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**Agreement Certificate**

**18/5526**

Product Sheet 1

### PUDLO WATERPROOFING SYSTEMS

### PUDLO TS, TR AND TF MEMBRANES

This Agrément Certificate Product Sheet<sup>(1)</sup> relates to PUDLO TS, TR and TF Membranes, for use externally or in sandwich constructions as damp-proofing membranes, as externally applied waterproofing for substructures and podium decks, and for restricting the ingress of radon.

(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

**Resistance to water and water vapour** — the products, including joints, will resist the passage of moisture into a structure (see section 6).

**Resistance to underground gases** — the products will restrict the ingress of radon into buildings (see section 7).

**Resistance to mechanical damage** — the products will accept, without damage, the limited foot traffic and loads associated with installation and the effects of thermal or other minor movement likely to occur in practice (see section 8).

**Durability** — under normal service conditions, the products will provide an effective barrier to the transmission of moisture for the life of the structure in which they are incorporated (see section 12).



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 First issue: 8 May 2018

John Albon – Head of Approvals  
Construction Products

Claire Curtis-Thomas  
Chief Executive

*Certificate amended on 20 November 2018 to update Company details, generic title and specific title.*

*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.*

*Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.*

#### British Board of Agrément

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## Regulations

In the opinion of the BBA, PUDLO TS, TR and TF Membranes, 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)

<b>Requirement:</b>	<b>C1(2)</b>	<b>Site preparation and resistance to contaminants</b>
Comment:		When properly installed in a correctly designed structure, the products can contribute to a structure satisfying this Requirement, with regards to radon. See section 7 of this Certificate.
<b>Requirement:</b>	<b>C2(a)</b>	<b>Resistance to moisture</b>
Comment:		The products, including joints, will enable a structure to satisfy this Requirement. See section 6.1 of this Certificate.
<b>Requirement:</b>	<b>7</b>	<b>Materials and workmanship</b>
Comment:		The products are acceptable. See section 12 and the <i>Installation</i> part of this Certificate.



### The Building (Scotland) Regulations 2004 (as amended)

<b>Regulation:</b>	<b>8(1)</b>	<b>Durability, workmanship and fitness of materials</b>
Comment:		The products can contribute to a construction satisfying this Regulation. See section 12 and the <i>Installation</i> part of this Certificate.
<b>Regulation:</b>	<b>9</b>	<b>Building standards applicable to construction</b>
Standard:	3.2	Site preparation – protection from radon gas
Comment:		The products will enable a floor to satisfy the requirements of this Standard with reference to clauses 3.1.2 <sup>(1)(2)</sup> , 3.1.6 <sup>(1)(2)</sup> , 3.1.7 <sup>(1)(2)</sup> , 3.1.8 <sup>(1)(2)</sup> , 3.2.1 <sup>(2)</sup> , 3.2.2 <sup>(1)(2)</sup> . See section 7 of this Certificate.
Standard:	3.4	Moisture from the ground
Comment:		The products will enable a structure to satisfy the requirements of this Standard, with reference to clauses 3.4.1 <sup>(1)(2)</sup> , 3.4.2 <sup>(1)(2)</sup> , 3.4.5 <sup>(1)(2)</sup> and 3.4.7 <sup>(1)(2)</sup> . See section 6.1 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The products 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.
<b>Regulation:</b>	<b>12</b>	<b>Building standards applicable to conversions</b>
Comment:		All comments given for the products under Regulation 9, Standards 1 to 6 also apply to this Regulation, with reference to clause 0.12.1 <sup>(1)(2)</sup> and Schedule 6 <sup>(1)(2)</sup> .

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).



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

<b>Regulation:</b>	<b>23(a)(i)</b>	<b>Fitness of materials and workmanship</b>
Comment:	<b>(iii)(b)(i)</b>	The products are acceptable. See section 12 and the <i>Installation</i> part of this Certificate.

<b>Regulation:</b>	<b>26(2)</b>	<b>Site preparation and resistance to contaminants</b>
<b>Comment:</b>		When properly installed in a correctly designed structure, the products can contribute to a structure satisfying this Regulation, with regards to radon. See section 7 of this Certificate.
<b>Regulation:</b>	<b>28(a)</b>	<b>Resistance to moisture and weather</b>
<b>Comment:</b>		The products, including joints, will enable a structure to satisfy the requirements of this Regulation. See section 6.1 of this Certificate.

## Construction (Design and Management) Regulations 2015 Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 1 *Description* (1.3) and 3 *Delivery and site handling* (3.3 and 3.4) of this Certificate.

### Additional Information

#### NHBC Standards 2018

In the opinion of the BBA, PUDLO TS, TR and TF Membranes, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Technical Requirement R3 and Chapters 4.1 *Land quality – managing ground conditions*, 5.1 *Substructure and ground bearing floors* clause 5.1.20 *Damp-proofing concrete floors, for use below the slab and in sandwich constructions* and 5.4 *Waterproofing of basements and other below ground structures*.

Where Grade 2 or 3 waterproofing protection is required and the below ground wall retains more than 600 mm measured from the top of the retained ground to the lowest finished floor level, the products must be used in combination with either a Type B or C waterproofing protection, as defined in BS 8102 : 2009. The Certificate holder should be consulted for approved Type B and C solutions.

#### CE marking

The Certificate holder has taken the responsibility of CE marking the products, in accordance with harmonised European Standard EN 13967 : 2012. 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 PUDLO TS, TR and TF Membranes are manufactured from flexible polypropylene alloy (FPA). The membranes are available in the three grades; PUDLO TS (Standard unreinforced), PUDLO TR (glass reinforced) and PUDLO TF (polyester-fleece backed).

1.2 The membranes are available in a grey colour.

1.3 The membranes have the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (unit)	PUDLO TS (Standard unreinforced)		PUDLO TR (glass reinforced)		PUDLO TF (polyester- fleece backed)	
	1.2	1.5	1.2	1.5	1.2	1.5
Thickness* (mm)	1.2	1.5	1.2	1.5	1.2	1.5
Width* (m)	1.5 or 2.1		1.5 or 2.1		1.5 or 2.1	
Length (m)	25 <sup>(1)</sup> or 30 <sup>(2)</sup>		25 <sup>(1)</sup> or 30 <sup>(2)</sup>		25 <sup>(1)</sup> or 30 <sup>(2)</sup>	
Mass per unit area* (kg·m <sup>-2</sup> )	1.08	1.35	1.10	1.37	1.25	1.51
Roll weight (kg)	48.6 <sup>(2)</sup> or 56.7 <sup>(1)</sup>	60.8 <sup>(2)</sup> or 70.9 <sup>(1)</sup>	49.5 <sup>(2)</sup> or 57.8 <sup>(1)</sup>	62.1 <sup>(2)</sup> or 72.5 <sup>(1)</sup>	55.8 <sup>(2)</sup> or 65.1 <sup>(1)</sup>	68.0 <sup>(2)</sup> or 79.3 <sup>(1)</sup>
Tensile strength* (N·m <sup>-2</sup> )						
longitudinal	16		—		16	
transverse	15		—		15	
Tensile strength* (N per 50 mm)						
longitudinal	—		600		—	
transverse	—		550		—	
Elongation at break* (%)						
longitudinal	700		700		700	
transverse	700		700		700	
Nail tear (N)						
longitudinal	330	450	390	450	450	400
transverse	240	450	290	400	650	600
Dimensional stability* (%)						
longitudinal	≤0.5		≤0.1		≤0.5	
transverse	≤0.5		≤0.1		≤0.5	
Low temperature foldability* (°C)	≤-40		≤-40		≤-40	
Static indentation* (method B)	L25		L25		L25	
Dynamic impact* (mm) (method B)	>1000		>1000		>1000	

(1) Roll width 2.1 m.

(2) Roll width 1.5 m.

1.4 Other items which may be used with the products and which are included in the scope of this Certificate are:

- mechanical fixings<sup>(1)</sup> — for supporting the membranes during installation and backfilling in vertical applications
- Fuseprep Plus — for cleaning the membranes prior to repair welding
- preformed internal/external corners — moulded from the same FPA as the membranes.

(1) The Certificate holder must be consulted for suitable fixings.

## 2 Manufacture

2.1 The products are manufactured by extrusion of flexible polypropylene alloy and lamination.

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 management systems of the manufacturer have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 by Bureau Veritas (Certificate 209130).

### 3 Delivery and site handling

3.1 The membranes are delivered to site in rolls packaged in polyethylene film bearing a self-adhesive tag with the product identification, size and production reference date. Each pallet also bears a label with the manufacturer's name, product identification, size and number of rolls.

3.2 Rolls must be stored in a cool, dry area on a clean, level surface, and kept under cover. Rolls must only be unwrapped from the packaging at the time of installation.

3.3 Fuseprep Plus is available in 1 litre containers.

3.4 The Certificate holder has the responsibility of classifying and labelling the products under the *CLP Regulation (EC) No 1272/2008 on the classification, labelling and packaging of substances and mixtures*. Users must refer to the relevant Safety Data Sheet(s).

## Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on PUDLO TS, TR and TF Membranes.

## Design Considerations

### 4 Use

4.1 PUDLO TS, TR and TF Membranes are satisfactory for use as Type A waterproofing protection as defined in BS 8102: 2009 for the waterproofing of new or existing substructures and podium decks.

4.2 The products are for use externally to provide an effective barrier to the transmission of liquid water under hydrostatic pressure where Grade 1 to 3 waterproofing protection is required, as defined in Table 2 of BS 8102 : 2009.

4.3 Where Grade 3 waterproofing protection is required, the environment must also be controlled by use of ventilation, dehumidification and/or air conditioning (as appropriate), to ensure that dampness does not occur.

4.4 The products will also restrict the ingress of radon into buildings from naturally occurring sources.

4.5 PUDLO TS and PUDLO TR are used for loose-lay horizontal applications or mechanically fixed in vertical applications. PUDLO TF is for use as a pre-applied membrane for below ground waterproofing (see section 15.4).

4.6 Buildings in areas of risk from radon should be constructed in accordance with the recommendations of BRE Report BR 211 : 2015 and following the guidance set out in BS 8485 : 2015.

### 5 Practicability of installation

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

### 6 Resistance to water and water vapour



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

6.2 The products are impervious to water and will give a waterproof layer capable of accepting minor structural movements without damage.

## 7 Resistance to underground gases



7.1 The products will restrict the ingress of radon into buildings from naturally occurring sources.

7.2 Measured radon gas diffusion coefficients of PUDLO TS (1.2 mm) are given in Table 2. It can be assumed that the other membranes will have similar performance.

Table 2 Gas diffusion coefficients of PUDLO TS (1.2 mm)

Gas	Method	Result (m <sup>2</sup> ·s <sup>-1</sup> )
Radon	K124/02/95	1.6 x 10 <sup>-11</sup> (unjointed)
		1.7 x 10 <sup>-11</sup> (jointed)

7.3 BRE Report BR 211 : 2015 recommends a 300 µm thick polyethylene sheet as the minimum required thickness for a radon gas-resistant membrane. It is generally accepted that other materials with comparable or higher gas resistance are suitable, provided they can withstand the construction process. In the opinion of the BBA, the products satisfy these criteria.

## 8 Resistance to mechanical damage

8.1 When installed, the membranes are capable of accommodating the minor movements likely to occur under normal service conditions.

8.2 The products can accept the limited foot traffic and light loads associated with installation.

8.3 The products can be damaged by sharp objects and care should be taken particularly when the membranes are exposed during construction and back-filling or screeding operations, and they should be protected as soon as practicable after installation. The Certificate holder should be consulted for suitable protection.

8.4 Provided sufficient care is taken, the products will not be damaged by normal foot traffic during construction.

## 9 Adhesion and stability

When suitably attached to the structure, the membranes will, under normal circumstances, accommodate the minor movements likely to occur in the structure in which they are incorporated.

## 10 Effect of temperature

The membranes are not adversely affected by the temperatures likely to occur during installation and in service.

## 11 Maintenance

As the products are confined and have suitable durability, maintenance is not required. However, any damage occurring during installation must be repaired in accordance with section 17, prior to backfilling.

## 12 Durability



When fully protected and subjected to normal service conditions, PUDLO TS, TR and TF Membranes will provide an effective barrier to the transmission of water, water vapour and radon for the life of the structure in which they are incorporated.

## 13 Reuse and recyclability

The products comprise polypropylene and polyester, which can be recycled.

## Installation

### 14 General

14.1 PUDLO TS, TR and TF Membranes must be installed in accordance with the relevant requirements of BS 8102 : 2009, CP 102 : 1973 (Section 3), BS 8000-4 : 1989, this Certificate and the Certificate holder's instructions.

14.2 Buildings in areas of risk from naturally occurring or landfill gas should be designed and constructed in accordance with BRE Report BR 211 : 2015 and following the guidance of BS 8485 : 2015.

14.3 Concrete surfaces must be well cured, clean and free from sharp projections.

14.4 The membranes must be laid and jointed under clean, dry conditions at a temperature of  $\geq 5^{\circ}\text{C}$ .

14.5 The membranes must be protected as soon as practicable after installation and before backfilling.

### 15 Procedure

15.1 In horizontal applications, the membranes are loose-laid by unrolling onto the ground or sub-base, avoiding ripples and with a minimum 70 mm overlap between adjacent sheets and end laps.

15.2 Joints in PUDLO TF should be made by laying the membrane as described in section 15.1 and lapped over the selvedge strip. PUDLO TF is then welded as described in section 16. Alternatively, in the absence of a selvedge strip, ie end laps, apply a 150 mm strip of PUDLO TS or PUDLO TR centrally over the joint and weld both edges, as described in section 16.

15.3 In vertical applications, the membranes must be mechanically secured within the lap area using fasteners and seam plates ensuring a minimum 70 mm overlap between adjacent sheets and end laps. The maximum distance between each fastener must be 280 mm and the minimum distance between the plates and sheet edge must be 15 mm. The Certificate holder must be consulted for suitable fixings.

15.4 PUDLO TF can be pre-applied by securely fastening it to formwork prior to the concrete being poured. The membrane must be fastened so that the fleece faces the concrete pour. The Certificate holder should be consulted for suitable fixings.

15.5 Lap joints in pre-applied PUDLO TF must be sealed as described in section 15.2 when the formwork is removed and after ensuring the areas to be welded are clean and dry.

15.6 All joints must be sealed as described in section 16.

### 16 Jointing

16.1 Joints in the membranes must be sealed using hot air welding and a roller, ensuring a fully welded width of 30 mm.

16.2 Spot welding should be carried out along the length of the seam to ensure proper sheet alignment.

16.3 The inside of the seam is then welded leaving a minimum width of 30 mm on the outside of the seam for final welding.

16.4 The outside edge of the seam (minimum 30 mm) is then welded.

16.5 Alternatively, automatic heat transfer equipment may be used

16.6 The integrity of all welds must be checked using a metal probe.

## 17 Repair

17.1 Damaged membrane can be repaired by cutting back to sound material and patching.

17.2 Patches must overlap the edge of the repair by at least 50 mm in all directions and the corners must be rounded off.

17.3 The area to be patched must be wiped clean with Fuseprep Plus before welding, as described in section 16.

## Technical Investigations

## 18 Tests

18.1 An assessment was made of existing test data in relation to:

- thickness
- width
- mass per unit area
- water absorption
- flatness
- straightness
- peel resistance of joint
- shear resistance of joints
- tensile strength
- elongation at break
- dynamic indentation
- static indentation
- dimensional stability
- low temperature foldability
- resistance to root penetration.

18.2 Tests were carried out to establish:

- resistance to water pressure (60 kPa) of the weld jointed membrane
- resistance to chisel impact
- water vapour resistance
- nail tear resistance
- effect of heat ageing.

## 19 Investigations

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.



## Bibliography

BRE Report BR 211 : 2015 *Radon : guidance on protective measures for new buildings*

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

BS 8102 : 2009 *Code of practice for protection of below ground structures against water from the ground*

BS 8485 : 2015 *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings*

BS EN ISO 9001 : 2008 *Quality management systems — Requirements*

CP 102 : 1973 *Code of practice for protection of buildings against water from the ground*

EN 13967 : 2012 + A1 : 2017 *Flexible sheets for waterproofing — Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet — Definitions and characteristics*

### 20 Conditions

#### 20.1 This Certificate:

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

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

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

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

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

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

- 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.

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