Air leakages through cross laminated timber (CLT) constructions

Hans Boye Skogstad, M.Sc. 1
Lars Gullbrekken, M.Sc. 1
Kristine Nore, Ph.D. 2
1 SINTEF Building and Infrastructure, Norway
2 Moelven MassivTre AS, Norway
Intro

- Laboratory measurements
- Objective: Measure the airtightness of a cross laminated timber construction with both wall and floor elements.
- Measurements are conducted to evaluate the need of separate wind- and/or vapour barrier in cross laminated timber constructions.
- Test results are used to evaluate the need of a separate air barrier in cross laminated timber constructions in order to fulfil the Norwegian requirements regarding air tightness \( n_{50} \).
Method

- The resistance to penetration of air through the CLT wall-floor-wall construction is measured according to NS-EN 12114 Thermal performance of buildings. Air permeability of building components and building elements. Laboratory test methods.
- The air leakages are measured at 50 Pa pressure difference over the test section.
- Airtightness measurements performed at delivery moisture content of 14 kg/kg and after drying to <10 kg/kg.
- The measurements are performed in the air permeability chamber located at SINTEF Building and Infrastructure in Trondheim.
Test sections
Two different wall elements with and without gluing of the board edges
Two different test sections

With glued board edges

11mm Sylomer mat

Without glued board edges

Plywood blocks
Test performance
Test results

Air leakage m³/h

- Not glued 14 % (kg)
- Not glued 10 % (kg)
- Glued 14 % (kg)
- Glued 10 % (kg)

- Whole test section
- Floor section
- Wall section
<table>
<thead>
<tr>
<th>Test section</th>
<th>Moisture content kg/kg</th>
<th>Influence on the buildings air change rate h(^{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board edges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>not glued</td>
<td>~ 0.14</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.10</td>
<td>7.7</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Board edges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>glued</td>
<td>~ 0.14</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.10</td>
<td>2.8</td>
</tr>
</tbody>
</table>
Discussion

- Air leakage through the CLT construction can vary depending on the moisture content.
- The measurements support the recommendation that CLT constructions need to be designed with airtight joints.