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**Agrément
Certificate
No 05/4214**

Designated by Government
to issue
European Technical
Approvals

ALUCOBOND CLADDING SYSTEM

Panneaux de façade
Verkleidungsplatten

Product



Refurbishment of students' residence, Portsmouth



• THIS CERTIFICATE OF CONFIRMATION RELATES TO THE ALUCOBOND CLADDING SYSTEM.


• The cladding system, which comprises Alucobond composite panels riveted to an aluminium sub-frame, has been assessed for use externally on masonry or concrete buildings as a decorative and protective facing.

• It is essential that the system is installed in accordance with the manufacturer's instructions.

• The system is marketed in the UK by Alcan International Network UK Ltd, The Grove, Slough, Berkshire SL1 1QF.
Tel: 01753 522800
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Regulations

1 The Building Regulations 2000 (as amended) (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the requirements of the Building Regulations to which cladding products can contribute in achieving compliance. In the opinion of the BBA, Alucobond Cladding, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: A1

Loading

Comment:

When designed as specified in sections 7.3 and 9.3 of this Certificate, the system has sufficient strength and stiffness to accept wind loads and to transfer them to the supporting sub-frames.

Requirement: B4(1)

External fire spread — external walls

Comment:

The system meets the Class 0 requirements and its acceptability for use as set out in sections 10.1 to 10.6 of this Certificate.

Requirement: C2(b)

Resistance to moisture

Comment:

The system will resist the passage of rainwater and other precipitation to the supporting structure. See sections 11.1 to 11.3 of this Certificate.

continued

Confirmation of a French Avis Technique No 2/02-918 issued by the Centre Scientifique et Technique du Bâtiment (CSTB) to Alcan Singen GmbH.

Requirement: **Regulation 7** Materials and workmanship
Comment: The system is acceptable. See section 13.1 of this Certificate.

2 The Building Standards (Scotland) Regulations 1990 (as amended)



In the opinion of the BBA, Alucobond Cladding, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation:	10	Fitness of materials and workmanship
Standard:	B2.1	Selection and use of materials, fittings, and components, and workmanship
Comment:		The system is acceptable. See the <i>Installation</i> part of this Certificate.
Standard:	B2.1	Selection and use of materials, fittings, and components, and workmanship
Comment:		The system is acceptable. See section 13.1 of this Certificate.
Regulation:	11	Structure
Standard:	C2.1	Structure — Stability
Comment:		When designed as specified in sections 7.3 and 9.3 of this Certificate, the system has sufficient strength and stiffness to accept wind loads and to transfer them to the supporting sub-frames.
Regulation:	12	Structural fire precautions
Standard:	D6.5	Concealed spaces — Rainscreen cladding
Standard:	D8.1	Fire spread to adjoining buildings — Principles
Standard:	D8.2	Fire spread to adjoining buildings — Non-combustible materials
Standards:	D10.1 and D10.2	Fire spread on an external wall
Comment:		The system meets the Class 0 requirement and its acceptability for use is as set out in sections 10.1 to 10.6 of this Certificate.
Regulation:	17	Resistance to moisture
Standard:	G3.1	Resistance to precipitation — Resistance to precipitation
Comment:		The system will resist the passage of rainwater and other precipitation to the supporting structure. See sections 11.1 to 11.3 of this Certificate.

3 The Building Regulations (Northern Ireland) 2000



In the opinion of the BBA, Alucobond Cladding, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 13.1 of this Certificate.
Regulation:	C4	Resistance to ground moisture and weather
Comment:		The system will resist the passage of rainwater and other precipitation to the supporting structure. See sections 11.1 to 11.3 of this Certificate.
Regulation:	D1	Stability
Comment:		When designed as specified in sections 7.3 and 9.3 of this Certificate, the system has sufficient strength and stiffness to accept wind loads and to transfer them to the supporting sub-frames.
Regulation:	E5(a)	External fire spread
Comment:		The system meets the Class 0 requirement and its acceptability for use is as set out in sections 10.1 to 10.6 of this Certificate.

4 Construction (Design and Management) Regulations 1994 (as amended) Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

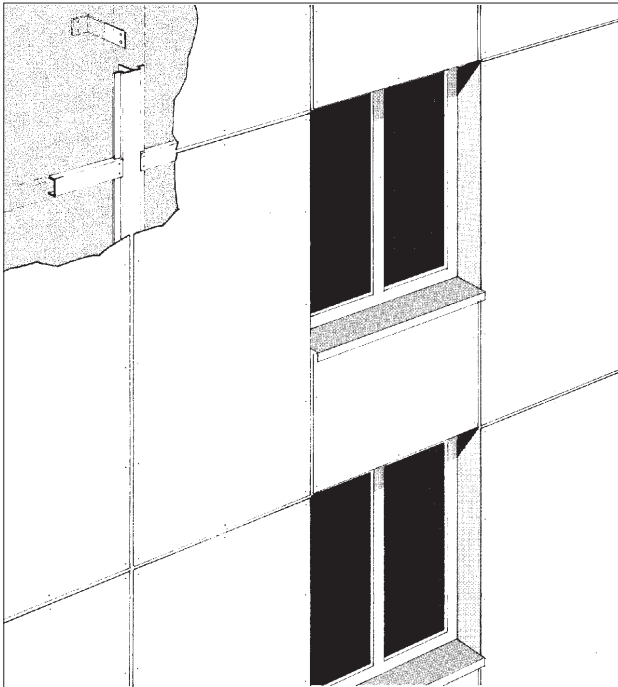
See section: 5 Description (5.4).

Technical Specification

5 Description

5.1 The Alucobond Cladding System, which comprises Alucobond composite cladding panels riveted to an aluminium sub-frame, is suitable for use as a protective and decorative external facing for masonry or concrete buildings (see Figure 1).

Figure 1 The Alucobond Cladding System



5.2 The panels comprise two 0.5 mm thick aluminium alloy (EN AW-5005[Al Mg1 (B)]/H22 to BS EN 485-2 : 2004) sheets, bonded to either side of a 3 mm thick core of low-density polyethylene (LDPE).

5.3 The 4 mm thick panels are available in standard widths of 1000 mm, 1250 mm, and 1500 mm, and standard lengths up to 3 m. Light coloured panels in lengths up to 8 m are also available.

5.4 The panels have a nominal weight of 5.5 kgm^{-2} and an EI rigidity value of 0.240 kNm^2 per m.

5.5 The external face of the panels is protected with a stove-lacquered PVDF (polyvinylidene fluoride) resin, available in 20 standard colours. The internal face is mill finish aluminium.

5.6 The panels are produced in a continuous double-belt process by extruding polyethylene between two aluminium sheets during which the polyethylene hot-melt bonds to the aluminium.

5.7 Regular quality control is carried out during panel production. Checks include dimensions, flatness and bond strength. Factory production control is monitored by the CSTB.

5.8 The panels may be bent to form corner panels and trims for use around openings and installation perimeters. The bent panels are formed by routing out the inner face and most of the LDPE core, down the length of a panel, and then bending to shape, using equipment and procedures prescribed by the manufacturer. The operation can be carried out by a fabricator approved by the manufacturer or on site by an approved contractor.

5.9 The panels are fixed to the substrate via an aluminium sub-frame system comprising wall brackets fixed to the substrate, T-rails bolted to the brackets and cross-members riveted to the T-rails. The panels are riveted around the perimeter to T-rails and cross-members (see Figure 2 and Table 1).

5.10 A suitable sub-frame system, the Ecoclad System (see Figure 2) is available from the manufacturer. Other similar aluminium sub-frame systems may be used subject to approval by a qualified engineer or other appropriately qualified person.

Figure 2 Fixing details

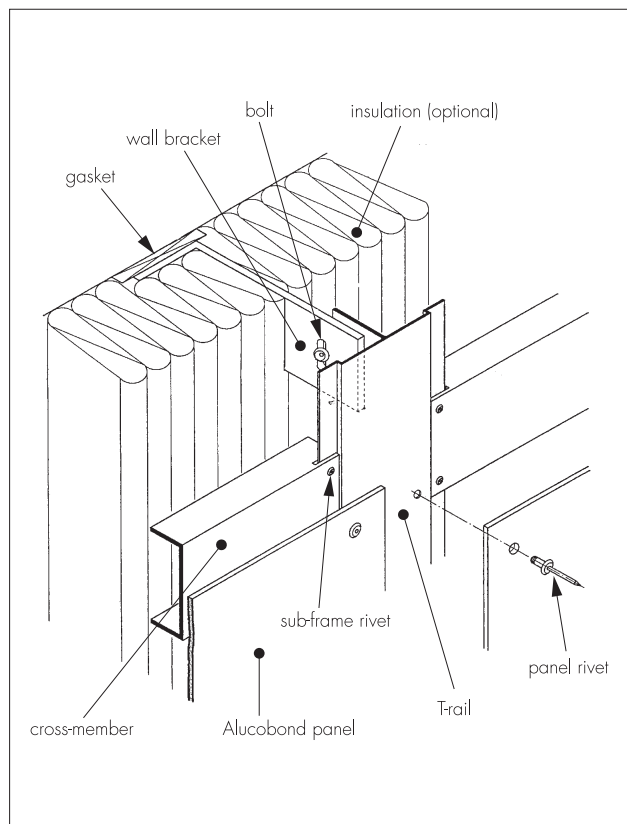


Table 1 Component details

Component	Dimensions	Material
Wall bracket and fixing gasket	Specified by a qualified engineer for a particular installation	
T-rail	min thickness 1.6 mm standard length 6 m	Aluminium alloy extrusion (alloy A1 Mg Si 0.5 F22, 6101/T6 to BS EN 573-3 : 2003) mill finish or powder coated
Cross-member	min thickness 1.6 mm length as required	As specified for T-rail
Bolt	8 mm	Stainless steel
Blind sub-frame rivet	3 mm shank diameter 6 mm head diameter	Aluminium with stainless steel mandrel
Alucobond panel	See section 5.3	See section 5.2
Blind panel rivet	5 mm shank diameter 11 or 14 mm head diameter	Aluminium body (powder coated) with stainless steel mandrel or aluminium pop rivet with steel mandrel which drops out on application

6 Delivery and site handling

6.1 The panels are delivered to site stacked on pallets with a protective polyethylene film covering the external face. For metallic-coloured panels the protective film bears an arrow to enable correct alignment during installation.

6.2 The panels should be stored on a flat, level surface in stacks not exceeding 2 m high.

6.3 Each pallet carries a label bearing the product identification and order number.

6.4 Packs of framing members are delivered to site banded onto wooden pallets. These should be stacked horizontally on bearers to prevent distortion, to a maximum height of 1 m. Other components should be stored in a safe weatherproof store.

Design Data

7 General

7.1 The Alucobond Cladding System is suitable for use externally as a decorative and protective facing. The panels are fixed to aluminium sub-frames designed in accordance with BS 8118-1 : 1991.

7.2 To avoid distortion or other damage from thermal stresses, the panels must be installed in accordance with the manufacturer's instructions and the procedures specified in this Certificate. In particular, a minimum 1 mm clearance must be allowed around all panel rivets.



7.3 Masonry or concrete walls, to which the sub-frame and cladding are fixed, should be constructed in the conventional manner in accordance with one or more of the following technical specifications, as appropriate:

- BS 5628-1 : 1992 and BS 5628-3 : 2001
- BS 8110-1 : 1997 and BS 8110-2 : 1985
- The national Building Regulations:

England and Wales

Approved Document A1/2, section 1C

Scotland

Technical Standards Part C, *Small Buildings Guide*

Northern Ireland

Technical Booklet D.

7.4 Provision should always be made for drainage and ventilation behind the cladding. Ventilation pathways must be provided to allow free passage of air behind the panel, in accordance with the following specification:

- the minimum gap between the sub-frame and the substrate or insulation is 20 mm
- minimum ventilation openings per linear metre at the top and bottom of the installation above and below window openings, by use of appropriate trims, are:
 - 5000 mm² for installation height up to 3 m
 - 6500 mm² for installation heights 3 to 6 m
 - 8000 mm² for installation heights 6 to 10 m
 - 10000 mm² for installation heights 10 to 18 m
- for installations above 18 m, the cladding is installed in modules with a break at 18 m
- for buildings in which the relative humidity exceeds 65% (maximum normal domestic) and the wall does not include a vapour check, additional 5000 mm² ventilation slots per metre run of cladding should be incorporated at minimum 8 m spacings.

8 Practicability of installation

The system is easy to install under normal site conditions using the conventional cutting, drilling and machining techniques recommended by the manufacturer.

9 Strength and stability

Wind loading

9.1 Wind loads will be transferred to the substrate through the panel, sub-frame and wall fixings. A minimum 1 mm clearance around all rivets allows for panel movement on wind loading [and thermal expansion (see section 7.2)].

9.2 The fixing of the sub-frame to the wall is outside the scope of this Certificate and needs to be assessed independently by a suitably qualified engineer or other appropriately qualified person.



9.3 The wind loads that may be taken by the panels are dependent upon the panel size and the spacing between perimeter rivets, as shown in Table 2. The load tables are based on the following data:

- permissible design stress in covering metal sheets equals 51 Nmm^{-2} (safety factor of 3.0 regarding ultimate failure, and 1.75 regarding permanent deformation)
- panel EI rigidity value of $0.24 \text{ kNm}^2\text{m}^{-1}$
- permissible design loads for 5 mm fastening rivets (safety factor 3):
in shear $R_c = 720 \text{ N}$
in tension $R_t = 680 \text{ N}$
- interaction between shear and tensile loads is given by:

$$\frac{F_c}{R_c} + \frac{F_t}{R_t} \leq 1.0$$

where F_c and F_t are the applied shear and tensile loads respectively

- fastening clearance, diameter of hole minus diameter of rivet, equals 2 mm
- minimum drilling margin at edge of panel equals 15 mm
- permissible deflection of T-rails $\leq 1/200$ of vertical span between wall brackets.

9.4 Wind loads incident upon a cladding installation should be calculated in accordance with BS 6399-2 : 1997.

9.5 The deflections given in Table 2 are in the order of span/30. These deflections will not result in failure or permanent deformation but, for aesthetic reasons, a more conservative deflection criteria, for example span/100, may be more appropriate.

Resistance to impact

9.6 The system is suitable for use in locations where there is little possibility of impact or abrasion damage, that is, at ground-floor level in private areas, where there is some incentive to exercise care, and at higher levels in public areas, as covered by categories C to F of BS 8200 : 1985.

Table 2 Permissible loads

Load (Pa)	Maximum permissible length (mm)	Central deflection (mm)	Maximum spacing of rivets (mm)
Panel width 1000 mm			
500	8000	26	500
600	8000	32	500
700	8000	37	500
800	3700	37	500
900	3300	35	500
1000	3000	34	500
1100	2700	33	500
1200	2400	31	500
1400	2100	30	500
1600	1700	25	500
1800	1400	22	500
2000	1200	20	500
2200	1100	18	500
2400	1000	17	500
2600	900	16	500
2800	800	15	400
3000	750	15	400
Panel width 1250 mm			
500	3800	35	500
600	3300	38	500
700	3000	38	500
800	2800	37	500
900	2500	36	500
1000	2300	35	500
1100	2000	31	500
1200	1800	28	500
1400	1500	25	500
1600	1300	23	500
1800	1100	21	500
2000	1000	20	500
2200	900	19	500
2400	800	18	400
2600	750	18	400
2800	700	17	300
3000	650	16	300
Panel width 1500 mm			
500	3400	43	500
600	3000	42	500
700	2700	41	500
800	2300	36	500
900	2000	32	500
1000	1800	30	500
1100	1600	28	500
1200	1500	27	500
1400	1250	25	500
1600	1100	24	500
1800	1000	23	500
2000	900	22	400
2200	800	21	400
2400	750	20	300
2600	700	19	300
2800	650	18	300
3000	600	15	300

10 Behaviour in relation to fire



10.1 When tested to BS 476-6 : 1989 the cladding panel achieved a fire propagation index (I) of 0 with sub-indices (i_1), (i_2) and (i_3) also of 0.

10.2 When tested in accordance with BS 476-7 : 1987 the product achieved a Class 1 rating.

10.3 On the evidence of results reported in sections 10.1 and 10.2 the product achieved the Class 0 requirement as defined in the national Building Regulations.

10.4 The fixing gasket is present in such small quantity as to have negligible effect on the overall fire performance of the cladding.

10.5 The incorporation of combustible material behind the cladding should be avoided where possible.

10.6 Cavity barriers should be incorporated behind the cladding as required under the national Building Regulations, but should not block essential ventilation pathways, for example by use of intumescent cavity barriers (not covered by this Certificate), or overhanging incombustible breaks at each floor level.

11 Air and water penetration



11.1 Provision for ventilation behind the cladding must be made in accordance with the requirements specified in section 7.4.

11.2 The top of the installation should be open but protected from the ingress of rain by an overhanging trim or bent panel. The sides of the installation should be closed with a trim or panel.

11.3 The system is not sealed, but any rain penetrating behind the cladding will be minimal and will drain away through the ventilation pathway provided in accordance with section 7.4.

12 Maintenance

12.1 Soiled panels can be cleaned using a soft cloth or sponge with warm soapy water or detergents or with a proprietary cleaner recommended by the manufacturer. Strong acids/alkalis and harsh abrasives should not be used.

12.2 By following the manufacturer's instructions, a damaged panel can be replaced without disturbing the other parts of the cladding.

13 Durability



13.1 The system will perform effectively as a cladding with an ultimate life of at least 30 years.

13.2 The performance of the coating will depend upon the colour chosen, its environment, location, and aspect face. It will retain a good appearance

for up to 20 years in non-corrosive environments, or for up to 15 years in marine or severe industrial environments. Colour changes, in general, will be slight and uniform on any one elevation.

Installation

14 General

14.1 A preliminary survey of the substrate wall must be carried out and installation of the Alucobond Cladding System designed and planned in consultation with a qualified engineer or other appropriately qualified person.

14.2 The installation should be carried out in accordance with the manufacturer's recommendations and the requirements of this Certificate.

14.3 Installation should not be carried out in extremes of temperature (between 5°C and 25°C is recommended).

14.4 The panels may be installed either vertically or horizontally, that is with supporting T-rails fixed to the substrate either vertically or horizontally.

14.5 Corner and other bent panels may be prepared in the factory or on site. Panels may be pre-drilled in the factory or on site.

15 Procedure

15.1 Support brackets are fixed to the substrate using fixings and procedures recommended by a suitably qualified engineer or other appropriately qualified person. Vertical spacing between wall brackets should be as specified in section 9.3, with a maximum spacing along a T-rail of 1500 mm.

15.2 T-rails are fixed to the brackets with the top fixing tight and the others sliding, with a minimum 10 mm allowance for expansion. A minimum 10 mm expansion gap is allowed between standard 6 m lengths of T-rail.

15.3 Cross-member sections are riveted to the T-rails. The cross member should not be butted tightly between T-rails, to allow for some minimal expansion of this section.

15.4 The panels are riveted around their perimeter to T-rails and cross-members, observing the following requirements:

- a minimum 10 mm gap between panels
- rivets centrally placed in oversized drill holes with a minimum 1 mm clearance around the 5 mm rivet. When drilling through panel and sub-frame on site, a stepped drill, as recommended by the manufacturer, should be used
- rivet heads with a minimum 1 mm overlap onto panel
- riveting commencing at the middle of each side and working to the corners

- rivets at spacings and edge distance as given in section 9.3
- metallic-coloured panels aligned in accordance with the directional arrow on the protective film
- removal of the protective film only after installation
- a minimum 20 mm ventilation pathway behind the panels
- the top and bottom of adjacent panels fixed to separate L-shaped cross-members at breaks between T-rails.

15.5 A perforated base plate should be installed at the bottom of the installation, permitting adequate ventilation as specified in section 7.4 but preventing the intrusion of rodents.

15.6 The system should be left open at the top, protected with an overhanging trim or bent panel.

15.7 The system should be closed at the sides with appropriate panelwork or trims.

15.8 Suitable cavity barriers, as described in section 10.6, should be installed behind the cladding as necessary, to comply with the relevant building regulations relating to fire safety.

Technical Investigations

The following is a summary of the technical investigations carried out on the Alucobond Cladding System.

16 Tests

16.1 Tests were carried out by the CSTB to determine:

- performance under wind loads
- impact strength
- material characteristics.

16.2 Tests were carried out for the BBA to determine behaviour in relation to fire.

17 Investigations

17.1 Site visits were made to assess the practicability of installation.

17.2 Independent examination of the manufacturing process was made by the CSTB, including method adopted for quality control.

17.3 An assessment was made by the CSTB of hygrothermal performance, durability and colour stability.

Bibliography

BS 476-6 : 1989 *Fire tests on building materials and structures — Method of test for fire propagation for products*

BS 476-7 : 1987 *Fire tests on building materials and structures — Method for classification of the surface spread of flame of products*

BS 5628-1 : 1992 *Code of practice for use of masonry — Structural use of unreinforced masonry*

BS 5628-3 : 2001 *Code of practice for use of masonry — Materials and components, design and workmanship*

BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

BS 8110-1 : 1997 *Structural use of concrete — Code of practice for design and construction*

BS 8110-2 : 1985 *Structural use of concrete — Code of practice for special circumstances*

BS 8118-1 : 1991 *Structural use of aluminium — Code of practice for design*

BS 8200 : 1985 *Code of practice for design of non-loadbearing external vertical enclosures of buildings*

BS EN 485-2 : 2004 *Aluminium and aluminium alloys — Sheet, strip and plate — Mechanical properties*

BS EN 573-3 : 2003 *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Chemical composition*

Conditions of Certification

18 Conditions

18.1 This Certificate:

- (a) relates only to the product that is named, described, installed, used and maintained as set out in this Certificate;
- (b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;
- (c) is valid only within the UK;
- (d) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (e) is copyright of the BBA;
- (f) is subject to English law.

18.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

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

- (a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) remain covered by a valid French Agrément; and

(c) are reviewed by the BBA as and when it considers appropriate.

18.4 In granting this Certificate, the BBA is not responsible for:

- (a) the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product;
- (b) the right of the Certificate holder to market, supply, install or maintain the product; and
- (c) the actual works in which the product is installed, used and maintained, including the nature, design, methods and workmanship of such works.

18.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory, common law or other duty of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the installation and use of this product.



In the opinion of the British Board of Agrément, Alucobond Cladding is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 05/4214 is accordingly awarded to Alcan Singen GmbH.

On behalf of the British Board of Agrément

Date of issue: 24th March 2005

A handwritten signature in black ink, appearing to read 'P. Q. Newson'.

Chief Executive