MADE IN BELGIUM

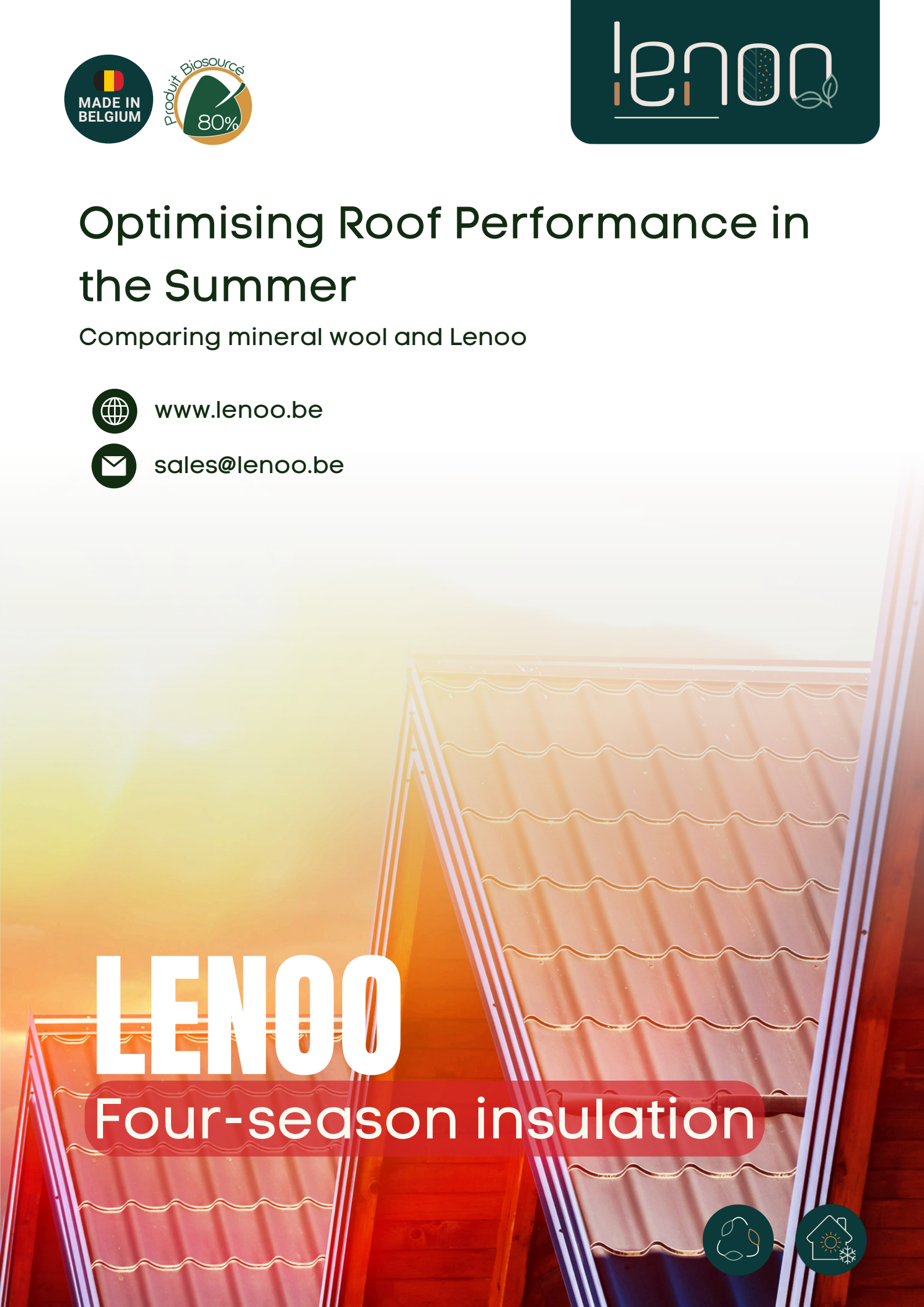
Produit Biosourcé 80%

Optimising Roof Performance in the Summer

Comparing mineral wool and Lenoo

www.lenoo.be

sales@lenoo.be



Protecting against heatwaves

Climate change has been causing temperature increases that equate to milder winters and more intense summers with more frequent heatwaves. It is therefore essential to use high-performance insulation that can protect our interior spaces against temperature extremes in winter and summer alike. Opting for insulation adapted to heatwaves is crucial not just for personal comfort, but to keep household bills low by reducing the need for air conditioning. It also helps to reduce carbon dioxide emissions, bringing our homes in line with the priorities of the energy transition and environmental protection.

- Superior comfort
- Less air conditioning
- Lower CO2 emissions

However, it is important to note that not all insulation materials offer the same performance, particularly with regard to protection in the summer. In Belgium, homes have traditionally been insulated using mineral wool. Although this material is good at retaining heat in winter, it is far less effective during periods of intense summer heat.

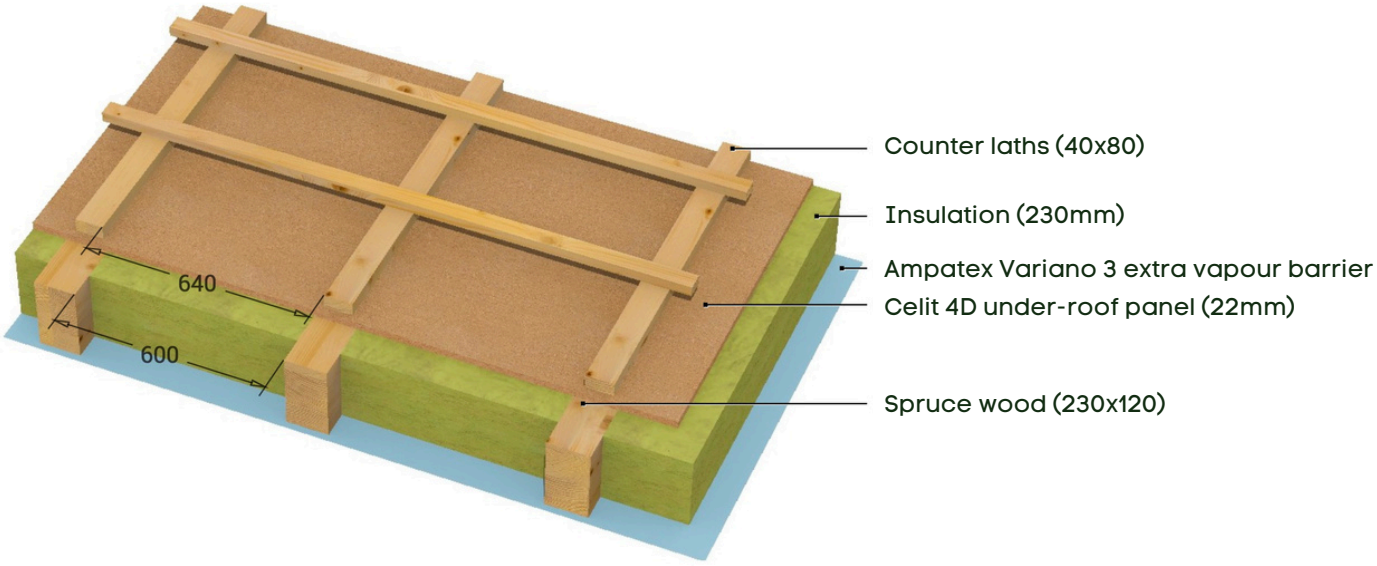
This type of insulation also raises significant environmental concerns. Its production is energy-intensive and requires considerable resources, which has a negative impact on the environment. Its durability has also been called into question: it tends to become less effective over time. Finally, end-of-life disposal is an additional challenge: mineral wool is not easy to recycle or dispose of in an environmentally friendly manner. These factors need to be taken into account when choosing insulation, for optimal performance with minimal environmental impact.

WHY THE ROOF IS IMPORTANT

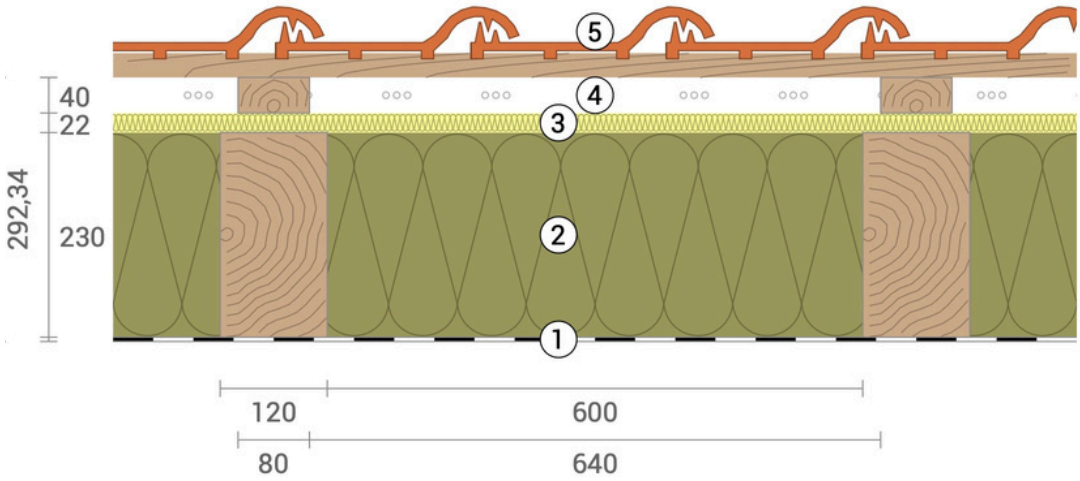
A sloping roof has a large surface that is exposed to the sun, and the intense solar radiation generates temperatures under the tiles that are significantly higher than those of the outside air. This heat accumulates under the roof, above a generally small habitable space, intensifying the heat under the rafters. Effective insulation in this part of the house is therefore essential to reduce heat penetration and ensure adequate thermal comfort inside, even when the occupants may be close to the surfaces of the sloping ceiling.

COMPOSITION OF OUR ROOF

Here is a 3D view of the composition under the tiles (terracotta) of our roof. Sufficiently thick insulation is used – be it rock wool or Lenoo insulation material – to achieve a minimum overall thermal resistance of 5, taking all structural factors into account, as calculated by the Ubakus software programme.



2D view of the composition with terracotta tiles :



1) Ampatex Variano 3 extra vapour barrier
2) Insulation (230mm)
3) Celit 4D under-roof panel (22mm)
4) Ventilated air gap (40mm)
5) Terracotta tiles (103 mm)

The vapour barrier is a membrane placed on the inside of the thermal insulation. Its role is to limit how much water vapour penetrates the roof structure from the inside of the house, while allowing any moisture present in the structure to escape. This helps prevent problems caused by damp such as mould or wood rot, and improves the energy efficiency of the house.

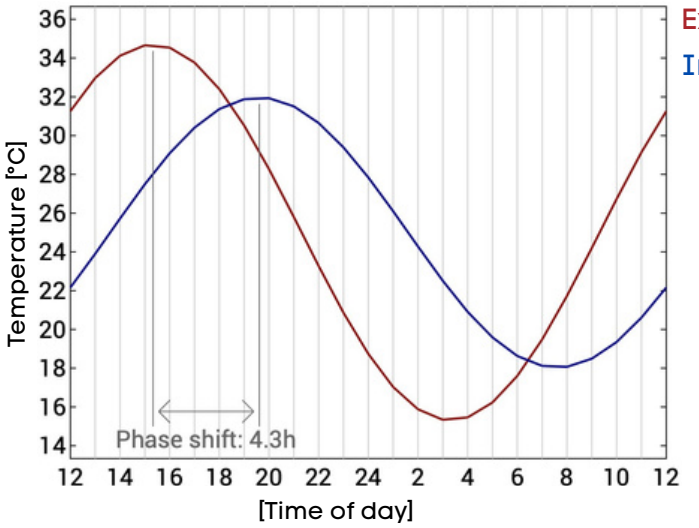
The under-roof panel serves as an additional protective barrier under the tiles or roof covering. It protects the roof structure from the elements (rain, snow, wind) and any water that gets under the tiles. It also contributes to the roof's thermal and acoustic insulation.

The ventilated air gap is a space between the tiles and the under-roof panel. It allows continuous air circulation that removes moisture and excess heat from under the tiles. This ventilation prevents condensation and overheating, extending the life of the roofing materials and improving the home's thermal performance.

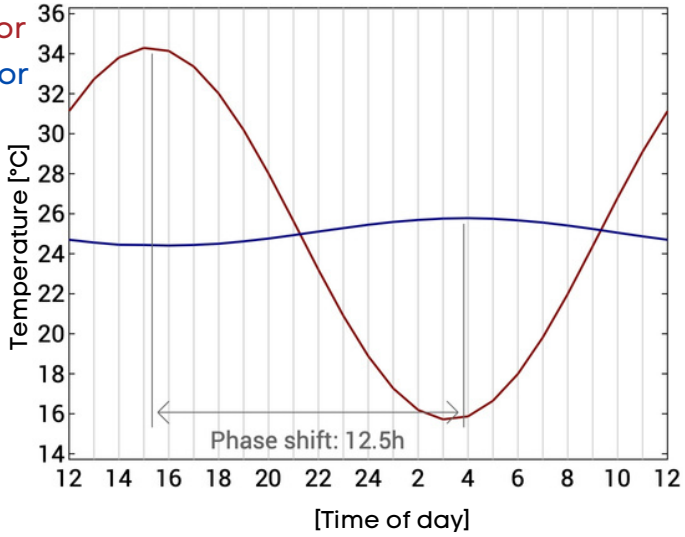
These three components that are typically present in an insulated roof work together to keep the roof watertight, durable and energy-efficient.

SURFACE TEMPERATURE CHANGES DURING THE DAY

Mineral wool



Lenoo



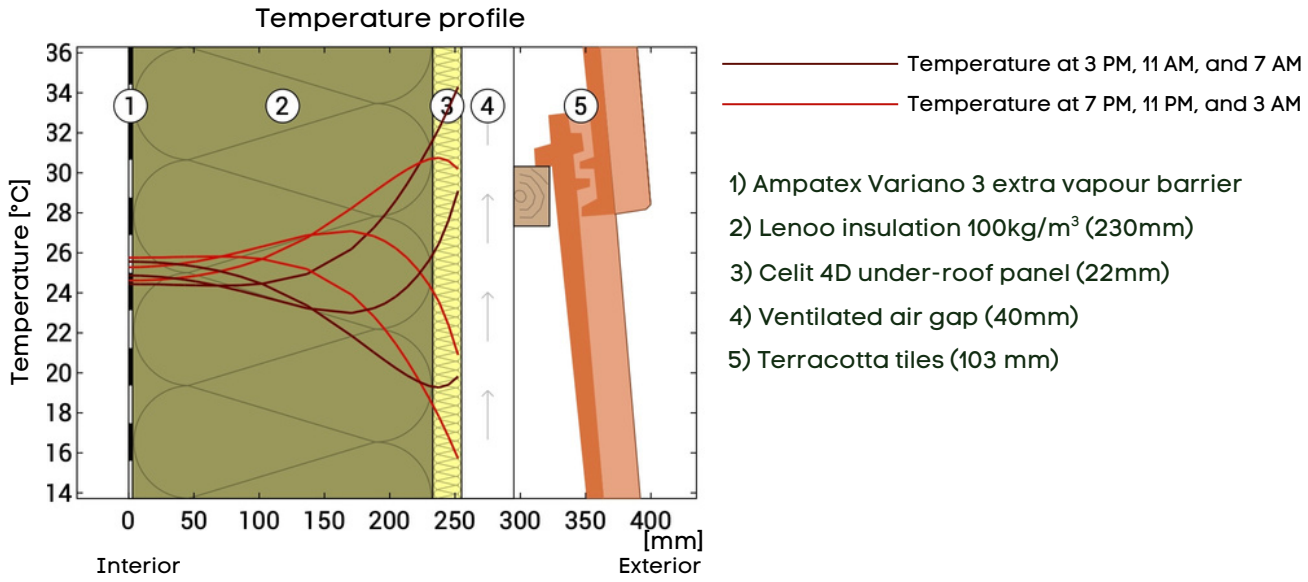
The graphs below illustrate the performance of the two types of insulation in typical heatwave conditions, with temperatures varying between 15°C at night and 35°C during the day.

The first graph, on the left, represents mineral wool. After the temperature has peaked at around 3 pm (red line), the heat is felt inside the home at around 7 pm (blue line), four hours later. This phenomenon, known as phase shift, shows that the heat takes some time to penetrate inside. However, mineral wool insulation doesn't do enough to mitigate this peak, because the interior wall temperature remains high, reaching up to 32°C.

By contrast, the second graph, on the right, illustrates the performance of Lenoo insulation. The temperature peak is experienced much later, at around 3 am (more than 12 hours later), when the outside temperatures are already cooler, but the heat is now much less intense The home's interior wall temperature is stabilised at around 25°C throughout the day. Some ventilation during the night will be enough to make it feel a little cooler, greatly reducing the need for air conditioning.

Real temperature or **apparent temperature**? The temperature felt in an interior space depends not just on the air temperature, but on the temperature of the surrounding surfaces such as walls, ceilings and floors. The temperature of the air affects our thermal comfort because it comes into direct contact with our skin. However, nearby surfaces can also affect this feeling because of thermal radiation: a cold wall can give the impression of drawing heat out of our body, while a warm wall may seem to radiate heat towards us. During periods of intense heat, it is therefore essential to keep the surfaces in your environment at a moderate temperature for optimal comfort.

ABSORPTION OF HEAT BY LENOO INSULATION



The graph above illustrates the stability of the temperature inside a wall insulated with Lenoo material. The temperature inside the wall stays constant at around 25°C throughout the day.

In short, Lenoo insulation stands out for its ability not just to provide effective roof insulation in the winter but to also protect against rising summer temperatures. It offers a much better thermal phase shift than mineral wool, keeping interiors cool for longer and reducing reliance on air conditioning. As a bio-sourced insulation material, Lenoo also reduces buildings' ecological footprint and qualifies for a significant additional premium when used in renovation work in the Walloon Region. Lenoo insulation is a sustainable and economical solution that meets today's climate challenges.

The effectiveness of a building's thermal protection is measured by its ability to reduce temperature variations (damping) and delay heat transfer (phase shift). However, predicted internal temperatures do not always reflect actual temperatures, due to other factors such as the capacity of interior walls and floors to store heat. What's more, the temperature under the tiles can rise to double the outside temperature in full sunlight, which has a significant impact on indoor thermal comfort. Night-time ventilation and the impact of direct sunlight, which can be much more significant than heat passing through an insulated wall, must also be taken into account. The use of external solar protection is crucial. Without it, the reduction in temperature variations is almost negligible given the heat input through large windows exposed to the sun.