

1.1 Novel Solution #7 - Reflective floor insulation (Delft pilot)

1.1.1 Location in building - Delft

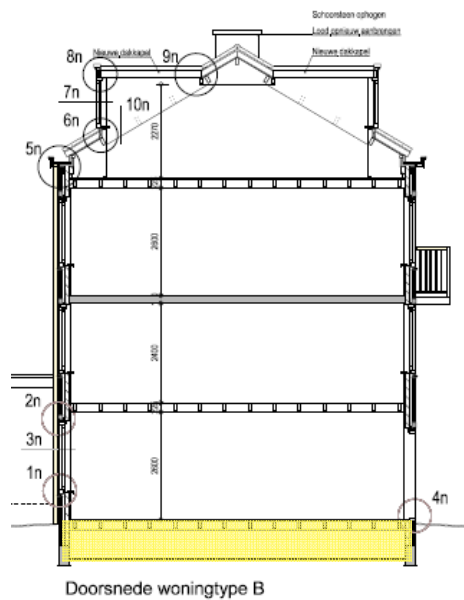


Figure 1: Overview of the Type B floors. Source Woonbron

Both the 28 attached single houses and the 40 bottom floor apartments in the project have a wooden floor resting on wooden beams with enough space to the ground to crawl underneath.

1.1.2 Existing Construction

Before the start of the project there was no insulation underneath the floor.



Figure 2: Typical crawlspace. Source Woonbron

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1.1.3 Identified Problems

Besides the obvious goal of comfortable living, Woonbron wants its dwellings to be well insulated as it basically aims to protect its tenants against rising energy-prices by focussing on good envelopes. The floor is an important part of this, although it does not have the same influence as roof, façade or windows have.

From the viewpoint of the correct rationale to deal with energy-savings at dwelling level the Technical University Delft has proposed the Trias Energetica. The Trias energetica shows a triangled step by step approach:

1. Reduce the demand for energy by avoiding waste and implementing energy-saving measures;
2. Use sustainable sources of energy like wind, the sun, water and the ground;
3. Use fossil fuel energy as efficiently as possible and only if sustainable sources of energy are unavailable.

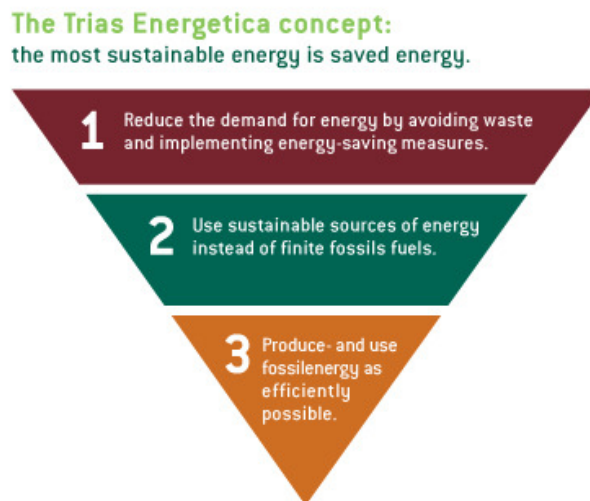


Figure 3: Trias Energetica. Source: www.eurima.org

It is clear that the improvement of the envelope (glazing/facades/roof/proposed floors) is the first step in this process. This solution focuses on the floor-insulation.

1.1.4 Solution

In the Netherlands, suspended timber ground floors are typically supplementary insulated with glass wool (fibreglass), wool or polyester sheets fitted between the floor joists and securely fixed or strapped in place. Another common solution would be to put some kind of material on the floor underneath the wooden flooring, in both cases providing that the ventilation stays adequate. It is always possible, of course, to use some kind of PUR (polyurethane) and close things of.

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In this project however, it was decided to install Tonzon. Tonzon consists of hanging layers of reflective foil with air trapped between them like in a closed cushion, attached to the floor from underneath, and a clean plastic blanket on the floor of the crawl space. Advantages are reduced thermal bridges, rather quick and easy application, cleanness (as the floor is sealed off with a plastic blanket, stopping humidity from the ground) and, of course the insulation value.



Figure 4: Overview of the foils with air-chambers. Source: www.tonzon.nl

1.1.5 Energy Experiences

As the Tonzon R_c value is $R_c = 3.8 \text{ m}^2\text{K/W}$ (when for example the PUR alternative usually does not reach the promised $2.5 \text{ m}^2\text{K/W}$) the actual energetic quality of the improved floors really shows in the energy-labels.

There are other projects in the portfolio of Woonbron however where it has been shown that it is very difficult to install the Tonzon insulation in the best way, leaving doubts about value in the very complicated situations (for example in a very narrow crawl space, or in situations with many beams and pipes).



Figure 5: Picture of the actual project. Source: Evert Hasselaar / OTB



1.1.6 Lessons Learnt

In practise is turned out that there was a high risk of asbestos in the structures underneath the floors. This is – of course – not dangerous when you do not open up the floor and it just rests there. However, it may be dangerous when you start working underneath the floor as will be necessary when applying the floor insulation.

Due to the dwellings being occupied during the refurbishment is was deemed too disturbing for the tenants to install the floor insulation. The approach Woonbron now takes is to install the same floor insulation, but only when a house in empty, due to a tenant moving. This is of course a slower strategy then a normal refurbishment, but with a turn-over rate of 5% of tenants a year, the work does continue.