Glass as a structural material in construction - towards a Eurocode on Structural Glass

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Construction standards
A driver for innovation and industry

Riga, 3 June 2015
Structural Glass

Line supported
Structural Glass

Bent glass
Structural Glass

Point fixated
Structural Glass

Adhesive bonded

Overhead glazing
Structural Glass

Primary Structural Elements
Milestones of Glass production and Glass architecture

Structural Design of Glass Components and Joints

Laminated glass
annealed glass
fully toughened glass

1851 1930 1960

Crystal Palace Paxton
Crystal Palace Railway Station (1980)
Heat strengthened glass

1995

Exhibition Hall Leipzig

2004

Main Station Facade in Berlin
Conclusions for the European construction industry

- Structural Glass – more and more frequently used in construction
- Structural Glass needs safety verification
- But Today, design of Structural Glass and its safety verification are performed according to National Codes and „habits“
- National Design Codes are different in EU member states in terms of safety and mechanical approach
- Differences of the National Design Codes represent hinderance of free market trade

• Need for a European Design Code on Structural Glass
# The Structural Eurocodes family

## TC 250 Coordination Group

### SC/WG for Existing Eurocodes
- WG7 – Basis of design
- SC1 – Actions
- SC2 – Concrete
- SC3 – Steel
- SC4 – Composite and concrete
- SC5 – Timber
- SC6 – Masonry
- SC7 – Geotechnics
- SC8 – Earthquake
- SC9 – Aluminium

### Other Working Groups
- WG1 – Policy and Guidelines
- WG2 – Existing Structures
- **WG3 – Structural Glass**
- WG4 – Fibre and Reinforced Polymers
- WG5 – Membrane Structures
- WG6 – Robustness

## Horizontal Groups
- HG – Bridges
- HG – Fire

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**Working Groups that may work as Horizontal Groups**
- **WG3 – Structural Glass**

**Working Groups directly addressed by the commission to work out a Eurocode**
- **WG3 – Structural Glass**
Three pillars principle

Delivery conditions of prefabricated structural glass components

- **Product Specifications**
  - CEN/TC 129
- **Product Standards Testing Standards**
  - EOTA
  - ETAG´s ETA´s
- **Structural design rules**
  - CEN/TC 250
  - SCs, EGs, HGs, WGs
- **Execution rules**
  - CEN/TC 129
  - CEN/TC 135
  - CEN/TC 250
Response to Specific Mandate M/515

CEN TC 250 response to Mandate M/515

Accomplished!


Subject to agreement of CEN TC 250

CEN TS (previously known as ENV but with explanations)

Trial use / Commenting (2 years)

CEN TC 250 decision converting CEN TS into EN

EN = EUROCODE
Guidance for European Structural Design of Glass Components

Support to the implementation, harmonization and further development of the Eurocodes

AUTHORS:
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and

EDITORS
S. Dimova, A. Pinto, M. Feldmann, S. Denton

2014
### Response to Specific Mandate M/515

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Products

strength

Prestressing

Number of breakage pieces

Redundancy capacity if used as laminated glass

Float
HSG
TTG
Products: Glass (Strength)
CEN TS / Eurocode: Part 1

Products: Quality of tempering
Products: Interlayers (stiffness)
CEN TS / Eurocode: Part 1

Requirements: Durability
Products: TTG
CEN TS / Eurocode: Part 2

Design: Redundancy
Design: Redundancy and failure consequence
Glass walls: impact

Vertikalschnitt
Fallhöhe \( h \)

Pendelkörper:
Druck = 4,0 bar
\( m = 50 \text{ kg} \)

Ansicht Auftreffstellen

Scheibenmitte A (1000/1000)
Rand (1000/300)
Ecke (300/300)

Scheibenmitte B (1000/630)
Glass floors and roofs: impact
CEN TS / Eurocode: Part 3
Enhanced Redundancy
Connections: bearing capacity

Glasscheibe (VSG)
Lochbohrung
Zwischenschicht (Vergussmörtel)
Aluminiumhülse
Stahlbolzen
Connections: bearing capacity

Adhesively Bonded Connections

Glasbauteil
Belastungen
Rahmen
elastische Klebfuge

CEN TS / Eurocode: Part 3
Glass columns: Stability and Strength
Hybrid members in bending: load carrying capacity
Glass beams and glass roofing: load carrying capacity

Thank you for your attention!