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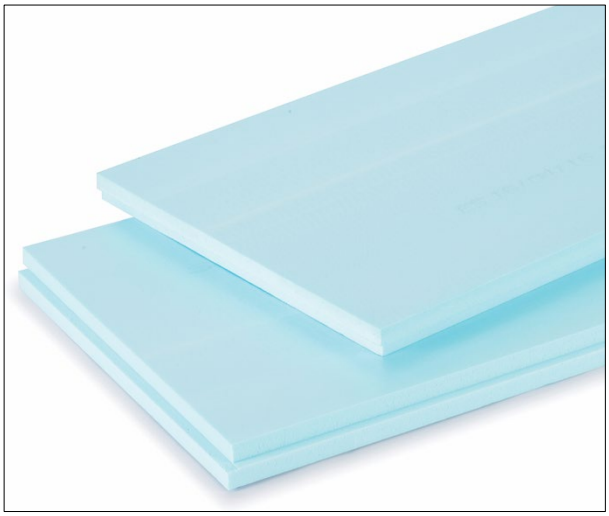
Agrément Certificate
19/5704
Product Sheet 1 Issue 2

DANOSA INVERTED ROOF SYSTEMS

DANOPREN TR AND DANOPREN 500 INVERTED ROOF INSULATION

This Agrément Certificate Product Sheet(1) relates to DANOPREN(2) TR and DANOPREN 500 Inverted Roof Insulation, extruded polystyrene (XPS) boards for use as inverted roof insulation on new and existing domestic and non-domestic untrafficked flat and zero fall roofs, and terraces subject to pedestrian access only. The insulation boards are used with the DANOFLOW water-flow-reducing layer between the insulation and the ballast layer.

(1) Hereinafter referred to as 'Certificate'.
(2) DANOPREN is a registered trademark.



The assessment includes

Product factors:

- compliance with Building Regulations
- compliance with additional regulatory or non-regulatory information where applicable
- evaluation against technical specifications
- assessment criteria and technical investigations
- uses and design considerations

Process factors:

- compliance with Scheme requirements
- installation, delivery, handling and storage
- production and quality controls
- maintenance and repair

Ongoing contractual Scheme elements†:

- regular assessment of production
- formal 3-yearly review

KEY FACTORS ASSESSED

Section 1. Mechanical resistance and stability
Section 2. Safety in case of fire
Section 3. Hygiene, health and the environment
Section 4. Safety and accessibility in use
Section 5. Protection against noise
Section 6. Energy economy and heat retention
Section 7. Sustainable use of natural resources
Section 8. Durability

The BBA has awarded this Certificate to the company named above for the systems described herein. These systems 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 Second issue: 25 July 2025
Originally certified on 21 October 2019

Hardy Giesler
Chief Executive Officer

This BBA Agrément Certificate is issued under the BBA's Inspection Body accreditation to ISO/IEC 17020. Sections marked with † are not issued under accreditation.
The BBA is a UKAS accredited Inspection Body (No. 4345), Certification Body (No. 0113) and Testing Laboratory (No. 0357).
Readers MUST check that this is the latest issue of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.
The Certificate should be read in full as it may be misleading to read clauses in isolation.
Any photographs are for illustrative purposes only, do not constitute advice and should not be relied upon.

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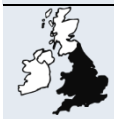
SUMMARY OF ASSESSMENT AND COMPLIANCE

This section provides a summary of the assessment conclusions; readers should refer to the later sections of this Certificate for information about the assessments carried out.

Compliance with Regulations

Having assessed the key factors, the opinion of the BBA is that DANOPREN TR and DANOPREN 500 Inverted Roof Insulation, 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 Building Regulations 2010 (England and Wales) (as amended)

Requirement:	**A1**	**Loading**
Comment:		The systems can contribute to satisfying this Requirement. See section 1 of this Certificate.
Requirement:	**B3(2)**	**Internal fire spread (structure)**
Comment:		The systems may be restricted by this Requirement in some circumstances. See section 2 of this Certificate.
Requirement:	**C2(c)**	**Resistance to moisture**
Comment:		The systems can contribute to satisfying this Requirement. See section 3 of this Certificate.
Requirement:	**L1(a)(i)**	**Conservation of fuel and power**
Comment:		The systems can contribute to satisfying this Requirement; however, compensating fabric measures may be required. See section 6 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The systems are acceptable. See sections 8 and 9 of this Certificate.
Regulation:	**25B**	**Nearly zero-energy requirements for new buildings**
Regulation:	**26**	**CO_2 emission rates for new buildings**
Regulation:	**26A**	**Fabric energy efficiency rates for new dwellings (applicable to England only)**
Regulation:	**26A**	**Primary energy rates for new buildings (applicable to Wales only)**
Regulation:	**26B**	**Fabric performance values for new dwellings (applicable to Wales only)**
Regulation:	**26C**	**Target primary energy rates for new buildings (applicable to England only)**
Regulation:	**26C**	**Energy efficiency rating (applicable to Wales only)**
Comment:		The systems can contribute to satisfying these Regulations; however, compensating fabric/service measures may be required. See section 6 of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	**8(1)**	**Fitness and durability of materials and workmanship**
Comment:		The systems are acceptable. See sections 8 and 9 of this Certificate.
Regulation:	**9**	**Building standards – construction**
Standard:	1.1(b)	Structure
Comment:		The systems can contribute to satisfying this Standard, with reference to clause 1.1.2[(1)(2)]. See section 1 of this Certificate.
Standard:	2.1	Compartmentation
Standard:	2.2	Separation
Comment:		The systems may be restricted by these Standards in some circumstances, with reference to clauses 2.1.15[(2)], 2.2.7[(2)] and 2.2.10[(1)]. See section 2 of this Certificate.

Standard:	3.15	Condensation
Comment:		The systems can contribute to satisfying this Standard, with reference to clauses 3.15.1[(1)(2)], 3.15.3[(1)(2)], 3.15.4[(1)(2)], 3.15.5[(1)(2)] and 3.15.6[(1)(2)]. See section 3 of this Certificate.
Standard:	6.1(b)(c)	Energy demand
Comment:		The systems can contribute to satisfying this Standard, with reference to clauses 6.1.1[(1)] and 6.1.2[(2)]; however, compensating fabric/service measures may be required. See section 6 of this Certificate.
Standard:	6.2	Building insulation envelope
Comment:		The systems can contribute to satisfying this Standard, with reference to clauses 6.2.1[(1)(2)], 6.2.3[(1)], 6.2.4[(2)], 6.2.6[(1)], 6.2.7[(2)], 6.2.8[(1)], 6.2.9[(1)(2)], 6.2.10[(1)(2)], 6.2.11[(2)] and 6.2.12[(1)]; however, compensating fabric measures may be required. See section 6 of this Certificate.
Standard:	7.1(a)b)	Statement of sustainability
Comment:		The systems can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting at least a bronze level of sustainability as defined in this Standard. In addition, the systems can contribute to a construction meeting a higher level of sustainability as defined in this Standard, with reference to clauses 7.1.4[(1)], 7.1.6[(1)(2)], 7.1.7[(1)], 7.1.9[(2)] and 7.1.10[(2)]. See section 6 of this Certificate.
Regulation:	**12**	**Building standards – conversion**
Comment:		All comments given for the systems under Regulation 9, Standards 1 to 6, 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(1)(a)(i) (iii)(b)(i)(ii)**	**Fitness of materials and workmanship**
Comment:		The systems are acceptable. See sections 8 and 9 of this Certificate.
Regulation:	**29**	**Condensation**
Comment:		The systems can contribute to satisfying this Regulation. See section 3 of this Certificate.
Regulation:	**30**	**Stability**
Comment:		The systems can contribute to satisfying this Regulation. See section 1 of this Certificate.
Regulation:	**35(2)**	**Internal fire spread – structure**
Comment:		The systems may be restricted by this Regulation in some circumstances. See section 2 of this Certificate.
Regulation:	**39(a)(i)**	**Conservation measures**
Comment:		The systems can contribute to satisfying this Regulation; however, compensating fabric measures may be required. See section 6 of this Certificate.
Regulation:	**40(2)**	**Target carbon dioxide emission rate**
Regulation:	**43(1)(2)**	**Renovation of thermal elements**
Regulation:	**43B**	**Nearly zero-energy requirements for new buildings**
Comment:		The systems can contribute to satisfying these Regulations; however, compensating fabric/service measures may be required. See section 6 of this Certificate.

Additional Information

NHBC Standards 2025

In the opinion of the BBA, DANOPREN TR and DANOPREN 500 Inverted Roof Insulation, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs, terraces and balconies*.

The opinion of the BBA does not amount to any endorsement or approval by NHBC and does not in any way guarantee that NHBC will approve such product / system as compliant with the NHBC Technical Requirements and Standards.

Fulfilment of Requirements

The BBA has judged DANOPREN TR and DANOPREN 500 Inverted Roof Insulation to be satisfactory for use as described in this Certificate. The systems have been assessed for use as inverted roof insulation on new and existing domestic and non-domestic untrafficked flat and zero fall roofs, and terraces subject to pedestrian access only.

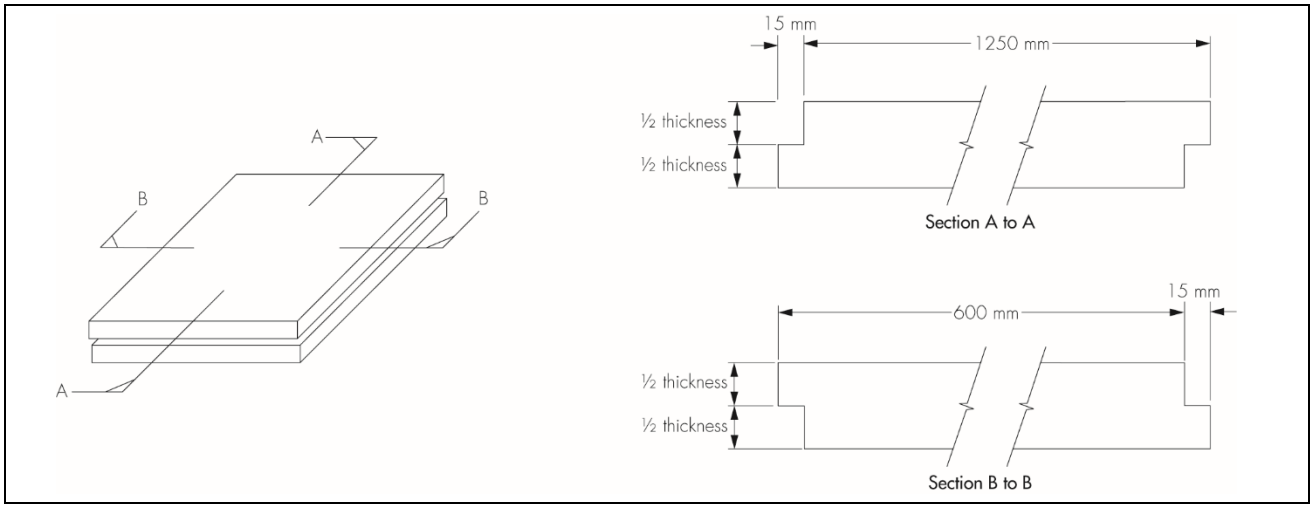
ASSESSMENT

Product description and intended use

The Certificate holder provided the following description for the systems under assessment.

DANOPREN TR and DANOPREN 500 consist of extruded polystyrene (XPS) foam boards, available in one standard size and rebated for lap jointing (see Figure 1).

Figure 1 DANOPREN TR and DANOPREN 500 insulation boards



The DANOPREN TR and DANOPREN 500 insulation boards have the nominal characteristics given in Table 1.

Table 1 Nominal characteristics of DANOPREN TR and DANOPREN 500 insulation boards

Characteristic (unit)	Value	
	DANOPREN TR	DANOPREN 500
Work size – length x width (mm)	1250 x 600	1250 x 600
Overall size – length x width (mm)	1265 x 615	1265 x 615
Thickness (mm)	40, 50, 60, 80, 100	50, 60, 80, 100
Edge detail	Rebated on all 4 sides (15 mm x half board thickness)	Rebated on all 4 sides (15 mm x half board thickness)
Colour	Blue	Blue

Ancillary Items

DANOFLOW is a three-layer polypropylene laminate composite which is used as a water-flow-reducing layer between the insulation and the roof ballast layer to form the DANOSA Inverted Roof Systems, and is essential to use with the insulation boards and has been assessed with the insulation boards.

The nominal characteristics of the DANOFLOW water-flow-reducing layer are shown in Table 2.

Table 2 Nominal characteristics of the DANOFLOW water-flow-reducing layer

Characteristic (unit)	Value
Roll length (m)	50
Roll width (m)	1.5
Thickness (mm)	0.4
Mass per unit area ($g \cdot m^{-2}$)	100
Lap joints (mm) — unsealed	300

The Certificate holder recommends the following ancillary items for use with the systems, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- gravel ballast
- paving ballast
- proprietary paving support/spacer pads
- separating or cushion layers, if required
- rainwater outlet grilles
- dual-level rainwater outlets
- insulation upstand boards
- flashings and skirtings
- DANOLOSA — a paving slab incorporating extruded polystyrene insulation
- DANOFELT PY 300 — a needle-punched polyester geotextile, for use as a separating layer
- DANOPREN UPSTAND BOARD (50 mm XPS insulation with a 6 mm fibre cement board facing)
- DANODREN JARDIN — a high density polyethylene (HDPE) drainage layer
- DANODREN R20 — an HDPE drainage layer.

Applications

DANOPREN TR and DANOPREN 500 are intended for use as thermal insulation in the inverted roof concept (above the roof waterproofing) on new and existing domestic and non-domestic untrafficked flat and zero fall roofs, and terraces subject to pedestrian access only, on a suitably designed timber, concrete or metal structural deck, in conjunction with an appropriate fully supported waterproofing system.

The DANOPREN TR and DANOPREN 500 insulation boards must always be overlaid with the DANOFLOW water-flow-reducing layer; a gravel ballast or paving slab finish is then applied on top.

Definitions for products and applications inspected

The following terms have been defined for the purpose of this Certificate as:

- flat roof — a roof having a minimum finished fall of 1:80
- zero fall roof — a roof having a minimum finished fall between 0 and 1:80
- pitched roof — a roof having a fall in excess of 1:6
- limited access roof — a roof subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc
- pedestrian access roof — a roof subjected to increased access to that defined for a limited access roof, but not open to vehicular traffic.

Product assessment – key factors

The systems were assessed for the following key factors, and the outcome of the assessments is shown below. Conclusions relating to the Building Regulations apply to the whole of the UK unless otherwise stated.

1 Mechanical resistance and stability

Data were assessed for the following characteristic.

1.1 Strength and stability

1.1.1 The insulation boards were tested for compressive strength and the results are given in Table 3.

Table 3 Compressive stress at 10% deformation

Product assessed	Assessment method	Requirement	Result
DANOPREN TR	BS EN 826 : 2013	Declared value CS(10)300 ≥ 300 kPa	Pass
DANOPREN 500		Declared value CS(10)500 ≥ 500 kPa	Pass

1.1.2 On the basis of data assessed, the systems have adequate resistance to the loads associated with light maintenance traffic on roofs, and to pedestrian foot traffic on roof terraces.

1.1.3 If loads in excess of those defined in section 1.1.2 are anticipated, such as the installation of heavy equipment, the ability of the systems to sustain such loads must be assessed by a suitably experienced and competent individual. The use of the systems under these circumstances is outside the scope of the Certificate.

2 Safety in case of fire

Data were assessed for the following characteristics.

2.1 External fire spread

The resistance to fire exposure of a built-up roofing system will be dependent on the fire performance of the combined individual components and cannot be predicted from the classification of the insulation alone. The classification and permissible areas of use of a specific roof system must be confirmed by reference to the requirements of the documents supporting the national Building Regulations.

2.2 Reaction to fire

2.2.1 The insulation boards were tested for reaction to fire and the classification is given in Table 4.

Table 4 Reaction to fire classification

Product assessed	Assessment method	Requirement	Result[(1)]
DANOPREN TR DANOPREN 500	UNE-EN 13501-1 : 2019	Value achieved	E

(1) AFITI-LICOF, classification report reference 4461T22-2, 08/09/2022. Copies available from the Certificate holder on request.

2.2.2 When ballasted with a minimum 50 mm depth of aggregate (≥ 80 kg·m^{-2} and 4-32 mm aggregate size), sand/cement screed to a thickness of at least 30 mm or fully supported cast stone or mineral slabs of at least 40 mm thickness, a roof will be unrestricted with regard to proximity to a relevant boundary by the documents supporting the national Building Regulations.

2.3 Resistance to fire

Where the roof forms a junction with a compartment wall, the junction must maintain the required period of fire resistance.

3 Hygiene, health and the environment

Data were assessed for the following characteristics.

3.1 Water vapour permeability

3.1.1 The systems were assessed for water vapour resistivity/resistance and the results are given in Table 5.

Table 5 Water vapour resistivity/resistance

Product assessed	Assessment method	Requirement	Result
DANOPREN TR DANOPREN 500	BS EN ISO 10456 : 2007	Declared value	750 MN·s·g^{-1}·m^{-1}
DANOFLOW	BS EN ISO 12572 : 2001 Condition C	Value achieved	0.1 MN·s·g^{-1}

3.1.2 For the purposes of assessing the risk of condensation, the water vapour resistivity/resistance values may be taken as stated in Table 5.

3.2 Resistance to moisture

3.2.1 The insulation boards were tested for long term water absorption by diffusion and the results are given in Table 6.

Table 6 Long term water absorption by diffusion

Product assessed	Assessment method	Requirement	Result
DANOPREN TR	Long term water absorption by diffusion (% by volume) to BS EN 12088 : 2013	Value achieved	0.876%
	Additional water absorption after freeze thaw (% by volume) to BS EN 12091 : 2013		0.8795%
DANOPREN 500	Long term water absorption by diffusion (% by volume) to BS EN 12088 : 2013	Value achieved	1.142%
	Additional water absorption after freeze thaw (% by volume) to BS EN 12091 : 2013		0.2837%

3.2.2 The water absorption results in Table 6 are used to determine the design thermal conductivity value (λ_U) as given in Table 8.

3.3 Weathertightness

The water-flow-reducing layer was tested for watertightness and the result is given in Table 7.

Table 7 Watertightness

Product assessed	Assessment method	Requirement	Result
DANOFLOW	BS EN 1928 : 2000 and BS EN 13859-1 : 2010	Declared value Class W1	Pass

4 Safety and accessibility in use

Not applicable.

5 Protection against noise

Not applicable.

6 Energy economy and heat retention

Data were assessed for the following characteristics.

6.1 Thermal conductivity

The insulation boards were tested for thermal conductivity and the results are given in Table 8.

Table 8 Thermal conductivity

Product assessed	Insulation thickness	Assessment method	Requirement	Result
DANOPREN TR DANOPREN 500	40 to 60 mm	BS EN 13164 : 2012 and BS EN ISO 10456 : 2007	Design value(1) (moisture corrected) (λ_U)	0.035 $W \cdot m^{-1} \cdot K^{-1}$
	70 to 80 mm			0.036 $W \cdot m^{-1} \cdot K^{-1}$
	90 to 100 mm			0.037 $W \cdot m^{-1} \cdot K^{-1}$

(1) The design thermal conductivity value (λ_U) for the insulation is calculated using the water absorption results in Table 6, the declared dry thermal conductivity (λ_D) of 0.033 $W \cdot m^{-1} \cdot K^{-1}$ (40 to 60 mm), 0.034 $W \cdot m^{-1} \cdot K^{-1}$ (70 to 80 mm) or 0.035 $W \cdot m^{-1} \cdot K^{-1}$ (90 to 100 mm), and a moisture conversion coefficient f_ψ of 2.5.

6.2 Conservation of fuel and power

6.2.1 Using the design thermal conductivity values (λ_U) given in Table 8 and the requirement for precipitation and drainage from section 6.2.2, an example U value calculation has been carried out as shown in Table 9.

6.2.2 Rainfall reaching the roof waterproofing membrane will temporarily affect the rate of heat loss from the roof and should be accounted for by adding a correction (ΔU_r) to the calculated roof U value in accordance with Annex F.4 of BS EN ISO 6946 : 2017, as follows (see also BBA Information Sheet No 4):

$\Delta U_r = pf\chi (R_1/R_T)^2$ where:

ΔU_r = correction to the calculated thermal transmittance of the roof element ($W \cdot m^{-2} \cdot K^{-1}$)
p = average rate of precipitation during the heating season ($mm \cdot day^{-1}$)
f = drainage factor giving the fraction of p reaching the waterproofing membrane
χ = factor for increased heat loss caused by rainwater flowing on the membrane (0.04 $W \cdot day \cdot m^{-2} \cdot K^{-1} \cdot mm^{-1}$)
R_1 = thermal resistance of the layer of insulation above the waterproofing membrane ($m^2 \cdot K \cdot W^{-1}$)
R_T = total thermal resistance of the construction before application of the correction ($m^2 \cdot K \cdot W^{-1}$)
$f\chi$ = 0.005 (drainage correction for the system incorporating the DANOFLOW water-flow-reducing layer).

6.2.3 The U value of a completed roof will depend on the insulation thickness, the type of substrate and its internal finish. Example U values are given in Table 9.

Table 9 Example U values[1]

Target U value ($W \cdot m^{-2} \cdot K^{-1}$)	DANOPREN TR and DANOPREN 500 Insulation Boards thickness required[2] (mm)	
	p[3] = 3 ($mm \cdot day^{-1}$)	p[3] = 8 ($mm \cdot day^{-1}$)
0.09	–[4]	–[4]
0.11	–[4]	–[4]
0.12	–[4]	–[4]
0.13	100 + 100 + 100	–[4]
0.15	100 + 80 + 80	–[4]
0.16	80 + 80 + 80	100 + 100 + 80
0.18	80 + 60 + 60	80 + 80 + 80
0.20	60 + 60 + 60	80 + 80 + 50

(1) Inverted roof construction: paving or gravel ballast layer; water-flow-reducing layer; DANOPREN TR/DANOPREN 500 insulation; 10 mm bitumen waterproofing layer (λ = 0.23 $W \cdot m^{-1} \cdot K^{-1}$); 200 mm reinforced concrete deck (λ = 2.5 $W \cdot m^{-1} \cdot K^{-1}$); 3 mm plaster skim ($\lambda$ = 0.4 $W \cdot m^{-1} \cdot K^{-1}$).
(2) Thinnest available insulation thickness or thickness combination to achieve the required U value. Thickest boards as bottom layer when multi-layer used.
(3) Values for p taken as examples of best to worst case for all UK locations, with a $f\chi$ value of 0.005 $W \cdot day \cdot m^{-2} \cdot K^{-1} \cdot mm^{-1}$.
(4) See section 6.2.5.

6.2.4 On the basis of data assessed, the systems can contribute towards a construction satisfying the national Building Regulations in respect of energy economy and heat retention.

6.2.5 For improved energy or carbon savings, designers must consider appropriate fabric/service measures.

7 Sustainable use of natural resources

Not applicable.

8 Durability

8.1 The potential mechanisms for degradation and the known performance characteristics of the materials in these systems were assessed.

8.2 Specific test data were assessed as given in Table 10.

Table 10 Durability

Product assessed	Assessment method	Requirement	Result
DANOPREN TR DANOPREN 500	Dimensional stability to BS EN 1604 : 2013 (70°C for 48 hours)	Length, width and reduction in thickness ≤ 5% change	Pass
	Compressive strength to BS EN 826 : 2013 after long term water absorption by diffusion and freeze thaw resistance to BS EN 12088 : 2013 and BS EN 12091 : 2013	Reduction in compressive stress at 10% deformation of redried specimens after freeze thaw test ≤ 10%	Pass

8.3 Service life

Under normal service conditions, the systems will have a life in excess of 25 years, provided they are designed, installed and maintained in accordance with this Certificate and the Certificate holder's instructions.

PROCESS ASSESSMENT

Information provided by the Certificate holder was assessed for the following factors:

9 Design, installation, workmanship and maintenance

9.1 Design

9.1.1 The design process was assessed, and the following requirements apply in order to satisfy the performance assessed in this Certificate.

9.1.2 Concrete, metal or timber roofs must be designed in accordance with the relevant provisions of BS 6229 : 2018, BS 8217 : 2005 and BS 8218 : 1998, in particular to accommodate the weight of the ballast layer.

9.1.3 Imposed loads, dead loading and wind loads must be calculated by a suitably experienced and competent individual in accordance with the principles of BS EN 1991-1-1 : 2002, BS EN 1991-1-3 : 2003 and BS EN 1991-1-4 : 2005, and their UK National Annexes.

9.1.4 Separation or cushion layers between the insulation boards and the roof waterproofing may be needed in some circumstances (see section 9.1.11).

9.1.5 Care must be taken to ensure that upgraded roofs are capable of carrying the increased load and depth of the installed systems. The structural strength and deformation of both the roof structure and the inverted roof insulation panels must be assessed by a suitably experienced and competent individual, to resist actions due to the combination of the dead load imposed by the paving and gravel ballast finish, and the imposed load from foot traffic and snow and the possible weight of rainwater should the roof outlet(s) become blocked.

9.1.6 Decks must be covered with one or more of the following roof waterproofing specifications:

- built-up specifications using reinforced bitumen membranes to BS 8747 : 2007 in accordance with the recommendations of Table 5, and installed to the relevant clauses of BS 8217 : 2005
- mastic asphalt laid in accordance with BS 8218 : 1998
- other waterproofing systems which are the subject of a current BBA Certificate, and laid in accordance with, and within the limitations imposed by, that Certificate.

9.1.7 It is essential that roof falls and drainage paths are correctly designed to avoid ponding (and the subsequent risk of silt build-up) and stresses in freezing conditions, and to reduce water entry in the event of a failure in the waterproofing layer.

9.1.8 The roof must be designed with adequate falls unless the roof waterproofing system has been specifically designed and covered by a valid BBA Certificate for use in a zero fall application. For zero fall roofs it is particularly important to identify the correct drainage points, to ensure that drainage is sufficient and effective. Reference must be made to the appropriate clauses of the LRWA Guidance Note No. 7 : 2012 *Specifier Guidance for Flat Roof Falls*, which generally requires surface drainage falls in most situations.

9.1.9 Dual-level roof drainage must be provided in accordance with BS 6229 : 2018 and BS EN 12056-3 : 2000 to drain water off at the level of the DANOFLOW water-flow-reducing layer and also at the level of the roof waterproofing.

9.1.10 Drainage points must be located at the lowest point of the roof, to facilitate the effective removal of rainwater. Care is needed to identify these locations. For example, precast concrete decks will deflect between spans, and mid-span may be the lowest point of the roof rather than roof edges or column supports.

9.1.11 Where there is a risk from plasticiser migration or other contaminants from the roof waterproofing (such as PVC single-ply membranes), a suitable plastic fibre or similar isolating sheet must be interposed between the roof waterproofing and the insulation boards. For loose laid single-layer roof waterproofing membranes, a cushion layer must be interposed.

9.1.12 The DANOFLOW water-flow-reducing layer must be installed above the insulation boards, with minimum 300 mm laps and covered with a gravel ballast or paving finish.

9.1.13 The ballasted roof finish may be either gravel ballast or paving, which must be assessed by a suitably experienced and competent individual according to region exposure and building height. In addition, the dead load imposed by the finish must be allowed for in calculating the total acceptable load on the deck. Care must be taken to ensure that upgraded roofs are capable of carrying the increased load and depth of the installed systems. Ballast must not be stacked in one place on the roof unless the roof is capable of supporting it.

9.1.14 Gravel ballast must be washed, rounded and 16 to 32 mm in size (nominal), and laid to a minimum thickness of 50 mm. The minimum size of ballast depends on the wind loads and parapet height to prevent wind scour of the ballast. The ballast must be installed in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex.

9.1.15 Paving finish ballast must comprise a minimum 40 mm thickness of cast stone, mineral or pressed concrete paving slabs. Paving slabs can be either laid fully supported or may be supported using proprietary support/spacer pads, in accordance with the Certificate holder's recommendations.

9.1.16 Calculations of the thermal transmittance (U value) of a specific roof construction must be carried out in accordance with BS EN ISO 6946 : 2017 and BRE Report BR 443 : 2019, using the design thermal conductivity value (λ_U) given in Table 8.

9.1.17 Care must be taken in the overall design and construction of junctions with other elements and openings to minimise thermal bridges and air infiltration. Detailed guidance can be found in the documents supporting the national Building Regulations.

9.1.18 Roofs will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2021. Further guidance may be obtained from BRE Report BR 262 : 2002.

9.1.19 In England and Wales, roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 0.35 $W \cdot m^{-2} \cdot K^{-1}$ at any point and the junctions with walls are designed in accordance with section 9.1.17 of this Certificate.

9.1.20 In Scotland, roofs will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2021. Further guidance may be obtained from BRE Report BR 262 : 2002 and section 9.1.17 of this Certificate.

9.2 Installation

9.2.1 Installation instructions provided by the Certificate holder were assessed and judged to be appropriate and adequate.

9.2.2 Installation must be carried out in accordance with this Certificate and the Certificate holder's instructions. A summary of instructions and guidance is provided in Annex A.

9.2.3 It is essential to establish that the roof waterproofing has been installed correctly and that it is weathertight, clean and free from any extraneous matter. Every joint between sheets, flashing and other details must be checked to ensure that the roof covering is suitable for an inverted roof specification.

9.2.4 The insulation boards are laid in a brick bond pattern; it is essential that all joints between the boards are tight and that no gaps exist where they meet rooflights, edge details and other services which perforate the roof deck.

9.2.5 The insulation boards can be installed as a single layer, or multi-layer (double or triple layers) to suit the requirements for a particular installation. When using multiple layers, the insulation board joints must be staggered/offset. The Certificate holder must be contacted for further advice on multi-layering, but such advice is outside the scope of this Certificate.

9.2.6 When the systems are to be placed over a loose-laid roof covering, they must be installed and ballasted as soon as possible to protect the covering from the effects of wind uplift (see sections 9.1.12 to 9.1.15) and installers must take care not to damage the existing roof waterproofing.

9.2.7 The ballast loading layer must be installed in accordance with BS 6399-2 : 1997, BS EN 1991-1-4 : 2005, BRE Digest 295 : 1985 and BRE Digest 311 : 1986.

9.2.8 The ballast loading layer must be applied as work progresses to protect the insulation and the DANOFLOW water-flow-reducing layer from the effects of wind uplift, solar degradation and foot traffic.

9.2.9 In existing roofs, the existing roofing and substructure must be examined for degradation and, where necessary, repairs effected. Particular consideration must be given to the condensation risk that the existing roof structure may present.

9.3 Workmanship

Practicability of installation was assessed by the BBA, on the basis of the Certificate holder's information. To achieve the performance described in this Certificate, installation of the systems must be carried out by a competent general builder, or a contractor, experienced with these types of systems.

9.4 Maintenance and repair

9.4.1 Ongoing satisfactory performance of the systems in use requires that they are suitably maintained. The guidance provided by the Certificate holder was assessed and found to be appropriate and adequate.

9.4.2 The following requirements apply in order to satisfy the performance assessed in this Certificate.

9.4.3 The systems are confined and have suitable durability and so do not require maintenance.

9.4.4 The other components of the roofing system must be maintained in accordance with conventional good practice, including annual removal of any plants (in the case of gravel/paving finish), cleaning/checking of water outlets and gutters if necessary and checking that the gravel ballast is still in place and not interfering with or blocking gullies or outlets. Any displaced ballast, for example by wind scouring, must be promptly returned to its original state.

9.4.5 The use of chemicals (eg weed killers) must be checked for compatibility with the insulation, DANOFLOW water-flow-reducing layer and the deck waterproofing layer. The Certificate holder can advise on the suitability of a particular material; however, such advice and products are outside the scope of this Certificate.

10 Manufacture

10.1 The production processes for the systems have been assessed, and provide assurance that the quality controls are satisfactory according to the following factors:

10.1.1 The manufacturer has provided documented information on the materials, processes, testing and control factors.

10.1.2 The quality control operated over batches of incoming materials has been assessed and deemed appropriate and adequate.

10.1.3 The quality control procedures and product testing to be undertaken have been assessed and deemed appropriate and adequate.

10.1.4 The process for management of non-conformities has been assessed and deemed appropriate and adequate.

10.1.5 An audit of each production location was undertaken, and it was confirmed that the production process was in accordance with the documented process, and that equipment has been properly tested and calibrated.

† 10.2 The BBA has undertaken to review 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.

11 Delivery and site handling

11.1 The Certificate holder stated that the DANOPREN TR and DANOPREN 500 insulation boards are delivered to site in polythene shrink-wrapped packs incorporating a label with the product name and characteristics, batch number, date of manufacturing, CE-marking information, the Certificate holder's name and the BBA logo incorporating the number of this Certificate.

11.2 Rolls of the DANOFLOW water-flow-reducing layer are delivered to site in packages that carry a label bearing the marketing company's name, the grade identification and the BBA logo incorporating the number of this Certificate

11.3 Delivery and site handing must be performed in accordance with the Certificate holder's instructions and this Certificate, including:

11.3.1 The boards must be stored flat, off the ground on a clean, level surface, and under cover or protected with opaque polythene, to protect them from high winds and prolonged exposure to sunlight. Where possible, packs should be stored inside. If outside, the boards must be raised above ground level.

11.3.2 Care must be exercised to avoid crushing the edges or corners. If damaged, the boards must be discarded.

11.3.3 The boards must not be exposed to open flame or other ignition sources, or to solvents or other chemicals.

11.3.4 Rolls of DANOFLOW must be stored flat on their sides, on a smooth, clean, dry surface, under cover and protected from sunlight.

†ANNEX A – SUPPLEMENTARY INFORMATION

Supporting information in this Annex is relevant to the systems but has not formed part of the material assessed for the 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.

CE marking

The Certificate holder has taken the responsibility of CE marking the DANOPREN TR and DANOPREN 500 insulation boards in accordance with harmonised European Standard EN 13164 : 2012.

Management Systems Certification for production

The management system of the manufacturer has been assessed and registered as meeting the requirements of ISO 9001 : 2015 and ISO 14001 : 2015 by Bureau Veritas (Certificates ES139363-1 and ES144052-1 respectively).

Additional information on installation

General

A.1 The insulation boards can be cut using a fine-toothed saw, sharp knife or a hot wire cutter.

A.2 The insulation boards may be installed in any weather but, due to their size, care is required in high winds. Installers must not carry them near to parapets or apertures in the deck and, once placed, they must be covered with the DANOFLOW water-flow-reducing layer and ballasted as soon as possible.

Upgrading roofs

A.3 Where parapets, details and services have insufficient height to accommodate the increased depth of insulation/protection, a minimum of 150 mm from the top of the gravel to the top of the skirtings must be provided.

A.4 If upgrading involves laying the systems on existing inverted roof insulation, the advice of the Certificate holder must be sought, but such advice is outside the scope of this Certificate.

A.5 Rainwater outlets may need to be modified or replaced to suit, eg by the installation of gravel guards.

Procedure

A.6 Single-layer roofing must be the subject of very close scrutiny, and the inspection must include an examination for perforation and for the likelihood of subsequent perforation from beneath (by, for example, uneven decks and protruding nail heads).

A.7 The DANOFLOW water-flow-reducing layer must be loose-laid over the insulation, at right angles to the slope, with 300 mm unsealed lap joints overlapping in the downward direction of the flat roof slope. At upstands and penetrations, the DANOFLOW water-flow-reducing layer must be turned up to finish above the surface of the ballast layer (protected by a cover flashing) and turned down at drainage outlets.

A.8 The ballast layer (comprising either a gravel ballast or paving slabs) must then be laid over the DANOFLOW water-flow-reducing layer as soon as possible, to prevent flotation, wind uplift, UV degradation and damage from foot traffic.

Gravel ballast finish

A.9 The gravel ballast layer must be carefully placed directly over the DANOFLOW water-flow-reducing layer to ensure complete depth and cover is achieved over the entire surface of the insulation boards.

A.10 Gravel must not contain excessive fines in order to prevent clogging of gullies and outlets and to discourage organic growth.

Paving slab finish

A.11 Standard pressed concrete, cast stone or mineral paving slabs of at least 40 mm thickness (see section 9.1.15) must be carefully placed directly over the DANOFLOW water-flow-reducing layer to ensure complete cover is achieved over the entire surface of the insulation boards. Paving slabs can either be laid fully supported, or may be supported using proprietary support/spacer pads.

A.12 Typical construction details are given in Figures 2 to 6:

Figure 2 Typical installation detail — gravel ballast finish

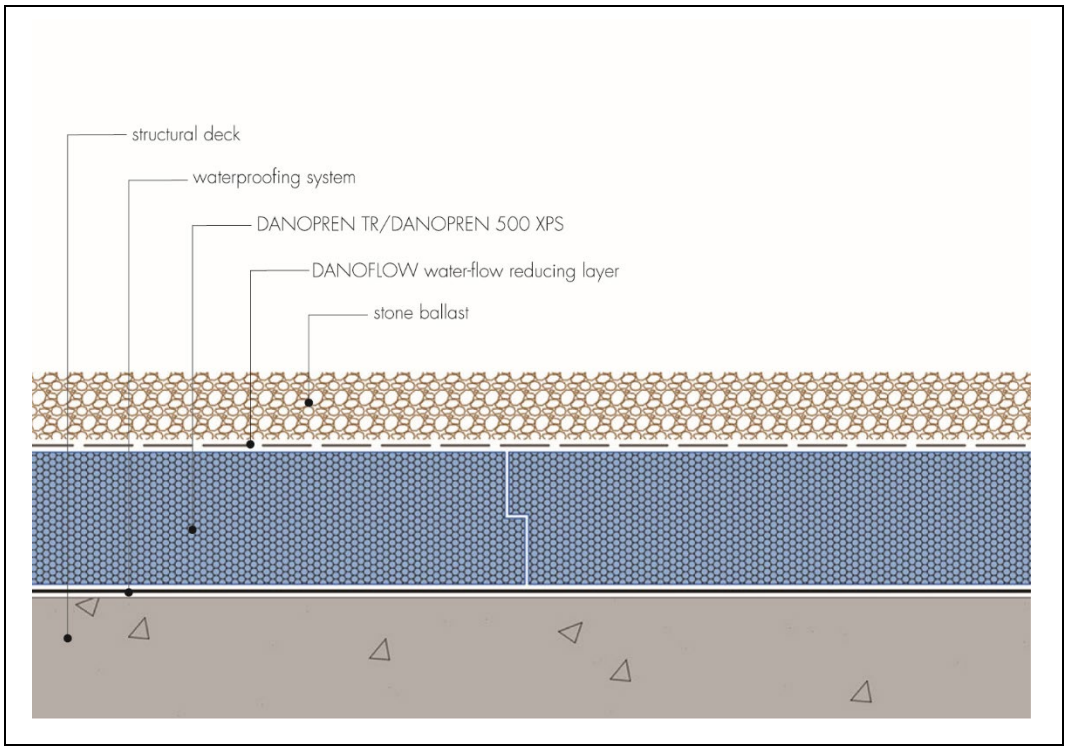


Figure 3 Typical installation detail — paving ballast finish

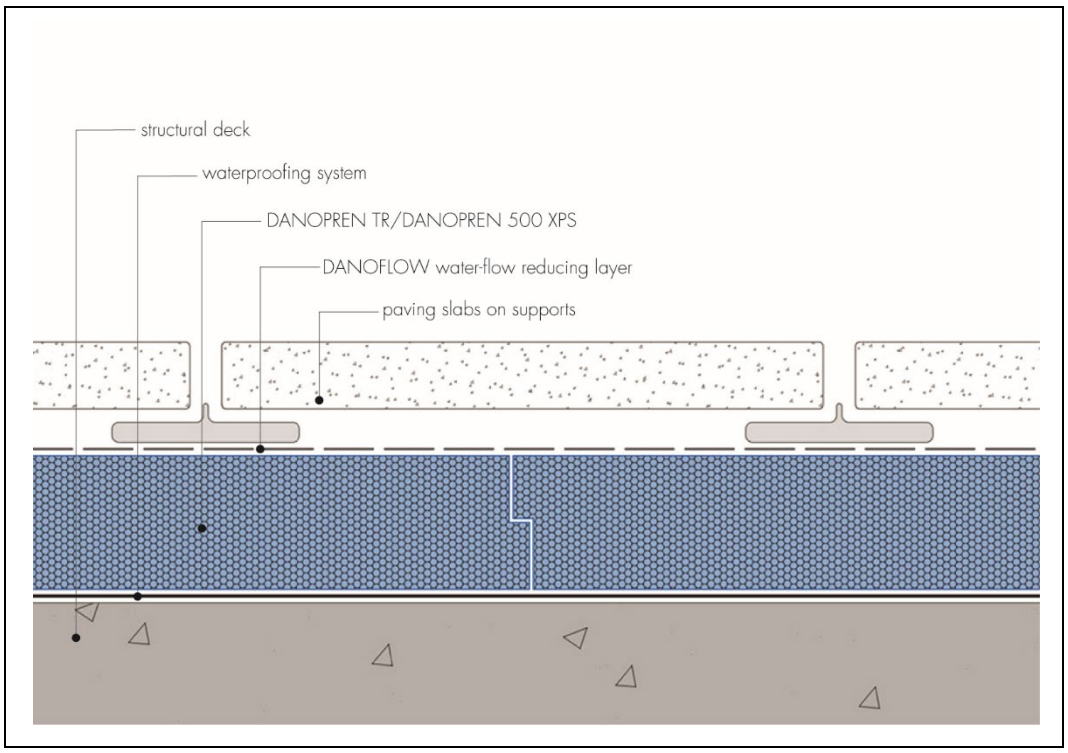


Figure 4 Water outlet detail – gravel ballast finish

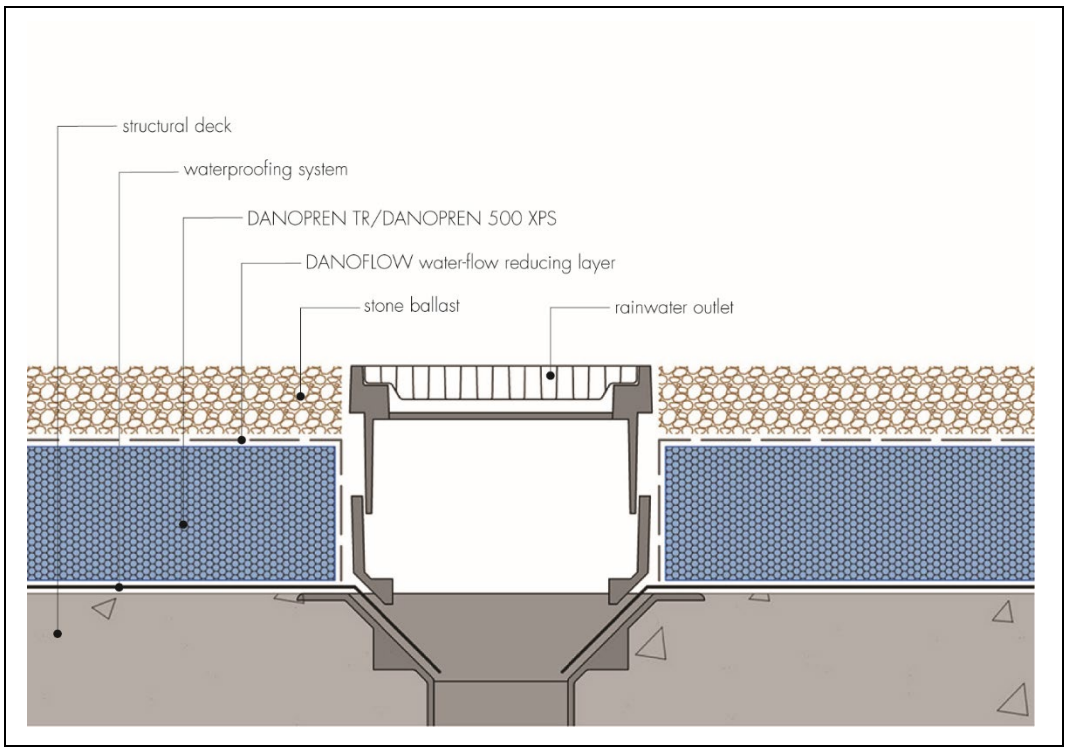


Figure 5 Water outlet detail – paving ballast finish

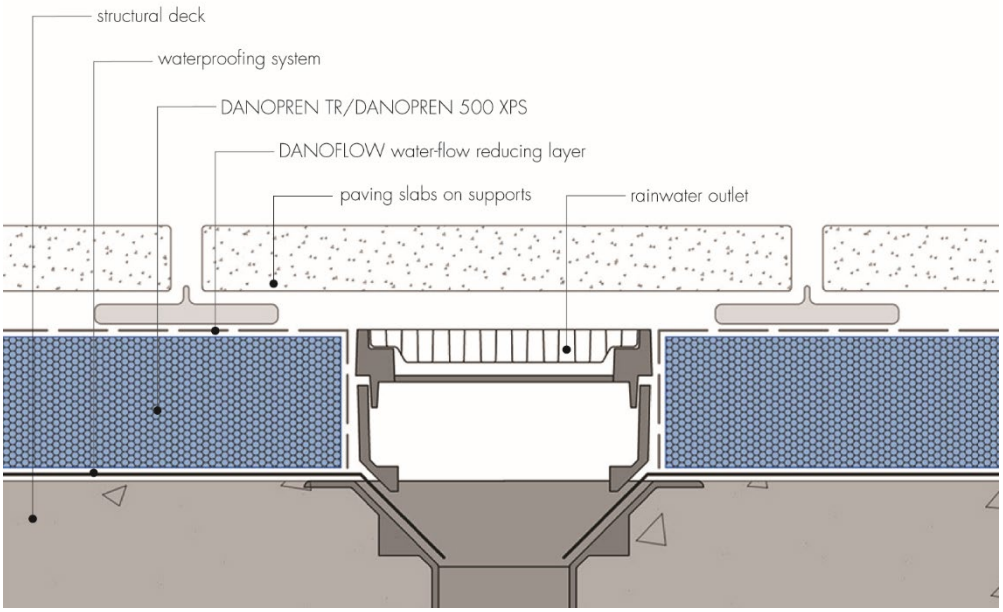
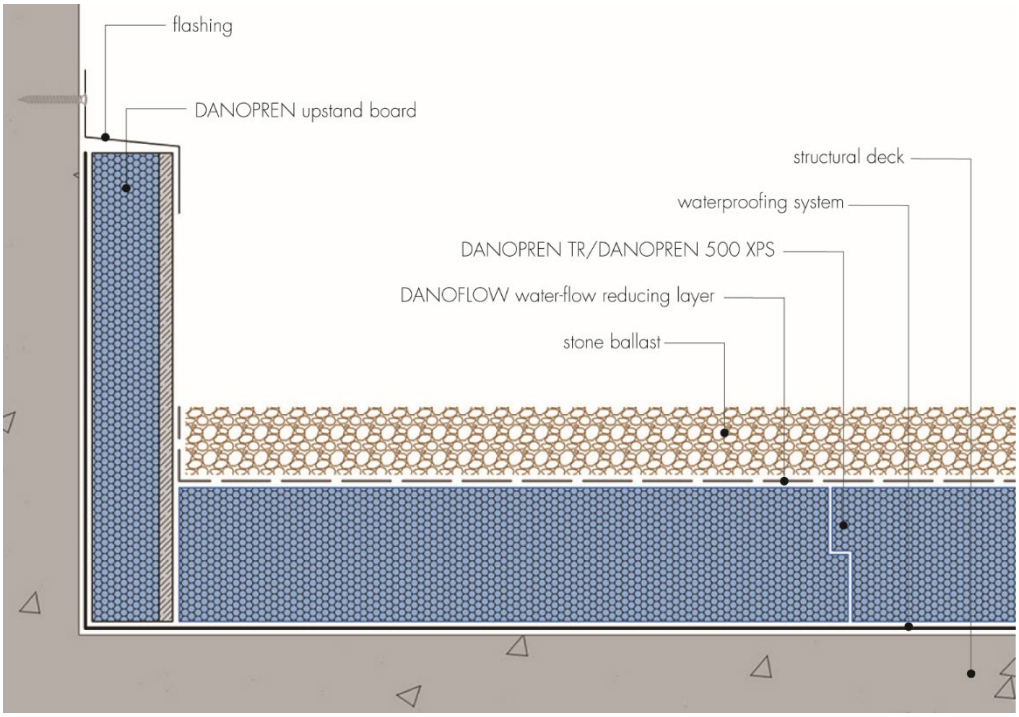


Figure 6 Typical upstand detail – gravel ballast finish



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Conditions

1 This Certificate:

- relates only to the systems that are 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
- 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
- and any matter arising out of or in connection with it or its subject matter (including non-contractual disputes or claims) is governed by and construed in accordance with the law of England and Wales.
- the courts of England and Wales shall have exclusive jurisdiction to settle any matter arising out of or in connection with this Certificate or its subject matter (including non-contractual disputes or claims).

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.

3 This Certificate will be displayed on the BBA website, and the Certificate Holder is entitled to use the Certificate and Certificate logo, provided that the systems and their 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.

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

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 systems or any other product
- the right of the Certificate holder to manufacture, supply, install, maintain or market the systems
- actual installations of the systems, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the systems are installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the systems, including their manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to UKCA marking and CE marking.

6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of these systems which is contained or referred to in this Certificate is the minimum required to be met when the systems are 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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