



## **Elaborated renovation packages**

### **D2.4**



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### DOCUMENT HISTORY

Version	Date	Modified contents	Implemented by
1.0	23/07/2018	First release	Exeleria
1.1	07/09/2018	Berlin PS added	Exeleria

## Executive summary

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This report contains an explanation and detailed description of the most suitable renovation package for the DREEAM Project selected by each Building Owner as described in task 2.3, who have selected between 3 different renovation packages following their own criteria according to target parameters as are: energy, investment, emissions, easiness, etc.

To carry out the renovation in the buildings, 3 components have been taken into account:

- Renovation of the envelope
- Renovation and implementation of the active components
- Energy production through Renewable Energy

For the case of **Padiham**, the renovation of the envelope includes EWIS, insulation of the roof and new windows.

For the active components, the heating and DHW system is replaced: condensing gas boiler in the case of gas & electric dwelling and electric heaters and a hot water cylinder for the 100 % electric dwellings. To solve the problems of damp in the wall a positive input ventilation system has been selected.

The production of energy with renewables, consist in a small photovoltaic system in the roof for each dwelling.

For the case of **Treviso**, there is a deep envelope renovation that cover all the components of the building and includes an innovative insulation system as aerogel.

The production of heating and DHW will be done by a condensing boiler for each dwelling. A mechanical ventilation system with heat recovery unit helps to reduce de energy demand.

In the roof will be installed two systems of Renewable Energy: a thermal solar for the DHW production and a photovoltaic for the production of electricity for the common areas

For the case of **Berlin**, the actions taken into consideration are the improvement of the envelope and the implementation of renewable energy with a PV system in the roof, which includes a storage system based on the innovative Tesla batteries.

The production of heating and DHW, based in the district heating, will remain in the current situation due to the high efficiency of this system.

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**Padiham (UK)**

**Pilot site**

# 1 Renovation pack for Padiham

## 1.1 Selected renovation pack

Between all the renovation packages proposed by exeleria, Places for People has decided to go through the Concept 5 for the 100 % electric dwellings and the Concept 6 for the electric and gas dwellings.

There are two modifications from the selected renovation pack:

- Photovoltaic system: 1,1 kWp per dwelling instead of 3 kWp
- Ventilation system: Positive input ventilation.

These are the selected renovation measures:

### 1.1.1 Envelope

Element	Description	Current U-Value (W/m <sup>2</sup> K)	Proposed U-Value (W/m <sup>2</sup> K)
<b>External walls</b>	External wall insulation of 80 mm Mineral wool	1,20	0,29
<b>Roof</b>	250 mm mineral wool)	0,58	0,11
<b>Windows</b>	New windows	2,80	1,20

### 1.1.2 Active components

Element	Description	Features
<b>Heating &amp; DHW (100% elec)</b>	Night storage units and electric boiler	100%
<b>Heating &amp; DHW (gas &amp; elec)</b>	Condensing gas boiler, new distribution system	97 %
<b>Ventilation</b>	Positive Input Ventilation system	Reduces relative humidity levels

### 1.1.3 Renewable energy

Element	Description	Energy production
<b>Photovoltaic</b>	4 solar panels (1,1 kWp)	900 kWh

## 1.2 Results of the selected renovation pack

The results obtained by the implementation of the renovation measures selected have been previously calculated in the Task 2.2 and modified with the last changes.

The following graphics represent the comparison between the current situation in the Pilot Site and the future situation after the renovation for the selected renovation pack according to these indicators:

- Energy savings

### 100 % electric dwelling

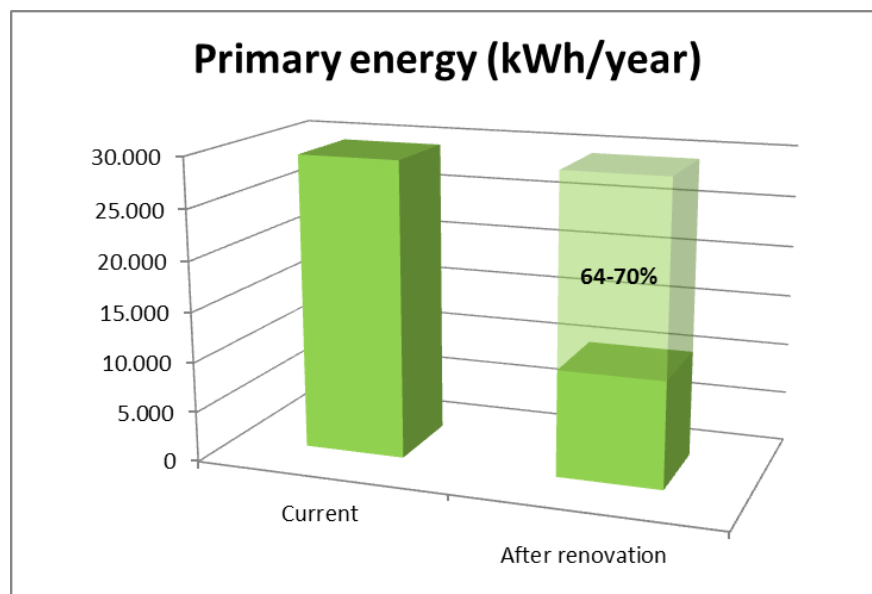
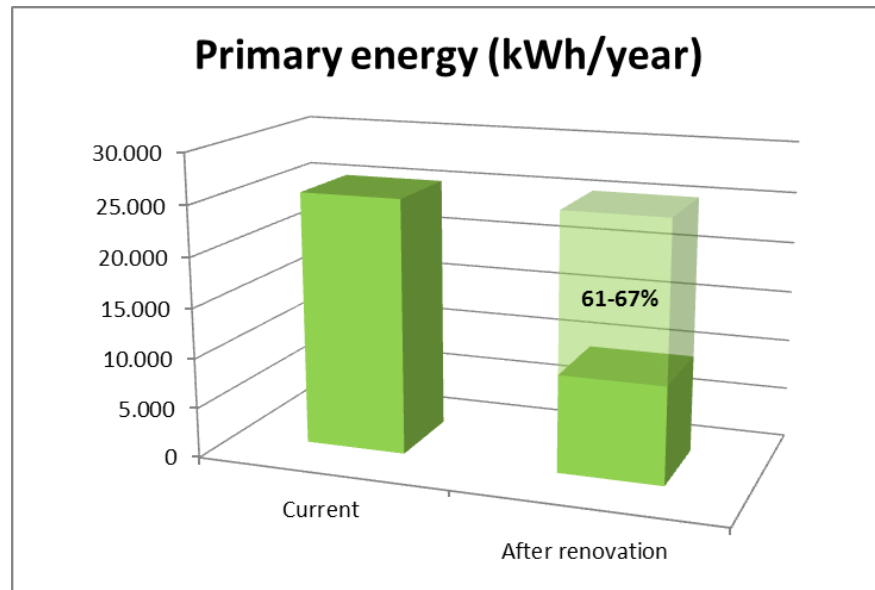


Figure 1 Primary energy Padiham 100% elec.

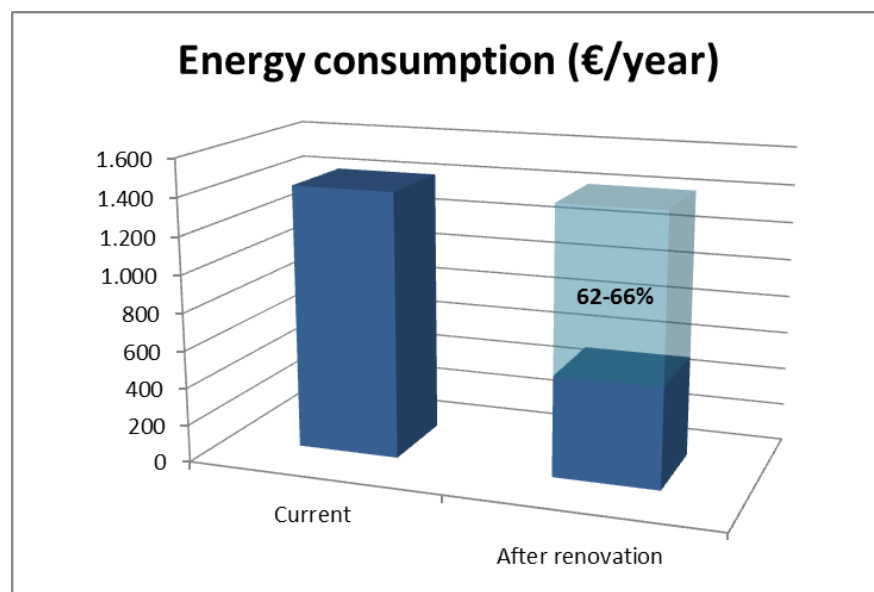
### Gas & electric dwelling



*Figure 2 Primary energy Padiham gas&elec.*

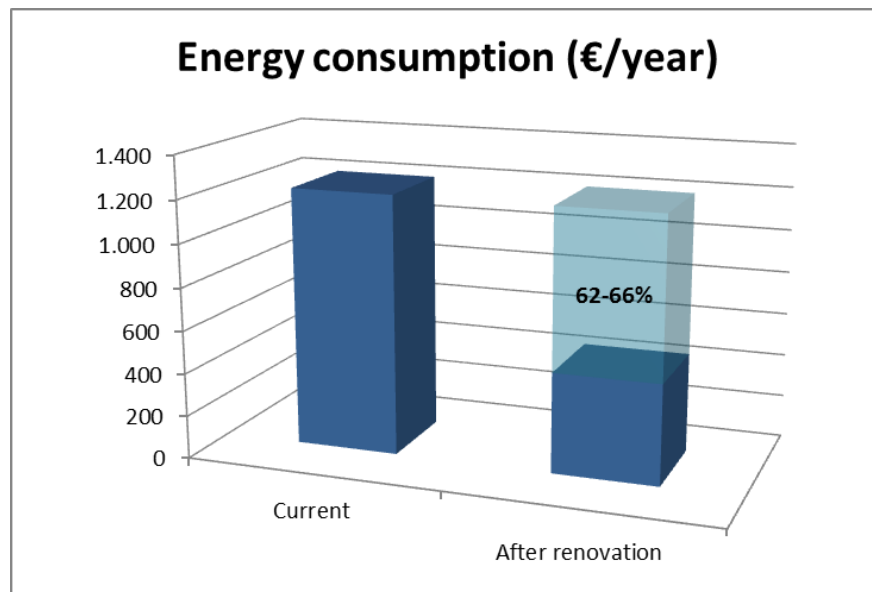
- Economic savings

### 100 % electric dwelling



*Figure 3 energy cost Padiham 100% elec.*

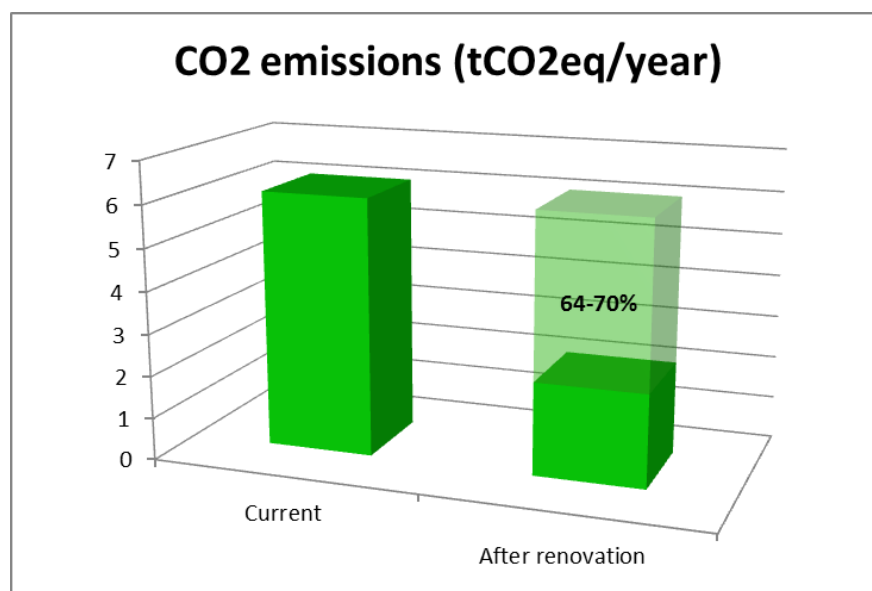
### Gas & electric dwelling



*Figure 4 energy cost Padiham gas&elec.*

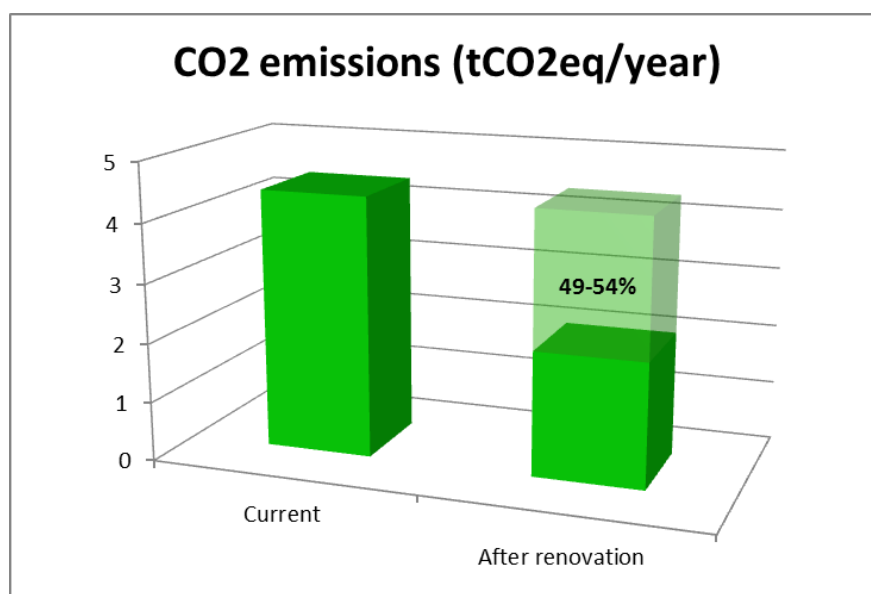
- CO<sub>2</sub> savings

### 100 % electric dwelling



*Figure 5 CO<sub>2</sub> emissions Padiham 100% elec.*

Gas & electric dwelling



*Figure 6 CO2 emissions Padiham gas&elec.*

### 1.3 DREEAM Tool & renovation pack

The selected renovation concepts by the Building Owner could not have been simulated in the WP1 tool due to a calculation problem with Padiham Pilot Site.

Therefore it cannot be showed the combination of all the different solutions proposed and the Pareto diagram depending on the targets selected.



## 1.4 Detailed components of the renovation

This section includes a more detailed information gathered about the components selected for the renovation

### 1.4.1 Envelope

The components related with the reduction of the heating demand are the new insulation and windows:

- Insulation

Material	Use	Thickness (mm)	Conductivity (W/mK)
Mineral wool	External walls	80	0,036
Mineral wool	Roof	250	0,036

- Windows

Feature	Description
Composition	NA
U-Value	1,2 W/m2K
Rw	NA
Permeability	Class 4
Frame	PVC
Emissivity	Low emissivity



# PermaRock Mineral Fibre External Wall Insulation Systems

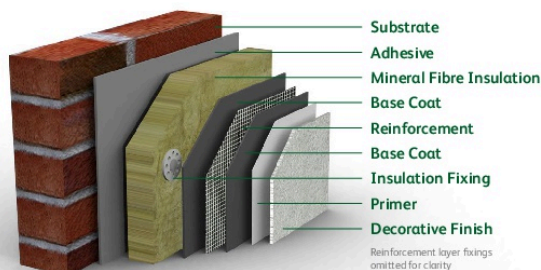
## Overview

PermaRock Mineral Fibre external wall insulation (EWI) systems are fire-safe, high performance thermal insulation systems that are extremely versatile and particularly suited for application to residential buildings, hospitals, schools, and public buildings where the highest levels of fire resistance and non-combustibility are required. The systems are recommended for multi-storey, high-rise buildings and any building that is less than 1m from a boundary.

## Key Features

- BRE Global Certification
- BIM Level 2 compliant (NBS BIM Library)
- Fire tested in accordance with BS 8414 - compliant with BR 135; can be used on buildings over 18m\*
- Excellent Fire Performance: non-combustible insulant (Class A1)
- Fire breaks not required
- Class 0 fire rating\*
- Ecopoints Score of 0.10 (m<sup>2</sup>) - Excellent Rating
- Acoustic benefit over other insulant types

### Typical Mineral Fibre EWI system incorporating through-coloured K or R Finish



**PERMAROCK**

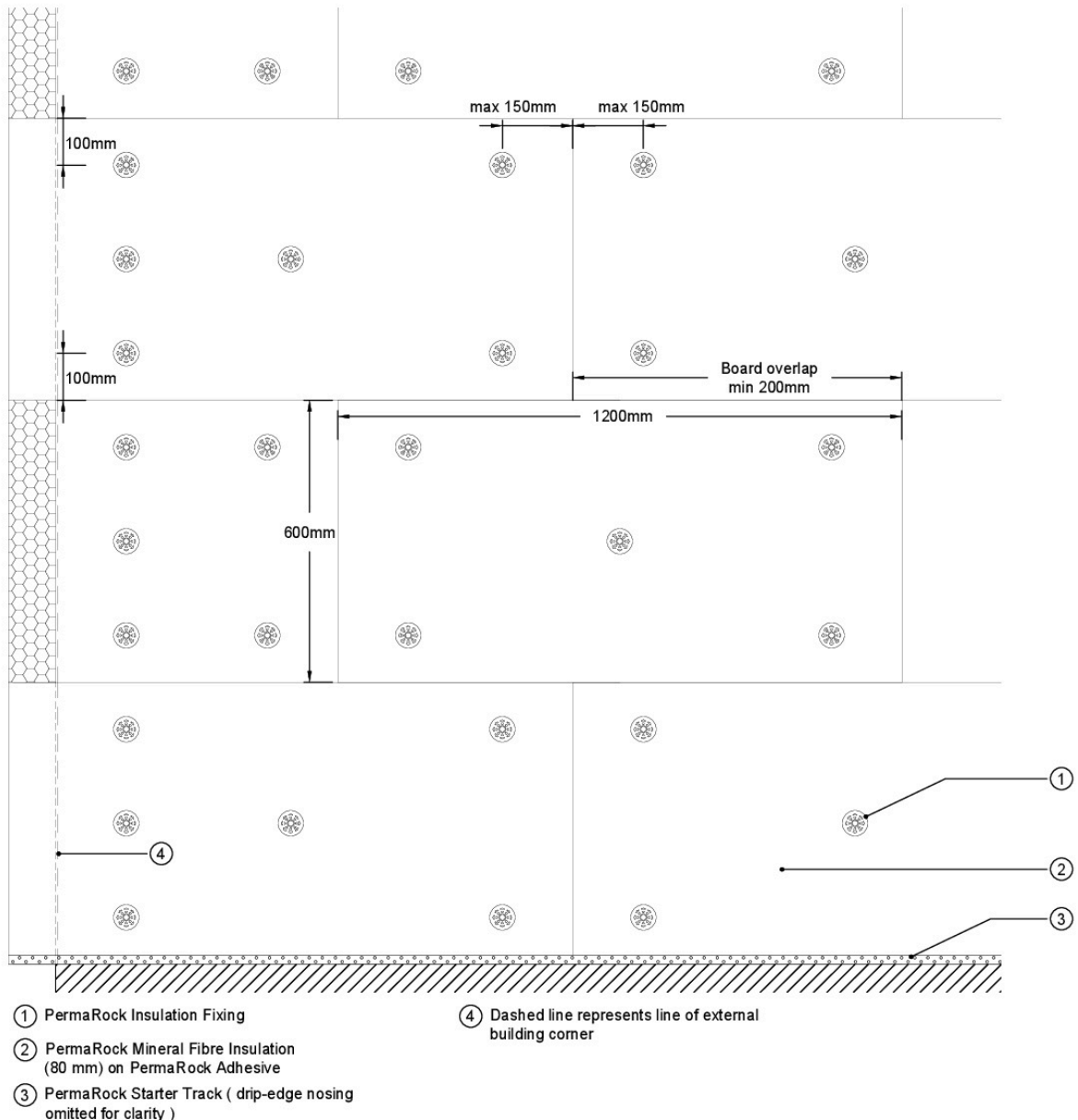
### Quick Check


Approvals	BRE Global Certification
Market Sectors	Residential, Education, Healthcare, Public Buildings, Commercial
Substrate Types	Brickwork, Dense + No-Fines Concrete, Blockwork, Metal Frame, Timber Frame
Building Height (limitations)	No limit*
Decorative Render / Finishes	See table overleaf
Insulation Thermal Conductivity (W/mK)	0.036 - 0.039**
Insulation Thicknesses	30 - 250 mm**

\*Dependent on decorative finish type and detail design  
\*\*Dependent on density of board

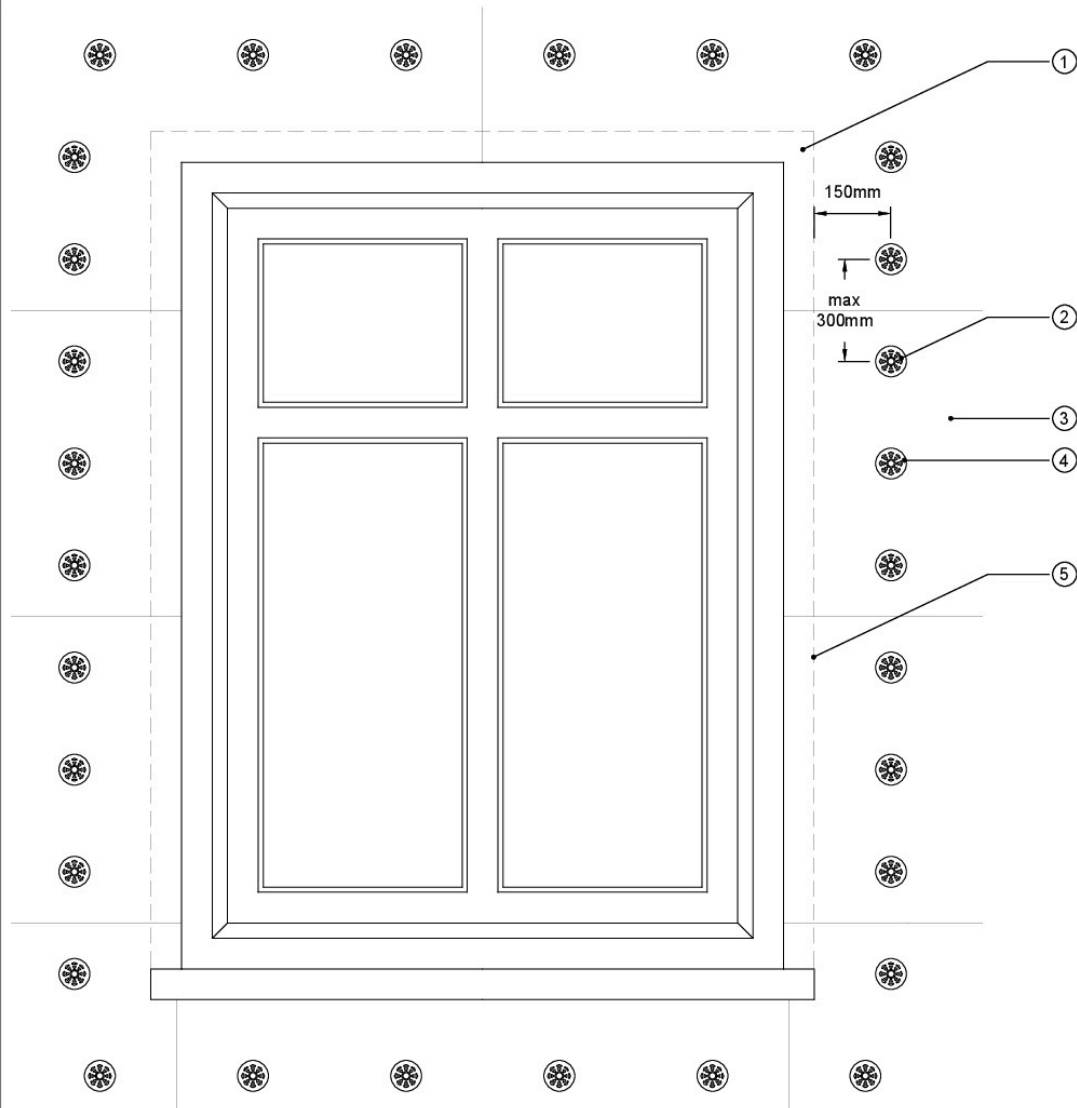


- NOTE :
1. Insulation boards are full interlocked at all external and internal corners.
  2. Each full size (1200 mm x 600 mm) board to be fixed with minimum 5 no. fixings (60 mm  $\varnothing$  heads).
  3. At external building corners, vertical spacing of fixings not to exceed 300 mm.
  4. Around structural openings, fixing centres not to exceed 300 mm.
  5. Insulation board joints offset by minimum 200 mm.
  6. Minimum board width 200 mm.
  7. In addition to insulation board fixings, stainless steel reinforcement layer fixings may be required through the reinforcing mesh for fire safety purposes on buildings above two (2) storeys.
  8. Supplementary fire safety fixings are required through the reinforcing mesh along the line of all fire barriers within the system.
  9. Subject to specification additional fixings may be required, consult PermaRock for further information.



<div></div> <div>PermaRock Products Ltd. Jubilee Drive Loughborough Leicestershire LE11 5TW Tel: (01509) 262924 Email: permarock@permarock.com Fax: (01509) 230063 Web: www.permarock.com</div>	Client : Sustainable Group (UK) Ltd	Title : Insulation Board Fixing Pattern - 5 No. Fixing/Board					Drawn By : TYY	Approved By : JFR
	Project : Burnley - Places for People DREEM Project, Padham	Project Ref: 70/383					Scale : NTS	Date : 22/01/2018
	Notes :						Original Size : A4	Rev.
		Rev	Date	Amendments	By	Approved		
Where applicable all dimensions and details should be read in conjunction with specialist consultants drawings and the project specification. All dimensions should be checked on site by the contractor and any discrepancies should be brought to the attention of PermaRock Products Ltd. This drawing is the copyright of PermaRock Products Ltd. It shall not be copied to any other third party without the express written consent of PermaRock Products Ltd.							Drawing No : 70-383-D001	

- NOTE : 1. Insulation boards are full interlocked at all external and internal corners.  
 2. Insulation board joints shall not coincide with corners of structural opening. Using L-shaped boards.  
 3. Each full size (1200 mm x 600 mm) board to be fixed with minimum 5 no. fixings (60 mm  $\varnothing$  heads).  
 4. At external building corners, vertical spacing of fixings not to exceed 300 mm.  
 5. Around structural openings, fixing centres not to exceed 300 mm.  
 6. Insulation board joints offset by minimum 200 mm.  
 7. Minimum board width 200 mm.  
 8. Supplementary fire safety fixings are required through the reinforcing mesh along the line of all fire barriers within the system.  
 9. Subject to specification additional fixings may be required, consult PermaRock for further information.

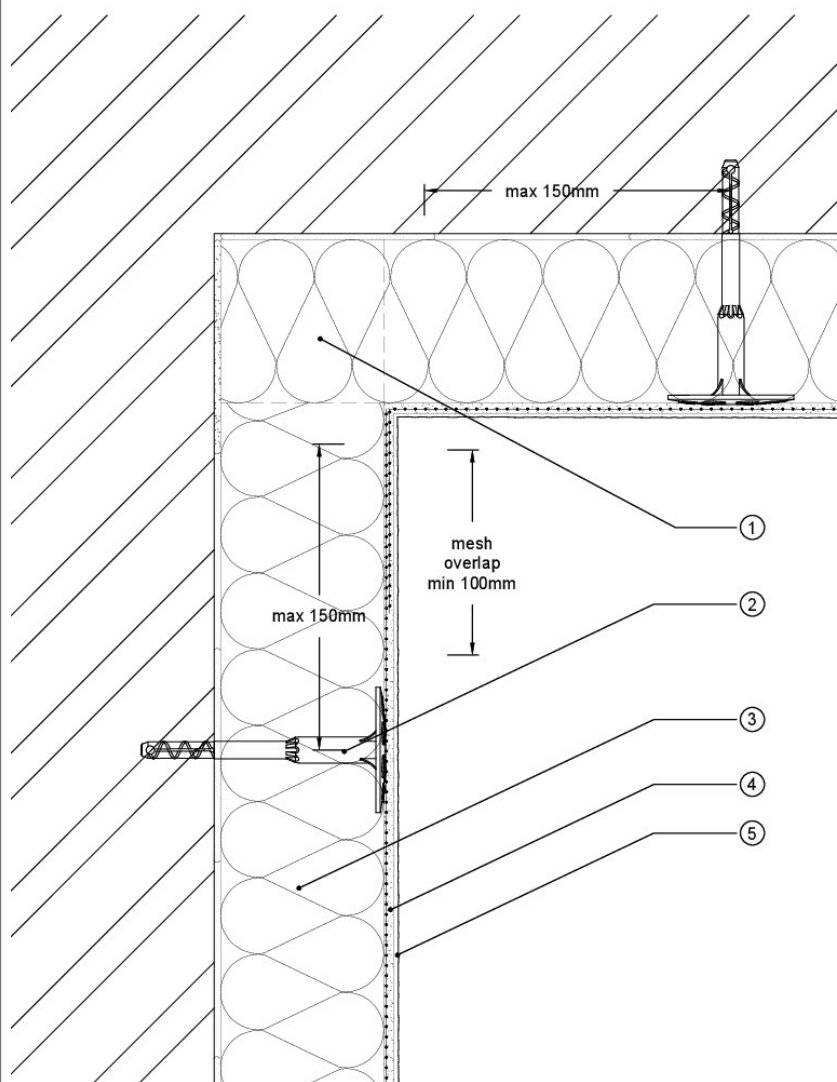


- ① Insulation board cut to L-shapes at corners of structural openings  
 ② PermaRock Insulation Fixing  
 ③ PermaRock Insulation (type and thickness to specification) on PermaRock Adhesive

- ④ Additional fixings around structural openings required to ensure maximum 300mm between fixing centres in a 150mm wide zone around the structural opening  
 ⑤ Dashed line represents line of structural opening

<b>PERMAROCK</b> PermaRock Products Ltd. Jubilee Drive Loughborough Leicestershire LE11 5TW Tel: (01509) 262924 Fax: (01509) 230063 Email: permarock@permarock.com Web: www.permarock.com	Client : Sustainable Group (UK) Ltd	Title : Insulation Board Fixing Pattern - Structural Opening	Drawn By : TYY	Approved By : JFR
	Project : Burnley - Places for People DREEAM Project, Padham	Project Ref: 70/383	Scale : NTS	Date : 22/01/2018
	Notes :	Rev	Date	Amendments
		By	Approved	Original Size : A4
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- ① Rows of insulation boards interlocked at internal corner
- ② PermaRock Insulation Fixing
- ③ PermaRock Mineral Fibre Insulation (80 mm) on PermaRock Adhesive
- ④ PermaRock Bedding Mortar (2 no. coats) incorporating PermaRock Reinforcing Mesh
- ⑤ PermaRock K-finish (1.5mm Silicone<sup>ULTRA</sup>) on PermaRock K+R Primer-Colour(s) as specified

**PERMAROCK**

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Client : Sustainable Group (UK) Ltd	Title : Plan Section - Internal Corner	Drawn By : TYY	Approved By : JFR
Project : Burnley - Places for People DREEM Project, Padham	Project Ref : 70/383	Scale : NTS	Date : 22/01/2018
Notes :	Rev	Date	Amendments
	By	Approved	Original Size : A4
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### 1.4.2 Active components

- Gas & electric dwelling

The production of heating and Domestic Hot Water in the gas&electric dwelling will be done by a condensing gas boiler replacing the old conventional boiler.

There is no technical data about the selected boiler by Places for People

- Electric dwelling

The production of heating in 100% electric dwellings is made by electric heaters. The models selected are: QM050; QM070; QM100; and QM125 and QRAD070 and QRAD100.

The production of DHW is made by a hot water cylinder

- Ventilation

The selected ventilation system is based in the positive ventilation. The device mounted in the loft, provides fresh filtered air to multiple inputs to multiple areas.

Technical data of the ventilation unit is attached.

## Quantum Technical Specifications

Model No.	Height	Depth	Width	Installed Weight
QM050	730mm (28.75")	185mm (7.3")	580mm (22.9")	66kg
QM070	730mm (28.75")	185mm (7.3")	703mm (27.7")	83kg
QM100	730mm (28.75")	185mm (7.3")	865mm (34.1")	107kg
QM125	730mm (28.75")	185mm (7.3")	1069mm (42.1")	135kg
QM150	730mm (28.75")	185mm (7.3")	1069mm (42.1")	155kg

Model No.	Output Rating	Input Rating	Max. Storage Capacity	Boost Element Rating
QM050	0.5kW	1.0kW	8.5kWh	0.4kW
QM070	0.7kW	1.56kW	10.9kWh	0.63kW
QM100	1.0kW	2.2kW	15.4kWh	0.88kW
QM125	1.25kW	2.76kW	19.3kWh	1.13kW
QM150	1.5kW	3.3kW	23.1kWh	1.3kW

ENERGY CELL PACKS – Packaged separately, required in the following quantities:

Model No.	QM050	QM070	QM100	QM125	QM150
Energy Cell Packs Required	4	6	8	10	12

<b>Controls</b>	Electronic user interface with LCD display offering room temperature setting, seven day programmer, installer settings, three pre-set timer profiles, holiday setting and more.
<b>Charge Controller</b>	Fully automatic charge controller incorporates self learning algorithms to optimise daily energy storage, using multiple sensors to automatically adjust the charge taken based on recent energy use patterns and future programmed requirements.
<b>Thermostat</b>	Electronic – accurate to +/-0.3°C.
<b>Safety Devices</b>	Electromechanical – limit thermostat (self resetting); cut-out (manual reset); over temperature thermostat for fan; over temperature limit thermostat for fan.
<b>Fan</b>	Low rev/low noise heat circulation fan with variable speed and soft start.
<b>Storage Core</b>	High density bonded magnetite energy cells.
<b>Thermal Insulation</b>	Front, rear top and ends – microporous silica. Base – calcium silicate slab.
<b>Colour/Finish</b>	White.
<b>Battery Backup</b>	3.3V coin cell battery to backup real time clock. Battery life > 5 years.
<b>Supply</b>	230-240V / 50Hz. Off-peak + 24 hour supply required.
<b>Approvals</b>	BEAB / EN60335 / EMC / CE.
<b>Warranty</b>	Terms and conditions apply. Product must have been installed in accordance with manufacturers instructions. See <a href="http://www.dimplex.co.uk/quantumregistration">www.dimplex.co.uk/quantumregistration</a> for full details.

## COMPARATIVE TEST DETAILS (FOR GRAPH ON PAGE 7)

### Climate Room Test Chamber

A climate room was built to accurately replicate a room from typical UK housing stock. It has two external walls and two internal walls, and the temperatures outside all walls, ceiling and floor are accurately controlled.

The U values of walls, windows and door are as follows:

Room dimensions	4m x 3m x 2.4m
U values:	
• Double layer solid brick outer walls	2.0
• Insulated internal walls and ceiling	0.34
• Insulated floor	0.25
• UPVC double glazed window	3.3
• UPVC double glazed door	3.0
• Air change rate	1 A/C per hour

### The Test

A daily temperature profile was set up outside the two external walls to simulate an average heating day in a property based in Sheffield, England.

Minimum outside temperature	+4°C
Maximum outside temperature	+11°C

The heating periods were set at 07:00 to 09:00 and 16:00 to 23:00. The target room thermal comfort temperature was 21°C. The following heater was tested under these conditions:

- 3.4kW (input) static storage heater with manual charge control – supplemented with a direct acting heater
- 2.8kW (input) Quantum heater (QM125)

## Technical specifications

### Thermostat

Electronic type, accurate to  $\pm 0.2^{\circ}\text{C}$ .

### Convective Element

Compact, finned, mineral-filled sheathed type, providing virtually silent operation.

### Radiant Element

Encapsulated microwave element fixed to the inside of the front panel, covering the whole fascia.

### Thermal cut-out

Two auto reset cut-outs, one for each element. Thermal fuse protection on front element.

### Construction

Durable epoxy-polyester powder coated steel casing, with upward-facing grille. Temperature resistant nylon thermoplastic moulded parts.

### Colour/Finish

White

### Installation

Supplied with metal wall bracket.

### Electrical connections

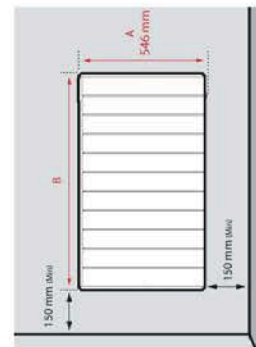
1.0m, 4 core cable (live, neutral, earth, pilot) supplied fitted to each heater.

### IP rating

Splashproof IPX4.

Model No.	Loading	Convective element	Radiant element	Height A	Width B	Depth C	Weight
QRAD090	0.9kW	301W	199W	516mm	513mm	105mm	7.1kg
QRAD075	0.75kW	551W	199W	546mm	513mm	105mm	7.1kg
QRAD100	1.0kW	714W	286W	546mm	676mm	105mm	8.7kg
QRAD150	1.5kW	1213W	287W	546mm	756mm	105mm	9.4kg
QRAD200	2.0kW	1600W	340W	546mm	918mm	105mm	11.0kg

### Dimensions and minimum clearances



### Dimension C and minimum clearances



## Q-Rad and Quantum

### A perfect partnership

**The Q-Rad electric radiator has been designed to operate as a stand-alone heater or as a mixed heating system using Q-Rads in the bedrooms and Quantum off-peak heaters in living areas.**

Quantum is the world's most advanced electric space heater. It uses low cost, off-peak energy to provide the most economical electric heating system on the market today, plus it also provides heat only when it's needed – whatever the time of day or night.

Quantum is the culmination of three years' research and development work and builds on the knowledge and expertise we have gained from over 60 years manufacturing efficient, reliable and attractively designed products. Not only has Quantum been designed and developed by our own in-house team of experts, it is also award-winning, scooping the prestigious Electrical Industry Energy & Carbon Saving Award in 2013.

- ✓ Up to **27% cheaper** to run than a standard storage heater system:
- ✓ Uses low cost, off-peak energy.
- ✓ Incorporates our revolutionary iQ controller† making Quantum highly controllable – yet simple to use.
- ✓ Heat on demand – whatever the user's lifestyle.
- ✓ 10 year warranty!



Please visit [www.dimplex.co.uk/quantum](http://www.dimplex.co.uk/quantum) or call us on 0844 879 3587 for a copy of our Quantum brochure.

† Calculated using SAP2012 - the only Government approved energy performance assessment method. Patent applied for. † Terms and conditions apply. See [www.dimplex.co.uk/quantumregistration](http://www.dimplex.co.uk/quantumregistration) for details.



# STAINLESSLITE PRO DIRECT

90 | 120 | 150 | 180 | 210 | 250 | 300 LITRES



## KEY FEATURES

- The lightest cylinder on the market
- Re-engineered design with flat top to provide 20% more insulation
- Aligned tapping positions promote easier installation
- Colour matched components for visual appeal
- Wide base to improve unit stability
- Durable rubber connection labels and caps with foam retention
- External expansion allows for installation in height restricted areas and easier servicing
- Suitable for use with economy electricity tariffs to maximise efficiency



25 YEAR WARRANTY



LIGHTEST CYLINDER ON THE MARKET



SOLAR PHOTOVOLTAIC



IMMERSION HEATER

# TECHNICAL SPECIFICATION



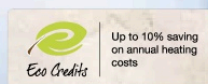
## STAINLESSLITE PRO DIRECT

Description	Product stock code	D90	D120	D150	D180	D210	D250	D300
ERP rating		PRODR90	PRODR120	PRODR150	PRODR180	PRODR210	PRODR250	PRODR300
Heat loss	Watts	32	39	47	55	62	74	86
Capacity	litres	91	119	148	178	208	248	287
Height	mm	764	931	1118	1306	1494	1744	1950
Diameter	mm	550	550	550	550	550	550	550
Weight (empty)	kg	18	21	25	28	32	36	41
Weight (full)	kg	109	140	173	206	240	284	328
Heat up time	min	90	119	150	179	209	249	289
Number of immersions		1	2	2	2	2	2	2
Secondary return		No	No	No	No	Yes	Yes	Yes

NOTES:  
 1. Heat up time from 15°C to 60°C (applies to primary heat source only)  
 2. For further ERP information, please refer to the installation manual at [www.gledhill.net](http://www.gledhill.net)  
 3. The schematics shown above are representative only, please refer to the installation manual for full technical requirements

# MIV® Loft Mounted Unit

Multiple Input Ventilation (MIV®)



The Lifetime Range®

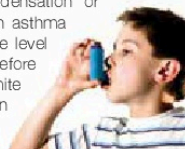


## • How is it different?

Instead of providing just a single source of fresh air into a property, usually located in a hallway or landing, the MIV® Loft Mounted Unit has the ability to supply fresh, filtered air via multiple inputs into areas with greater requirements for ventilation.

Highly efficient, inputs can be situated into or adjacent to rooms affected by increased levels of humidity, such as the kitchen, bathrooms and other wet rooms.

Fresh air inputs can also be located in bedrooms or living spaces that suffer from particularly bad condensation or in the bedroom of an asthma sufferer to reduce the level of humidity and therefore the house dust mite population – a known trigger for allergies and asthma.



## • Unique EnviroVent Mini Diffuser



Available with the MIV® Loft Mounted Unit is the stylish EnviroVent energy saving diffuser, providing an innovative alternative to standard ceiling vents.

## • Make it MIV® Multi-Zone Destratification

Warm air accumulates at ceiling level and is normally lost through windows and extract fans. This air can be up to 7°C higher than the internal air at ground level.

By introducing an almost imperceptible fresh air supply into multiple rooms, the MIV® Loft Mounted Unit redistributes heat around the home by pushing the heat back down and keeping the convection currents moving to reduce space heating costs. By saving only 1 degree of heat this multi-zone destratification can cut fuel bills by 10%.



## Energy Saving Benefits

### ✓ Minimum Energy Consumption

Powered by an Ultra Low Watt Brushless DC Motor, the MIV® Loft Mounted Unit utilises the latest technology to ensure minimum energy consumption and long term trouble free life.

### ✓ Solar Gain

The unit takes maximum advantage of the benefits of solar gain from within the loft space - the natural accumulation of heat from the sun on bright days. Temperatures in the loft space are on average 3°C higher than outside, which results in a relative saving of around 150 Watts per day in an average modern family home. This equates to approximately 10% of annual heating costs.

### ✓ Heat Distribution

Warm air accumulates at ceiling level. This air can be up to 7°C higher than the internal air at ground level. By introducing an almost imperceptible air supply into the dwelling from the loft space, the MIV® Loft Mounted Unit helps to redistribute heat around the home and thus reduce space heating costs.

### ✓ No Need To Open Windows



To reduce humidity and condensation during the heating season, significant energy loss occurs by opening windows. By installing an MIV® Loft Mounted Unit and providing fresh filtered air to the home humid air is displaced without opening windows and thus making significant savings to the occupier.

## About

Building on the principles of the hugely successful and established EnviroVent PIV systems, the MIV® Loft Mounted Unit has been designed and developed to launch a totally new and innovative technology - Multiple Input Ventilation (MIV®).

## features & benefits

- Ultra Low Watt DC motor technology
- Sealed for life ball bearings
- Loft or external air supply
- Integral Hours Run Meter (as standard)
- Integral intelligent comfort heater (as standard)
- Optional remote controlled boost facility
- 5 year on-going maintenance free warranties
- Provides all year round quality filtered air
- Reduces/eliminates surface condensation
- Quiet operation
- Removes musty odours
- Enhances heat distribution
- Takes advantage of the benefits of solar gain in the loft space
- Benefits asthma sufferers by reducing dust mites and mould spores
- Reduces Radon levels
- Easy to install
- Expert fitting staff



The EnviroVent MIV® Loft Mounted Unit and MIV® Air Source are manufactured in Harrogate, United Kingdom.



These products are supplied with five year maintenance free warranties.

envirovent

MIV Loft Mounted Unit

06



## Upgrade



### MIV® Air Source

#### Solar Gain and Summer Cooling

The MIV® Air Source takes maximum advantage of the benefits of solar gain from the loft space throughout the year. Solar gain is the natural accumulation of heat from the sun on bright days.

Temperatures in the loft are on average 3°C higher than outside and as the unit draws fresh air from the loft and delivers it into the property, this results in a saving of around 500 Kilowatts of energy per year in an average family home – equating to significant savings in annual heating costs. Going beyond traditional input ventilation, the MIV® Air Source has the facility to source cooler air from outside the building when the temperature in the loft space rises above 25°C.

Detecting the rise in temperature, the unit starts to draw air from atmosphere via a temperature controlled diverter mechanism. This not only provides efficient perception cooling into the property during warmer weather, but also maintains the required level of ventilation continuously throughout the year. This facility is greatly beneficial for properties affected by high levels of Radon.

### Intelligent Remote Control (optional)

A remote control incorporating five mode settings: trickle, medium, high, boost and auto is available. Auto-mode enables or disables the heater.



### Annual Running Costs ✓

Annual running costs with heater DISABLED. All costs are based on an electricity cost of £0.15 per unit (kWh). The calculations must therefore be used as a guide only.

#### Settings

##### MIV® Loft Mounted Unit

Trickle	Medium
£4.86	£5.85

The MIV® Air Source Unit has been calculated at 320 days supplying air through the filter and 45 days sourcing directly from outside taken from average annual temperatures.

##### MIV® Air Source

Trickle	Medium
£4.30	£5.71

### Comparisons against other household appliances

##### MIV® Loft Mounted Unit

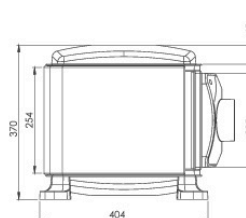
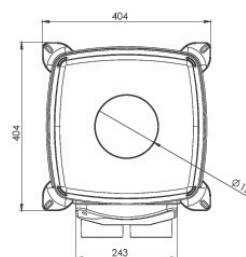
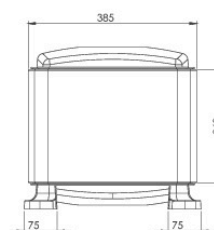
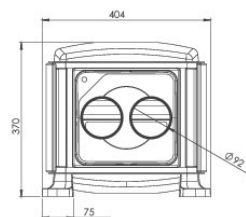
Household Appliance	Time required to consume £5.85 of electricity
Fridge Freezer	20 Days
42" TV (Viewing Time)	20 Days
100W Light Bulb	14.6 Days
Home Computer	4.7 Days
Games Console	4.7 Days
Iron	41 Hours
Tumble Dryer	17 Hours
Coldfill Dishwasher	17 Loads

##### MIV® Air Source

Household Appliance	Time required to consume £5.71 of electricity
Fridge Freezer	19.7 Days
42" TV (Viewing Time)	19.6 Days
100W Light Bulb	14.3 Days
Home Computer	4.6 Days
Games Console	4.6 Days
Iron	41 Hours
Tumble Dryer	17 Hours
Coldfill Dishwasher	17 Loads

### Dimensions (mm) ✓

#### MIV® Loft Mounted Unit



### Options & Ancillaries ✓

EnviroVent Mini Diffuser	1DIF EVL SML1
Round Rigid Ducting - Ø100	1RD 100 X 2M
90° Bend - Ø100	1RD 90 BEND 100



This technology is also ideal for new build projects. Scan the QR code to check out the PIV for new build video.



Every product in EnviroVent's Lifetime Range® is manufactured in Harrogate, United Kingdom.



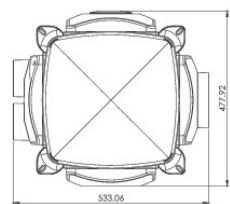
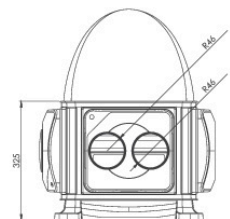
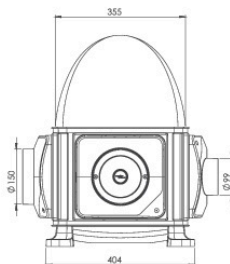
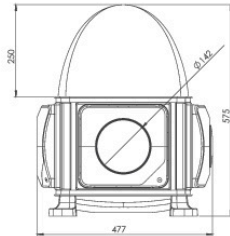
Did you know that we now offer bpec approved training programmes? Call us on 01423 810 810 for more information.

MIV Loft Mounted Unit



## Dimensions (mm) ✓

### MIV® Air Source



## Technical Specifications ✓

### Product

Whole house multiple input ventilation system for properties with a loft space.

### Applications

#### MIV® Loft Mounted Unit

Sited in a loft space, the unit delivers air to multiple rooms of a property to provide displacement ventilation in order to improve indoor air quality and resolve condensation related problems.

#### MIV® Air Source

During warmer months of the year when the temperature in the loft space exceeds 25°C, the MIV® Air Source has the additional facility to draw air from atmosphere via a temperature controlled diverter mechanism. This provides efficient perception cooling into the property and maintains the required level of ventilation continuously throughout the year.

#### Performance & Sound Levels (as installed figures)

##### MIV® Loft Mounted Unit

Incoming Air Temp. (°C)	Fan Speed Setting	Specific Fan Power (SFP)	Airflow (l/s)	Power Usage (W)	Outlet noise dB(A) @ 3m
<19 (1) (2)	Trickle	0.24	15	4	<15
	Medium	0.22	20	4	<15
	Large	0.21	26	6	<15
	Boost	0.25	34	9	<15

##### MIV® Air Source

Incoming Air Temp. (°C)	Fan Speed Setting	Specific Fan Power (SFP)	Airflow (l/s)	Power Usage (W)	Outlet noise dB(A) @ 3m
<19 (1)	Trickle	0.16	19	3	<15
	Medium	0.18	24	4	<15
	Large	0.23	30	7	<15
	Boost	0.31	36	11	15
>25 (3)	Trickle	0.28	26	7.3	-
	Medium	0.31	32	9.8	-
	Large	0.33	38	12.6	-
	Boost	0.36	44	15.7	-

- (1) The unit performs in 'condensation control mode' at air temperatures below 19°C
- (2) At above 19°C the unit increases airflow rates per setting by 10%
- (3) The unit performs in 'summer by-pass mode' at air temperatures at or above 25°C
- (4) Power usage with heater disabled

### Installation

Full installation guide is enclosed with all products; or sent separately in advance - if required

### Motor

Incorporates the Ultra Low Watt DC motor technology with sealed for life ball bearings designed to operate continuously at a pre-set 'background' rate.

### Fan

Is a 140 x 220mm centre mounted forward curved centrifugal fan.

### Filter

Is a synthetic fibre based filter mat to G4 standard in accordance with EN779 standard ratings. The filter should conform to all European Union and US fire classification standards (e.g. DIN 53438-F1 and UL900-class 2) and be self-extinguishing.

### Servicing / Maintenance

Achieved by removal/exchange/replacement of filters and consumable items. There should be no requirement for any maintenance within the five year period.

### Guarantee

Covered by an on-going, repeatable 5 year warranty, subject to the completion of specified maintenance.

### Integral 'Intelligent Low Temperature' Comfort Heater

Powered by a single supply and capable of holding incoming air temperatures accurately - around 10°C. The integral heater element is manufactured in a solid tubular sheath material and not in open wire format.

### Accreditations

This product is in conformity with the European Low Voltage Directive 2006/95/EEC and the EMC Directive 2004/108/EC including amendments. Full compliance with the relevant parts of the standards listed below supports the conformity of the designated product with the provisions of the above mentioned EC Directives.

#### Low Voltage Directive

EN 60335-1:2002, +A1:2004, +A2:2006, +A12:2006, +A13:2008, +A14:2010

EN 60335-2-80:2003, +A1:2004, +A2:2009

#### EMC Directive

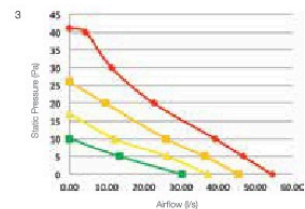
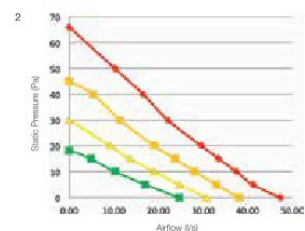
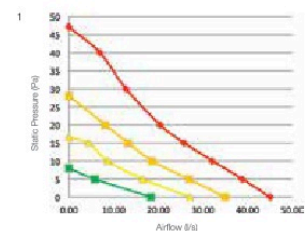
EN 55014-1:2006 (EMISSIONS)

EN 55014-2:1997, +A1:2001 Cat IV (IMMUNITY)

BBA

Certificate No: 03/4043

## Performance Curves ✓



1. MIV® Loft Mounted Unit
2. MIV® Air Source with summer by-pass NOT activated
3. MIV® Air Source with summer by-pass activated

Key  
■ Trickle  
■ Medium  
■ Large  
■ Boost

Performance curve results are based on the unit running below 19°C and exclude ancillaries



Don't have a loft space? Don't worry, turn to pages 9 and 10 for the EnviroVent Wall Mounted Unit which is suitable for flats and apartments.

#### EVL-TS

#### EVL-HTS

#### MIVAS-H

#### MIVAS-HW

#### EVL-H-IN-TS

#### 1ACSMOKEALARM

#### MIV® Loft Mounted Unit

#### MIV® Loft Mounted Unit with heater

#### MIV® Air Source with heater

#### MIV® Air Source with heater and wireless control

#### MIV® Inline with heater

#### Smoke alarm for the above units

For more information on these products call 0345 27 27 810

envirovent

MIV Loft Mounted Unit

08

### 1.4.3 Renewable energy

- Solar photovoltaic

The photovoltaic system is composed by four solar modules for each dwelling that give a total of 1,1 kWp.

The energy produced by the system will cover the energy demand for the common areas. The production of the system has been simulated, giving the following results:

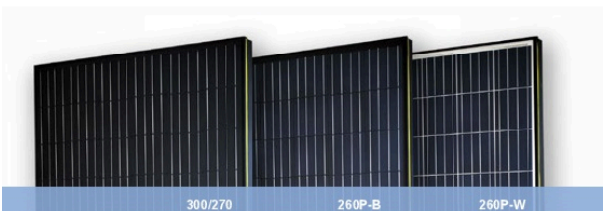
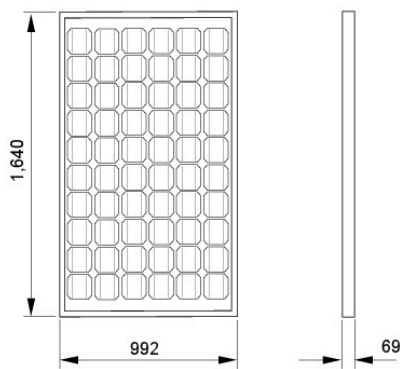
Month	DHW demand (kWh)	Production (kWh)
Jan	0,91	28,0
Feb	1,58	44,2
Mar	2,80	86,9
Apr	3,46	104
May	3,80	118
Jun	3,78	113
Jul	3,60	112
Aug	3,04	94,3
Sep	2,64	79,3
Oct	1,84	57
Nov	1,16	34,7
Dec	0,84	25,9
Average	2,46	74,7
TOTAL		897

# PV16 Solar Photovoltaic Panels

Clearline  
fusion



- Simple roof integration with clean, low-profile aesthetic for new build and retrofit
- Rapid installation times of less than 1hour/kWp easily achieved
- Compatible with the widest range of slate and tile including special fixings for Scottish slate roofs
- Fitted during the normal roofing programme, enabling clarity of responsibility and safe working practices
- Achieves highest fire rating and wind resistance without modifications to the roof



## Mechanical Specification

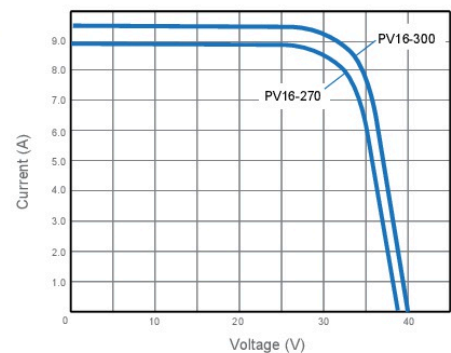
Model		PV16
Aperture Area	m <sup>2</sup>	1.6
Width (across roof)	mm	992
Height (up roof)	mm	1,640
Thickness	mm	69
Weight	kg	21.0
Static roof loading (distributed)	kg /m <sup>2</sup>	12.9
Characteristic Wind Resistance	kPa	5.32
Ultimate Design Load <sup>1</sup>	kPa	5.32
Fire Rating to BS 476-3		AA
Power Warranty	% rated	90%10 years, 80% 25 years
Standards		IEC61215, 61730, TUV, MCS05 , MCS12

Clearline PV solar panels have been thoroughly tested, not only as energy generating equipment, but also as a building component.

## Electrical Specification

Model	PV16-	260P	270	300
Peak Power <sup>2</sup>	Wp	260	270	300
Module Efficiency <sup>3</sup>	%	16.6	17.3	19.2
Number of Cells		60	60	60
Maximum Power Voltage (V <sub>mpp</sub> )	V	30.0	31.7	32.5
Maximum Power Current (I <sub>mpp</sub> )	A	8.7	8.5	9.2
Open Circuit Voltage (V <sub>oc</sub> )	V	37.8	38.4	40.1
Short Circuit Current (I <sub>sc</sub> )	A	9.0	9.0	9.6
NOCT <sup>4</sup>	°C	43.4	45.0	
Cell Type ( -crystalline Silicon)		Poly-	Mono-	
Power Temperature Coefficient	% / °C	-0.403	-0.450	
Current Temperature Coefficient	% / °C	0.054	0.060	
Voltage Temperature Coefficient	% / °C	-0.296	-0.340	
Maximum System Voltage	V <sub>oc</sub>	1,000		
Safety Classification		Class II		

## I-V Curves



80034 1.2

<sup>1</sup> Design resistance to ultimate loads includes a partial material safety factor of 1.0

<sup>2</sup> Subject to a manufacturing tolerance of +0 /+3%.

<sup>3</sup> Based on aperture area.

<sup>4</sup> Nominal Operating Cell Temperature

Electrical specification measured under standard test conditions: Irradiation 1 kW/m<sup>2</sup> with light spectrum AM 1.5 and a cell temperature of 25°C.

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## **Treviso (IT)**

### **Pilot site**

## 2 Renovation pack for Treviso

### 2.1 Selected renovation pack

Between all the renovation packages proposed by exeleria, ATER Treviso has decided to go through the Concept 1, which includes the following renovation measures:

#### 2.1.1 Envelope

Element	Description	Current U-Value (W/m <sup>2</sup> K)	Proposed U-Value (W/m <sup>2</sup> K)
<b>External walls</b>	External wall insulation of 160 mm EPS + 10 mm aerogel for thermal bridges	0,99	0,18/0,16
<b>Roof</b>	200 mm rock wool (non passable roof) and 80 mm XPS (passable)	1,06	0,18/0,31
<b>Ground floor</b>	200 mm XPS	1,00	0,26
<b>Windows</b>	3-glazed window	2,34	1,10

#### 2.1.2 Active components

Element	Description	Features
<b>Heating &amp; DHW</b>	Individual condensing boiler with storage tank	97%
<b>Ventilation</b>	Mechanical ventilation system with heat recovery	Up to 75%

#### 2.1.3 Renewable energy

Element	Description	Energy production
<b>Solar thermal</b>	26 solar collectors (67,86 m <sup>2</sup> ) + 1.500 l centralized storage tank	22.717 kWh
<b>Photovoltaic</b>	26 solar panels (8,5 kWp)	8.000 kWh

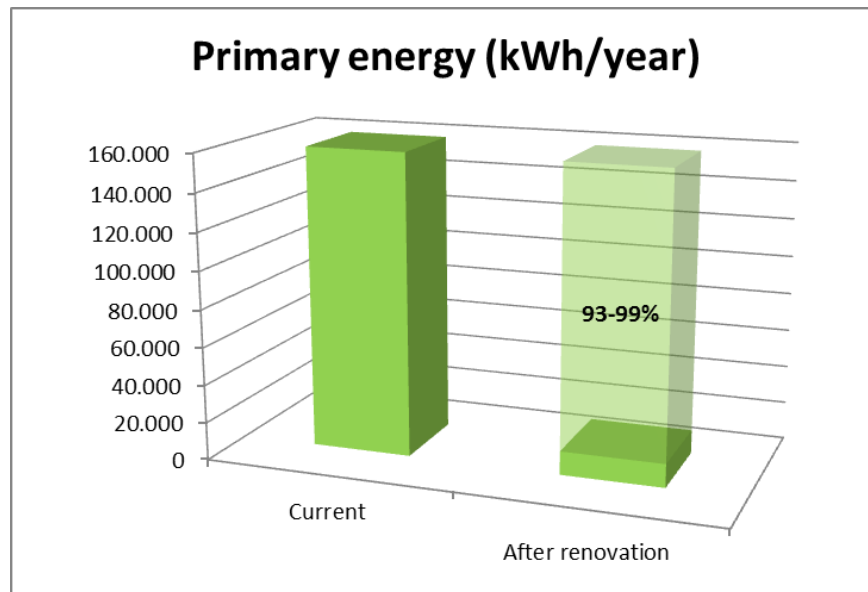


## 2.2 Results of the selected renovation pack

The results obtained by the implementation of the renovation measures selected have been previously calculated in the Task 2.2.

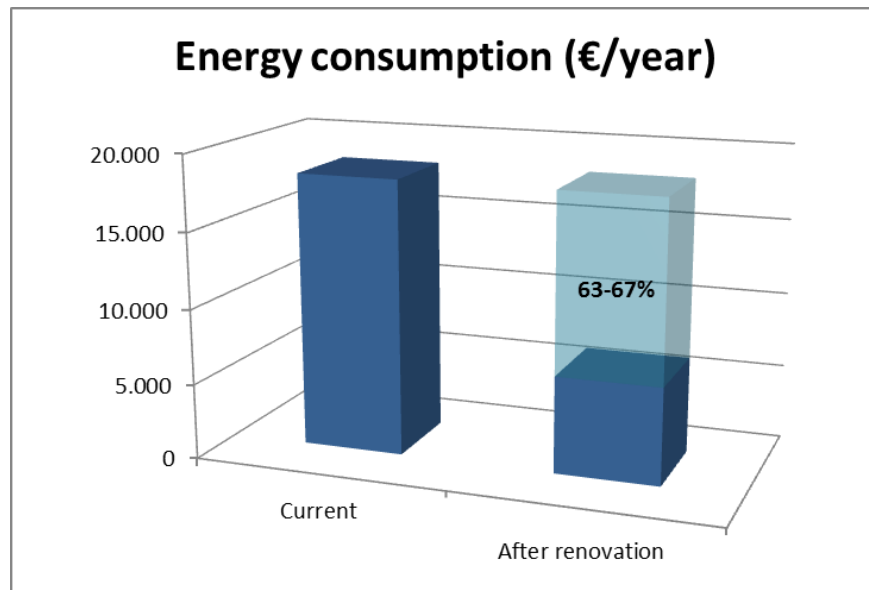
The following graphics represents the comparison between the current situation in the Pilot Site and the future situation after the renovation for the selected renovation pack according to these indicators:

- Energy savings



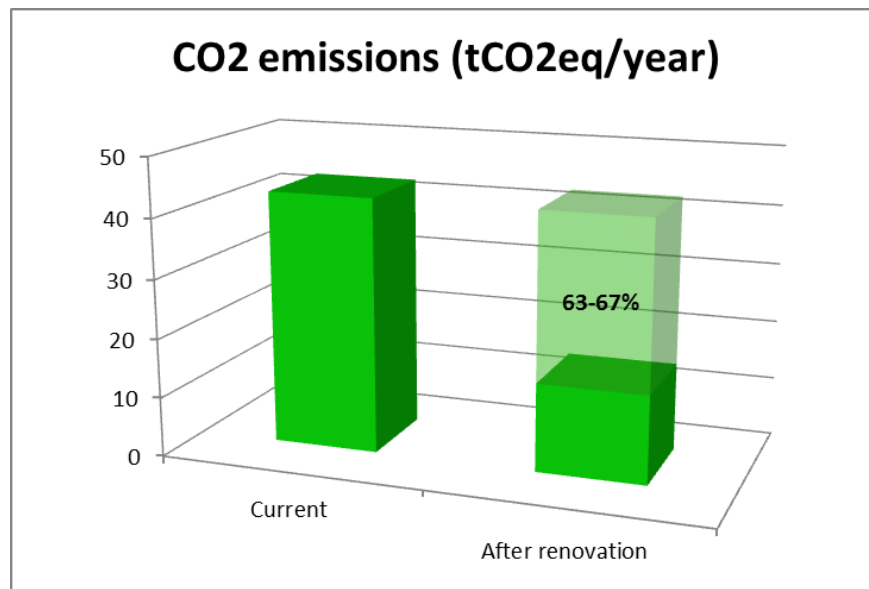
*Figure 7 energy consumption Treviso.*

- Economic savings



*Figure 8 energy cost Treviso.*

- Economic savings



*Figure 9 CO2 emissions Treviso*

## 2.3 DREEAM Tool & renovation pack

The selected renovation concepts by the Building Owner have been simulated in the tool in order to check all the different solutions possible combining all of them in different ways.

In the following illustration, there is the result of the tool obtained by selecting the refurbishment measures explained in the section 2.1 of this report. Depending on the evaluation criteria of the building owners, a total amount of 39 different targets can be analysed. For the example below, Investment costs and Primary Energy total have been selected:

### Optimal Strategies

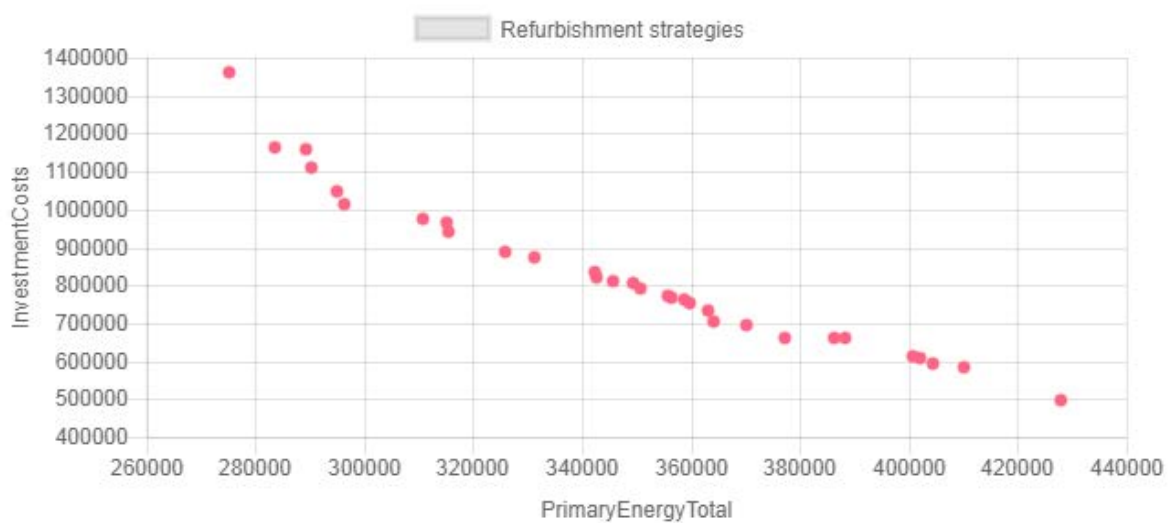


Figure 10 DREEAM tool results Treviso

The WP1 Tool give us an output of 31 results for the selected renovation pack. An analysis of sensitivity has been made to compare how affect to go through a less energy savings solution or a more expensive solution:

# Optimal Strategies

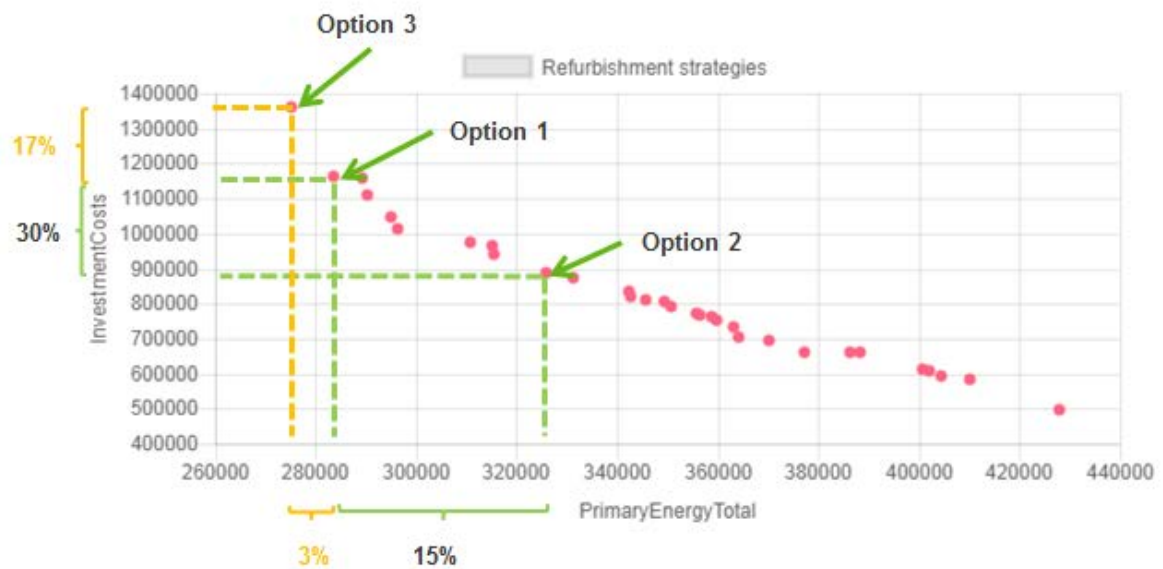


Figure 11 Renovation solutions comparison

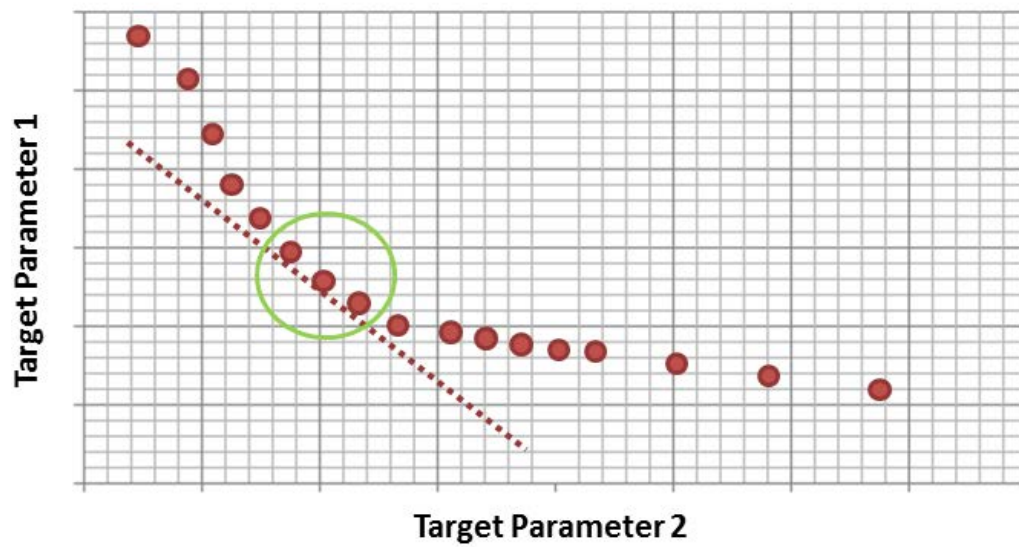
If we have selected the Option 1 as reference, a solution which implies a less energy saving reduction can be Option 2, that has 15 % Primary Energy total. However, the impact in the investment is much higher, the total investment of this solution will be reduced in a 30 %.

Furthermore, Concept 3 represents a combination of renovation measures which implies higher energy savings (3% more) has an increment in the investment of 17 %.

From this analysis arises the need to select which of all the solutions shown is more optimal, that means, which implies a better balance between both desired target parameters.

These optimal solutions are found at the point of tangency if we draw a line outside the curve:

## Optimal Strategies



*Figure 12 Optimal solution*

This means that if we move to the left of that point in the graph we will be penalized to a greater extent in parameter 1 and if we move to the right in parameter 2

## 2.4 Detailed components of the renovation

This section includes a more detailed information gathered about the components selected for the renovation

### 2.4.1 Envelope

The components related with the reduction of the heating demand are the new insulation and windows:

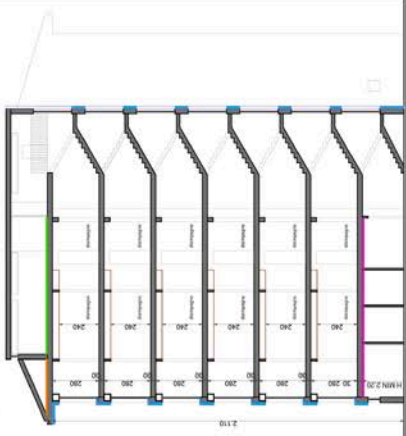
- Insulation

Material	Use	Thickness (mm)	Conductivity (W/mK)
EPS	External walls	160	0,036
Aerogel	Thermal bridges	10	0,015
Rockwool	Roof (non-passable)	200	0,035
XPS	Roof (passable)	80	0,036
XPS	Ground floor	200	0,036

- Windows

Feature	Description
Composition	3+3/18/4/18/3+3
U-Value	1,1 W/m2K
Rw	37 dB
Permeability	Class 4
Frame	PVC
Emissivity	Low emissivity

-  polistirene espanso XPS 500 cm 10 + lattaia in cartongesso da esterni gr. 1,3 cm
-  sistema a cappotto in polistirene EPS cm 14
-  polistirene espanso XPS 500 cm 8 + pavimento in battuto di cemento falcato cm 4
-  materassi in lana di roccia cm 20



VIA BORGO FURO 35A: PROSPETTO NORD OVEST  
VIALE FRANCIA 1: PROSPETTO SUD OVEST

VIA BORGO FURO 35A: PROSPETTO SUD EST  
VIALE FRANCIA 1: PROSPETTO NORD EST

## SEZIONE A-A\*

MAGAZINE E PORTICO = 2,20 m  
DISIMPEGNE E BAGNI = 2,40 m





**BANDO PUBBLICO PER INTERVENTI DI EFFICIENZA E RISPARIUNO ENERGETICO - EFFICIENTAMENTO ENERGETICO DEGLI EDIFICI PUBBLICI - Fondo per lo Sviluppo e la Coesione - Programma Operativo Regionale 2007 - 2013**  
(D.G.R. n. 1180 del 20 giugno 2011)

**PROGETTO ESECUTIVO**  
PER LA MANUTENZIONE STRUTTURALE E RIQUALIFICAZIONE ENERGETICA DEGLI EDIFICI COMUNALI DI TAVERNA VENEZIA (CR) (C.F. 01400010271)

**REGIONE LIGURIA**  
**AMBITO TERRITORIALE PER L'EDILIZIA**  
**INIZIATIVA REGIONALE PER LA PIANIFICAZIONE E L'INTERVENTO**

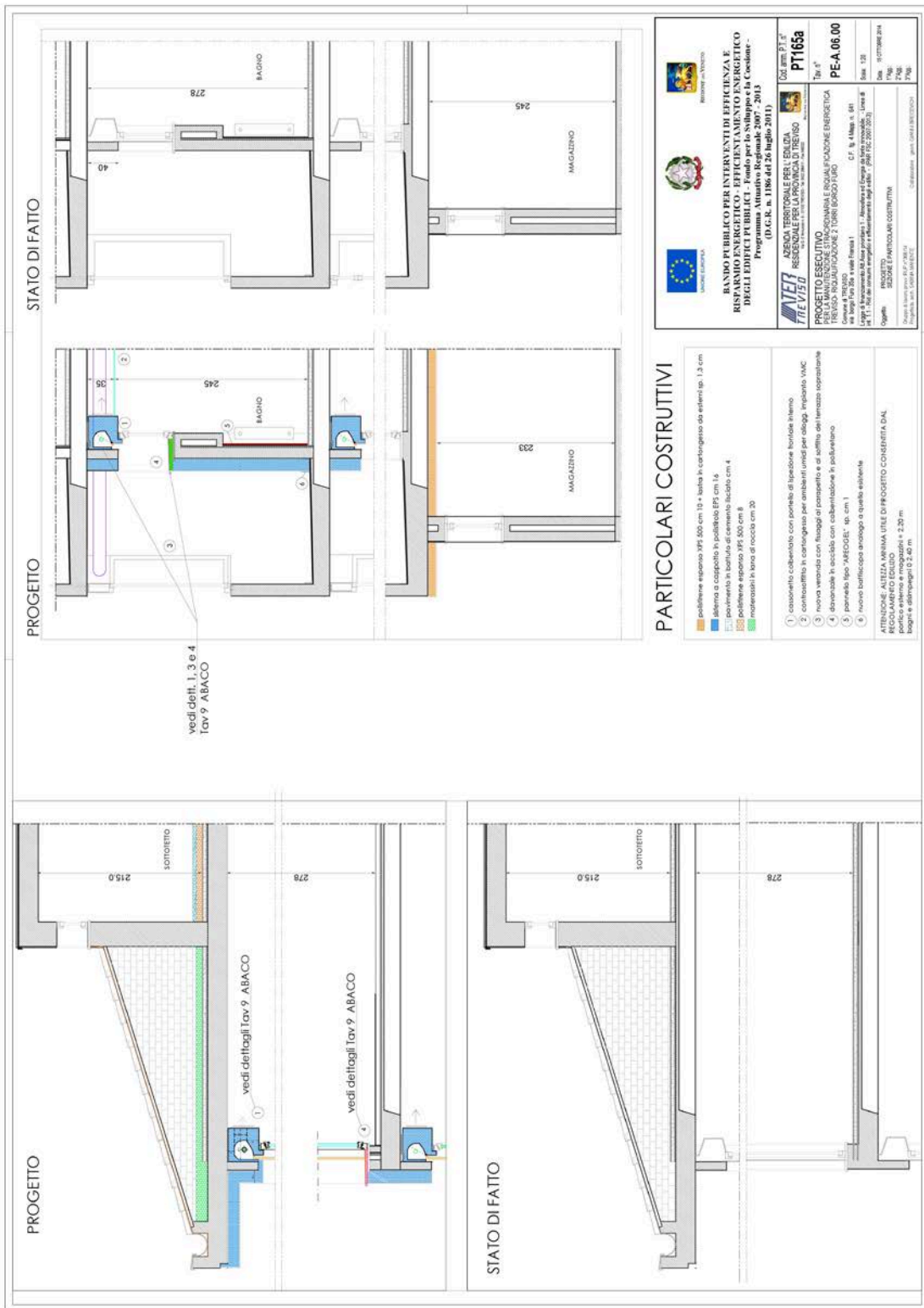
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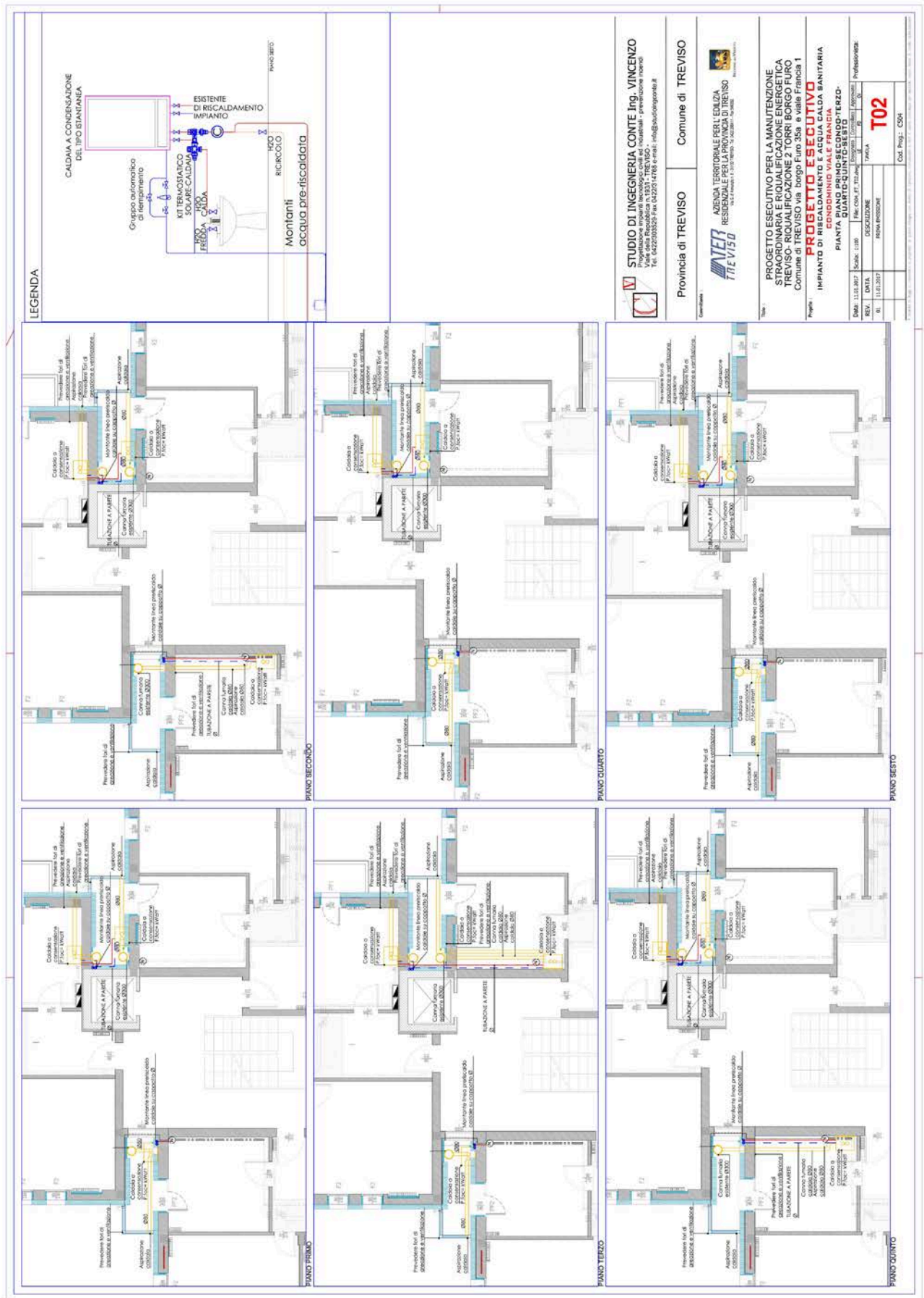
## 2.4.2 Active components

- Condensing boiler

The production of heating and Domestic Hot Water will be done by a condensing gas boiler decentralized replacing the old conventional boiler.

In each dwelling will be installed a boiler with the following features:

Feature	Description
Power	25 kW
Max efficiency	108 % (dir.92/42/EEC)
DHW flow rate	13,8 l/min
Sound level	50 dBA
Weight	35 kg aprox
Dimensions	710x400x330
Expansion vessel	10 l



- Ventilation system

The ventilation system consist in a decentralized installation which includes a heat recovery unit with enthalpic heat exchanger.

These are the features of the technical data:

Feature	Description
<b>Model</b>	AERMEC TRS35
<b>Efficiency Temp winter</b>	77 %
<b>Efficiency Enth winter</b>	63 %
<b>Efficiency Temp summer</b>	63 %
<b>Efficiency Enth summer</b>	61 %
<b>Nominal air flow</b>	270-350 m3/h
<b>Ext static pressure</b>	30-90 Pa
<b>Power input</b>	45-120 W
<b>Sound pressure level</b>	25-31 dB(A)
<b>Elec. supply</b>	230/1/50 V/ph/Hz



### 2.4.3 Renewable energy

- Solar thermal

The solar thermal system is composed by 26 collectors, having a total collecting surface of 57,20 m<sup>2</sup>.

The production of hot water is stored in a 1.500 l tank. The hot water is supplied to each dwelling as a preheated water for the condensing boiler.

The following table represent the production of the system in relation with the DHW demand:

Month	DHW demand (kWh)	Production (kWh)	Coverage (%)
Jan	2.847	483	17,0
Feb	2.571	1.328	51,7
Mar	2.847	2.093	73,5
Apr	2.755	2.203	80,0
May	2.847	2.751	96,7
Jun	2.755	2.755	100,0
Jul	2.847	2.847	100,0
Aug	2.847	2.847	100,0
Sep	2.755	2.301	83,5
Oct	2.847	1.647	57,9
Nov	2.755	712	25,8
Dec	2.847	749	26,3
<b>TOTAL</b>	<b>33.518</b>	<b>22.717</b>	<b>67,8</b>



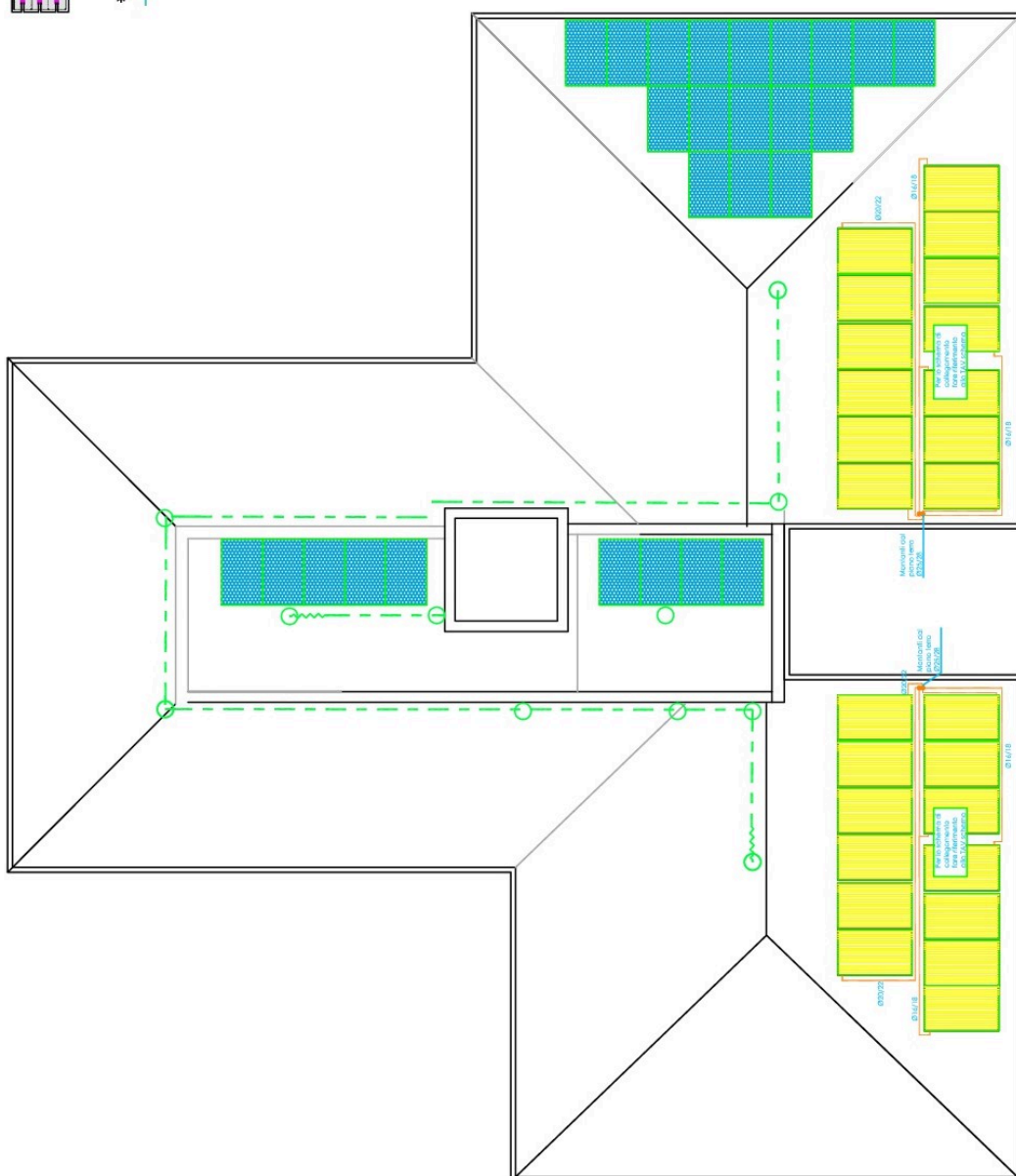


- Solar photovoltaic

The photovoltaic system is composed by two rows of 13 solar modules that give a total of 8,5 kWp.

The energy produced by the system will cover the energy demand for the common areas. The production of the system have been simulated, giving the following results:

Month	DHW demand (kWh)	Production (kWh)
Jan	13,8	429
Feb	22,9	642
Mar	30,7	950
Apr	34,5	1.040
May	39,3	1.220
Jun	40,0	1.200
Jul	42,6	1.320
Aug	38,6	1.200
Sep	31,9	957
Oct	22,6	701
Nov	15,2	456
Dec	13,2	410
<b>Average</b>	<b>28,8</b>	<b>876</b>
<b>TOTAL</b>		<b>10.500</b>



**STUDIO DI INGEGNERIA CONTE Ing. VINCENZO**  
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Provincia di TREVISO

Comune di TREVISO

**NIPER**  
**TREVISO**

AZIENDA TERRITORIALE PER L'EDILIZIA  
RESIDENZIALE PER LA PROVINCIA DI TREVISO

Via G. Arancini 8 - 31100 TREVISO - Tel. 0422/268111 - Fax 0422/268222

PROGETTO ESECUTIVO PER LA MANUTENZIONE  
STRAORDINARIA E RIQUALIFICAZIONE ENERGETICA  
TREVISO- RIQUALIFICAZIONE 2 TORRI BORGO FURO  
COMUNE DI TREVISO VIALE FRANCIA 1

**PROGETTO ESECUTIVO**  
IMPIANTO DI RISCALDAMENTO E ACQUA CALDA SANITARIA  
PIANTA COPERTURE

PIANTA SUPERIORE		Professione:	
Scala: 1:100	File: C:\83_01_104.dwg	Disegnato:	Approvato:
REV.	DATA	TAVOLA	
01	18.01.2017	PRIMA EMISSIONE	
		T03	

		Cod. Prog.: C403	
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**Berlin (GE)**

**Pilot site**

## 3 Renovation pack for Berlin

### 3.1 Selected renovation pack

Between all the renovation packages proposed by Exeleria, Berlin 1892 has decided to go through the Concept 1 *(which is currently being redefined due to identification of recent technical issues\*, during the course of renovation and thus not fully reflected in this report)*, which includes the following renovation measures:

*\*The insulation of the basement ceiling has been omitted. Due the routing of the pipes in the basement, insulation would not be effective. Because of that, parts of the ceiling could not be insulated, so there would be too many losses.*

#### 3.1.1 Envelope

Element	Description	Current U-Value (W/m2K)	Proposed U-Value (W/m2K)
<b>External walls</b>	No actions proposed	0,50	-
<b>Ground floor</b>	120 mm mineral fibre	1,10	0,23
<b>Roof</b>	240 mm polystyrol	0,50	0,14
<b>Windows</b>	3-glazed window	2,30	1,00

#### 3.1.2 Active components

Element	Description	Features
<b>Heating &amp; DHW</b>	No actions considered in the district heating	-
<b>Ventilation</b>	Replacement of the extraction ventilation system in bathrooms	-

#### 3.1.3 Renewable energy

The PV calculation needs to be revised according to a different set of PV installation.

Element	Description	Energy production
<b>Photovoltaic</b>	231 solar panels (378,84 m <sup>2</sup> ) and a storage system of 92 kWh	74.676 kWh

### 3.2 Results of the selected renovation pack

The results obtained by the implementation of the renovation measures selected have been previously calculated in the Task 2.2.

The following graphics represents the comparison between the current situation in the Pilot Site and the future situation after the renovation for the selected renovation pack according to these indicators:

- Energy savings

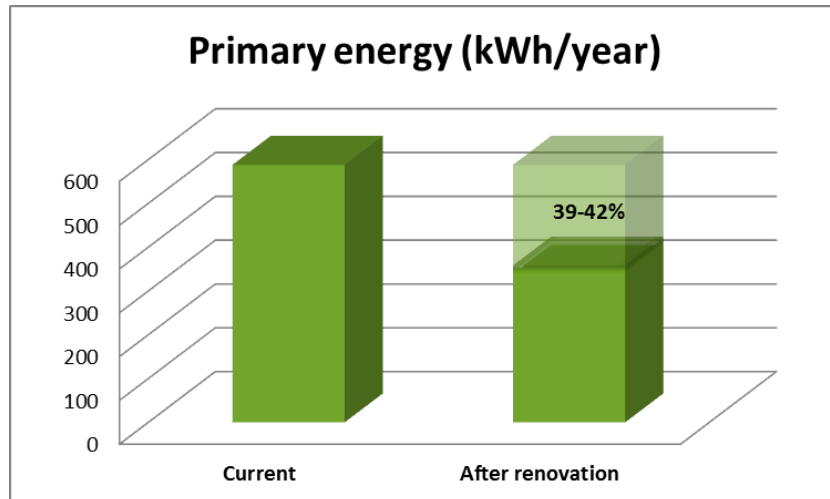


Figure 13 energy consumption Berlin

- Economic savings

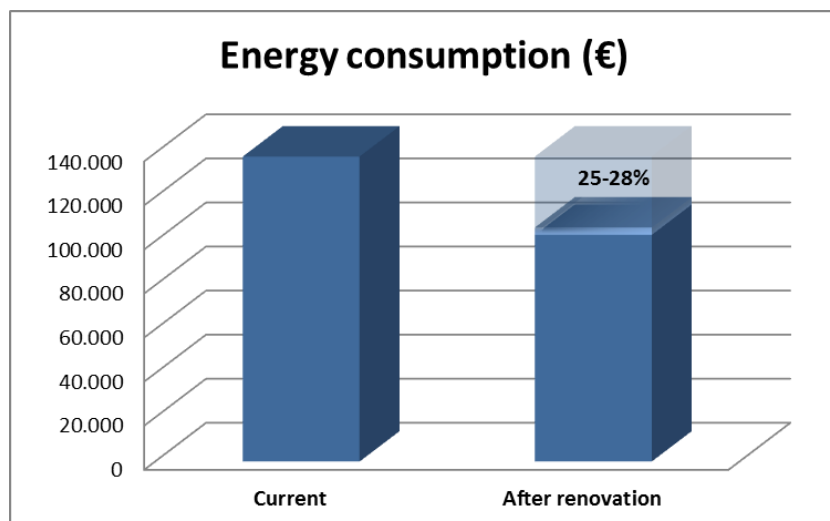
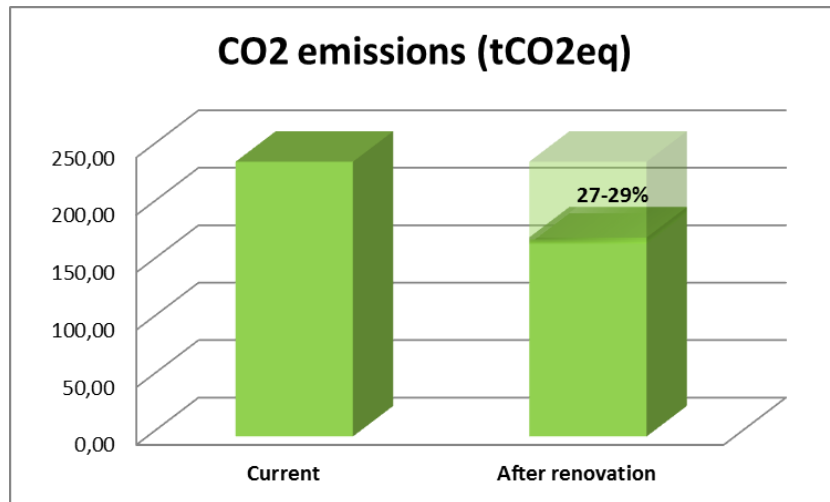


Figure 14 energy cost Berlin.

- Economic savings



*Figure 15 CO2 emissions Berlin*

### 3.3 DREEAM Tool & renovation pack

The selected renovation measures analysed in the Task 2.2 have been simulated in the tool in order to check all the different solutions possible combining all of them in different ways.

In the following illustration, there is the result of the tool obtained by selecting the refurbishment measures selected. Depending on the evaluation criteria of the building owners, a total amount of 39 different targets can be analysed. For the example below, Investment costs and Primary Energy total have been selected:

#### Optimal Strategies

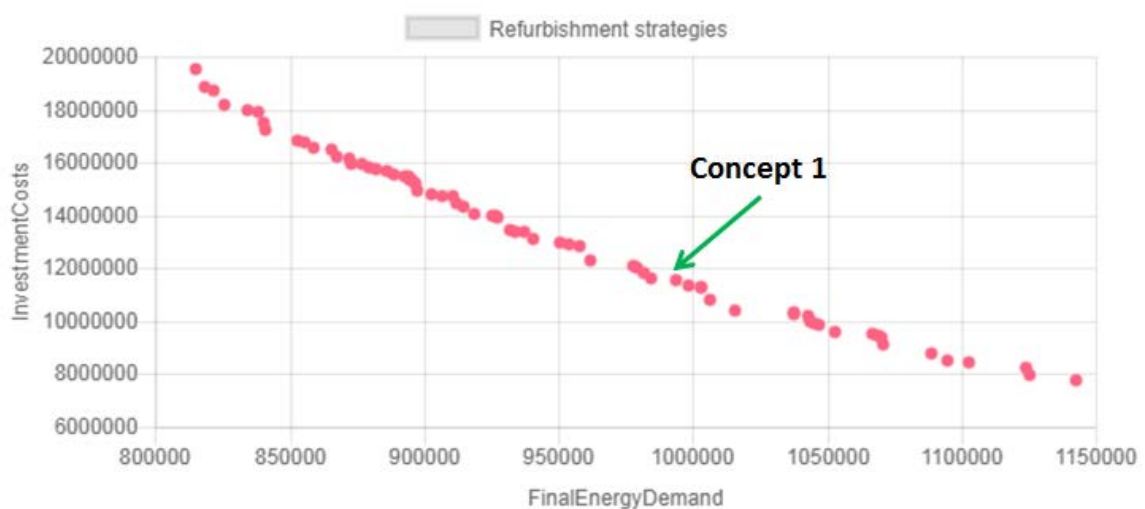


Figure 16 DREEAM tool results Berlin

The WP1 Tool give us an output of 68 results for the selected renovation pack, among the renovation concept selected is included.

As it is shown in the point cloud obtained in the graph, no curvature is shown that implies a differentiation between the obtained results. The overall renovation measures obtained are arranged in a straight constant slope.

That means that an increase in the energy savings obtained implies a proportional increase in the initial investment.

### 3.4 Detailed components of the renovation

This section includes a more detailed information gathered about the components selected for the renovation

#### 3.4.1 Envelope

The components related with the reduction of the heating demand are the new insulation and windows:

- Insulation

Material	Use	Thickness (mm)	Conductivity (W/mK)
Mineral fibre	Floor	120	0,035
Polystyrol	Roof	240	0,035

# BV Nettelbeckplatz

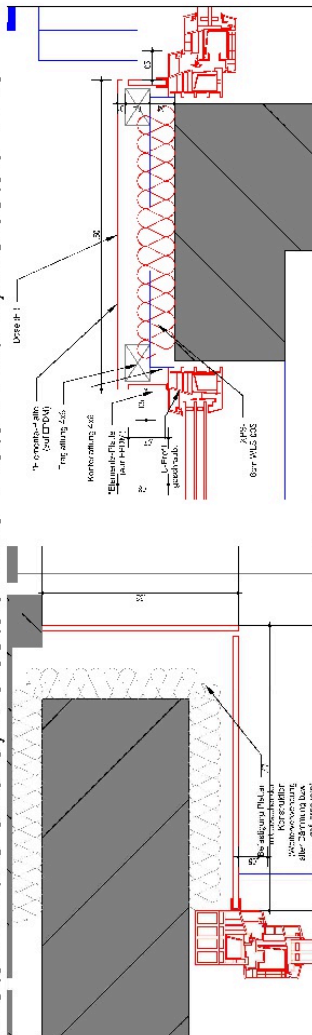
Wohnung: WE34\_Pasewalker Str. 7, 6.OG (Ehemals Tapphorn)

Layout: WE34\_Dachdecker\_Terrasse .PDF

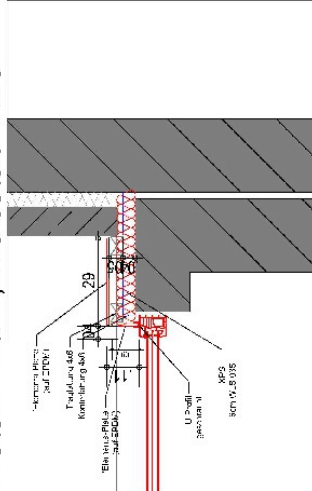
Blattgröße: A4

M : 1:50

Detail Pkt. 5 und 6, Maßstab 1:10 Detail Pkt. 2, Maßstab 1:10



Detail Pkt. 1, Maßstab 1:20



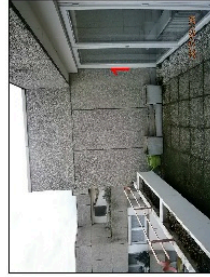
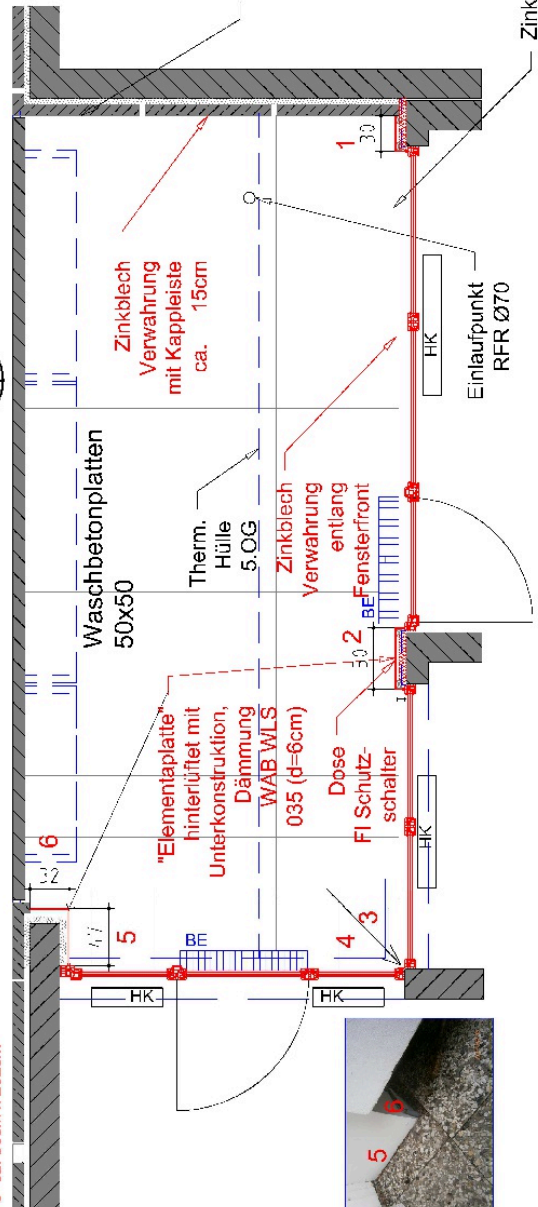
"Elementplatten" (grundriß, neu, mit bauseitigem Anstrich im Austausch gegen alte Platten) Maße sind am 15.6.2017 (nach Einbau neue Fenster) am Bau zu nehmen

- 1- ca. 39cm x 202cm + ca. 9cm x 202cm (samt Unterkonstruktion aus Latten und Konterlaten, 6cm XPS WLS 035 als Dämmung WAB, Zulüftung mit Insektenschutz)
- 2- ca. 50cm x 202cm + ca. 7cm x 202cm (samt Unterkonstruktion aus Latten und Konterlaten, 6cm XPS WLS 035 als Dämmung WAB, Zulüftung m. Insektenschutz, Dose mit FI integrieren)
- 3- Eckprofil Fensterbauer
- 4- Eckprofil Fensterbauer
- 5- ca. 47cm x 202cm
- 6- ca. 30cm x 202cm

Grundriß



3\* Notüberlauf



Anschluss Waschbetonfassade/Zinkverblechung  
Waschbetonbelag



Zinkverblechung Fensterschwelle

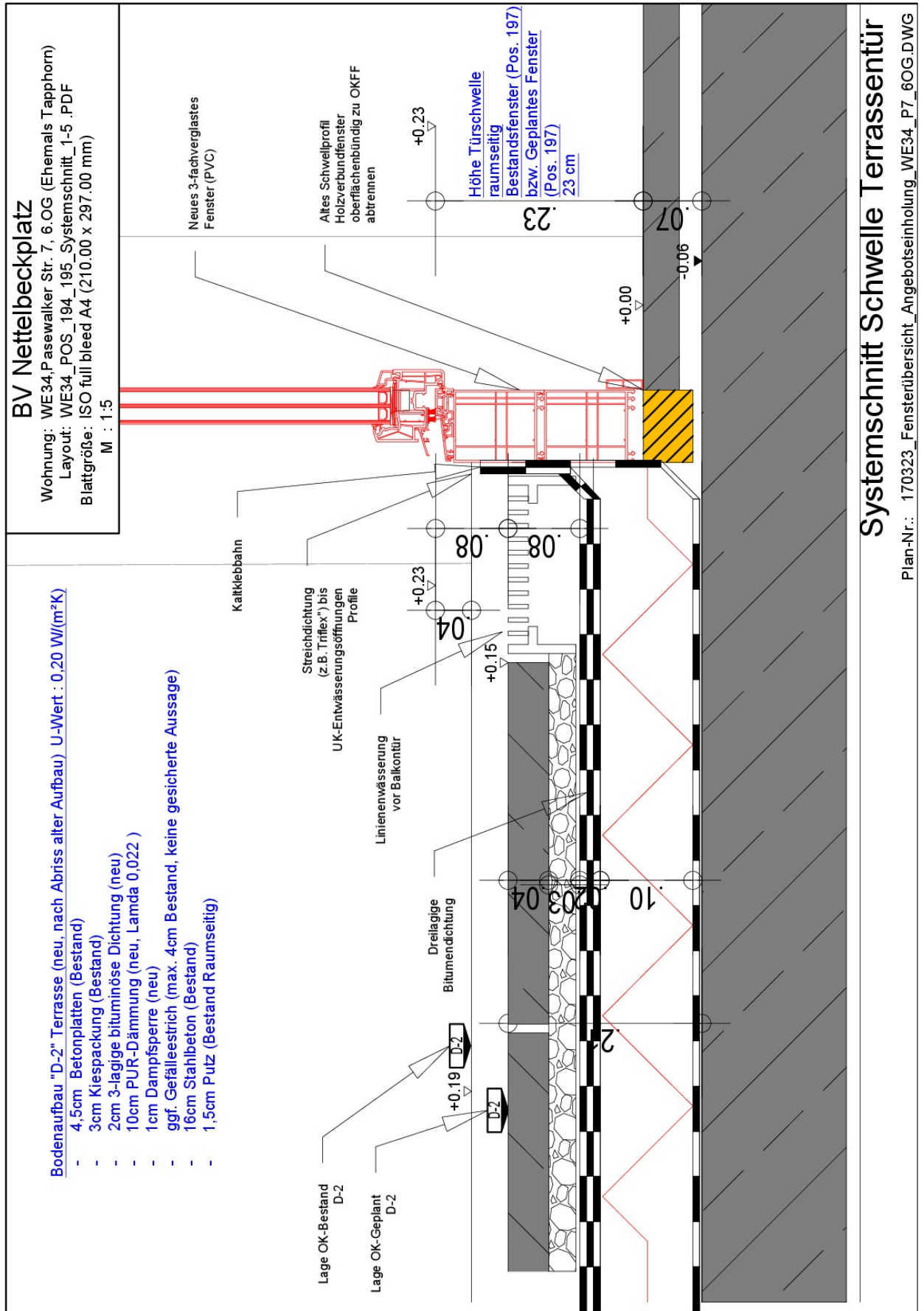
Plan-Nr.:

170614\_Dachdecker\_Ausführung\_WE34\_P7\_6OG.DWG



- Windows

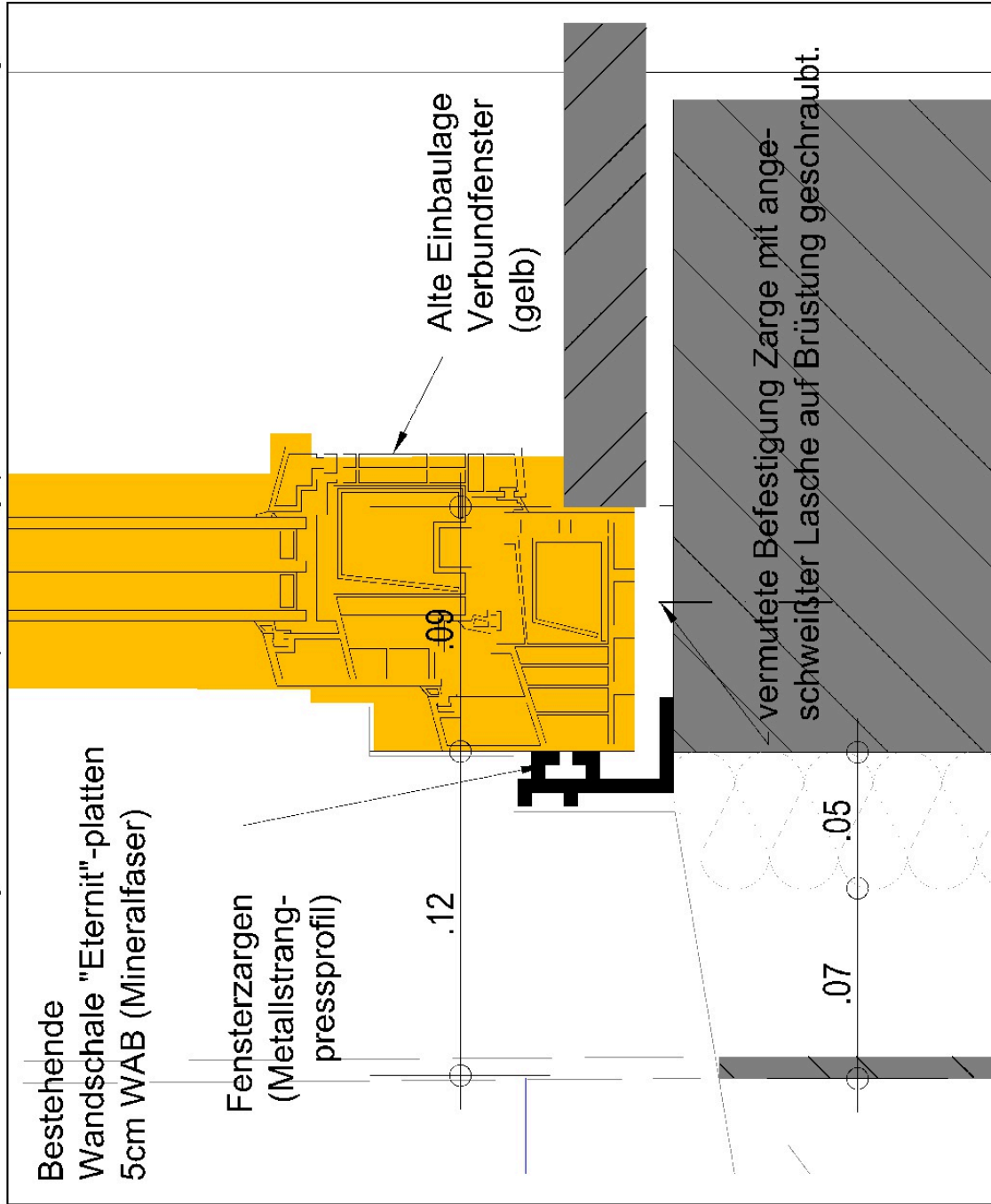
Feature	Description
Composition	3 layers, 2 cameras
U-Value	1,0 W/m <sup>2</sup> K
Rw	37 dB
Permeability	Class 4
Frame	PVC
Emissivity	Low emissivity



**Systemschnitt Schwelle Terrassentür**

Plan-Nr.: 170323\_Fensterübersicht\_WE34\_P7\_6OG.DWG

Schnitt 2-2 :Brüstung Neues Fenster (3-fach vergl.) m. besteh. Eternitverkleidung

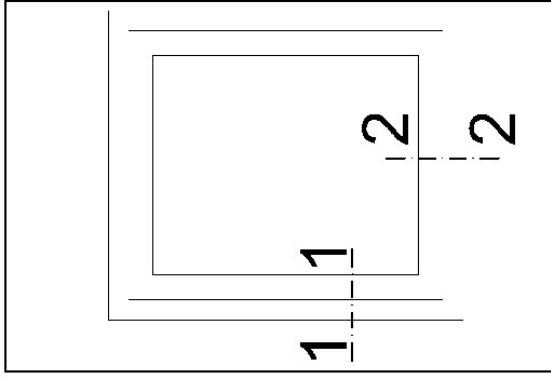


BV Nettelbeckplatz (Altneubauten)

Plan-Nr.: 170717\_Zargenfenster\_Fassadeanschluss.dwg  
Layout: Fensterzarge\_Schnitt\_2\_Neu

Blattgröße: A4  
M : 1:2

Übersicht: Schnitte



Situation nach  
Demontage Altfenster  
und Einbau 3-fach  
verglastes Fenster

### 3.4.2 Active components

- Heating and DHW

The production of heating and Domestic Hot Water provided by the district heating will not be implemented with any measurement due to the high efficiency of the system.

For this reason that the system will prevail as it is in the current state.

- Ventilation system

Extraction ventilation system in bathrooms is replaced for a new one with better properties.

These are the possible features of the device to be installed:

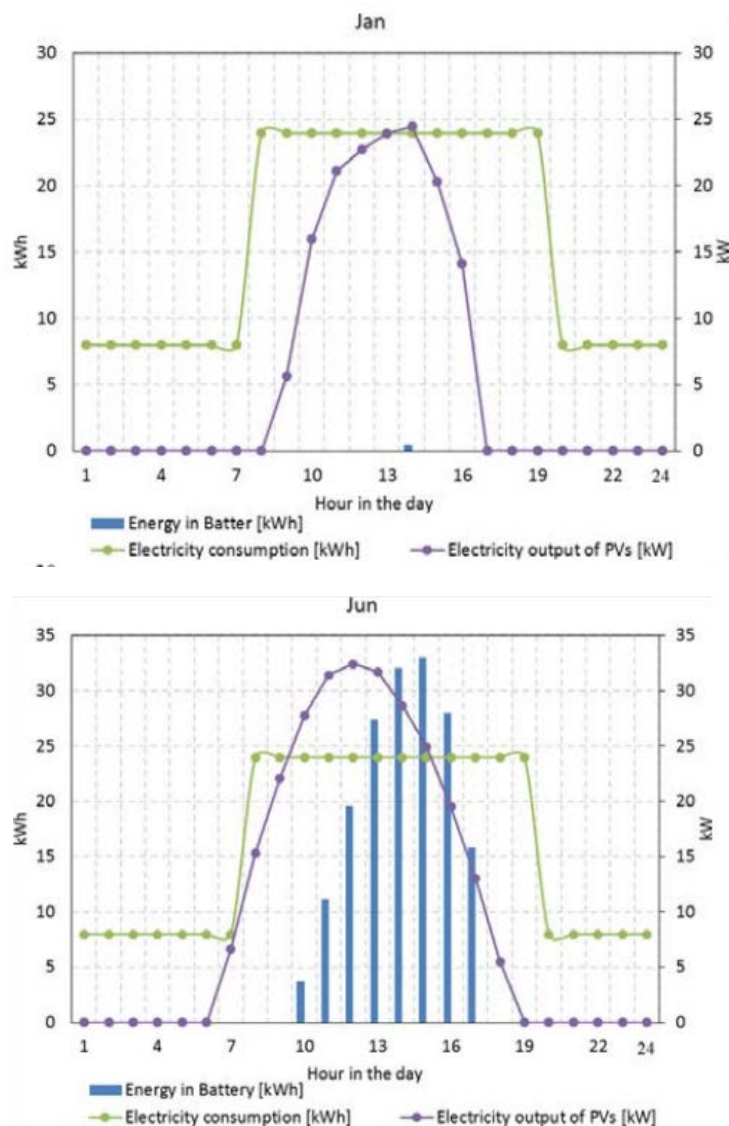
Feature	Description
<b>Model</b>	S&P Silent-100
<b>Power input</b>	8 W
<b>Elec. supply</b>	230/1/50 V/ph/Hz
<b>Speed</b>	2.400 rpm
<b>Sound pressure level</b>	26,5 dB(A)
<b>Nominal air flow</b>	95 m3/h

### 3.4.3 Renewable energy

- Solar photovoltaic

The photovoltaic system is composed by 231 modules Viessmann Vitovolt 300 Typ M300 PA and a storage system of 7 batteries Tesla POWERWALL 2AC, which can storage 92 kWh.

The annual total production of the photovoltaic system is 74.676 kWh. In the following graphics it can be seen the curves of energy production compared with the energy demand in the best (June) and worst (January) month of the year:



Photovoltaic  
modules

Vitovolt 300





## VITOVOLT 300

Patented by Viessmann, the switching absorber coating protects high-performance flat-plate collectors against overheating and stagnation.

### The right model for every house

The right photovoltaic module for any requirement: The Vitovolt 300 product range offers monocrystalline modules up to an output rating of 270 Wp. The range also includes 48 or 60 cell polycrystalline modules that have an output of up to 260 Wp.

### High yielding photovoltaic modules; quality without compromise

Vitovolt 300 photovoltaic modules are distinguished by their high output, uncompromising quality and extensive product and performance guarantees. In addition, all modules offer only 'plus' output tolerances as standard. You benefit from an increase in output of up to 5 Wp as a result. Our photovoltaic modules are suitable for installation on the roofs of detached houses and apartment buildings, as well as on commercial and industrial premises.

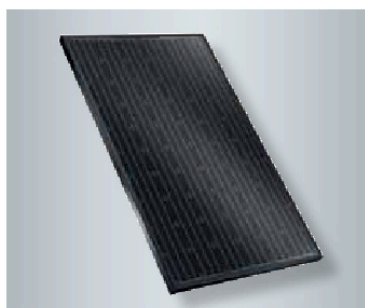
### Attractive design

Vitovolt 300 modules are distinguished by their design and dimensions. Modules in the MSBC series feature a black anodised frame, monocrystalline cells in a particularly dark hue and a black Tedlar film. Extraordinary design has been combined with the highest performance values! The effect is even more architecturally stunning when these modules are incorporated into a flush mounted roof integration system.



### Take advantage of these benefits

- Positive output tolerance for additional output of up to 5 Wp per module
- Anti-reflection glass for high yields
- Security of investment resulting from product guarantee extended to 10 years and a 25-year output guarantee to at least 80 % of rated output
- High module efficiency of up to 16.8 %
- Non-twisting anodised aluminium frame
- Strict cell selection process for balanced and high value appearance
- High operational reliability as a result of three bypass diode jumpers
- Tested Viessmann quality: Every photovoltaic module is subjected to an optical and electrical quality test
- Standardised process for the ability to recycle all Vitovolt 300 modules in a sustainable and efficient manner



Monocrystalline photovoltaic module Vitovolt 300 with black anodised frame and dark Tedlar film



Polycrystalline photovoltaic module Vitovolt 300 with 48 or 60 cells in a compact design





Vitosol 100-FM flat-plate collectors

		Vitosol 100-FM (type SV1F)	Vitosol 100-FM (type SH1F)
<b>Gross area</b>	m <sup>2</sup>	2.51	2.51
<b>Absorber area</b>	m <sup>2</sup>	2.32	2.32
<b>Aperture surface</b>	m <sup>2</sup>	2.33	2.33
<b>Dimensions</b>			
Width	mm	1056	2380
Height	mm	2380	1056
Depth	mm	72	72
<b>Weight</b>	kg	42	42



Vitosol 100-FM flat-plate collectors

Vitosol 100-FM individual collector	Type	SVKF	SVKG
<b>Absorber area</b>	m <sup>2</sup>	2.01	2.01
<b>Gross area</b>	m <sup>2</sup>	2.18	2.23
<b>Aperture surface</b>	m <sup>2</sup>	2.02	2.02
<b>Dimensions</b>			
Width	mm	1056	1070
Height	mm	2066	2080
Depth	mm	73	73
<b>Weight</b>	kg	37	38

Vitosol 100-FM (type SVKF) for on-roof installation

Vitosol 200-F (type SVKG) for in-roof installation



Vitovolt 300 photovoltaic modules

		Vitovolt 300 M260 MSBC M265 MSBC M270 MSBC	Vitovolt 300 P200 PSEA	Vitovolt 300 P250 PSEB P255 PSEB P260 PSEB	Vitovolt 300 P250 PGHA P255 PGHA
<b>Output category</b>	W <sub>p</sub>	260 - 270	200	250 - 260	250 - 255
<b>Module efficiency</b>	%	up to 16.8	15.19	up to 15.97	up to 15.6
<b>Type of cell</b>		Monocrystalline	Polycrystalline	Polycrystalline	Polycrystalline
<b>Dimensions</b>					
Width	mm	983	986	989	990
Height	mm	1639	1335	1654	1650
Depth	mm	40	46	40	42

## POWERWALL

Tesla Powerwall is a fully-integrated AC battery system for residential or light commercial use. Its rechargeable lithium-ion battery pack provides energy storage for solar self-consumption, load shifting, and backup.

Powerwall's electrical interface provides a simple connection to any home or building. Its revolutionary compact design achieves market-leading energy density and is easy to install, enabling owners to quickly realize the benefits of reliable, clean power.



### PERFORMANCE SPECIFICATIONS

AC Voltage (Nominal)	120/240 V
Feed-In Type	Split Phase
Grid Frequency	60 Hz
Total Energy <sup>1</sup>	14 kWh
Usable Energy <sup>1</sup>	13.5 kWh
Real Power, max continuous	5 kW (charge and discharge)
Real Power, peak (10s)	7 kW (discharge only)
Apparent Power, max continuous	5.8 kVA (charge and discharge)
Apparent Power, peak (10 s)	7.2 kVA (discharge only)
Maximum Supply Fault Current	10 kA
Maximum Output Fault Current	32 A
Overcurrent Protection Device	30 A
Imbalance for Split-Phase Loads	100%
Power Factor Output Range	+/- 1.0 adjustable
Power Factor Range (full-rated power)	+/- 0.85
Internal Battery DC Voltage	50 V
Round Trip Efficiency <sup>1,2</sup>	90%
Warranty	10 years

<sup>1</sup> Values provided for 25°C (77°F), 3.3 kW charge/discharge power.

<sup>2</sup> AC to battery to AC, at beginning of life.

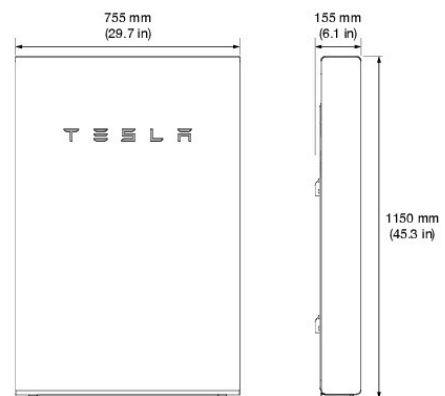
### COMPLIANCE INFORMATION

Certifications	UL 1642, UL 1741, UL 1973, UL 9540, UN 38.3
Grid Connection	Worldwide Compatibility
Emissions	FCC Part 15 Class B, ICES 003
Environmental	RoHS Directive 2011/65/EU
Seismic	AC156, IEEE 693-2005 (high)

TESLA

### MECHANICAL SPECIFICATIONS

Dimensions	1150 mm x 755 mm x 155 mm (45.3 in x 29.7 in x 6.1 in)
Weight	125 kg (276 lbs)
Mounting options	Floor or wall mount



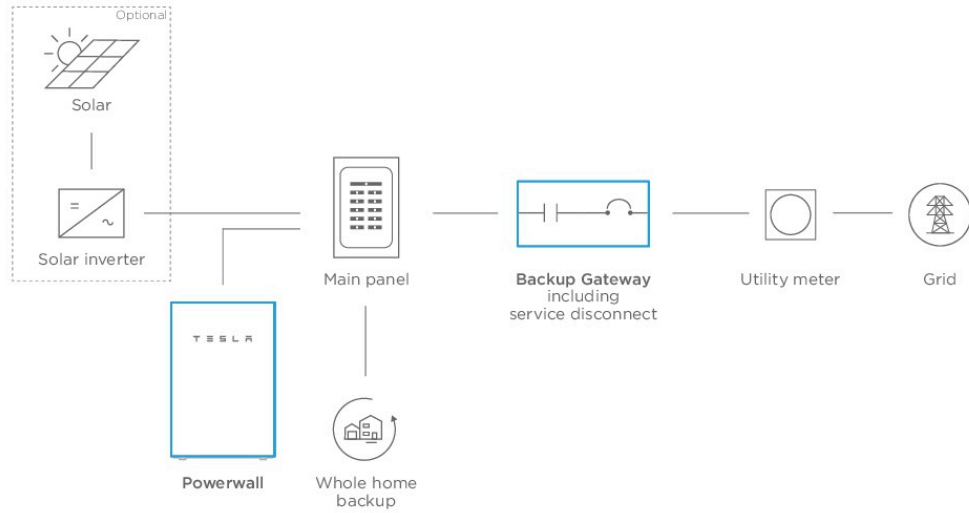
### ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Operating Humidity (RH)	Up to 100%, condensing
Storage Conditions	-20°C to 30°C (-4°F to 86°F) Up to 95% RH, non-condensing State of Energy (SoE): 25% initial
Maximum Elevation	3000 m (9843 ft)
Environment	Indoor and outdoor rated
Enclosure Type	NEMA 3R
Ingress Rating	IP67 (Battery & Power Electronics) IP56 (Wiring Compartment)
Wet Location Rating	Yes
Pollution Degree Rating	PD3
Noise Level @ 1m	< 40 dBA at 30°C (86°F)

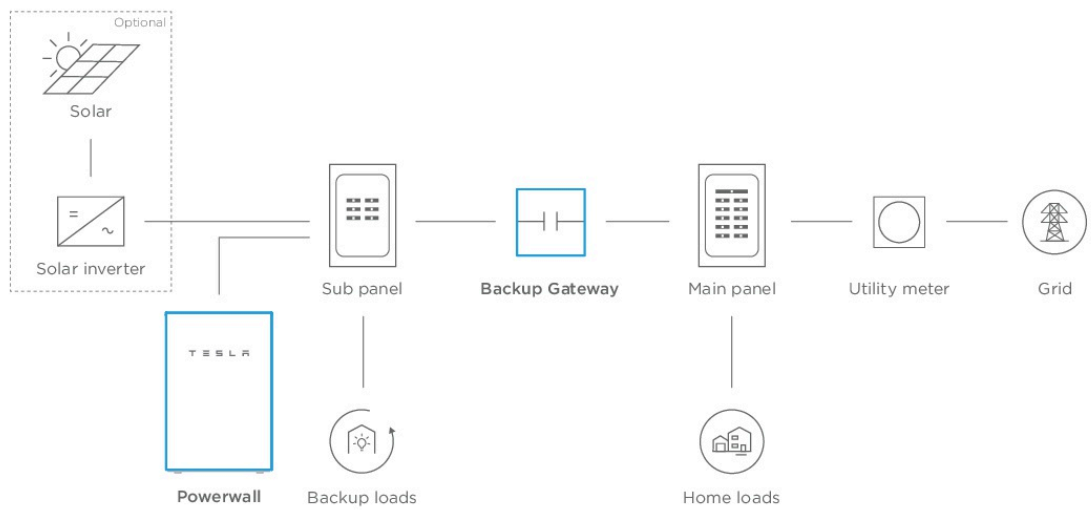
TESLA.COM/ENERGY

## TYPICAL SYSTEM LAYOUTS

### WHOLE HOME BACKUP



### PARTIAL HOME BACKUP



TESLA

NA - BACKUP - 2017-07-17

TESLA.COM/ENERGY

## 4 Conclusions

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Deep renovation actions in buildings can reduce significantly the energy demand, the cost of the energy consumption and the greenhouse emissions

At present, in Europe there is a high stock of buildings with a remarkable potential of energy demand reduction through a renovation and the use of Renewable Energy. This can help to reach the targets in the European Union for 2020 in terms of climate and energy.

Normally, one of the biggest problems in the evaluation of performing a renovation in buildings is that only economic savings are considered, despite of many other advantages associated to this process.

The main actions to achieve the energy reduction in buildings are the following:

- Envelope: Though the envelope of the buildings are produced most of the energy losses. It is very important in a renovation to upgrade the thermal properties of the building before go through other renovation measures.
- Active components: Technology is being developed all the time and consequently in the market exists more efficient components to convert energy. To invest in energy efficiency is very profitable. Also the active components go in the same line with the comfort of the tenants. Each time is more common to have mechanical ventilation systems that filter and condition air apart from renovate it.
- Renewable Energy: To reach the targets of energy savings cannot be done only reducing the demand, it requires also the own production of energy. That can be done with the implementation of Renewable Energy. There are many sources of Renewable Energy, but not all the existing technologies can be adapted to residential buildings. The most common technologies used are solar thermal for the production of DHW and solar photovoltaic for the production of electricity.