Measurements of air leakage through clamped joints

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ABSTRACT
Laboratory measurements have been performed to investigate the airtightness of clamped joints in the wind- and vapour layers. Air leakage was measured immediately after mounting with moisture content of the wooden members at approximately 17 weight %, and after drying down to approx. 7 weight %.

It was found that screws as fasteners provided better airtightness than nails. Center distance of 600 mm resulted in general higher air leakages than shorter center distances like 300 mm or 150 mm. These findings confirm and support practical recommendations previously made by SINTEF Building and Infrastructure for the Norwegian Building industry.

KEYWORDS

Wood, Airtightness

BACKGROUND
The harsh Norwegian climate requires buildings designed to high standards. An airtight building envelope is critical to achieve an energy efficient building and to avoid moisture problems.

Use of clamped joints is a traditional way to make joints in the wind- and vapour barrier airtight in Norway and other countries. The air tightness of clamped joints depends on several parameters, for both prefabrication of building elements and for construction on site. Some of them have been investigated in a laboratory study. The resistance to penetration of air through clamped joints in the wind- and vapour barrier was tested in accordance with EN 12114 (Standard Norge 2000).

The research has been performed within the smartTES project (www.smartTES.com)

METHOD
The air leakage was measured by use of a test box with an open side (500 mm x 2000 mm) to which the barrier material including the clamped joint were mounted. Inside the test box a 1800 mm stud was mounted to which the batten and joint were screwed or nailed, making the length of the clamped joint 1800 mm. Two sheets of 0,15 mm PE-foil with dimensions 2100 mm x 330 mm was used to represent the typical foil materials used as wind- and vapour barriers. A sectional drawing of the test box is shown in Figure 1. 63 test samples were constructed. The measurements

were conducted with different thicknesses of the batten (18,30 and 48 mm), different sizes of nails or screws and various cc- distances of the nails or screws (150, 300 and 600 mm). Air leakage was measured immediately after mounting with moisture content of the wooden members at approximately 17 weight %, and after drying down to approx. 7 weight %, resemble wood indoor moisture content.

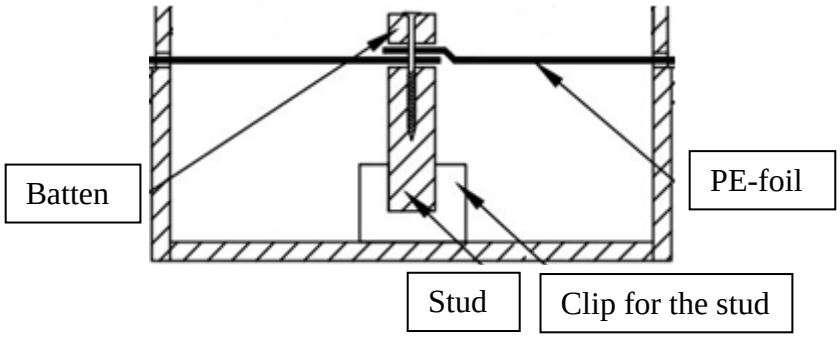

Figure 1: Cross section of the test box.

RESULTS

Before drying (moisture content = 17 weight%) most of the test samples where very air tight as shown in Figure 2.

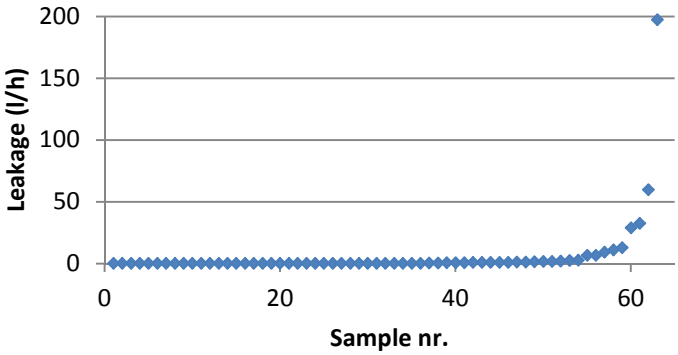

Figure 2: More than half of the 63 samples had no measureable air leakage. 83% of the samples had lower leakages than 2 l/h.

Figure 3 shows the air leakage both before and after drying for the samples clamped with nails. The dimension of the batten and nail was respectively 18, 30 and 48 mm mm and 65-2,8 mm, 75-2,8 mm, 90-2,8 mm.

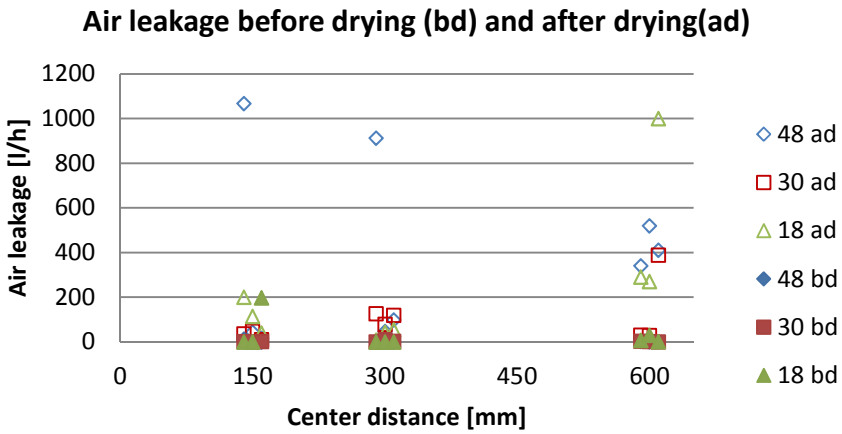

Figure 3: Filled symbols shows air leakage before drying (bd). Open symbols shows air leakage after drying (ad).

The air leakage increased considerable after drying as shown in Figure 3. For all thicknesses of the batten cc- distance of 150 mm and 300 mm gives lower air leakages after drying than center distance of 600 mm.

Figure 4 shows the air leakage both before and after drying for the samples clamped with a batten with 18, 30 and 48 mm and screws with dimension 6x80 mm and 6x120 mm respectively.

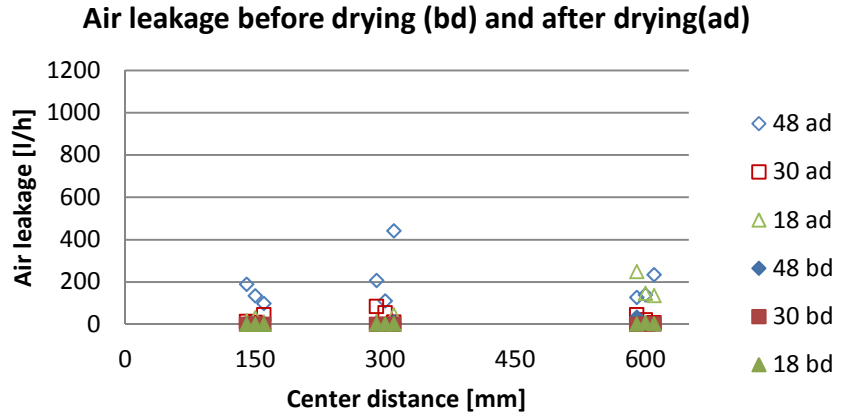

Figure 4: Filled symbols shows air leakage before drying (bd). Open symbols shows air leakage after drying (ad).

The results show clearly that air leakage increases after drying. Battens with thickness of 48 mm gives larger air leakages than battens with thickness 18 and 30 mm.

CONCLUSIONS

It was found that screws as fasteners provided better airtightness than nails. Center distance of 600 mm resulted in general higher air leakages than shorter center

distances like 300 mm or 150 mm. These findings confirm and support practical recommendations previously made by SINTEF Building and Infrastructure for the Norwegian Building industry (Byggdetaljer 523.255 2007).

References

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