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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
06/4354
Product Sheet 1

BAUDER SINGLE PLY PVC ROOF WATERPROOFING MEMBRANES

THERMOFOL U

This Agrément Certificate Product Sheet(1) relates to Thermofol U, a range of flexible polyvinylchloride (PVC) polyester-reinforced membranes, for use as single-ply roof waterproofing membranes.

(1) Hereinafter referred to as 'Certificate'.

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

Weathertightness — the membranes will resist the passage of moisture into the building (see section 6).

Properties in relation to fire — tests indicate that the membranes will enable a roof to be unrestricted under the national Building Regulations (see section 7).

Resistance to wind uplift — the membranes will resist the effects of any likely wind suction acting on the roof (see section 8).

Resistance to foot traffic — the membranes will accept the limited foot traffic and loads associated with installation and maintenance (see section 9).

Durability — under normal service conditions the membranes will provide a durable roof waterproofing with a service life in excess of 30 years (see section 11).

The BBA has awarded this Certificate to the company named above for the products described herein. These products have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of Fourth issue: 19 June 2015

John Albon — Head of Approvals
Construction Products

Claire Curtis-Thomas
Chief Executive

Originally certificated on 11 July 2006

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, Thermofol U, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying 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) (as amended)

Requirement:	B4(2)	External fire spread
Comment:		Tests indicate that on a suitable substructure, the use of the membranes will enable a roof to be unrestricted under this Requirement. See section 7 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance indicate that the membranes, including joints, meet this Requirement. See section 6.1 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The membranes are acceptable. See section 11 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:		The use of the membranes satisfies the requirements of this Regulation. See sections 10 and 11 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		Tests indicate that the membranes, when applied to a suitable substructure, are regarded as having low vulnerability under clause 2.8.1[1][2] of this Standard. See section 7 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance indicate that the use of the membranes, including joints, will enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1[1][2] and 3.10.7[1][2]. See section 6.1 of this Certificate.
Standard:	7.1(a)	Statement of sustainability
Comment:		The membranes 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.
Regulation:	12	Building standards applicable to conversions
Comment:		All comments given for the membranes under Regulation 9 also apply to this Regulation, with reference to clause 0.12.1[1][2] and Schedule 6[1][2].

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

The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	23(a)(i)(iii)(b)(i)	Fitness of materials and workmanship
Comment:		The membranes are acceptable. See section 11 and the *Installation* part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		Tests for water resistance indicate that the membranes, including joints, meet the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	36(b)	External fire spread
Comment:		Tests indicate that on suitable substructures the use of the membranes will be unrestricted under the requirements of this Regulation. See section 7 of this Certificate.

Construction (Design and Management) Regulations 2015

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

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

See section: 1 *Description* (1.2) and 3 *Delivery and site handling* of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of Thermofol U, provided it is installed, used and maintained in accordance with this Certificate, as meeting Technical Requirement R3 in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies*.

CE marking

The Certificate holder has taken the responsibility of CE marking the products in accordance with harmonised European Standard EN 13956 : 2005. An asterisk(*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Thermofol U single-ply membranes are a range of flexible polyester-reinforced plasticised PVC membranes. The 1.5 mm membrane is available in a fleece-backed version.

1.2 The membranes are light grey in colour[1] and manufactured to the nominal characteristics given in Table 1.

(1) Also available in blue-grey and other colours on request.

Table 1 Nominal characteristics

Parameters (units)	Membranes				
	U12	U15	U18	U20	U15V
Thickness* (mm)	1.2	1.5	1.8	2.0	1.5[1]
Roll width* (m)[2]	1.5	1.5	1.5	1.5	1.5
Roll length* (m)	20	20	20	20	20
Roll weight (kg)	46	57	67	75	63
Mass per unit area* ($kg \cdot m^{-2}$)	1.4	1.8	1.8	2.4	2.3
Tensile force* (N per 50 mm)	1000	≥1000	≥1000	≥1000	≥1000
Elongation at break* (%)	19	≥19	≥19	≥20	≥20
Tear strength* (N)	>180	>200	>200	>200	>300
Dynamic indentation* (mm)					
hard substrate	>300	>400	>500	>600	>700
soft substrate	>600	>700	>800	>900	>1000
Static indentation* (kg)					
hard substrate	>20	>20	>20	>20	>20
soft substrate	>20	>20	>20	>20	>20
Watertightness* (kPa)	≥10	≥10	≥10	≥10	≥10
Dimensional stability* (%)	<0.3	<0.3	<0.3	<0.3	<0.3
Low temperature foldability* (°C)	<–30	<–30	<–30	<–30	<–30

(1) Thickness excludes fleece backing.
(2) Other widths available on request.

1.3 Other items or components which may be used with the product, but which are outside the scope of this Certificate, are:

- Bauder Membrane Adhesive — for bonding Thermofol U15V fleece-backed membrane to substrates
- Thermofol Metal — PVC-coated steel sheets, for use in producing profiles for perimeter flashings
- Thermofol D15 — 1.5 mm unreinforced PVC membrane, for use in non-regular detailing
- Bauder VB20 and Vapour Barrier — polyethylene film vapour control layers
- Bauder PIR — rigid insulation boards
- Bauder Tapes 03 and 20 — self-adhesive tapes for the jointing and sealing of polyethylene vapour barriers
- Thermofol preformed corners — for the creation of corner details
- Thermofol Contact Adhesive — for bonding PVC membrane
- Thermofol — details direct to metal, concrete or timber
- Thermofol Walkway Membrane — for the protection of the roofing membrane and to provide an anti-slip surface in walkway areas
- Bauder PF 300 Protection Fleece — for providing protection to the membrane surface in ballasted and paved applications
- a range of outlet and pipe flashing accessories.

2 Manufacture

2.1 The membranes are manufactured from a plasticised PVC compound by calendering and lamination, with a synthetic reinforcement, and, in the case of the backed product, a polyester fleece.

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 nonconformities
- 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.

2.3 The membranes are manufactured in Germany by Paul Bauder GmbH & Co KG.

3 Delivery and site handling

3.1 The membranes are delivered to site in wrapped rolls packaged on pallets. The labels bear the marketing company's name, product identification, batch number and the BBA logo incorporating the number of this Certificate.

3.2 Rolls should be stored on their side, on a clean, level surface, and under cover.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Thermofol U.

Design Considerations

4 Use

4.1 Thermofol U membranes are satisfactory for use as a waterproofing layer on flat and pitched roofs as follows:

- mechanically-fastened systems on flat and pitched roofs with limited access
- fully-adhered on flat and pitched roofs with limited access
- loose-laid and ballasted waterproofing for flat roofs with limited access
- vertical detailing.

4.2 Limited access roofs are defined for the purpose of this Certificate as those subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters etc. Where traffic in excess of this is envisaged, additional protection to the membrane must be provided (see section 9).

4.3 Flat roofs are defined for the purpose of this Certificate as those having a minimum finished fall of 1:80. For design purposes, twice the minimum finished fall should be assumed, unless a detailed analysis of the roof is available, including overall and local deflection and direction of falls. Pitched roofs are defined for the purpose of this Certificate as those having falls greater than 1:6.

4.4 Decks to which the membranes are to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards* 2014, Chapter 7.1 *Flat roofs and balconies*, and the Certificate holder's instructions.

4.5 Insulation materials to be used in conjunction with the membranes must be in accordance with the Certificate holder's instructions and be either:

- as described in the relevant clauses of BS 8217 : 2005, or
- the subject of a current BBA Certificate and used in accordance with, and within the scope of, that Certificate.

4.6 Contact with bituminous, coal tar and oil-based products must be avoided as the membranes are not compatible with lower grades of bitumen. If contact with such products is likely, a separating layer should be interposed before installing the waterproofing sheet. Where doubt arises, the advice of the manufacturer or the Certificate holder should be sought.

5 Practicability of installation

The products should only be installed by roofers who have been trained and approved by the Certificate holder.

6 Weathertightness

6.1 The membranes, including joints, when completely sealed and consolidated, will adequately resist the passage of moisture into the building, and enable a roof to comply with the requirements of the national Building Regulations.

6.2 The membranes are impervious to water and will achieve a weathertight roof capable of accepting minor structural movement.

7 Properties in relation to fire

7.1 Results of tests indicate the following systems will, in the opinion of the BBA, achieve a $B_{ROOF}(t4)$ classification:

- a system comprising a 19 mm oriented strand board substrate, a low-density polyethylene vapour control layer and a 50 mm layer of PIR insulation board covered by Thermofol U 1.5 mm
- a system comprising an 18 mm orientated strand board substrate and a 150 mm layer of EPS insulation board, covered by Thermofol U 1.5 mm fleece-backed membrane fully-bonded with polyurethane adhesive.

7.2 A roof waterproofed with the product and ballasted with a minimum depth of 50 mm of aggregate is deemed to be unrestricted. The roof therefore meets:

England and Wales — Requirement B4(2)

Scotland — Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — Regulation 36(b).

7.3 The designation of other specifications should be confirmed by:

England and Wales — test or assessment in accordance with Approved Document B, Appendix A, clause A1

Scotland — test to conform to Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — test or assessment by a UKAS-accredited laboratory, or an independent consultant with appropriate experience.

8 Resistance to wind uplift

8.1 The resistance to wind uplift of a mechanically-fastened waterproofing layer is provided by the fasteners passing through the membrane into the substrate. The number and position of fixings will depend on a number of factors including:

- wind uplift forces to be restrained
- tensile properties of the membrane
- pull-out strength of the fasteners
- appropriate calculation of safety factors.

8.2 The wind uplift forces are calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. On this basis, the number of fixings required should be established using a maximum permissible load of 0.5 kN per fixing.

8.3 Where the membrane is bonded to insulation boards, the resistance to wind uplift will be dependent on the cohesive strength of the insulation and the method by which it is secured to the roof deck. This must be taken into account when selecting a suitable insulation material.

8.4 The ballast requirements for loose-laid systems should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex. The membrane should always be ballasted with a minimum depth of 50 mm of aggregate. In areas of high-wind exposure, the Certificate holder's advice should be sought. Alternatively, concrete slabs on suitable supports can be used.

9 Resistance to foot traffic

Results of tests indicate that the membranes can withstand the limited foot traffic and light concentrated loads associated with installation and maintenance. Reasonable care should be taken to avoid puncture by sharp objects or concentrated loads. Where traffic in excess of this is envisaged, such as for maintenance of lift equipment, a walkway should be provided, for example, using concrete slabs supported on bearing pads.

10 Maintenance

Roofs covered with the membranes must be the subject of annual inspections, to ensure continued performance.

11 Durability

11.1 Accelerated weathering tests confirm that satisfactory retention of physical properties is achieved. Available evidence indicates that the membranes will have a service life in excess of 30 years.

11.2 In environments where the membranes are in contact with organic solvents, the life expectancy of the membranes may be reduced. In cases of doubt the advice of the Certificate holder should be sought.

12 Reuse and recyclability

The membranes comprise PVC and polyester, which can be recycled.

13 General

13.1 Installation of Thermofol U membranes must be carried out in accordance with relevant clauses of BS 8000-0 : 2014 and BS 8000-4 : 1989, the manufacturer's instructions and this Certificate.

13.2 Substrates to which the membranes are applied must be sound, dry, clean and free from sharp projections such as nail heads and concrete nibs. When used over a rough substrate, a suitable protection layer must be laid first.

13.3 Installation must not be carried out during inclement weather (eg rain, fog or snow). When the temperature is below 5°C, suitable precautions against surface condensation must be taken.

13.4 Where contact with coal tar or oil-based products is likely, an isolating layer must be interposed between the product and the substrate. Where contact with bituminous materials is likely, consideration should be given to the use of an isolating layer, and the advice of the manufacturer should be sought.

13.5 The membranes must not come into contact with unfaced polystyrene insulation boards. A suitable separation layer must be used if this type of board is used.

14 Procedure

Loose-laid and ballasted applications

14.1 The product is unrolled onto the substrate without folds or ripples, with a 100 mm overlap, and is mechanically fixed and fully adhered at details and perimeters. Flashing and lap jointing must be carried out as described in section 15.

14.2 A suitable protection layer must be laid over the product prior to the application of the ballast.

14.3 When used in an inverted roof specification a suitable filter layer must be installed on top of the insulation.

14.4 Loose-laid applications should be covered by at least a 50 mm depth of well-rounded gravel. In areas of high-wind exposure, paving slabs set on a suitable support may be considered (eg pads). A minimum upstand height of 150 mm above the top of the ballast or paving should be allowed for detailing.

14.5 When used in a loose-laid application, normal account should be taken in the design of the deck with regard to the extra dead loading owing to the weight of the aggregate and/or paving.

Mechanically-fastened applications

14.6 The membranes are secured by corrosion-resistant plates and mechanical fixings.

14.7 The membranes are unrolled onto the substrate, without folds or ripples, with a minimum 100 mm side lap and 150 mm head lap. Flashing and lap jointing must be carried out as described in section 15.

14.8 The membranes are fixed to the deck (through insulation boards, where appropriate) in the joint overlaps, prior to welding of the joint, in accordance with the Certificate holder's instructions.

14.9 The fastener washers should be positioned a minimum of 10 mm from the edge of the lower membrane. The fixings should be installed at centres calculated from the average wind force in that location.

14.10 A minimum distance of 150 mm between fasteners should be observed at all times. This may require the use of narrower membranes to obtain the correct number of fasteners per square metre.

Fully-adhered application using Thermofol U15V membrane only

14.11 When using Bauder Membrane Adhesive the advice of the Certificate holder should be sought on the suitability of substrates.

14.12 The membrane is unrolled onto the substrate without ripples and rolled back to expose the underside.

14.13 A coat of adhesive is applied to the substrate and to the back of the membrane in a full and continuous coat.

14.14 The membrane is rolled back onto the adhesive approximately 5 to 10 minutes after application. After initial contact, the surface of the membrane is rolled and pressed to ensure full contact.

15 Jointing procedure

15.1 Joints must be made using hot-air or welding techniques in accordance with the manufacturer's instructions.

15.2 If the lap area is contaminated, both sheets must be cleaned using a cleaner recommended by the Certificate holder.

Hot-air welding

15.3 Hot-air welding is conducted by using either an automatic or a hand-operated machine, with a temperature set in accordance with the Certificate holder's instructions.

15.4 The lap joint must be a minimum width of 40 mm for an automatic machine, and 50 mm for a hand-held machine.

15.5 The seams must be tested with a metal probe at least 15 minutes after welding, to identify poorly welded areas. Any such areas should be made good.

Flashing procedure

15.6 Flashings must be formed in accordance with the Certificate holder's instructions.

16 Repair

In the event of damage, repairs can be carried out by cleaning the area around the damage and applying a patch of the product in the manner described in section 15.

Technical Investigations

17 Tests

17.1 Test results were evaluated in relation to Thermofol U membranes relating to:

- tensile strength
- elongation at break
- nail test
- dimensional stability
- low temperature foldability
- interlaminar adhesion
- shear strength
- peel strength
- effects of heat ageing
- wind uplift
- static indentation
- dynamic impact.

17.2 Testing was also carried out on the Thermofol U fleece-backed membrane to determine peel strength.

17.3 Samples were obtained from a site installed in 1991 of an earlier Bauder PVC grade membrane and Thermofol U membrane from the Certificate holder for the following testing:

- dynamic impact
- low temperature foldability.

17.4 Testing was also carried out on the membrane to determine:

- thickness
- width
- mass per unit area
- straightness
- flatness
- ash content
- plasticiser content.

18 Investigations

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

18.2 Existing data on fire performance of the product were evaluated.

Bibliography

BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*

BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*

BS EN 1991-1-4 : 2005 *Eurocode 1 : Actions on structures — General actions — Wind actions*
NA to BS EN 1991-1-4 : 2005 UK National Annex to *Eurocode 1 : Actions on structures — General actions — Wind actions*

EN 13956 : 2005 *Flexible sheet for waterproofing — Plastic and rubber sheets for roof waterproofing — Definitions and characteristics*

19 Conditions

19.1 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.

19.2 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.

19.3 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.

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

19.5 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:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual 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.

19.6 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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