EuroPHit

D3.8_Evaluate Specialist Deep-Retrofit Products Report

CS14

Wilmcote House, Portsmouth

INTELLIGENT ENERGY – EUROPE II

Energy efficiency and renewable energy in buildings

IEE/12/070

EuroPHit

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

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Abstract

General overview of what is the main subject of this report.

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

1.1.1.1 Use of existing materials in a non-typical method such as additional thickness of insulation;

1.1.1.2 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;

1.1.1.3 Testing of new-to-market materials which have had limited application in real-world scenarios; and

1.1.1.4 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.

It is planned that existing, uncommon and new to market materials and products will be used on each of the step-by-step EnerPHit projects where possible. Where materials are not yet certified for use on public buildings, their properties will be assessed qualitatively by the design and construction teams in terms of their potential for application in EnerPHit projects in future. (source: EuroPHit contract)

2 Introduction

2.1 General project description

4.1.1 Original situation

Wilmcote house provides over 100 homes largely in the form of 3 bedroom maisonettes, which are arranged across 3 blocks linked via two main stair cores. It is located in the central Portsea Island area of Portsmouth. The building is owned and managed by Portsmouth City Council. Wilmcote House was built in 1968 using a prefabricated reinforced concrete sandwich panel system; it is in need of significant repairs, including some structural work, without which the remaining life of the building is likely to be around 30 years. The concrete sandwich panels incorporate only around 25mm of insulation, which combined with all electric heating means staying warm in the building is expensive; many residents experience fuel poverty.

Improving the building to the demanding EnerPHit standard involves a number of challenges; how to insulate the rear façade which features integral but exposed walkways without introduction thermal bridges, how to provide appropriate and effective ventilation and how to provide cost effective heating in a building with limited space for communal services and whose structural characteristics proscribe the use of gas

4.1.2 Modernisation proposal

Wilmcote House will be split into three thermal envelopes with the two stair cores remaining outside the thermal envelopes in order to simplify the detailing required. External walk ways will be enclosed within the thermal envelopes of the blocks in order to improve the area / volume ratio, make the detailing simpler and thus more cost effective. Internal balconies that exist on alternate stories, those between the walkways, will also be enclosed, increasing the size of the maisonettes and again and simplify detailing. The three blocks will be made airtight using an external membrane before an external insulation system is applied to each block.

Each dwelling will be provided with individual MVHR systems. Existing heating systems will be retained for the time being due to resident familiarity and budgetary constraints. Heating could be addressed as and when the current systems reach the end of their lives, in accordance with the step-by-step approach taken by EuroPHit. Ground floors will also not be insulated at this stage but could be considered in a future ‘step’.

2.2 Scope of this report

Brief description of what is the aim of this report.

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

2.2.1.1 Ease of use, including whether specialist training is required for application;

2.2.1.2 Fit for purpose;

2.2.1.3 General availability in the marketplace;

2.2.1.4 Health and Safety considerations; and

2.2.1.5 Cost.

It is anticipated that the construction teams in each country will evaluate 15 generic building products that would be suitable for application in Step-by-step refurbishment to EnerPHit standard. This adds up to 8 construction teams * minimum 15 products=minimum 120 generic products evaluated.' (source: EuroPHit contract)

3 Building envelope

3.1 External Wall Insulation

4.1.3 Rockwool Rockshield

“Rockwool RockShield external wall insulation offers triple value - outstanding thermal and weather protection plus an attractive exterior for new build and refurbishment projects.

The RockShield system is produced from renewable volcanic rock that keeps energy bills low as well as being kind to the environment. There are a number of options in thickness and fixing methods to meet different substrate conditions. Decorative coats and specifically developed paints are available in a wide range of textures and colours, ensuring the best possible finish for your building’s character, context and type.”

Manufacturer	:	Rockwool
Homepage	:	http://www.rockwool.co.uk/
Product name	:	Rockshield
URL:	:	http://www.rockwool.co.uk/products/u/2014.product/9906/building-insulation/rockshield%C2%AE
Fit for purpose	:	High-performing external wall insulation and weather-proofing system
U-value [W/(m²K]	:	Extensions: 0.28 Renovation and Repair: 0.30 New build requirements can range between: 0.27 and 0.22
Thickness [mm]	:	22.3 to 25.3
Installation pace	:	The insulation is easily cut on site using non-specialist tools, such as a panel saw
Pre-conditions	:	Only to be installed by Rockwool approved installers
Usability	:	Low maintenance
Availability	:	
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	Range of decorative coat options, textured finishes, and colours available

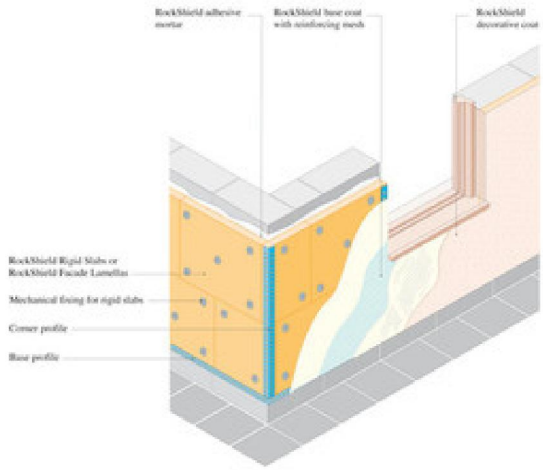

Figure 1: Rockwool Rockshield

4.1.4 Rockwool Rainscreen Duo Slab

“Effective, non-combustible thermal insulation for ventilated rainscreen and overcladding applications.

Rainscreen Duo Slab is a dual density slab which has been specifically developed for insulation behind rainscreen cladding systems and also for sealed cladding systems such as curtain wall and other over cladding systems.”

Manufacturer	:	Rockwool
Homepage	:	http://www.rockwool.co.uk/
Product name	:	Rainscreen Duo Slab
URL:	:	http://www.rockwool.co.uk/products/u/2014.product/9901/building-insulation/rainscreen-duo-slab%C2%AE
Fit for purpose	:	• Designed for use on high rise buildings • High resistance to wind and rain during construction • Fewer fixings required for installation compared to standard mineral wool slabs • Robust front face resists damage and over-driving of fixings • Non-combustible insulation
U-value [W/(m²K]	:	Typically 0.20 to 0.34
Thickness [mm]	:	100 to 180
Installation pace	:	
Pre-conditions	:	

Usability	:
Availability	:
Health /Safety	:
Costs [€/m²] Installed	:
Other	:

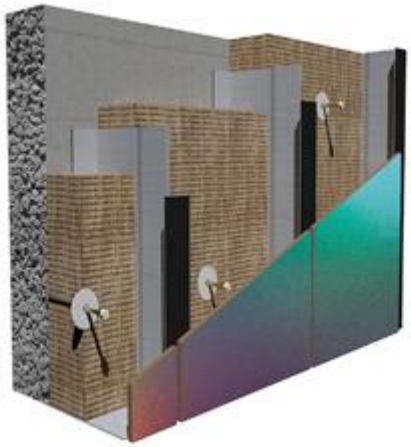

Figure 2: Rockwool Rainscreen Duo Slab

3.2 Below-ground Insulation

4.1.5 Xenergy SL

"XENERGY XPS combines the proven features of STYROFOAM XPS - durability, reliability and strength – but has even better insulation performance thanks to the addition of infra-red blocking particles to scatter and reflect heat radiation within the foam board."

Manufacturer	:	DOW
Homepage	:	http://building.dow.com/europe/
Product name	:	Xenergy SL
URL:	:	http://building.dow.com/eu/gbr/en/products/xenergy/xenergysl.htm
Fit for purpose	:	Durable, lightweight yet robust performance, high strength and excellent moisture resistance, making them ideal for below-ground and inverted roof insulation demands, or for areas where structural support is required.
U-value [W/(m²K]	:	0.032
Thickness [mm]	:	100, 120, 140 and 160
Installation pace	:	Similar to Styrofoam
Pre-conditions	:	
Usability	:	• Similar to Styrofoam • Can be installed in any weather
Availability	:	
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	• Global Warming Potential (GWP) of less than five • Ozone Depletion Potential (ODP) of zero

Figure 3: Xenergy SL Insulation

3.3 Thermal Break Connections

4.1.6 ThermConX

ThermConX are the only thermal break connections able to completely break the conductive path while retaining the full structural integrity of the connection.

The reason this is possible is because ThermConX are not reliant on metal supports running through the connection in order provide the necessary structural integrity and load bearing capacity.

Currently, the most common method of thermal break connection design is based on a procedure known as breaking the beam. This procedure involves breaking the metal beam so that fixing plates can be welded back onto it. In between these fixing plates layers of neoprene and plastic are placed which are secured within the joint once the connecting bolts are tightened and the plates drawn back together.

Benefits of ThermConX:

- Contains no conductive path for heat energy to escape while still retaining full structural integrity.
- A single ThermConX unit saves the equivalent amount of energy as a continually burning 60w light bulb.
- The only thermal break connections to have been awarded full L.A.B.C. National Type Approval.
- Totally inert and requires no running or maintenance costs for the lifetime of the building.
- Available in a wide range of styles to suit all applications and methods of construction.
- Stops interstitial condensation and the formation of mould.
- Fully patented technology.

Manufacturer	:	Insula
Homepage	:	http://www.insula.ltd.uk/
Product name	:	ThermConX
URL:	:	http://www.insula.ltd.uk/thermal_break_connections
Fit for purpose	:	Available in a wide range of styles to suit all applications and methods of construction.
U-value [W/(mK]	:	0.2
Thickness [mm]	:	Various
Installation pace	:	Good – delivered to site complete with all fixings, ready to be installed immediately.

Pre-conditions	:
Usability	:
Availability	:
Health /Safety	:
Costs [€/m²] Installed	:
Other	:

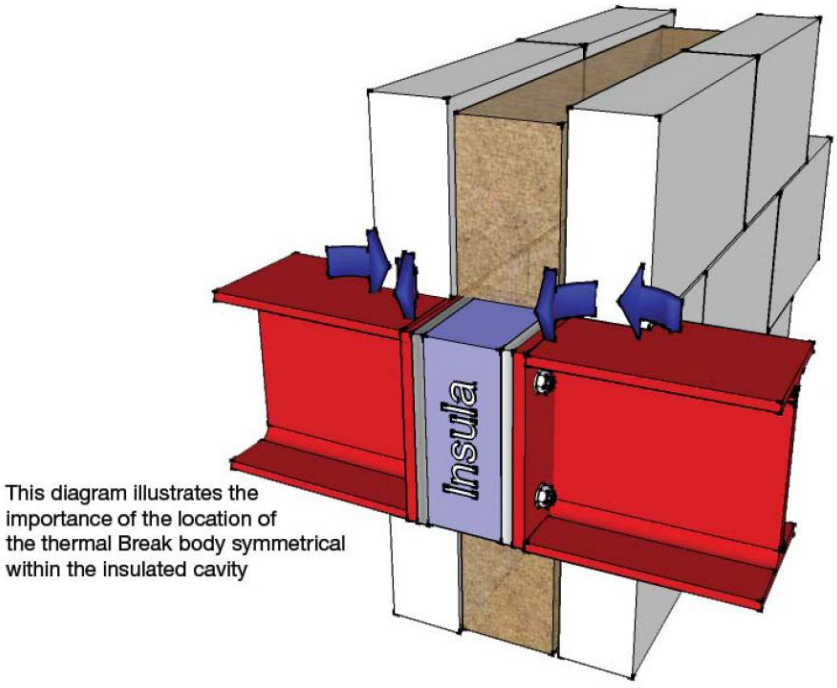

Figure 4: Insula

3.4 Windows and Doors

4.1.7 Rehau Geneo

"In terms of energy efficiency, GENEO® is the best window profile currently available on the market in the UK with an 86mm profile depth. Consequently, with GENEO® profiles it is possible to achieve the most energy efficient window products of their class which are Passivhaus certified, creating an unsurpassed comfortable environment.

RAU-FIPRO®, the innovative material formulation created by REHAU results in window profiles with high stability, torsional stiffness and static properties, which were previously not possible without the addition of steel reinforcements. RAU-FIPRO® has been developed based on fibre composites used in aircraft construction and Formula 1 vehicles bringing high end technology to the window manufacturing industry."

Manufacturer	:	Rehau
Homepage	:	http://www.rehau.com/gb-en/
Product name	:	Geneo
URL:	:	http://www.rehau.com/gb-en/pvcu-windows-doors--composite-curtain-walling/windows/tilt-and-turn-windows/geneo
Fit for purpose	:	• Many architectural possibilities using individual shapes, e.g. round and triangular windows and also chamfering and Georgian bar techniques • Extensive range of design options using colouring with decorative foils as well as lacquering
U-value [W/(mK]	:	0.73 to 1.1
Installation pace	:	
Pre-conditions	:	
Usability	:	
Availability	:	
Health /Safety	:	Easier handling and assembly due to up to 40 % weight advantage compared to conventional window profile systems
Costs [€/m²] Installed	:	
Other	:	• First fully self-reinforced window profile system • Made from a high-tech fibre reinforced composite material RAU-FIPRO® which is fully recyclable up to six times

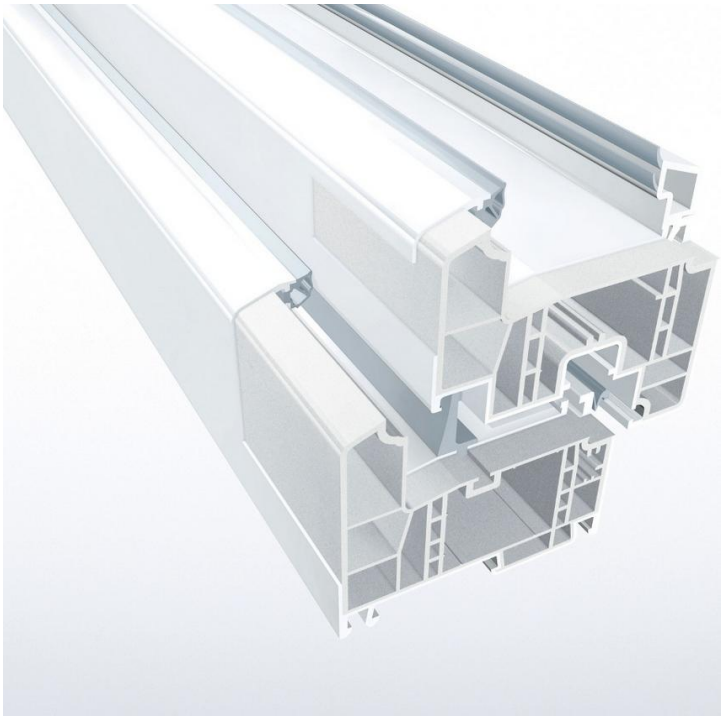

Figure 5: Rehau Geneo Window

3 Airtightness

3.5 Airtightness Membrane

3.1.1 Pro Clima Intello

“Can be used as a vapour check and airtightness membrane for all externally diffusion-open structures, e.g. with roof underlay (pro clima SOLI-TEX), softwood fibreboard or MDF board. For a high level of pro-tec-tion against moisture induced failures in structurally challenging constructions such as diffusion-resistant flat/pitched roofs. Also suitable in extreme environments such as in high mountain regions.”

Manufacturer	:	Pro Clima
Homepage	:	https://proclima.com/home
Product name	:	Intello
URL:	:	https://proclima.com/products/internal-sealing/intello
Fit for purpose	:	Maximum protection for the insulation
U-value [W/(mK]	:	0.17
Installation pace	:	
Pre-conditions	:	
Usability	:	• Ideal prevention against structural damage and mould, even in the event of unexpected moisture intrusion • High protection from condensation in winter climate
Availability	:	
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	

Figure 6: Pro Clima Intello

3.6 Airtightness Tape

3.1.2 Pro Clima Tescon No. 1

"TESCON No.1 is a flexible multi-purpose adhesive tape for airtight bonds indoors and outdoors in accordance with DIN 4108, SIA 180 and ÖNorm B8110-2."

Features:

- TESCON No.1 is used to form a secure and permanent seal of overlaps between foil and fleece membranes (Intelligent vapour checks and airtightness membranes, roof underlays and wall membranes) and joins between such membranes and smooth, non-mineral surfaces.
- TESCON No.1 is also suitable for sealing butt joints between wood-based panels such as OSB or MDF sub-roof panels or wood fibre softboards (e.g., Gutex) in combination with TESCON Primer RP.
- Bonds overlaps between sheets of vapour check and joints between wood based panels (such as OSB), also seals service penetrations.

Manufacturer	:	Pro Clima
Homepage	:	https://proclima.com/home
Product name	:	Tecson No. 1
URL:	:	
Fit for purpose	:	
U-value [W/(mK]	:	
Installation pace	:	
Pre-conditions	:	

Usability	:	
Availability	:	
Health /Safety	:	
Costs [€/m²] Installed	:	
Other	:	• Offers high protection against piercing in corners due to its high elasticity. • With release paper. • Easy to tear by hand.

Figure 7: Tecson No. 1

4 Ventilation

4.1 Zhender ComfoAir 200

Features:

- Comfort ventilation up to a duty of 200 m³/h
- Heat recovery with a heat recovery efficiency of up to 95%
- Low power consumption thanks to EC direct current motors
- Automatic 100% summer bypass
- Infinitely variable frost protection function: efficient even at low temperatures
- Quick, safe installation and servicing
- Simple operation
- Integrated preheater (optional)
- Wireless remote control available
- Digital Ease control unit
- CO2 control (optional)
- With weekly timer as standard
- 'Open Fire' programme for properties with chimneys
- Passivhaus Institut accredited

Figure 8: Zehnder ComfoAir 200

4.2 Spiralite Ducting

"Spiralite is an innovative and unique ductwork system fabricated using rigid phenolic insulation panels.

It is up to 86% lighter than traditional steel ductwork with insulation, significantly more energy efficient, fully sustainable and quicker to install. It also has significant cost benefits over traditional steel ducting, both on installation and whole-of-life. Installation time is reduced as only one fitter is required and once in operation the Spiralite system produces energy savings of up to 40%.

Spiralite is fabricated in the UK from phenolic panels which are cut and formed into flat oval or circular shapes. These shapes give the product exceptional rigidity, a feature which is enhanced by the continuous vapour proof laminate which seals the inside of the duct to give a strong and extremely air tight duct system.

Spiralite is a complete ductwork system; bends, shoes, tees and indeed any shape that can be made in metal can be made in Spiralite pre-insulated ducting."

Manufacturer	:	Spiralite
Homepage	:	http://www.spiralite.co.uk/
Product name	:	
URL:	:	http://www.spiralite.co.uk/ducting/
Fit for purpose	:	Lightweight
Installation pace	:	Quicker than traditional steel ductwork
Pre-conditions	:	
Usability	:	Reduction in initial site labour, management, project and logistic costs – taking labour risk off-site
Availability	:	
Health /Safety	:	Safe and easy to work with – no sharp steel edges, no heavy duty cutting or lifting equipment
Costs [€/m²] Installed	:	
Other	:	

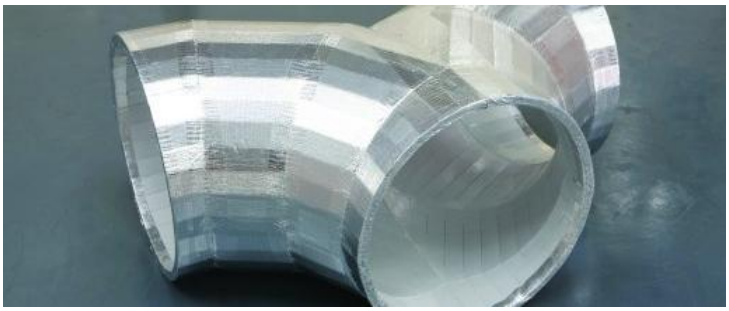

Figure 9: Spiralite Ducting