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WP5.5: Product concepts for high efficiency step by step retrofits

Final presentation

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Product development

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1. Aim of Product development
2. Summary of demand - what exists and what is needed
3. Meetings with Producers
4. Design briefs for specific products and concepts
5. Final guidelines
6. Outlook

1. Aim of Product development

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Global aims

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1. Provide the **Industry** with inspiration:
- by promoting the development of new products
- by providing incentives for thinking outside of the box
- trough scientifically defined design briefs

2. Provide an understanding to **architects and developers**
- thanks to a list of existing products
- by providing an overview of products in development
- by showing how new concepts might affect design decisions

3. Strengthening the **PH Concept**
- by providing a wider range of solutions
- finding new solutions with an even better financial return

Overall refurbishment plan

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Before you start: check dependencies

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Table 1: Cross Check of dependencies for any Building

Step-by-step	Facade	Roof	Windows/ Doors	Heating	Cooling	Ventilation	RES integration	Interior
Facade	CHECK	Thermal bridges	Airtight connections, Thermal bridges	Facade integrated technologies	Shading optimalisation	Penetrations & Facade integrated technologies	Facade integrated technologies	Optimising building envelope
Roof		CHECK	Daylight optimization & Shading, Roof access	Roof integrated technologies	Penetrations & Roof integrated technologies	Penetrations & Roof integrated technologies	Roof integrated technologies	Optimising building envelope
Windows/Doors			CHECK	Window & Facade integrated technologies	Night & Natural Ventilation	Window & Facade integrated technologies	Window & Facade integrated technologies	Daylight optimalisation & Shading
Heating				CHECK	Cooling/Heating synergies	Ventilation/Heating synergies	RES strategies for Heating	Heating concepts
Cooling					CHECK	Ventilation/Cooling synergies	RES strategies for Cooling	Cooling concepts
Ventilation						CHECK	RES strategies for Cooling	Ventilation concepts
RES integration							CHECK	Energy storage &Conservation
New Interior								CHECK

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Areas with high inovative potential

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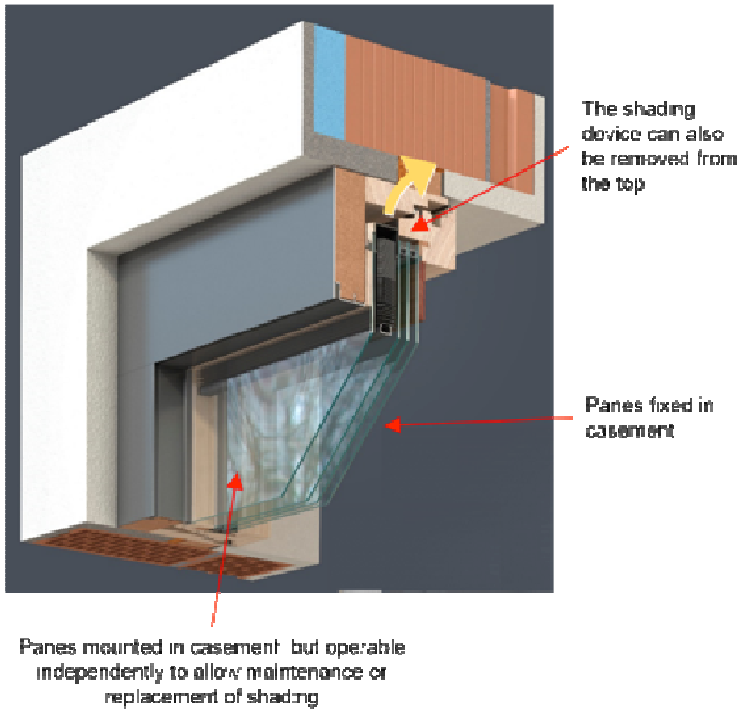
In **Summary of Demand** document, we have identified these areas of interest:

- Insulation, Airtightness & Thermal Bridges
- Windows & Shading
- Heating, Cooling & Hot water
- Ventilation
- RES Integration

Refer this document for a list of

- Existing products
- New concept* proposals
- New product proposals

*Concepts might need several products or a more complex approach



Source: Smartwin - Integrated shading

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Dissemination

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Achieve new product adoption in the market place:

- Get people interested at fairs and presentations in general
- Pilot projects for architects and industry to promote cooperation
- Support for implementation through other EU projects

PHI will continue to provide **Design Briefs** for new potential products. This will provide a continual basis for improvment and development of certified products.

In general this project has provided an understanding that science, design and industry can and should work together to provide new solutions making PH buildings even better.

2. Summary of Demand - what exists and what is needed

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Content of Summary

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Use the Summary of Demand to get:

- An overview of existing products
- Inspiration from new concepts
- Ideas for new products

On the first 18 pages the necessary criteria and requirements that have to be followed for any product development are mentioned:

- Passivhaus criteria
- EnerPhit criteria
- Climate Zones

Download:

http://europhit.eu/sites/europhit.eu/files/D5.2_Summary%20of%20Demand_Final.pdf

Examples in Summary

EuroPHit

Many products already exist and were listed in the document.
Altogether 145 existing products are listed.

Areas with a high potential of improving were identified.

Here some examples:

- Clean endings of partly finished insulation work
- Attic doors
- Integrated shading in Window frame
- Ventilation radiators
- Active overflow units
- Regenerative MVHR
- Additionally mounted facades with PV integration

Looking out for Synergies

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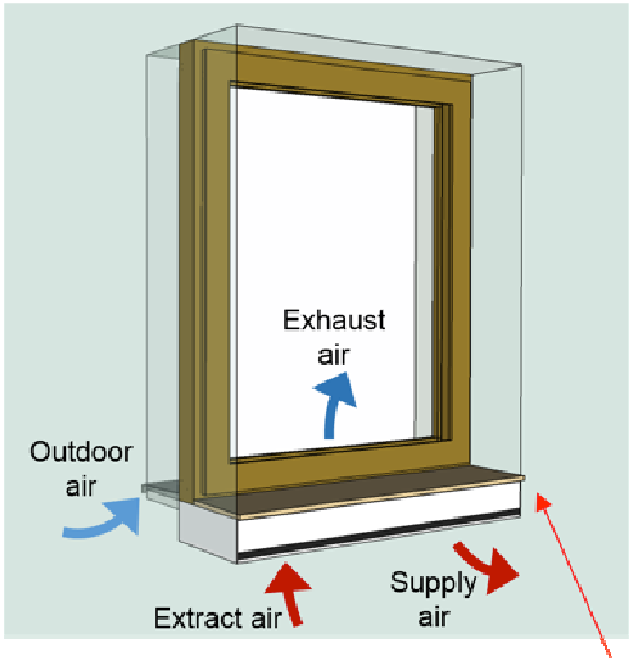
Synergies of different technologies could provide new advantages for user and industry alike.

Here some examples:

- Use of PV for combined hot water and cooling in warm climates
- Prefabricated envelope and step-by-step kits for occupied buildings
- Facade integrated heating, cooling and ventilation systems
- RES integrated shading
- Ventilation radiators for apartment buildings
- Window integrated ventilation



3. Meeting with Producers

Consultations with the Industry

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Several meetings were conducted with Industry representatives to consult possible new developments.

Here from a meeting in Czech Republic about MVHR development: (Airpohoda)

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4. Design Briefs for specific products

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Design Briefs

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Before this project, no Design Briefs existed. Only many separate ideas.

Thanks to the **Design Briefs** the development of new products has become a more rigorous:

- Clearly stated requirements define the product and limits that have to be reached
- Calculation and testing methods are defined in advance
- Design principles help producers focus on potentially difficult elements of the design

We believe PH Product Design Briefs will become an important element of any future development of energy efficient products.

Design brief: Attic staircase

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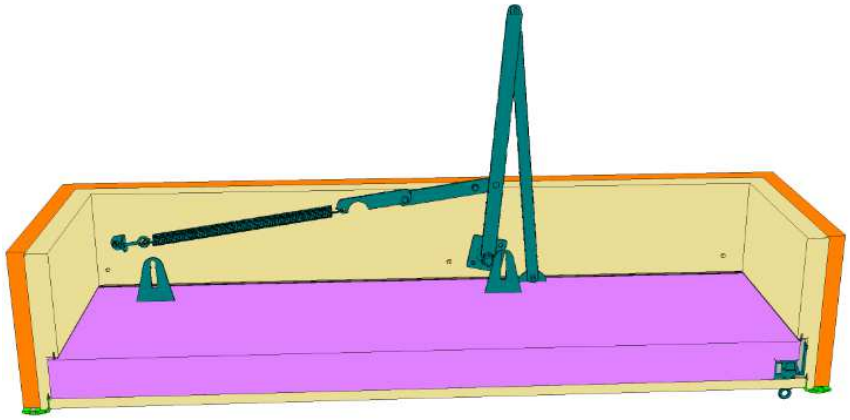
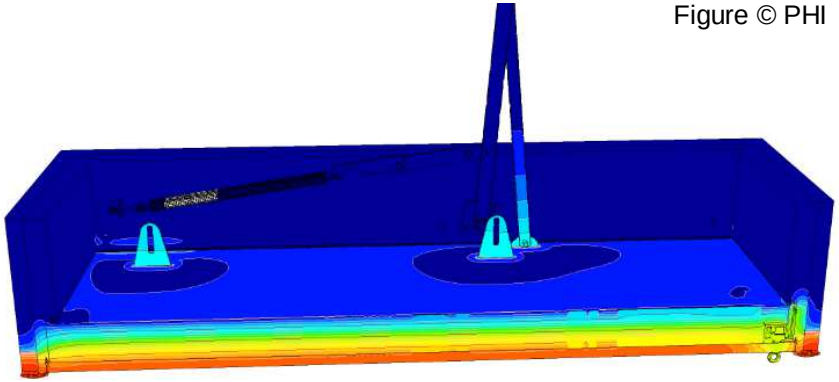


Figure © PHI



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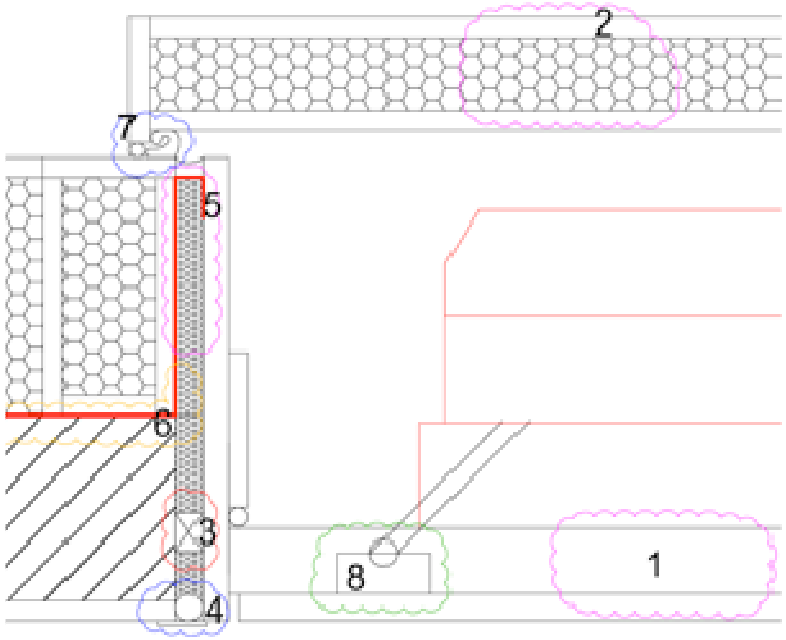

Detailing the integration of attic stairs
Source: PHI

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Design brief: Wall integrated ventilation

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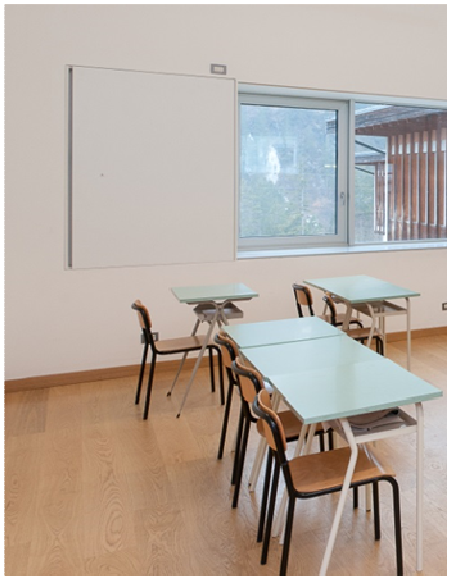
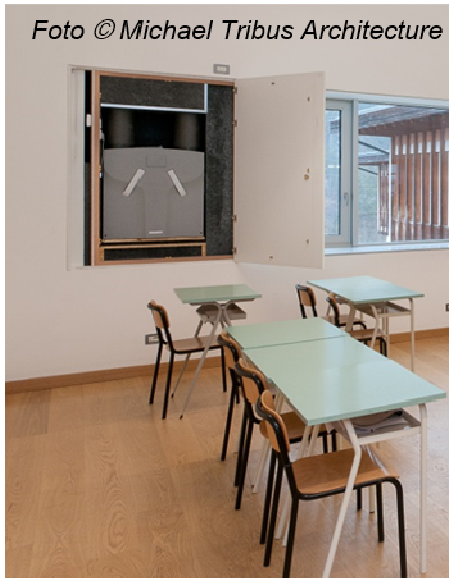
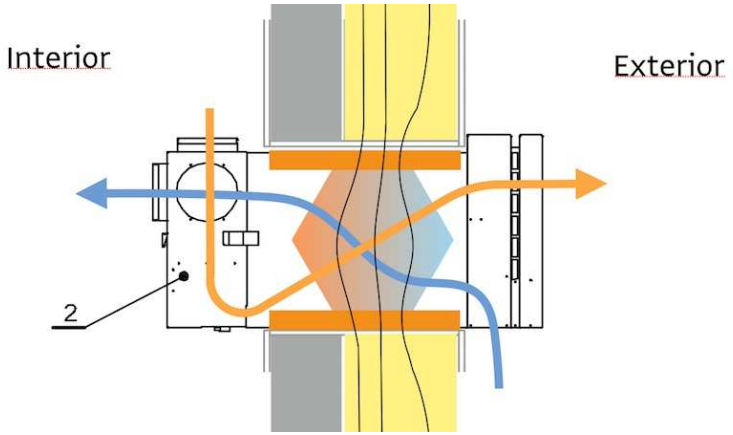




Ventilation device for a classroom integrated in an element of a curtain wall system [Source: Michael Tribus Architecture]



SmartVent Wall integrated unit
Source: Createrra

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Design brief: Regenerating MVHR - alternating

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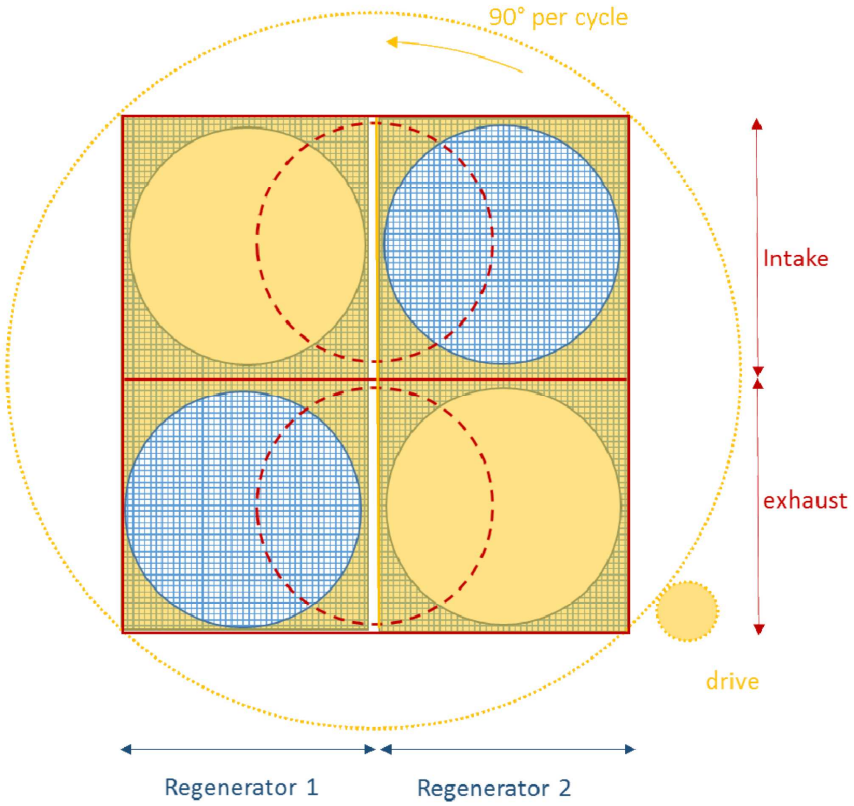

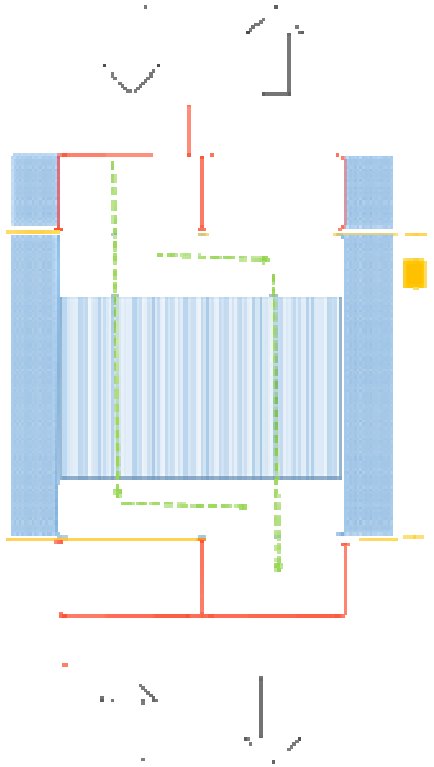

Rotary slide valve. Each 90° turn of the yellow disc switches intake and exhaust between regenerator 1 and regenerator 2

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Design brief: Glazing with integrated shading

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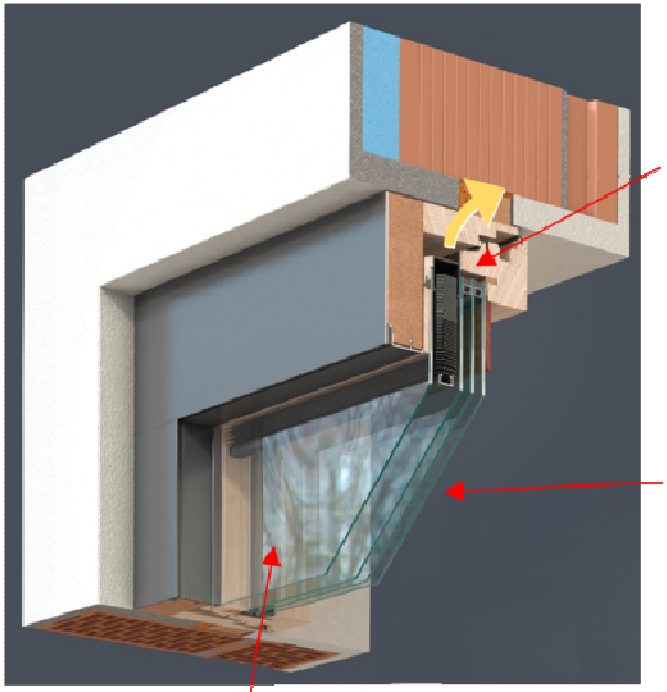
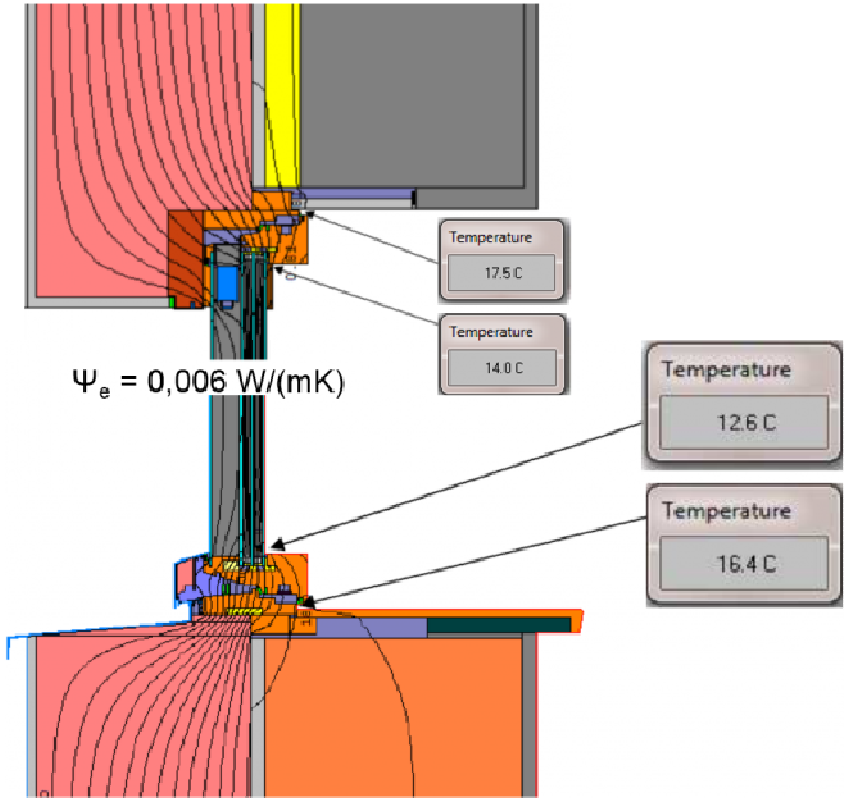


The shading device can also be removed from the top

Panes fixed in casement

Source: Lorber / Pro Passivhausfenster

Panes mounted in casement, but operable independently to allow maintenance or replacement of shading



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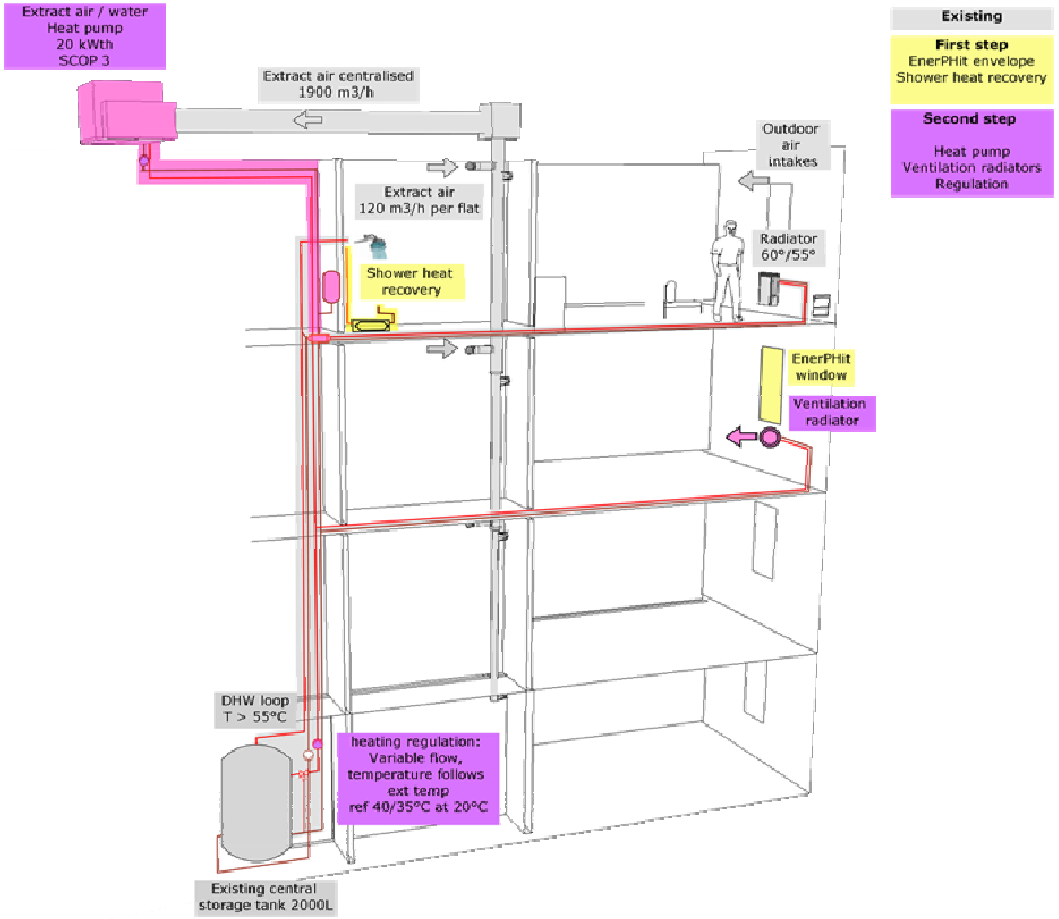
Design brief: Appartment Radiator Ventilation

EuroPHit



Connection of heat pump to existing circulation hot water loop

Schematic diagram of a ventilation radiator (Source: Myhren 2011)

LA MAISON PASSIVE

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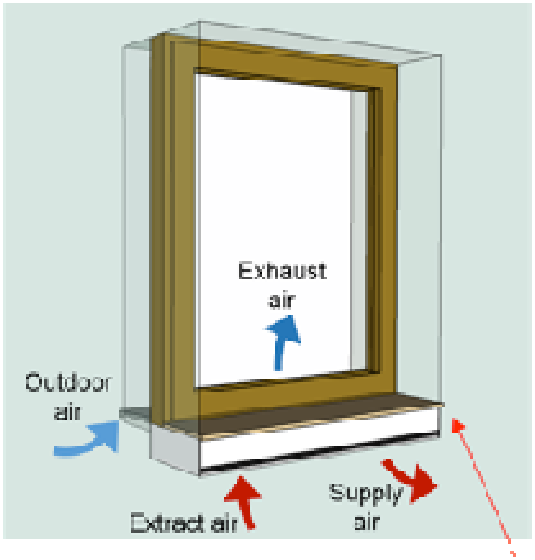
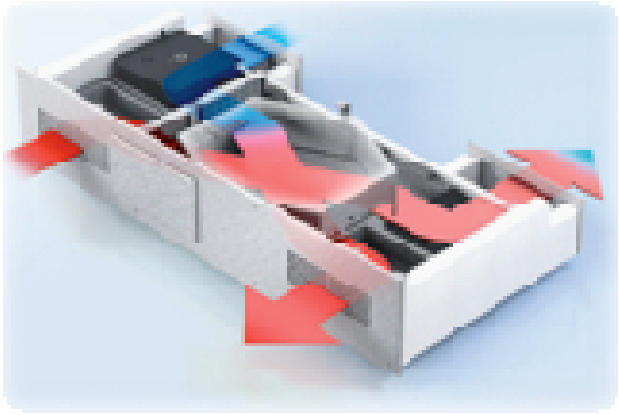
Design brief: Window integrated Ventilation

EuroPHit



Ventilation and HR unit concealed in window sill

Ventilation and HR concealed in window sill.



Ventilation device designed to be installed under the window frame [Source: Paul Wärmerückgewinnung]

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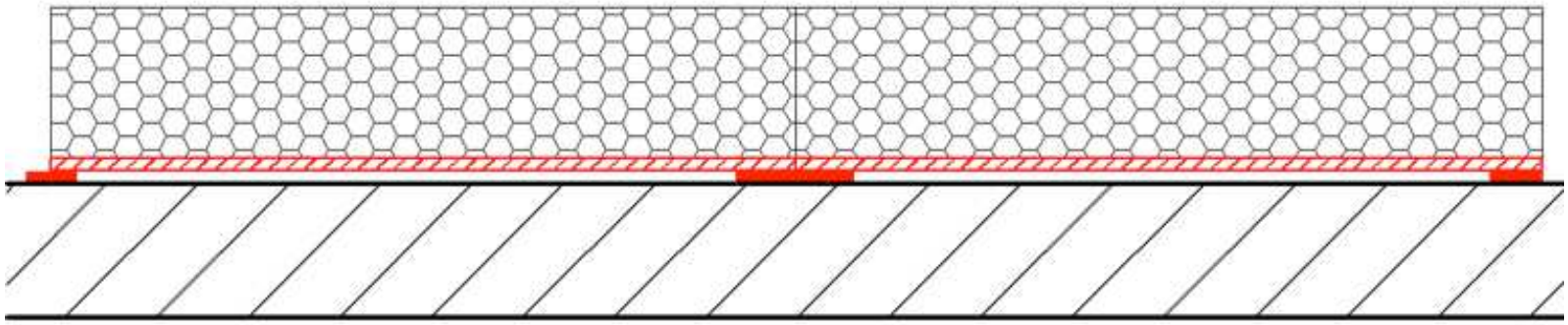
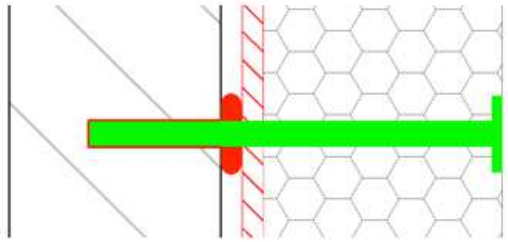
Design brief: External Air Tightening

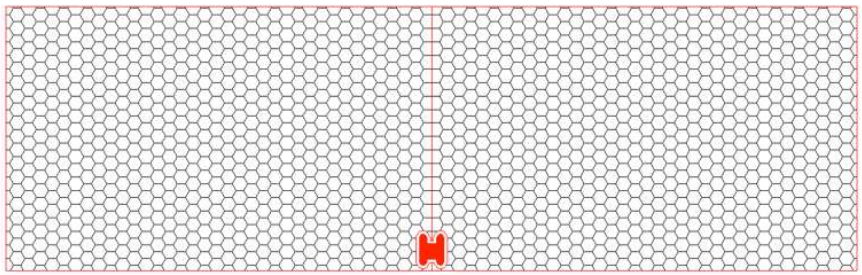
EuroPHit



Block perimeter connects air tight layers (source PHI)



Adhesive (red) injected in hole and gap between wall and insulation (Source PHI)



Exemplary block-to-block connection with sealing strip (red) in undercut groves (Source PHI)

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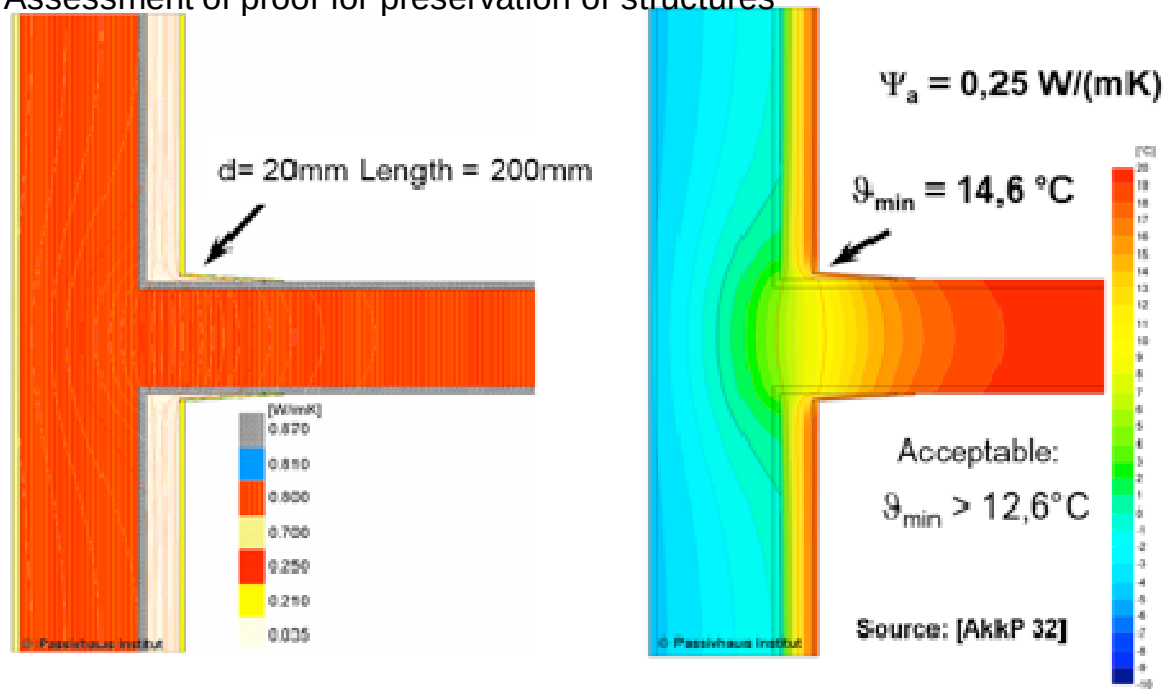
Design brief: Internal insulation

EuroPHit

Checklist: planning internal insulation

- Structural condition of the existing construction
- Characteristic values of materials
- Planning requirements
- Assessment of proof for preservation of structures



In this case, a „wedge“ in the intersection between the wall and the slab allows for a higher surface temperature, reducing the risk of mold formation and/ or structural damage.
Source: PHI AkkP 32

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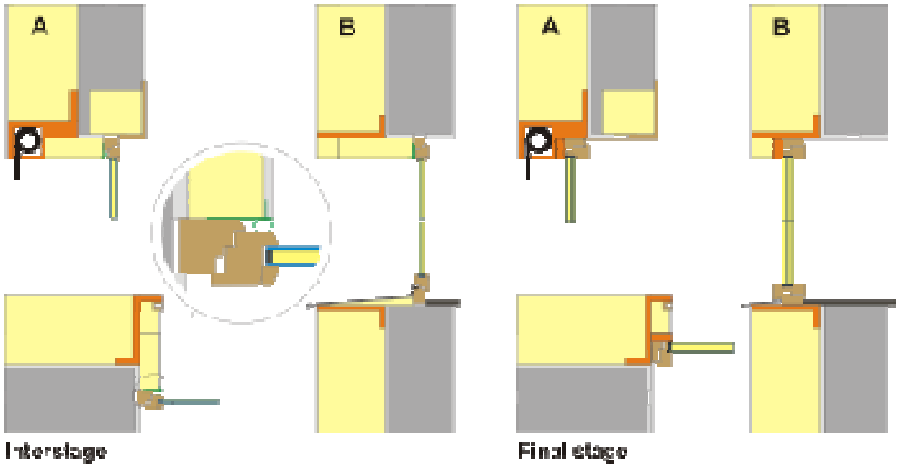
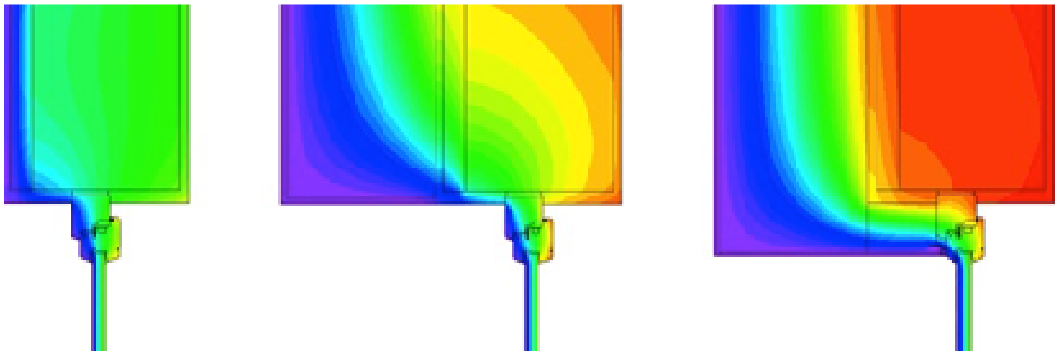
D. brief: Window connection - Insulation first

EuroPHit



Possible connections schematics if windows are exchanged at a later point (Source: PHI)



Isotherms installation (Source: PHI)

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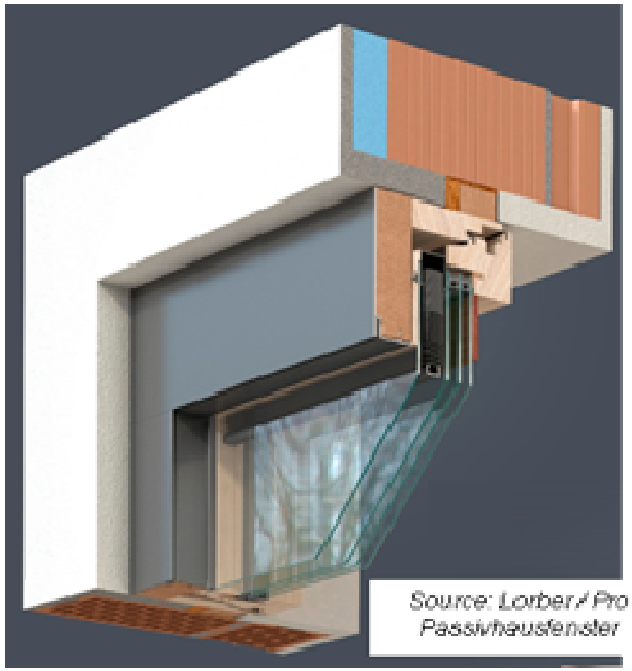
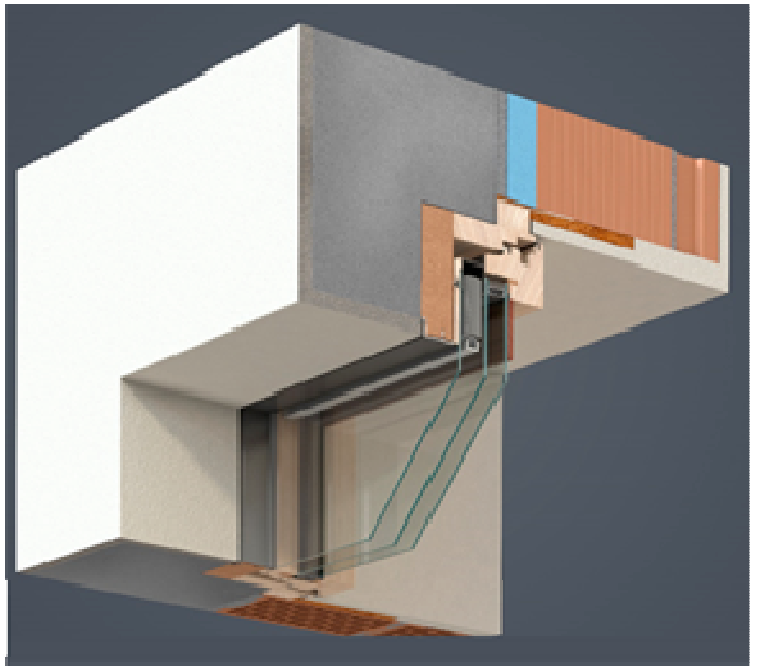
D. brief: Window connection - Windows first

EuroPHit





The window is moved from the inside to the exterior during insulation

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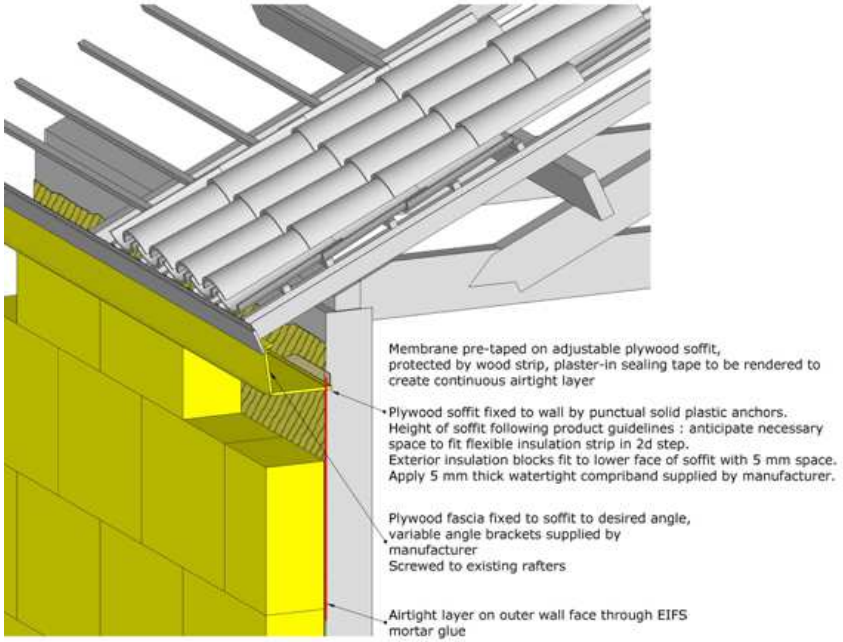
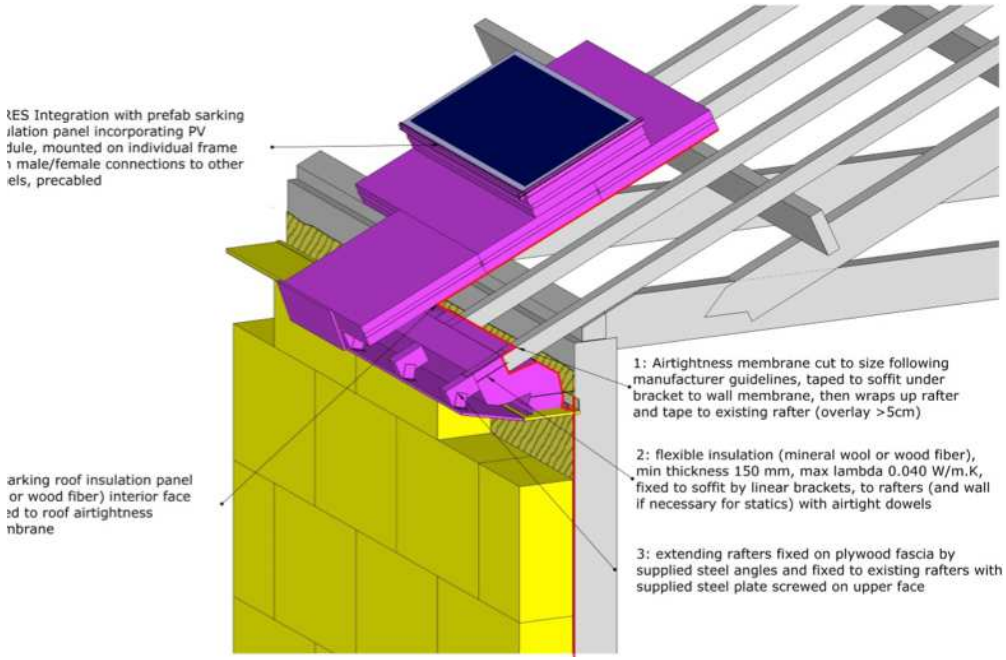
Design brief: Roof to wall insulation

EuroPHit

Step 1:



Step 2:



Roof to eave connection
(Source: LaMaison Passive)

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Design brief: Active overflow ventilation

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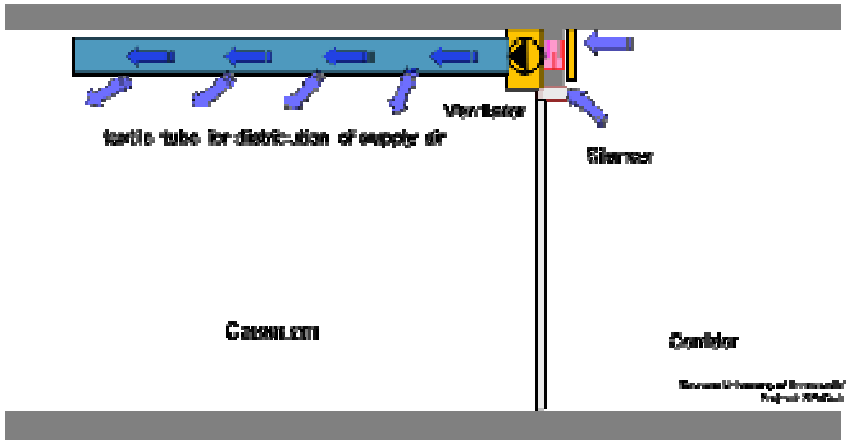
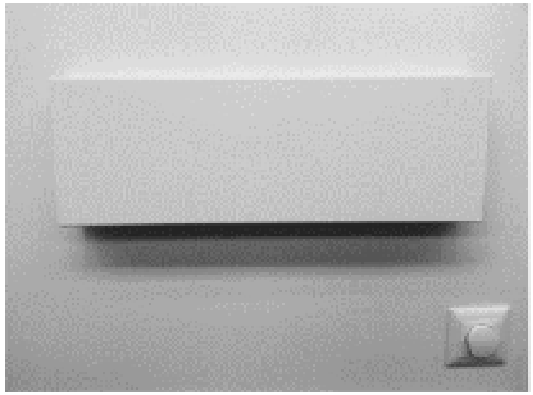


Schematic of an active overflow ventilator for large volumes (classrooms)

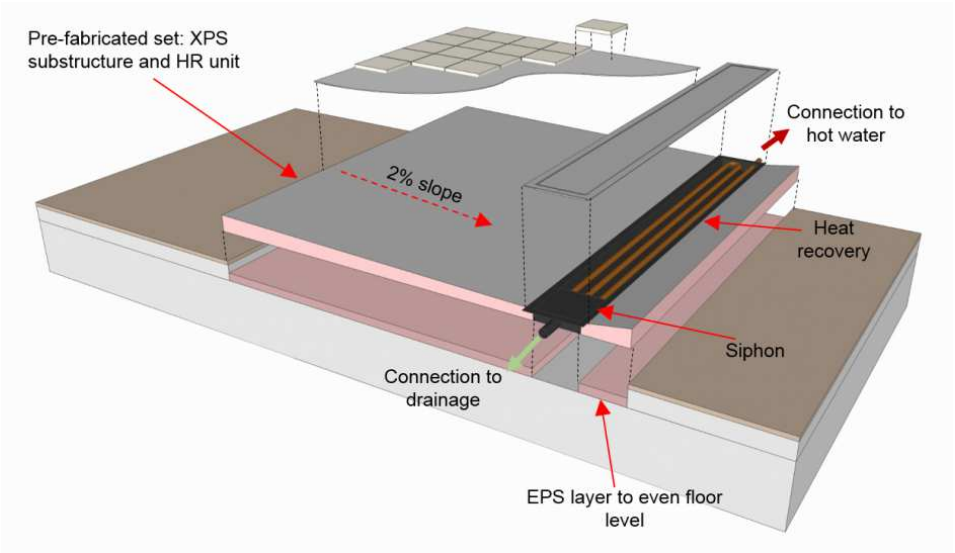


Examples of overflow ventilators for small volumes (Comfoduct Zehnder).

Design brief: Drain water heat recovery

EuroPHit

Shower drain water heat recovery element from Wagner-Solar



Pre-fabricated proposed low height heat recovery system for refurgishments (Source: PHI)

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Design brief: Ventilation duct system

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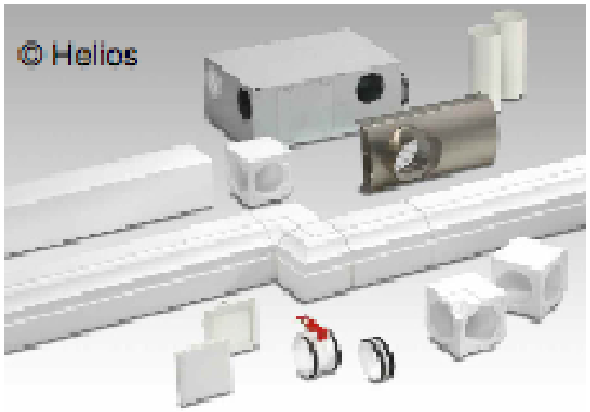
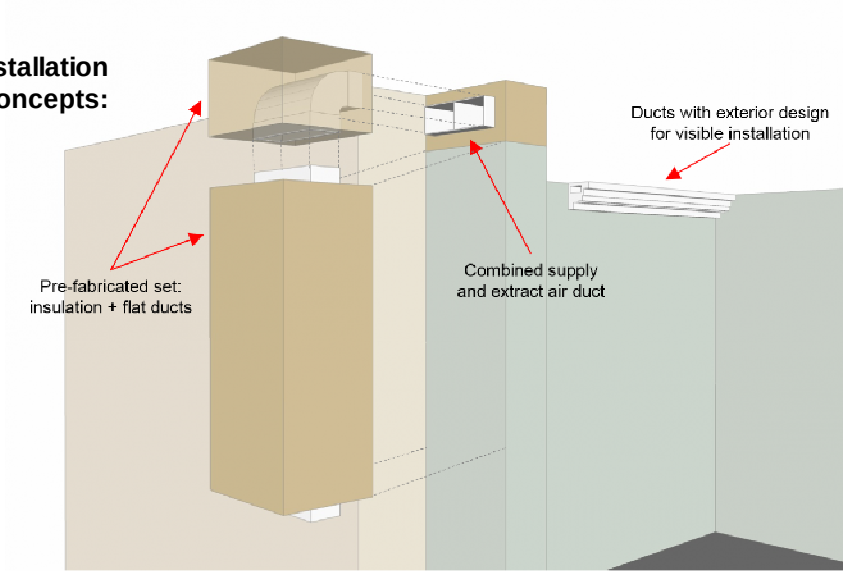
Combined Outdoor air and Exhaust air duct (PHI)

Pre-fabricated duct system designed for renovation (Source: Helios)



Suitable ducts for integration in the facade (Westaflex)

Installation concepts:



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Design brief: Large decentralized ventilation

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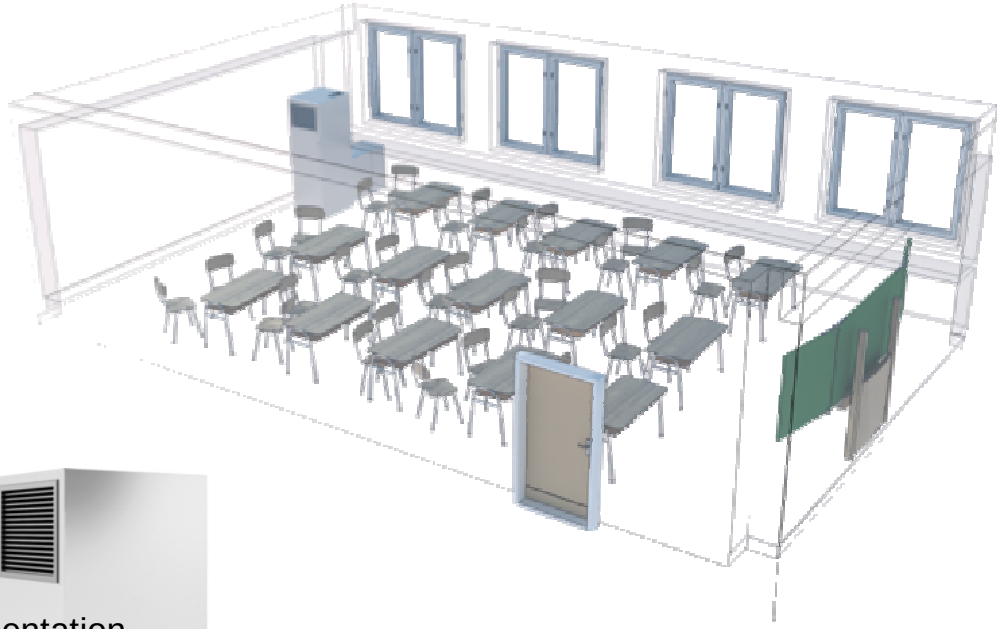
- Air volumes up to 700 m /h
- Condensate less concept
- Stand alone
- Integrated reheater
- Compact dimensions
- New unified design
- Duct less system – easy for installation
- Minimum requirement for project documentation
- Extra low acoustic parameters
- Excellent values of SFP
- High efficiency of heat exchange
- Integrated Plug & play regulation
- Integrated Webserver (RD5)
- Air quality sensors included
- Smoke sensor included



Class overview with decentral ventilation unit

(Source: Atrea)

Stand alone unit without condensate drain
(Source: Atrea)

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Design Brief Overview

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Here a list of downloadable Design Briefs:

- Attic Staircase
- External Air-tightening, Insulation and Finishing System (EAIFS)
- Interior Insulation
- Roof to wall insulation
- Wall/Facade integrated Ventilation
- Window Integrated Ventilation
- Active Overflow Ventilation Systems
- Ventilation Duct Systems/Tools
- Regenerative MVHR - Alternating Type
- Drain Water Heat Recovery (DWHR) System
- PV Facade Integration
- Ventilation Radiators
- Decentralized School ventilation units

Links to the download site:
http://europhit.eu/products-focus

Component Awards

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Another major breaktrough for product development has been achieved through two Component Awards:

- Passive house Windows installation step-by-step (2015) and
- Cost efficient ventilation for residential buildings (2016)

Both awards have produced outstanding results, defining new solutions that will become state of the art in the future.

Links to the component awards:

http://europhit.eu/component-award-2015

http://europhit.eu/component-award-2016

Component AWARD 2015

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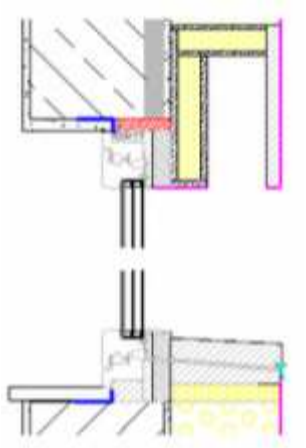

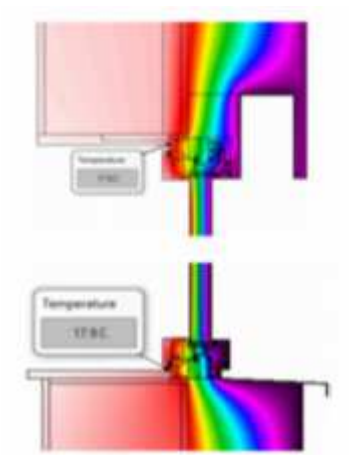

The main challenge in the Component Award 2015 for Passive House windows was that the product had to show a degree of flexibility since refurbishments are often carried out in a step-by-step manner.

Ideal windows had to deliver excellent results during the transitional period as well as after the completion of all refurbishment measures.

The cost effectiveness of the windows was assessed first and foremost, with a comparison of purchase costs with potential savings.

Component AWARD 2016

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Cost efficient ventilation for residential buildings

- Refurbishment of multi-family houses
- 3 room apartment
  - Heat recovery unit
  - Ducting system
  - Installation and additional costs
  - Maintenance costs
- No preference for central or flatwise solutions
- Energy and cost efficient solutions for both types needed

COMPONENT AWARD 2016
Passive House Institute

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Component AWARD 2016

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Requirements: Certified Passive House Components

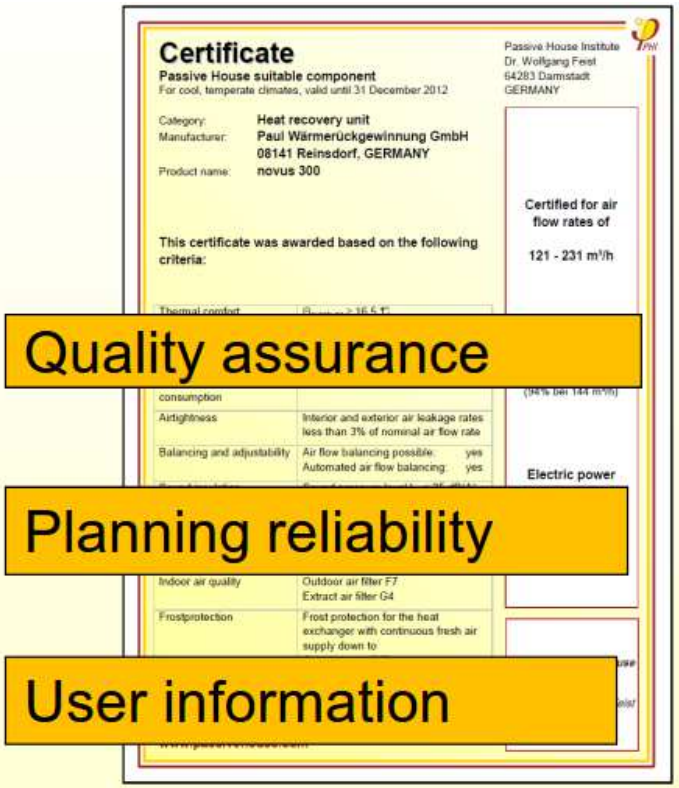
1. Hygiene criterion
   Outside air filter at least F7, Exhaust Filter at least G4

2. Comfort criteria
   Minimum supply air temperature: 16.5 °C @ -10°C outside air temperature

3. Efficiency criteria
   a. Heat: $\eta_{HR} > 75$ %
   b. Electricity (1): max. 0,45 Wh/m³
   c. Electricity (2): Standby: max 1 W

4. Control strategy
   Min. 3 ventilation level

5. Frost protection



http://europhit.eu/component-award-2016

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5. Final guidelines

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Final Guideline Content

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The Final guidelines are helpful for anyone who stands before a refurbishment project:

- What steps should I consider before starting the project?
- Which products should be taken into account?
- Which are the most inovative concepts for:
  - Building Envelope and Windows?
  - Heating , Cooling and Hot Water?
  - Ventilation?
  - and RES Integration?

The Final guideline is a summary of main findings with references to the Summyry of Demand and Design Briefs.

Innovation potential

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Before starting a project, check out the state of the art these main areas of innovation:

- **Innovative concepts in Envelope and Windows**
  - Airtight solutions applied form the exterior
  - Prefabricated facade elements
  - Integration of technology in facade
- **Innovative concepts in heating, cooling and hot water**
  - Dehumidifying and cooling in a hot and humid climates
  - Solar powered heating, cooling and hot water production
  - Ventilation radiators combined with extract heat pump
- **Innovative conepts in Ventilation**
  - Placement of ventilation unit
  - Novel air distribution concepts
  - Innovative heat exchangers
- **Innovative concepts in RES Integration**
  - Integrated solutions in glass and roof tiles
  - Retrofitting facades with PV panels

Reached goals

EuroPHit

During the EuroPhit project, these goals have been reached:

- A list of 145 existing products available today
- A variety of meetings with producers in different countries
- More than 120 product and concept ideas listed
- 16 detailed Product and Concept Briefs developed
- Detailed best practice for Windows replacement and retrofitting Ventilation documented (Product Awards)
- Identification of 11 areas with a high innovation potential to be developped further
- Producers in the EuroPHit Members Database and PHI certified product database have been informed by email of the outcome of the project.

6. What's next

Call for producers - never too late to inovate!

EuroPHit

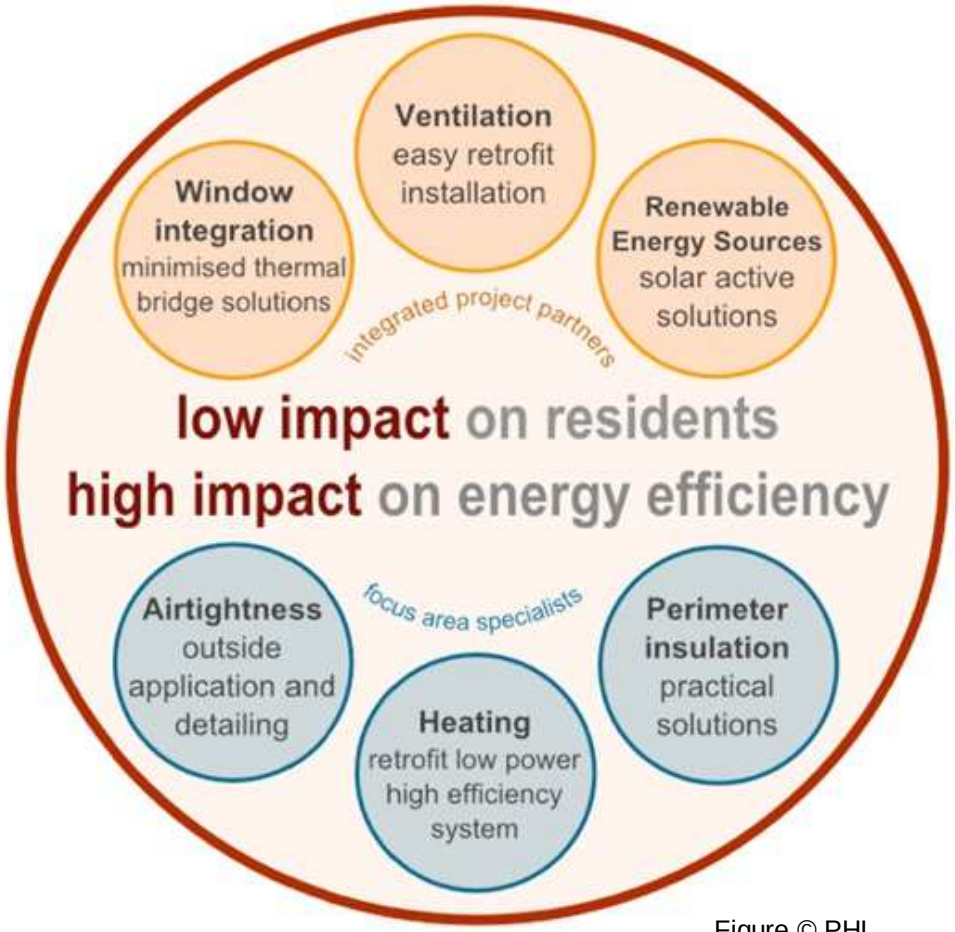

Figure © PHI

Market advantage through innovative products:

EuroPhit project has supported manufacturers in designing products that aid step-by-step renovation.

Summary of Demand, Design Briefs and Final Guidelines will also for the coming years provide a good basis for any company interested in product development.

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Passive House Institute

Getting involved

EuroPHit

- Join the EuroPHit network for **FREE and get Forum acces** and **updates of the project outcomes**
- Learn something new from EuroPHit outcomes

europhit.eu/downloads

- Contribute on our Forum with your questions and comments
- Attend one of our upcoming events: europhit.eu/events

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Thank you
for your attention

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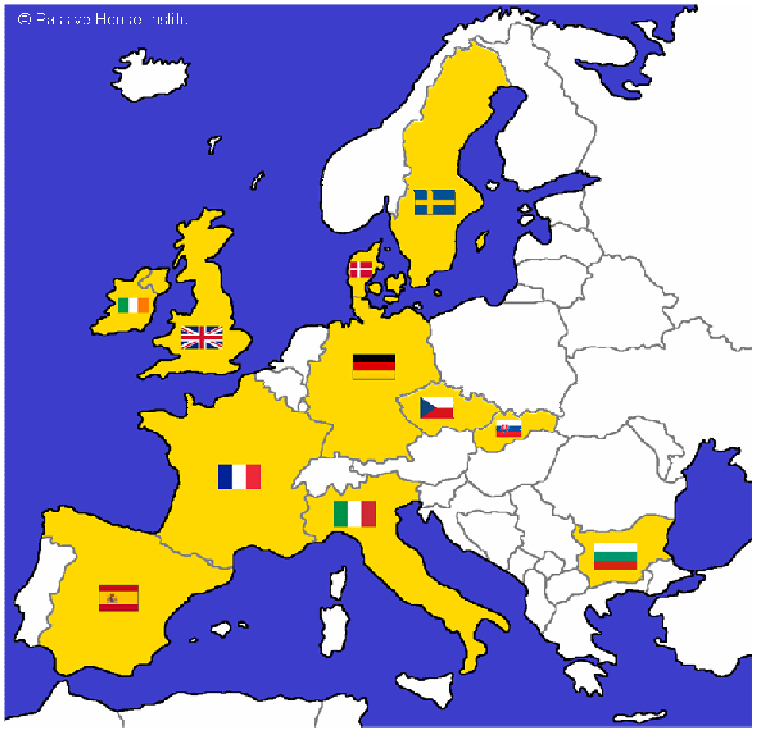

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