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Agrément Certificate
12/4900
Product Sheet 1

VMZINC STANDING SEAM ROOF SYSTEMS

VMZINC STANDING SEAM STRUCTURAL ROOF SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the VMZINC Standing Seam Structural Roof System, for use as structural flat, curved or pitched roofs with finished slopes from 3° to 60°, with internal humidity class of 1 to 4, where access is available for maintenance and repair only.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Structural performance — the roof system will remain structurally stable and deflections will not be excessive under normal service conditions if installed in accordance with the requirements of this Certificate (see section 6).

Weathertightness — the roof system will resist the passage of rain and wind-driven snow when installed in accordance with the provisions of this Certificate (see section 7).

Thermal insulation — the roof system can contribute to the building meeting the requirements of the national Building Regulations (see section 8).

Condensation risk — the risk of condensation forming under normal service conditions is negligible when the roof system is designed and installed in accordance with the provisions of this Certificate (see section 9).

Durability — provided the system is installed and maintained as described in this Certificate, the roof will remain effective for at least 60 years in rural and urban environments (see section 14).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 28 May 2012

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, the VMZINC Standing Seam Structural Roof System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):

The Building Regulations 2010 (England and Wales)

Requirement:	A1	Loading
Comment:		The system has sufficient strength and stiffness to sustain and transmit the design load in accordance with sections 6.1 to 6.5 of this Certificate.
Requirement:	B2	Internal fire spread (linings)
Comment:		The interior exposed surfaces of the systems have been assessed as having the surface rating class given in section 11.2 of this Certificate.
Requirement:	B4(2)	External fire spread
Comment:		The external surface of the sheets can be taken as having a notional 'AA' designation as defined by BS 476-3 : 2004, and therefore, constructions incorporating the systems are not subject to a minimum distance from a boundary. See section 11.1 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		The system will resist the passage of moisture to the inside of the building when designed and installed in accordance with this Certificate and the manufacturer's instructions. See sections 7.1 and 7.2 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The system will have a minimal risk of harmful effects on the building and the occupants who use the building due to interstitial and surface condensation when it designed in accordance with this Certificate. See sections 9.1 to 9.3 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The system can meet or contribute to meeting the requirements of this regulation. See sections 8.1 to 8.3 and 10.1 to 10.3 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See sections 14.1 and 14.2 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The use of the system satisfies the requirements of this Regulation. See sections 13.1 to 13.3, 14.1, 14.2 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	1.1(a)(b)	Structure
Comment:		The system has sufficient strength and stiffness to transmit the design load, with reference to clause 1.1.1[1][2]. See sections 6.1 to 6.5 of this Certificate.
Standard:	2.5	Internal linings
Comment:		The interior exposed surfaces of the system, with reference to clause 2.5.1[1][2], have been assessed as having the risk classification given in section 11.2 of this Certificate.
Standard:	2.8	Spread from neighbouring buildings
Comment:		The sheets have a low vulnerability classification and satisfy this Standard, with reference to clause 2.8.1[1][2]. See section 11.1 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The system will resist the passage of moisture to the inside of the building, with reference to clause 3.10.1[1][2], when designed and installed in accordance with this Certificate and the manufacturer's instructions. See sections 7.1 and 7.2 of this Certificate.
Standard:	3.15	Condensation
Comment:		The system will have a minimal risk of harmful effects on the building and people who use the building due to interstitial and surface condensation when it designed in accordance with this Certificate, with reference to clauses 3.15.1[1], 3.15.3[1], 3.15.4[1] and 3.15.5[1]. See sections 9.1 to 9.3 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		The system can satisfy or contribute to satisfying clauses 6.1.0[1][2], 6.2.1[1][2], 6.2.3[1] and 6.2.4[2]. See sections 8.1 to 8.3 of this Certificate. The system can also contribute to satisfying clauses 6.2.4[1], 6.2.5[1][2] and 6.2.6[2]. See sections 10.1, 10.2 and 10.4 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The product can contribute to meeting the relevant Requirements of Regulation 9, Standards 1 to 6, and therefore, will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See sections 14.1 and 14.2 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See sections 13.1 to 13.3 of this Certificate.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		The system will resist the passage of moisture to the inside of the building, when designed and installed in accordance with this Certificate and the manufacturer's instructions. See sections 7.1 and 7.2 of this Certificate.
Regulation:	C5	Condensation
Comment:		The system will have a minimal risk of harmful effects on the building and people who use the building due to interstitial condensation when it designed in accordance with this Certificate. See sections 9.1 and 9.3 of this Certificate.
Regulation:	D1	Stability
Comment:		The system has sufficient strength and stiffness to sustain and transmit the design load in accordance with sections 6.1 to 6.5 of this Certificate.
Regulation:	E3	Internal fire spread — Linings
Comment:		The interior exposed surfaces of the systems have been assessed as having the surface rating class given in section 11.2 of this Certificate.
Regulation:	E5	External fire spread
Comment:		The external surface of the sheets can be taken as having a notional 'AA' designation as defined by BS 476-3 : 2004, and therefore, constructions incorporating the systems are not subject to a minimum distance from a boundary. See section 11.1 of this Certificate.
Regulation:	F2(a)(i)	Conservation measures
Comment:		The system can meet or contribute to meeting the requirements of this regulation. See sections 8.1 to 8.3 and 10.1, 10.2 and 10.5 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See section: 3 *Delivery and site handling* (3.2 and 3.7) of this Certificate.

Additional Information

NHBC Standards 2011

NHBC accepts the use of VMZINC Standing Seam Structural Roof Systems, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 7.1 *Flat roofs and balconies* and 7.2 *Pitched roofs*.

General

This Certificate is a Confirmation of a French Agrément Certificate 5/05-1838 issued by Centre Scientifique et Technique du Bâtiment (CSTB) to Société UMICORE, Les Mercuriales, 40 rue Jean-Jaurès, F-93176 Bagnolet Cedex.

Technical Specification

1 Description

1.1 The VMZINC Standing Seam Structural Roof System consists (see Figure 1):

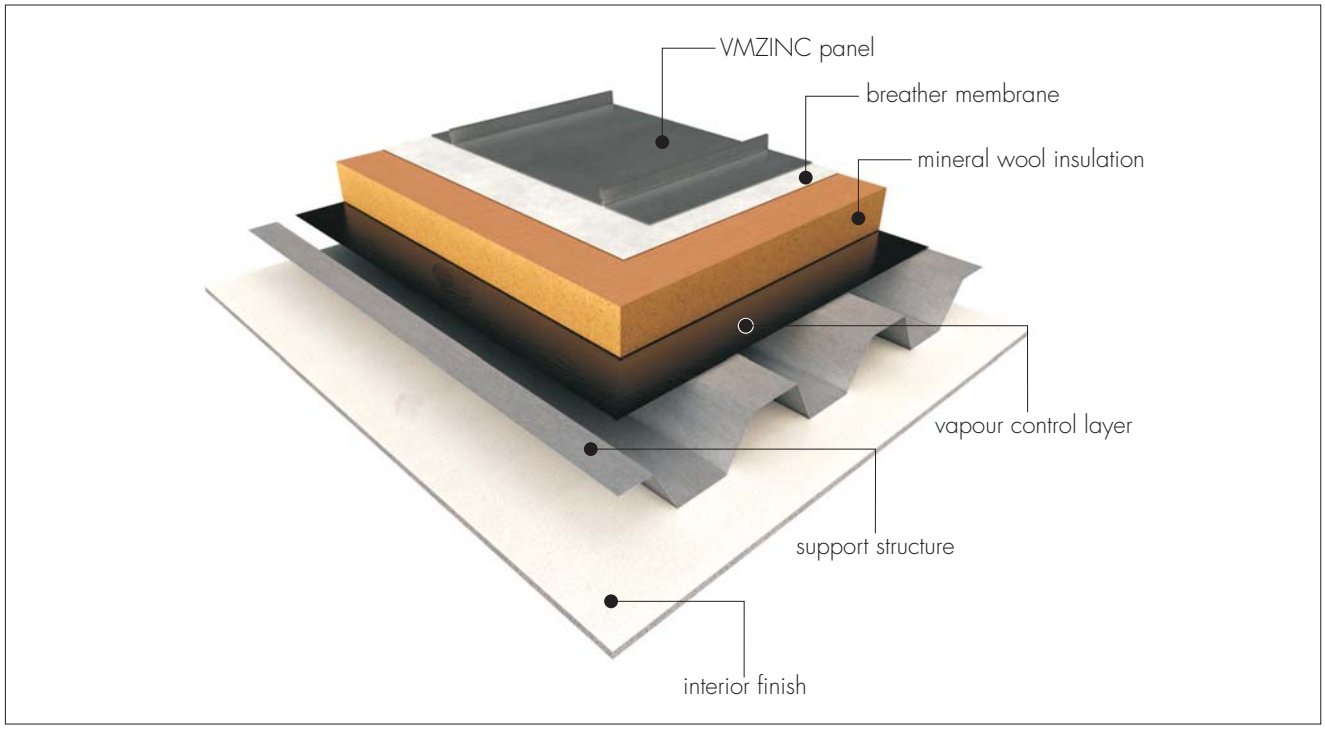
- VMZINC panels
- breather membrane(1)
- mineral wool insulation(1)
- vapour control layer(1)
- internal finish(2)
- steel or timber deck support structure(2)
- stainless steel fixed and sliding clips
- HDPE sleeves for fixings at fixed clips
- stainless steel distribution plates for sliding clips
- fixings.

(1) This Certificate only covers the specification of these components.

(2) Outside the scope of this Certificate.

1.2 The system build-up with a steel deck support structure is shown in Figure 1.

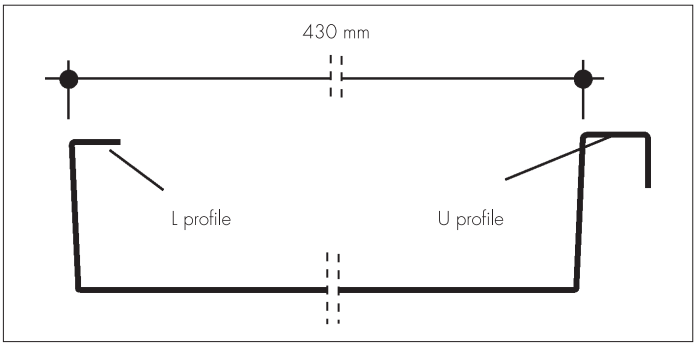
Figure 1 VMZINC Standing Seam Structural Roof System with steel deck support structure



1.3 VMZINC panels are manufactured from 0.7 mm thick zinc sheets complying with BS EN 988 : 1997. Flat sheets are profiled into panels (see Figure 2) with a cover width of 430 mm, a standing seam height of 25 mm and have a 60 µm thick composite polyurethane-polyamide lacquer protective layer on the bottom face. The panels are available in four finishes:

- VMZINC PLUS (natural)
- QUARTZ-ZINC PLUS
- ANTHRA-ZINC PLUS (pre-weathered dark finish)
- PIGMENTO PLUS

Figure 2 Panel profile



1.4 The VMZINC breather membrane must comply with BS EN 13859-1 : 2010, typically supplied with a width of 1.5 m and in 50 m length rolls, with a water vapour diffusion equivalent air layer thickness (S_d) of less than 0.09 m.

1.5 The mineral wool insulation must comply with BS EN 13162 : 2008. The density of the insulation must not be less than 135 kg·m^{-3}, with a compressive strength (at 10% compression) not less than 50 kPa. The thickness of the insulation used can range from 50 mm to 180 mm (subject to thermal design) and must have a declared λ_D *value* of <0.040 Wm^{-1}K^{-1}[1].

(1) Based on $\lambda_{90/90}$ *values*.

1.6 The specification of the vapour control layer (VCL) must have adequate water vapour resistance (see section 9.3).

1.7 The steel deck support structure should comply with BS EN 10346 : 2009. Crown width of the trapezoidal sheet should not be less than 40% of the profile width. The structural engineer responsible should confirm that the assumed loadings are correct and to determine the metal deck is suitable.

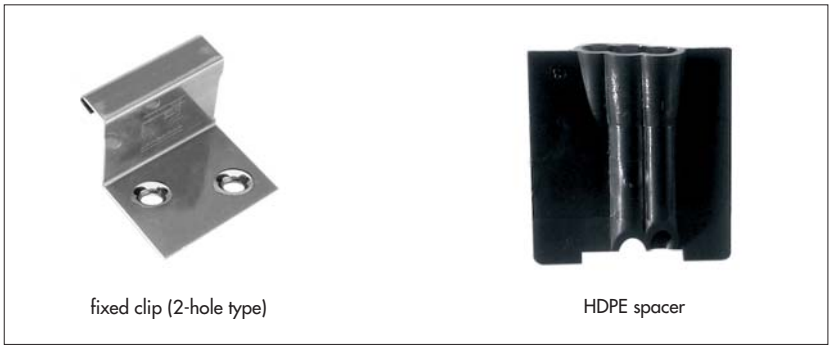
1.8 The selection of an appropriate timber deck support structure should be in accordance with BS 8103-3 : 2009. The timber deck must have a minimum thickness of 15 mm for solid softwood boards or plywood and 18 mm for particle boards or oriented strand board (OSB). Wood-based panels should comply with BS EN 13986 : 2004.

1.9 The support structure is fixed to steel or timber purlins which are outside the scope of the Certificate.

1.10 The panels are secured with stainless steel fixed and sliding clips. The sliding clips are used for providing the necessary thermal movement for the zinc sheets.

1.11 Fixed clips are manufactured from stainless steel grade X5 CrNi 18-10 (1.4301) complying with BS EN 10088-2 : 2005 (see Figure 3). The thickness of the stainless steel is 0.4 mm and the clips have either two 5.4 mm holes or one 8.1 mm hole to fix the clips to the distribution plate with appropriate fixing screws. Clips with two holes are used for steel deck and 15 mm thick timber deck substructures and clips with one hole are used for timber deck substructures with a thickness of greater than 15 mm. The fixed clips are used in conjunction with HDPE spacers in order to avoid crushing the insulation (see Figure 3). The spacers are placed between the breather membrane and the support structure and they are available in different sizes depending on the insulation thickness.

Figure 3 Fixed clip and HDPE spacer



fixed clip (2-hole type) HDPE spacer

1.12 Sliding clips are manufactured from stainless steel grade X10 CrNi 18-8 (1.4310) complying with BS EN 10088-2 : 2005 (see Figure 4). The thickness of the stainless steel is 0.5 mm and the clips have a 6 mm diameter hole to fix the clips to the distribution plate with appropriate fixing screws. Stainless steel distribution plates are embedded into the insulation boards to provide a fixing point for the sliding clips to prevent point loading (see Figure 4). The distribution plates are manufactured from stainless steel grade X10 CrNi 18-8 (1.4310) and have a thickness of 0.5 mm.

Figure 4 Sliding clip and distribution plate

sliding clip distribution plate

1.13 Self-tapping fastening screws, for attaching fixed and sliding clips to steel decks, are manufactured from stainless steel grade X5 CrNiMo 17-12-2, 1.4401 complying to BS EN 10088-2 : 2005 and have a diameter of 4.8 mm. The length of the screw must exceed the insulation thickness by a minimum of 10 mm.

1.14 Fastening screws for timber decks must also be made from stainless steel. The screw diameter is 4.8 mm for the sliding clips and either 4.8 mm or 6 mm for the fixed clips depending on the timber deck thickness and the fixed clip type (1-hole or 2-holes) as described in section 1.11. The length of the screw must exceed the insulation thickness by a minimum 20 mm.

2 Manufacture

2.1 The zinc material is refined and manufactured by hot rolling into sheet and coil form.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of non-conformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained

3 Delivery and site handling

3.1 VMZINC panels must be transported and stored vertically by standing on the L profile in specially designed containers in dry conditions and a constant temperature.

3.2 The panels have a weight of 5.8 kg·m^{-2}. Care is required when handling long lengths of panels, particularly at height.

3.3 Any damage to components before or during installation will affect the durability of the roof system.

3.4 Insulation boards are delivered to site on pallets in polyethylene wrapping. For long-term protection these must be stored indoors or under a waterproof covering. The insulation must be dry during installation.

3.5 The vapour control layer (VCL) and breather membrane must be handled carefully to avoid puncturing and to prevent damage, and must be stored horizontally. For long-term storage, the rolls should be protected from ultraviolet light and stored indoors or under non-translucent covers. The VCL and breather membrane must be dry during installation.

3.6 Steel or timber deck elements should be handled in accordance with the recommendations of their suppliers.

3.7 Protective clothing should be worn as required and all relevant Health and Safety regulations should be observed.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the VMZINC Standing Seam Structural Roof System.

Design Considerations

4 General

4.1 The VMZINC Standing Seam Structural Roof System is satisfactory for use as structural roofing in flat or curved installations with a finished fall of between 3° and 60° in buildings with an internal humidity class 1 to 4, where access is available for maintenance and repair only.

4.2 If architectural features are required on the roof, such as fittings or rooflights, special care and attention is necessary to ensure that, in common with all metal roofs, these features have been correctly detailed and fitted.

4.3 The system is weathertight and structurally stable within the limits set out in this Certificate.

5 Practicability of installation

The system is designed to be installed by a competent general builder, or a roofing contractor, experienced with this type of system.

6 Structural performance

6.1 The structural design must be carried out by a suitably qualified structural engineer.

6.2 Structural steel decks should be designed in accordance with BS 5950-6 : 1995 or BS EN 1993-1-1 : 2005 together with its UK National Annex.

6.3 Structural timber decks should be designed in accordance with BS 5268-2 : 2002 or BS EN 1995-1-1 : 2004 together with its UK National Annex. BS 8103-3 : 2009 should also be considered in timber deck design.

6.4 When the design is carried out in accordance with British Standards, the design loads should be calculated in accordance with BS 6399-1 : 1996, BS 6399-2 : 1997 and BS 6399-3 : 1998. When the design in carried out in accordance with Eurocodes, the design loads should be calculated in accordance with BS EN 1991-1-1 : 2002, BS EN 1991-1-3 : 2003 and BS EN 1991-1-4 : 2005 together with their UK National Annex.

6.5 The VMZINC panels are fully supported by the thermal insulation. The distance between fixings must be designed on a project specific basis taking into consideration the connection resistance between the panels and the fixing clips and the pull-out resistance from the substrate (see sections 6.6 and 6.7). Wind loads should be determined in accordance with BS 6399-2 : 1997 or BS EN 1991-1-4 : 2005 together with its UK National Annex. Attention should be paid to increased pressure coefficients at edges and corners.

6.6 Design resistance against wind loads of the connection between the VMZINC panels and the fixing clips is shown in Table 1.

Table 1 Design resistance against wind loads of the connection between 430 mm wide panels and fixing clips

	Distance between fixings (mm)[1]				
	150	165	250	330	500
Wind load resistance (kN·m^{-2})[2]	7.7	7.0	4.6	3.5	2.3

(1) Distance measured perpendicular to the eave.

(2) Each connection can resist a wind load of 0.5 kN considering a safety factor of 1.5 for the 430 mm wide VMZINC panel.

6.7 The pull-out resistance of the fixing from the support structure should be greater than the resistance of the clip/panel connection and will depend on the fastener and the substrate intended to be used. This pull-out design value must be determined based on calculations, adequate data or testing on a project specific basis and an appropriate safety factor applied.

6.8 In the structural design the maximum mid-span deflection of the roof should be limited to:

- L/90 (dead loads plus wind loads)
- L/240 (dead loads plus imposed loads) for steel decks
- L/300 (dead loads plus imposed loads) for aluminium decks
- L/500 (dead loads), where L is the width of the VMZINC profiled sheet.

7 Weathertightness

7.1 When installed in accordance with the Certificate holder's instructions, the system is weathertight when used in installations with finished falls of 3° to 60°. For curved roofs the minimum fall at the ridge must be at least 3° over the first metre.

7.2 The weathertightness of the system will not be adversely affected by normal service deflections.

8 Thermal insulation

8.1 The thermal performance of each building incorporating the roof system must be evaluated in accordance with the relevant Building Regulations, and is the responsibility of the overall designer of the building.

8.2 The U value of the roof structure should be calculated in accordance with BS EN ISO 6946 : 2007 and BR 443 : 2006 on a project specific basis. Thermal properties of the insulation product should be sought from the manufacturer and the declared λ_D *value* should be used in design. Thermal conductivity design values for other roof components can be taken from BS EN ISO 10456 : 2007. The thermal bridging effect of the fastening screws penetrating the insulation must be considered in the calculation in accordance with BS EN ISO 6946 : 2007, Annex D. Inclusion of the small airspaces in the trapezoidal metal deck should not be included in the calculation.

8.3 Junctions shown in Figure 5 adequately limit heat loss by conduction and, when installed to limit air infiltration (see sections 10.1 and 10.2), comply with the requirements of the relevant Accredited Construction Details. The relevant default psi (ψ) values quoted in BRE Information Paper IP 1/06, Table 4, may be used for these junctions in calculations.

8.4 Typical U values of the roof structure are shown in Table 2.

Table 2 Typical U values of the roof structure[1]

Insulation thickness (mm)	U value ($W \cdot m^{-2} \cdot K^{-1}$)									
	Distance between fasteners measured perpendicular to the eave (mm)									
	150		165		250		330		500	
	Steel deck	Timber deck	Steel deck	Timber deck	Steel deck	Timber deck	Steel deck	Timber deck	Steel deck	Timber deck
100[2]	0.41	0.40	0.41	0.40	0.40	0.39	0.39	0.38	0.38	0.38
120[2]	0.35	0.34	0.34	0.34	0.34	0.33	0.33	0.32	0.32	0.32
140[2]	0.30	0.29	0.30	0.29	0.29	0.28	0.29	0.28	0.27	0.27
150[2]	0.28	0.28	0.28	0.27	0.27	0.27	0.27	0.26	0.26	0.26
160[3]	0.26	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.24	0.24
180	0.24	0.23	0.23	0.23	0.23	0.22	0.22	0.22	0.22	0.22

(1) U values were calculated using a typical thermal conductivity of 0.040 $W \cdot m^{-1} \cdot K^{-1}$ (based on $\lambda_{90/90}$ *values*) for the mineral wool insulation, 1.5 mm metal deck and 15mm timber deck and 4.8 mm stainless steel fixing screws.

(2) Additional insulation is necessary to meet the requirements of the national Building Regulations.

(3) When the distance between fasteners is less than 250 mm, additional insulation is necessary to meet the requirements of the national Building Regulations.

9 Condensation risk

9.1 In common with all metal roof constructions, there is a risk of condensation. This can arise either as surface condensation at thermal bridges or interstitial condensation within the roof construction.

Surface condensation

9.2 The temperature at which surface condensation will occur on the internal surfaces of the roof is dependent on the internal relative humidity and the internal and external temperatures. The risk of surface condensation and mould growth for a particular construction should be assessed in accordance with BS EN ISO 13788 : 2002. Temperature factors should not exceed the critical values given in BRE Information Paper IP 1/06, Table 1 and Table 2. Additional guidance in connection with this can be found in BS 5250 : 2002 and MCRMA/EPIC publication *Design guide for Metal Roofing and Cladding to comply with energy requirements of UK Building Regulations*.

Interstitial condensation

9.3 The system has been assessed in accordance with BS EN ISO 13788 : 2002 and BS 5250 : 2002 for the risk of damage and harmful effects on the building due to interstitial condensation. Roofs with timber deck and roofs with steel deck in buildings with internal humidity classes 1 to 2 and classes 1 to 4 respectively (see Table 3), under the normal climatic conditions experienced in the UK, interstitial condensation is unlikely to be a significant problem, providing:

- an appropriate VCL is incorporated into all constructions, such as self-adhesive aluminium foil-backed modified bitumen membrane and supplied as standard with the system (not assessed by the BBA)
- the VCL remains undamaged, is continuous over ridges and hips, and is sealed at penetrations/abutments
- VCL laps are adequately sealed
- the VCL for roofs with timber decks has a minimum vapour resistance of 500 MN·s·g^{-1} (S_d > 100 where S_d is the water vapour diffusion-equivalent air layer thickness in metres) in humidity class 1
- the VCL for roofs with steel decks has a minimum vapour resistance of 500 MN·s·g^{-1} (S_d > 100) in humidity classes 1 to 3.

9.4 Example vapour resistance values are shown in Table 4. The design for risk to condensation is the responsibility of the designer and must take into account the specific roof construction and site location.

Table 3 Building internal humidity classes

Humidity class[1]	Example building type
1	Storage areas
2	Offices, shops
3	Dwellings with low occupancy
4	Dwellings with high occupancy, sports halls, kitchens, canteens, buildings with unflued gas heaters

(1) As referenced in BS EN ISO 13788 : 2002 and BS 5250 : 2002.

9.5 Interstitial condensation calculations carried out in accordance with BS EN ISO 13788 : 2002 and BS 5250 : 2002.

Table 4 Example Minimum Vapour Resistance values (MN·s·g^{-1}) — *VMZINC Structural roof*

Metal Deck[1]				
Climate zone	Humidity Class			
	1	2	3	4
Heathrow (London)	500	500	500	500
Ringway (Manchester)	500	500	500	500
Turnhouse (Edinburgh)	500	500	500	4750[3] 6300[4]
Timber Deck[2]				
Climate zone	Humidity Class			
	1	2	3	4
Heathrow (London)	500	500	1500[3] 2000[4]	5250[3] 5750[4]
Ringway (Manchester)	500	500	4000[3] 4750[4]	8750[3] 9500[4]
Turnhouse (Edinburgh)	500	2500[3] 3250[4]	8570[3] 9750[4]	14750[3] 16250[4]

(1) Metal deck taken as 1.5 mm (joints between profiles to be fully sealed)
(2) Timber deck taken as 15 mm
(3) Vapour resistance for the VMZINC roof system with 50 mm mineral wool insulation.
(4) Vapour resistance for the VMZINC roof system with 180 mm mineral wool insulation.

10 Air permeability

10.1 The airtightness of the system is reliant on the VCL. The airtightness of a roof system is dependent on maintaining the integrity of the seal throughout. In addition to sealing at all joints, the VCL must be suitably sealed at the perimeter and all penetrations. Details of sealing at all laps, eaves, ridges, hips, valleys and penetrations must be in accordance with the Certificate holder's instructions.

10.2 The airtightness of the building will also be dependent on the performance of other building elements. Provided these incorporate appropriate design details and building techniques, air infiltration through the building fabric should be minimal and the building reasonably airtight.

10.3 Completed buildings in England and Wales are subject to pre-completion testing for airtightness in accordance with the requirements of Approved Documents L1A and L2A, section 20B.

10.4 Completed buildings in Scotland are only subject to pre-completion airtightness testing if the target air permeability of the proposed building is less than 10 $m^3 \cdot h^{-1} \cdot m^{-2}$, or if the figure is between 10 $m^3 \cdot h^{-1} \cdot m^{-2}$ and 15 $m^3 \cdot h^{-1} \cdot m^{-2}$ and the designer does not wish to use the 15 $m^3 \cdot h^{-1} \cdot m^{-2}$ default figure in the proposed building, in accordance with Mandatory Standard 6.2, clauses 6.2.5(1) and 6.2.6(2).

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

10.5 In Northern Ireland, completed buildings are subjected to pre-completion testing for airtightness in accordance with the requirements of Technical Booklets F1, sections 2.46 to 2.54, and F2, sections 2.57 to 2.61.

11 Behaviour in relation to fire

11.1 The VMZINC panels have a notional 'AA' designation as defined by BS 476-3 : 2004 ('low vulnerability' class in Scotland).

11.2 Steel structural decks as internal linings have a national classification of Class 0 ('low risk' class in Scotland). Timber structural decks as internal linings have a national classification of Class 3 ('high risk' class in Scotland).

12 Acoustics

Test data to BS EN ISO 140-3 : 1995 and BS EN ISO 717-1 : 1997 indicating the sound reduction indices is given in Table 5. The tests were carried out on roof structures with a 0.75 mm steel deck.

Table 5 Sound reduction indices

Mineral wool insulation thickness (mm)	Sound reduction index — R_w (dB) (C; C_{tr})
80	37 (–2 ; –7)
120(1)	38 (–2 ; –8)

(1) Two insulation boards at 60 mm thickness combined.

13 Maintenance

13.1 The system should be inspected regularly for accidental damage to the roof sheets and also for any build-up of dirt and debris. Damage must be repaired and accumulated dirt and debris removed. The frequency of inspections will depend on the environment and use of the building.

13.2 In industrial and coastal areas it may be necessary to clean the installation periodically by hosing with water and a neutral detergent to restore its appearance and to remove corrosive deposits. It may be necessary to clean soffits in all environments.

13.3 Damaged sheets can be removed and replaced. The advice of the Certificate holder should be sought.

14 Durability

14.1 The durability of VMZINC panels will depend upon the coating material, the immediate environment, aspect faced and use. Roofing constructed with the sheets will have a minimum service life of 60 years in rural and urban environments. A shorter service life will be given if particular local conditions are chemically corrosive, eg in the immediate vicinity of and downwind from coastal areas, manufacturing facilities such as chemical works, cement works, copper foundries or coal mines.

14.2 Contact of the zinc panel with metals such as copper, unprotected or ungalvanized steel and natural lead must be prevented. Direct contact with products such as fresh concrete, plaster, bitumen or mortar should also be avoided.

14.3 In common with natural zinc, the appearance of the product will change with time due to weathering of the surface, as the zinc forms a mixture of adherent conversion products. The rate and nature of change will depend on the product chosen, environment of the site, the roof pitch and the climatic conditions experienced, but the appearance should remain consistent over any one elevation.

15 Reuse and recyclability

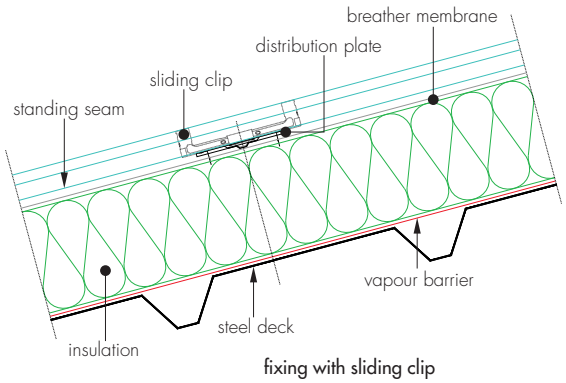
The zinc material of the VMZINC panels is fully recyclable.

Installation

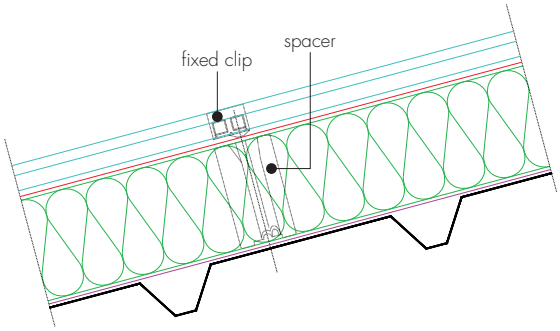
16 General

Installation of VMZINC Standing Seam Structural Roof Systems is carried out by experienced roofing contractors in accordance with the Certificate holder's instructions. Guidance can be provided by the Certificate holder for contractors who are unfamiliar with the system. Typical installation details can be seen in Figure 5.

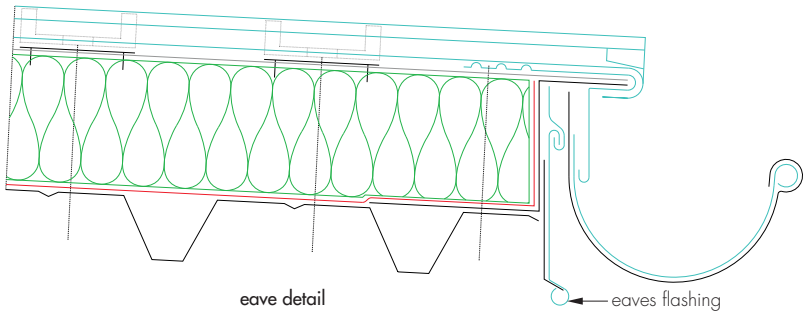
Figure 5 Typical installation details



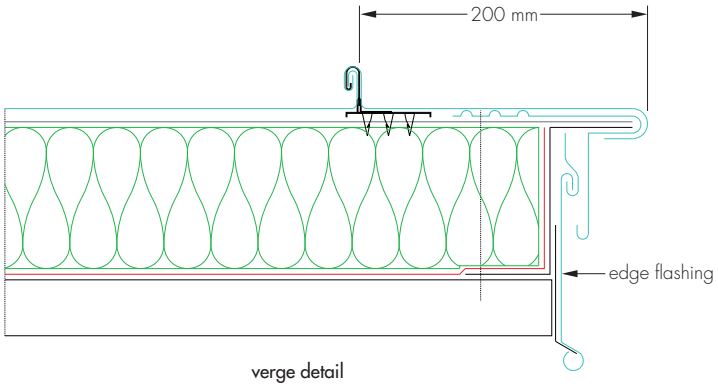
fixing with sliding clip



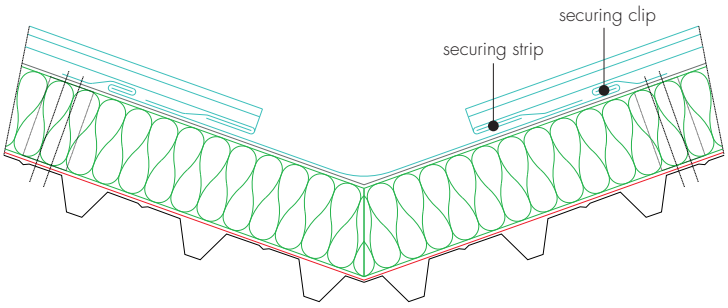
fixing with fixed clip



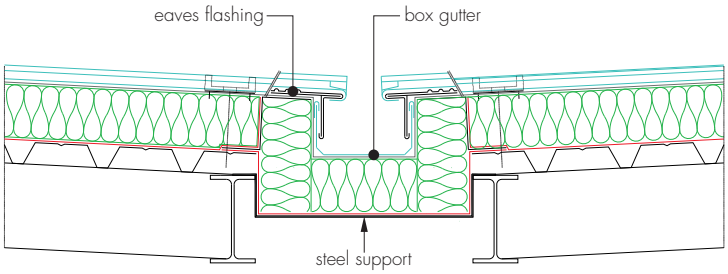
eave detail



verge detail



valley detail



valley gutter

17 Support structures

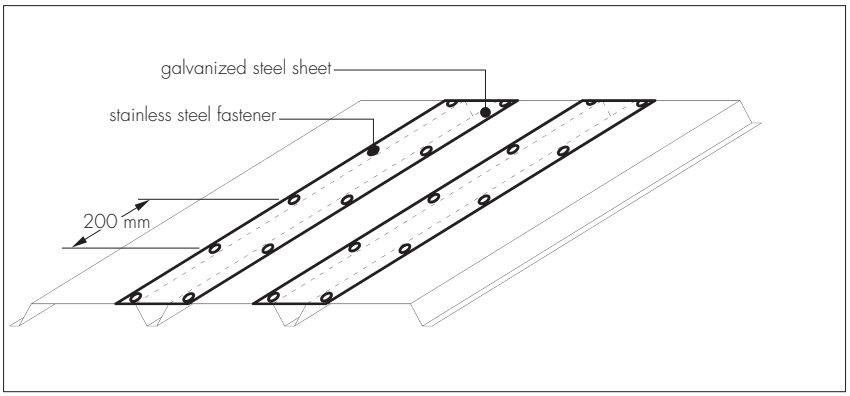
Steel deck

17.1 The steel deck support structure should be installed in accordance with the supplier's recommendation. Fixing of the clips to the steel deck must always be on the crown.

17.2 It is preferred that the ribs of the trapezoidal sheets run parallel with the eave so the ribs are aligned with the fixing clips.

17.3 When the ribs run perpendicular to the eave, for dimensional or aesthetic reason, a strip of Z275 galvanized steel, 150 mm wide and 1 mm thick, is applied under the vapour control layer, with 4.2 mm by 25 mm stainless steel screws at 200 mm centres, to cover the gap between the ribs (see Figure 6).

Figure 6 Bridging between crowns of steel trapezoidal sheets



17.4 For curved roofs, information on the minimum allowed radius should be sought from the steel deck supplier.

Timber deck

17.5 Timber decks made from solid softwood boards can be tongue and groove or the boards can be laid with a gap of 3 to 5 mm. For curved roofs, the radius of the roof must be greater than 250 times of the board thickness.

17.6 Wood-based panels can be either tongue and groove or square edged. Movement gaps at abutment with rigid upstands should be not less than 10 mm and gaps between square edge boards should not exceed 3 mm. For curved roofs, information on the minimum allowed radius should be sought from the wood-based panel supplier.

17.7 The difference in level between solid softwood boards or wood-based panels should not exceed 2 mm at joints.

18 Procedure

Vapour control layer

18.1 The VCL must be made continuous by minimum of 100 mm width sealed laps. The VCL must also be connected with sealed joints to the adjoining elements and must be sealed at penetrations and abutments.

18.2 Any damage to the VCL must be repaired during the installation.

18.3 Guidance on the minimum required vapour resistance of the VCL is given in section 9.3.

18.4 It is recommended that joints between adjacent timber panels or steel sheets forming the support structure are sealed.

Thermal insulation

18.5 Mineral wool boards can be laid in one or two layers with staggered joints. For steel decks, the longer edge of the board must be perpendicular to the ribs of the profiled sheets.

18.6 The insulation boards are mechanically-fixed to the timber or steel deck temporarily with one fixing in the middle of the board.

18.7 The insulation material must be installed in dry conditions. In the event of interruption of the work, temporary protection should be provided for uncovered parts. Installation of any damp or wet material must be avoided.

18.8 The difference in level between the insulation boards should not exceed 5 mm at joints.

Breather membrane

18.9 Breather membranes should be laid parallel with eaves with a minimum overlap of 200 mm.

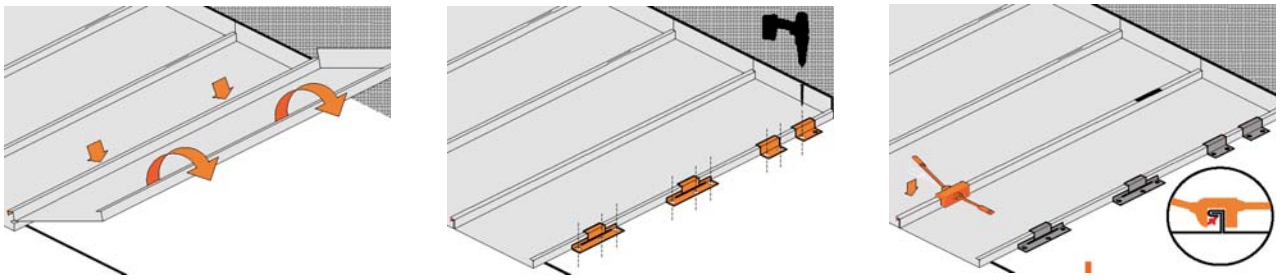
VMZINC panels

18.10 Installation of the panels (see Figure 7) can begin on either side of the roof. Dormers, chimneys or other obstacles should be taken into account when deciding the layout.

18.11 The distance between fixing clips is to be calculated as described in section 6.5. Fixed clips are used in conjunction with HDPE spacers and fixed through the insulation with one or two screws to the support structure as described in section 1.11. Sliding clips are placed on distribution plates which are embedded into the thermal insulation boards via claws (see Figure 4).

18.12 The joints between the panels must be sealed using a double lock seam. Crimping can be done using an electric or hand crimper. Crimping is not recommended when the zinc temperature is below 7°C unless the crimper is equipped with a heater.

Figure 7 Seam detail



Technical Investigations

19 Investigations

19.1 An assessment was made of test data relating to:

- resistance to wind load
- acoustic performance
- durability.

19.2 An assessment was made of data relating to:

- weathertightness
- thermal performance
- condensation risk
- air permeability
- fire performance
- durability.

19.3 The following calculations were carried out:

- typical U values in accordance with BS EN ISO 6946 : 2007
- interstitial of condensation in accordance with BS EN ISO 13788 : 2002 and BS 5250 : 2002.

19.4 A visit was made to a site to assess the practicability of installation.

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20 Conditions

20.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

20.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

20.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

20.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

20.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

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- individual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

20.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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