mac

info@masticasphaltcouncil.co.uk
01273 242 778

Mastic Asphalt Roofing

Technical Guide

Index

info@masticasphaltcouncil.co.uk
01273 242 778

Introduction

This Technical Guide gives recommendations for the use of mastic asphalt in roofing to both flat and sloping roofs and covers a variety of applications. This includes green roof systems, in which mastic asphalt can be used as a proven root resistant material.

Mastic asphalt roofing is the perfect choice for many roofing applications, and offers numerous benefits such as:

- Proven durability - well in excess of 50 years
- It can be laid at speed - ideal for larger projects
- Sustainable material which is 100% recyclable
- Flame-free application and non-flammable in service
- Achieves EXT.F.AA fire rating to BS 476: Part 3 and Broof T4 according to BS EN 13501-5
- Installed by trained craftsmen
- Excellent value for money
- Highly versatile material, providing a reliable base for numerous attractive roof finishes including green roofs, podiums, inverted roofs with paving or timber decking, promenade tiles and reflective coatings.

Mastic asphalt roofing requires the use of ancillary materials and products. Specifiers should satisfy themselves, by reference to manufacturers' information and test results, that these materials and products will be suitable for their roofing requirements and compatible with the use of mastic asphalt. All such materials should be installed in accordance with manufacturer's instructions.

The mastic asphalt should be one of the following:

a. BBA Certified polymer modified mastic asphalt, roofing grade for superior specifications offering stability at high operating temperatures and flexibility at low operating temperatures.
b. Mastic asphalt for roofing conforming to type R988 in BS 6925.
c. Mastic asphalt for roofing conforming to BS EN 12970.

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Design of roof to be asphalted

General

The design of flat roofs intended to be covered by mastic asphalt waterproofing should conform to the recommendations of BS 6229:2018 Flat Roofs with Continuously Supported Flexible Waterproof Coverings, with reference to the Building Regulations where applicable.

Selection parameters

It is important that consideration is given at an early stage to the following:

a. The type of roof construction to be employed

b. How anticipated movement is to be accommodated and the locations of any movement joints

c. What trafficking, if any, is anticipated

d. The means by which the requirements of the Building Regulations are to be met, particularly the maximum thermal transmittance values of the Building Regulations

e. How condensation problems are to be prevented

f. Detail considerations

g. Roof drainage

h. What cross falls and/or falls are required to achieve the required drainage falls

i. How skirting heights and minimum threshold heights are to be incorporated

j. The correct location of damp-proof courses relative to the mastic asphalt waterproofing

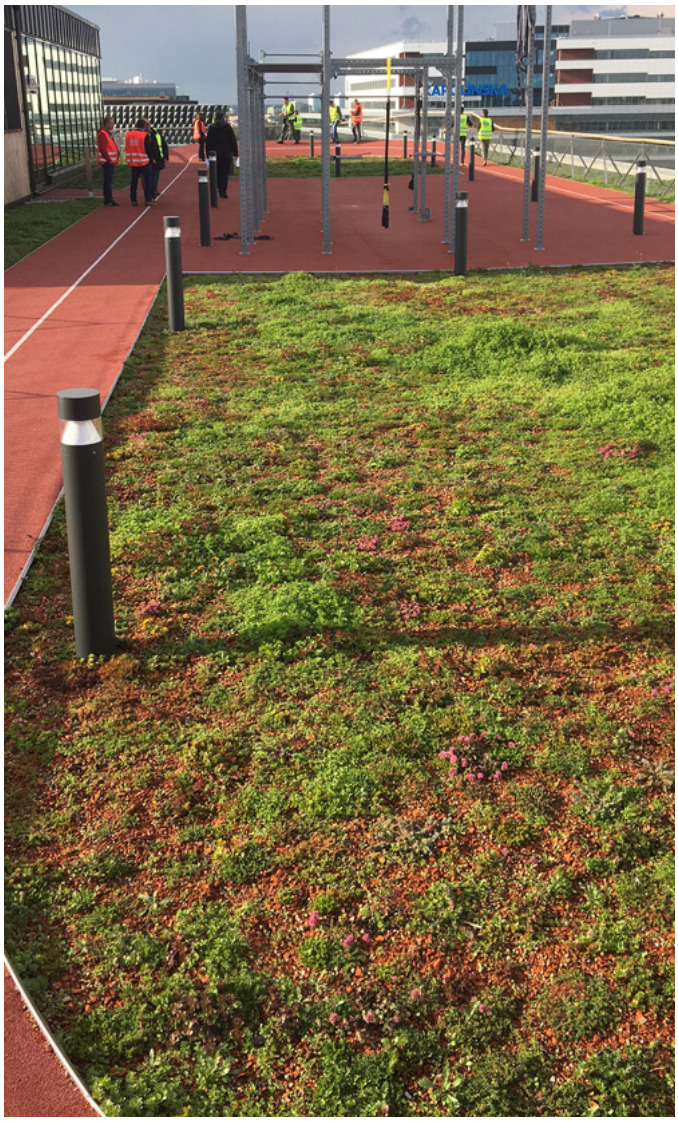
k. Sufficient working space for the application of materials.

Access for inspection

To facilitate access for regular inspection (as recommended in BS 6229) consideration should be given to provision of a fixed permanent access to all flat roofs. Such access will also be useful for maintenance and repair.

Roofing details

The general arrangement details and the principles to be followed at skirtings, upstands, abutments, verges, gutters and expansion joints are as per the details illustrated at the end of this Technical Guide..



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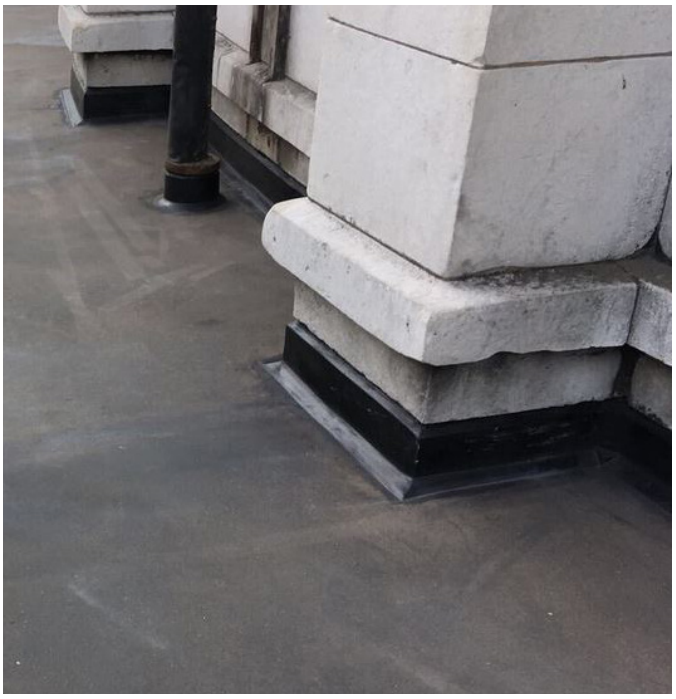
Design of the base

General

Surfaces to which mastic asphalt is to be applied should be installed or prepared to a true and even surface, free from irregularities e.g. in accordance with National Structural Concrete Specification (NSCS) guidelines. The specification should, therefore, enable the asphalt to be supplied to a reasonably uniform thickness.

All materials should provide a substantial and continuous support to the mastic asphalt roofing and should be able to sustain the loads imposed by traffic both during and after roofing operations.

Any substrate to receive mastic asphalt roofing should be reasonably dry, even, free of dust, laitance, grease, dirt, projecting nail heads, sharp arrisses or holes. The designer should study the need for movement joints in the structure. Movement joints should be continuous through vertical upstands, walls and edges of buildings.



Falls & Drainage

Design of falls

The design of falls and drainage patterns will have a considerable influence on the depth of the total roof construction or roof zone, which should be a fundamental consideration at the very earliest stages of conception of a building. It is only after assessing the depth of roof zone that the designer can decide the levels of all other aspects of construction above the level of the flat roof.

Ideally the structural deck/slab should be used to introduce falls for drainage; a minimum 1:80 finished fall is recommended to both the general area of the roof and to any formed internal gutters.

All flat roof surfaces (including gutter beds) should be designed with a fall of 1:40 to ensure finished drainage falls of 1:80 are achieved. This should take account of construction tolerances, permitted deviations and deflection under load, and, unless justified by more detailed structural analysis, to account for deflections/settlement. Where two falls intersect, a minimum finished fall of 1:80 along the mitre should be recommended.

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Design of falls - cont.

NOTE 1: Drainage falls can be achieved by sloping the supporting structure. Alternatively, if the slab/deck is designed flat and level, falls can be achieved by screeding, firrings or by the use of tapered insulation.

NOTE 2: Mastic asphalt waterproofing systems are approved for use with zero falls but back falls are not acceptable and should be corrected. In order to ensure a finished surface with a zero fall, a design fall of 1:80 should be used and a detailed structural analysis should account for construction tolerances, settlement and for deflection under load.

Where areas are found by a site level survey to have negative falls, i.e. will hold water, remedial action should be taken, e.g. localized screed or additional rainwater outlet. To facilitate efficient drainage rainwater outlets should be recessed or fitted in sumps, where practical.

Roof drainage

Rainfall intensity should be assessed in accordance with BS EN 12056-3 taking into account the site location and the profile of the roof. The number, size and location of drainage points should ensure rainwater is drained from the roof as quickly as possible.

Flat roofs may be drained by two basic methods:

1). Towards the outer edges and into external gutters, or parapet chutes

2). Towards internal gutters or outlets within the main roof area.

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01273 242 778

Roof decks

General

The structural deck provides the primary support for the roofing system. It must resist dead, live, wind and snow loads, including storms. It must also be suitable for the proposed mastic asphalt roofing system, and intended subsequent use. Relevant structural and loading codes for each material must be followed, and the requirements of the current Building Regulations must be checked and observed. If the use of the roof is to be changed, the suitability of the deck and the structure must be re-confirmed.

The deck may also be laid or fixed so as to provide a suitable fall for drainage of the roof surface, as required in BS 6229, Code of Practice for flat roofs with continuously supported flexible coverings. The following section outlines the most common types of flat roof structural deck.

In-situ concrete decks

Cast in-situ reinforced concrete decks can be laid to achieve an adequate fall, or a separate screed to falls can be used. The finished surface must be adequately dry to accept the specified mastic asphalt roof waterproofing system, and free of any ridges or hollows. The most suitable surface is provided by an easy / skip float finish.

Pre-cast concrete decks

A variety of pre-cast deck units are available, and these should be used and fixed in accordance with manufacturer's instructions. A screed is normally required to provide an even surface for waterproofing and to provide drainage falls, if falls cannot be incorporated in the supporting structure. Construction water should be minimised, and where present, drained by leaving the deck joints open on the underside.

Timber-based panels

Timber and timber products (including plywood and OSB) must be FSC Certified and conform to the Construction Products Directive (CPD) for structural use, as covered in BS EN 13986, and should be marked 'CE2+ Structural'.

Timber panels are subject to moisture and thermal movement. They should be fixed with a minimum of 3mm gap between panels, and 10mm at roof edges/perimeters (for further guidance contact the panel manufacturer).

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Plywood decks

Plywood is available as a square-edged or tongue and grooved panel. The plywood should conform to the relevant requirements of BS EN 636, Clause 7 regarding use in humid conditions, and Clause 8 regarding exterior use. Materials suitable for flat roofing would be marked ‘BS EN 636–2’ or ‘BS EN 636–3’. Plywood should be of exterior or WBP glue type and of a quality and thickness suitable for structural applications. All joints and edges should be fully supported.

Oriented strand board (OSB)

Oriented strand board grade 3 (OSB 3) has been developed as a suitable alternative to structural grade plywood. It is an engineered wood product, manufactured from orientated wood flakes combined with an exterior grade resin and compressed under high temperature.

The result is a load-bearing panel suitable for structural use in flat or pitched roofing, but is restricted from high humidity roofs, such as swimming pools. OSB 3 is available as a square-edged or tongue and grooved panel. Only OSB 3 manufactured to BS EN 300 and marked as such should be used in roofing. OSB 4 would also be suitable, but is not generally available in the UK. Ideally such products should have third-party certification.

Woodwool decks

Woodwool is an open textured board (or slab) composed of wood strands bound together with a cement mixture. It was used as a roof deck material from the mid-1950s until the late 1990s. Woodwool is no longer manufactured in the UK, and is now regarded as a ‘fragile material’ under the guidance in HSG33 from the Health and Safety Executive. Works on roofs with such decks need a careful risk assessment agreed before commencement.

Metal decking

Profiled metal roof decking should be manufactured either in: galvanised steel or aluminium sheet. All use of profiled steel sheeting should comply with BS EN 1993-1-3. There is a wide range of metal profiles and thicknesses for various load/span relationships, usually over steel supporting structures.

A profiled metal deck does not provide a continuous supporting upper surface and requires covering with plywood, OSB 3 or insulation to enable mastic asphalt to be laid.

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01273 242 778

Screeds

General

Screeds provide a suitable surface to receive mastic asphalt roofing and can also be used to achieve falls and cross-falls. In addition, some screeds can provide a level of thermal insulation and contribute to the overall thermal performance of the roof.

Mastic asphalt screed

Mastic asphalt screed is available which is manufactured from selected bitumens, limestone filler and specially graded aggregates. It is designed to provide drainage falls as well as a stable base for the specified roof waterproofing system. Mastic asphalt screed can be applied at a wide range of thicknesses (minimum 10mm) and falls, usually on in-situ and pre-cast concrete bases. It is suitable for insulated warm roofs, inverted roofs, green roofs, blue roofs and balcony/terrace applications.

A major advantage of this type of mastic asphalt screeding is that the laid material can be accessed and the waterproofing installed as soon as the screed has cooled to ambient temperature. In addition, it avoids the need for a separate air and vapour control layer (AVCL), can be easily worked around roof protrusions and does not require compaction. Mastic asphalt screed will accept, without damage, the type of traffic and concentrated loads associated with the installation of a flat roof waterproofing system.

Sand and cement screeds

Sand and cement screeds should be designed and installed in accordance with BS 8204-1. They contain considerable amounts of water and the surface should be adequately cured and dry before the mastic asphalt roofing specification is applied. Where screeds are formed or supported on permanent shuttering or metal profiles, provision must be made for water to drain adequately, in accordance with the manufacturer's instructions.

Lightweight aggregate screeds (cement bonded)

Suitable lightweight aggregates are formed from expanded clay or sintered pulverised fuel ash, bonded with a cement binder. A 13mm sand and cement topping is necessary to provide a smooth level surface for the roofing specification.

Insulating cement screeds

A range of cement based screeds containing Perlite, Vermiculite, recycled EPS and other additives are available from various sources. These are often of a lighter weight than just sand and cement and impart a degree of insulation to the roof structure. Guidance on the thermal performance and installation of these products must be sought from the individual manufacturer concerned.

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01273 242 778

Thermal insulation

General

In a warm roof system the principal insulation is placed above the slab/deck and the insulation should be tightly fitted rigid boards able to sustain the intended loads.

In an inverted roof system the principal insulation is placed above the mastic asphalt waterproofing. The insulation must have a high resistance to water absorbtion and be dense enough to support the imposed loads.

The statutory requirements for the thermal performance of buildings in England and Wales is set out in Building Regulations 2010 Part L as amended for existing buildings and Building Regulations 2013 Part L for new buildings.

The new Part L is published in four sections:

L1A: New dwellings
L1B: Existing dwellings
L2A: New buildings other than dwellings
L2B: Work in existing buildings other than dwellings.

Scotland and Northern Ireland are subject to local regulations.

Warm roofs - PIR insulation

Mastic asphalt can be installed onto rigid polyisocyanurate insulation boards, faced with perforated glass tissue. The efficient closed cell foam core of these boards has an exceptionally low thermal conductivity and achieves required U-values with a minimum thickness.

Warm roofs - mineral wool

Mineral wool insulation boards with a high density upper layer can also be used in mastic asphalt warm roof systems. These are manufactured from renewable volcanic stone which produces a non-combustible roofing insulation board, offering exception fire performance, superior acoustics and impact reduction performance.

Warm roofs - cellular glass

Cellular glass insulation is a rigid insulation material, composed of completely sealed glass cells. The product offers a good combination of properties such as incombustibility, superior compressive strength, guaranteed water and vapour tightness and long lasting thermal insulation performance.

Inverted roofs - XPS / EPS / cellular glass insulation

Suitable grades of Extruded Polystyrene (XPS), Expanded Polystyrene (EPS) and Cellular Insulation can be placed above mastic asphalt in all inverted roof specifications. As well as giving the required thermal properties, these products are resistant to water and will provide long term protection to the mastic asphalt waterproofing.

Vacuum Insulated Panels (VIPs)

Vacuum insulated panels (VIP) have a very low thermal conductivity, and are at least three times more thermally efficient than other materials. However, they cannot be adapted on site, or damaged during use, or their performance is ruined. The panels have to be installed to a precise scheme design, with infills of ‘standard’ insulation.

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Control of condensation

Designers should assess the risk of surface and interstitial condensation in accordance with BS 5250.

In the case of a roof incorporating mastic asphalt, a suitable thermal insulation may be included within the system. This layer must have sufficient insulation value for its underside to remain above the temperature at which condensation can start, even on the coldest nights.

The provision of insulation alone, however, may not be sufficient to prevent condensation. If the insulation is permeable to water vapour, the vapour will pass upwards through it and condense on the underside of the waterproof membrane (Fig. 1).

To prevent this happening an air and vapour control layer (AVCL) should be provided on the underside of the insulating layer (see Fig. 2). An air and vapour control layer can be an approved metal lined vapour barrier or 10mm think single coat of mastic asphalt roofing on an underlay of glass fibre tissue.

Note: The need for a separate air and vapour control layer may be avoided by specifying an inverted roof system.

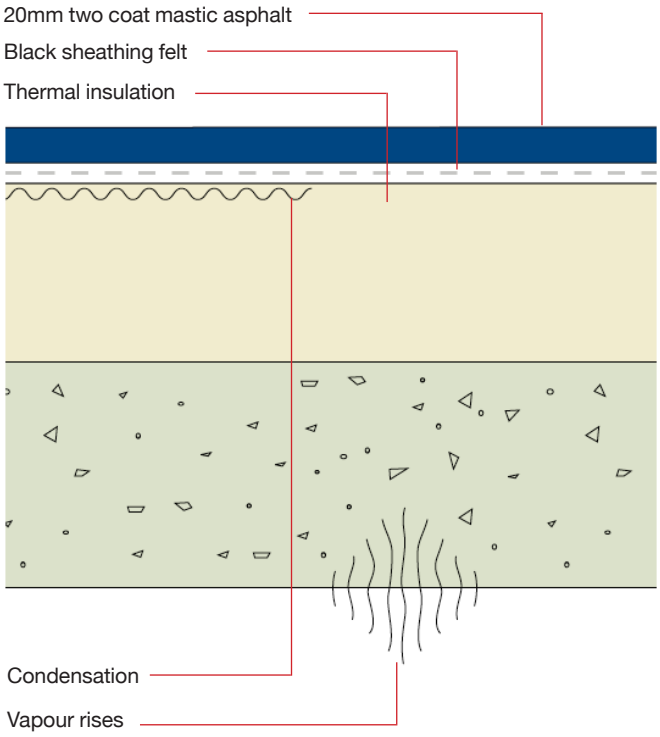

Fig 1. No air / vapour control layer - condensation occurring

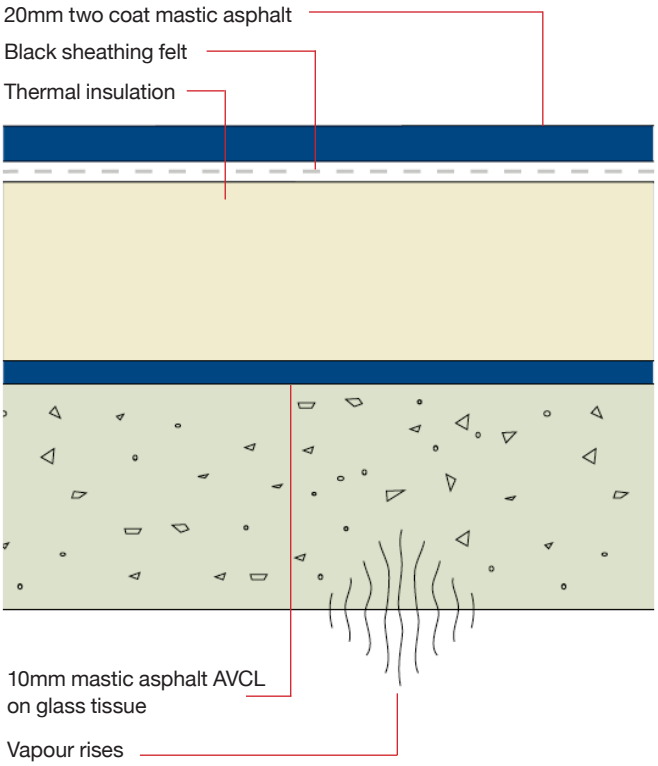

Fig 2. Typical warm roof section with air / vapour control layer

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01273 242 778

Mastic asphalt roofing

General

Mastic asphalt roofing should be installed in accordance with the recommendations of BS 8128:1998 - Code of Practice for Mastic Asphalt Roofing. The number of coats should be appropriate to the waterproofing requirements and traffic conditions of the roof.

Horizontal, sloping and vertical surfaces

Horizontal surfaces up to & including 10° pitch

On horizontal surfaces up to and including 10° pitch the mastic asphalt should be laid in two coats to a thickness of 20mm on a separating membrane of sheathing felt. In general, difficulties can be experienced in laying mastic asphalt directly over insulants to surfaces over 5° pitch.

Sloping and vertical surfaces over 10° pitch, other than timber or lightweight concrete and excluding skirtings

On sloping and vertical surfaces over 10° pitch the mastic asphalt should be laid in three coats to a thickness of 20mm without a separating membrane.

Sloping and vertical surfaces of timber or lightweight concrete over 10° pitch, including skirtings

On sloping and vertical surfaces of timber or lightweight concrete the mastic asphalt should be laid in three coats to a thickness of 20mm on expanded metal lathing over a separating membrane of sheathing felt.

Horizontal surfaces designed as inverted roofs, roof gardens, reservoirs or buried waterproofing

On horizontal surfaces designed as inverted roofs, green roofs, reservoirs or buried waterproofing, the mastic asphalt should be laid in three coats to a thickness of 30mm over a separating membrane of glass fibre tissue. Alternatively, a fully bonded system may be installed, consisting of one layer sheet membrane bonded to deck covered with mastic asphalt in two coats 20mm thick.

Mastic asphalt air & vapour control layer

A mastic asphalt vapour barrier should be laid in one coat not less than 10mm thick on a glass fibre tissue.

Planters / Roof gardens

Waterproofing should be applied horizontally and vertically to the inside and outside faces of planters. If it is only intended to provide a minimum 150mm skirting to the outside face of planters, consideration should be given to the provision of damp-proof courses or cavity trays within the planter walls. Within planters, the mastic asphalt should be protected from backfilling and subsequent digging operations by concrete slabs, non biodegradable boards or similar means.

Skirtings and upstands

Skirtings and upstands other than timber or lightweight concrete

On skirtings and upstands up to 300mm high the mastic asphalt should be applied in two coats to a thickness of 13mm. Where skirtings and upstands are over 300mm high the mastic asphalt should be applied in three coats to a thickness of 20mm.

NOTE: Two coat work may be permissible to vertical upstands in excess of 300mm in areas such as tank rooms and mechanical services areas where the appearance of the finished work is not of paramount importance, or where the mastic asphalt will be subsequently covered by inverted roof boards, cladding etc.

Skirtings and upstands of timber and lightweight concrete

On skirtings and upstands of timber or lightweight concrete the mastic asphalt should be applied in three coats to a thickness of 20mm, on expanded metal lathing over a separating membrane of black sheathing felt.

Skirtings and upstands on expanded metal lathing to concrete, brick or blockwork

In certain circumstances it may be necessary to incorporate expanded metal lathing to concrete, brickwork or blockwork. In these situations the mastic asphalt should be applied in three coats to a thickness of 20mm including a separating membrane of sheathing felt, where required.

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01273 242 778

Detail considerations

General

All flat roof surfaces should be laid to cross falls and/or falls to ensure proper drainage as recommended in BS 6229. Rainwater outlets should be sited at low points in the general roof area well clear of other penetrations, where possible.

All mastic asphalt upstands should be a minimum 150mm above the finished roof level. If level access is required from within the building, such as a door opening to a balcony or terrace, the height of the upstand can be reduced to not less than 75mm from the threshold to the main water shedding layer of the system, in accordance with BS6229: 4.5.

Movement joints

It is only necessary to provide movement joints in a mastic asphalt roof membrane where one is provided in the structure. Where possible, movement joints should always be located at the high point of the drainage falls.

Where it is considered necessary to provide movement joints in the roof structure, these should be of the twin kerb type with a suitable metal or butyl rubber capping.

Flush movement joints in mastic asphalt should be avoided where possible. Where they are unavoidable, care should be taken to ensure they are a suitable proprietary type compatible with mastic asphalt and that a secure bond can be made between the joint and the roof covering.

The roof deck on either side of the movement joint should be adequately stiffened to avoid excessive differential deflection. The movement joints should be continuous through vertical upstands, walls and edges of buildings.

If a proprietary flush movement joint is used on car park or pedestrian walkways/terraces, it must be capable of accepting the expected type of traffic and degree of movement, that its materials are compatible with mastic asphalt and that secure joint can be made between it and the mastic asphalt, in accordance with the expansion joint manufacturer's recommendations.

Keying to vertical surfaces

Keying to vertical and sloping concrete surfaces

Where smooth formwork has been used, the laitance, or any release agent from the formwork, should be removed by needle gun, wire brushing or other suitable mechanical means. Prior to asphalting, the prepared surface should be treated with an application of high-bond primer in accordance with the manufacturer's instructions.

Alternatively, expanded metal lathing fixed to smooth concrete may be used to provide the necessary key. However, this is not a preferred option.

On lightweight aggregate concrete and lightweight concrete blockwork, mechanically fixed expanded metal lathing, on sheathing felt, should be used to provide the necessary key (see Table 1).

Keying to brickwork surfaces

The horizontal joints in brickwork should be flush pointed and the brickwork treated with an application of high-bond primer in accordance with the manufacturer's instructions.

Engineering bricks do not provide an adequate key for mastic asphalt and should only be used in association with an application of high-bond primer to manufacturer's instructions and mechanically fixed expanded metal lathing (see Table 1).

Where mastic asphalt is to be applied to old brickwork, the surface should be cleaned and high-bond primer applied. Where blistering or loss of bond is encountered the use of sheathing felt and expanded metal lathing, mechanically fixed at not greater than 150mm centres, should be considered.

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01273 242 778

Skirtings to brickwork and concrete

Skirtings should be tucked into a chase or groove at the top edge, and should be a minimum 150mm above all roof finishes. Skirtings should be applied in two coats to a thickness of 13mm.

Skirtings over 300mm are regarded as vertical work and should be applied in three coats to a thickness 20mm.

On old or irregular brickwork or blockwork it is usually necessary for the skirtings to be applied in three coats, the first coat being a 'dubbing out' coat to correct irregularities in the wall followed by the standard two coat work. The total thickness should be between 15mm and 20mm. Cement and sand render can be used as an alternative for 'dubbing out' to correct irregularities. Particular care should be taken to ensure proper adhesion of the first coat of mastic asphalt. The exposed uppermost part of the mastic asphalt skirting should be formed with a splay to shed rainwater, even though a metal flashing may be fixed to cover the exposed part. A splayed arris is formed when mastic asphalt is continued through the wall to form a horizontal damp-proof course.

Fillets

Fillets should be formed with a solid angle of roofing grade mastic asphalt, in two coats, with a minimum of 40mm on the face, at approximately 45°.

Chases

Chases should be provided in brickwork and concrete and should be 25mm x 25mm. The lower nib of the chase should be carefully removed in order to maintain a full thickness of mastic asphalt at this point. The chase should be pointed as soon as practical after asphalting using cement, sand and mortar containing a suitable polymer admixture such as styrene butadiene rubber or acrylic.

Margin infill

In a warm roof construction a minimum 25mm margin should be created between the edges of the thermal insulation boards and the skirting/upstands.The margin should be solidly filled with mastic asphalt to provide support to the skirting and angle fillet, and to eliminate voids at these junctions.

Where substantial thicknesses of thermal insulation boards are used, the width of the margin should be increased as necessary to ensure that a solid infill is achieved.

Keying to stonework surfaces

The type of key required depends entirely on the kind of stone and on the type of stonework. The surface of the stone, where possible, should be lightly roughened in order to provide a suitable key, or the use of high-bond primer should be considered.

Keying to timber surfaces

To provide an adequate key for mastic asphalt laid on vertical timber surfaces and those of slope greater than 10°, and also at junctions formed with such surfaces, a continuous layer of metal lathing should be securely fixed by means of nails or staples. The expanded metal lathing should be fixed over the sheathing felt at maximum 150mm centres in all directions.

Keying to metal surfaces

All metal surfaces such as pipes, metal standards etc. should be treated with high-bond primer in accordance with the manufacturer's instructions. Alternatively, expanded metal lathing, strapped or spot welded, may be used to provide the necessary key.

Where pipes penetrate timber, metal or wood wool roof decks, or where pipes carry hot materials or require to be isolated, an appropriate sleeve should be provided in order to isolate the mastic asphalt from the pipe.

Table 1

Treatments for vertical and sloping surfaces to receive mastic asphalt

TREATMENT	REFERENCE
BLACK SHEATHING FELT	1
EXPANDED METAL LATHING	2
HIGH-BOND PRIMER	3
MECHANICALLY PREPARED SURFACE	4

SURFACE	TREATMENT REQUIRED
FACING BRICKS (FLUSH POINTED)	3
ENGINEERING BRICKS (FLUSH POINTED)	3 AND 2
TIMBER	1 AND 2
SMOOTH CONCRETE (ALTERNATIVE 1)	4 AND 3
SMOOTH CONCRETE (ALTERNATIVE 2)	3 AND 2
TEXTURED CONCRETE (COARSE AGGREGATE)	3
LIGHTWEIGHT AGGREGATE CONCRETE	1 AND 2
LIGHTWEIGHT AGGREGATE BRICKWORK	1 AND 2
METAL PIPES AND THE LIKE (ALTERNATIVE 1)	3
METAL PIPES AND THE LIKE (ALTERNATIVE 2)	3 AND 2

Verges

Edge trims

Suitable preformed GRP roof edge trims may be secured at edges of roofs, using a section designed for use with mastic asphalt. Materials adversely affected by thermal movement should be avoided, such as aluminium.

Apron with undercut drip

A mastic asphalt apron with an undercut drip may be provided on masonry constructions, the mastic asphalt being applied in two coats to a thickness of 13mm, if below 150mm deep.

Eaves gutters

Where the roof falls into an eaves gutter, the asphalt should be finished over a lead or other suitable flashing set into a rebate in the substructure. The flashings should be welted at the back and the depth of rebate should allow for the full thickness of mastic asphalt to be maintained over the welt. Alternatively, a watershed pre-formed edge trim could be adapted for use at this detail.

A lead detail should be designed and installed in accordance with The Lead Sheet Manual, as published by the Lead Sheet Training Academy (LSTA).

Fixing accessories

Rainwater outlets

Cast iron or spun aluminium rainwater outlets with a clamping ring arrangement are particularly recommended for use with mastic asphalt. Rainwater outlets should be mechanically secured to prevent movement and should be recessed to facilitate drainage.

Site work

Preparatory site work prior to asphalting

Before commencing laying the mastic asphalt, the following should be checked:

a). The base has been properly laid to the specified falls (where required), tolerances and finishes, the equivalent of a wood float finish being required on horizontal concrete screeds or slab

b). All chases have been properly cut

c). All outlets have been installed, fixed and located at the correct height relative to the base

d). Vertical surfaces have been properly prepared

e). Movement joints have been correctly installed

Achieving required quality of work

In order to achieve the required quality of work, steps should be taken to ensure that:

a). Design and specification decisions are taken, recorded and transmitted by the designer

b). The design intentions are understood and achievable in the given circumstances

c). The work is regularly monitored to assure conformance with specification and appropriate building regulations.

d). The work is carried out by trained and certified operatives.

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01273 242 778

Documentation and preparation

Full documentation should be prepared as described. There should be a full exchange of information before the work begins on site. Any queries should be resolved before the work begins. Clear instruction on all aspects of the work involved should be given to personnel.

Before work begins all necessary scaffolding should be in position together with sufficient hoisting facilities and measures appropriate for the protection of personnel and the public.

The deck should be in an adequate condition to receive the mastic asphalt and all necessary builder's work should have been completed.

Only sufficient materials for the day's requirements should be taken out of store and placed convenient to the area being worked. They should only be unwrapped immediately prior to use and all wrapping materials should be disposed of carefully.

Equipment should be sited as close as is practicable to the area being worked.

Receiving and checking materials

Roofing materials should be checked upon arrival on site to ensure that they:

a). Are correctly marked and/or, where applicable, are in the manufacturer's original wrappers

b). Conform to specification

c). Are sufficient for the work

Goods not meeting the requirements should be removed from site.

Workmanship

Remelting

Strict temperature control should be maintained throughout the remelting process. Generally, the temperature of the mastic asphalt should not exceed 230 degrees Centigrade.

Remelting should be carried out in mechanically agitated mixers, and cauldrons should only be used in exceptional circumstances, governed by site conditions and the areas of mastic asphalt to be laid.

Transportation of molten material

When the material is sufficiently molten to be workable, it should be carried in buckets, wheelbarrows or heated dumpers to the point of laying. To prevent the molten material from sticking to the buckets, wheelbarrows, etc. they may be sprinkled inside with a minimum quantity of inorganic dust such as limestone dust. For acid resisting mastic asphalt a silica or similar acid resisting dust should be used.

Setting out and planning the work

The design of the application and the number of operatives engaged determine, at the discretion of the spreader, the setting out and the size of the bays. The dimensions of each bay should be such that easy control by the spreaders is ensured during the process of laying and rubbing. Mitred bays may be laid dependent upon the nature of any falls provided.

The whole of the structure should be rigid. In a timber substrate, the construction should minimise the effects of shrinkage, warping or displacement or relative movement of timber. Care should be taken to guard against any conditions which might allow decay, partly through the moisture already in timber or resulting from the ingress of water from other parts of the structure or from abnormal condensation.

Immediately after all the work on preliminary activities has been completed, installation of the mastic asphalt application will proceed to project specification.

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Laying air and vapour control layers

Whenever an air and vapour control layer (AVLC) is specified it must be installed in accordance with the manufacturer's recommendations, with any damage being made good before installing the insulation boards. Care should be taken at all detail work to ensure the insulation is completely enclosed and protected against water vapour from below.

Laying thermal insulation boards

Warm roof construction

Insulation boards should be bonded in an approved adhesive or similar, adopting a brick bond pattern and with edges firmly butted together in accordance with the board manufacturer's instructions.

The thermal insulation should be laid with a minimum 25mm wide margin between the edges of the boards and all skirtings and abutments. The margin should be subsequently filled with mastic asphalt, prior to laying the first coat of horizontal mastic asphalt.

Inverted roof construction

Thermal insulation boards should be loose laid in a brick bond pattern with edges pushed firmly together in accordance with the board manufacturer's instructions. A suitable isolating membrane, such as polypropylene fleece, is recommended between the mastic asphalt and inverted insulation.

Laying the separating membrane

Horizontal work

The appropriate separating membrane should be loose laid with not less than 50mm lapped joints beneath the mastic asphalt.

The purpose of the separating layer is to isolate the mastic asphalt roofing from substrate movement whilst still providing sufficient friction to help restrain the asphalt against contraction in cold weather. It must also allow a free lateral passage for hot air and moisture vapour during the application of the hot asphalt and act as a long term pressure release layer.

Black Sheathing Felt is used as the separating layer in all flat roof applications with the exception of buried systems where glass fibre tissue could be adopted.

Sloping or vertical lightweight concrete or timber

Black Sheathing Felt should be used in conjunction with expanded metal lathing mechanically fixed at not greater than 150mm centres in all directions.

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Laying the mastic asphalt roofing

Due to the nature of mastic asphalt, the nominal thicknesses given are indicative rather than precise. Any irregularities in the horizontal substrate will be reflected in the final surface with accompanying inconsistencies of thickness.

Horizontal work

Mastic asphalt roofing should be laid in bays. The number and thickness of coats will depend on the purpose and use of the application.

Each coat of each bay should be spread evenly and uniformly by means of a float, to the recommended thickness, onto the previously prepared surface, the separating membrane or the preceding coat. Timber or metal gauges should be used in order to ensure accuracy.

Each coat of mastic asphalt roofing should be followed by any succeeding coat as soon as is practical, since exposure to contamination, for example, by dust or dirt, might impair adhesion and cause blistering.

If 'blowing' occurs, the bubbles should be stabbed and the affected area carefully made good while the mastic asphalt is still hot.

Junctions

Special care should be taken in laying mastic asphalt to form an efficient junction with the edge of a bay already laid. The hot mastic asphalt is taken over the edge of the existing bay and allowed to remain for a sufficient period of time to ensure complete fusion between the two bays. When the edge of the mastic asphalt bay is contaminated it should be cleaned by a temporary application of hot mastic asphalt.

Care should be taken to arrange that the junction between the two adjacent bays of a coat of mastic asphalt should not be less than 75mm from a corresponding junction in a preceding coat.

Where bays of mastic asphalt have been left open due to phasing of the contract, or for other reasons, the edges of previously laid bays should be warmed and cleaned by the application of hot mastic asphalt before the joint with the new material is made.

This procedure should also be adopted at junctions between vertical and horizontal surfaces.

Skirtings

Skirtings should be executed in not less than two coats, particular care being taken to ensure proper adhesion of the first coat to the base. The first coat should be applied with a steel trowel or a small wooden float, with the second, and any specified subsequent coats, being applied with a wooden float.

Angle fillets

At the internal intersection of two planes, and after the mastic asphalt has been laid to each face, the final coat of mastic asphalt should be warmed and cleaned by the temporary application of hot mastic asphalt. A solid angle fillet of mastic asphalt should be formed in two coats with a face of not less than 40mm.

External angles

Special care should be taken that the full thickness of mastic asphalt is maintained at all external angles formed by intersecting planes, whether horizontal or vertical.

Surface finishes

The horizontal surface of the mastic asphalt roofing should be sand rubbed.

Whilst the mastic asphalt is still warm, horizontal surfaces should be well rubbed with a wooden float, using clean, sharp sand. Special attention should be given to the junction between bays. All surplus material should be removed after rubbing is completed.

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Surface protection

General

All asphalt roofing, including upstands, should be protected against static point loading and mechanical damage.

On inverted roofs, the ballast and insulation will provide protection to the mastic asphalt. The insulation and ballasting should be installed as soon as is practically possible and after any waterproofing integrity testing of the membrane has been carried out. Care should be taken to provide adequate protection at upstands.

Sand rubbing

To minimise surface crazing on horizontal and slightly sloping surfaces, immediately after completion of laying and whilst the mastic asphalt is still warm, clean sharp sand should be rubbed evenly into the surface of the mastic asphalt with a wooden float.

Promenade surfacing

On terrace/balcony roofs where point loading is anticipated, a suitable tile should be laid in accordance with manufacturer's instructions. Alternatively, other forms of paving may be laid in a cementitious bedding on an isolating membrane.

Vertical and sloping surfaces

On vertical and sloping surfaces, exposed upstands, kerbs etc. a suitable solar reflective paint may be used.

Solar protection

Various methods of reducing solar gain may be adopted, and should follow the laying of the mastic asphalt without undue delay.

In a warm roof construction it is essential to provide efficient solar protection to the mastic asphalt which should be applied as soon as possible after the mastic asphalt has been laid.
On horizontal surfaces this should be by the application of one of the following:

a. Solar reflective paint (not metal or water-based), applied in accordance with manufacturer's recommendations. Maintenance will also be necessary in accordance with the paint manufacturer's requirements.

b. Stone chippings of limestone, granite, gravel, calcined flint, calcite, feldspar or similar of 10-14mm nominal size, free from dust, bedded in a suitable compound.

c. Stone aggregate of 20mm nominal size, loose laid, but secured around outlets etc.

d. Light coloured pedestrian tiles fixed in suitable adhesive in accordance with tile manufacturers' recommendations particularly when point loading is expected.

e. Concrete paving slabs bedded in cement, sand, mortar on a loose laid isolating membrane.

info@masticasphaltcouncil.co.uk
01273 242 778

Maintenance and repair

General

Mastic asphalt roofing which has been designed and installed in accordance with the recommendations of this technical guide along with the relevant British Standards can be expected to provide trouble-free, reliable service provided it is properly maintained. Maintenance inspections should be carried out regularly by persons knowledgeable in mastic asphalt work.

Mastic asphalt roofs should be inspected twice yearly:- in the autumn, to clear leaves, debris and dirt, which may prevent proper drainage or cause deterioration, and in spring to identify and rectify any damage due to weather. Where the roof is in an area of high dust or pollution, or in close proximity to trees, more frequent inspections may be necessary.

Inspection should be carried out both internally and externally. Particular attention should be given externally to roof covering abutments, joints, gutters and outlets and internally to corners, abutments and penetrations. Observations by occupants of the building should be noted.

Checklist for roofs

During the course of regular maintenance inspections the whole of the roof should be systematically checked and a note made of any items requiring attention. The following checklist should be used:

a). ***Surface finish and solar reflectors***. Check that surface chippings are evenly distributed and unaffected by wind scour and that ballast has not been displaced. Note any cracked or damaged tiles or slabs. Where a reflective paint has been used, assess the necessity for renewal, taking into account the roof's age and formation of the roof, ie. the presence and type of insulation etc.

b). ***Skirtings, kerbs and turndowns***. Check that upstands are intact and fully adhered. Note any blistering, distortion or slumping. Pay particular attention to fillets and arrises for cracks from movement or impact. Where skirtings are tucked into a chase in concrete or brickwork, check the condition of the pointing.

c). ***Edge trims***. Check for signs of movement, displacement or stress, particularly at the joints between adjacent sections of trim and for retraction between asphalt and back edge of the trim.

d). ***Drainage.*** Ensure that all gutters, rainwater outlets and discharge points are clean and that the water discharge from the roof is uninterrupted. Carefully examine the junction between the asphalt and rainwater outlets. Note any apparent defects or signs of silting or ponding.

e). ***General area***. Examine the whole roof area, note any areas of stress or blistering and any signs denoting failure of insulant or base. Record the extent and type of any defects.

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Repair procedures

Repairs should be carried out after the type and extent of any defects have been noted and their underlying cause identified. The intention of repair work should be to restore the asphalt to its original condition and ensure its continuing performance. All repairs should therefore be carried out using materials, accessories and standard of workmanship comparable with the original installation.

Any surface treatment that has been damaged or displaced should be made good to match the existing surface.

Defective pointing should be broken out and renewed. Split or broken non- ferrous metal cover flashings should be repaired as necessary.

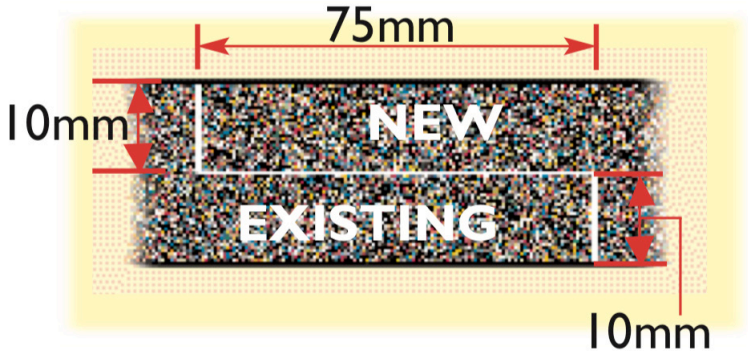
Excessive blistering may be indicative of more serious underlying problems and should be cut out and the substrate examined to establish the cause.

All repair work to a mastic asphalt surface should be performed by a qualified mastic asphalt operative.

If it is necessary to remove an area of mastic asphalt roofing, the line of the cuts should be covered with molten asphalt until the underlying material has softened. The mastic asphalt should not be removed until this has taken place. In no circumstances should a hammer and chisel be used to cut cold mastic asphalt. Alternatively, a disc cutter may be used to remove mastic asphalt, especially where paving grade mastic asphalt has been used.

Defective areas should be carefully removed. When jointing new mastic asphalt to existing mastic asphalt, the principle of the lapped joint should be observed. In multi-layer applications the perimeter of existing mastic asphalt should be softened to permit removal of material to a depth of the original coat thickness for a width of not less than 75mm.

The use of a forced flow hot air torch, or the controlled use of a gas gun may be acceptable for specific requirements. In the case of the latter, extreme care should be taken to avoid contact between the naked flame and the mastic asphalt.



Joint between existing & new mastic asphalt roofing

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01273 242 778

Environmental Statement

A carbon-zero industry

The Mastic Asphalt Council is a trade association representing specialist mastic asphalt contractors and manufacturers. It provides member support in all aspects of manufacture and application as well as providing architects, surveyors, local authorities and members of the general public with free technical and practical advice.

All mastic asphalt produced by member manufacturers and applied by MAC contractors is carbon zero. This “carbon off-set” policy ensures that unavoidable emissions in both manufacture and application are calculated by an independent assessor; this information is then converted into a monetary amount (levy) which is used to support carbon reduction initiatives in both the UK and Africa (further details are available upon request).

Manufacture

MAC’s manufacturers are committed to continuing the development of reduced temperature melt materials thus further minimising the industry’s energy consumption.

Compliance

MAC strives to ensure that all member activities meet relevant regulation and legislation at a national and local level.

Suppliers

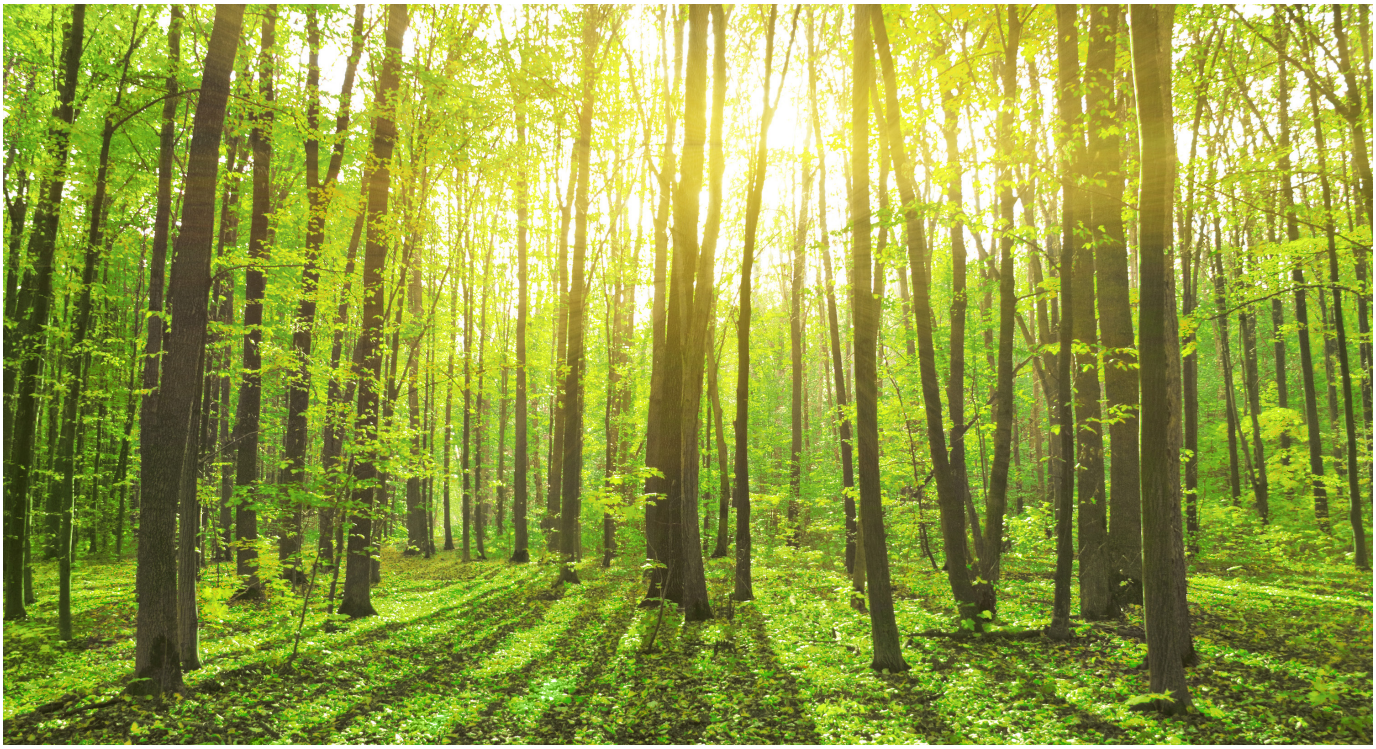
MAC encourages its members to work with material suppliers, contractors and subcontractors through partnerships designed to develop sustainable activities and best practice.

Environment and resource use

MAC campaigns with its members to demonstrate that any activities have a controlled and mitigated environmental impact, that they are safe in their intended use and are efficient in their consumption of energy and natural resources.

Continuous improvement

MAC works with members to develop a framework for continual improvement by conducting regular audits to improve understanding, customer and client needs and community expectations.



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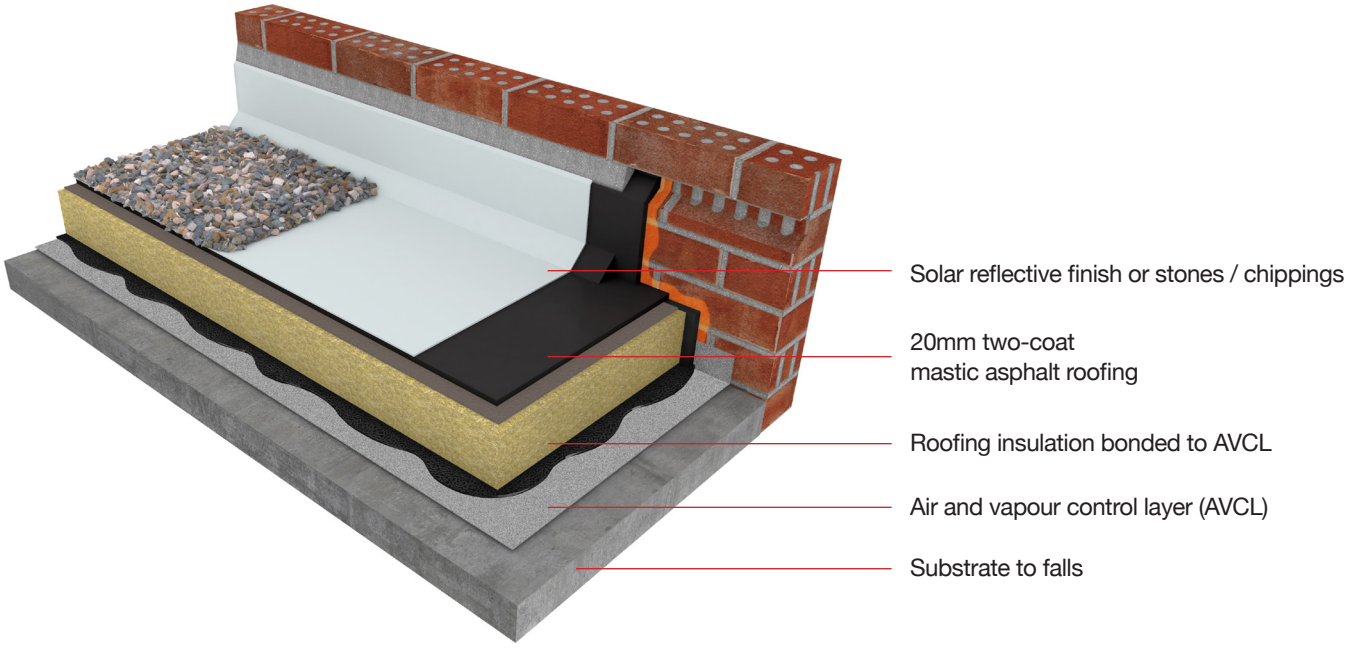
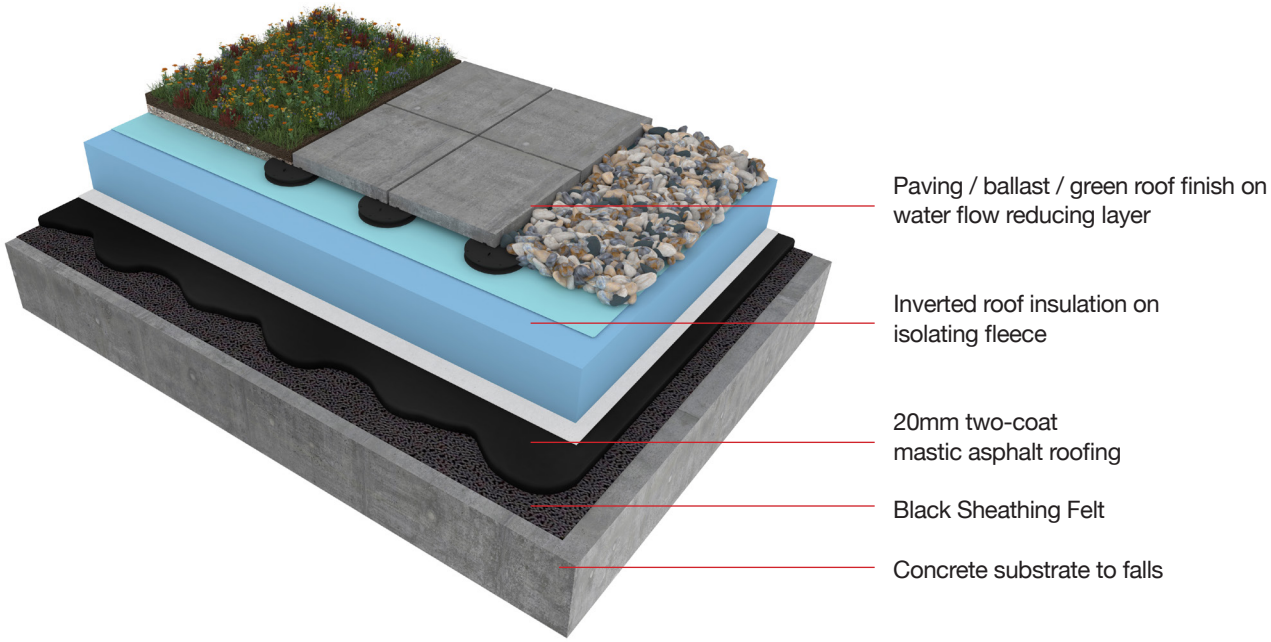
Sample system build-ups

1). Mastic asphalt warm roof system



2). Mastic asphalt inverted roof system



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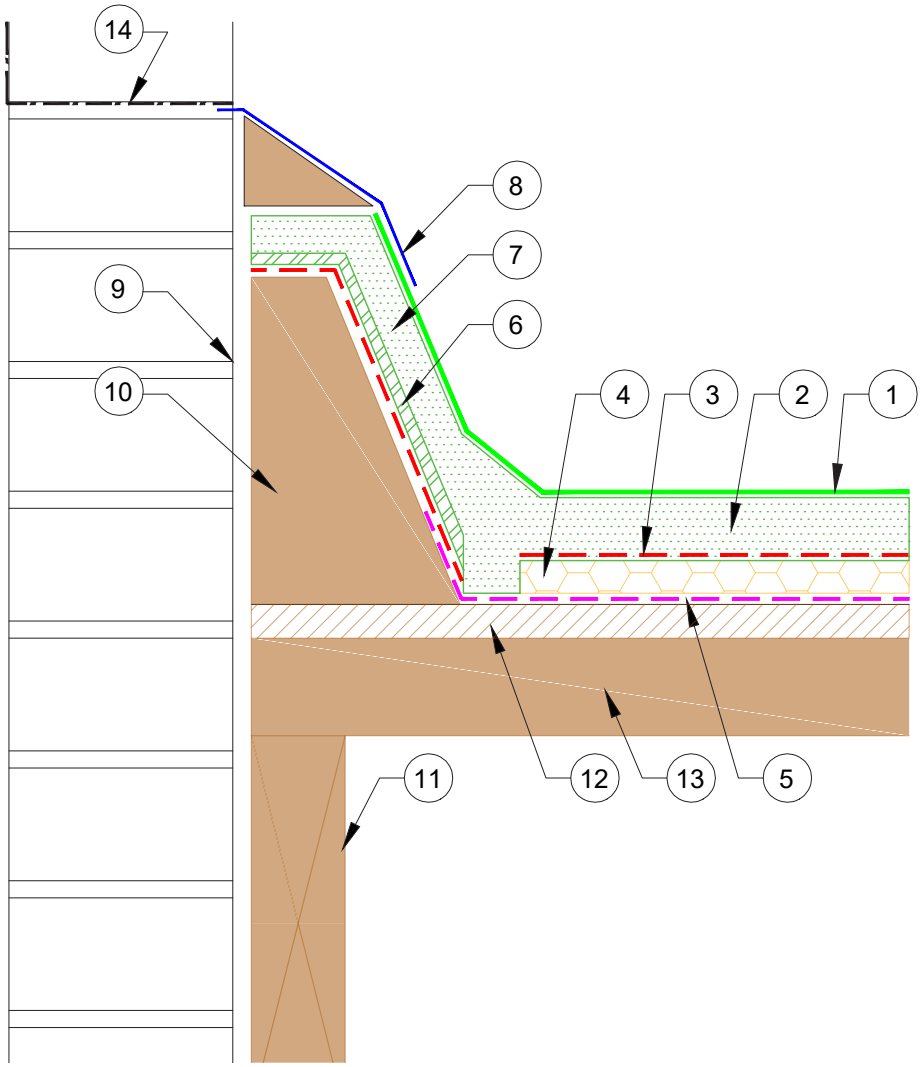
Typical specifications

1). Timber roof deck with free standing kerb (warm roof)



1. SOLAR REFLECTIVE TREATMENT
2. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
3. BLACK SHEATHING FELT
4. THERMAL INSULATION
5. AIR VAPOUR CONTROL LAYER
6. EXPANDED METAL LATH
7. MIN 150mm HIGH 20mm THREE COAT MASTIC ASPHALT SKIRTING/ 13mm TWO COAT MASTIC ASPHALT SKIRTING
8. FLASHING FIXED WITH TRADITIONAL PLUMBER DETAIL INCLUDING TIMBER FILLET
9. BRICKWORK
10. FREE STANDING TIMBER KERB
11. TIMBER JOIST
12. PLYWOOD BOARDING OR SIMILAR
13. CROSS FIRRING
14. DAMP PROOF COURSE

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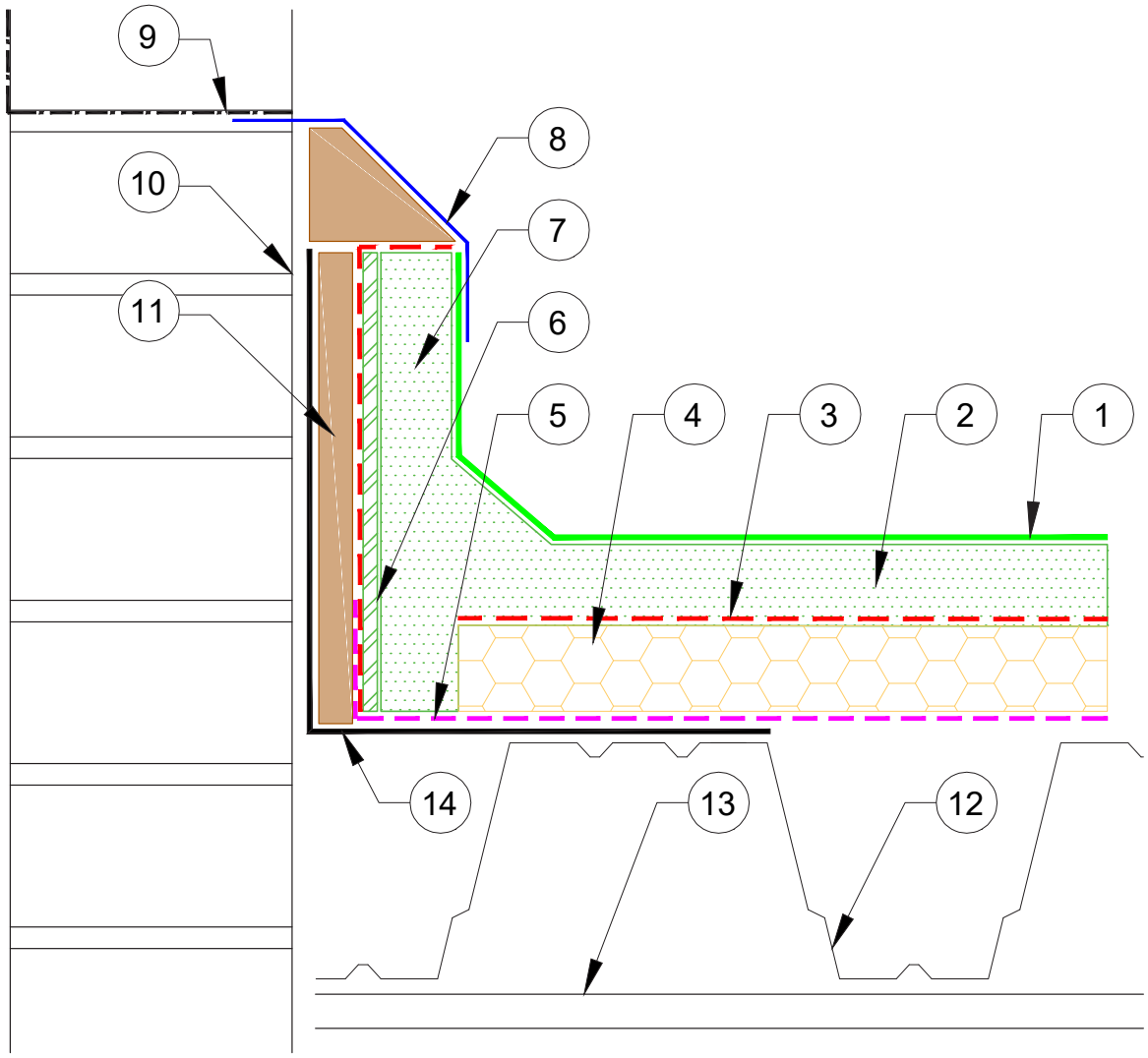
2). Metal roof deck with free-standing upstand



1. SOLAR REFLECTIVE TREATMENT
2. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
3. BLACK SHEATHING FELT
4. THERMAL INSULATION
5. AIR VAPOUR CONTROL LAYER
6. EXPANDED METAL LATH
7. MIN 150mm HIGH 20mm THREE COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET
8. FLASHING FIXED WITH TRADITIONAL PLUMBER DETAIL INCLUDING TIMBER FILLET
9. DAMP PROOF COURSE
10. BRICKWORK
11. TIMBER UPSTAND
12. METAL ROOF DECK TO FALLS
13. CEILING
14. METAL ANGLE

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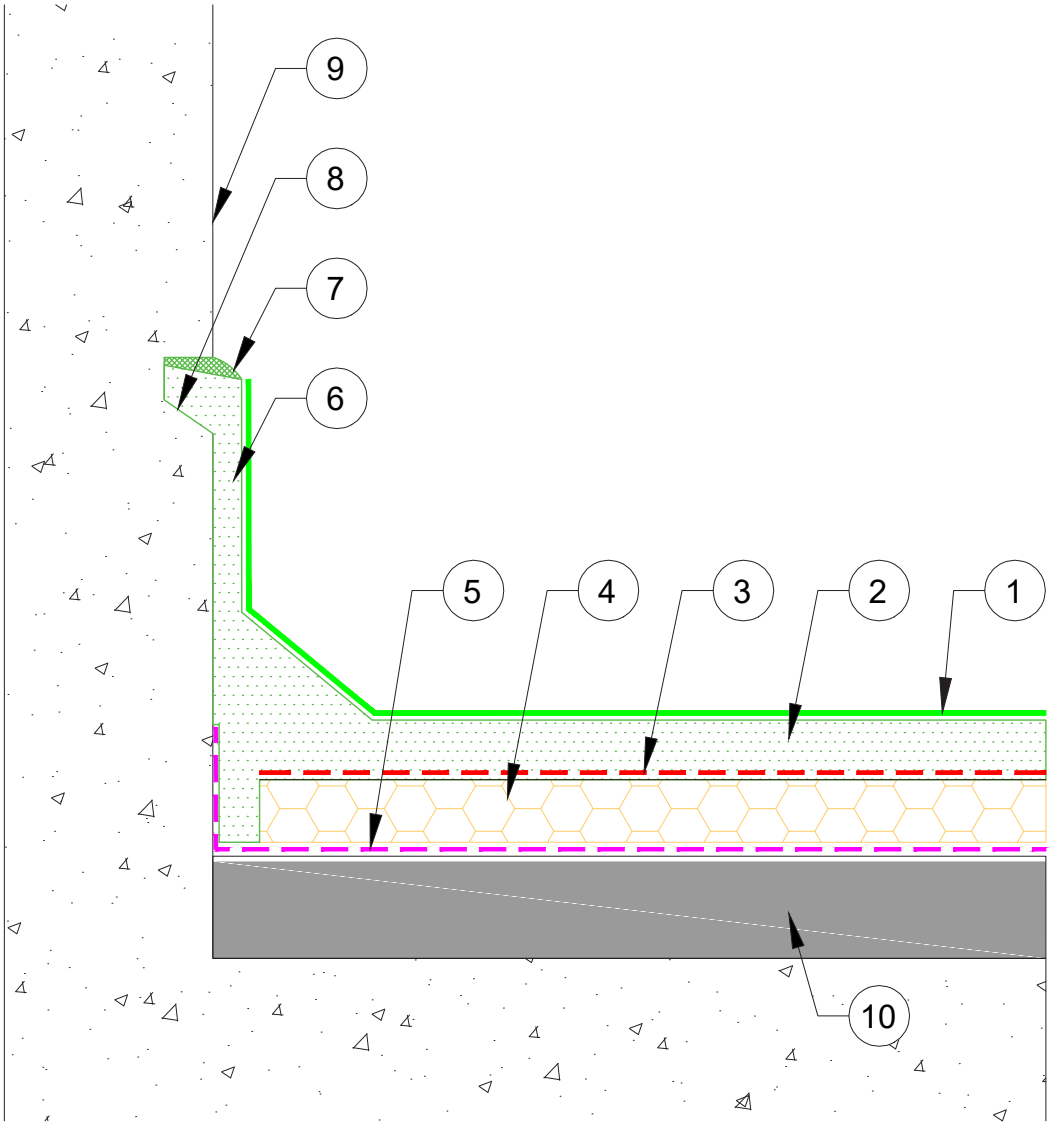
3). Concrete roof deck and skirting (warm roof)



1. SOLAR REFLECTIVE TREATMENT
2. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
3. BLACK SHEATHING FELT
4. THERMAL INSULATION
5. AIR VAPOUR CONTROL LAYER
6. MIN 150mm HIGH 20mm THREE COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET
7. CEMENT MORTAR POINTING
8. CHASE IN CONCRETE 25x25mm
9. CONCRETE/ BRICKWORK UPSTAND OR CONCRETE DECK
10. SCREED LAID TO FALLS

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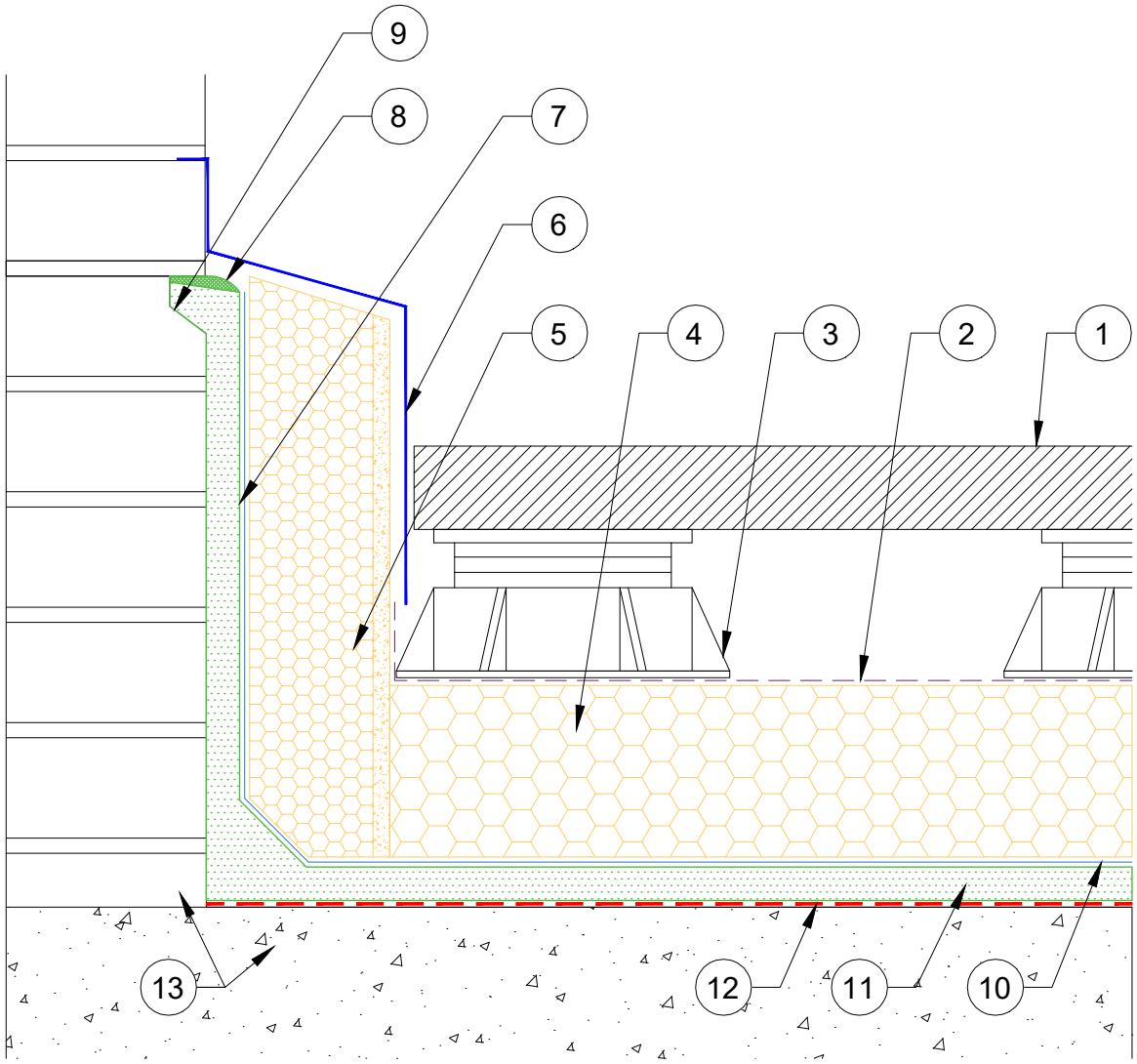
4). Concrete roof deck and skirting (inverted roof) with external insulation



1. PAVING
2. WATER REDUCING LAYER/ FILTER SHEET
3. ADJUSTABLE PAVING PEDESTAL
4. THERMAL INSULATION
5. INSULATION UPSTAND BOARD WITH CEMENT FACE
6. FLASHING FIXED WITH TRADITIONAL PLUMBERS DETAIL
7. MIN 150mm HIGH 20mm THREE COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET/ 13mm TWO COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET
8. CEMENT MORTAR POINTING
9. CHASE IN CONCRETE 25x25mm
10. LOOSE LAID WATERPROOFING BUILDING PAPER
11. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
12. BLACK SHEATHING FELT
13. CONCRETE/ BRICKWORK UPSTAND OR CONCRETE DECK

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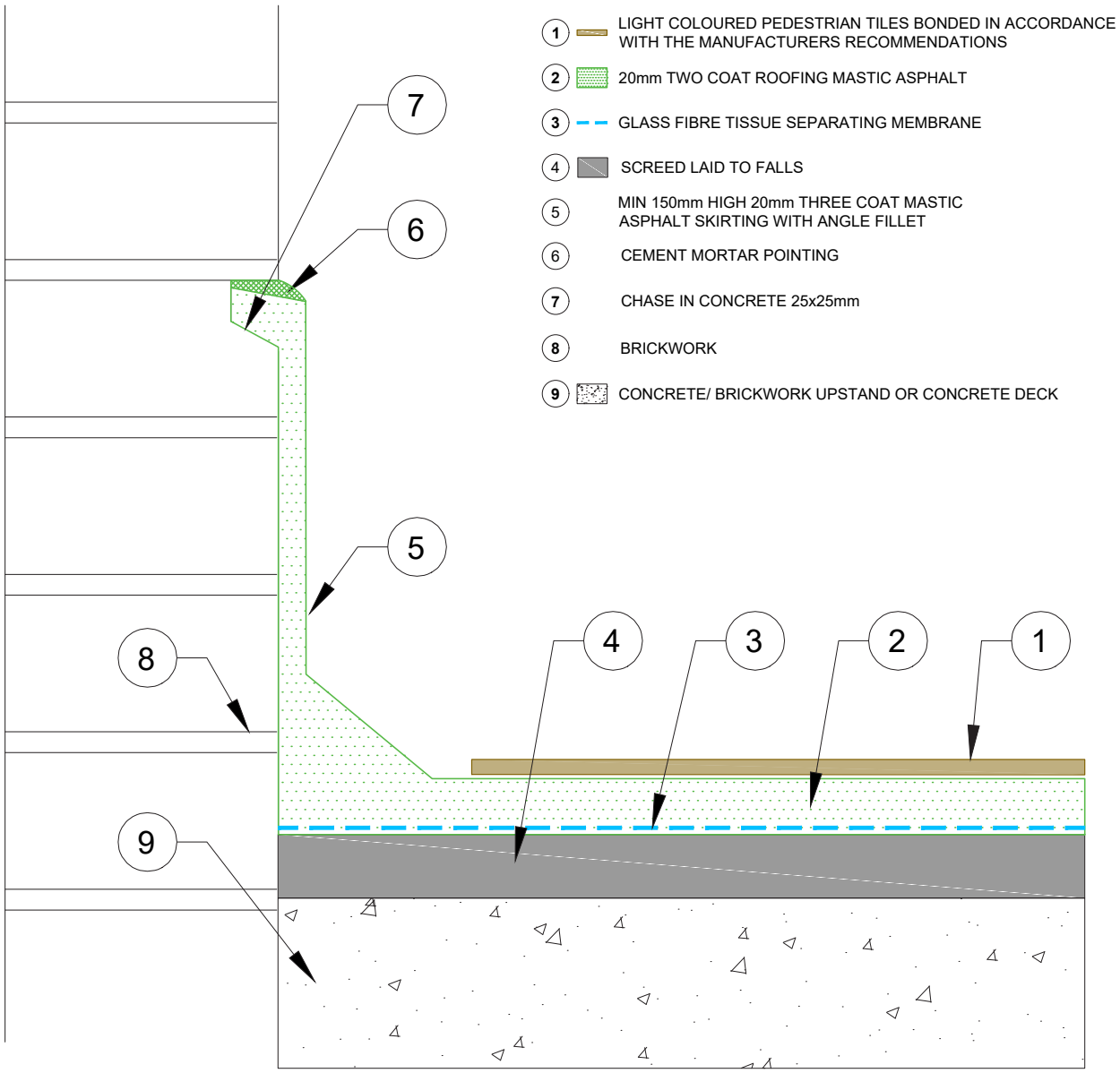
5). Private balconies with tiles (bitumen bedded)



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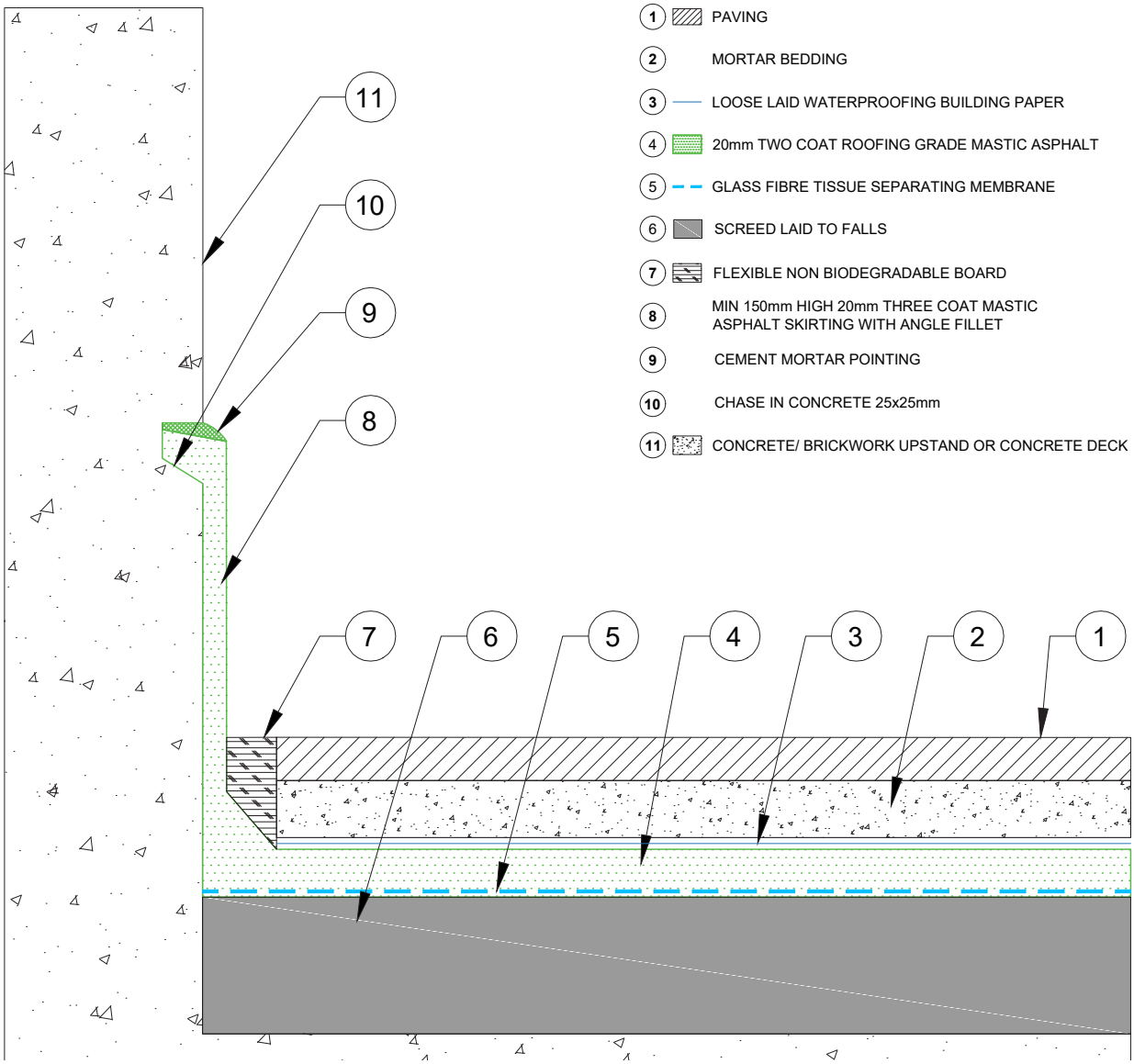
6). Private balconies / terraces with paving slabs (fully buried)



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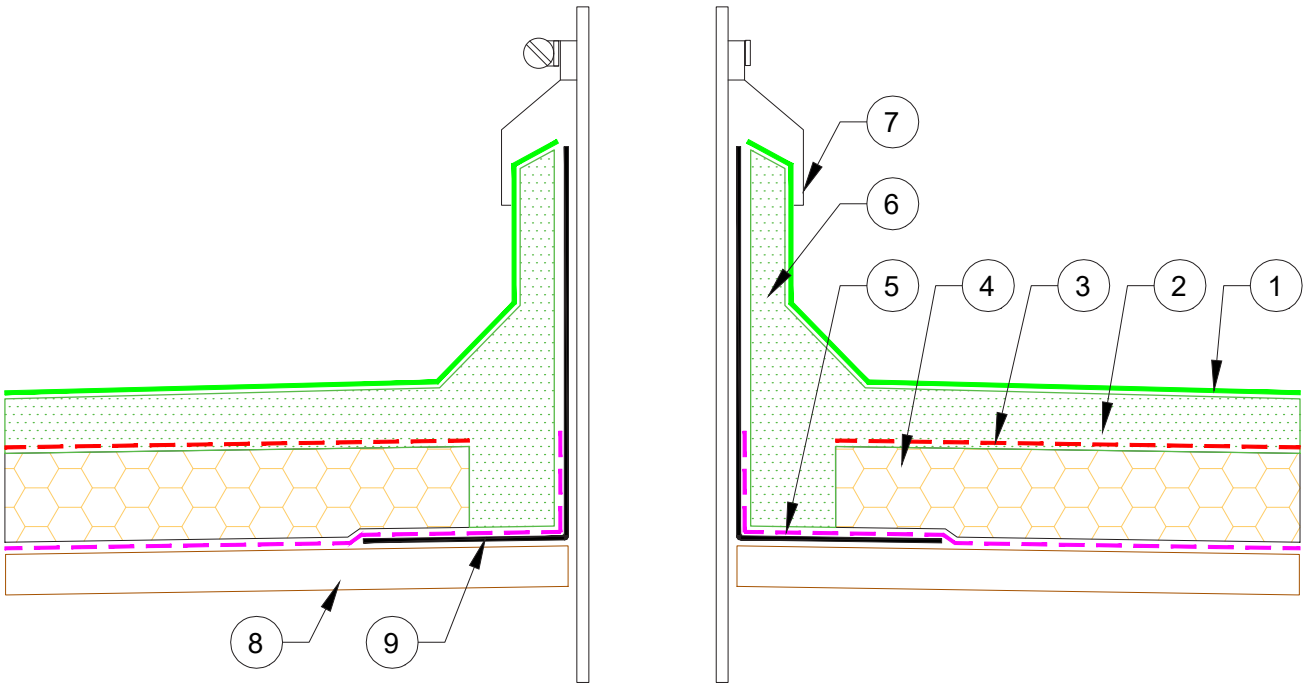
7). Sleeved pipe penetration (warm roof)



1. SOLAR REFLECTIVE TREATMENT
2. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
3. BLACK SHEATHING FELT
4. THERMAL INSULATION
5. AIR VAPOUR CONTROL LAYER
6. MIN 150mm HIGH 20mm THREE COAT MASTIC ASPHALT SKIRTING/ 13mm TWO COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET
7. METAL COLLAR CLIPPED TO PIPE
8. PLYWOOD BOARDING OR SIMILAR
9. NON- FERROUS METAL SLEEVE TO PIPE

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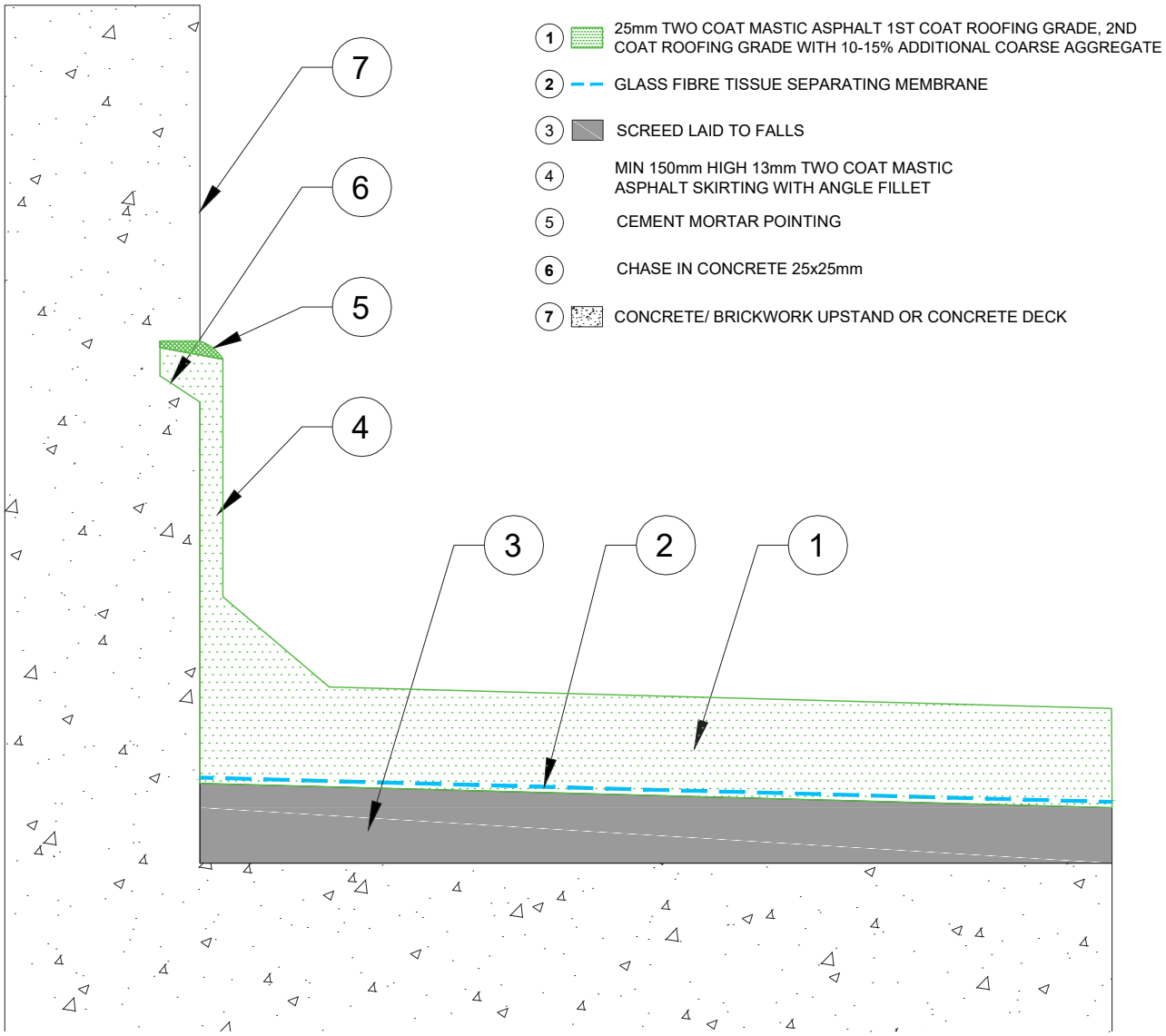
8). Access decks, drying & play areas



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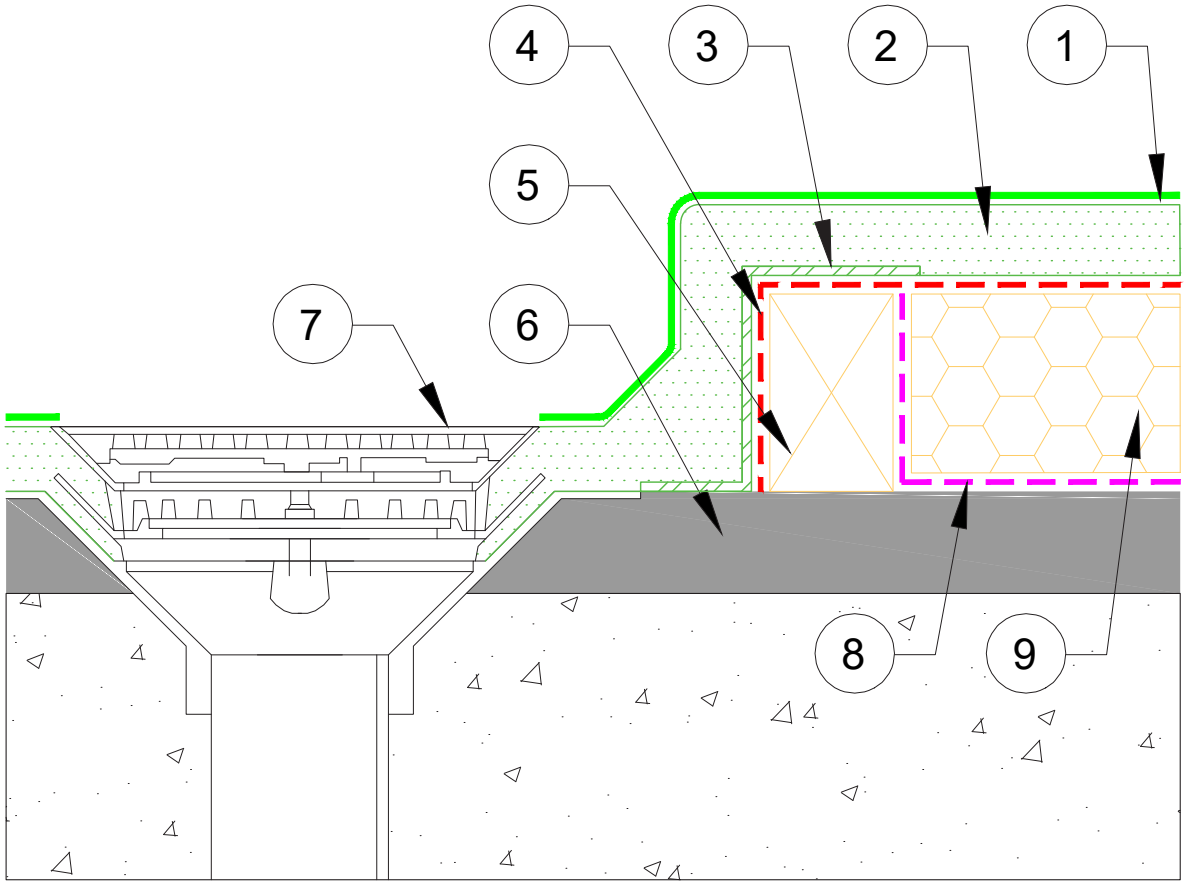
9). Clamping ring outlet



1. SOLAR REFLECTIVE TREATMENT
2. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
3. EXPANDED METAL LATH
4. BLACK SHEATHING FELT
5. INSULATED HARD EDGE
6. SCREED LAID TO FALLS
7. ROOF OUTLET AND METAL GRATING
8. AIR VAPOUR CONTROL LAYER
9. BOARD TYPE INSULANT

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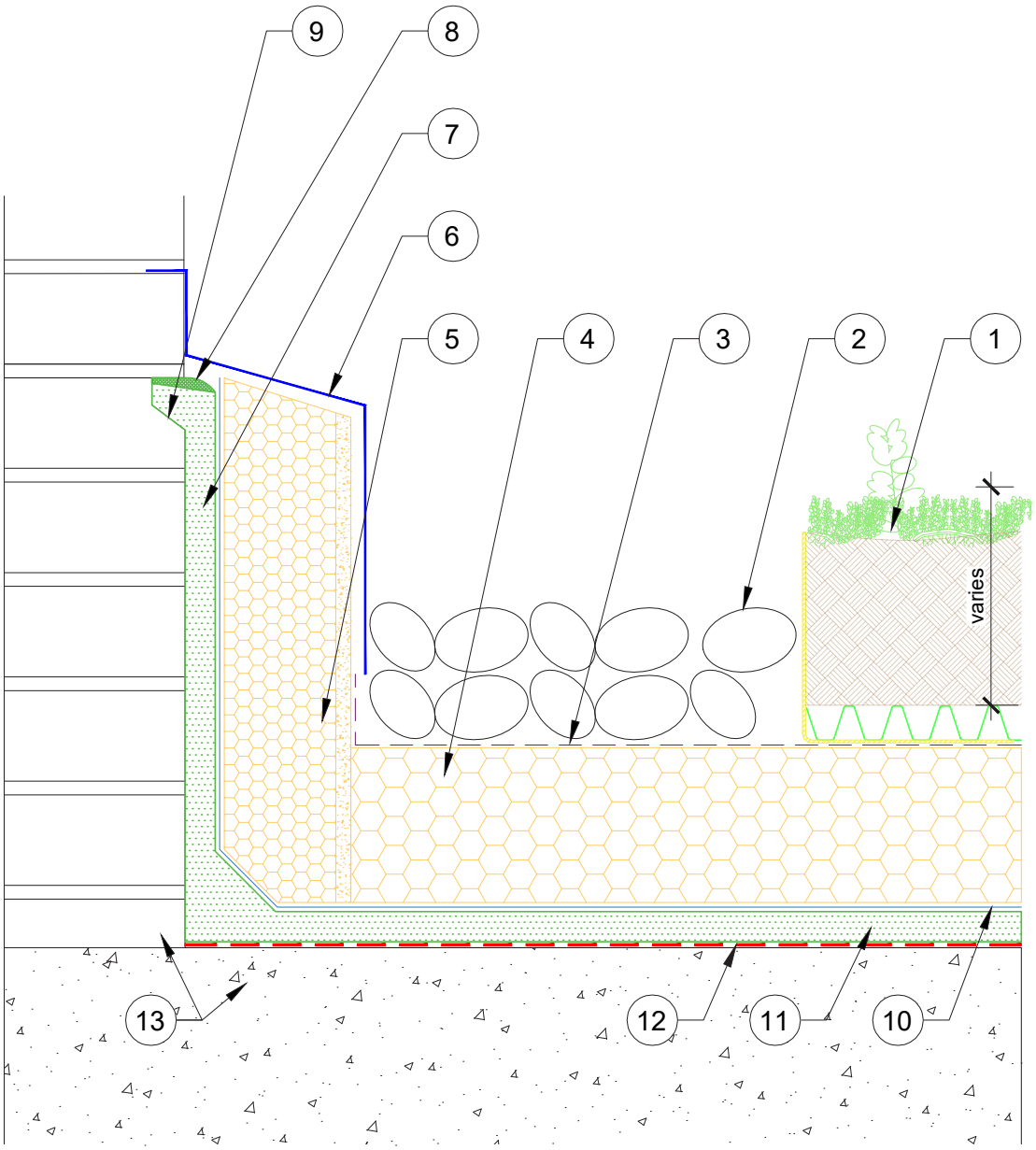
10). Green roof detail (inverted roof)



1. EXTENT OF GREEN ROOF WITH RETAINING TRIM & FILTER LAYER
2. WASHED ROUNDED BALLAST
3. WATER REDUCING LAYER/ FILTER SHEET
4. THERMAL INSULATION
5. INSULATION UPSTAND BOARD WITH CEMENT FACE
6. FLASHING FIXED WITH TRADITIONAL PLUMBER DETAIL
7. MIN 150mm HIGH 20mm THREE COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET/ 13mm TWO COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET
8. CEMENT MORTAR POINTING
9. CHASE IN CONCRETE 25x25mı
10. ISOLATING MEMBRANE
11. 20mm TWO COAT ROOFING GF
12. BLACK SHEATHING FELT
13. CONCRETE/ BRICKWORK UPS

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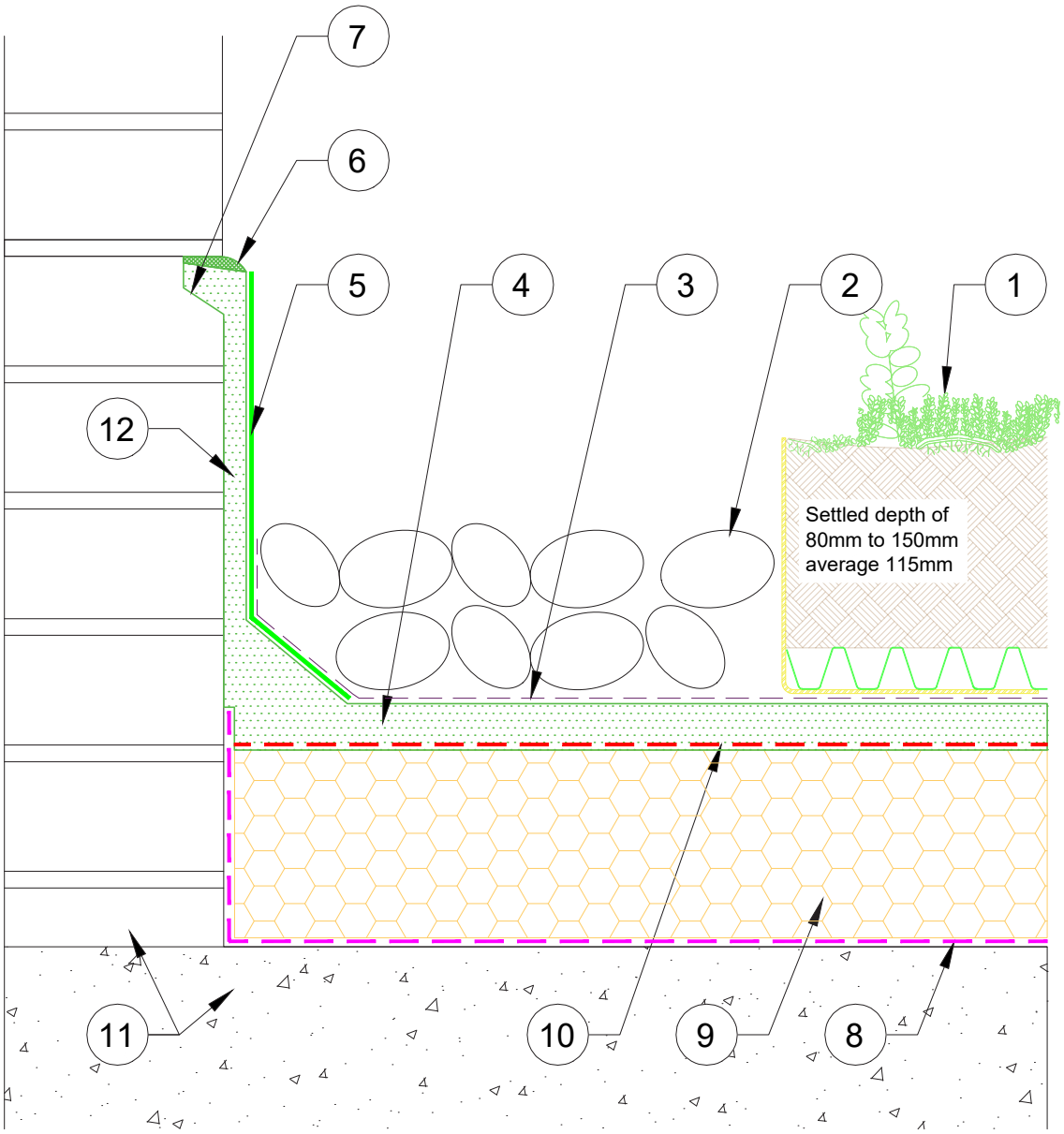
01273 242 778

10). Green roof detail (warm roof)



1. EXTENT OF GREEN ROOF WITH RETAINING TRIM
2. WASHED ROUNDED BALLAST
3. SEPERATING LAYER/ VEGETATION BARRIER
4. 20mm TWO COAT ROOFING GRADE MASTIC ASPHALT
5. SOLAR REFLECTING PAINT
6. CEMENT MORTAR POINTING
7. CHASE IN CONCRETE 25x25mm
8. AIR VAPOUR CONTROL LAYER
9. THERMAL INSULATION
10. BLACK SHEATHING FELT
11. CONCRETE/ BRICKWORK UPSTAND OR CONCRETE DECK
12. MIN 150mm HIGH 12mm TWO COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET/ 13mm TWO COAT MASTIC ASPHALT SKIRTING WITH ANGLE FILLET

For any further technical assistance please contact:

The Mastic Asphalt Council
27 Greenways Crescent
Shoreham by Sea
Sussex, BN43 6HR

info@masticasphaltcouncil.co.uk
01273 242 778

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