Towards a second generation of European Standards on Eurocodes

Michael N. Fardis
University of Patras, Greece
Vice-Chairman, CEN/TC250: ”Structural Eurocodes”
What are the Eurocodes?

• The Eurocodes are a set of 58 harmonised European Standards (EN) for the structural (& geotechnical or seismic) design of buildings and civil engineering works, as well as of structural components thereof.
• They serve over 500,000 engineers in EU and EFTA Member States (MSs) and other CEN countries.
• They underpin a market worth of ~65 billion Euro of professional services.
• They provide free-of-technical-obstacles access to a construction sector which produces ~10% of the GNP in a Single Market of over 500 million people.
The first generation of EN-Eurocodes

Suite of 10 Eurocodes, with 58 Parts (ENs):
EN 1990 Eurocode: Basis of structural design
EN 1991 Eurocode 1: Actions on structures
EN 1992 Eurocode 2: Design of concrete structures
EN 1993 Eurocode 3: Design of steel structures
EN 1994 Eurocode 4: Design of composite (steel-concrete) structures
EN 1995 Eurocode 5: Design of timber structures
EN 1996 Eurocode 6: Design of masonry structures
EN 1997 Eurocode 7: Geotechnical design
EN 1998 Eurocode 8: Design of structures for earthquake resistance
EN 1999 Eurocode 9: Design of aluminium structures
Interrelation and hierarchy of Eurocodes

- EN1990
- EN1991
- EN1992 concrete
- EN1993 steel
- EN1994 composite (steel-concrete)
- EN1995 timber
- EN1996 masonry
- EN1999 aluminium
- EN1997 geotechnical
- EN1998 seismic
- Structural safety, serviceability, durability
- Actions on structures
- Material Eurocodes, design & detailing
- Horizontal service Eurocodes
Flexibility in the Eurocode system

- Eurocodes do not allow design with rules other than their own.
- National choice may be exercised through the National Annex, only where the Eurocode itself explicitly allows:
  1. Choosing a value for a parameter, for which a symbol or range of values is given in the Eurocode;
  2. Choosing among alternative classes/models fully described in the Eurocode;
  3. Adopting an Informative Annex or referring to an alternative national document, complementing and not contradicting the Eurocode.

- Items of national choice in 1-2: Nationally Determined Parameters (NDPs)
- National choice through NDPs:
  - On issues controlling safety, durability & economy (national competence) & where there are geographic or climatic differences (eg, seismic hazard)
  - For cases 1 & 2, the Eurocode itself recommends (in a Note) a choice. The European Commission urges Member States to adopt the recommended choice, to minimize diversity within the Single Market.
  - If a National Annex does not exercise national choice for a NDP, designer and/or the owner may choose, depending on the conditions of the project.
National implementation of the Eurocodes

4th EU Standardisation Summit
Riga, LV, June 4, 2015

EUROCODE
Main text

EC

Nationally Determined Parameters
NDPs

* Values and/or classes where alternatives are given in the Eurocode
* Values to be used where a symbol only is given in the Eurocode
* Country specific data
* The procedure to be used where alternative procedures are given in the Eurocode

National Annex

* Decisions on the application of informative annexes
* Reference to non-contradictory complementary information to assist the user to apply the Eurocode

Normative Annexes

Informative Annexes
The EN-Eurocodes in the EU and in the world

CEN Members
CEN affiliates, countries which adopted Eurocodes or expressed interest in them
There is a genuine competition (between) Europe and USA to set global regulatory standards… Brussels is becoming the world's regulatory capital… ..The more proscriptive European vision better suits industry’s demand for certainty: if you manufacture globally, it is simpler to be bound by the toughest regulatory system in your supply chain… Firm after firm began applying EU standards worldwide, as third countries copied them. .. One American official says that the EU is winning the regulatory race, adding:

“there is a sense that this is their precise intent.” He cites a speech by the Trade Commissioner, Peter Mandelson, claiming that the export of “our rules and standards around the world” was one source of European power.

“Europe had no idea the rest of the world was going to copy its standards”, retorts a Eurocrat. “It's a very pleasant side-effect, but we set out to create the legislation we thought Europe needed.”

The Economist, Charlemagne, Sept. 2007
From the 1\textsuperscript{st} to the 2\textsuperscript{nd} Generation of EN-Eurocodes
Timeline

- 1975: Eurocodes started
- 1990: ENVs started
- 1992: ENVs published
- 1998: Conversion of ENV to EN
- 2007: Publication 1st generation of Eurocodes
- 2010: Programming Mandate
- 2011: Response to Programming Mandate
- 2012: Specific Mandate
- 2013-2014: Response to Specific Mandate
- 2015: Grant agreement awarded for Phase 1
- 2020: Target

Publication 2nd generation of the Eurocodes
Specific Mandate 515 of EC to CEN

Scope:
- Amend Eurocodes of 1st generation;
- Extend, by developing new Eurocodes.

Directions:
- Encourage innovation;
- Take into account new societal demands and needs;
- Facilitate harmonisation of national technical initiatives on new topics of interest for construction sector;
- Improve user-friendliness.
CEN/TC250’s response to specific Mandate 515

- Drawn up by CEN/TC250 Chairman, Steve Denton, with input/support from CEN/TC250.
- ~140p.-long document, specifying in detail the technical work programme and its organisation.
- Work to be carried out in four overlapping Phases, each one to take ~three-and-a-half years and start with ~one-year time-lag from the previous one.
- Phase 1 is the most important one; it corresponds to almost one-half of the total effort and cost.
- Target end-date of all four Phases: 2020-21.
Grant Agreement EC-CEN for Specific Mandate 515

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Funding ≈ €4.5M for Phase 1 out of 4 of the evolution to the 2nd generation;

Duration of Phase 1: Jan. 1, 2015 to Oct. June 30, 2018 (42 months);

Budget-wise, the largest-ever standardisation agreement;

- Yet, amount of technical effort which will be, or has already been invested directly or indirectly, in Phase 1: one order of magnitude more than the EC funding.

Over 200 experts involved in Phase 1:

- International open call for interest and tenders and two-tier evaluation by different panels of select experts;
- Direct involvement of those serving CEN/TC250 from positions of responsibility and the members of TC250’s subcommittees.
New elements in the 2nd generation of Eurocodes

- EN1990
  - EN1991
    - EN1992 concrete
    - EN1993 steel
    - EN1994 composite (steel-concrete)
    - EN1995 timber
    - EN1996 masonry
    - EN1999 aluminium
    - ENXXXX structural glass
  - EN1997 geotechnical
  - EN1998 seismic

- Structural safety, serviceability, durability
- Actions on structures
- Material Eurocodes, design & detailing
- Robustness of structures
- Assessment & retrofitting of existing structures
- Horizontal service Eurocodes
- Fibre-Reinforced Polymer structures
- Membrane structures
General objectives of the evolution

4th EU Standardisation Summit  Riga, LV, June 4, 2015

• Further harmonisation: Reduce number of Nationally Determined Parameters.

• Enhance “Ease of use” by:
  Improving clarity;
  Simplifying routes through the Eurocodes;
  Limiting, where possible, alternative application rules;
  Avoiding/removing rules of little practical use in design; etc.

• Fill voids in scope.

• Consolidate; produce short, succinct texts.

• Ensure stability for users:

  Evolution, not Revolution!
National comments submitted in recent “Systematic Review” of the EN-Eurocodes:

- Consider;
- Adopt or not;
- Reply/justify decision.

Specific technical issues identified by TC250 (with input from its competent Sub-Committees) in response to the EC’s Specific Mandate M515, and annexed to the Grant Agreement:

- Elaborate;
- Revise Eurocode accordingly.

Reduction of NDPs.

Improvement of Ease-of-Use.
Chairman’s Advisory Panel: ‘Ease of use & reduction of NDP’

5 Pillars

1. Statements of intent to meet users’ needs
2. Principles and related priorities
3. Examples
4. Strategic performance measures
5. Management, governance and support

Interviews
Written contributions
Questionnaires
Discussions

4th EU Standardisation Summit
Riga, LV, June 4, 2015
CAP on ‘Ease of use & reduction of NDP’

CEN/TC 250 – CAP on ease of use
Final report on enhancing ease of use of the Structural Eurocodes

Date: 18/11/2014
Prepared by: Gerhard Breitschaft and Mariapia Angelino with contributions from CAP members
Reviewed by: Steve Denton

Position paper unanimously approved by CEN members on March 6 (public)

CEN/TC 250 Position paper on enhancing ease of use of the Structural Eurocodes

Date: 31/01/2015
Prepared by: Steve Denton with contributions from CEN/TC 250 members
<table>
<thead>
<tr>
<th>CATEGORIES OF EUROCODES’ USERS</th>
<th>CEN/TC 250 STATEMENTS OF INTENT</th>
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<tbody>
<tr>
<td>Practitioners – Competent engineers [Primary target audience]</td>
<td>We will aim to produce Standards that are suitable and clear for all common design cases without demanding disproportionate levels of effort to apply them</td>
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<tr>
<td>Practitioners – Graduates</td>
<td>We will aim to produce Eurocodes that can be used by Graduates where necessary supplemented by suitable guidance documents and textbooks and under the supervision of an experienced practitioner when appropriate</td>
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<tr>
<td>Expert specialists</td>
<td>We will aim not to restrict innovation by providing freedom to experts to apply their specialist knowledge and expertise</td>
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<tr>
<td>Product Manufacturers</td>
<td>Working with other CEN/TCs we will aim to eliminate incompatibilities or ambiguities between the Eurocodes and Product Standards</td>
</tr>
<tr>
<td>Software developers</td>
<td>We will aim to provide unambiguous and complete design procedures. Accompanying formulae will be provided for charts and tables where possible</td>
</tr>
<tr>
<td>Educators</td>
<td>We will aim to use consistent underlying technical principles irrespective of the intended use of a structure (e.g. bridge, building, etc.) and that facilitate the linkage between physical behaviour and design rules</td>
</tr>
<tr>
<td>National regulator</td>
<td>We will endeavour to produce standards that can be referenced or quoted by National Regulations</td>
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<tr>
<td>Private sectors businesses</td>
<td>We will continue to promote technical harmonization across European markets in order to reduce barriers to trade</td>
</tr>
<tr>
<td>Clients</td>
<td>We will produce Eurocodes that enable the design of safe, serviceable, robust and durable structures, aiming to promoting cost effectiveness throughout their whole life cycle, including design, construction and maintenance</td>
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<tr>
<td>Other CEN/TCs</td>
<td>We will engage proactively to promote effective collaboration with those other CEN/TCs that have shared interests</td>
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Principles for Ease-of-Use

(in order of decreasing importance):

1. Improve clarity/understandability of technical provisions;
2. Improve accessibility to technical rules, ease of navigation between them;
3. Improve consistency within and between Eurocodes;
4. Include State-of-the-Art material based on commonly accepted research results & validated by practical experience
5. No fundamental changes to design approach in 1st generation EN-Eurocodes & in document structure;
6. Clear guidance for all common design cases;
7. Limit coverage of special cases, very rarely encountered by designers, to only general and basic technical provisions;
8. Expert practitioners free to work from first principles & innovate;
9. Limit alternative application rules for the same situation.
10. Simplified methods only if a) of general application and for common situations, b) technically justified and safe-sided.
11. Improve consistency with ENs for products or execution;
Current status of evolution to the 2\textsuperscript{nd} generation

• Major collaborative effort between CEN, BSI, NEN and CEN/TC 250 to prepare quotation.

• Comprehensive tender documents for open call prepared in early 2015 by NEN, BSI and CEN/TC 250 management group.

• Call for experts for project teams launched on schedule in early April 2015; closed on 25 May 2015

• Tender reviews currently underway, with objective to confirm 25 Project Teams by mid August with EC agreement
• CEN/TC 250 is deeply grateful to CEN, BSI and NEN for their support in preparing the response to the mandate and the call for experts.
• The Structural Eurocodes are an important suite of design standards used by ~500 000 engineers
• Work is underway to develop the 2nd generation of EN Eurocodes.
• This is a major undertaking that would be impossible with the support of the European Commission
• CEN/TC 250 is indebted to CEN, BSI and NEN for their exemplary support
• The 2nd Generation of Eurocodes will have an extended scope and address new societal challenges, with a major focus on enhanced ease of use
Thank you!