmonization maybe possible (fixed or classes)

Comparison of NDPs in EN 1992-1-1 done by A Ignatiadis, DAfStb
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Newest Developments in Organisation of TC250

- Appointment of new Chairman Steve Denton UK,
- Vice Chairmen Michael Fardis GR, Gerhard Breitschaft DE
- Management Group
- Advisory Panels
### TC 250 Structural Eurocodes

- **Chairman:** S Denton
- **Vice Chairmen:** G Breitschaft, M Fardis
- **Secretary:** T Wilkins [BSI]
- **CEN PM:** Gonçalo Ascensão

### SC/WG for Existing Eurocodes

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### TC 250 Coordination Group

- **Chairman:** S Denton
- **Secretary:** T Wilkins [BSI]

#### Horizontal Group Bridges
- **Convenor:** S Denton*

#### Horizontal Group Fire
- **Convenor:** B Zhao

#### Other WG

- **WG2 – Existing Structures**
  - **Convenor:** P Lüchinger [SNV]

- **WG3 – Structural Glass**
  - **Convenor:** M Feldmann [DIN]

- **WG4 – Fibre reinforced polymer**
  - **Convenor:** L Ascione [UNI]

- **WG5 – Membrane Structures**
  - **Convenor:** M Mollaert [NBN]

- **WG6 – Robustness**
  - **Convenor:** R Van der Pluijim [NEN]
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Evolution of Structural Eurocodes

- European Commission (EC) issues programming mandate M/466 EN to CEN in May 2010
- Response was issued to EC in June 2011
- EC issued specific mandate M/515 EN in Dec 2012
- Technical response prepared, issued to EC in May 2013: ‘Towards a second generation of EN Eurocodes’
- Technical response agreed, contractual quotation in preparation
Response to mandate M/515 EN

- **Detailed document prepared by TC 250**
- **Defines detailed work programme**
- **Explains how work will be done**
- **138 pages**
Annex 1

TCEN1990

Response to Mandate M/515 EN: Structural Eurocodes

Task Ref: TCEN1990.11
Task Name: Evolution of EN1990 – General

Proposed Task Phase: P1
Deliverable: A new version of EN 1990 with an increased scope reflecting new ideas identified by National Standard Bodies and the other Eurocodes, together with background information for all changes and new material, excluding new version of Annex A2 for bridges and new Annex E relating to bearings and expansion joints.

Outline Task Scope:
Revision of EN 1990 to incorporate comments from the EN 1990, 5 year review and requirements from other Eurocodes for principle guidance on fatigue, non-linear analysis etc with the Specific Mandate Section 5 from Mandate for amending existing Eurocodes and extending the scope of structural Eurocodes (Document Dec.28/2012 – EN, Brussels, 13th November 2012). Scope does not include specific work relating to Bridges which is included in Task TCEN1990.T2.

Starting documents:
EN 1990: Basis of Structural Design

Justification for inclusion in Phase 1:
EN 1990 is the head Eurocode, setting the rules for achieving safety, serviceability, robustness and durability as well as Reliability and Quality Management for the other 57 parts of the Structural Eurocode suite and CEN structural product standards. It is the cornerstone for all other Structural Eurocodes and serves as a template for the development of new parts as well as revision of existing standards. The items identified by the CEN/TC250/Expert Group for the revision of EN 1990 described in this proposal have been developed collaboratively with a representative cross section of stakeholders and need to be given priority. The selected task will further support and strengthen harmonisation, the development of an EU Internal Market in the design and construction sector. The working takes into account market and research developments in materials, production, construction techniques and design methods in the sector. It also reflects new societal needs and demands as linked to structural design of buildings and other construction works. Therefore EN 1990 as the head code needs to be updated at the earliest convenience so as to form a basis for the work of the other sub-committees. As full a draft as possible must be made available at end of Phase 1.

Sub-task Ref. Sub-task name Brief description, background and reasons for the work (including any additional comments / notes) Interdependencies Key benefits Output Priority item for EC contract

1 Reduction in number of National Choices (NDPs) Review the contents of all Countries’ National Annexes and supporting documents, where they provide information needed to implement the Eurocode Part. Compare the values or choices made by all Countries in their relevant National Annex, using if possible, the JRC database of collected National values and choices. Where little or no variation exists between Countries, eliminate the NDP, where there is good consensus, but not unanimity, seek to persuade those not using that value or choice to adopt it. In cases of widespread variation between Countries, seek the reasons for them and try to eliminate them so their consensus can be achieved, for example by use of international studies and research.

2 Enhanced ease of use Enhance ease of use by improving, clarifying, simplifying routes through the Eurocode, avoiding or removing rules of little practical use in design and avoiding additional and/or empirical rules for particular structure or structural element types, all to the extent that it can be technically justified whilst safeguarding the core of essential technical requirements. Take into account feedback from users of the Eurocode.

3 Transfer of Basis of Design rules from EN 1991-1-4, EN 1991-3, EN 1993-3-1 and EN 1993-3-2 and EN 1995-1-1 Transfer of Basis of Design rules from EN 1991-1-4, EN 1991-3, EN 1993-3-1 and EN 1993-3-2 and EN 1995-1-1. These parts include factors that will be moved to EN 1990, to ensure consistency with general rules and harmonisation. (NB: this is a maintenance activity no resources have been allowed for this).

4 Evolution of management of structural reliability of construction works (Annex B) Adopt EN 1990 by establishing and implementing control procedures for design and execution in agreement with the principles of the standard, on a national level, recognizing differences between the various countries. Making Annex B of EN 1990 more comprehensive by increasing its scope to construction works with higher consequences of failure than Consequence Class C3 and recognising compliance of designing. Improving alignment with Execution Standards (EN 1090 and EN 13870) and appropriate material Eurocodes.

5 Robustness Review and update as necessary the requirements for Robustness in Section 2 of EN 1990 in light of recent published cost (COST Action TU0601. 2011) report. It is expected that work will also include moving some information from EN 1990 to EN 1997 and further developing these rules. This will be in liaison with WGs: Robustness.

6 Sustainability Update EN 1990 to include aspects of sustainability relevant to the scope of the Eurocodes, responding to the relevant requirements for Sustainability B of EN 1990 more comprehensively by increasing its scope to construction works with higher consequences of failure than Consequence Class C2 and recognising compliance of designing. Improving alignment with Execution Standards (EN 1090 and EN 13870) and further developing these rules. This will be in liaison with WGs: Robustness. SC1, 14 EN 1990.

All work to provide information completed
All Basis of Design information will be in EN 1990 thus avoiding mixed responsibilities that can lead to inconsistency.


1990 as the head code needs to be updated first so as to form a basis for the work on reliability differentiation of the other SCs and WGs and CEN Committees developing Execution Standards

EN 1990 as the head code needs to be updated first so as to form a basis for the work of the other SCs and WGs.

EN 1990 will address the new Requirement for the “Sustainable use of natural resources” in particular as it addresses durability in the CPR.

New and modified clauses in EN 1990.

Key benefits: Interdependencies: Output: Priority item for EC contract: Yes Yes Yes Yes Yes Yes

File name: EN1990 Template 3 draft 4.0 Draft/Final version of: 26/04/2013 TC EN 1990 – page: 1 of 3

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A DOP M T R OF T H E
5-6 December, 2013

File name: SC1 Template 3 draft 4.0 Draft/Final version of: 26/04/2013 SC1 – page: 1 of 14

File name: EN1990 Template 3 draft 4.0 Draft/Final version of: 26/04/2013
### Annex 3.1

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### Project

**Main Project Team work**

- Finalization by relevant SC/WG
- Interdependent activities
- Interrelated activities

**Preliminary Project Team activity awaiting other tasks**

- Finalization by relevant SC/WG
- Interdependent activities
- Interrelated activities

**Maximum extension of activity**

- Preliminary Project Team activity awaiting other tasks
- Main Project Team work
- Finalization by relevant SC/WG
- Interdependent activities
- Interrelated activities

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**ADOPTION OF THE EUROCODES IN THE BALKAN REGION**

5-6 December, 2013

Draft 4.0 - April 2013
Agenda

1. Introduction
2. Present Situation
3. Structure of CEN/TC 250
4. Evolution of Structural Eurocodes
5. Future developments
Future Developments

The Eurocodes are like a huge buffet...
Future Developments

...prepared by various very good chiefs...
Future Developments

...for many different guests.
Future Developments

Some of the code users like it ...

...very delicious and don’t fear complications
Future Developments

Some of our users like only easy codes

Simple but tasty
Vision for future Developments

- *Enhance ‘ease of use’ is a key priority*
- *Greater harmonisation – reduction in NDPs*
- *Some extension of scope*
  - New Eurocodes
  - New Parts
  - New Content
Future Developments

“Benefits

The benefits of the Structural Eurocodes include: providing a common understanding regarding the design of structures between owners, operators and users, designers, contractors and manufacturers of construction products; facilitating the exchange of construction services between Member States; providing a common basis for research and development in the construction sector; allowing the preparation of common design aids and software; and increasing the competitiveness of the European civil engineering firms, contractors, designers and product manufacturers in their world-wide activities.”
Business Plan

“Priorities
This work includes the development of a new Structural Eurocode on Glass and revisions to the existing codes to cover:

improving the ease of use of the Eurocodes, particularly for day-to-day calculations,
increased harmonisation through a reduction in National Determined Parameters, or convergence of values used,
aspects of the assessment, re-use and retrofitting of existing structures,
strengthening of the requirements for robustness.

The work programme also includes the incorporation of ISO Standards for atmospheric icing and actions from waves and currents on coastal structures in the Eurocodes family, and the steps towards the development of new Eurocodes on membrane structures and structural applications of Fibre Reinforced Polymers (FRP).”
## Business Plan

**Impact**

User confidence in Eurocodes retained as they remain state-of-the-art documents

Improved efficiency of design processes and reduced barriers to entry through enhanced user friendliness

**Benefit**

This is an essential underpinning requirement for the Eurocodes to remain credible standards of the highest reputation, promoting confidence in their use within Europe and adoption elsewhere around the world. Increased user-friendliness in comparison with the first generation of Eurocodes will reflect best practice in standards development.

The design market has an annual worth of 75€Billion. Every 0.1% efficiency saving in design processes would therefore yield a 75€Million annual saving. Enhanced user friendliness will reduce barriers to entry and aid opportunities for small and medium sized enterprises.

---

**ADOPTION OF THE EUROCODES IN THE BALKAN REGION**

5-6 December, 2013
## Business Plan

<table>
<thead>
<tr>
<th><strong>Impact</strong></th>
<th><strong>Benefit</strong></th>
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<tbody>
<tr>
<td>Improved harmonization across member states, through e.g. reduction in NDPs and different design methods</td>
<td>Improved harmonization will reduce barriers to trade of products and services.</td>
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<tr>
<td>Use of new methods and new materials. Enhanced coverage of robustness</td>
<td>This will enable the latest technologies and knowledge to be applied in a way that is acceptable for practitioners, promoting cost effectiveness and sustainability in design, and innovation.</td>
</tr>
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</table>
Business Plan

**Impact**

- Relevant sustainability consideration incorporated within design requirements
- Climate change consideration embraced within Eurocodes
- Incorporation of initial requirements for assessment and retrofit of existing structures

**Benefit**

- This supports European Community objectives, including those for energy saving and waste accrual.
- This will provide increased resilience of long-life infrastructure assets to potential climatic changes. It is very cost effective to address such risks at the design stage rather than through later retrofitting. Such an approach also reduces user disruption and environmental impacts.
- This supports the effective and sustainable management of existing infrastructure, providing a consistent technical framework across member states as a platform for future R&D and appropriate harmonization, enabling the sustainable life extension of existing assets.
Many thanks for your attention!

Presentation by
Dipl.-Ing. Gerhard Breitschaft

DIBt Deutsches Institut für Bautechnik
Kolonnenstraße 30 B
D-10829 Berlin / Germany
Tel.: +49 30 78730-212
Fax: +49 30 78730-11212
e-mail: gbr@dibt.de

www.dibt.de

Vice chairman CEN TC 250

Support by Steve Denton, Chairman TC250