Agrément Certificate 2000/277

The master copy of this document appears on the website: http://www.agrement.co.za

Validity

Users of any Agrément certificate should check its status: all currently valid certificates are listed on the website. In addition, check whether the certificate is Active or Inactive.

The certificate holder is in possession of a confirmation certificate attesting to his status.

Subject:
Isoboard® Inverted Roof Insulation

Certificate holder:
Isofoam South Africa (Pty) Ltd

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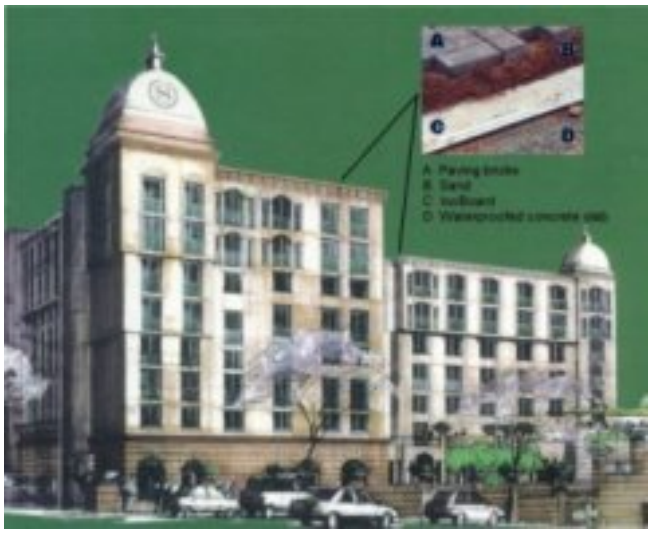

Quick guide

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Use

The certificate covers Isoboard® Inverted Roof Insulation as a thermally insulating layer, overlaid with water-permeable filter fabric and ballast, when applied on suitably designed and waterproofed flat concrete roofs to which there is limited access, in inverted roof (protected membrane) systems.

This certificate and Agrément South Africa's assessment apply only to Isoboard® Inverted Roof Insulation that is manufactured and installed as described and illustrated in this certificate and where the terms and conditions of certification are complied with.

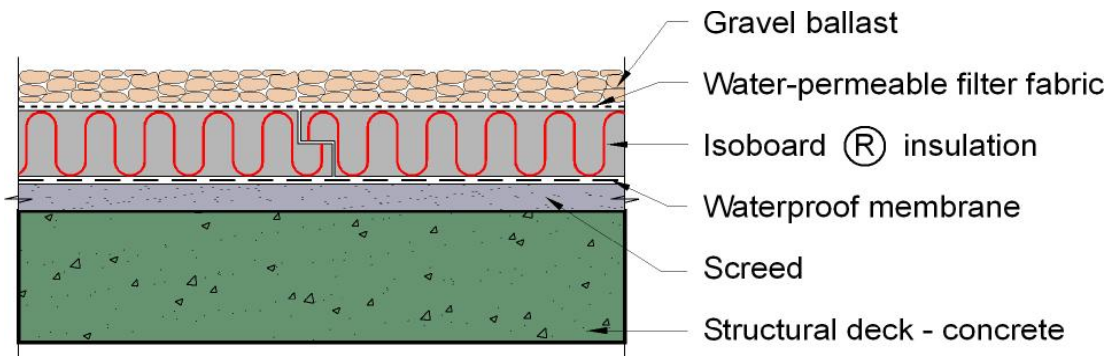
General description

Isoboard® Inverted Roof Insulation comprises an extruded-polystyrene rigid-foam board which is:

- white or pigmented blue
- 600 mm wide with the edges of the board profiled for shiplapping, manufactured in standard thicknesses of 30, 40 and 50 mm, in standard lengths of 1250 mm or 2500 mm.

On request, 60 and 70 mm thick boards can be manufactured.

The product is delivered to building sites in translucent plastic packaging.



Cross-section through typical inverted roof system

CONTENTS

PREAMBLE

This certificate is issued by Agrément South Africa in terms of the powers granted to it by the Minister of Public Works. This certificate:

- has been granted after a technical appraisal of the performance of the Isoboard® Inverted Roof Insulation for the uses covered by the certificate
- is independent of any patent rights that may or may not subsist in the subject of the certificate
- does not relieve the certificate holder from the obligation to obtain the prior approval of the building authority concerned for the use of the subject.

Agrément South Africa considers that the quality and performance of the Isoboard® Inverted Roof Insulation will be satisfactory provided that the requirements stipulated in this certificate are adhered to. However, Agrément South Africa does not on behalf of itself, or the State, or any of its employees or agents, guarantee such quality or performance.

Responsibility for compliance with the requirements of this certificate and the quality of the finished products resides with the certificate holder.

No action for damages, or any other claim whatsoever lies against Agrément South Africa, its members, the State or any of its employees should the said components and materials fail to comply with the standard set out in this certificate.

Building authorities or users who are in any doubt about any detail or variation, should contact Agrément South Africa.

Republic of South Africa. *National Building Regulations*, Government Notice No R. 2378, Government Gazette No 12780, Pretoria, South Africa, 12 October 1990.

The validity of this certificate is reviewed every three years. The certificate shall remain valid as long as Agrément South Africa is satisfied that:

- the certificate holder complies with the general and specific conditions of certification and the technical requirements stipulated in the certificate
- the performance-in-use of the subject is acceptable
- any changes in building legislation, regulations, relevant standards or Agrément performance criteria have not invalidated the technical assessment which formed the basis of certification.

Agrément South Africa reserves the right to withdraw the certificate at any time, should reasonable cause exist.

Notices affecting the validity of this certificate will be published in the Government Gazette.

PART 1: CONDITIONS OF CERTIFICATION

Isoboard® Inverted Roof Insulation described in this certificate must:

- be manufactured and supplied by the certificate holder or a licensee
- be installed in accordance with Part 3 and the certificate holder's installation manual
- comply with the conditions of certification.

Any changes to the production process, or the material formulation, or the method of installation could result in various aspects of the performance of this product no longer complying with Agrément criteria. Any change not authorised by Agrément South Africa in writing prior to its implementation will invalidate this certificate, and the certificate can then not be used to demonstrate compliance with the National Building Regulations.

Licensee - any person or company appointed by the certificate holder and registered with Agrément South Africa to manufacture and supply Isoboard® Inverted Roof Insulation in accordance with this certificate and authorised by him to claim compliance with the certificate. It is the certificate holder's responsibility to ensure that the licensee manufactures and supplies the product in compliance with this certificate and in accordance with the approved quality system.

Isoboard® Inverted Roof Insulation

Tested and approved fit for purpose for use as inverted roof insulation when used as specified in

CERTIFICATE 2000/277

AGRÉMENT SOUTH AFRICA
innovative construction product assessments

General conditions

Marking

The product packaging must be suitably marked with Agrément South Africa's emblem together with the number of this certificate.

Validity

The continued validity of this certificate is subject to a satisfactory review by Agrément South Africa every three years.

Quality monitoring

The certificate holder is required to participate in Agrément South Africa's post-certification quality management scheme, which requires:

- that the certificate holder shall continue to implement and manage the quality management system approved by Agrément South Africa during the assessment of Isoboard® Inverted Roof Insulation
- the co-operation of the certificate holder in facilitating post-certification quality monitoring by Agrément South Africa or its authorised agents.

Design requirements

A competent person must be responsible for the hydraulic design of inverted roof systems, the structural design of new roofs and checking the structural adequacy of existing roofs to take the weight of the ballast.

Reappraisal

- must be requested by the certificate holder before making changes to the product
- will be required by Agrément South Africa if there are changes to the National Building Regulations or to Agrément criteria

This certificate may be withdrawn if the certificate holder or a registered licensee fails to comply with these requirements, in which case it cannot be used to demonstrate compliance with the National Building Regulations.

On behalf of the Board of Agrément South Africa

Chairman
12 April 2000

PART 2: ASSESSMENT

Scope of assessment

The conventional aspects of the construction are subject to the rules of good building practice (typically as described and illustrated in Agrément South Africa's *Supplement to certificates* and in the *Home building manual Parts 1, 2 & 3* issued by the National Home Builders Registration Council), and must comply with the National Building Regulations.

This assessment applies to those innovative aspects of Isoboard® Inverted Roof Insulation as described in Part 3 of the certificate. It also applies to those conventional aspects of the product which, in the opinion of Agrément South Africa, are influenced by the innovative aspects.

The innovative aspects are:

- the edges of each board lap over the edges of the adjacent boards to provide a continuous layer of insulation
- the insulation is installed on top of weatherproofing
- the system is not affected by water
- the insulation is held down and protected by a layer of paving slabs or gravel ballast.

This assessment is based on:

- documentation provided by the client
- inspections of the applicant's factory and completed installations
- known behaviour of the materials used in the product
- the certificate holder's quality management system.

Cognizance has also been taken of the work done by the British Board of Agrément for the certification of similar products.

Assessment

In the opinion of Agrément South Africa, Isoboard® Inverted Roof Insulation as described in the certificate is suitable for the construction of roof insulation as specified (see page1).

The performance in use of Isoboard® Inverted Roof Insulation will be such that the product will satisfy:

- the relevant requirements for safety and health prescribed by Agrément South Africa
- where stated in Table 1, the requirements of the National Building Regulations.

Agrément South Africa's detailed comments on the various aspects are set out in Tables 1 and 2 below. Each aspect of performance was assessed by experts in that field.

Compliance with National Building Regulations

The innovative aspects of the Isoboard® Inverted Roof Insulation relate to the National Building Regulations as set out in Table 1. Any regulation not specifically referred to is considered to be outside the scope of this certificate and must be applied by the local authority in the normal manner.

Table 1: Compliance with the National Building Regulations

Aspects of performance	Opinion of Agrément South Africa	Compliance with the National Building Regulations
Materials	The quality and suitability of the materials are satisfactory.	The materials used in Isoboard® Inverted Roof Insulation are deemed to satisfy the requirements of regulation A13 (1) (a): Administration.

Table 2: Assessment

Aspects of performance	Opinion of Agrément South Africa	Explanatory notes
Effect of Isoboard® on waterproofing membranes	Satisfactory.	Isoboard® will not improve the impermeability of waterproofing membranes, nor will it cure membrane failure on existing roofs. If installed properly, Isoboard® Inverted Roof Insulation will extend the life of new and existing waterproofing membranes by protecting them from: • high temperatures caused by solar radiation • temperature cycling • degradation caused by ultra-violet light • mechanical damage • damage caused by interstitial condensation. Isoboard® can readily be lifted to facilitate membrane inspection and maintenance.
Thermal performance	Satisfactory.	Isoboard® is effective as an inverted roof insulating material. The conductivity of Isoboard® will increase over a period of years. The increase in conductivity results from: • migration of gases • absorption of water as a result of: o submersion in water o water vapour diffusion o freeze-thaw cycling. The U values for various thickness of insulation applied over a typical 150 mm thick concrete roof slab are shown in Table 4.
Condensation	Satisfactory. Interstitial condensation will not be a problem with insulated concrete roof slabs.	Warm water trapped under boards is likely to be replaced by colder water during periods of rain. During heavy or continuous rainfall, roof waterproofing and the concrete roof slab will be cooled. Should condensation occur on the underside of roofs as a result of this cooling, it would be short term, disappearing when rain stops.

Table 2: Assessment (continued)

Aspects of performance	Opinion of Agrément South Africa	Explanatory notes
Durability	Satisfactory. When stored and installed in accordance with the requirements set out in Part 3, Isoboard® will have a life of at least 20 years.	Isoboard® is rot-proof, offers no food value to vermin and will not support mould or fungal growth.
Resistance to flotation of Isoboard®	Satisfactory.	Isoboard® is covered with either gravel ballast or concrete paving slabs as detailed in Table 5 to prevent boards floating, should ponding occur during rain.
Resistance to wind uplift	Satisfactory.	Isoboard® is covered with either gravel ballast or concrete paving slabs as detailed in Tables 6 and 7 to prevent boards being lifted by wind.
Behavior in fire	Satisfactory. SANS 10177: *Fire testing of materials, components and elements used in buildings*	Isoboard® is considered to be combustible in terms of SANS 10177: Part V. Once it has been covered with gravel ballast or paving slabs, however, the fire performance of Isoboard® is acceptable.
Resistance of Isoboard® to foot traffic	Satisfactory.	Where regular foot traffic is envisaged, for example, access to lift motor-rooms, walkways of concrete paving slabs are provided. Where traffic cannot be controlled, paving slabs are used throughout. These paving slabs must be bedded on a 20 mm thick layer of 4 – 8 mm (nominal) gravel.
Resistance of Isoboard® to concentrated loads	Satisfactory.	The ballasted Isoboard® Inverted Roof Insulation is not affected by light concentrated loads. However, machinery or equipment installed on roofs must be supported on properly designed plinths or brackets supported directly on the surface of concrete roof slabs and not on the surface of the Isoboard®.
Quality management	The certificate holder's quality management system complies with Agrément South Africa's requirements. Properly applied it will ensure that quality of manufacture will be consistently maintained.	Agrément South Africa's requirements are based on SANS 9001:2000. SANS 9001:2000: *Quality management systems- Requirements*

PART 3: TECHNICAL DESCRIPTION

General description

Isoboard® Inverted Roof Insulation is made from standard Isoboard® in thicknesses and with edge profiles to suit inverted roof insulation applications. Isoboard® Inverted Roof Insulation is used as a thermally insulating layer on suitably designed new or existing flat concrete roofs.

Manufacture

The Isoboard® Inverted Roof Insulation is manufactured by Isofoam South Africa (Pty) Ltd in its factory in Atlantis Industria. Isofoam South Africa (Pty) Ltd distributes the products.

The physical properties of 30 mm thick Isoboard® are set out in Table 3.

The U values for 150 mm thick conventional waterproofed concrete roof slabs insulated with different thicknesses of Isoboard® are set out in Table 4.

Isofoam South Africa (Pty) Limited offers technical support from Isoboard sales offices in Cape Town, Pretoria, Johannesburg and Durban. This technical support includes. installation manuals and guidance, using a dynamic thermal simulation tool (Isofoam Toolbox) in the selection of the correct board thickness to achieve specific conditions or energy usage inside buildings.

Delivery and site storage

The boards are delivered to site in packs wrapped in translucent plastic packaging which carries the emblem of Agrément South Africa as illustrated and handling instructions. Isoboard® must be stored in covered areas away from direct sunlight and ultra-violet light.

Care must also be taken to prevent boards coming in contact with solvents and materials that contain volatile organic components which will have adverse effects on the polystyrene.

The boards must not be exposed to naked flame or other sources of heat, nor should they be stored near materials such as packing paper, waste and flammable liquids.

Installation

SANS 10021: *The waterproofing of buildings*

The waterproofing membranes are laid strictly in accordance with the manufacturer's instructions on new or existing concrete roofs that are structurally capable of carrying all expected loads and where due regard has been taken of the recommendations made in SANS 10021:*The waterproofing of buildings.*

Membranes are laid on surfaces swept clean of any extraneous material. Where old membranes with bonded chip surfaces are overlaid or where membranes are laid over other rough surfaces, a cushioning layer may be required below the membrane.

On existing roofs where new membranes are laid over existing membranes, these must be thoroughly inspected and repaired where necessary.

Insulation boards are laid in brick bond pattern with shiplap edges pressed firmly together. Boards are cut carefully using a knife or saw to ensure a snug fit against upstands, kerbs and services which perforate the roof deck. Care is taken not to damage membranes, especially single layer membranes.

Insulation boards are covered, as work proceeds, with water-permeable filter fabric and loaded with washed gravel ballast consisting of 20 – 40 mm (nominal) gravel, or concrete paving slabs bedded in a 20 mm thick bed of 4 - 8 mm washed gravel.

The thickness of such gravel ballast or concrete paving slabs which is required to resist floatation and wind uplift is set out in Tables 5, 6 and 7 for the various zones of flat roofs for buildings of different heights, with and without parapets.

Boards are laid on an advancing front away from a point of access so that materials are only carried across areas of protected membrane. Insulation boards can be installed in any weather but due to their light weight, care will be needed in high wind.

Concentrated loads on Isoboard® Inverted Roof Insulation which would occur under the supports of machinery or equipment installed on roofs, must be supported on properly designed plinths or brackets supported directly on the concrete roof slab.

Care must be taken during installation to ensure that no area of roof is overstressed by piles of gravel ballast or paving slabs waiting to be distributed.

On existing roofs where parapets, details, services, etc have insufficient height to accommodate the depth of the insulation board and loading material, modifications may be necessary. Upstands and kerbs may have to be lifted and rainwater outlets replaced or modified by the installation of gravel guards - see Figure 1.

Concrete paving slabs are laid where walkways occur (for example, to lift motor-rooms) and may also be laid in areas that are subjected to higher wind uplift, or where kerbs or upstands are not as high as they should be to retain gravel ballast.

Maintenance

Isoboard® does not require any special maintenance other than ensuring that neither the insulation board nor the protective loading layer has been displaced. This can be done during normal roof maintenance and/or inspection of membranes, rainwater outlets, gutters and flashings. Isoboard® panels and ballast may be readily lifted to allow access to waterproofing membranes for maintenance purposes.

Table 3: Physical properties of 30 mm thick Isoboard®

Property	Standard[4]	Value
Density	ISO 845: 1988	36,1 kg m^{-3}
Compressive strength	ISO 844: 1978	0,310 MPa
Water vapour permeability	ISO 1663: 1981	0,78 ng Pa^{-1} s^{-1} m^{-1}
Water absorption	ISO 2896: 1987	0,26 % by volume
Coefficient of linear thermal expansion	ISO 4897: 1985	67 x $10P^{-6}$ $°C^{-1}$
Thermal conductivity (average of two tests)	ISO 8302: 1991	0,024 W m^{-1} K^{-1}

Table 4: U values for 150 mm thick conventional waterproofed concrete roof slabs insulated with different thicknesses of Isoboard®

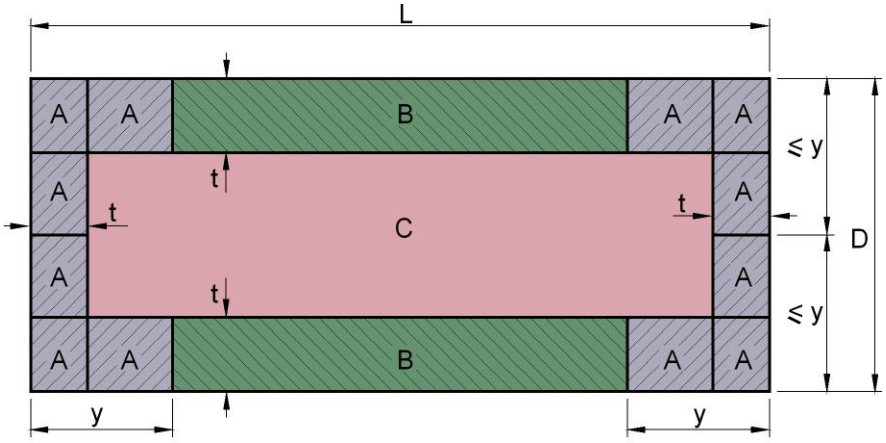
Thickness (mm) of Isoboards® insulation applied above weatherproofing	30	40	50	60	70
U value (W m^{-2} K^{-1}) of insulated roof	0,79	0,63	0,52	0,44	0,38
Note: A thermal conductivity value of 0,030 W m^{-1} K^{-1} has been assumed for Isoboard®, which allows for a 23 % increase in conductivity due to ageing, vapour permeability and water absorption.					

Table 5: Thickness of gravel ballast or paving slabs required to prevent flotation of Isoboard®

Thickness of Isoboard® (mm)	Required thickness of gravel ballast (mm)	Required thickness of normal weight concrete paving slabs (mm)
30	30	25
40	40	30
50	50	35
60	60	45
70	70	55
Notes: Bulk density of gravel assumed to be 1600 kg m^{-3} Density of paving slab concrete assumed to be 2400 kg m^{-3}		

Loading required to prevent wind uplift

Tables 6 and 7 give the thickness of stone ballast or concrete paving slabs required to prevent wind uplift of Isoboard® in the various zones of a flat roof for buildings of different heights, with and without parapets. The plan diagram below shows the different zones of a flat roof referred to in the tables.



Note: A, B and C = zones on the roof subject to different wind pressures

H = total height of building

L and D = dimensions of building

X = the larger of L or D

t = width of the perimeter zone which is the smaller of $\frac{X}{10}$ or $\frac{H}{5}$

y = the length of zone A from each corner and is equal to 2,5 x t

Example: For building 40 m x 12 m in plan and 5 storeys (15 m) high

X = 40, t = the smaller of $\frac{X}{10}$ ie $\frac{40}{10}$ = 4 m and $\frac{H}{5}$

ie $\frac{15}{5}$ = 3 m

therefore: t = 3 m and y = 2,5 x t ie 2,5 x 3 = 7,5 m
(NB 2y > D in this example)

Plan of rectangular flat roof showing zones subject to different wind pressures as recommended in BS 6399 Part 2: 1997

Table 6: Thickness of gravel ballast or concrete paving required over Isoboard® to resist wind uplift on roofs with parapets in typical suburbs or industrial areas

Zone and pressure coefficient	Height of roof above ground level (m)	Wind pressure (N m^{-2})	Design wind pressure (KN m^{-2})	Required thickness of gravel ballast (mm)	Required thickness of normal weight concrete paving (mm)
Zone A	5	401	0,722	45	30
Cf = 1,8	10	486	0,876	55	36
	15	591	1,063	66	44
	20	662	1,191	74	50
	25	717	1,291	81	54
	30	763	1,374	86	57
	35	803	1,446	90	60
	40	839	1,510	94	63
	45	871	1,567	98	65
	50	900	1,620	101	68
Zone B	5	401	0,502	31	21
Cf = 1,25	10	486	0,608	38	25
	15	591	0,738	46	31
	20	662	0,827	52	34
	25	717	0,897	56	37
	30	763	0,954	60	40
	35	803	1,004	63	42
	40	839	1,049	66	44
	45	871	1,089	68	45
	50	900	1,125	70	47

Table 6: Thickness of gravel ballast or concrete paving required over Isoboard® to resist wind uplift on roofs with parapets in typical suburbs or industrial areas (continued)

Zone and pressure coefficient	Height of roof above ground level (m)	Wind pressure (N m^{-2})	Design wind pressure (KN m^{-2})	Required thickness of gravel ballast (mm)	Required thickness of normal weight concrete paving (mm)
Zone C	5	401	0,281	18	12
Cf = 0,7	10	486	0,341	21	14
	15	591	0,413	26	17
	20	662	0,463	29	19
	25	717	0,502	31	21
	30	763	0,534	33	22
	35	803	0,562	35	23
	40	839	0,587	37	24
	45	871	0,610	38	25
	50	900	0,630	39	26

Notes:

Pressure coefficients as recommended by BS 6399 Part 2: 1997.

Wind pressure determined in accordance with the recommendations of SANS 10160 for buildings at sea level in terrain category 3, assuming:

- a basic wind speed of 40 m s^{-1}
- 3 second duration of gust
- mean return period of 25 years.

Bulk density of gravel assumed to be 1600 kg m^{-3}.

Density of paving slab concrete assumed to be 2400 kg m^{-3}.

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

SANS 10160: *The general procedures and loading to be adopted in the design of buildings*

Table 7: Thickness of gravel ballast or concrete paving required over Isoboard® to resist wind uplift on roofs without parapets in typical suburbs or industrial areas

Zone and pressure coefficient	Height of roof above ground level (m)	Wind pressure (N m^{-2})	Design wind pressure (KN m^{-2})	Required thickness of gravel ballast (mm)	Required thickness of normal weight concrete paving (mm)
Zone A Cf=1,8	5	401	0,803	50	33
	10	486	0,973	61	41
	15	591	1,181	74	49
	20	662	1,323	83	55
	25	717	1,434	90	60
	30	763	1,527	95	64
	35	803	1,607	100	67
	40	839	1,678	105	70
	45	871	1,742	109	73
	50	900	1,800	113	75
Zone B Cf=1,25	5	401	0,562	35	23
	10	486	0,681	43	28
	15	591	0,827	52	34
	20	662	0,926	58	39
	25	717	1,004	63	42
	30	763	1,069	67	45
	35	803	1,125	70	47
	40	839	1,174	73	49
	45	871	1,219	76	51
	50	900	1,260	79	53

Table 7: Thickness of gravel ballast or concrete paving required over Isoboard® to resist wind uplift on roofs without parapets in typical suburbs or industrial areas (continued)

Zone and pressure coefficient	Height of roof above ground level (m)	Wind pressure (N m^{-2})	Design wind pressure (KN m^{-2})	Required thickness of gravel ballast (mm)	Required thickness of normal weight concrete paving (mm)
Zone C Cf=0,7	5	401	0,281	18	12
	10	486	0,341	21	14
	15	591	0,413	26	17
	20	662	0,463	29	19
	25	717	0,502	31	21
	30	763	0,534	33	22
	35	803	0,562	35	23
	40	839	0,587	37	24
	45	871	0,610	38	25
	50	900	0,630	39	26

Notes:

Pressure coefficients as recommended by BS 6399 Part 2: 1997.

Wind pressure determined in accordance with the recommendations of SANS 10160 for buildings at sea level in terrain category 3, assuming:

- a basic wind speed of 40 m s^{-1}
- 3 second duration of gust
- mean return period of 25 years.

Bulk density of gravel assumed to be 1600 kg m^{-3}.

Density of paving slab concrete assumed to be 2400 kg m^{-3}.

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

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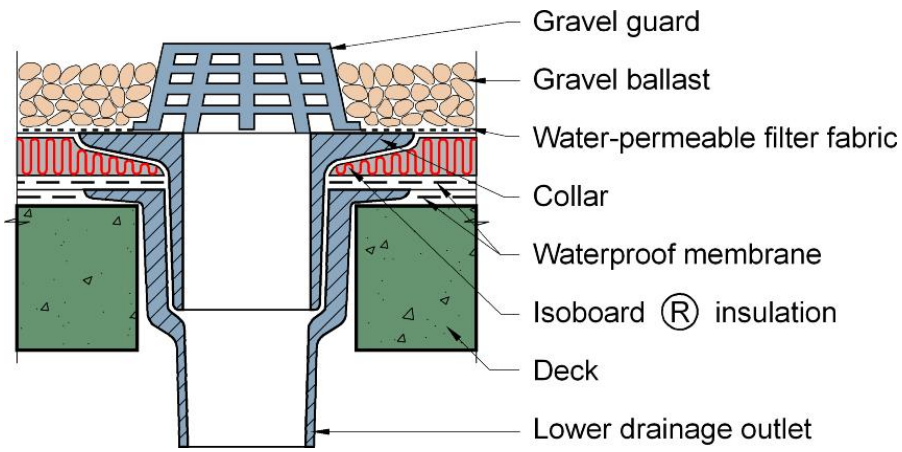

Figure 1: Gulley detail – two level drainage

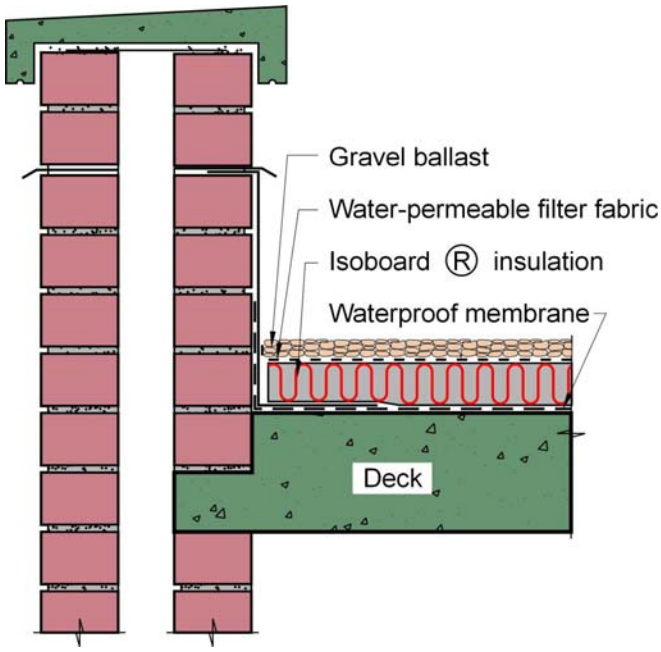

Figure 2: Parapet roof deck detail – tanking specification where falls are not optimum and ponding could occur

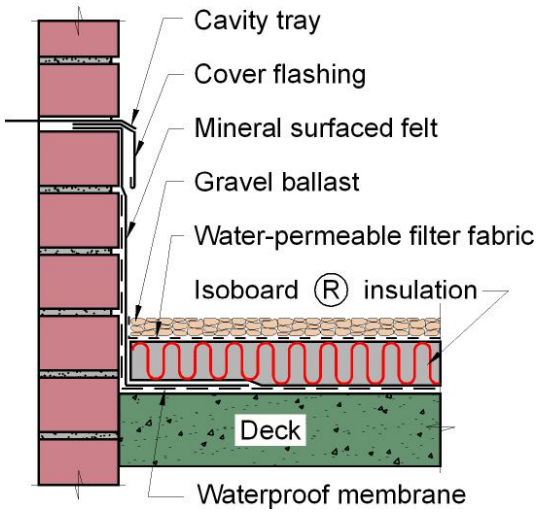

Figure 3: Parapet roof deck detail – bituminous waterproofing membrane

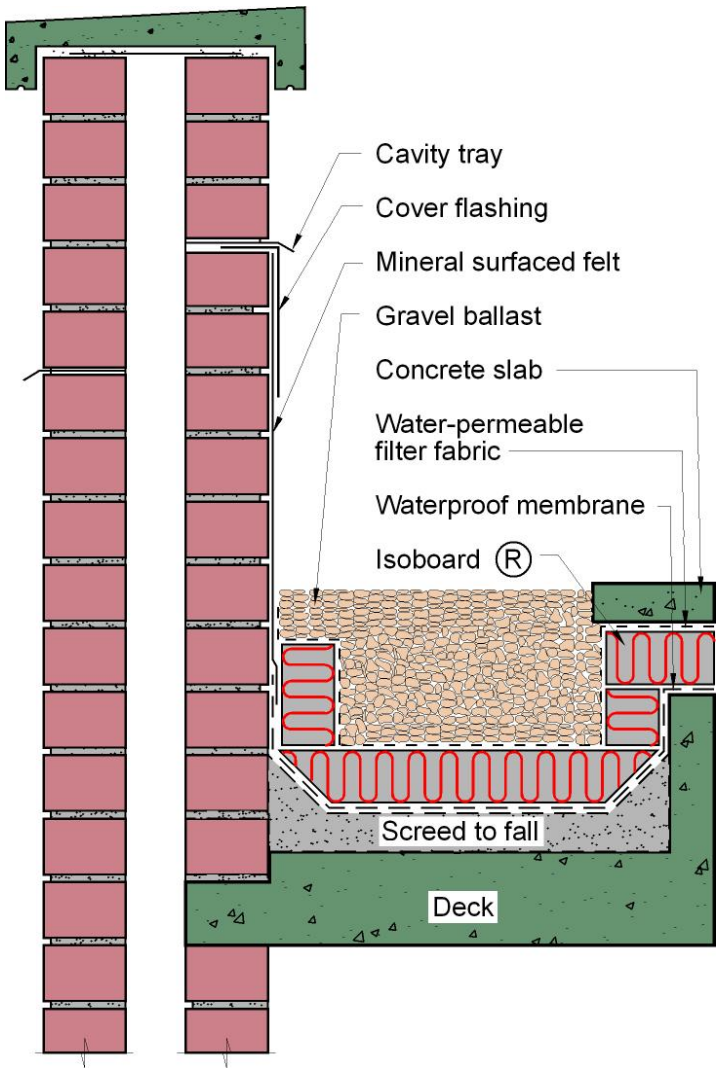

Figure 4: Parapet roof deck gutter detail – mastic asphalt