European reaction to fire classification of wood products

Birgit Östman
SP Trätek – Wood Technology
Stockholm

Tallinn September 2005
## Reaction to fire classes for building products (excl. floorings)

<table>
<thead>
<tr>
<th>Main class</th>
<th>Smoke class</th>
<th>Burning droplets class</th>
<th>Requirements according to</th>
<th>FIGRA</th>
<th>Typical products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non comb</td>
<td>SBI</td>
<td>Small flame</td>
</tr>
<tr>
<td>A1</td>
<td>–</td>
<td>–</td>
<td>x</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>A2</td>
<td>s1 - s3</td>
<td>d0 - d2</td>
<td>x</td>
<td>x</td>
<td>–</td>
</tr>
<tr>
<td>B</td>
<td>s1 - s3</td>
<td>d0 - d2</td>
<td>–</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>C</td>
<td>s1 - s3</td>
<td>d0 - d2</td>
<td>–</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>D</td>
<td>s1 - s3</td>
<td>d0 - d2</td>
<td>–</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>E</td>
<td>–</td>
<td>- or d2</td>
<td>–</td>
<td>–</td>
<td>x</td>
</tr>
<tr>
<td>F</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Typical products refer to common building materials that fall into the specified fire classes. FIGRA stands for Fire Growth Rating Association, which measures the rate of flame spread and smoke production.
Normal procedure:

Each manufacturer has to test own products to get
- European class
- the CE-mark
Special EC procedure:

CWFT – Classification Without Further Testing for

‘products with known and stable fire performance’
CWFT procedure:

- DG Enterprise application
- Fire Regulators’ Group, FRG / EGF through its CWFT Working Group
- Standing Committee on Construction, SCC
- Commission Decision
- Publication in Official Journal
- Included in Harmonised product standards
Five wood products:

- Wood-based panels
- Structural timber
- Glulam
- Wood panelling and cladding
- Wood flooring
Wood-based panels

Plywood in the SBI test
Structural timber

Examples of end uses
Glulam (beams and columns)

Examples of end uses
Glulam
Wood panelling

Examples of end uses
Interior and exterior panelling
Wood panelling
Test Results
Wood-based panels

FIGRA, W/s vs. Density, kg/m³ graph:
- OSB
- Particle board
- Plywood
- Fibre board
- MDF
- Flaxboard

Density range: 0 to 1200 kg/m³
FIGRA range: 0 to 1200 W/s
Structural timber

FIGRA, W/s vs. Density, kg/m³
Wood panelling and cladding

FIGRA, W/s vs. Density, kg/m³
Classifications
## Final table in Commission Decision
(Official Journal January 2003)
Classes of Reaction to Fire Performance for Wood-based panels

<table>
<thead>
<tr>
<th>Wood-based panels</th>
<th>Min density kg/m³</th>
<th>Min thickness mm</th>
<th>Class</th>
<th>Class Floorings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid wood panels</td>
<td>400</td>
<td>12</td>
<td>D-s2,d0</td>
<td>D&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
<tr>
<td>Plywood</td>
<td>400</td>
<td>9</td>
<td>D-s2,d0</td>
<td>D&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
<tr>
<td>OSB board</td>
<td>600</td>
<td>9</td>
<td>D-s2,d2</td>
<td>D&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
<tr>
<td>Cement-bonded particleboard</td>
<td>1000</td>
<td>10</td>
<td>B-s1,d0</td>
<td>B&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
<tr>
<td>Fibreboards, Medium</td>
<td>600</td>
<td>9</td>
<td>D-s2,d0</td>
<td>D&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
<tr>
<td>Fibreboards, Soft</td>
<td>250</td>
<td>9</td>
<td>E</td>
<td>E&lt;sub&gt;FL&lt;/sub&gt;</td>
</tr>
<tr>
<td>Fibreboards, Hard</td>
<td>900</td>
<td>6</td>
<td>D-s2,d0</td>
<td>D&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
<tr>
<td>Particleboards</td>
<td>600</td>
<td>9</td>
<td>D-s2,d0</td>
<td>D&lt;sub&gt;FL&lt;/sub&gt;-s1</td>
</tr>
</tbody>
</table>

Footnotes with limitations for end-use conditions
Extension underway during 2005-06
<table>
<thead>
<tr>
<th>Material</th>
<th>Product detail</th>
<th>Min density kg/m³</th>
<th>Min thickness mm</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural timber 1)</td>
<td>Visual and machine graded structural timber with rectangular cross-sections shaped by sawing, planing or other methods or with round cross-sections.</td>
<td>350</td>
<td>22</td>
<td>D-s2, d0</td>
</tr>
<tr>
<td>Glulam 2)</td>
<td>Glued laminated timber products in accordance with EN 14080.</td>
<td>380</td>
<td>40</td>
<td>D-s2, d0</td>
</tr>
</tbody>
</table>

1) Applies to all wood species in product standard
2) Applies to all wood species and glues in product standard
### Proposed table for inclusion in Commission Decision

(ERG / EGF July 2005)

#### Classes of Reaction to Fire Performance for Wood panelling

<table>
<thead>
<tr>
<th>Product</th>
<th>Product detail</th>
<th>Min density ( \text{kg/\text{m}^3} )</th>
<th>Min thicknesses, total / minimum ( \text{mm} )</th>
<th>End use condition</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panelling and cladding</strong></td>
<td>Wood pieces with or without tongue and/or groove and with or without profiled surface</td>
<td>390</td>
<td>9 / 6</td>
<td>Without air gap or with closed air gap behind</td>
<td>D-s2, d2</td>
</tr>
<tr>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td>390</td>
<td>12 / 8</td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
</tr>
<tr>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td>390</td>
<td>9 / 6</td>
<td>Without air gap or with ( \leq 20 \text{ mm} ) open air gap behind</td>
<td>D-s2, d0</td>
</tr>
<tr>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td>390</td>
<td>18 / 12</td>
<td>Without air gap or with open air gap behind</td>
<td>D-s2, d0</td>
</tr>
<tr>
<td><strong>Wood ribbon elements</strong></td>
<td>Wood pieces with rectangular cross section</td>
<td>390</td>
<td>10</td>
<td>Surrounded by open air on all sides</td>
<td>D-s2, d0</td>
</tr>
</tbody>
</table>

Footnotes with limitations for end-use conditions
Wood floorings
Wood floorings with and without surface coating

- Spruce
- Pine
- Beech
- Chestnut
- Oak
- Multilayer

With coating
Without coating
### Proposed table for inclusion in Commission Decision

(EGF July 2005)

**Classes of Reaction to Fire Performance for Wood flooring**

<table>
<thead>
<tr>
<th>Product</th>
<th>Product detail</th>
<th>Min density kg/m³</th>
<th>Min thickness mm</th>
<th>End use condition</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood flooring and parquet</td>
<td>Solid flooring of oak or beech with surface coating</td>
<td>Beech: 680 Oak: 650</td>
<td>8</td>
<td>Glued to substrate</td>
<td>C&lt;sub&gt;fl-s1&lt;/sub&gt;</td>
</tr>
<tr>
<td>Wood flooring and parquet</td>
<td>Solid flooring of oak, beech or spruce with surface coating</td>
<td>Beech: 680 Oak: 650 Spruce: 450</td>
<td>20</td>
<td>With or without air gap underneath</td>
<td>C&lt;sub&gt;fl-s1&lt;/sub&gt;</td>
</tr>
<tr>
<td>Wood parquet</td>
<td>Multilayer parquet with a top layer of oak of at least 5 mm thickness and with surface coating</td>
<td>650 (top layer)</td>
<td>10</td>
<td>Glued to substrate</td>
<td>C&lt;sub&gt;fl-s1&lt;/sub&gt;</td>
</tr>
<tr>
<td>Wood parquet</td>
<td>-”-</td>
<td>650 (top layer)</td>
<td>14</td>
<td>With or without air gap underneath</td>
<td>C&lt;sub&gt;fl-s1&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

Footnotes with limitations for end-use conditions

All other wood floorings with surface coating are in class D<sub>fl-s1</sub>
Conclusions:

- Main influencing parameters are thickness, density and substrate (including air gap)
- Limits for these parameters determined
- Classes D-s2, d0 and for floorings Dfl-s1 or Cfl-s1
- Commission Decisions ready or proposed
- Classification included in Harmonised product standards
- Used for CE-marking
- Products not covered by CWFT decisions may be tested and obtain higher classifications