DGZ SCREW TESTING ACTIVITY

MEZeroE
Measuring Envelope systems for Zero Energy buildings

ROTHOBLAAS

Product: DGZ screw with double thread

Rothoblaas is an Italian multinational company from the Alpine region, leader in the development and supply of high-tech solutions for the areas of beam and post and Mass Timber construction systems, energy efficiency, zero emissions and other building best practices.

DGZ screws for continuous connection of the insulation layer

Pilot Measurement & Verification Line 2

Managed by: EURAC Research

PM&VL2

An important feature the PM&VL2 will offer is the coupling of testing and modelling activity, hence exploiting the tests in order to calibrate models and broadening the analyses.

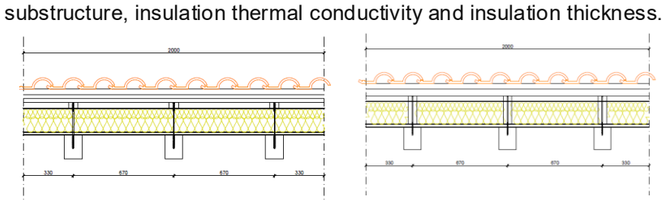
EFFICIENCY

Which is the need covered by this service?

The analysis aims to evaluate the thermal performance of the roof construction using DGZ screws, an innovative type of screw with double thread that allows continuous and uninterrupted fastening of the roof insulation package, when compared to an equivalent construction using partially threaded screws in the context of an insulated timber roof. The simulations were performed on the DGZ wood screws limiting the thermal bridges in accordance with energy saving regulations.

Design of Experiments

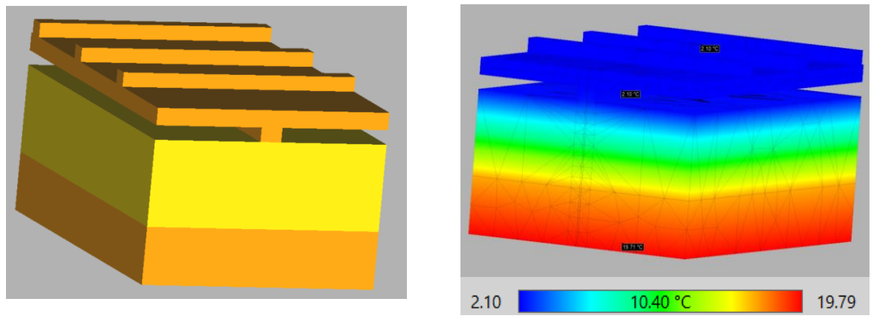
3D thermal simulations of the roof structure with the screw are carried out in accordance with the standard UNI EN ISO 10211:2018 with the software “Mold 3D 5 Dynamic”. The simulations are performed varying many parameters, including type of roof substructure, insulation thermal conductivity and insulation thickness.



Roof construction with DGZ screws (left) and partially threaded screws (right)

Results

1. The thermal bridge effect using the DGZ screws is always smaller than the one using partially threaded screws. The reduction of the thermal transmittance U of the roof using the DGZ screws in comparison to the roof structure with the partially threaded screws, $\Delta U_{DGZ-\text{partially threaded}}$, ranges from $0.014\ \frac{W}{m^2K}$ to $0.033\ \frac{W}{m^2K}$.
2. The difference between the two roof structures using the two types of screws is more visible for the cases with timber beams than for the cases with CLT.
3. Increasing the thickness of insulation, the effect of the thermal bridge decreases.
4. The estimation of the additional thickness of insulation required to compensate the increased thermal transmittance in the case of partially threaded screws compared to the DGZ screws, $\Delta t_{DGZ-\text{partially threaded}}$, ranges from $1.1\ cm$ to $3.0\ cm$.



Example of 3D thermal bridge simulation: geometry (on the left) and temperature trends (on the right)

Conclusions

Calculations have shown an advantage in using DGZ screws instead of partially threaded timber batten screws because the insulation is not interrupted. This advantage, in terms of thermal transmittance (U-value), is seen more for structures with timber beams than for CLT. In addition, the advantage is greater for fewer centimetres of insulation, again in terms of thermal transmittance of the whole package. The U-value advantage is also greater for higher-performance insulation (lower thermal conductivity).

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