Overview on EN 1993

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(Chairperson CEN/TC250/SC3)
Content

• Structure and overview on Eurocode 3
• Organization
• Revision and further developments of Eurocode 3
• Mandate M/515
• Examples of issues for further developments
• Final remarks
Structure and overview on Eurocode 3

General parts (12 parts)

Application parts (8 parts)

Application parts ➔ „Master“ for field of application
Structure and overview on Eurocode 3

Eurocode 3

EN 1993-1: General rules and rules for buildings
EN 1993-2: Steel Bridges
EN 1993-3: Towers, Masts and Chimneys
EN 1993-4: Silos, Tanks and Pipelines
EN 1993-5: Piling
EN 1993-6: Crane supporting structures

→ General Part

refer to

→ Application Parts
## Structure and overview on Eurocode 3

| EN 1993-1-1: | General rules and rules for buildings |
| EN 1993-1-2: | Structural fire design |
| EN 1993-1-3: | Supplementary rules for cold-formed members and sheeting |
| EN 1993-1-4: | Supplementary rules for stainless steels |
| EN 1993-1-5: | Plated structural elements |
| EN 1993-1-6: | Strength and stability of shell structures |
| EN 1993-1-7: | Plated structures subject to out of plane loading |
| EN 1993-1-8: | Design of joints |
| EN 1993-1-9: | Fatigue |
| EN 1993-1-10: | Additional rules for the extension of EN 1993 up to steel grades S700 |

EN 1993-1-1 and EN 1993-1-8 are of central importance
Organization

- At European level CEN/TC250/SC3 „Design of Steel Structures“ involving NSBs = National Standardization Bodies (e.g. BSI, DIN, AFNOR, NEN etc.)
Organization

CEN/TC 250
Structural Eurocodes

CEN/TC 250/SC 1
Actions on Structures
Working Group EN 1993-1-1
B. Snijder (NL)

CEN/TC 250/SC 2
Design of Concrete Structures
Working Group EN 1993-1-2
P. Schaumann (D)

CEN/TC 250/SC 3
Design of Steel Structures
Working Group EN 1993-1-5
U. Kuhlmann (D)

CEN/TC 250/SC 4
Design of Composite Structures
Working Group EN 1993-1-8
T. Ummenhofer (D)

Working Group EN 1993-1-10
B. Kühn (D)

→ Technical work by 19 CEN Working Groups*

* Formerly called Evolution Groups
Organization

Proposal for corrigenda or amendment coming from: industry, national bodies, experts, ...

Support by „Working Group” (Evolution Group)

CEN/TC250/SC3

Technical clarification of problem with solution and report

Resolution of amendments through CEN/TC250/SC3

Update of EN 1993 via CEN/TC250 and CEN

National Bodies
Organization

- CEN Evolution/Working Groups ↔ ECCS Technical Committees

Exchange of experts - Common meetings, use of ECCS-Internet-Platform, common dissemination, common research projects
## Organization

### Current list of Working Groups of SC3

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<thead>
<tr>
<th>Working Group</th>
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<td>CEN/TC250/SC3</td>
<td>Evolution of EN 1993-1-1 – General rules for buildings</td>
<td>B. Snijder</td>
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<td>H. Friedrich</td>
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<td>Evolution of EN 1993-1-12 – High strength steel</td>
<td>O. Lagerqvist</td>
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<td>L. Davaine</td>
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<td>A. Schmitt</td>
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<td>U. Kuhlmann</td>
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Revision and further developments of Eurocode 3

- **EN-Versions**
  - Consolidated Versions 2010/12
  - EN-Versions plus National Annexes

- **1. Changes and corrections**
  - 2005
  - 2007
  - 2010
  - 2012
  - 2014
  - 2019

- **Revision phase**
  - Today

- **General revision and maintenance**
  - 5-year review according CEN
  - Call for „Systematic Review“

- **Further developments**
  - EU Mandate M/S15
  - 2014 – 2019/2020

- **1. New Versions Eurocodes 2019/2020**

- **E.g. Introduction Germany 2012/07/01**
Revision and further developments of Eurocode 3

General revision and maintenance “Systematic Review”

Technical enhancements in the frame of the EU Mandate M/515
Revision and further developments of Eurocode 3

To the Members of CEN/TC 250

Structural Eurocodes

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Dear Member,

CEN/TC 250 SYSTEMATIC REVIEWS

In accordance with BT resolution C60/2008, the launch of systematic reviews for the 58 Eurocodes was delayed.

The systematic reviews are now being treated as a complementary activity to the execution of Mandate M/515 EN Structural Eurocodes, with the timing compatible with the phasing of the TC 250 work programme [CEN/TC 250 N 953]. It should be noted that the publication of the next generation of the EN Eurocodes is not planned to conclude before 2020.

The following reviews have been launched:


Members are invited to register their responses to the questions below via their National Standards Body’s nominated voter on the Committee Internal Ballot (CIB) no later than:

30 September 2014
Mandate M/515

- **Title**
  - Mandate for amending existing Eurocodes and extending the scope of structural Eurocodes

- **Duration**
  - 2014 – 2019/2020? (parallel to 1. review period of Eurcodes)

- **Key Issues**
  - Reduction of Nationally Determined Parameters (NPDs) of existing Eurocode parts
  - Enhancing ‘ease of use’ of existing Eurocodes by:
    i. improving the clarity
    ii. simplifying routes through the Eurocodes
    iii. limiting, where possible, the inclusion of alternative application rules; and
    iv. avoiding or removing rules of little practical use in design

- Creation of new Eurocodes, e.g. for “Glass” or “Existing Structures”
Mandate M/515

- **Title**
  - Mandate for amending existing Eurocodes and extending the scope of Structural Eurocodes

  - Start originally March 2014 (now spring 2015?), Duration of 5 years, equal to official CEN review period of Eurocodes

  - Total work program is split up into 4 overlapping phases

  → All coming amendments and corrigenda will be realized by the Mandate
## Mandate M/515

### SC3 Mandate Tasks

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<th>Task-Ref.</th>
<th>Task-Phase</th>
<th>Corresponding Part of EN 1993</th>
<th>Task-Name</th>
<th>No. of Sub-tasks</th>
<th>No. of priority Sub-tasks</th>
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<td>SC3.T1</td>
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<td>EN 1993-1-1</td>
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<td>9</td>
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<td>Harmonisation and Extension of Rules for Shells and Similar Structures - Revised EN 1993-1-6 and EN 1993-1-7</td>
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<td>Evolution of existing parts of EN 1993 not included in the other parts. Revised EN 1993-1-12, -4-3, -5, -6</td>
<td>4</td>
<td>3</td>
<td>U. Kuhlmann</td>
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</table>

→ 13 single tasks for 20 parts of Eurocode 3
Mandate M/515

- Distribution of 13 SC3-Tasks
  - 2 Tasks (EN 1993-1-1 and EN 1993-1-8) in Phase 1 as basis where all the other parts are dependent on
  - 4 Tasks in Phase 2, mainly basic parts concerning stability
  - 3 Tasks in Phase 3, mainly basic parts concerning fatigue, toughness and material
  - 4 Tasks in Phase 4, application parts for bridges, silos, masts and tower etc.

- Main issues
  - Further development in view of reduction of NDPs, clarity and ease of use
  - Harmonizing of content, Harmonizing of different parts of Eurocode 3
  - Keep main structure and content for reliability
Mandate M/515

• Principles
  o After discussion the following principles for the further development of Eurocode 3 were decided within CEN/TC250/SC3

**Decision 4/2013**

- keep the overall structure of EN 1993 and its parts
- improve the clarity
- harmonize and simplify rules (same format, structure, notations,..) and harmonize different parts of Eurocode 3 and if possible also with other relevant Eurocodes
- reduce the overall volume (e.g. by avoiding informative annexes)
- reduce number of alternatives.
Further developments on the example of EN 1993-1-1

- Simplification of the stability rules
- Unification of the rules between general and application parts
- Reduction of the rules in particular for lateral torsional buckling
Further developments on the example of EN 1993-1-1

- Cross-section Classification

  ➢ Adaption of threshold values
  ➢ Adjustment with rules in EC3 Part 1-3, 1-5 and 1-6
  ➢ Continuous transition between Class 2 and 3

<table>
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<th>Class</th>
<th>Part subject to bending</th>
<th>Part subject to compression</th>
<th>Part subject to bending and compression</th>
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</table>

- Stress distribution in parts (compression positive)

  - Class 3
    - $c/t \leq 124\psi$
    - $c/t \leq 121\psi$
    - $c/t \leq 38\psi$

  - When $\psi > -1$: $c/t \leq 42\psi$

  - When $\psi \leq -1^*$: $c/t \leq 62\psi(1-\psi)(-\psi)$

  - $\psi \leq -1^*$ applies where either the compression stress $\sigma \geq f_c$ or the tensile strain $\varepsilon_t > f_y/E$.

  - $\psi \leq 1^*$ and a compression stress of $\sigma_{\text{com.,E}} \geq f_c$ applies when the tensile strain exceeds $\varepsilon_t = f_y/E$. 

  $$\psi \leq -1^* \leq 0.608 + 0.343\psi + 0.049\psi^2$$

  $$\psi \leq 1^* \leq 60.5(1-\nu)^{1/5}$$
Further developments on the example of EN 1993-1-8

- Weld strength function

\[
\tau_{w,Rd} = \frac{f_{u,k} / \sqrt{3}}{\beta_w \cdot \gamma_{M2}}
\]

- tensile strength of base metal
- \(f_{u,k}\)
- correlation factor \(\beta_w\)

→ weld strength for S460 smaller than S355

→ weld strength independent of filler metal

- No possibilities to cover mismatch-effects
- Undermatching may have advantages regarding ductility, weldability, quality

→ Improved design specifications also for steel grades up to 700 N/mm²
Further developments on the example of EN 1993-1-5

• Additional design rules and recommendations for modern stiffener design

• Additional design rules for girders with corrugated webs

• Further developments of rules for FEM-calculations and harmonization with EN 1993-1-6
Further developments

- Integration of EN 1993-1-12 for High Strength Steels up to 700N/mm² in the respective sections in the other general parts of EN 1993-1
- Reorganization and fundamental revision of EN 1993-1-7
  Harmonization with EN 1993-1-5 (plate buckling) and EN 1993-1-6 (shell buckling)
- New design rules for girders with web-openings
Final remarks

• How to influence the future code?

➢ Everyone
  - Applying Eurocodes → Gaining experience
  - Questions and comments to the mirror groups

➢ Collaboration in mirror groups
  - Influence on National Annex
  - Proposals for amendments

➢ Collaboration in Working Groups
  - Experts nominated from National Standardization Bodies
Final remarks

- Aims
  - harmonized and user-friendly design rules

- Modern Eurocodes
  - Necessary basis for complex problems
  - Easy-to-use rules for standard cases (80%)

The application of the Eurocodes pays off

Apply rules, gather experience and influence development
- Create codes for the future -
Thanks for attention!