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**Agrément
Certificate
No 95/3114**
Second issue*

Designated by Government
to issue
European Technical
Approvals

DRYSEAL GRP ROOFING SYSTEMS

Système d'étanchéité pour toitures
Dachabdichtung

Product



Safeway Head Office, Hayes, Middlesex


• THIS CERTIFICATE RELATES TO DRYSEAL GRP ROOFING SYSTEMS, CONSISTING OF A FACTORY PRODUCED GLASS-FIBRE REINFORCED POLYESTER RESIN FLAT SHEET AND PREFORMED TRIMS MECHANICALLY FIXED AND JOINTED ON SITE BY THE HAND LAY-UP PROCESS AND COATED WITH A LIQUID APPLIED UV PROTECTIVE COATING.

- The products are for use as waterproofing systems on flat or pitched roofs with limited access.
- The products, to be in compliance with this Certificate, should be applied only by trained approved installers.

These Front Sheets must be read in conjunction with the accompanying Detail Sheets, which provide information to specific systems.

Regulations — Detail Sheet 1

1 The Building Regulations 1991 (as amended) (England and Wales)

 The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of roof waterproofing with the Building Regulations. In the opinion of the BBA, Dryseal GRP Roofing Systems, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement: **B4(2)**

Comment:

External fire spread

Data obtained from tests to BS 476 : Part 3 : 1958 indicate that on suitable substructures the use of Dryseal GRP Systems will enable a roof to be unrestricted under the requirements of this Regulation. See sections 3.1 and 3.2 of the relevant Detail Sheet.

Requirement: **C4**

Comment:

Resistance to weather and ground moisture

Tests for water resistance on the products indicate that the products, when correctly installed, meet this Requirement. See section 6.2 of these Front Sheets.

Requirement: **Regulation 7**

Comment:

Materials and workmanship

The products comprise acceptable materials. Workmanship on site must be of an acceptable standard. See section 4 of the relevant Detail Sheet.

Electronic Copy

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



In the opinion of the BBA, Dryseal GRP Roofing Systems, 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
Standard:	B2.1	Selection and use of materials and components
Comment:		Dryseal GRP Roof Waterproofing Systems can comply with this Standard. See section 4 of the relevant Detail Sheet.
Regulation:	12	Structural fire precautions
Standard:	D6.7	Distance of sides of buildings from boundaries — roofs and rooflights
Comment:		Data obtained from tests to BS 476 : Part 3 : 1958 indicate that on suitable substructures use of Dryseal GRP Roofing Systems will enable a roof to be unrestricted under the requirements of this Regulation. See section 3.2 of the relevant Detail Sheet.
Regulation:	17	Preparation of sites and resistance to moisture
Standard:	G3.1	Resistance to precipitation
Comment:		Tests for water resistance indicate that use of the products, when correctly installed, can enable a roof to satisfy the requirements of this Regulation. See section 6.2 of these Front Sheets.

3 The Building Regulations (Northern Ireland) 1994 (as amended)



In the opinion of the BBA, Dryseal GRP Roofing Systems, 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 products comprise acceptable materials. Workmanship must be of an acceptable standard. See section 4 of the relevant Detail Sheet.
Regulation:	C5	Resistance to ground moisture and weather
Comment:		Tests for weather resistance indicate that use of the products, when correctly installed, can enable a roof to satisfy the requirements of this Regulation. See section 6.2 of these Front Sheets.
Regulation:	E8	External fire spread
Comment:		Data obtained from tests to BS 476 : Part 3 : 1958 indicate that on suitable substructures use of the products will enable a roof to be unrestricted under the requirements of these Regulations. See sections 3.1 and 3.2 of the relevant Detail Sheet.

4 Construction (Design and Management) Regulations 1994

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

See sections: 10 *Precautions* Detail Sheet 1, and 1 *Description* (1.2) and 2 *Delivery and site handling* (2.1, 2.4 and 2.5) of the appropriate Detail Sheet.

Design Data

5 General

5.1 Dryseal GRP Roofing Systems, when installed in accordance with this Certificate and the relevant clauses of the manufacturer's instructions, are satisfactory for use as waterproofing layers on flat or pitched roofs with limited access.

5.2 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for maintenance of the roof covering and cleaning of gutters, etc. Where traffic in excess of this is envisaged, special precautions, such as additional protection to the membrane, must be taken.

5.3 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80. Pitched roofs are defined as those having falls in excess of 1:6.

5.4 When designing flat roofs, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available, including overall and local deflection, direction of falls, etc. When upgrading existing flat roofs, care should be taken to eliminate ponding water.

5.5 Decks to which the products are to be applied must comply with the relevant requirements of BS 6229 : 1982, BS 8217 : 1994, Hambleside Danelaw Limited's specifications and, where appropriate, NHBC Standards Chapter 7.1, and

the Zurich Building Guarantees Technical Standards, Section 5, clause 5.9.3.19.

5.6 Insulation materials used in conjunction with the products must be a rigid insulation board of sufficient compressive strength to resist indentation when fixing, and be:

- (a) as described in the relevant clauses of BS 8217 : 1994, or
- (b) the subject of a current BBA Certificate and be used in accordance with and within the limitations of that Certificate.

6 Weathertightness

6.1 To achieve weathertightness it is essential that the joints and coating are correctly applied as described in the manufacturer's literature.



6.2 Tests confirm that Dryseal GRP systems will adequately resist the passage of moisture to the inside of the building and so meet the requirements of:

England and Wales

Approved Document C4, Section 5.1

Scotland

Standard G3.1, Regulations 17

Northern Ireland

Regulation C5.

6.3 The products are impervious to water and, when used in the systems described, will give a weathertight roofing capable of accepting minor structural movements without damage.

7 Resistance to wind uplift

Dryseal GRP systems have adequate resistance to the effects of wind suction likely to occur in practice.

8 Resistance to foot traffic

The system can accept, without damage, the limited foot traffic and light concentrated loads associated with installation and maintenance operations. However, reasonable care is required to avoid damage by sharp objects or concentrated loads.

9 Maintenance

In the event of damage, repairs should be carried out in accordance with the manufacturer's instructions.

10 Precautions

10.1 Vapours from the liquid components of the Dryseal GRP systems, some of which contain styrene monomer, may cause sensitisation and irritation to the respiratory system, eyes and skin. The systems should be used only in areas with sufficient ventilation to prevent the build-up of vapour. Contact with the skin, eyes and clothes must be avoided. The manufacturer's instructions and the relevant safety regulations for working procedures must be adhered to at all times.

10.2 The liquid components must not be allowed to enter the drainage system.

Bibliography

BS 476 *Fire tests on building materials and structures*
Part 3 : 1958 *External fire exposure roof test*

BS 6229 : 1982 *Code of practice for flat roofs with continuously supported coverings*

BS 8217 : 1994 *Code of practice for built-up felt roofing* (supersedes CP 144 : Part 3)

Conditions of Certification

11 Conditions

11.1 This Certificate:

- (a) relates only to the product that is 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) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;
- (d) is copyright of the BBA.

11.2 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, shall be construed as references to such publication in the form in which it was current at the date of this Certificate.

11.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabricating process(es) thereof:

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

(b) continue to be checked by the BBA or its agents; and

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

11.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of any patent 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 nature of individual installations of the product, including methods and workmanship.

11.5 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, the Dryseal GRP Roofing Systems are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 95/3114 is accordingly awarded to Hambleside Danelaw Limited.

On behalf of the British Board of Agrément

A handwritten signature in black ink, appearing to read 'P. C. Newson', is written over a light grey background.

Date of Second issue: 10th December 1999

Chief Executive

**Original Detail Sheet issued 24th May 1995. This revised version issued to include reference to the revised national Building Regulations, the addition of the CDM statement and associated text, revised Conditions of Certification and deletion of references to corner mouldings.*



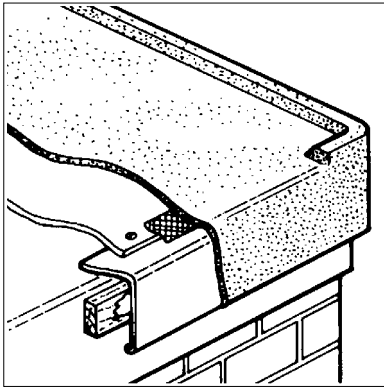
Hambleside Danelaw Limited

Certificate No 95/3114

**DRYSEAL GRP ROOFING SYSTEM (POLYURETHANE/
ACRYLIC UV PROTECTIVE TOP COAT)**
DETAIL SHEET 2

Second issue*

Product



• THIS DETAIL SHEET REFERS TO THE DRYSEAL GRP ROOFING SYSTEM (POLYURETHANE/ACRYLIC UV PROTECTIVE TOP COAT), CONSISTING OF A FACTORY PRODUCED GLASS-FIBRE REINFORCED POLYESTER RESIN FLAT SHEET AND PREFORMED TRIMS MECHANICALLY FIXED AND JOINTED ON SITE BY THE HAND LAY-UP PROCESS AND COATED WITH A LIQUID APPLIED ONE-PART UV PROTECTIVE TOP COAT.

- The system is for use as a waterproofing on flat or pitched roofs with limited access.
- The system should be applied only by trained approved installers.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the system's position regarding the Building Regulations, general information relating to the system, and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 The Dryseal GRP Roofing System (polyurethane/acrylic UV protective top coat) consists of a prefabricated glass-fibre reinforced polyester resin flat sheet and preformed trims, mechanically fixed and jointed on site by the hand lay-up process and coated with a one-part UV protective liquid applied polyurethane/acrylic top coat.

1.2 The system comprises:

F1350 Flat Sheet — manufactured in widths up to 1350 mm, nominal thickness 1.0 mm, nominal weight 24 kg, length 12 metres and pigmented light grey. Longer lengths are available on order.

F1250 HD Heavy Duty Flat Sheet — manufactured in widths up to 1250 mm, nominal thickness 1.3 mm, nominal weight 22 kg, length 9 metres and pigmented light grey, for use where a higher specification is required. Longer lengths are available on order.

Polyester resin/MEKP liquid catalyst/450 gm⁻² glass-fibre mat strip/30 gm⁻² glass tissue — for use in the on-site jointing of the flat sheet and protection of exposed fixings by the hand lay-up process with a double layer reinforcement.

Polyurethane/acrylic coating PUTL5, PUTL20, PUTD5 and PUTD20 — applied as top coat at rate of 1 kg per 3 m². The coating improves the resistance to solar ageing and is available in light and dark grey.

Mechanical fastenings — for use where flat sheet needs to be mechanically fixed to deck, eg over insulation boards, as per Hambleside Danelaw Limited's approved list.

Continuous flashing F300 — a 300 mm wide flashing for use where a continuous narrow strip of membrane is required. Available in rolls in lengths of 30 metres, longer lengths are available on order.

Flat edge/drip trims A200 and A250 HD — a range of preformed GRP roof edge details for use where drainage is required. Available in a range of fascia depths.

Raised edge/check kerb B230 and B280 — a range of preformed GRP roof edge details for use where prevention of water run-off is required. Available in a range of fascia depths.

Simulated lead wall cover flashing trim C140 — for use to replace traditional lead flashings.

Wall fillet D260 and D270 — for use against abutments, providing for expansion and cross-roof ventilation.

Internal and external angles G150, G275, H150 and H275 — for use when 90° angle details are required.

Internal flexible angle J170 and J380 — for use when a 30° to 50° angle is required, eg at deck to lay board detail.

Coping trims K65 and K130 — for use to cover existing coping on parapets, etc.

1.3 Ancillary items for use with the system include:

Bonding compound — for use in spot bonding to timber and bonding trim overlaps

Expansion joints — preformed GRP units for use over building joints.

1.4 The raw materials are subject to a quality control system.

2 Delivery and site handling

2.1 The system is delivered to site with the flat sheet in rolls, trims in lengths, and topcoat in 20 litre or 220 litre drums. Each component will be identified with a label, bearing the component reference code, batch number and the BBA identification mark incorporating the number of this Certificate.

2.2 All preformed components should be stored in a dry, well ventilated area, clear of the ground and well supported.

2.3 The liquid components will normally have a six-month shelf life if stored in sealed containers, under dry conditions, in temperatures of between 5°C and 25°C and away from direct sunlight.

2.4 The polyester resin for jointing is flammable, with a flashpoint below 32°C, and must be stored in accordance with the Highly Flammable Liquids Regulations 1972.

2.5 All hazardous components of the system, as classified under the Chemicals (Hazard Information and Packaging for Supply) Regulations 1994, bear the appropriate hazard warning label.

Design Data

3 Properties in relation to fire



3.1 The flat sheet is produced from a polyester resin rated as being EXT.S.AB when tested in accordance with BS 476 : Part 3 : 1958. When coated with the polyurethane/acrylic coating and a blockboard composite panel substrate, tests to BS 476 : Part 3 : 1958 indicate that the Dryseal GRP Roofing System (polyurethane/acrylic UV protective top coat) should obtain an EXT.F.AC rating.



3.2 The designation of other specifications should be confirmed:

England and Wales

test or assessment in accordance with Approved Document B, Appendix A, Clause A1

Scotland

test to conform with Standard D6.7

Northern Ireland

test or assessment carried out by a UKAS laboratory, BRE, or an independent consultant with appropriate experience.



On the basis of previous knowledge of the constituent materials and accelerated laboratory tests, the GRP Flat Sheet component of the system can be expected to perform satisfactorily for a period of at least 30 years. Because of the uncertainty as to the prevailing site conditions during the formation of joints and application of top coat, the quality and the durability of these areas of the system cannot be accurately defined. However, where it is subject of regular examination, maintenance and repair, it can be expected to have a similar life expectancy of the GRP Flat Sheet. Where such maintenance is not carried out, on the basis of a limited history of use of the total system, a minimum life expectancy of 10 years should be assumed.

Installation

5 General

5.1 Application of the Dryseal GRP Roofing System (polyurethane/acrylic UV protective top coat) is carried out by installers trained and approved by Hambleside Danelaw Limited. Application must be carried out in strict accordance with the relevant clauses of Hambleside Danelaw Limited's instructions and this Certificate.

5.2 The system should not be laid in rain, snow, heavy fog, high winds, nor if rain is imminent, nor at temperatures below 5°C. However, once the GRP flat sheet has been installed and jointed, the system is weathertight and can be temporarily left before installation of the top coat. The flat sheet surface must be clean and dry prior to the installation of the top coat.

5.3 Deck surfaces must be dry, clean, free from sharp projections such as nail heads, concrete nibs, etc, and be in a sound condition.

5.4 For timber decks used in cold roof construction, 16 mm diameter holes should be drilled in the deck in every joist space at 450 mm centres, in order to allow permeation of air.

5.5 Any treated timber wall/fascia battens or insulation stops required should be fixed in accordance with Hambleside Danelaw Limited's instructions.

6 Procedure

6.1 The flat sheet is rolled out over the substrate, marked and cut to length allowing for 50 mm laps to the perimeter. The flat sheet is marked with a line 50 mm in from the edge to assist with the positioning of laps.

6.2 The flat sheet is mechanically fastened through laps at maximum 350 mm centres, using approved anti-corrosive fixings and stress plates.

6.3 Other preformed trims required are then mechanically fixed as described in section 6.2.

6.4 All lap joints, seams, fixing heads and penetrations of the flat sheet should be sealed using the hand lay-up process of applying GRP, in accordance with Hambleside Danelaw Ltd's instructions.

6.5 Once the GRP joints have cured (speed depends on ambient temperature) the polyurethane/acrylic top coat can be applied. If application of the top coat is not immediate, the roof can be left uncompleted for a short period of time as the GRP layer is weathertight.

6.6 The roof area must be clear of all loose debris, clean, dry and grease free prior to the installation of the top coat.

6.7 The top coat should be applied using a roller or brush, at the rate of 1 kg per three square metres, ensuring total coverage. Application to roof details, eg around penetrations, edges, etc, must be carried out prior to the coating of the main roof area.

Technical Investigations

The following is a summary of the technical investigations carried out on the Dryseal GRP Roofing System (polyurethane/acrylic UV protective top coat).

7 Tests

7.1 Samples of the Dryseal GRP Roofing System (polyurethane/acrylic UV protective top coat), and components of the system, were obtained from the manufacturer for the purpose of testing. Tests performed by the BBA on the system using an F1350 Flat Sheet only, which give the typical results for the materials, are summarised in Tables 1 and 2.

7.2 Tests on the dimensions and hard body impact were carried out on the trims, and found to be satisfactory.

7.3 A thermal shock test was carried out on a two metre by two metre sample, including a joint, on a plywood substrate; the system was found to be satisfactory.

8 Other investigations

8.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

8.2 A visit was made to a site in progress to assess the methods of installation.

8.3 Installation instructions were examined to establish the practicability of the materials used.

8.4 An examination was made of indicative fire data to BS 476 : Part 3 : 1958 and an assessment made.

Table 1 Physical properties — general

Test (units)	Method*	Mean results		
		Flat sheet	Coating	Total system
Density (kgm ⁻³)	BS 2872 : 620A	1496	1250	—
Weight per unit area (kgm ⁻²)		1.37	—	—
Tensile strength (N per 50 mm) control	BS 2782 : 320E (10 mm min ⁻¹)	4393	15	4328
heat aged ⁽¹⁾		—	—	3166
UV aged ⁽²⁾		—	—	3114
water soak ⁽³⁾		—	—	3354
Elongation at break (%) control	BS 2782 : 320E (10 mm min ⁻¹)	3	>300	4
heat aged ⁽²⁾		—	—	3
UV aged ⁽³⁾		—	—	2
water soak ⁽³⁾		—	—	3
Moisture absorption (%)	BS 2782 : 430A	—	—	0.67
Water vapour permeability (gm ⁻² day ⁻¹)	BS 3177 (75% RH/25°C)	—	—	0.63
Water vapour resistance (MNsg ⁻¹)	BS 3177 (75% RH/25°C)	—	—	325.7
Barcol hardness control	BS 2782 : 1001	48	—	—
water boil ⁽⁴⁾		27	—	—
water soak ⁽³⁾		25	—	—
heat aged ⁽⁵⁾		56	—	—
Resin: glass ratio (% resin)	BS 2782 : 1006	66.6	—	—

(1) Heat aged 90 days at 80°C.

(2) UV aged 2000 light hours in accordance with ASTM G53-93, using QUV 313 lamps at a cycle of 4 hours UV at 45°C, 4 hours condensation at 40°C.

(3) Water soak 28 days at 23°C.

(4) 2 hours water boil.

(5) Heat aged 7 days at 70°C.

— = not tested

*The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

Table 2 Service performance

Test (units)	Method*	Mean result
Resistance to water pressure	MOAT 27 : 5.1.4	no leakage
Fatigue cycling ⁽¹⁾	MOAT 27 : 5.1.8	satisfactory
control		satisfactory
heat aged ⁽²⁾		
Static indentation ⁽³⁾	MOAT 27 : 5.1.9	L ₄
Dynamic indentation	MOAT 27 : 5.1.10	
perlite		I ₃
EPS		I ₃
Delamination strength (Nmm ⁻²)	BBA Method ⁽⁴⁾	
control	(20 mm min ⁻¹)	2.0 ⁽⁷⁾
heat aged ⁽⁵⁾		1.6 ⁽⁸⁾
water soak ⁽⁶⁾		1.3 ⁽⁷⁾
Tensile bond strength (Nmm ⁻²)	BBA Method ⁽⁹⁾	
control	(20 mm min ⁻¹)	1.0 ⁽¹⁰⁾
heat aged ⁽⁵⁾		0.7 ⁽¹⁰⁾
water soak ⁽⁶⁾		0.9 ⁽¹¹⁾
Nail pull-through ⁽¹²⁾ (N)		610
Unrolling at low temperature ⁽¹³⁾	MOAT 27 : 5.4.3	satisfactory
Coefficient of expansion	MOAT 50 : 4.3.1	
(mm m ⁻¹ °C ⁻¹)		
-20°C to 23°C		
direction A		0.027
direction B		0.028
23°C to 80°C		
direction A		0.017
direction B		0.020

- (1) Test carried out on joint and flat sheet.
 (2) Heat aged 28 days at 80°C.
 (3) Top coat was penetrated but no damage to flat sheet, no water penetration when area tested under 50 mm head.
 (4) Samples 100 mm x 100 mm were sandwiched between steel plates of similar dimensions and adhered using epoxy adhesive. A universal test machine was used to apply a tensile load.
 (5) Heat aged 90 days at 80°C.
 (6) Water soak 28 days at 23°C.
 (7) Failure between GRP flat sheet and top coat.
 (8) Failure within top coat.
 (9) Discs of 50 mm diameter of GRP were adhered to plywood using Sika 252 bonding compound. Steel plates of a similar size were then bonded to the GRP using epoxy adhesive. A universal test machine was used to apply a tensile force.
 (10) Failure within plywood.
 (11) Failure between plywood adhesive interface.
 (12) Nail with 10 mm head diameter was used. Test specimens showed no signs of damage after nailing at 5°C.
 (13) Carried out on flat sheet.

*The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

Bibliography

- BS 476 *Fire tests on building materials and structures*
 Part 3 : 1958 *External fire exposure roof test*
- BS 2782 *Methods of testing plastics*
 Part 3 *Mechanical properties*
 Methods 320A to 320F : 1976(1986) *Tensile strength, elongation and elastic modulus*
 Part 4 *Chemical properties*
 Methods 430A to 430C : 1983 *Determination of water absorption at 20°C, and of boiling water absorption at 23°C with allowance for water-soluble matter. Determination of boiling water absorption. Determination of boiling water absorption with allowance for water-soluble matter*
 Part 6 *Dimensional properties*
 Methods 620A to 620D : 1980 *Determination of density of solid plastics excluding cellular plastics (immersion method)*
 Part 10 *Glass reinforced plastics*
 Method 1001 : 1977(1989) *Measurement of hardness by means of a Barcol impressor*
 Method 1006 : 1978(1989) *Determination of volatile matter and resin content of synthetic resin impregnated textile glass fabric*
- BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*
- MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*
- MOAT No 50 : 1992 *Technical guidelines for the assessment of thermal insulation systems intended for supporting waterproof coverings on flat and sloping roofs*



On behalf of the British Board of Agrément

Date of Second issue: 10th December 1999

P. C. Hewson
 Chief Executive

*Original Detail Sheet issued 24th May 1995. This revised version issued to include reference to revised national Building Regulations and deletion of references to corner mouldings.

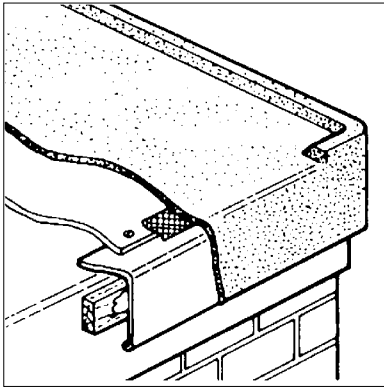


Hambleside Danelaw Limited

Certificate No 95/3114

**DRYSEAL GRP ROOFING SYSTEM
(POLYESTER TOP COAT SYSTEM)**
DETAIL SHEET 3

Product



• THIS DETAIL SHEET REFERS TO THE DRYSEAL GRP ROOFING SYSTEM (POLYESTER TOP COAT SYSTEM) CONSISTING OF A FACTORY PRODUCED GLASS-FIBRE REINFORCED POLYESTER RESIN FLAT SHEET AND PREFORMED TRIMS MECHANICALLY FIXED AND JOINTED ON SITE BY THE HAND LAY-UP PROCESS AND COATED WITH A LIQUID APPLIED UV PROTECTIVE TOP COAT.

- The system is for use as a waterproofing on flat or pitched roofs with limited access.
- The system should be applied only by trained approved installers.

This Detail Sheet must be read in conjunction with the Front Sheets, which give the system's position regarding the Building Regulations, general information relating to the system, and the Conditions of Certification, respectively.

Technical Specification

1 Description

1.1 The Dryseal GRP Roofing System (Polyester Top Coat System) consists of a prefabricated glass-fibre reinforced polyester resin flat sheet and preformed trims, mechanically fixed and jointed on site by the hand lay-up process and coated with a UV protective liquid applied polyester top coat.

1.2 The system comprises:

F1350 Flat Sheet — manufactured in widths up to 1350 mm, nominal thickness 1.0 mm, nominal weight 24 kg, length 12 m and pigmented light grey. Longer lengths are available on order.

F1250 HD Heavy Duty Flat Sheet — manufactured in widths up to 1250 mm, nominal thickness 1.3 mm, nominal weight 22 kg, length 9 m and pigmented light grey, for use where a higher specification is required. Longer lengths are available on order.

Polyester resin/MEKP liquid catalyst/450 gm⁻² glass-fibre mat strip/30 gm⁻² glass tissue — for use in the on-site jointing of the flat sheet and protection of exposed fixings by the hand lay-up process with a double layer reinforcement.

Polyester Top Coat PET-20D, PET-20L — applied as top coat to system. The coating improves the resistance to solar ageing. The colours available are dark grey (D) and light grey (L), other colours are available to special order.

Mechanical fastenings — for use where flat sheet needs to be mechanically fixed to deck, eg over insulation boards, as per Hambleside Danelaw Limited's approved list.

Continuous flashing F300 — a 300 mm wide flashing for use where a continuous narrow strip of membrane is required. Available in rolls in lengths of 30 m, longer lengths are available on order.

Flat edge/drip trims A200 and A250 HD — a range of preformed GRP roof edge details for use where drainage is required. Available in a range of fascia depths.

Raised edge/check kerb B230 and B280 — a range of preformed GRP roof edge details for use where prevention of water run-off is required. Available in a range of fascia depths.

Simulated lead wall cover flashing trim C140 — for use to replace traditional lead flashings.

Wall fillet D260 and D270 — for use against abutments, providing for expansion and cross-roof ventilation.

Internal and external angles G150, G275, H150 and H275 — for use when 90° angle details are required.

Internal flexible angle J170 and J380 — for use when a 30° to 50° angle is required, eg at deck to lay board detail.

Coping trims K65 and K130 — for use to cover existing coping on parapets, etc.

1.3 Ancillary items for use with the system include:

Bonding compound — for use in spot bonding to timber and bonding trim overlaps

Expansion joints — preformed GRP units for use over building joints.

1.4 The raw materials are subject to a quality control system.

2 Delivery and site handling

2.1 The system is delivered to site with the flat sheet in rolls, trims in lengths, and topcoat in 20 litre or 220 litre drums. Each component is identified with a label, bearing the component reference code, batch number and the BBA identification mark incorporating the number of this Certificate.

2.2 All preformed components should be stored in a dry, well ventilated area, clear of the ground and well supported.

2.3 The liquid components normally have a six-month shelf life if stored in sealed containers, under dry conditions, in temperatures of between 5°C and 25°C and away from direct sunlight.

2.4 The polyester resin for jointing is flammable, with a flashpoint below 32°C, and must be stored in accordance with the Highly Flammable Liquids Regulations 1972.

2.5 All hazardous components of the system, as classified under the Chemicals (Hazard Information and Packaging for Supply) Regulations 1994, bear the appropriate hazard warning label.

Design Data

3 Properties in relation to fire



3.1 The flat sheet is produced from a polyester resin rated as being EXT.S.AB when tested in accordance with BS 476 : Part 3 : 1958. When installed on a Sterling board substrate, tests to BS 476 : Part 3 : 1958 indicate that the Dryseal GRP Roofing System (Polyester Top Coat System) should obtain an EXT.F.AC rating.



3.2 The designation of other specifications should be confirmed:

England and Wales

test or assessment in accordance with Approved Document B, Appendix A, Clause A1

Scotland

test to conform with Standard D6.7

Northern Ireland

test or assessment carried out by a UKAS laboratory, BRE, or an independent consultant with appropriate experience.

4 Durability



On the basis of previous knowledge of the constituent materials and accelerated laboratory tests, the GRP Flat Sheet component of the system can be expected to perform satisfactorily for a period of at least 30 years. Because of the uncertainty as to the prevailing site conditions during the formation of joints and application of top coat, the quality and the durability of these areas of the system cannot be accurately defined. However, where it is subject of regular examination, maintenance and repair, it can be expected to have a similar life expectancy of the GRP Flat Sheet. Where such maintenance is not carried out, on the basis of a limited history of use of the total system, a minimum life expectancy of 10 years should be assumed.

Installation

5 General

5.1 Application of the Dryseal GRP Roofing System (Polyester Top Coat System) is carried out by installers trained and approved by Hamble Side Danelaw Limited. Application must be carried out in strict accordance with the relevant clauses of Hamble Side Danelaw Limited's instructions.

5.2 The system should not be laid in rain, snow, heavy fog, high winds, nor if rain is imminent, nor at temperatures below 5°C. However, once the GRP flat sheet has been installed and jointed, the system is weathertight and can be temporarily left before installation of the top coat. The flat sheet surface must be clean and dry prior to the installation of the top coat.

5.3 Deck surfaces must be dry, clean, free from sharp projections such as nail heads, concrete nibs, etc, and be in a sound condition.

5.4 For timber decks used in cold roof construction, 16 mm diameter holes should be drilled in the deck in every joist space at 450 mm centres, in order to allow permeation of air.

5.5 Any treated timber wall/fascia battens or insulation stops required should be fixed in accordance with Hamble Side Danelaw Limited's instructions.

6 Procedure

Flat sheet

6.1 The flat sheet is rolled out over the substrate, marked and cut to length allowing for 50 mm laps to the perimeter. The flat sheet is marked with a line 50 mm in from the edge to assist with the positioning of laps.

6.2 The flat sheet is mechanically fastened through laps at maximum 350 mm centres, using approved anti-corrosive fixings and stress plates.

6.3 Other preformed trims required are then mechanically fixed as described in section 6.2.

6.4 All lap joints, seams, fixing heads and penetrations of the flat sheet should be sealed using the hand lay-up process of applying GRP, in accordance with Hambleside Danelaw Ltd's instructions.

6.5 Once the GRP joints have cured (speed depends on ambient temperature) the top coat can be applied. If application of the top coat is not immediate, the roof can be left uncompleted for a short period of time as the GRP layer is weathertight.

Top coat application

6.6 The roof area must be clear of all loose debris, clean, dry and grease free prior to the installation of the top coat.

6.7 Resin is measured out into clean, calibrated, buckets as required. Catalyst is added as detailed in installation instructions, the amount is dependent upon ambient temperature and volume of resin.

6.8 The minimum amount of catalyst used is 1% by volume (approximately 10 ml per litre of resin) and maximum used is 3% by volume (approximately 30 ml per litre of resin).

6.9 Catalyst is sprinkled onto top coat whilst stirring. Stirring is continued until catalyst is dispersed completely.

6.10 The top coat should be applied using a roller or brush, at the rate of 1 kg per three square metres maximum, ensuring even and total coverage. Application to roof details, eg around penetrations, edges, etc, should be carried out prior to the coating of the main roof area.

6.11 If unused top coat starts to gel (form skin or leave granular lumps on surface), stop using immediately. A fresh batch of resin must be prepared prior to continuing.

Technical Investigations

The following is a summary of the technical investigations carried out on the Dryseal GRP Roofing System (Polyester Top Coat System).

7 Tests

7.1 Samples of the product and components of the system, were obtained from the manufacturer for the purpose of testing. Tests performed by the BBA on the system using an F1350 Flat Sheet only, which give the typical results for the materials, are summarised in Tables 1 and 2.

7.2 Tests on the dimensions and hard body impact were carried out on the trims, and found to be satisfactory.

7.3 A thermal shock test was carried out on a 2 m by 2 m sample, including a joint, on a plywood substrate. The system was found to be satisfactory.

8 Other investigations

8.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

8.2 A visit was made to a site in progress to assess the methods of installation.

8.3 Installation instructions were examined to establish the practicability of the materials used.

8.4 An examination was made of indicative fire data to BS 476 : Part 3 : 1958 and an assessment made.

Table 1 Physical properties — general

Test (units)	Method*	Mean results		
		Flat sheet	Coating	Total system
Density (kgm ⁻³)	BS 2782 : Part 6 : Method 620A	1496	1218	—
Weight per unit area (kgm ⁻²)		1.37	—	—
Tensile strength (N per 50 mm) control	BS 2782 : Part 3 Method 320E (10 mm min ⁻¹)	4393	—	4328
heat aged ⁽¹⁾		—	—	3166
UV aged ⁽²⁾		—	—	3114
water soak ⁽³⁾		—	—	3354
Elongation at break (%) control	BS 2782 : Part 3 Method 320E (10 mm min ⁻¹)	3	—	4
heat aged ⁽²⁾		—	—	3
UV aged ⁽³⁾		—	—	2
water soak ⁽³⁾		—	—	3
Moisture absorption (%)	BS 2782 : Part 4 Method 430A	—	—	0.67
Water vapour permeability (gm ⁻² day ⁻¹)	BS 3177 (75% RH/25°C)	—	—	0.56
Water vapour resistance (MNsg ⁻¹)	BS 3177 (75% RH/25°C)	—	—	366
Barcol hardness control	BS 2782 : Part 10 Method 1001	48	—	—
water boil ⁽⁴⁾		27	—	—
water soak ⁽³⁾		25	—	—
heat aged ⁽⁵⁾		56	—	—
Resin: glass ratio (% resin)	BS 2782 : Part 10 Method 1006	66.6	—	—

(1) Heat aged 90 days at 80°C.

(2) UV aged 2000 light hours in accordance with ASTM G 53-93, using QUV 313 lamps at a cycle of 4 hours UV at 45°C, 4 hours condensation at 40°C.

(3) Water soak 28 days at 23°C.

(4) 2 hours water boil.

(5) Heat aged 7 days at 70°C.

— = not tested

*The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

Table 2 Service performance

Test (units)	Method*	Mean result
Resistance to water pressure	MOAT 27 : 5.1.4	pass
Fatigue cycling ⁽¹⁾ control heat aged ⁽²⁾	MOAT 27 : 5.1.8	pass pass
Static indentation ⁽³⁾	MOAT 27 : 5.1.9	L ₄
Dynamic indentation EPS	MOAT 27 : 5.1.10	I ₃
Delamination strength (Nmm ⁻²) control heat aged ⁽⁴⁾ water soak ⁽⁵⁾ UV ⁽⁶⁾	BBA Method ⁽³⁾ (20 mm min ⁻¹)	1.0 0.9 0.8 0.9
Nail pull-through ⁽⁷⁾ (N)		610
Unrolling at low temperature ⁽⁸⁾	MOAT 27 : 5.4.3	pass
Coefficient of expansion (mm m ⁻¹ °C ⁻¹) -20°C to 23°C direction A direction B	MOAT 50 : 4.3.1	0.027 0.028
23°C to 80°C direction A direction B		0.017 0.020

(1) Test carried out on joint and flat sheet.

(2) Heat aged 28 days at 80°C.

(3) Samples 100 mm by 100 mm were sandwiched between steel plates of similar dimensions and adhered using epoxy adhesive. A universal test machine was used to apply a tensile load.

(4) Heat aged 100 days at 80°C.

(5) Water soak 28 days at 23°C.

(6) UV aged 1000 light hours using QUV weatherometer with UVB 313 lamps cycling four hours UV at 50°C followed by four hours condensation at 50°C.

(7) Nail with 10 mm head diameter was used. Test specimens showed no signs of damage after nailing at 5°C.

(8) Carried out on flat sheet.

*The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections of the various documents.

Bibliography

BS 476 *Fire tests on building materials and structures*
BS 476-3 : 1958 *External fire exposure roof test*

BS 2782 *Methods of testing plastics*

Part 3 *Mechanical properties*

Methods 320A to 320F : 1976(1986) *Tensile strength, elongation and elastic modulus*

Part 4 *Chemical properties*

Methods 430A to 430C : 1983 *Determination of water absorption at 20°C, and of boiling water absorption at 23°C with allowance for water-soluble matter. Determination of boiling water absorption. Determination of boiling water absorption with allowance for water-soluble matter*

Part 6 *Dimensional properties*

Methods 620A to 620D : 1980 *Determination of density of solid plastics excluding cellular plastics (immersion method)*

Part 10 *Glass reinforced plastics*

Method 1001 : 1977(1989) *Measurement of hardness by means of a Barcol impressor*
Method 1006 : 1978(1989) *Determination of volatile matter and resin content of synthetic resin impregnated textile glass fabric*

BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*

ASTM G 53-93 *Operating light and water exposure apparatus (fluorescent UV-condensation type) for exposure of non metallic compounds*

MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*

MOAT No 50 : 1992 *Technical guidelines for the assessment of thermal insulation systems intended for supporting waterproof coverings on flat and sloping roofs*



On behalf of the British Board of Agrément

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Chief Executive