

**COST E55**  
**Working Group 2: Vulnerability of timber structures**  
**Concept working Plan**

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**Introduction**

Regarding the vulnerability of timber structures the whole range of topics traditionally paid attention to should be regarded. Most of these topics are listed in this starting document, which, hopefully, results in some kind of a working plan for working group 2 for the next 3,5 years during the E55 Graz meeting in may 2007.

Depending on the individual interests of the working group members and the key issues in research for the moment, topics will be discussed in the working group meetings or not. Consequently, at this stage, the working group members should feel free to highlight topics to be discussed during the meetings. Certainly it is encouraged to bring together research ideas and results on related topics in different research facilities in the periods between the meetings. These activities might result in “training classes” at one (or more) of the research facilities and/or in Short Term Scientific Mission(s).

**Topics**

Building Structures  
Outdoor Structures

*Members*

Roundwood  
Sawn  
Glulam  
Sheet Materials

- Plywood
- OSB
- chipboard
- MDF / HDF
- Hardboard / softboard
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Composite structures, including “engineered wood products”

- I-joists
- Trusses
- (mechanically) jointed beams and columns
- “Tech Wood”
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## Connections

### Dowel type fasteners

- Nails
- Staples
- Wood screws
  - Traditional
  - Hexagon
  - Spaanplaatschroeven
  - Full threaded modern wood screws
    - common small diameter, “low” material quality, screws without pre-drilling
    - “high” diameter , “high” material quality, self pre-drilling screws (diameters 8 mm – 10 mm – 12 mm) like SPAX, TECFI, RAPID, \*\*\*.
    -
  - Specialities like SFS, Torx, INDUO, \*\*\*
- Dowels
- Bolts
- Tubes
- Glued in Rods
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### Plate connectors

- Simpson Strong Tie (BMF)
- Gang Nail
- Tooth Plates (Bulldog, Geka, \*\*\*)
- Split Rings, Plate Rings
- Specialities (in combination with the special dowel type fasteners)
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### Glued connections

- finger joints
  - glued laminated timber (lamellas)
  - full cross sections
    - sawn timber’
    - (huge) glued laminated elements
- composite structures (I-joists)

### Traditional Carpentry connections (relation to COST Action IE 0601 ?)

- wood – wood connections
- wooden dowels

## Theoretical considerations resulting in practical implementations (standardization)

### Strength and stiffness modelling

- Glulam
- Composite structures
  - I-joists
  - Trusses
- (mechanically) jointed beams and columns
- Connections
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### Structural probabilistic analysis

- Grading
- Structural initial imperfections
- Detoriation (structural durability) in relation to load carrying capacity
- Model uncertainties
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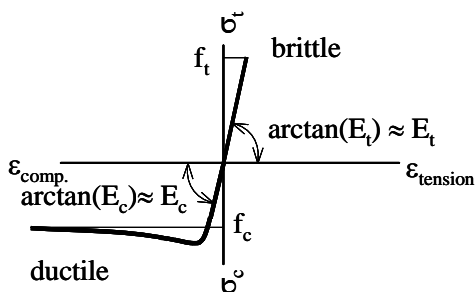
### Duration of Load (DOL)

- members
- connections

### Mechanosorptive aspects

- members
- connections

### Linear and non-linear relations



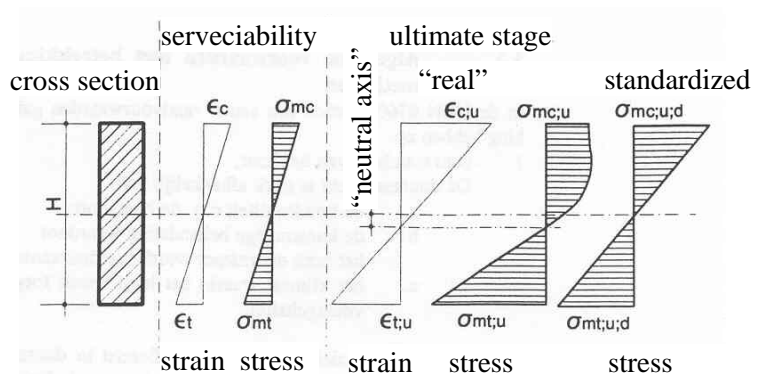
- bending
- compression
  - structural stability
- detoriation (structural durability)
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### Seize effects

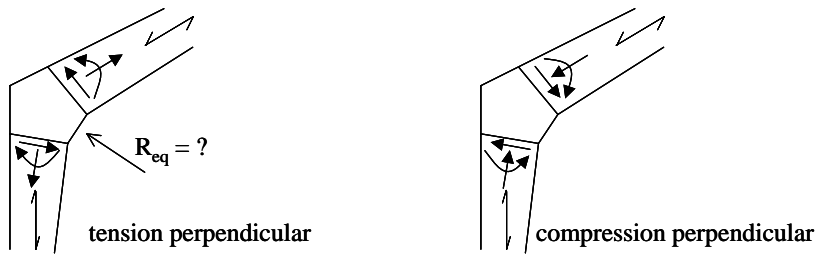
- Weibull's theory of brittle materials
- Fracture mechanics
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### Schematisations

- line elements – plate elements
- rolled – hinged – wedged in



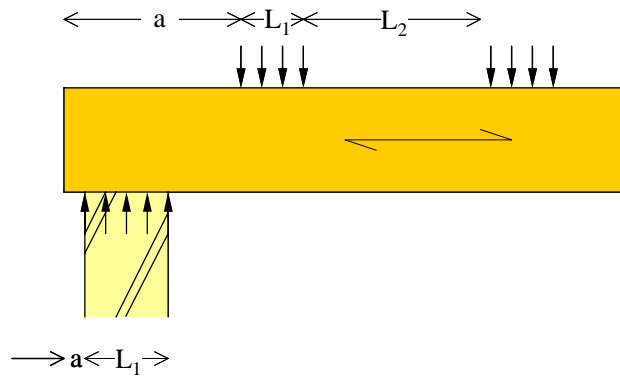
*Combined stresses*



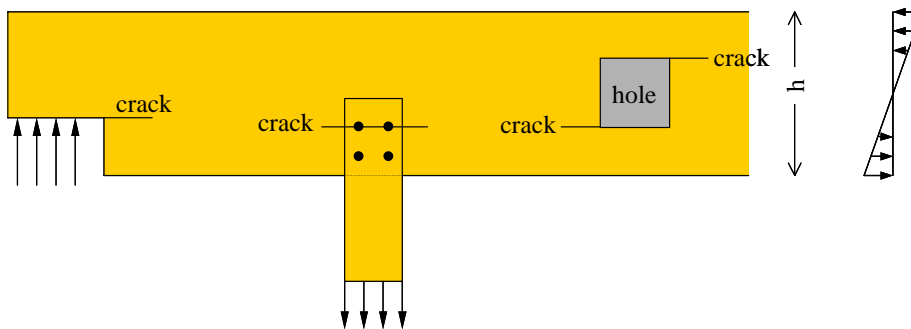
- Hankinson
- Norris
- Tsaj – Wu

*Compression perpendicular to the grain*

- Relation to the method of strength determination



*Tension perpendicular to the grain (and shear?)*



*Structural stability*

- Members
  - Compression (columns)
  - Bending (beams)
- bracing