Number BAW 18-085/01/A **Replaces:** -	BDA Agrément kiwa **BDA Agrément® BAW 18-085/01/A**	**Category** External walls – sheets
Date 2018-06-28		**Phase** Assessment
Project number 16-C-0651 / 2098		**Subject** Wall sheathing
Validity www.kiwa.co.uk/bda		

Product	**Versaliner®**
Agrément holder	Euroform Products Ltd Unit 2, Lyncastle Road Warrington WA4 4SN, UK T: +44 (0) 1925 860 999 E: info@euroform.co.uk W: www.euroform.co.uk
Description	Sheet with a core based on MgO board with on each side a reinforcement mesh made of fiberglass and a non-woven textile, hereinafter the “Product”. Available in a maximum size of 3000 mm × 1200 mm and standard thicknesses of 9 mm or 12 mm.
Scope (use)	Sheet for structural and non-structural use on metal or timber framed external walls, as an external sheathing board or as a lining on the inside. Use in a proprietary system, e.g. for direct render or as wall cladding, should hold its own verification of performance and is the sole responsibility of the supplier or manufacturer of that system.
Objective	This document provides independent information to specifiers, contractors, installers and other construction industry professionals considering the fitness for the intended use of the Product.
Summary of Agrément	This Agrément covers the following: • Conditions of use; • Sources, including codes of practice, test and calculation reports; • Independently assessed Product characteristics and other system information; • Factory Production Control and annual verification procedure; • Points of attention for the specifier; • Installation procedures; • Compliance with Building Regulations and non-Regulatory requirements.
Major points of assessment	**Structural performance (sections 3 and 7.3)** The Product on Lightweight Steel Frame (LSF) can withstand a design wind load of 2,400 Pa. The Product can contribute to the racking resistance of a timber framed wall. **Behaviour in relation to fire (sections 3 and 7.4)** The Product is classified as class A1 (Non-Combustible) in accordance with BS EN 13501-1. **Durability (section 7.5)** The Product has a low swell, does not show crying/sweating and does not require maintenance. It is designated as category A (for weather resistance) and class 1 (for bending strength) according to standard BS EN 12467, meaning sheets can withstand heat-rain and freeze-thaw conditions.
Statement	It is the opinion of the Kiwa Ltd. that the product Versaliner® is fit for the intended use, provided it is specified, installed and used in accordance with this Agrément. Paul Oakley, BSc Technical Manager, Building Products Mark Crowther, M.A. (Oxon) Technical Director

1 Conditions of use

1 Application
The assessment of the Product relates to the use in new and refurbished residential, commercial and industrial buildings as lining or sheathing board. The backing wall or inner leaf shall be designed and constructed in accordance with the relevant parts of the Eurocodes and with the Agrément holder's requirements.

2 Assessment
Kiwa Ltd. has assessed the structural performance and characteristics of the Product according to the information provided. Factory Production Control has been assessed and reported[12] by Kiwa N.V., Technical Assessment Body, represented in the UK by Kiwa Ltd.

3 Installation
It is recommended that the quality of installation and workmanship is controlled by a competent person. Such a person shall be an experienced and trained employee of the installing contractor. The Product shall be installed strictly in accordance with the requirements of the Agrément holder and the requirements of this Agrément.

4 Geographical scope
The validity of this document is limited to England, Wales, Scotland, Northern Ireland and Ireland, with due regard to section 9 of this Agrément (Building Regulations).

5 Validity
The purpose of this BDA Agrément® is to provide for well-founded °onfidence to apply the Product in the described applications and according to approved specifications. According to the BDA Guideline – BDA Agrément® the validity of this Agrément is therefore three years after the official date of issue, published on www.kiwa.co.uk/bda. After this the validity can be extended every three years after a positive review. This Agrément is not valid in those cases where Kiwa Ltd. identifies that the design and materials do not comply with article 7.1.

2 Sources

1 BDA Guideline – BDA Agrément®, 2015-06-30
2 BS EN ISO 6946:2017 Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods.
3 BR 262: Thermal insulation: avoiding risks, 2002 edition, BRE Scotland.
4 BR 443: Conventions for U-value calculations, 2006 edition, BRE Scotland
5 BS 5250:2011 + A1:2016 Code of practice for control of condensation in buildings
6 BS EN 1991-1-4:2005+A1:2010: Eurocode 1. Actions on structures – Part 1-4: General actions – Wind actions.
7 NA to BS EN 1991-1-4:2005+A1:2010. UK National Annex to Eurocode 1, Part 1-4.
8 BS EN 12467:2012+A1:2016. Fibre-cement flat sheets. Product specification and test methods.
9 BS EN 1995-1-1:2004+A2:2014. Eurocode 5: Design of timber structures. General. Common rules and rules for buildings.
10 NA to BS EN 1995-1-1:2004+A1:2008. UK National Annex to Eurocode 5: Design of timber structures. General. Common rules and rules for buildings.
11 PD 6693-1:2012. Recommendations for the design of timber structures to Eurocode 5: Design of timber structures. General. Common rules and rules for buildings.
12 Euroform Products Ltd, Brochure - Versaliner Board Guide, latest issue: see website.
13 Kiwa Ltd., Inspector's Initial Factory Visit Report Form (Form 4), 7 April 2017.
14 Kiwa BDA Testing, Test Report no. 0139-C-17/1: Euroform Versaliner MgO board – determination of product characteristics, 2017-07-06.
15 Lucideon Test Report, reference 15928 (QT-35314/1/SL)/Ref. 2/CR1, issued 11 June 2018: Simulated Wind Load Testing of 9 mm Versaliner to CWCT Standards.
16 Lucideon Test Report, reference 145353 (QT-33820/1/SL)/Ref. 1/Supp2, 2017-06-16: Air Leakage Testing of Euroform 9 mm Versaliner Board to EN 12114.
17 Ceram Test Report, 132179 (QT-26057/1/JB)/Ref.1, 2013-07-02: Material Properties of Euroform Versaliner Boards in Accordance with BS EN 12467:2012
18 Ceram Test Report, 132280 (QT-26537/1/SL)/Ref.2/Supp 2, 2013-09-20: Material Characterisation of Versaliner Boards in Accordance with the UK Timber Frame Association Performance of Sheathing Boards.
19 Ceram Test Report, 132280 (QT-26537/1/SL)/Ref. 3, 2013-07-30: Racking Tests on 9 mm Versaliner in Accordance with BS EN 594:2011.
20 TCKI, Test Report 9 mm board, water vapour transmission properties (EN-ISO 12572:2001), no. TEMU 8327 377, 2017-06-27.
21 TCKI, Test Report 12 mm board, water vapour transmission properties (EN-ISO 12572:2001), no. MSCU 486219-1, 2017-06-27.
22 Ensatec, Test Report: MAGNESIUM OXIDE BASED BOARDS, REPORT NR: 243953ENG, 2017-11-15.

23 Ensatec, Classification Report: MAGNESIUM OXIDE BASED BOARDS, REPORT NR: 243977ENG, 2017-11-15.
24 Kiwa BDA Testing, Test Report no. 0139-C-17/2: Euroform Versaliner MgO board – behaviour at increased temperature and relative humidity, 2017-05-17.

Remark: in the text of this document reference is made to some of these sources by adding the relevant reference number in superscript.

3 Independently assessed system characteristics of components used for critical functions**)

****)** The critical functions which apply to this section are structure, reaction to fire and durability.

Characteristics of boards

• nominal thickness	: 9 mm or 12	mm
• nominal dimensions (length × height)	: 3000 mm x 1200	mm
• mean apparent density 9 mm (70 °C, 23 °C and 50% / 75% R.H.)[14]	: 893, 942 / 949	$kg \cdot m^{-3}$
• mean apparent density 12 mm (70 °C, 23 °C and 50% / 75% R.H.)[14]	: 913, 949 / 960	$kg \cdot m^{-3}$
• apparent modulus of rupture (MOR)[8,17], wet condition	: ≥ 5.17	MPa (= class 1)
• water impermeability[17] (water head of 20 mm during 24 h)	: pass	(-)
• bond strength[18] (perpendicular to the plane), mean value	: ≥ 1.64	$N \cdot mm^{-2}$
• resistance to axial withdrawal of screws[18] (pull-out strength)	: ≥ 48	$N \cdot mm^{-1}$
Note withdrawal: screws per EN-ISO 1478 size ST4.2		
• water vapour transmission (mean values):		
• water vapour permeability[20,21] (δ), 9 mm / 12 mm	: 0.0149 / 0.0124	gm/MNs
• vapour resistivity[20,21], 9 mm / 12 mm	: 67 / 80	MNs/gm
• vapour resistance, 9 mm / 12 mm	: 0.7 / 1.0	MNs/g
• water vapour resistance factor (μ), 9 mm / 12 mm	: 13.42 / 16.13	(-)
• equivalent air layer thickness (S_d), design value, 9 mm / 12 mm	: 0.15 / 0.21	m
• reaction to fire, class[22,23]	: A1	(-)
• thermal conductivity (λ)	: 0.27	$W \cdot m^{-1} \cdot K^{-1}$

Air permeability of butt joints

• air permeability (of open butt joints)[16]	: 3.36	$dm^3 \cdot m^{-1} \cdot s^{-1}$
• air permeability (of taped butt joints)[16]	: 0.0	$dm^3 \cdot m^{-1} \cdot s^{-1}$

Structural performance

• Wind-uplift resistance[15] (serviceability), design load	: 2,400	Pa
• Wind-uplift resistance[15] (safety), peak test (suction)	: 3,600	Pa

Note wind load: values are valid for LSF studs 1.2 mm × 50 mm × 100 mm spaced 600 mm apart, fasteners are screws EMF1 40 mm × 4.75 mm spaced 300 mm along the perimeter and 400 mm to the centre/intermediate studs.

• Racking resistance[19], test results not design values:		
- without vertical load F_{vert}, mean strength (F)	: 9.07	kN
- without vertical load F_{vert}, mean stiffness (R)	: 1191	$N \cdot mm^{-1}$
- with vertical load (F_{vert} = 5 kN), mean strength (F)	: 14.12	kN
- with vertical load (F_{vert} = 5 kN), mean stiffness (R)	: 1630	$N \cdot mm^{-1}$

Note racking resistance: values are the arithmetic mean of 3 measurements on a 2400 mm high wall panel. Composition of wall panel: studs and rails of timber 38 mm × 89 mm (grade C16), 9 mm thick sheets on one side only, studs spaced 600 mm apart, fasteners are nails 2.8 mm × 50 mm spaced 150 mm along the perimeter of a sheet and 300 mm apart in the intermediate studs.

4 Factory Production Control (FPC)

Kiwa N.V., Technical Assessment Body, represented by Kiwa Ltd. has determined that the Agrément holder with respect to the Product fulfills all provisions concerning the specifications described in this Agrément. The initial FPC audit[13] demonstrated that the Agrément holder operates an adequate Quality Management System (QMS) and Quality Plan (QP) to cover the necessary clauses required by the BDA Agrément® Guideline[1] for a BDA Agrément®.

5 Quality Management System

Euroform Products is part of SIG Trading Ltd which is ISO 9001:2015 accredited (Intertek certificate 041480 original issue date 8th June 1998, current issue date 18th December 2017). The Agrément holder operates an effective and well maintained QMS.

6 Continuous surveillance

In order to demonstrate that the FPC is in conformity with the requirements of the technical specification described in this Agrément the continuous surveillance, assessment and approval of the FPC will be done in a frequency of not less than once per year by Kiwa Ltd.

7 Points of attention for the specifier

1 Permitted applications

- sheathing at the exterior (cold) side of framed backing walls if covered by a breather membrane; without breather membrane water still can penetrate a wall via (taped) butt joints, fasteners and penetrations (e.g. flues, ducts);
- sheathing at the warm side of framed walls; use a Vapour Control Layer (VCL) at the interior (warm) side of the external wall to limit the risk of interstitial condensation;
- use as a substrate for direct render or as wall cladding is not allowed;

7 Points of attention for the specifier (continued)

- in all areas of exposure to wind driven rain external walls with the Product at the exterior (cold) side shall include a 15 mm drained air gap between the breather membrane and the cladding panel; that air gap shall be ventilated for timber frame;
- timber studs shall have minimum dimensions as specified by an engineer; use nails with a maximum spacing of 150 mm at the perimeter and 300 mm to the intermediate studs. Install fasteners at least 40 mm from the corners and 15 mm from the edges;
- Light Steel Framing (LSF) studs shall have minimum dimensions of 100 mm × 50 mm × 1.2 mm; use self-drilling screws with a maximum spacing of 300 mm at the perimeter and 400 mm to the intermediate studs. Install fasteners 40 mm from the corners and 15 mm from the edges.

2 Building physics – general

- the building physical behaviour of walls incorporating the Product shall be verified as suitable by a specialist; the specialist can be either a qualified employee of the specifier or a qualified consultant;
- the specialist will check for non-standard interior conditions in particular and will advise about improvements to achieve the final specification; it is recommended that this person would cooperate closely with the Agrément holder;
- for the purpose of U-value calculations and to determine if the requirements (of legislation or other statutes) are met, the thermal resistances of the constructions shall be calculated according to BS EN ISO 6946[2], BR443[4], and BS 5250[5] as appropriate;
- the Product can limit the air permeability of a wall when all (butt) joints and penetrations are properly sealed[16] with a suitable tape;
- the thermal conductivity of the Product (given in section 3) is a tabulated value taken from standard BS EN 12524:2000 and is deemed to be similar to a plasterboard of 900 $kg \cdot m^{-3}$.

3 Structural performance

- Wind actions should be calculated in accordance with BS EN 1991-1-4:2005+A1:2010 and the subsequent National Annex. Due consideration should be given to the higher pressure coefficients applicable to corners of the building as recommended in this Standard;
- the Product can contribute to the racking resistance of a timber framed wall assembly; the mean values for strength and stiffness in section 3 are not design values and are merely illustrative for a wall panel with a height between 2.1 m and 3.0 m and with sheets on one side; a wall panel different from the one in section 3 (with regard to the grade of timber, dimensions and spacing of the studs and the type and spacing of fasteners) will yield different values;
- a design value $R_{v,Rd}$ for racking strength for timber framed wall diaphragms shall be calculated according to relevant standards[9,10,11]; simplified analysis according to method A[9] states the width of a sheet shall be at least 0.25 times the height of a wall panel[9]; consult a specialist for advice and/or use test reports of an accredited laboratory if necessary;
- discard any contribution of the Product to the racking resistance of LSF; walls made of LSF shall withstand racking forces by use of appropriate anchors, plates, braces and connections;
- the Product can withstand a negative (suction) peak test pressure[15] of 3,600 Pa on LSF; for serviceability the design wind load is 2,400 Pa.

4 Reaction to fire

- the uncovered Product is non-combustible and has class A1; a result valid for 9 mm and 12 mm thick boards without a surface covering (e.g. fabric, paint, wall paper);
- when the Product is part of a (cladding) panel the whole composition, with or without air gap or (ventilated) cavity, defines the reaction to fire class; the tested composition for a SBI-test[22] included a calcium silicate board at a distance (cavity width) of 40 mm from the back face of the Product without joints;
- the Product can contribute to the fire resistance of a wall, additional testing is required to determine the performance RE and/or REI of the wall in order to know the time in minutes the wall can withstand collapse (R), the transmission of flames and hot gases (E) and/or limit heat transmission (I); use of an intumescent sealant may be required.

5 Durability

- the boards can be subjected to heat-rain and freeze-thaw conditions, the Product can be designated[8] category A and class 1 according to standard BS EN 12476;
- the boards have an average swell[18] in thickness of less than 0.59% after 24 h immersion;
- the boards show no crying/sweating[24] after exposure for 14 days at 30 °C and 90% RH; droplets will not cause metal corrosion or the 'infection' of wood (causing a higher water absorption than normal).

6 Consulting service

- the Agrément holder can provide a technical consulting service for calculations and installation advice.

8 Installation procedure

1 General

- details of the Product are given in section 3 of this Agrément;
- installation of the Product shall be in accordance with the Agrément holder's requirements and current good building practice; the Agrément holder can provide guidance for sub-contractors who have not installed the Product previously.
- prior to installation the procedure includes safety precautions and pre-installation checks; these topics are described in section 8.3;
- during installation care shall be taken to avoid damaging the components; in case of damage, repair or replace according to the Agrément holder's requirements.

2 Delivery and site handling

- the sheets are stacked on a pallet and are wrapped in stretch film. Care shall be taken during transit and storage to avoid damage. Prevent the sheets from getting wet during storage; stack pallets a maximum of 4 high;
- each pallet of the sheets shall be marked with the BDA Agrément-logo including the number of this Agrément.

3 Installation

3.1 Safety precautions

- carry out work at heights above that reached from ground level by complying with The Work at Height Regulations 2005; use a ladder, scaffold, suspended platform or hydraulic platform; use personal protective equipment (PPE) e.g. a safety harness and/or ladder support;
- typical construction site requirements are 110 volt or battery powered tools.

3.2 Pre-installation checks (external)

- verify if the edges of the sheets are sound; discard damaged sheets;
- check for the presence and position of movement joints.

3.3 Installation – mounting of sheets

- use self-tapping screws or use (manual or powered) nails; see fixing specifications in brochure[12];
- use screws with a drill tip for LSF; the thickness for LSF shall be 1.2 mm minimum;
- screws with a drill tip (these are self-tapping too) do not require pre-drilling if the drill tip has the right size; the size of the drill tip depends on the maximum thickness of the metal substrate (i.e. metal sheet/flange/profile); a drill tip too small will cause screws to snap during drilling;
- board arrangement: see brochure[12];
- fixing distances (spacing): see brochure[12]; for timber frame use fasteners with a constant spacing along the perimeter of every sheet[9,11]; fasteners within the perimeter of a sheet (in a centre stud) shall be spaced at a maximum of twice the fastener perimeter spacing[9,11];
- processing (cutting or sawing): see brochure[12];
- edging and jointing detail: see brochure[12]; for external sheathing on LSF maintain around every sheet a joint of 3 mm – 4 mm to allow for movement due to moisture and temperature;
- verify if the fire performance of connections and joints is adequate, use of an intumescent sealant may be required for this.

9 Building Regulations

1 The Building Regulations 2010 and subsequent amendments

- A1(1) Loading – sustain loads and transmit these safely to the ground. Calculations shall show the Product can satisfy this requirement with regard to the racking strength for a timber framed wall assembly. See sections 3 and 7.3.
- A1(2) Loading – imposed loads and wind loads. The Product can meet this requirement for a negative wind load when applied on Light Steel Framing (LSF). See sections 3, 7.1 and 7.3 of this Agrément.
- B4(1) External fire spread – an external wall with the Product can contribute to all provisions of Part B4 of Approved Document B, volumes 1 and 2. See sections 7.1 and 7.4 of this Agrément;
- Regulation 7 Materials and workmanship – the Product is manufactured from suitably safe and durable materials for their application and can be installed to give a satisfactory performance. See sections 3 and 7 of this Agrément.

2 The Building (Amendment) Regulations 2014 (Wales) and subsequent amendments

- A1(1) Loading – sustain loads and transmit these safely to the ground. Calculations shall show the Product can satisfy this requirement with regard to the racking strength for a timber framed wall assembly. See sections 3 and 7.3.
- A1(2) Loading – imposed loads and wind loads. The Product can meet this requirement for a negative wind load when applied on Light Steel Framing (LSF). See sections 3, 7.1 and 7.3 of this Agrément.
- B4(1) External fire spread – an external wall with the Product can contribute to all provisions of Part B4 of Approved Document B, volumes 1 and 2. See sections 7.1 and 7.4 of this Agrément;
- Regulation 7 Materials and workmanship – the Product is manufactured from suitably safe and durable materials for their application and can be installed to give a satisfactory performance. See sections 3 and 7 of this Agrément.

9 Building Regulations (continued)

3 The Building (Scotland) Regulations 2004 and subsequent amendments

3.1 Regulations 8 (1)(2) Durability of materials and workmanship

- The Product is manufactured from acceptable materials and is considered to be adequately resistant to deterioration and wear under normal service conditions, provided they are installed in accordance with the requirements of this Agrément. See section 7 of this Agrément.

3.2 Regulation 9 Building Standards - Construction

- 2.6 Fire spread to neighbouring buildings - the Product is low risk with reference to the clauses 2.6.5 (Domestic) and 2.6.6 (Non-Domestic) of the Technical Handbooks;
- Building insulation envelope - the Product can contribute to satisfying the requirements of these Standards; see sections 7.2 and 7.3 of this Agrément.

3.3 Regulation 12 Building Standards-Conversions

- All comments given for the Product under Regulation 9 also apply to this Regulation, with reference to clause 0.12 and Schedule 6 of this Standard.

4 The Building Regulations (Northern Ireland) 2012 and subsequent amendments

- 23(a)(i)(iii)(b) Fitness of materials and workmanship – the Product is manufactured from materials which are considered to be suitably safe;
- 28(a)(b) Resistance to moisture and weather – the Product can be constructed so as to prevent any harmful effect on the building or the health of the occupants caused by the passage of moisture to any part of the building from (a) the ground and (b) the weather. See section 7.1 of this Agrément;
- 30(a)(b) Stability – for the Product to transmit the combined dead, imposed and wind loads to the ground an adequate subframe and backing wall need to be constructed. See sections 7.1 and 7.3 of this Agrément;
- 36(a) External fire spread – the Product is non-combustible. Adequate resistance to the spread of fire over an external wall depends on the combination with other materials, the use, position and height of the building. See section 7.4 of this Agrément.

5 Requirements: The Building Regulations (Ireland) 1997 to 2017

- in order to demonstrate compliance with Irish Building Regulations the BDA Agrément® certifies that the Product complies with the requirements of a recognized document and indicates it is suitable for its intended purpose and use;
- B (B3(3)/B8(3)) Internal fire spread (structure) – the Product does not favour the spread of fire. That risk is limited more by following guidance about cavity barriers, protection of openings and fire-stopping as given in TGDs about Fire Safety;
- C4 Resistance to weather and ground moisture – the Product, when installed in accordance with this Agrément, can meet the relevant requirements of TGD Part C4 of the Irish Building Regulations. See also section 3 of this Agrément;
- D (D3/D1) Materials and workmanship – the Product is manufactured from suitably safe and durable materials for the application and can be installed to give a satisfactory performance.