EuroPHit

D3.8_Evaluate Specialist Deep-Retrofit Products Report

CS12 & OP12

Sweden

INTELLIGENT ENERGY – EUROPE II

Energy efficiency and renewable energy in buildings

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EuroPHit

[Improving the energy performance of step-by-step refurbishment and integration of renewable energies]

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Project Coordinator	Jan Steiger Passive House Institute, Dr. Wolfgang Feist Rheinstrasse 44/46 D 64283 Darmstadt jan.steiger@passiv.de
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Author(s)	Ingo Theoboldt
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Abstract

Retrofitting to the EnerPHit standard will require the following initiatives with respect to building materials and products:

- Use of existing materials in a non-typical method such as additional thickness of insulation;
- Use of non-typical (or non-commonly used) materials to achieve the extraordinary performance of the EnerPHit standard, such as airtightness tapes and membranes, foam glass for thermal bridging and triple glazing in windows;
- Testing of new-to-market materials which have had limited application in real-world scenarios; and
- Identification of short-comings in the marketplace in terms of products or materials that would greatly enhance the application of EnerPHit on a broader scale.

Co-funded by the Intelligent Energy Europe Programme of the European Union

1 Introduction

1.1 Scope of this report

Generic product types will be qualitatively evaluated by the construction teams using such criteria as those listed below:

- Ease of use, including whether specialist training is required for application;
- Fit for purpose;
- General availability in the marketplace;
- Health and Safety considerations; and
- Cost.

2 Building envelope

2.1 Façades solutions

2.1.1 Foamglas façade insulation (CS12)

Manufacturer	:	Foamglas – selling through FOAMGLAS® Nordic AB	
Homepage	:	http://www.se.foamglas.com	
Product name	:	2.2 Oventilerat fasadsystem	
URL:	:	http://se.foamglas.com/sv/byggnad/anvaendningsomraden/isoleringssystem_foer_fasader/oventilerat_fasadsystem/#2-2-1	
Fit for purpose	:	Various U-Values and surfaces available Applicable on	
U-value [W/(m²K]	:	0,12 (total for CS12)	
Thickness [mm]	:	300 (plus existing wall and render)	
Installation pace	:	Relatively fast	
Preconditions	:	Suitable on all kinds of wall constructions	
Usability	:	Can be installed by common builders under supervision	
Availability	:	To be ordered from Foamglas Delivery times are given for every separate case.	
Health /Safety	:	Foamglas is save to work with	
Costs [€/m²]	:	Material price strongly depends on the ordered amount of material, e.g. 100m2 @ 300mm thick ca. 120 €/m2 **plus** labour, delivery and rendering.	Expensive
Other	:		

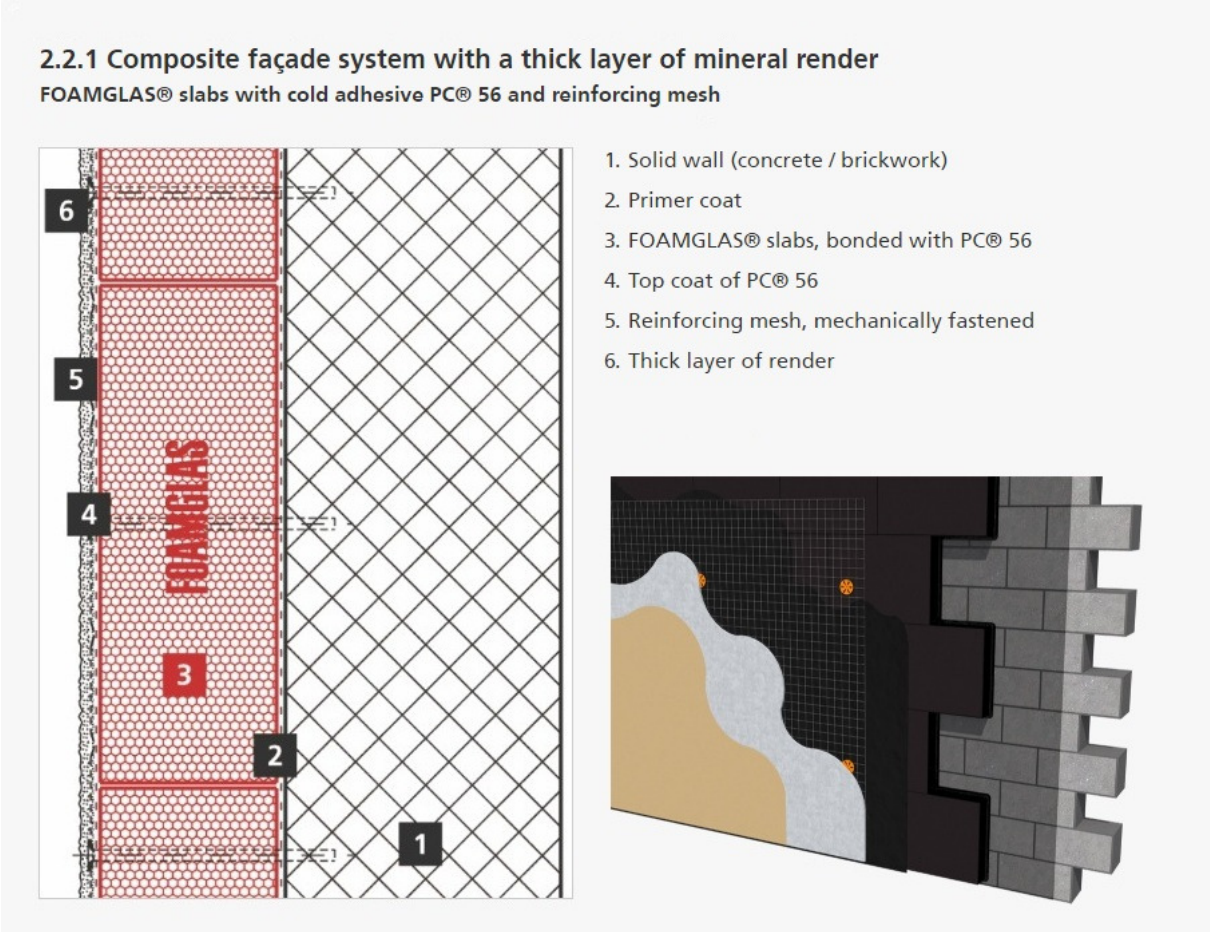

Figure 1: Foamglas® wall insulation system (source: Foamglas)

2.1.1.1 Massive walls insulation system properties

- Cost efficiency: The high durability preserves maximum value and guarantees minimal maintenance costs – even though the initial purchasing costs are relatively high.
- Sustainability: Optimum insulation and protection against moisture for generations.
- Safety: Compact, fully bonded insulation system preventing damages caused by damp either through condensate or water penetration. Cellular glass prevents fire spread, does not develop flaming droplets, nor fumes or toxic gases.
- Functionality: Insulation and vapour barrier in one single functional layer.

2.1.1.2 Special products avoiding thermal bridges (e.g. floor, windows, etc.)

External foamglas insulation helps reducing - respectively avoiding – thermal bridges. It is also used for reducing thermal bridging with window installations.

2.1.2 Rockwool REDAIR FLEX façade insulation system (OP25)

Manufacturer	:	Rockwool	
Homepage	:	http://www.rockwool.se	
Product name	:	Rockwool REDAIR FLEX	
URL:	:	http://www.rockwool.se/v%C3%A4gledning/fasadisolering/redair+flex+-+ventilerade+fasader/systembeskrivning	
Fit for purpose	:	Various U-Values and surfaces available Applicable on	
U-value [W/(m²K]	:	0,102 (total for OP25)	
Thickness [mm]	:	250 (plus existing wall and solar facade)	
Installation pace	:	Relatively fast	
Preconditions	:	Suitable on all kinds of wall constructions	
Usability	:	Can be installed by common builders under supervision	
Availability	:	To be ordered from Rockwool Delivered within 8 weeks	
Health /Safety	:	Mineral wool and wood	
Costs [€/m²] Installed	:	Ca. 250 – inkl. PV-façade (!)	Not very expensive
Other	:	Self-bearing, ventilated façade (external insulation)	

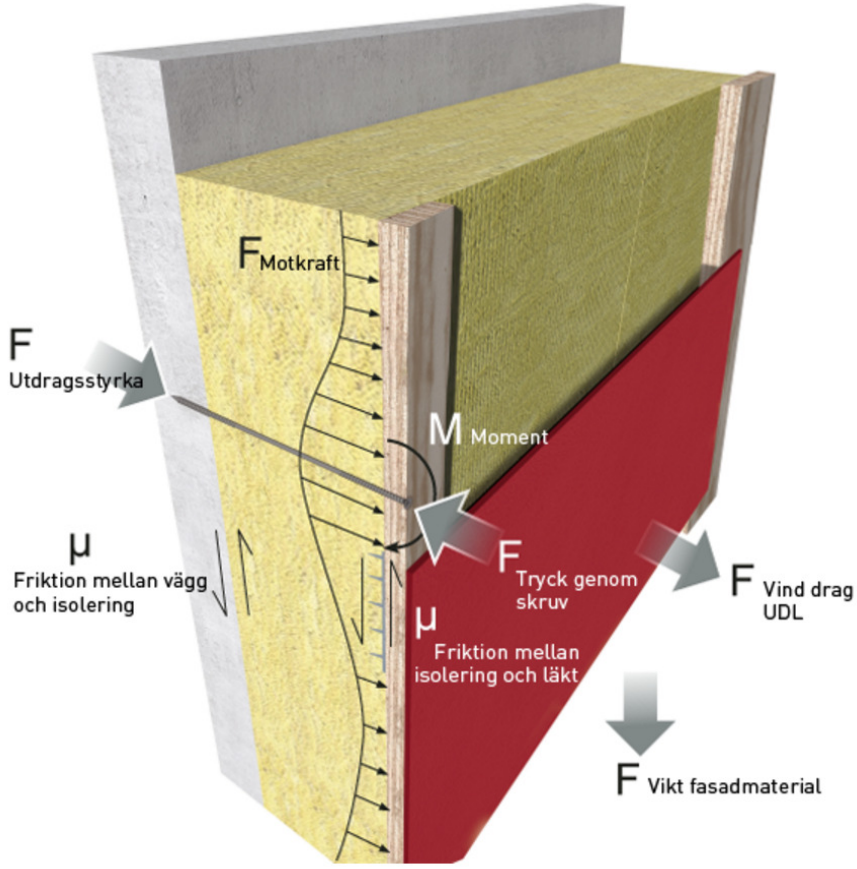

Figure 2: Rockwool REDAIR FLEX façade insulation system (source: Rockwool Sweden)

2.1.2.1 Massive wall insulation system properties

The self-bearing system can be used for buildings up to 30m high. In the case of OP25, the solar façade glass system was fitted as weather shield. Different thicknesses and wind load variants available.

2.1.2.2 Special products avoiding thermal bridges (e.g. floor, windows, etc.)

For the installation of windows and dorrs with reduced thermal bridging, the REDAIR LINK system can be used.

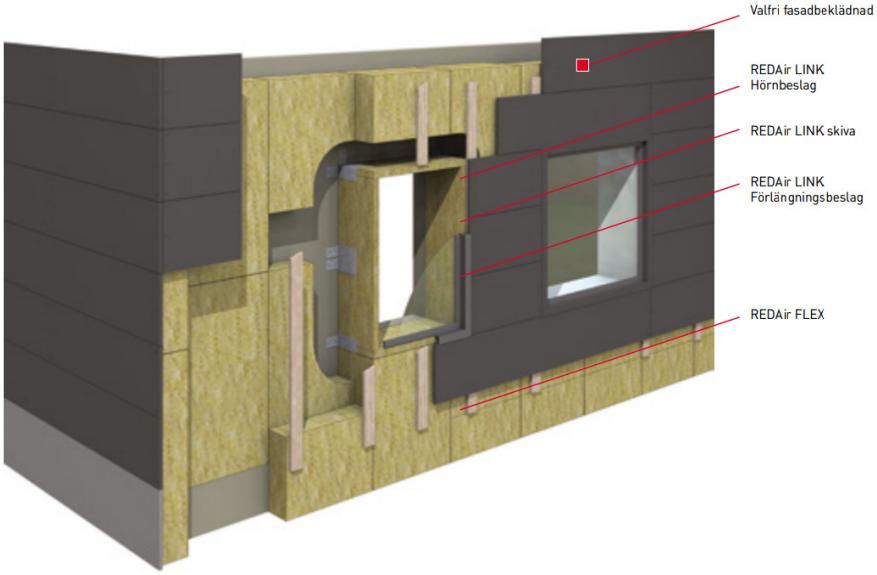

Figure 3: Rockwool REDAIR LINK system (source: Rockwool Sweden)

2.2 Airthightness

2.1.3 Suitable airthightness tapes for temporary use

The ones intended for use with CS12 are Tesa Moll “P” (for wider gaps) and “E” (for smaller gaps. This is between sash and frame. Since they are not of the sponge type, but EPDM, it is expected that they could easily be removed later on. This will most likely not be necessary – as the windows will be exchanged completely in a later step. Tapes around the frame (towards the wall) will not be used – since there, the old windows have been quite tightly installed.

For OP25, no tapes are needed either – since the window-replacement-step is the next one after loft insulation and MVHR installation (and both already have happened).

3 Ventilation

3.1 Ventilation ducts for refurbishment

For CS12, the existing chimney is used for vertical transportation of the air. In the loft, Paul's *Octopus* air distribution is a suitable system – which can also be used in the lower floor level.

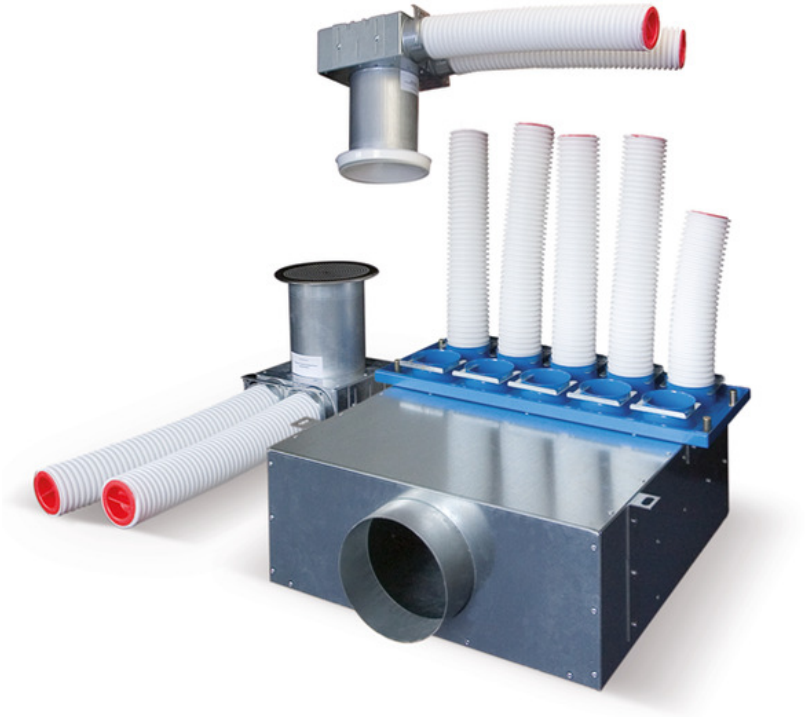

Figure 4: Paul Octopus air distribution system (source: Paul Lüftung)

3.2 Mechanical ventilation with heat recovery

This function will be covered by the Paul Focus 200 DC MVHR. Not especially designed for renovations, has it still its advantages - being relatively small. 91% heat recovery efficiency and 0.31 Wh/m^3 electricity efficiency place it further up on the list of small MVHRs (up to 600m^3/h).

Even though radon is blocked out almost 100% by the shield which has been installed in the basement floor, the forced ventilation with F7-filters helps additionally to clear unwanted substances in the indoor air.

Figure 5: Paul Focus 200 MVHR (source: Paul Lüftung)

A disadvantage which now surfaced under the run of the EuroPHit-project is the fact, that the distributor for Paul has ceased business – and it is now quite difficult to get someone to install and maintain the system. It is hoped that a suitable successor is up-and-running soon.Heating, cooling and domestic hot water generation and distribution

OP25 had already a *Swegon Gold* MVHR installed at the point of joining the EuroPHit project.

3.3 Domestic hot water: low primary energy solutions, heat recovery on grey waters

For Svartbäcksvägen 11, it is planned to install a shower with heat recovery such as the 'Duschwanne ECOshower" from Wagner solar GMBH. It is anticipated, that this device reduces the DHW-demand for the shower ca. 40%.

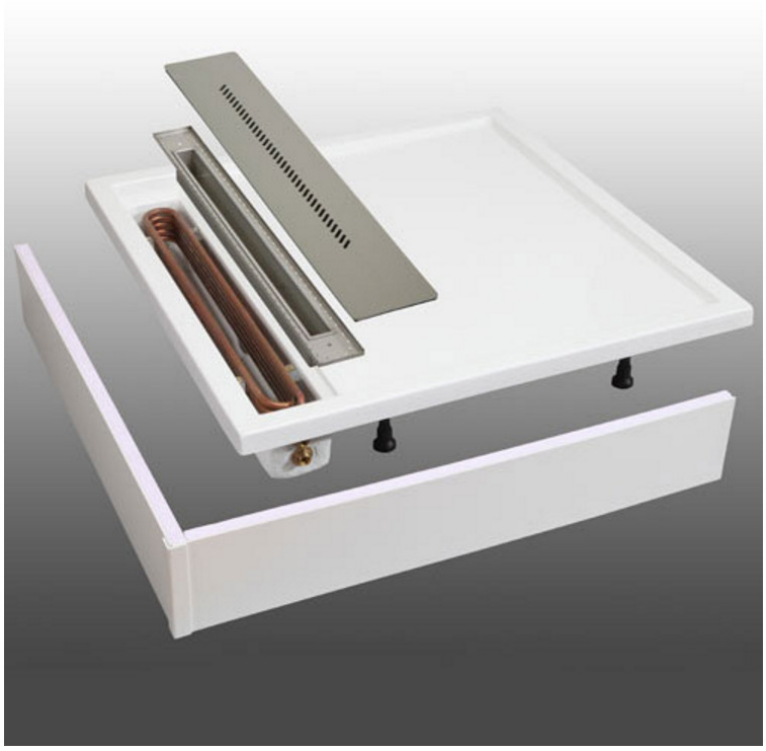

Figure 6: *ECOshower* from Wagner Solar GMBH (source: Wagner Solar GmbH)

3.4 Products for summer comfort

The MVHR will be used for night ventilation as main air supply in the summer – running on summer bypass. In Sweden, this is commonly a suitable way of reducing overheating in domestic buildings, since the temperatures during the night are usually relatively low. Because the heat source is district heat, it is not planned in this case to install a ground heat exchanger (which could additionally provide cooling in summer). It is commonly used though in PH-projects in Sweden – where a lot of ground source heat pumps are being used and the already existing brine system is adapted to provide for the GHX as well.

For OP25, sun production glazing has been chosen for the facades which have too much solar gain under summer time – since no additional external shading has been installed. The following diagram shows the different g-values which have been chosen for the 10 different facades. This is a fairly unusual method for domestic buildings, but saved (as said) the installation of additional shading elements. The size and compactness of *Stacken* allowed for this step - and still remaining under 15kWh/(m^2·a) heating demand.

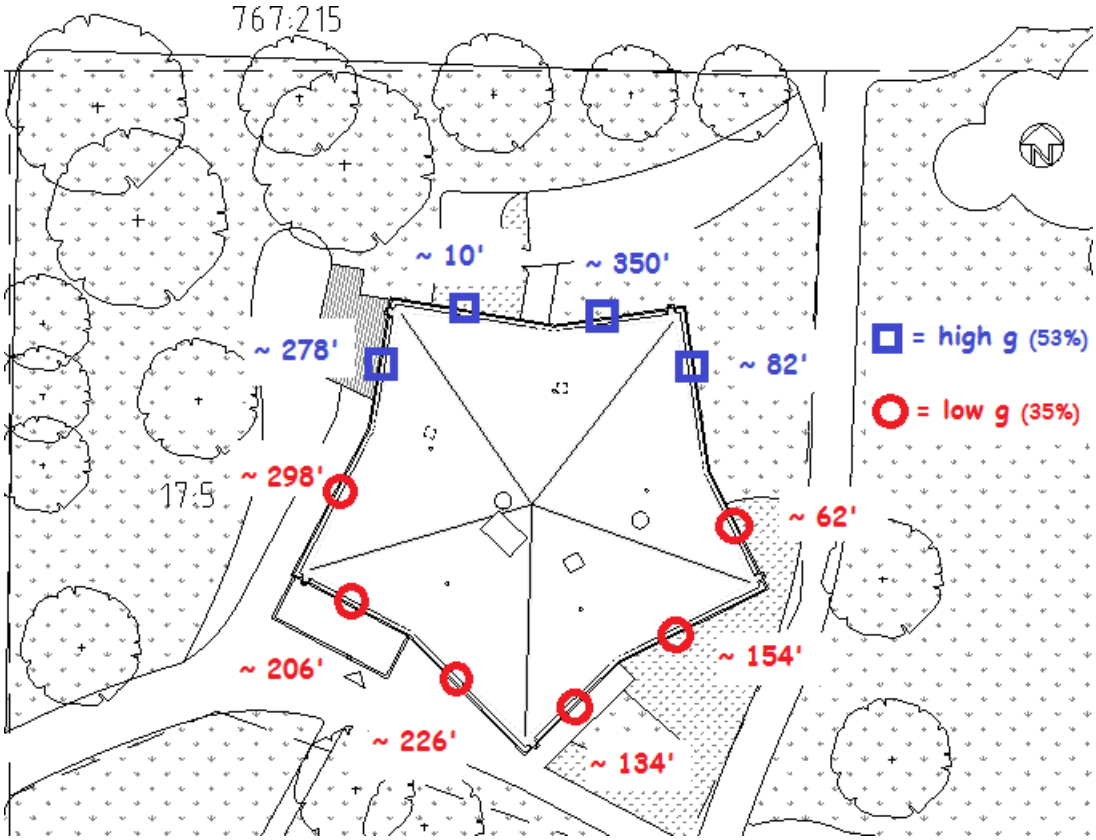

Figure 7: Distribution of g-values with their respective orientation on the facades (source: Passivhusbyrån)

4 Final remarks

The product used for CS12 and OP25 are all available already – some of them relatively new on the market, though. More information on new products can be gained from the results of WP5, D5.1-D5.5.