

# Project Documentation

## Gebäude-Dokumentation

### Abstract | Zusammenfassung



### Single family PH dwelling in West Cork, Ireland

#### Data of building | Gebäudedaten

Year of construction Baujahr	2014	<b>Space heating Heizwärmeverbrauch</b>	<b>10</b> <b>kWh/(m<sup>2</sup>a)</b>
U-value external wall U-Wert Außenwand	0.117 W/(m <sup>2</sup> K)		
U-value basement U-Wert Kellerdecke	0.098 W/(m <sup>2</sup> K)	Primary Energy Renewable (PER) Erneuerbare Primärenergie (PER)	24 kWh/(m <sup>2</sup> a)
U-value roof U-Wert Dach	0.123 W/(m <sup>2</sup> K)	Generation of renewable Energy Erzeugung erneuerb. Energie	11 kWh/(m <sup>2</sup> a)
U-value window U-Wert Fenster	0.85 W/(m <sup>2</sup> K)	Non-renewable Primary Energy (PE) Nicht erneuerbare Primärenergie (PE)	60 kWh/(m <sup>2</sup> a)
Heat recovery Wärmerückgewinnung	77.6 %	Pressurization test n <sub>50</sub> Drucktest n <sub>50</sub>	0.59 h <sup>-1</sup>
Special features Besonderheiten	PV array to provide renewable energy Integration of stack ventilation to provide natural summertime cooling		

## Brief Description

### West Cork PH

This distinctly modern family home is located on an elevated site in West Cork overlooking Roaring Water Bay and has been designed and constructed to meet the high-performance criteria of Passive House.

The configuration and layout have responded to the topography and vistas prevalent on the site. A series of folds link the internal spaces to the garden and patio areas and straddle a significant seam of sandstone. Large, glazed areas frame the panoramic views.

There is extensive but tireless use of bamboo in its many guises, to the floors, stairs, skirting, wardrobes, breakfast bar countertop and exterior decking, bringing a continuity of material and sustainability through the spaces – both inside and out. Stone excavated from the site was ideal for building and has been used in the drystone wall construction of the house itself and for site features.

With the knowledge that a building's energy demand can vary by up to 45% depending on its geographical location within Ireland, WMA were able to take full advantage in their design approach of the climate conditions confirmed by their site-specific climate data.

Though meeting Passive House standards and designed to respond to the local climatic conditions, this dwelling also performs particularly well having an A1 BER rating (building energy rating) at 23.7 kWh/m<sup>2</sup>/a.

The incoming nZEB requirements dictate that new dwellings will have to meet Maximum Energy Performance Coefficient (MEPC) of 0.302 and a Maximum Carbon Performance Coefficient (MCPC) of 0.305. This project achieves an EPC of 0.153 and a CPC of 0.156, indicating that a passive solar focused Passive House design can exceed the new nZEB requirements with ease.

This building received a commendation in the category of "Innovation" in the Wood Awards Ireland 2016.

## Kurzbeschreibung

### West Cork PH

Dieses ausgesprochen moderne Einfamilienhaus befindet sich auf einem erhöhten Grundstück in West Cork mit Blick auf die Roaring Water Bay und wurde so konzipiert und gebaut, dass es die hohen Leistungskriterien des Passivhauses erfüllt.

Die Konfiguration und das Layout haben der Topographie und den Aussichten des Geländes Rechnung getragen. Eine Reihe von Falten verbindet die Innenräume mit den Garten- und Terrassenbereichen und überspannt eine bedeutende Sandsteinfuge. Große, verglaste Flächen umrahmen das Panorama.

Bambus wird in seinen vielen Erscheinungsformen umfassend, aber unermüdlich für Böden, Treppen, Sockelleisten, Kleiderschränke, Frühstückstheken und Außenterrassen verwendet, wodurch eine Kontinuität von Material und Nachhaltigkeit durch die Räume gebracht wird – sowohl innen als auch außen. Steine, die von der Baustelle ausgegraben wurden, waren ideal zum Bauen und wurden für den Trockenmauerbau des Hauses selbst und für Baustellenelemente verwendet.

Mit dem Wissen, dass der Energiebedarf eines Gebäudes je nach geografischer Lage in Irland um bis zu 45 % schwanken kann, konnte WMA bei seinem Entwurfsansatz die durch die standortspezifischen Klimadaten bestätigten klimatischen Bedingungen voll ausschöpfen.

Trotz Passivhaus-Standards und klimatisch angepasster Bauweise schneidet diese Wohnung mit einem BER-Rating A1 (Gebäudeenergieklasse) von 23,7 kWh/m<sup>2</sup>/a besonders gut ab.

Die neuen nZEB-Anforderungen schreiben vor, dass neue Wohngebäude einen maximalen Energieeffizienzkoeffizienten (MEPC) von 0,302 und einen maximalen CO<sub>2</sub>-Leistungskoeffizienten (MCPC) von 0,305 erfüllen müssen. Dieses Projekt erreicht einen EPC von 0,153 und einen CPC von 0,156, was darauf hindeutet, dass ein passivsolarorientiertes Passivhausdesign die neuen nZEB-Anforderungen mit Leichtigkeit übertreffen kann.

Dieses Gebäude erhielt eine Auszeichnung in der Kategorie „Innovation“ bei den Wood Awards Ireland 2016.

## **Responsible project participants**

### **Verantwortliche Projektbeteiligte**

Architect	John Morehead, Wain Morehead Architects Ltd.
Entwurfsverfasser	<a href="http://www.wma.ie">www.wma.ie</a>
Implementation planning	John Morehead, Wain Morehead Architects Ltd.
Ausführungsplanung	<a href="http://www.wma.ie">www.wma.ie</a>
Building systems	Nilan Ireland
Haustechnik	<a href="http://www.nilanireland.ie">www.nilanireland.ie</a>
Structural engineering	Conor Coburn, Construct Engineering
Baustatik	<a href="http://www.constructeng.com">www.constructeng.com</a>
Building physics	John Morehead & Shane Fenton
Bauphysik	Wain Morehead Architects Ltd. <a href="http://www.wma.ie">www.wma.ie</a>
Passive House project planning	John Morehead, Wain Morehead Architects Ltd.
Passivhaus-Projektierung	<a href="http://www.wma.ie">www.wma.ie</a>
Construction management	
Bauleitung	CHOM Construction Ltd.

### **Certifying body**

#### **Zertifizierungsstelle**

MosArt Ltd.

[www.mosart.ie](http://www.mosart.ie)

### **Certification ID**

#### **Zertifizierungs ID**

**5048**

Project-ID (<https://passivehouse-database.org/>)

### **Author of project documentation**

#### **Verfasser der Gebäude-Dokumentation**

Wain Morehead Architects Ltd.

[www.wma.ie](http://www.wma.ie)

Date

08/09/2021

Datum

Signature

Unterschrift



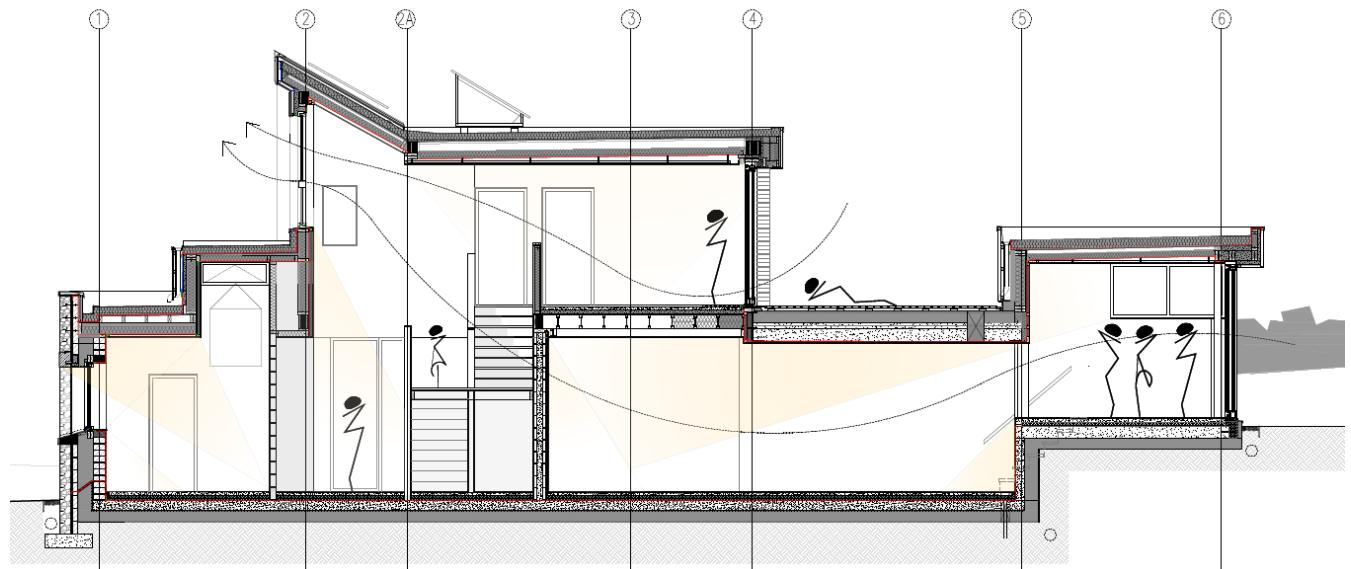
## 1. Exterior Photos / Ansichtsfotos



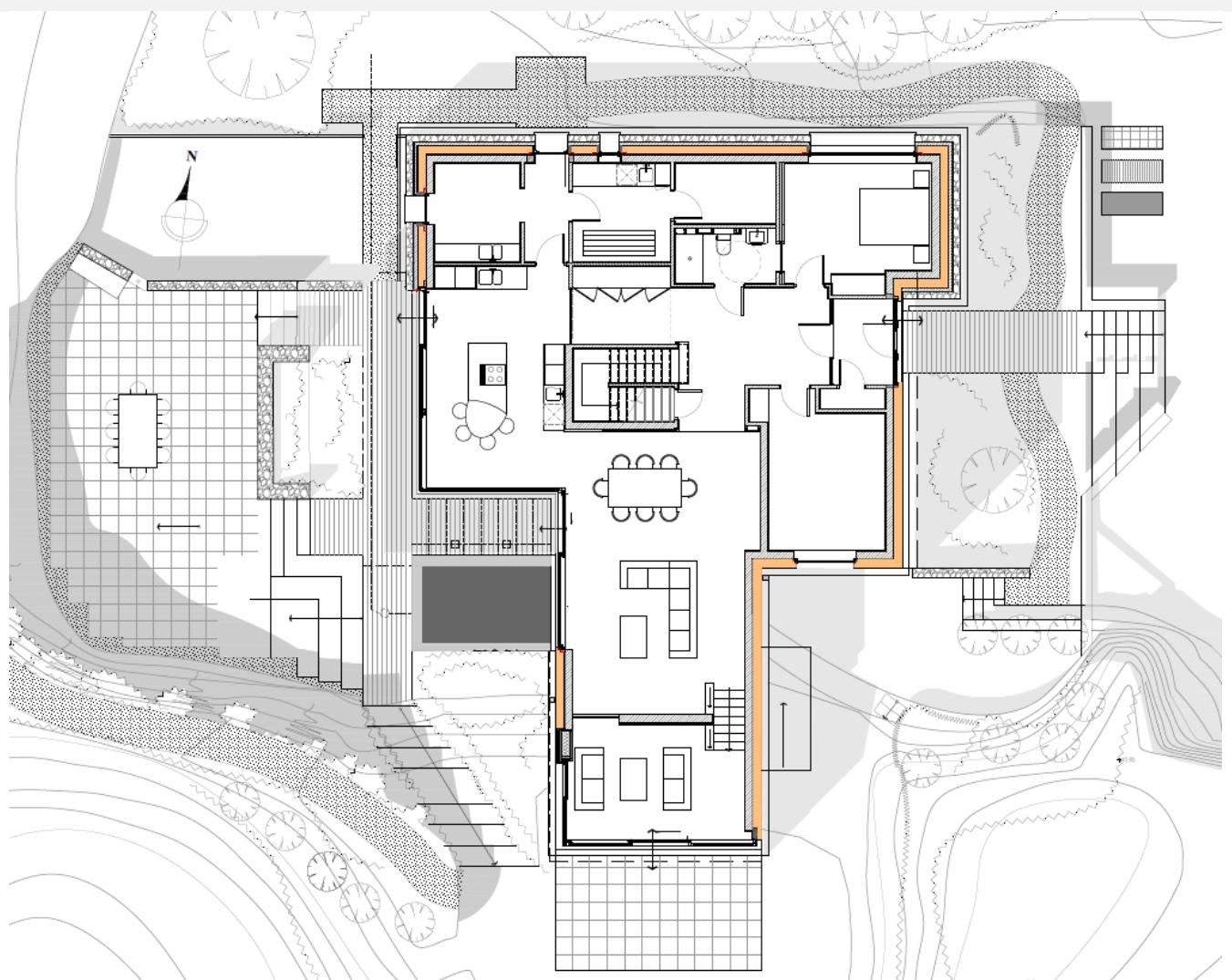
## 2. Interior Photos / Innenfoto exemplarisch



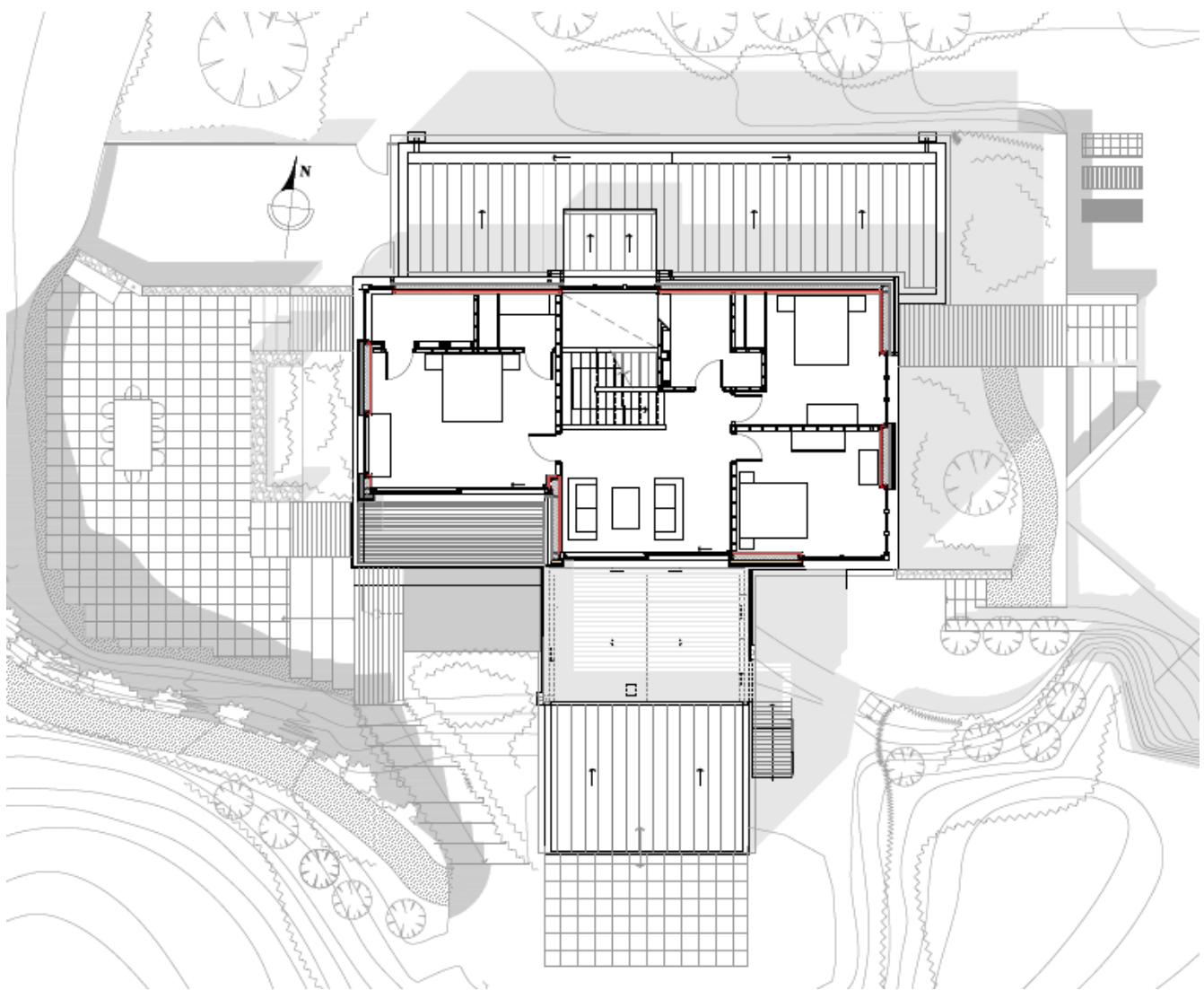
### 3. Section / Schnittzeichnung



### 4. Floor Plans / Grundrisse

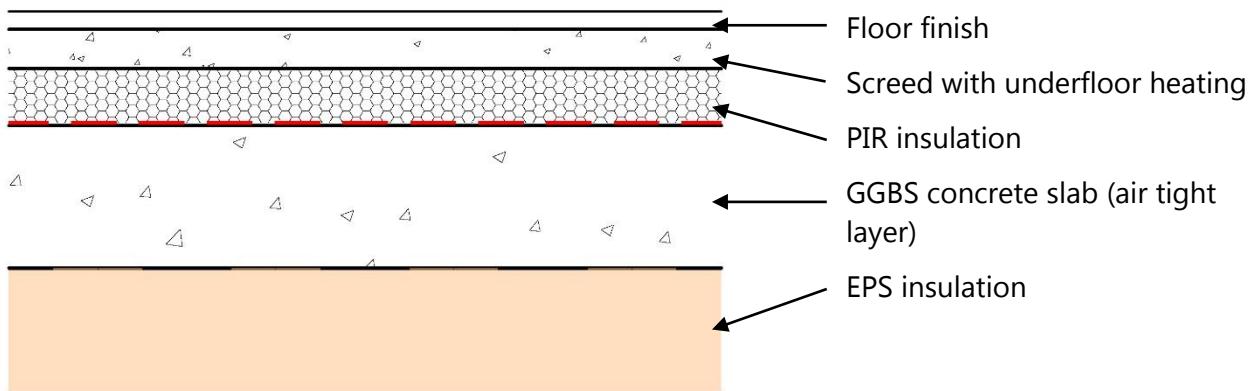


**Ground Floor**



**First Floor**

## 5. Floor Slab Construction / Konstruktion der Bodenplatte



An insulated raft foundation was selected to reduce thermal bridging. There are no strip footings or internal walls that penetrate the lower EPS layer causing heat losses

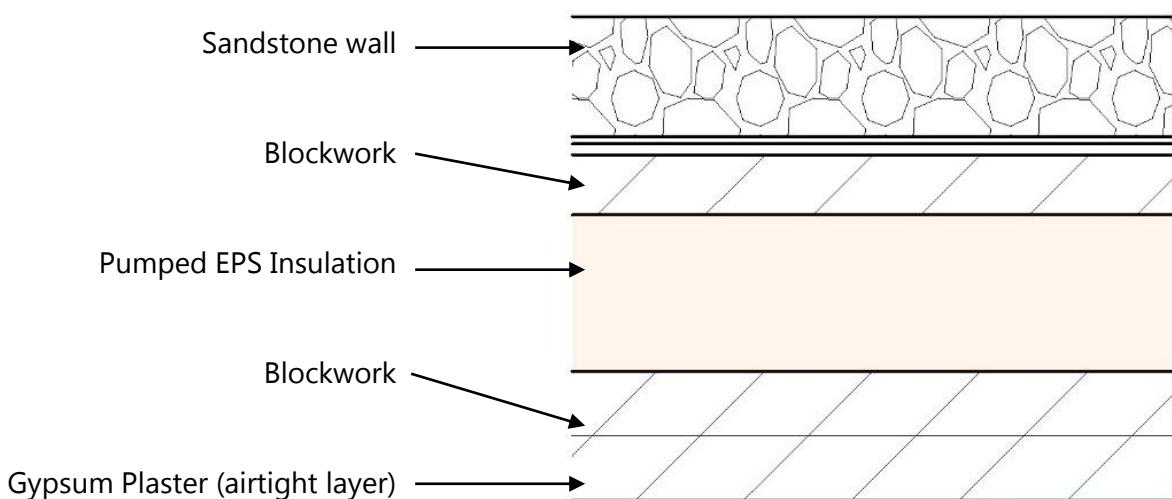


Assembly no.		Main Floor Level- Slab on Ground Floor 2016_229.pdf				Interior insulation?
Orientation of building element	3-Floor	Heat transmission resistance [m <sup>2</sup> K/W]				
Adjacent to	2-Ground	interior R <sub>se</sub> :	0.17	exterior R <sub>se</sub> :	0.00	
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Hardwood Timber Floor	0.180					22
Scred	0.410					60
Kingspan TF 70	0.022					80
Concrete	2.500					200
EPS	0.033					200
Percentage of sec. 1		Percentage of sec. 2		Percentage of sec. 3		Total
100%		0.0%		0.0%		56.2 cm
U-value supplement		0.00 W/(m <sup>2</sup> K)		U-value: 0.098 W/(m <sup>2</sup> K)		

## 6. Outer Wall Construction / Konstruktion der Außenwände

### Type 1 Cavity Wall Construction

A blockwork wide cavity wall was constructed, and pumped with EPS insulation. The inner block on flat wall is the structural wall, and the outer block wall restrains the natural sandstone from the site. Low thermal conductivity telpo wall ties have been used in the cavity zone to limit thermal losses.



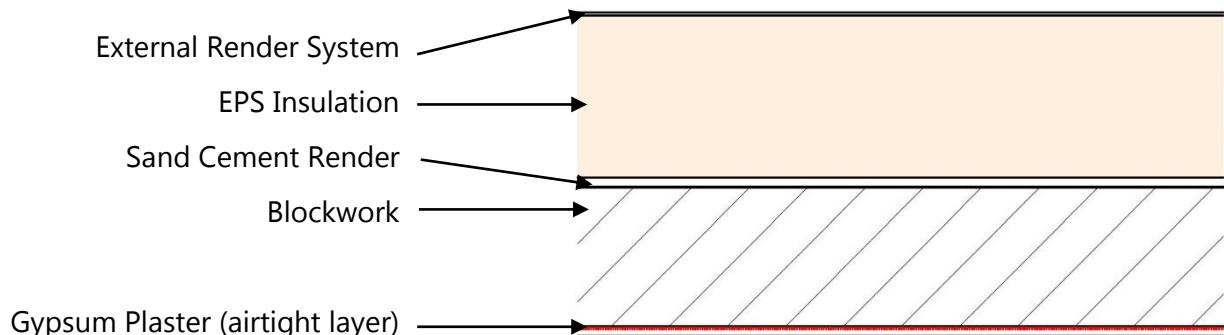
Assembly no.		Wall - Other External Wall Type 1 - Sandstone On Block Cavity 2106-309.pdf		Interior insulation?
Orientation of building element	2-Wall	Heat transmission resistance [m²K/W]		
Adjacent to	1-Outdoor air	interior R <sub>si</sub>	0.13	
		exterior R <sub>se</sub> :	0.04	
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)
Gypsum Plaster	0.570			
Concrete block	1.210			
Super Silver	0.031			
Rein.				
Concrete Block	1.210			
Render	0.700			
Sandstone	2.300			
Percentage of sec. 1	100%	Percentage of sec. 2	0.0%	Percentage of sec. 3
				0.0%
U-value supplement	0.00	W/(m²K)		U-value: 0.116 W/(m²K)
				Total 79.8 cm

## 6. Outer Wall Construction / Konstruktion der Außenwände

### Type 2 ETICS Wall

The primary wall on the ground floor is a 215mm blockwork wall with ETICS (external thermal insulation composite system) externally.

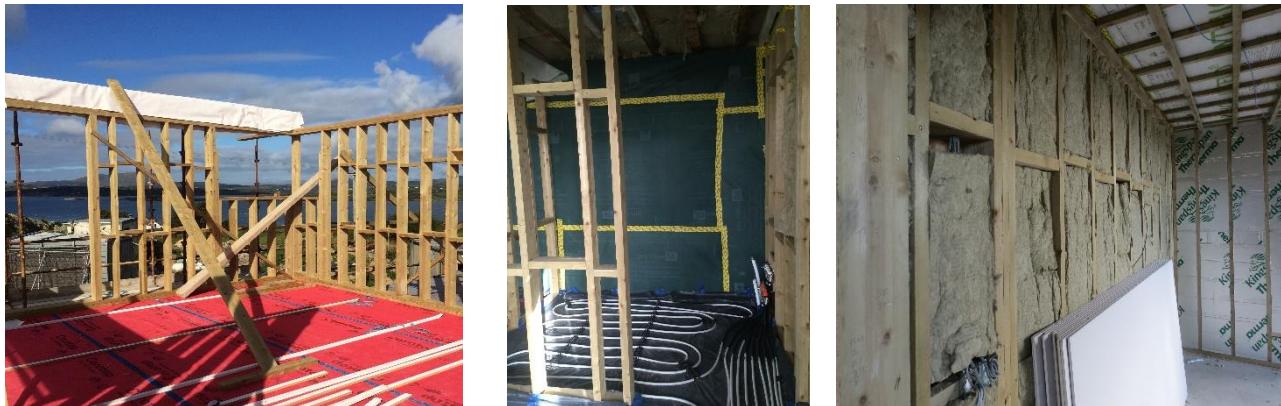
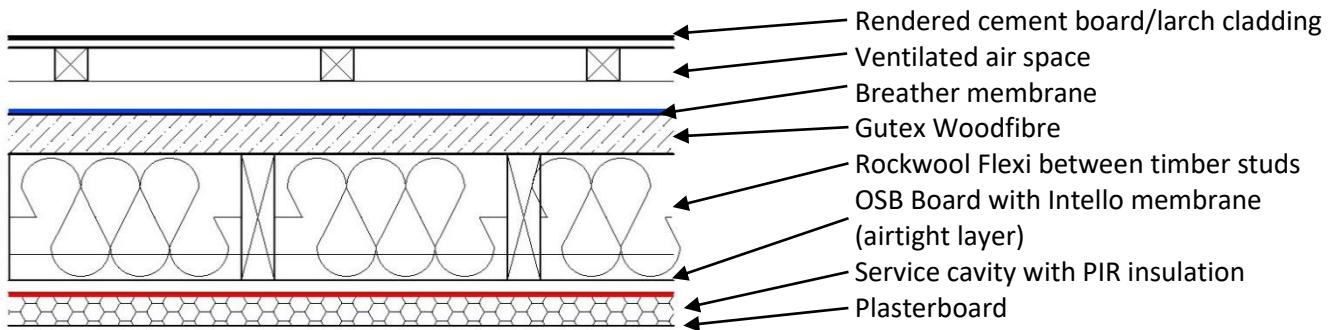
The use of the ETICS system with a insulated raft foundation reduced the thermal losses at the perimeter and allow for a thermally robust detail with a Psi Value of -0.034 W/mK



Assembly no.		Wall - External Wall Type 2 With External Insulation- 215 Blockwork				Interior insulation?
24ud						
Orientation of building element	2-Wall	Heat transmission resistance [m²K/W]				
Adjacent to	1-Outdoor air	interior R <sub>si</sub> :	0.13			
		exterior R <sub>se</sub> :	0.04			
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]	Thickness [mm]
Gypsum Plaster	0.570					15
Concrete Block	1.330					215
Render	1.000					18
EPS	0.033					250
Silicate Render	0.700					10
Percentage of sec. 1	100%	Percentage of sec. 2	0.0%	Percentage of sec. 3	0.0%	Total
						50.8 cm
U-value supplement	0.00	W/(m²K)		U-value:	0.126	W/(m²K)

## 6. Outer Wall Construction / Konstruktion der Außenwände

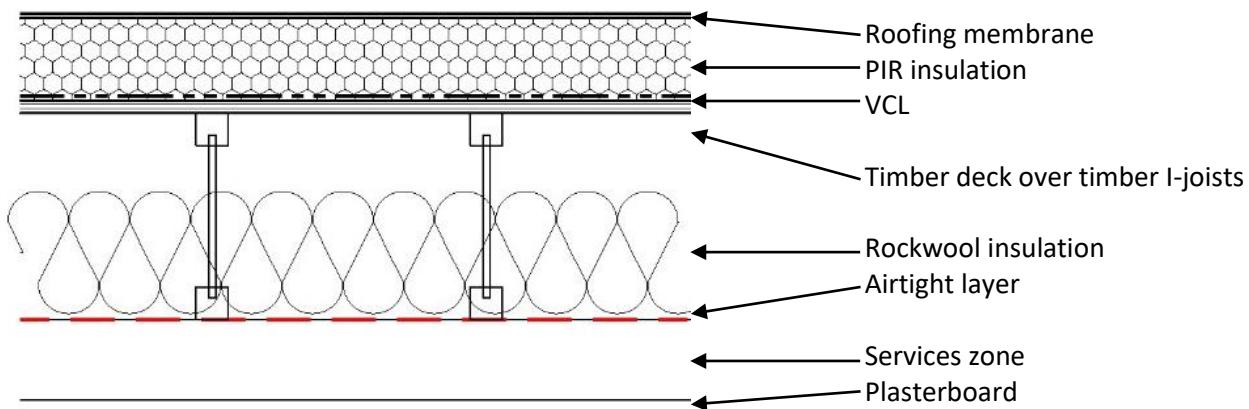
### Type 3 Timber Frame Wall



Assembly no.		Wall Type 3-Timber Frame-Insulation between Studs-With Renderboard			Interior insulation?
25ud					
Orientation of building element	2-Wall	Heat transmission resistance [m²K/W]			
Adjacent to	1-Outdoor air	interior R <sub>si</sub>	0.13		
		exterior R <sub>se</sub>	0.04		
Area section 1	λ. [W/(mK)]	Area section 2 (optional)	λ. [W/(mK)]	Area section 3 (optional)	λ. [W/(mK)]
Fermacell	0.300				
Kingspan TW55	0.022				
OSB 3 Smart ply	0.130				
Rockwool Flexi Ins	0.038	Timber Studs	0.130		
Gutex Multitherm	0.039				
Cavity Unvented Low-e	0.542			Timber Studs	0.130
Cement-Bonded	0.230				
Particelboard					
Baumit Topcoat	0.700				
Thickness [mm]					
	15				
	50				
	18				
	190				
	60				
	100				
	18				
	7				
Percentage of sec. 1	80%	Percentage of sec. 2	12.0%	Percentage of sec. 3	8.0%
U-value supplement	0.00	W/(m²K)		U-value:	0.116 W/(m²K)
Total					45.8 cm

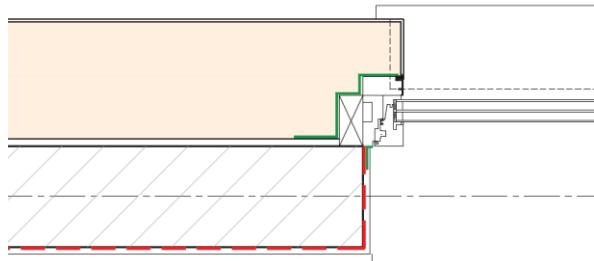
## 7. Roof Construction / Konstruktion des Daches

Type 1 Timber Frame Warm Roof

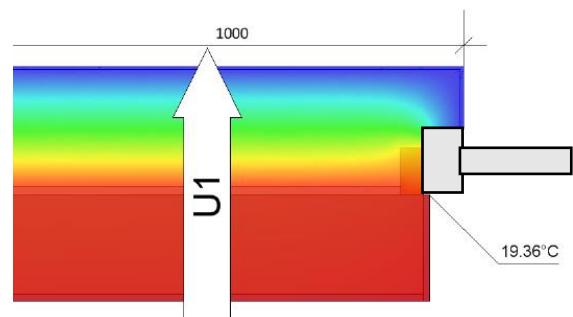


Assembly no.		Roof- Flat Roof - Warm Deck - 03 Main Roof 2015-1217.pdf		Interior insulation?	
Orientation of building element	1-Roof	Heat transmission resistance [m²K/W]			
Adjacent to	1-Outdoor air	interior R <sub>si</sub> :	0.10		
		exterior R <sub>se</sub> :	0.04		
Area section 1	λ [W/(mK)]	Area section 2 (optional)	λ [W/(mK)]	Area section 3 (optional)	λ [W/(mK)]
Plasterboard Ceiling	0.250				
Air Layer Unvent	0.306	Timber Joists	0.130		
Rockwool Flexi	0.038				0.130
Air Layer Unvent	1.225				0.130
Plywood Sheathing	0.130				
Kingspan Thermaroof	0.024				
Sarnafil Roofing	0.250				
Percentage of sec. 1	86%	Percentage of sec. 2	9.0%	Percentage of sec. 3	4.7%
U-value supplement	0.00	W/(m²K)		U-value:	0.122 W/(m²K)
				Total	50.3 cm
Thickness [mm]	13				
	50				
	100				
	200				
	18				
	120				
	2				

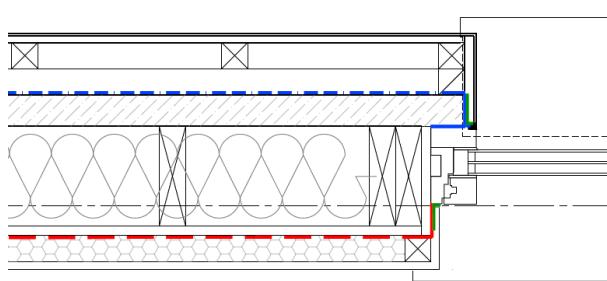
## 8. Window Installation / Fenster und Fenster-Einbau



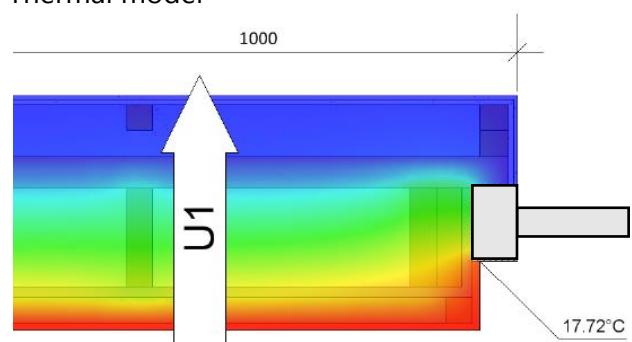
Window jamb in ETICS Wall



Thermal model



Window jamb in timber frame wall



Thermal model

**Window Manufacturer and Model** Optiwin Alphawin

Optiwin Alu2Holz

**Average Glass Uvalue** 0.85 W/m<sup>2</sup>K

**Average Glass g-Value** 0.59



Construction Photos

## 9. Description of the Airtight Envelope / Beschreibung der luftdichten Hülle

Air Tightness Result; 0.59 ach @ n50

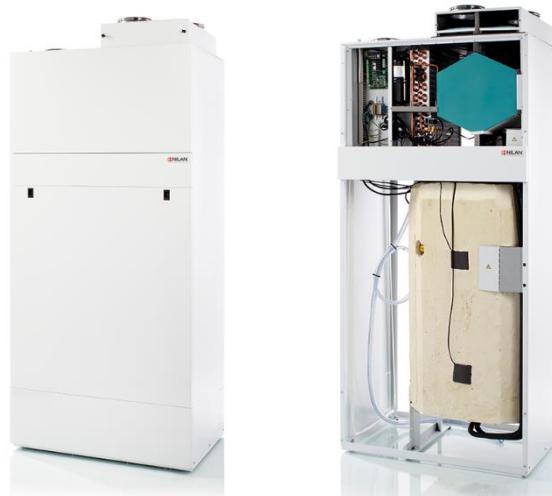
	Floor	Wall	Roof
Wall	Siga Rissan/ gypsum plaster on ground floor	Continuous gypsum plaster on the ground floor	Siga Corvum/ Intello Membrane
	Siga Corvum /Intello Membrane on first floor	Continuous Intello Membrane on the first floor	
Window Frame	Siga Rissan/ Gypsum plaster on ground floor	Siga Fentrim/ Gypsum plaster on ground floor	-
	Siga Corvum/ Intello Membrane on first floor	Siga Corvum/ Intello Membrane on first floor	



## 10. Ventilation Unit / Lüftungsgerät

A Nilan Compact P exhaust air heat pump was chosen as the ventilation unit.

The Nilan Compact P uses the residual energy from heating the incoming fresh air, to heat the domestic hot water for the building for 75% of the year

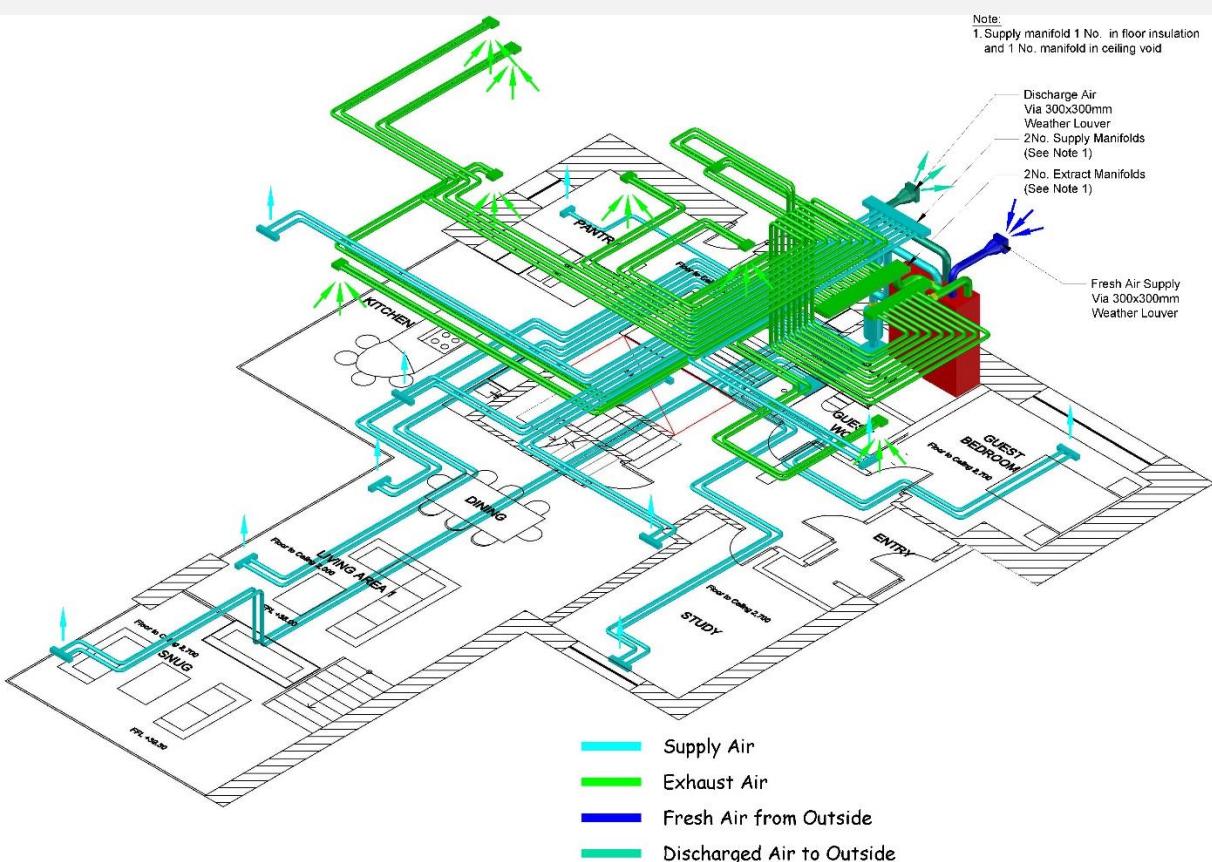


**Manufacturer & Model** Nilan Compact P

**Effective heat recovery efficiency** 77.6 %

**Electric-efficiency** 0.40 Wh/m<sup>3</sup>

## 11. Ventilation Planning / Lüftungsplanung Kanalnetz



Supply air to all the living spaces and bedrooms (cyan), extract air from the bathrooms, kitchen and pantry (green)

Air transfer between rooms is maintained by an architrave detail that allows for air transfer over the head of the internal door

## **12. Heat Supply / Wärmeversorgung**

The Nilan Geo6 heat pump provides domestic hot water and underfloor heating to the dwelling. An additional SHW250 was also installed to meet the domestic hot water demand



Underfloor heating pipework



A 2kW PV installation was also installed to provide renewable energy

## **13. Building Costs / Baukosten**

The costs for the project are not disclosed

## **14. Literature / Literatur**

## 15. PHPP-Results / PHPP-Ergebnisse

### Passive House Verification

		Building: Kilkilleen PH Street: Kilkilleen, Lisheen Postcode/City: Skibbereen Province/Country: Cork IE-Ireland Building type: Residential Climate data set: ud-01-Cork Airport Climate zone: 4: Warm-temperate Altitude of location: 32.44 m Home owner / Client: Nick and Annie Bowen Street: Kilkilleen, Lisheen Postcode/City: Skibbereen Province/Country: Cork IE-Ireland																																																																																														
Architecture: Wain Morehead Architects Street: NSC Campus Postcode/City: T12 X75N Mahon Province/Country: Cork IE-Ireland																																																																																																
Energy consultancy: Wain Morehead Architects Street: NSC Campus Postcode/City: T12 X75N Mahon Province/Country: Cork IE-Ireland		Mechanical system: Street: Postcode/City: Province/Country: Certification: PHA Street: Wicklow County Campus, Clermont House Postcode/City: A67 X566 Rathnew Province/Country: Wicklow IE-Ireland																																																																																														
Year of construction: 2014 No. of dwelling units: 1 No. of occupants: 3.2		Interior temperature winter [°C]: 20.0      Interior temp. summer [°C]: 25.0 Internal heat gains (IHG) heating case [W/m <sup>2</sup> ]: 2.3      IHG cooling case [W/m <sup>2</sup> ]: 2.3 Specific capacity [Wh/K per m <sup>2</sup> TFA]: 132      Mechanical cooling:																																																																																														
<b>Specific building characteristics with reference to the treated floor area</b> <table border="1"> <thead> <tr> <th colspan="2"></th> <th>Treated floor area m<sup>2</sup></th> <th>256.3</th> <th colspan="2">Criteria</th> <th>Alternative criteria</th> <th>Fullfilled?</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Space heating</td> <td>Heating demand kWh/(m<sup>2</sup>a)</td> <td>10</td> <td>≤</td> <td>15</td> <td>-</td> <td>10</td> <td>yes</td> </tr> <tr> <td>Heating load W/m<sup>2</sup></td> <td>10</td> <td>≤</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">Space cooling</td> <td>Cooling &amp; dehum. demand kWh/(m<sup>2</sup>a)</td> <td>-</td> <td>≤</td> <td>-</td> <td>-</td> <td>-</td> <td>yes</td> </tr> <tr> <td>Cooling load W/m<sup>2</sup></td> <td>-</td> <td>≤</td> <td>-</td> <td>-</td> <td>-</td> <td>yes</td> </tr> <tr> <td rowspan="2">Frequency of overheating (&gt; 25 °C) %</td> <td>2</td> <td>≤</td> <td>10</td> <td colspan="3"></td> <td>yes</td> </tr> <tr> <td>Frequency excessively high humidity (&gt; 12 g/kg) %</td> <td>0</td> <td>≤</td> <td>20</td> <td colspan="3"></td> <td>yes</td> </tr> <tr> <td>Airtightness</td> <td>Pressurization test result n<sub>50</sub> 1/h</td> <td>0.6</td> <td>≤</td> <td>0.6</td> <td colspan="3"></td> <td>yes</td> </tr> <tr> <td>Non-renewable Primary Energy (PE)</td> <td>PE demand kWh/(m<sup>2</sup>a)</td> <td>60</td> <td>≤</td> <td>-</td> <td colspan="3"></td> <td>-</td> </tr> <tr> <td rowspan="2">Primary Energy Renewable (PER)</td> <td>PER demand kWh/(m<sup>2</sup>a)</td> <td>24</td> <td>≤</td> <td>60</td> <td>60</td> <td colspan="2"></td> <td>yes</td> </tr> <tr> <td>Generation of renewable energy kWh/(m<sup>2</sup>a)</td> <td>11</td> <td>≥</td> <td>-</td> <td>-</td> <td colspan="2"></td> <td>-</td> </tr> </tbody> </table> <p><sup>2</sup> Empty field: Data missing; -: No requirement</p>										Treated floor area m <sup>2</sup>	256.3	Criteria		Alternative criteria	Fullfilled?	Space heating	Heating demand kWh/(m <sup>2</sup> a)	10	≤	15	-	10	yes	Heating load W/m <sup>2</sup>	10	≤	-	-	-	-	Space cooling	Cooling & dehum. demand kWh/(m <sup>2</sup> a)	-	≤	-	-	-	yes	Cooling load W/m <sup>2</sup>	-	≤	-	-	-	yes	Frequency of overheating (> 25 °C) %	2	≤	10				yes	Frequency excessively high humidity (> 12 g/kg) %	0	≤	20				yes	Airtightness	Pressurization test result n <sub>50</sub> 1/h	0.6	≤	0.6				yes	Non-renewable Primary Energy (PE)	PE demand kWh/(m <sup>2</sup> a)	60	≤	-				-	Primary Energy Renewable (PER)	PER demand kWh/(m <sup>2</sup> a)	24	≤	60	60			yes	Generation of renewable energy kWh/(m <sup>2</sup> a)	11	≥	-	-			-
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I confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The PHPP calculations are attached to this verification. Task: <b>2-Certifier</b> First name: <b>Tomas</b> Surname: <b>O'Leary</b> Certificate ID: <b>13967_MosArt_PH_20160804_TOL</b> Issued on: <b>11/08/16</b> City: <b>Wicklow</b> Passive House Classic? <b>yes</b> Signature:																																																																																																