Sustainability and Innovation

The lead market for Europe

Gerhard Sedlacek

Workshop: Background and Application
Brussels, February 18th, 2008
1. Sustainability – Standardisation and Research
2. Maintenance of Eurocodes
3. New Programme for CEN/TC250 – Works
4. Assessment of existing bridges
5. Structural design of glass components
6. Structural design of FRP-components
Definition sustainability

“Capacity to use the natural resources of the present without compromising their use by future generations”
“Lisbon” related to “competitiveness”, and resulting in requirements for e.g. the Internal Market, research and innovation.

“Kyoto” related to “sustainable development”, e.g. energy efficiency research and innovation.

“Moscow” related to “security of supply”, e.g. international dialogue, stock management, research and innovation.
Energy consumption

Building sector at present responsible for more than 40% of EU energy consumption

Requirement:
- reduction of energy demand
- intelligent use of renewable energies
to reduce CO₂ emission and EU energy dependence.
Integrated design to meet all six Essential Requirements of the CPD:

1. Mechanical resistance and stability
2. Safety in case of fire
3. Hygiene, health and the environment
4. Safety in use
5. Protection against noise
6. Energy economy and heat retention
European standard family

1. Concerted actions to develop a European Standard Family addressing all six Essential Requirements as a tool for structural optimisation

2. To extend the rules of new buildings and constructions to the existing stock of buildings and construction works
## Integral approach for sustainable construction

### European Standard Family

<table>
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<tr>
<th>Essential Requirements</th>
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<td><strong>mechanical resistance and stability</strong></td>
<td><strong>resistance to fire</strong></td>
<td><strong>hygiene, health, environment</strong></td>
<td><strong>safety in use</strong></td>
<td><strong>protection against noise</strong></td>
<td><strong>energy economy heat retention</strong></td>
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**Coordination in view of Guidance Paper L**
Consistency of Eurocodes and EN-Standards:

- **Traditional field** of hEN´s for construction products, prefabricated components and execution (Guidance Paper L) related to ER 1 (mechanical resistance and stability) ER 2 (resistance to fire) partially ER 4 (safety in use)

- **New field** for design methods, construction products, prefabricated components and execution related to ER 3 (hygiene, health, environment) partially ER 4 (safety in use) ER 5 (protection against noise) ER 6 (energy economy and heat retention)
Further developments - New approach:

1. Preparatory pre-normative technical works:
   by WG´s with JRC ⇒
   technical guidances
   + background documents
   representing a common
   European view

2. Standardisation works:
   by CEN/TC250 and EOTA:
   Improvement and Extension of Eurocodes
New Eurocodes

Preparatory pre-normative technical works:

- Reduction of volume and complexity of Eurocodes ⇒ further harmonisation
- Filling of gaps:
  ⇒ e.g. vibration limits for floors or pedestrian bridges
- Supplements to the Eurocodes
  1. Assessment of existing structures
  2. Glass structures
  3. FRP structures
Assessment of existing structures

Example: Bridges

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Sebastian Möller

RWTH Aachen
Life cycle

Example of quality management through the lifetime of bridges

Preparatory Works
- studies:
  - requirements
  - real estates
  - technical concepts
  - environment
  - aesthetics
  - financial
- agreements on project
- project specification

Preliminary Works

Construction phase
- tender
  - bids
  - selection
- contracts
  - start of works

Tendering

Design & Execution
- design
  - execution
  - quality control
  - opening for service

Service
foreseen deterioration
- inspection & maintenance

Replacement of components
renewal, repair

Unforeseen service conditions,
unforeseen deterioration
Unforeseen safety requirements
Unforeseen events

Assessment & Retrofitting

End of service life

Service phase

Disposal

Demolition, Recycling, Reuse
Example Moltke-Bridge in Berlin

Example Suspension Bridge in Cologne

from: Straßen NRW
Kennedy-Bridge in Bonn, built in 1948

from: Stadt Bonn
Assessment of Existing Steel Structures: Recommendations for Estimation of Remaining Fatigue Life


Background documents in support to the implementation, harmonization and further development of the Eurocodes

Joint Report
Prepared under the JRC – ECCS cooperation agreement for the evolution of Eurocode 3
(programme of CEN / TC 250)

First edition, October 2007
ESEC 2003.06 - 25 Ft
Commentary to Eurocode 3
EN 1993 - Part 1-9 - Fatigue

G. Sedlacek, A. Hoebbacher, A. Nussbaumer, J. Stolz, D. Tschekardt

Background documents in support to the implementation, harmonisation and further development of the Eurocodes.

Joint Report
Prepared under the JRC – ECCS cooperation agreement for the evolution of Eurocode 3 (programme of CEN / TC 250)
COMMENTARY AND WORKED EXAMPLES TO EN 1993-1-5 “PLATED STRUCTURAL ELEMENTS”

B. Johansson, R. Maqbool, G. Sedlacek, C. Müller, D. Berg

Background documents in support to the implementation, harmonization and further development of the Eurocodes

Joint Report
Prepared under the JRC – ECCS cooperation agreement for the evolution of Eurocode 3
(programme of CEN / TC 250)

First Edition: October 2007
EUR 26999 EN - 2007
Technical Guidance for the design of class components

Gerhard Sedlacek

Katharina Langosch
Glass consumption by applications

- Interior of buildings: 18%
- Automotive: 10%
- Refurbishment of buildings: 36%
- New buildings: 36%
Glass demand

Global glass demand growth 3.9% p.a.

Real GDP growth 2.6% p.a.
Standards

World Standards

- EN 67
- EU MS National: 50
- ISO: 16
- World without EU MS: 45

Brussels, 18-20 February 2008 – Dissemination of information workshop
Product types

Laminated glazing

Insulating glazing
Example for structural use
Example for structural use
Design of GFRP structures

Gerhard Sedlacek

Matthias Oppe

RWTH Aachen

BDK 1240 L1800
twb
Market growth

Source: American Composites Manufacturing Association
Example pedestrian bridge

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Example road bridge
Stability test