

RENOVATION REPORT

The renovation reports are grounded in the findings of the pilot projects conducted as part of the ISOL'ution project. They synthesise practical lessons learned and identify key considerations for the reuse of insulation materials in various building typologies and material types.

SITE 7

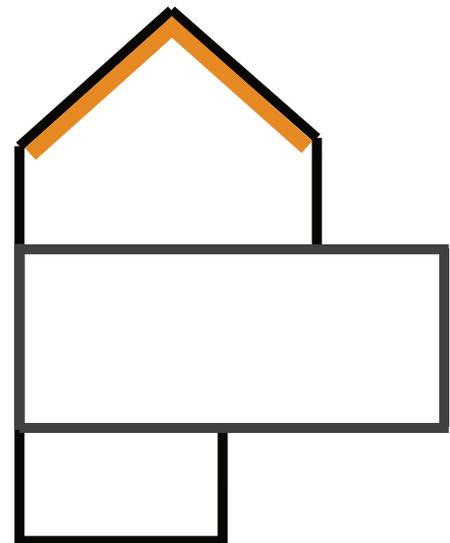
FLAT ROOF AND INTERIOR WALLS



EXISTING SITUATION

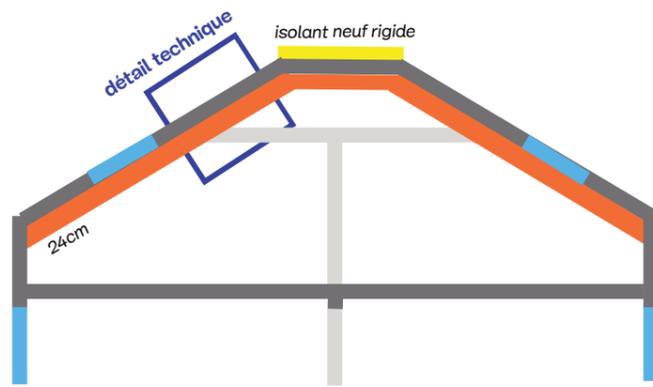
Attic of a single-family house used for storage

Location of intervention	attic
Affected floors	3
Housing units	1
Year of construction/major renovation	<1930
Type of construction	Timber frame
Component to be insulated	roof
Surface area of the envelope	260
Points to consider	complexity of the wooden structure, with places where several beams intersect



Section schématique de la typologie

TECHNICAL CHOICE



Coupe vertical schématique

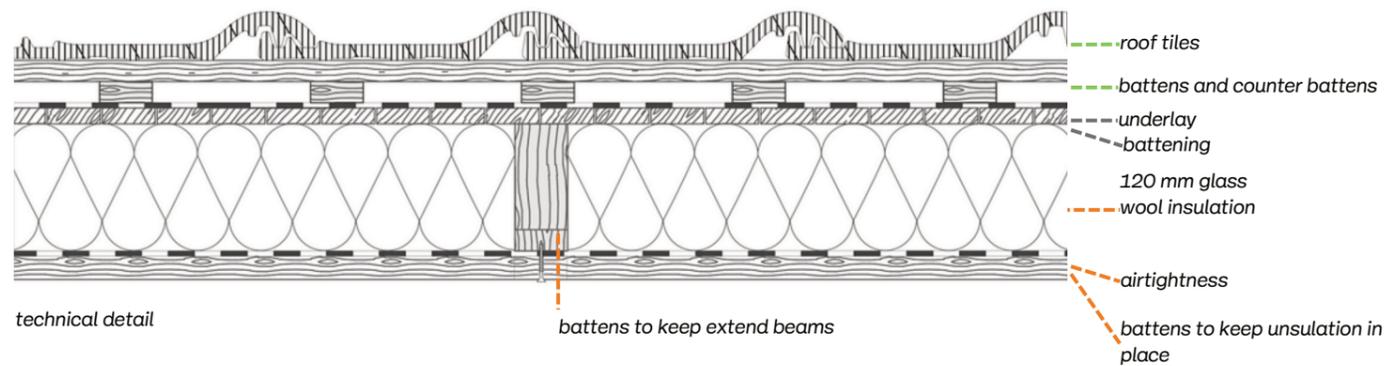
● isolant neuf ● fenêtre ● isolant réemployer ● structure

Elements to be insulated	pitched roof
Side of insulation	interior
Surface to be insulated	65 m2
Anchoring method	stuck between the rafters
Type of insulation used	mineral wool
Execution by	Haracinda

Explication détail technique

The conception of this project is relatively simple. First, the beams are extended by a strip of impregnated fir wood. The glass wool is wedged between the beams. The airtight seal is applied with precision to possible puncturing. Due to the relatively large distance between the beams (up to 1 metre), impregnated fir wood strips are fixed perpendicularly to the beams to hold the insulation in place.

For the time being, no finishing layer will be applied, as this attic is currently used for storage, in order to save money and allow for future flexibility. However, the necessary electrical and lighting points are already in place.



technical detail



MATÉRIAUX D'ISOLANT DE RÉEMPLOI UTILISÉ

The entire roof is insulated with glass wool that came from the old insulation in an attic floor of a detached house. The access to the attic happens through a very narrow vertical staircase, which made it difficult to move the insulation. The lack of protection complicated and slightly damaged the insulation. However, because the material had been placed horizontally and had not come into contact with the outside world, it was still in very good condition.

By chance, the original packaging of the insulation was found in the attic. We therefore knew that it was ISOCONFORT 35.



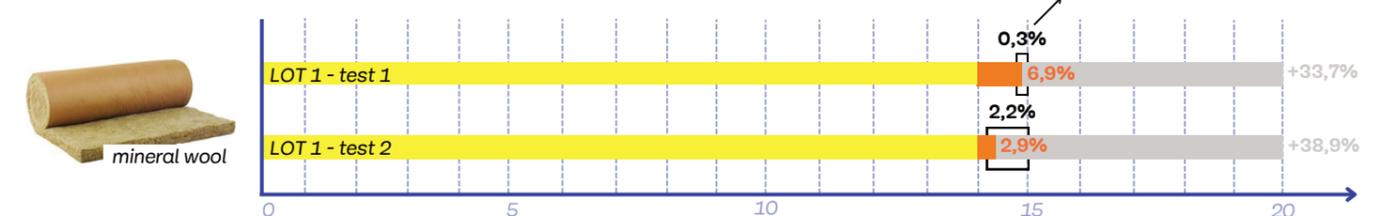
Test results of the thermal conductivity

The table below consists of two parts. First, it lists the materials used and their technical characteristics. Secondly, their thermal resistance is compared using different lambda (thermal conductivity) values and different thicknesses. The thickness of the insulation panels is calculated based on the thermal resistance of an equivalent new insulator (orange), the average measured value (yellow) and the default value (grey). If the technical information on an insulation material is

unknown or unavailable, a default thermal conductivity value from Annex A of Belgian standard NBN B 62-002 is used to calculate the thermal resistance. The thickness is calculated based on an R-value of 4m2.kW (this is the minimum thermal conductivity that applies in the Brussels RENOLUTION subsidy-scheme for roof insulation). The black box indicates the tolerance of the test-device to take into account for the results.

Materials	type	lot	quantity	thickness	average lambda test	new lambda	default value	supplier
Glasswool	mineral	1	230 m2	4cm	0,034814	0,035	0,050	detached house
Glasswool	mineral	1	230 m2	4cm	0,032164	0,035	0,050	detached house
					*1	*2	*3	

Insulation thickness in cm to achieve a thermal resistance of R: 4 m²-K/W



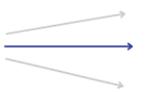
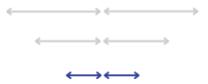
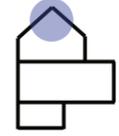
RENOVATION SCENARIOS

This table compares several scenarios: the original situation, a renovation with reused insulation materials, and a renovation with new materials. It examines various aspects: the wall composition, thermal conductivity of the insulation, price, overall environmental score, the share that insulation represents in the climate impact, the impact on climate change, and the thermal performance of the element. The TOTEM tool was used for these analyses. This table enables an informed decision to be made on whether or not to use reused materials for the insulation of a building element.

roof	Element composition	Area to be insulated (m²)	Thermal resistance of insulation R (m²·K/W)	Cost comparison	Environmental impact per life cycle stage (mPt/FU)	Impact per component (mPt/FU)	Impact on climate change (kg CO ₂ eq./FE)	Thermal performance (W/m²·K)
<p>initial state</p> 	Timber frame	0m²				<p>materials: 1,15</p> <p>energy: 187,15</p> <p>188,3</p>	3834 kgCO ₂ eq/m²	2,76W/m².K
<p>reused insulation</p> 	INSIDE + 12 cm glass wool insulation + vapour barrier	65 m²	lambda: 0,0335 R: 3,6	PRICE: 121,3€/m²: 7882,8€ I: 7,7€/m²: 500,5€ M: 37,7€/m²: 2450,5€ L: 80€/m: 5200€ transport 230€	<p>maintenance 0,23</p> <p>waste 0,23</p> <p>production 0,08</p> <p>energy 7,64</p>	<p>materials: 0,54</p> <p>energy 7,64</p> <p>insulation 0,04</p> <p>8,18</p>	162 kgCO ₂ eq/m²	0,29 W/m².K
<p>new insulation</p> 	INSIDE + 12 cm glass wool insulation + vapour barrier	65 m²	lambda: 0,035 R: 3,4	PRICE: 124€/m²: 8060€ I: 14€/m²: 1113€ M: 44€/m²: 2860€ L: 80€/m: 5200€	<p>maintenance 0,23</p> <p>waste 0,23</p> <p>production 0,52</p> <p>energy 7,64</p>	<p>materials: 0,98</p> <p>energy 7,89</p> <p>insulation 0,48</p> <p>8,87</p>	172 kgCO ₂ eq/m²	0,60 W/m².K



FEEDBACK

Design	Installation	Thermal conductivity
<p>side insulation</p>  <p>interior</p> <p>Internal insulation is inexpensive and easy to install. However, special attention must be paid to airtightness.</p>	<p>state insulation</p>  <p>average</p> <p>The insulation was kept in good condition in the attic. However, transporting this material, up a very steep staircase, into the van, to the building site, and then up to the attic floor without the necessary protection, partially damaged the insulation.</p>	<p>sample preparation</p>  <p>complicated</p> <p>Precise sample preparation was not easy. It was difficult to obtain a flat surface with this very light insulation material. Handling horizontally required particular care.</p>
<p>fixation</p>  <p>sandwiches</p> <p>The insulation is wedged between the roof beams, which are extended by battens to achieve a thickness of 12 cm. A second batten is placed onto the waterproofing to hold the insulation in place and secure the future finishing panels. These were crucial as the distance between the beams is large, up to 1 metre.</p>	<p>dimensions</p>  <p>homogenous</p> <p>This material is manufactured in long sheets. For installation on the attic floor, these sheets were mostly kept intact. This resulted in very uniform dimensions and facilitated the installation.</p>	<p>evolution</p>  <p>stable</p> <p>The thermal coefficient of the insulation deteriorated only very slightly compared to the value indicated on the packaging, which was found when the insulation was removed during demolition. On average, performance deteriorated by 5% compared to that of new materials.</p>
<p>humidity</p>  <p>low risk</p> <p>The air tightness is carefully ensured and the house is equipped with a ventilation system. Since the attic is only used for storage, moisture problems are limited.</p>	<p>manipulation materials</p>  <p>low</p> <p>Glass wool is very easy to handle.</p>	<p>default value</p>  <p>average</p> <p>The additional thickness calculated using the default value is approximately 35% higher than the actual value of the material in question. However, this value did not need to be applied as there was no uncertainty regarding the type of insulation used (ISOCONFORT 35) because the packaging is found with the insulation.</p>
<p>choice materials</p>  <p>mineral</p> <p>In this scenario, mineral wool insulation is the most easy, quick and cheap solution.</p>	<p>installation</p>  <p>easy</p> <p>Glass wool is easy to install. It was only the large span between the joists that posed a problem to keep the material in place. The airtight seal and battens therefore had to be installed section by section, rather than insulating the entire roof first and then making it completely airtight, etc. This technique is slightly more labour-intensive.</p>	<p>deformation</p>  <p>low</p> <p>The insulation has lost some of its thickness over time, but only to a very limited extent.</p>
<p>disponibility</p>  <p>average</p> <p>Glass wool insulation is widely available on the reuse market. The materials were found within a few days. It was very easy to dismantle as they were simply laid on top of the attic floor. Storage therefore only needed to be guaranteed for a short period of time.</p>	<p>nuisance</p>  <p>average</p> <p>The installation and transport of reused glass wool causes irritation for the people handling the materials. In this case, there was a lot of dust on top of the insulation, as it was not protected in the attic, this further increased the nuisance caused by the insulation.</p>	<p>variations market</p>  <p>low</p> <p>Glass wool insulation is a very material. There are no major differences between the characteristics of different types of glass wool.</p>
<p>prive</p>  <p>similar to new</p> <p>Because the glass wool was still in good condition, it was sold at a relatively high price. Especially since we also had to remove the insulation from the attic ourselves. This involved personal costs, protective equipment and transport. However, there were no additional costs for installing the insulation.</p>	<p>logistics</p>  <p>high</p> <p>New glass wool is sold in rolls and packaged under pressure in plastic film. For reused insulation, this is no longer the case, making it much more difficult to move the materials. It also caused damage to the sheets during transportation, and they contained more dust because. From this experience, we learned that it is very advantageous to package reused insulation, especially when they are large in size.</p>	<p>The experience of this project has both positive and negative aspects.</p> <ul style="list-style-type: none"> The insulation design is not particularly complex. There is no risk of moisture, the materials are relatively easy to reuse, but they have a low phase shift and not all thermal bridges are fully treated. Installing glass wool between the joists, from inside the roof, is fairly straightforward. The large distance between the joists can make it difficult to keep the insulation in place, but this is achieved by applying a batten to the beams. For health and safety reasons, it is very important to protect yourself properly when transporting and handling glass wool. Thermal conductivity remained relatively stable. There is no uncertainty about the type of insulation used, as the original packaging was found with the insulation.
<p>phase shift</p>  <p>low</p> <p>However, the attic is uninhabited so the impact of the confort of the inhabitants is limited.</p>	<p>building irregularities</p>  <p>average</p> <p>The historic roof structure contains complex beam connections that require special attention in terms of airtightness.</p>	
<p>thermal bridges</p>  <p>risk</p> <p>Currently, only the roof is insulated, not the common walls. This results in a potential difference in surface temperature between these two surfaces. However, the difference will not be very large, because the attic is generally not heated.</p>	<p>continuity insulation</p>  <p>interupted</p> <p>The insulation is interrupted by the beams of the roof structure.</p>	

CONCLUSION

This project shows that reused glass wool can be a simple, quick and economical solution. An uninhabited attic has favorable conditions for this application.

Despite a slight loss of thickness and nuisances related to the insulation not being packaged, it had maintained a good thermal performance.



ISOL'UTION

UTILISONS DU RÉEMPLOI

ISOL'ution is a collaboration between the ATM department of the ULB, La Rue asbl, Casa Blanco and Batiterre. The project aims to test the reuse of insulation materials in energetic renovation projects in Brussels. Insulation materials are recovered, sorted, tested (mainly on their thermal conductivity) and reinstalled in homes.

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