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Hot Melt Code of Practice

Specification and use of Hot Applied Polymer Modified Bitumen waterproofing systems for flat roofs, podiums, terraces, balconies and walkways

Produced by the Liquid Roofing and Waterproofing Association (LRWA) Issue 2, March 2025

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Foreword

About Hot Applied Polymer Modified Bitumen Waterproofing Systems

Hot Applied Polymer Modified Bitumen systems, commonly known as Hot Melt, have delivered a viable waterproofing solution for zero falls, flat, trafficked, extensive, inverted, and biodiverse roofs for over 40 years in the UK and are recognised as providing excellent waterproofing performance, robustness and long-term flexibility.

Systems are fully bonded to a primed substrate and achieve adhesion across a wide range of temperatures and are typically finished with a wide variety of decorative or amenity surface coverings, including paving, decking, ballast, green, blue and BioSolar roof systems.

Hot Melt waterproofing systems are expected to have a service life equivalent to "the structure in which it is incorporated", accredited by third-party assessment. This provides clients with durability security, reduced roofing maintenance needs and whole life cost benefits.

LRWA Hot Melt Code of Practice

This Code of Practice is the result of unpaid cooperation by professional technical experts across the UK Hot Melt industry. It is intended to be recognised as a code of best practice and, as such, it should be used to guide behaviour relating to the design, specification, installation and maintenance of Hot Melt waterproofing systems. However, there will be special cases where additional considerations will need to be made, such as fire performance considerations related to surface finishing.

Every user of the Hot Melt Code of Practice is responsible for their own actions and acts at their own risk. While the Code of Practice provides guidance with regard to the specification, installation and detailing of Hot Melt waterproofing systems, it is important to remember that every project is different, and all installations should be completed in accordance with the specified manufacturer's instructions.

The information contained in this document may be freely used by any interested parties.

LRWA Technical Advisory Group to the Hot Melt Code of Practice:

Alumasc Roofing
Axter Ltd
Bauder Ltd
BMI Group UK Ltd
Briggs Amasco Ltd
IKO Group PLC
Moy Materials (UK) Ltd
Proteus Waterproofing Ltd
Radmat Building Products Ltd
Sika Ltd

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Contents

Contents Continued overleaf

LRWA
Liquid Roofing and Waterproofing Association

Contents

Contents continued overleaf

LRWA
Liquid Roofing and Waterproofing Association

Contents

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1. Objectives and scope

(1.1) Objectives

This Code of Practice, prepared by the LRWA, provides a comprehensive guide to the selection and application of Hot Melt waterproofing systems. It aims to improve and then maintain performance and quality standards.

As such, it is based on best practice, including the collective experience of LRWA members alongside that of manufacturers, suppliers, contractors and specifiers within the roofing and waterproofing industry. The Code of Practice has been structured to provide the following:

An understanding of how to select the right quality products.

- Procedures for:
  - specification of materials and methods
  - survey and inspection
  - observation of relevant regulations and legislation

Guidance on ensuring the correct use and application for each individual project, including:

- health and safety
- substrate preparation
- specification preparation
- product application
- quality control procedures on site
- training and utilising competent contractors
- maintenance

In particular, this Code of Practice seeks to reinforce correct guidance and practice around achieving the correct falls on structural roof decks. Standing water due to incorrect deck construction, and ineffective or negative falls, could impose structural loads that the roof was not designed for, put strain on materials and components, and negatively affect the thermal performance of the roof.

(1.2) Scope

This Code of Practice covers the selection and application of Hot Melt waterproofing systems, produced by members of the LRWA, for the waterproofing of roofs, podiums, terraces, balconies and walkways (including associated fittings and constructions). The intended readership includes the following:

- Contractors
- Specifiers
- Clients
- Suppliers
- Other interested parties

This Code of Practice is not an installation manual and does not replace LRWA training courses and qualifications. Nor does it replace technical literature, installation instructions, and/or design details provided by individual system manufacturers. System-specific instructions provided by manufacturers should be followed carefully at all times in order to ensure correct performance.

As it gives advice and recommendations only, this Code of Practice should not be quoted as if it is a specification, and particular care should be taken to ensure that claims of compliance are not misleading. Compliance with this Code of Practice does not in itself confer immunity from legal obligations.

The principles described in this Code of Practice should reflect the majority of circumstances encountered on flat roof, terrace, podium, balcony and walkway projects, though site specific challenges can never be ruled out. Nevertheless, for properly maintained structures, the information provided can be expected to help achieve satisfactory performance.

It is assumed that all construction work and system installation relating to topics covered by this Code of Practice are carried out by operatives suitably qualified in the application of the products being installed.

A separate LRWA Code of Practice covers car park applications. The LRWA Design Guide for Specifiers gives advice and recommendations on the specification and use of liquid applied waterproofing systems. Please visit www.lrwa.org.uk/downloads/ for a copy of the document.

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2. Definitions

(2.1) General

For the purposes of this Code of Practice, the definitions and terminology provided in this section apply.

(2.2) Flat roofs

(2.2.1) Flat roof

BS 6229:2018 defines a flat roof as a "roof with a weathered surface at no more than ten degrees (10°) to the horizontal". Among its functions, a flat roof provides shelter, acts as a thermal element and helps to shed rainwater from the building. It often provides an ideal location for plant or equipment, meaning suitable maintenance access might also be required.

The structural roof deck for a Hot Melt waterproofing system is typically in-situ concrete. Pre-cast concrete, timber deck secured to timber joists or a trapezoidal profiled steel, or Cement Particle (CP) Board secured to trapezoidal profiled steel can be suitable structural roof decks, but the manufacturer should be consulted with regards to specific requirements, such as screed finishes, taping joint and/or accommodation of movement and tolerances.

Generally speaking, a flat roof should not be constructed to be 'flat', in order to avoid ponding and unintended additional loads on the roof structure. Section 4.4 of BS 6229:2018 deals with roof falls to achieve drainage.

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.

Where certified by a third party, certain Hot Melt waterproofing systems may be used with zero falls (or "absolute zero falls" for Blue Roofs). BS 6229:2018 is clear that back falls are not acceptable and should be corrected. It recommends that a design fall of 1:80 is used to achieve a finished surface with a zero fall, aided by a detailed structural analysis to account for construction tolerances, settlement and deflection under load.

If a site level survey finds that areas of the roof have negative falls and will hold water, localised screed or an additional rainwater outlet should be installed as remedial action. BS 6229 states: "To prevent ponding caused by lap build-ups around rainwater outlets, these should be recessed or fitted in sumps, where practical."

The LRWA recommend that Zero Falls roof decks are specified and installed in accordance with BS 8204-2:2003+A2:2011 Screeds, bases and in-situ floorings. Concrete wearing surfaces. Code of practice class SR2 to help eliminate backfalls and ponding.

For further information, refer to the following:

- LRWA Guidance Note No. 7 Specifier guidance on flat roof falls.
- LRWA Guidance Note No. 15 Clarification of BS 6229 regarding thermal performance of inverted and blue roofs.
- BBA Information No. 4 Inverted roofs – drainage and U-value corrections.

(2.2.2) Podium roof

A flat roof that is used as if it were ground level, such as street level over an underground railway station or parking garage. Podium roofs are constructed from in-situ or precast concrete and are finished with soft or hard landscaping finishes, sometimes as an entirely separate layer(s). Street furniture may be attached to the structure through the waterproofing. Where the waterproofing is to be penetrated by street furniture the manufacturer should be consulted early in the specification process to ensure the correct details are incorporated in design tender and installation processes.

(2.2.3) Warm roof

A flat roof where the principal thermal insulation material lies immediately beneath the weatherproof covering, installed over the structural roof deck and any necessary AVCL.

(2.2.4) Inverted roof

A flat roof where the principal thermal insulation material is installed on top of the weatherproof covering, protecting the waterproofing from the thermal shock associated with variations in temperature. A loose laid water flow reducing layer (WFRL) is typically installed above the thermal insulation and beneath the surface finish that provides the ballast layer. This is to control the travel of water within the roof build-up and enable drainage at both WFRL level and deck level.

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2. Definitions

Inverted roof constructions may also be referred to as a 'protected membrane' or 'upside down' roof.

Hot Melt waterproofing systems are used as the waterproofing layer below the insulation layer, usually directly over the structural deck.

For further information, refer to the following:

- LRWA Guidance Note No. 7 Specifier guidance on flat roof falls.
- LRWA Guidance Note No. 14 Best practice for the installation of water flow reducing layers.
- LRWA Guidance Note No. 15 Clarification of BS 6229 regarding thermal performance of inverted and blue roofs.
- BBA Information No. 4 Inverted roofs – drainage and U-value corrections.

(2.2.5) Cold roof

Thermal insulation is below the roof deck, usually at ceiling level. The roof deck is therefore at the external air temperature, and a well-ventilated airspace is required between the insulation and roof deck to limit the risk of condensation. Effective ventilation and adequate insulation is difficult to achieve, for which reason new-build cold roofs are extremely rare. Roofs with a span in any direction > 5 linear metres are not recommended for this type of construction.

(2.2.6) Green roof

A flat roof featuring growing medium and planting, installed as a system on top of the roof build-up. Four main types of green roof construction are generally defined; for more information see The GRO Green Roof Code - Green Roof Code of Best Practice incorporating Blue Roofs and BioSolar Applications (amended June 2023) and the LRWA Specifier Design Guide. It is beyond the remit of this Code of Practice to provide a detailed explanation of green roof construction.

By their robust nature Hot Melt waterproofing systems are ideally suited for use in buried applications, including green or 'living' roofs. Depending on the manufacturer and their system technology, some Hot Melt waterproofing systems might require an additional root resistant membrane to be bonded to the compound layer. For more information, refer to the manufacturer's details and any third-party accreditation.

(2.2.7) Blue roof

A system that attenuates rainwater on a roof, utilising a flow control device to manage rainwater drainage flow from the roof, helping to avoid overwhelming below ground storm drainage. They are an increasingly common feature of Sustainable Drainage Systems (SuDS).

Currently, no British or European standard exists for blue roof water attenuation solutions. Hot Melt waterproofing systems can be used with blue roof solutions, provided the requirements of both the Hot Melt system manufacturer and the blue roof system manufacturer are met.

Guidance on current best practice with regard to blue roofs may also be sought from BS 6229:2018, NFRC Technical Guidance for the construction and design of Blue Roofs and the CIRIA guide Blue roofs. A guide to implementation (C817D) (November 2024)

(2.3) Podiums, terraces, balconies and walkways

(2.3.1) General

The text of this sub-section should be read in conjunction with BS 8579:2020 Guide to the design of balconies and terraces.

(2.3.2) Podiums

A buried podium is a roof structure at, or below, ground level with hard and/or soft landscaping and sometimes vehicular access for emergency vehicles or parking. Waterproofing to the podium is linked to the tanking of the basement structure below.

A raised podium is a terrace, other than an access terrace, above ground level, over a non-habitable area(s) such as a car park.

(2.3.3) Terrace

A terrace is defined as an external accessible surface above an internal space above ground level exterior to and with direct access from a building to occupants for purposes other than exclusively maintenance. A terrace is a roof for the purposes of fire and waterproofing. Additionally, for fire purposes, a terrace can also perform the function of a floor. Certain spaces might incorporate features of both a balcony and terrace.

LRWA
Liquid Roofing and Waterproofing Association

2. Definitions

(2.3.4) Balcony

A balcony is defined as an accessible external amenity platform above ground level, exterior to and with direct access from a building. A balcony is formed above an external space that is not a habitable room. See 2.3.3 for the definition of terrace. A balcony is not regarded or designed as storage space. For the purposes of fire, a balcony is not a roof. Balconies are typically of concrete construction.

Balconies often have a wearing surface as part of the Hot Melt waterproofing systems, finished with bonded tiles, loose laid tiles or slabs, or decking. This Code of Practice only covers the waterproofing application.

(2.3.5) Walkways

Walkways are sometimes known as an access deck and are defined an accessible external amenity platform above ground level exterior to and with direct access from a building.

Like balconies, walkways can have a wearing surface as part of the Hot Melt waterproofing system, or can be finished with bonded tiles, loose laid tiles or slabs, or decking.

(2.4) Elements of Hot Melt waterproofing systems

(2.4.1) Substrate

Any suitable surface which forms the basis of the structure e.g. concrete, timber.

(2.4.2) Primer

A low viscosity bitumen solution or emulsion or other solution such as a polymer primer for the purpose of improving adhesion, sealing and preparing surfaces prior to the application of the Hot Melt waterproofing system. The system manufacturer must be consulted to confirm the correct priming regime.

(2.4.3) Waterproofing membrane

Hot Melt is supplied as a block or 'cake' to be melted on site in a thermostatically controlled hot melt cooker. It is then poured and spread in one or two layers incorporating a reinforcement material, followed by the application of an access/protection layer. The assembled system may only be applied to suitable substrates as instructed by the manufacturer.

Hot Melt may contain recycled oils, fillers, rubber crumb or other suitable additives in such proportions as to obtain a desired level of performance.

(2.4.4) Reinforcement material

In a traditional two layer Hot Melt system a polyester reinforcement fleece is laid into the first layer of Hot Melt prior to the application of the second layer. The access/protection sheet is installed last. In a single layer Hot Melt system, a glass-fibre or polymeric reinforcement mesh is laid onto the roof surface prior to the application of the Hot Melt and an access/protection sheet.

(2.4.5) Access/protection layer

A layer of material intended to allow access for the installation of insulation/surface finishes. Typically, access/protection layers are based on bitumen roofing membranes whilst protection boards are thicker, rigid bitumen impregnated boards. It may also prevent damage to the Hot Melt waterproofing system caused by following trades, but it should not be relied on. In this situation, temporary protection boards should be used in accordance with the Hot Melt waterproofing manufacturer's instructions.

(2.6) Other elements of the roof build-up

(2.6.1) Thermal insulation

Thermal insulation is usually extruded polystyrene (XPS), modified expanded polystyrene (EPS), Vacuum Insulated Panel (VIP) or cellular glass insulation board, Agrément certified (BBA or Kiwa) for use in inverted applications. Installed over the access/protection layer. For more information, see sub-section 3.4.

LRWA
Liquid Roofing and Waterproofing Association

2. Definitions

(2.6.2) Water flow reducing layer (WFRL)

A robust, vapour permeable, loose laid layer that restricts the flow of water through the inverted roof system. They are typically synthetic non-woven membranes that are UV stable and rot resistant.

Water flow reducing layers are tested with a specific thermal insulation, using a test method detailed in ETAG 031. The insulation and WFRL are named together in BBA or Kiwa certification and should be installed together accordingly.

The contractor should include a check of the installed WFRL as part of their quality control procedures, and the waterproofing system holder should ensure the system has been installed to meet the terms of their guarantee. For more information, see clause 2.2.4.

(2.6.3) Upstand board

A weather resistant, high impact facing board bonded to a suitable insulation board. Used to prevent cold bridges at upstands, parapet walls and/or a decorative finish.

(2.7) Surface Finishing

(2.7.1) Paving

Individual cast stone or mineral slabs, installed on paving spacers/ pedestals to provide required fire performance and wind uplift resistance. Also provides an aesthetic finish, amenity and/or a means of access. Paving may also be bedded in sand. Deemed to satisfy fire performance compliance through Commission Decision 2000/553/ EC is based on a minimum thickness of 40 mm (see 3.2.3). Note that 40 mm thickness may not provide the required wind uplift resistance for the waterproofing, insulation or the surface finish itself.

(2.7.2) Ballast

Loose laid gravel (rounded to reduce abrasion) of 4 to 32 mm diameter, provided to a minimum 50 mm depth or a mass ≥ 80 kg/m^2 to ensure the required fire performance (see 3.2.3) and wind uplift resistance. Rounded shingle ballast 20-40 mm diameter is commonly available, and it has a higher resistance to wind scour potential in the UK. Also provides an aesthetic finish, amenity and/or a means of access. Paving (see 2.7.1) is also used as ballast and may be referred to as such.

(2.7.3) Green roof elements

A green roof should be designed to provide the required fire performance and wind uplift resistance, as well as providing an aesthetic finish, amenity, a means of access, environmental benefits, biodiversity, incidental rainfall management, and other benefits associated with green roofing. See clause 2.2.6. Department for Communities and Local Government Fire Performance of Green Roofs and Walls August 2013, recommends that for all types of green roof the depth of the growing layer should be a minimum of 80 mm and the organic content should not exceed 50% to provide the required fire performance.

(2.7.4) Other finishes

A wide rnge of other finishes such as porcelain paving, aluminium decking, composite decking, Multi Use Games Areas (MUGA), Multi-Sport Synthetic Turf Pitches (STP's), artificial grass, etc. can also be specified for installation over Hot Melt roofing systems. In all cases the fire performance for the entire roof assembly including the surface finish must demonstrate compliance with the requirements of the building regulations (usually through test and certification (BS EN 13501-5) and the weight loading must be checked to ensure a minimum weight of 80 kg/m^2 on insulation applications (higher on tall buildings – to be established through calculation). The effect of wind loading on the particular surface itself must be considered.

(3.1) General

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Liquid Roofing and Waterproofing Association

3. Design and installation considerations

(3.1) General

Hot Melt waterproofing systems offer a highly durable solution for new build and suitable refurbishment projects. It is necessary to consider how systems will perform relative to the client's requirements.

(3.2) National building regulations and standards

(3.2.1) Compliance generally

The chosen specification must be capable of satisfying the Building Regulations/Standards, and their subsequent amendments, for the relevant country in the UK. There are three relevant physical properties that a Hot Melt waterproofing system must satisfy to contribute to regulatory compliance:

- Resistance to fire (see clauses 3.2.2 and 3.2.3).
- Resistance to moisture (see clause (3.2.4).
- Workmanship and fitness of materials (see clause (3.2.5).

(3.2.2) External fire performance

Systems should be tested by a UKAS accredited testing body in accordance with DD CEN/TS 1187:2012 Test methods for external fire exposure to roofs and classified in accordance with BS EN 13501-5, to assess its reaction to the external spread and penetration of fire from outside to in. The system should achieve a designated level of resistance for acceptance. Note: by achieving $B_{ROOF}(t4)$, the system is unrestricted in use.

For further information, refer to the following:

- England - Approved Document B (volumes 1 and 2).
- Wales – Approved Document B (volumes 1 and 2).
- Scotland – Section 2 of the Building Standards technical handbooks.

(3.2.3) Classification of external fire performance without need for testing for ballasted roofs

According to Commission Decision 2000/553/EC, there are roof covering products and/or materials which can be considered to fulfil all of the requirements for the performance characteristic 'external fire performance' without the need for testing, subject to compliance with any national provisions on the design and execution of works being fulfilled. This includes products that are intended to be fully covered in normal usage (by the inorganic coverings) such as the following:

- Loose laid gravel with a thickness of at least 50 mm or a mass ≥ 80 kg/m^2 (minimum aggregate size 4 mm, maximum 32 mm).
- Sand/cement screed to a thickness of at least 30 mm.
- Cast stone or mineral slabs of at least 40 mm thickness.

Note: Commission Decision 2000/553/EC does not offer any guidance on gaps between slabs, the use of pedestals and potential gaps beneath them. Indicative industry testing suggests that gaps or pedestals do not have any significant effect on the overall fire performance. However, LRWA recommends, following NHBC guidance, to have as-built gaps of 6 mm to 8 mm between individual paving units, and as-built gaps of 10 mm to 12 mm along perimeter upstands and thresholds.

(3.2.4) Green Roofs

The Green Roof Organisation (GRO) has published a fire compliance guidance document based on DCLG Fire Performance of Green Roofs and Walls, August 2013. LRWA recommends the guidance in that document is followed with regards to the principles of fire penetration and spread of flame.

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3. Design and installation considerations

(3.2.5) Resistance to moisture

Systems, being promoted as waterproofing products, must satisfy the requirement to protect the building and its occupants by resisting precipitation. Being seamless, Hot Melt waterproofing systems generally satisfy this requirement.

It is also a requirement to prevent interstitial and surface condensation. Linked to that, the relationship of the waterproofing to the chosen thermal insulation material (see sub-section 3.4) should be taken into account when assessing the thermal performance of the roof, balcony, terrace or walkway (which is subject to separate requirements and supporting technical guidance).

For further information, refer to the following:

- England - Approved Document C.
- Wales – Approved Document C.
- Scotland – Section 3 of the Building Standards technical handbooks.
- BS 5250:2021 Management of moisture in buildings. Code of practice

(3.2.6) Workmanship and fitness of materials

It is a requirement that building work be carried out with adequate and proper materials which:

- are appropriate for the circumstances in which they are used;
- are adequately mixed or prepared; and
- are applied, used or fixed in a workmanlike manner so as adequately to perform the functions for which they are designed.

For further information, refer to the following.

- England – Approved Document 7.
- Wales – Approved Document 7.
- Scotland – Section 0 of the Building Standards technical handbooks.

(3.3) Certification

(3.3.1) Recommended certification

It is recommended that only systems assessed in accordance with European Assessment Documents EAD 030350-00-0402 and EAD 030065-00-0402 and/or which hold a current Agrément certificate, should be specified. Member companies of the LRWA offer products that accord with this recommendation.

(3.3.2) EAD 030350-00-0402 and EAD 030065-00-0402

EAD 030350-00-0402 Liquid applied roof waterproofing kits and EAD 030065-00-0402 Composite roof waterproofing kit set out routes by which Hot Melt waterproofing systems can achieve a European Technical Approval (ETA) and, as a result, have the CE mark affixed.

The EADs have replaced ETAGs in giving overall guidance on assessment of fitness for use, including methods of verification and attestation of conformity. It continues to recognise the variety of types of Hot Melt waterproofing systems that exist, and approval should be appropriate to the relevant generic system type.

For further information, refer to the following:

- LRWA Guidance Note No. 3 Generic types of liquid applied waterproofing systems for roofs, balconies and walkways.
- LRWA Guidance Note No. 8 CE marking of liquid applied waterproofing kits.

(3.3.3) National certification

Agrément certificates can be obtained from either the British Board of Agrément (BBA) or Kiwa (BDA) and can assist in demonstrating fitness of materials (see clause 3.2.4). Certification can be obtained in parallel with obtaining an ETA, and having an ETA is not a condition of having an Agrément certificate.

Certificates may be based on the same test procedures as detailed in EAD 030350-00-0402 or EAD 030065-00-0402 but also include additional statements on compliance with national building regulations and non-regulatory requirements, standards, design and installation details, and a durability statement.

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Liquid Roofing and Waterproofing Association

3. Design and installation considerations

(3.3.4) Categorisation of user loads

The following extract is from the European Technical Approvals - General PART 1 Standard, and indicates the choice that should be made when selecting a Hot Melt waterproofing system.

"The 'systems', including its support and protection (if any), shall be capable of withstanding mechanical damage due to the user loads likely to occur during its working life. The risk of mechanical damage will depend on the accessibility of the roof and the frequency of the traffic envisaged. Table 2 gives the appropriate categories of user loads and examples of the related accessibility."

Table 2 – Categorisation according to user loads

Category	User load	Levels of accessibility permitted
P1	Low	Non-accessible
P2	Moderate	Accessible for maintenance of the roofing only
P3	Normal	Accessible for maintenance of plant and equipment, and to pedestrian traffic
P4	Special	Roof gardens, inverted roofs, green roofs

(3.3.5) Durability and working life

The durability of most Hot Melt waterproofing systems is the design life of the structure. The stated durability of a system must be supported by independent assessment and third-party certification (see clause 3.3.3).

The indication given on the working life of system(s) cannot be interpreted as a guarantee but is regarded only as a means of choosing the right products in relation to the expected economically reasonable working life of the works.

(3.3.6) Climate effects

The following extract is from the European Technical Approvals - General PART 1 Standard, and indicates how categories are assigned to two European climate zones.

"The 'system', including its support and protection (if any) shall be resistant to the solar exposure effects (solar energy, temperature etc.) occurring during its expected working life which will depend on the geographical location of use. Two categories of climatic zone have been established (Moderate and Severe) and a table defines the limiting values for mean annual radiant exposure and the mean air temperature during the warmest month. The UK comes into the Moderate zone."

(3.4) Thermal insulation

There are many different types, and manufacturers, of thermal insulation materials, all of which are designed to limit the thermal transmittance of heat energy into and out of a building.

In inverted roof applications, the chosen thermal insulation also protects the waterproofing layer from physical damage and degradation due to UV exposure and thermal cycling.

Insulation for inverted roofs must meet a strict range of performance criteria to be effective in that application. It must have a high compressive strength, low water absorption (<1% by volume) and be able to withstand repeated freeze/thaw cycles.

Suitable types of thermal insulation for inverted roof applications are extruded polystyrene (XPS), certain types of expanded polystyrene (EPS), cellular glass and vacuum insulated panels (VIPs) that are 'low water absorption technology' or 'modified' types. Insulation should be Agrément certified (BBA or Kiwa) for use in inverted applications. They are available with straight edges or with a profiled edges. Profiled lap joint edges will help to resist wind uplift and rainwater ingress.

Many Hot Melt waterproofing system manufacturers also supply insulation and ancillary products that are approved for use with their systems and can form part of their system guarantee. At all times, individual manufacturer's recommendations must be sought when selecting and applying a system in conjunction with any insulation.

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3. Design and installation considerations

(3.5) Gutters

In flat roof designs featuring a Hot Melt waterproofing system, internal gutters can be constructed as part of the deck construction and waterproofed in the same manner as the flat roof area. Falls in gutters must be considered in accordance with BS 6229.

(3.6) Upstands and flashings

Depending on the technology, and prior to the application of the thermally insulated upstand board (where required), upstands and flashings are either:

- formed using the Hot Melt monolithic compound in sequential layers and covered with an access/protection sheet; or
- detailed using one or more polymer modified reinforced bituminous membranes as in accordance with the manufacturer's specification and instructions.

The system should extend a minimum 150 mm above the finished roof level, including any thermal insulation/surface finish. Low or level threshold details should provide a minimum 75mm upstand from the WRFL level.

(3.7) Rooflights

Out of plane rooflights, comprising an upstand kerb and the glazed element, are the norm. The kerb must extend 150 mm above the finished height of the Hot Melt waterproofing system, including any insulation and surface finish, and be waterproofed to a suitably protected termination.

For the safety of operatives, it is important to provide protection around rooflight openings during installation.

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4. Health and safety provision

(4.1) Legislation and regulations

The Health and Safety at Work Act deals with fundamental working practices. Other legislation contributes to the welfare of those undertaking work and those in the vicinity of work.

The Construction (Design and Management) Regulations (CDM) may not be a legal requirement on short-term contracts, but it is good practice to apply the principles to all roofs, balconies and walkways. See sub-section 4.4.

It is important to gather as much health and safety information about a project and the site before work begins.

(4.2) Reference checklist

The following non-exclusive list shall be considered in relation to safety:

- CDM - relationship at time of quote.
- Contact with the client's CDM co-ordinator or safety officer.
- Contact with the client's planning supervisor.
- Safety during initial site visit by estimator.
- Scaffold erection and removal.
- Delivery, unloading, lifting and storage of materials.
- Provision of edge protection.
- Access for inspection purposes. Specific assessment of:
  - materials containing asbestos;
  - fragility classification of the roof (ACR Red and Green books);
  - rooflights;
  - vents with fumes (prevention of taking in fumes and discharges);
  - birds (especially sea);
  - unstable parapets;
  - safety lines (recently tested and certified), harnesses and fall restraint; and
  - condition of gutters.

NOTE: If the roof or any part of it cannot be assessed beyond all doubt as non-fragile, then it must be treated as fragile and accessed in accordance with the ACR Green Book.

- Decisions relating to specification. e.g. will it be possible to transport equipment, raw materials etc.
- Health and safety cost implication - adequate funding should be provided.
- Risk assessments should be provided and working methods, including hot works, agreed with the CDM co-ordinator/safety officer prior to commencement on site.
- Special client requirements for work area. i.e. site health and safety requirements, personal protection equipment (PPE), working hours, etc.
- Specification, COSHH, working environment, training, site supervision, method of work, waste regulations, disposal of containers.
- Safety during final quality check.
- Removal of site waste.

(4.3) Health and safety in roof work

Falls from height are the most common cause of accidental death in the construction industry and account for half of those accidently killed. Compliance with the current Working at Height (WAH) Regulations and HSE guidance on scaffolding etc. will help reduce falls, and injuries to others caused by materials falling from a roof.

HSG33 Health and safety in roof work from HSE Books is essential reading for all concerned with the commissioning, design or execution of roof work, or with responsibility for those who work on any new repair or refurbishment site.

For further information, refer to the following.

- IND 284 Working on roofs
- Work at Height Safety Association (WAHSA) Technical Guidance Note 7 Reference information for work at height
- Advisory Committee for Roofwork (ACR) roof safety publications
- LRWA Guidance Note No. 5 Health and safety provision for liquid applied waterproofing systems on roofs, balconies and walkways.
- LRWA Guidance Note No. 6 Safe use of liquid applied waterproofing systems.

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4. Health and safety provision

(4.4) CDM

The Construction (Design and Management) Regulations 2015 (CDM 2015) has the main purpose of establishing a safety management network at all stages of a construction project. Obligations are imposed on everyone, but principally the Principal Designer and Principal Contractor.

There must be a safety plan to combat risks at source. This involves a method statement from suppliers based on their own health and safety plans. LRWA manufacturers of Hot Melt waterproofing systems are compliant with these aims.

(4.5) COSHH

The Control of Substances Hazardous to Health Regulations 2002 (as amended) protect workers against the risk of exposure to substances considered to be hazardous to health.

The use of such substances arises out of or in connection with work undertaken under the control of the employer. The hazards that may be associated with the chemicals used in liquid applied waterproofing systems are shown in the Safety Data Sheets issued by the system supplier.

Under the regulations, the contractors must prepare and submit a suitable COSHH assessment to the client/contract administrator for all materials falling under the regulations.

(4.6) Safety data sheets

Safety data sheets provide information on chemical products that help users of those chemicals to make a risk assessment. They are issued by product manufacturers and are essential reading prior to handling any materials. They contain information under 16 primary headings, which are as follows:

1. Product and company identification.
2. Composition /information on ingredients.
3. Hazard identification.
4. First aid measures.
5. Firefighting measures.
6. Accidental release measures.
7. Handling and storage.
8. Exposure control/personal protection.
9. Physical and chemical properties.
10. Stability and reactivity.
11. Toxicological information.
12. Ecological information.
13. Disposal considerations.
14. Transport information.
15. Regulatory information.
16. Other information.

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5. Substrates

(5.1) Introduction

The primary objective of a Hot Melt waterproofing system is to waterproof, for the minimum period of time required by the client, the substrate to which it is applied. The successful application and performance of a system largely depends on the suitability and preparation of the substrate to which the system is directly applied.

Some system manufacturers supply all of the products in the system. This is the preferred option as the manufacturer has responsibility for the compatibility of the system, but it does not exclude the use of materials from different sources. In either case, the recommendations of the system manufacturer should be followed.

Correct installation of a system requires that the manufacturer's recommendations are followed. While varying from system to system, these recommendations refer to all stages of installation including substrate suitability and preparation.

Not all systems are suitable for use on all substrates. Specifiers and users of a Hot Melt waterproofing system must ensure that the substrate is suitable for the chosen system.

(5.2) Substrate categorisation

(5.2.1) General

There are a wide variety of substrates. From the perspective of applying a Hot Melt waterproofing system, however, they may be broadly categorised as follows:

(5.2.2) Substrates suitable for direct treatment

These are substrates which, when correctly prepared, provide a suitable base for a direct Hot Melt waterproofing system application. Substrate preparation can include a requirement for pre-treatments, treatment and removal of biological growths, priming systems and joint treatments. See section 7 for a review of preparation methods. Substrates for new build work may also be included in this category, especially if they are of known manufactured quality, such as plywood.

(5.2.3) Substrates requiring more detailed examination

These are substrates which require a detailed investigation before a chosen Hot Melt waterproofing system treatment can be confirmed. Although this is usually required for refurbishment applications, it may also be needed for new build substrates that may be more variable, such as new cast in-situ concrete decks. The investigation may include the following:

- Visual inspection of poorly described existing substrates.
- Core sample to determine or confirm the structure and any insulation requirements.
- Carrying out adhesion tests.
- Moisture content determination.
- Substrate surface finish assessment.

(5.2.4) Substrates unsuitable for Hot Melt waterproofing systems treatment

There are a number of substrates which are unsuitable for direct treatment with Hot Melt waterproofing systems. These substrates will need either to be removed or will require the overall application of a carrier membrane or suitable overlay board to provide a suitable base for the Hot Melt waterproofing system. Examples of unsuitable substrates include trapezoidal profiled galvanised steel or aluminium decking.

(5.3) Further guidance

Consult the individual system manufacturer.

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6. Structural concrete decks and finishes

(6.1) Introduction

This section relates to the use of a structural reinforced roof slab (in-situ or pre-cast) to support a Hot Melt waterproofing system and its associated finishes.

The guidance is aimed at designers, main contractors and specialist installers. It is also aimed at giving concrete roof slab installers an insight as to what is required from the deck to achieve a successful waterproofing outcome.

(6.2) Design considerations for concrete decks and roof slabs

(6.2.1) General

The design requirements for concrete roof slabs are found in NA+A2:14 to BS EN 1992-1-1:2004+A1:2004 UK National Annex to Eurocode 2. Design of concrete structures.

The structural deck should be capable of spanning the supporting structure when fully loaded. This is particularly important when dealing with roofs intended to have a zero fall (see subclause 6.3.2.1). Dead loads include, but are not limited to, insulation, ballast (including pebbles and paving), all forms of green roofs, blue roofs and solar PV.

Green roofs and blue roofs also feature various levels of water attenuation, which will need to be considered for structural loading.

(6.2.2) Concrete roof slab types

(6.2.2.1) Pre-cast

Concrete that is cast in a factory environment and transported to site. Once raised into position on an even supporting structure, it forms the roof substrate.

The layout of pre-cast concrete planks should be evaluated prior to the waterproofing installation. It is common for different areas of pre-cast planks to be laid at 90 degrees to each other, which can create steps in the deck if planks are cambered. Such steps will need to be removed through the use of suitable screeds to make sure the insulation has a flat surface to sit on.

Joints between planks should be grouted, taking care not to get grout on adjacent planks. Joints may also need to be separately reinforced in accordance with the Hot Melt system manufacturer's instructions.

(6.2.2.2) Cast in-situ

Concrete that is mixed on or off site to a pre-determined specification and poured into a temporary or permanent formwork.

Formwork can hold the key to reducing back falls and deflection. When cast in-situ in permanent formwork is not correctly supported during the curing process, it can lead to excessive backfalls or deflection. Permanent formwork should be of the vented type which will assist in the drying process. It must be remembered that in-situ concrete with permanent formwork could take significantly longer to cure than in-situ in temporary formwork.

A low shrink concrete mix will limit drying shrinkage and minimise cracks, which in turn will reduce the amount of preparation work prior to the waterproofing installation.

Additives and admixes included in the concrete mix to speed up or regulate the curing process should be declared via specification prior to the waterproofing installation. Care should be taken that the curing process has concluded prior to waterproofing installation.

Surface applied curing compounds are dealt with in section 6.3.5.

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6. Structural concrete decks and finishes

(6.2.3) Falls

(6.2.3.1) General

Hot Melt waterproofing systems are third-party certified for use at zero falls (see clause 2.2.1). Zero falls is a popular option because creating falls in or on a roof slab is expensive, and there is a significant cost reduction if it can be alleviated. If projects want to include different design falls (e.g., 1:40 to achieve 1:80), they can.

When falls are not designed into the roof slab, deflection and back falls can be the consequence. BS 6229:2018 prescribes a design fall of 1:80 to ensure a finished surface with a zero fall. A detailed structural analysis, undertaken at design stage by a qualified engineer, should account for construction tolerances, settlement and deflection under load, and highlight any areas of the deck at risk.

(6.2.3.2) Creating falls

Falls can be created in the concrete deck or roof slab in any of the following ways:

- In-situ concrete roof slab to falls.
- Pre-cast concrete panels set on a structure to falls.
- Screed to falls on concrete deck or roof slab.

The usual design option is a deck to fall. This can be more difficult to achieve with concrete deck or roof slab constructions than with other deck types, due to the practical considerations of forming a concrete deck or roof slab.

Section 10 and Annex G of BS EN 13670:2009 Execution of concrete structures provide information on the geometrical tolerances related to concrete decks and roof slabs and the maximum allowable deviations. The finished deck or roof slab must meet the minimum fall requirements of BS 6229:2018 when fully loaded.

On-site, if areas of negative fall (back falls/deflection) are found when the required site deck level survey is undertaken, remedial action (such as localised screed or additional rainwater outlets) must be taken to remove the issue. The solution is usually signed off by Building Control or the Building Insurer. See 6.2.5.

(6.2.4) Surface finishes

In line with BS EN 13670:2009 Execution of concrete structures, any finishes formed or unformed should meet the requirements of the execution specification of a concrete deck or roof slab. The standard also states the following:

8.6 (1) After form striking, that all surfaces shall be inspected in accordance with the Execution Class for conformity to the requirements,

8.6 (2) The surface shall not be damaged or disfigured during construction.

This places responsibility on the concrete deck or roof slab provider to ensure a standard of finish in accordance with an agreed specification.

As the waterproof covering may be in direct contact with the concrete deck, roof slab, or any suitable screed, the finished concrete deck, roof slab or screed surface is an important consideration (see subsection 6.4).

(6.2.5) Deck, slab and screed tolerances, and surface irregularities

The suitability of a concrete deck or roof slab, including any screed, to receive a Hot Melt waterproofing system depends on the quality of finish achieved by the concrete deck or roof slab installer in terms of level (including any fall), and the condition of the deck, roof slab or screed surface.

Achieving a level surface and minimising surface irregularities within accepted tolerances, is vital. It is important for all involved to discuss what is required, and possible, at an early stage in design and specification considerations. This will ensure main and specialist concrete contractors are aware of the roofing system manufacturer's and specialist contractor's requirements and the need to follow the recommendations of BS 6229:2018.

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6. Structural concrete decks and finishes

BS 8204-2:2003+A2:2011 Screeds, bases and in-situ floorings. Concrete wearing surfaces. Code of practice is primarily for floors, though it details how to specify concrete from a performance standpoint. The maximum permissible departure of the level of the wearing surface from a specified or an agreed datum plane should be specified. Departure from the datum should be measured from the datum plane by using a 2m straight-edge laid in contact with the wearing surface and resting under its own weight. Deviations of the surface should be measured from the underside of the straight edge using a slip gauge. The maximum permissible departures from a 2m straight edge are given in table 1.

Table 1 – Surface regularity classes and maximum deviations

Surface regularity (SR) class	Maximum deviation (mm)
SR1	3
SR2	5
SR3	10

BS 6229:2025 recommends SR2 for flat roofs. (Disclaimer: At the time of writing this Code of Practice, BS 6229 was open for public consultation. Please refer to BS 6229:2025 as information may change upon publication)

The surface of concrete wearing screeds should be brought to a level, within the specified tolerances, by using rigidly fixed forms, permanently built-in concrete rails or temporary levelling rails. Forms and rails should be fixed so that they are not displaced during the compaction of the concrete. For large area pours, the use of a laser level and staff can avoid the use of temporary levelling rails.

(6.3) Suitable substrates for Hot Melt waterproofing systems

(6.3.1) General

Not every form of deck substrate construction is suitable to receive a Hot Melt waterproofing system. This sub-section lists the types considered suitable. Substrates not listed should be checked with the manufacturer of the Hot Melt waterproofing system being used.

Concrete density requirements are product specific, so should be checked with the manufacturer.

(6.3.2) Curing time for concrete

One of the most important characteristics of a Hot Melt waterproofing system is its relationship with the roof deck/slab. If installed correctly, these systems will have a 100% bond with the deck, making them the system of choice on concrete structures.

Concrete curing is an area which, if not monitored accordingly, can cause an issue with this bond.

It is important to be aware of the moisture content of a concrete roof slab or screed, as excessive moisture that is trapped within can cause issues that are detrimental to the overall quality of the finished roofing system. Issues include the corrosion of metal products and loss of adhesion of the Hot Melt waterproofing system.

Surface dryness of a concrete roof slab or screed can be misleading, as excessive moisture can still be retained. Cast in-situ concrete roof slabs typically require 28 days' curing time before any roofing system can be installed, although this can be controlled via admixes and reduced water content. This is a general rule by which the concrete should have achieved a minimum of 80% of its full structural strength.

Guidance may be found in BS EN 13670:2009 Execution of concrete structures, or through information provided by the manufacturer or installer of the concrete roof slab.

Always investigate the curing time for any roof slab or screed and make sure that the site program reflects the time required.

The curing rate for a structural roof slab is expected to be much slower and may be nearer one year for a 150 mm thick roof slab to cure fully.

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6. Structural concrete decks and finishes

(6.3.3) Acceptable deck substrates

(6.3.3.1) Structural concrete deck

An aggregate mix of sand, gravel and cement, and suitable density to meet the Hot Melt system manufacturer's requirements (typically 2160 kg/m^3 to 2400 kg/m^3), installed with a wood float or other acceptable finish. Can be used to create falls as per BS 6229:2018.

The concrete deck should be properly cured. Recommended curing time is 28 days, depending on site conditions. Cast in-situ concrete roof slabs typically need 28 days' curing time before the Hot Melt waterproofing system can be installed. Generally, the concrete should achieve a minimum of 80% of its full structural strength. Guidance may be found in BS EN 13670:2009 Execution of concrete structures, or through information provided by the manufacturer or installer of the concrete roof slab or screed. Assessing whether it is possible to install the Hot Melt waterproofing onto a concrete deck earlier than this can only be established by the membrane having successfully passed a number of peel bond strength tests in a number of areas on the roof, especially around outlets and penetrations where the concrete may take longer to cure (see subsection 6.15). A fully cured deck will typically retain 3-5% moisture by volume at the surface.

(6.3.3.2) Lightweight structural concrete deck

An aggregate mix of expanded shale, clay, slate etc. and cured density to meet the Hot Melt system manufacturer's requirements (typically 1400 kg/m^3 to 1840 kg/m^3), installed with a wood float or other acceptable finish. Can be used to create falls as per BS 6229:2018.

Recommended curing time is 28 days, depending on site conditions and whether it is possible to install the Hot Melt waterproofing membrane onto a concrete deck prior to this – the membrane has to have successfully passed a peel bond strength test (see subsection 6.15). A fully cured deck will retain 5-20% moisture by volume.

(6.3.3.3) Concrete deck installed into vented profiled metal deck

A minimum cured density to meet the Hot Melt system manufacturer's requirements, installed with a wood float or other acceptable finish. Can be used to create falls as per BS 6229:2018.

May have to cure for up to 60 days before proper adhesion is achieved. Lightweight concrete should be installed over a vented metal deck. A peel bond check must be carried out to check for the correct adhesion.

(6.3.3.4) Pre-cast concrete planks

Manufactured off-site and can come in different formats. Typically made of structural-weight concrete and is generally an excellent substrate to receive Hot Melt waterproofing. All joints need to be grouted and reinforced. Screeds may be required to provide falls or to level pre-stressed cambers and will need to be moisture content checked by peel strength tests prior to waterproofing installation.

(6.3.3.5) Other deck constructions

Other deck constructions are suitable for Hot Melt applications, such as plywood, OSB 3, cement particle boards, Cross Laminated Timber (CLT), SIPs, but they must be independently approved for use in these applications. The waterproofing system manufacturer must be consulted on their suitability for use with their systems.

(6.3.4) Additional acceptable substrates (upstands)

(6.3.4.1) Metal sheet

Surface must be cleaned of all protective oils and any rust or oxidisation prior to Hot Melt waterproofing system installation.

(6.3.4.2) Brickwork

Mortar joints must be flush with brickwork face.

(6.3.4.3) Blockwork

Mortar joints must be flush with blockwork face.

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6. Structural concrete decks and finishes

(6.3.4.4) Construction board materials

Construction boards, such as plywood, OSB 3, cement particle boards, Cross Laminated Timber (CLT) may also be used for upstands. The waterproofing system manufacturer must be consulted on their suitability for use with their systems.

(6.3.5) Techniques for curing concrete

It is imperative that the concrete substrate is allowed to cure sufficiently to ensure that it forms the required adhesion with the Hot Melt waterproofing system. British Codes of Practice consider that it takes approximately 28 days for concrete to cure properly using the standard methods of curing. Concrete decks constructed using profiled metal as formwork will take up to 60 days to cure and dry. Guidance may be found in BS EN 13670:2009 Execution of concrete structures.

The curing process (hydration) is critical during the first few days, when the water tends to rapidly drain or evaporate out of the concrete. During this time, it is important to reduce the rate of water evaporation as much as possible. Standard methods to achieve this include the following:

- Curing compounds – the most common aid to concrete curing in the UK today (see 6.3.6).
- Water curing – relies on the concrete being kept continuously wet.
- Wet coverings – such as Hessian-type fabrics, kept continuously wet covering the concrete.
- Paper sheets – water-pervious paper kept continuously wet when laid over the concrete. Impervious paper requires no additional water, as it prevents the water within the concrete from evaporating too quickly.
- Plastic Sheets – form a vapour resistant barrier over the concrete, preventing moisture escaping from the concrete.

(6.3.6) Using surface curing compounds

(6.3.6.1) Introduction

Surface applied compounds are a popular method of assisting the curing time of concrete due to their ease of application and low material cost. Typically, the liquid-type curing compounds form a film on the concrete surface that significantly slows the evaporation rate of retained moisture. If the surface applied curing compound prevents the required bond between the waterproofing and the deck, the film should be removed. Removal can be achieved by power washing, chemical treatments, scarifying or grinding or a combination of methods. It is imperative that the film is completely removed otherwise it is likely to interfere with the bond of the system.

BS EN 13670:2009 Execution of concrete structures (E), 8.5 (10) provides further guidance stating:

- Curing compounds are not permitted on construction joints, on surfaces to be treated or surfaces where bonding of other materials is required, unless they are fully removed prior to the subsequent operation, or they are proven to have no detrimental effect on the subsequent operations.
- Curing compounds shall not be used on surfaces with special requirements for the surface finish unless they are proven to have no adverse effects

(6.3.6.2) Curing compounds suitable for use with Hot Melt waterproofing systems

- Sodium silicate-based compounds. When properly applied, these do not leave a film or residue on the concrete surface, which can affect the bond strength of the waterproofing to the concrete surface. They form an insoluble gel within the surface of the concrete deck, retarding evaporation of the mix water and gives a dustproof surface.
- Resin-based compounds. These form a residue that can take between 45 days and 60 days to oxidize and flake off, when exposed to the elements. As long as there is a residue left, the bond between the waterproofing and the concrete will always be questionable. The residue can be removed by brushing down the surface with a wire brush, or washing the concrete with a light solution of muriatic acid or trisodium phosphate (TSP). The concrete is then washed down with water and thoroughly dried. Resin-based compounds therefore may be acceptable as a curing method, but only on the proviso that they are completely removed prior to the application of the waterproofing.

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6. Structural concrete decks and finishes

(6.3.6.3) Curing compounds unsuitable for use with Hot Melt waterproofing systems

The use of any liquid curing compound in conjunction with Hot Melt waterproofing systems must be approved by the waterproofing system manufacturer. Curing compounds not compatible with waterproofing systems will need to be completely removed prior to installation of the waterproofing. Examples of unsuitable compounds include the following:

- Wax-based compounds. These cease to be effective after about 28 days but take 90 days to 100 days to fully dissipate when exposed to the elements. Wax residue will weaken the bond of the waterproofing system and is also difficult to remove.
- Acrylic silicate-based compounds. These form a permanent film on the surface of the concrete and could prevent the waterproofing from forming an acceptable bond with the concrete.

(6.4) Suitable finishes to concrete decks

(6.4.1) General

It is important to specify surface finishes that can successfully receive Hot Melt waterproofing systems, as described in clauses 6.4.2 to 6.4.5. Using other methods of surface finishing can increase the formation of laitance.

Laitance is a major cause of bond failure in Hot Melt installations. It takes the form of a weak, powdery, friable layer on the surface of concrete and cementitious screeds which appears after curing. It is formed when cement and fine aggregates rise to the surface when too much water is added, rain damage during placing, or from over trowelling. Subsequent poor curing of the surface will also contribute towards the formation of laitance. Preparation of the surface is the most important step of any Hot Melt installation. Removing laitance, is therefore paramount to a long-term successful installation.

(6.4.2) Wood float

The recommended finish to concrete substrates receiving the waterproofing. It is rough enough to provide the Hot Melt waterproofing with a strong key to the surface, and yet smooth enough to be able to achieve an even depth of membrane over its entire surface.

(6.4.3) Brush

Generally used in conjunction with a wood float finish, increasing the ability of the waterproofing to bond to the concrete surface. Ridges should be avoided.

(6.4.4) Skip/Easy float

Another surfacing method, which can be carried out on fresh concrete to produce a smooth matt appearance. A large, long, narrow float on the end of a knuckled handle is pushed or pulled over the surface of the wet concrete with the leading edge always higher than the rear edge, whichever way it is moving. The resultant finish tends to have a smooth texture similar to that produced by either hand or power floating, but it usually exhibits slight ridges between each pass of the float.

Care is needed in the timing of skip floating. If skip floating is undertaken too early, bleed water may be worked into the surface thereby weakening it, causing laitance which will need to be removed.

(6.4.5) Pan float

Produces a flattish, slightly textured surface which often contains float marks. Nowadays, the operation is carried out using powered machines fitted with either a large circular pan or large flat metal floats. Power floating is generally carried out later than hand floating as the concrete needs to take the weight of the machine. Pan floating produces a similar surface to hand floating, with a slightly textured surface often with circular swirl marks from the floating operation. Raised swirl marks will need to be removed. Too many passes can cause a ´burnished´ appearance which should be avoided. Pan floating can sometimes lead to surface delamination causing laitance, which will need to be removed.

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6. Structural concrete decks and finishes

(6.4.6) Unacceptable surface finishes

(6.4.6.1) Power float, steel float and steel trowel

These finishes lead to the water/cement ratio increasing near the surface of the concrete, resulting in the formation of laitance. Any laitance must be removed.

(6.4.6.2) Tamped

A tamped finish is produced by compacting the unformed concrete with a beam, batten or board to produce a surface with ridges at a fairly regular spacing of 20 to 30 mm and up to 5 mm high. It is too rough and provides an unacceptable finish, resulting in a variable thickness and increased use of material.

(6.5) Acceptable types of screed and structural toppings

(6.5.1) Standards

Where a concrete deck or roof slab requires a screed or structural topping prior to installation of the waterproofing, the materials used should comply with the following relevant standards, where one applies:

- Sand and cement (6.5.2) – BS 8204-1:2003+A1:2009.
- Self-levelling (6.5.3)
- Mastic asphalt (6.5.4) Poly Methyl Methacrylate (PMMA) Screed (6.5.5)

(6.5.2) Sand and cement

The specification of sand and cement screeds is discouraged for the following reasons:

- While reasonable adhesion can be obtained once prepared, if the waterproofing is damaged or breached the screed will permit water to track and become absorbed beneath the system. This greatly increases the difficulty and expense of finding the point of water ingress, prior to drying out the underlying substrate and carrying out remedial repairs.
- Pure sand and cement screeds can take a long time to dry. The rule of thumb is for every millimetre of screed up to 50 mm, allow one day per millimetre for the drying process. For every millimetre over 50 mm, allow two days per millimetre for the drying process. The use of additives to speed up the drying process is at the discretion of the main contractor/client. If contemplated, the type and make of additive should be confirmed with the waterproofing manufacturer to ensure the bond will not be affected.
- When exposed to rain, sand and cement screeds can absorb moisture, which makes the substrate unsuitable for bonding with Hot Melt waterproofing systems.

(6.5.3) Self-levelling

Where areas of cast in-situ concrete are found to have ponding or backfalls, self-levelling screeds can be used to eliminate said deflection and/or back falls on concrete decks, as described in BS 6229:2018. Must be compatible with Hot Melt waterproofing system, and the compressive strength must match the load to be placed on it.

(6.5.4) Mastic asphalt

Mastic asphalt can be used to create drainage falls and remove deflection or backfalls as per BS 6229:2018. Roofing or paving grade asphalt is an acceptable substrate to install Hot Melt waterproofing systems providing that it is clean and is prepared and primed in accordance with the waterproofing manufacturer's instructions.

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6. Structural concrete decks and finishes

Existing asphalt must be free of all embedded chippings and will require priming. Existing asphalt waterproofing may permit water to track and become absorbed beneath the system in the event that the waterproofing is damaged or breached.

(6.5.5) Poly Methyl Methacrylate (PMMA) Screed

A fast-curing PMMA-based compound levelling screed comprising of resin, filler and graded quartz aggregate is suitable for localised infilling and levelling of concrete structures prior to the installation of Hot Melt waterproofing. The concrete where the PMMA screed is installed will typically need to be prepared and primed in accordance with the screed manufacturer's instructions.

(6.5.6) Structural toppings

Mainly employed as a topping to pre-cast concrete planks. The mix of the topping should have the density that the manufacturer of the Hot Melt waterproofing system requires for a successful bond.

(6.6) Deck and screed moisture checks

(6.6.1) General

There are various non-destructive methods for detecting moisture remaining in a concrete or cementitious substrate including the following:

- Moisture meter (Tramex, Trotec etc.) – see 6.6.2.
- Plastic sheet method – see 6.6.3.

These methods can give an early indication that moisture is present, but they will not override the requirement for a successful peel bond test (see subsection 6.15). Note that these methods give a result for the sampled area only and not the whole of the deck. When using moisture meters, the moisture content within a temporary formwork in-situ concrete deck would be around 4-5% to achieve a successful bond. The allowable moisture content should be confirmed by the Hot Melt waterproofing manufacturer.

(6.6.2) Moisture meter

There are two main types of moisture meter frequently used to gauge the moisture content of concrete, resistance meters and microwave meters. Both types are non-destructive in use. Resistance moisture meters work by inserting metal pins into the concrete to measure the electrical resistance, which can then be translated into a moisture reading. These meters are widely used as they provide quick and reliable measurements. Microwave moisture meters use microwave radiation to measure moisture levels deeper within the concrete (typically up to 300 mm), making them particularly useful where surface readings might not be sufficient.

(6.6.3) Plastic sheet method

The plastic sheet method is a technique used to assess moisture levels in concrete. Although it does not provide a specific value, it indicates the moisture content of the concrete. A clear plastic sheet is taped over a small section of the concrete surface to create a seal. This setup remains undisturbed for approximately 24 hours. If moisture is present in the concrete, it will evaporate and condense on the underside of the plastic sheet, indicating elevated moisture levels.

Figure X – Plastic sheet method

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6. Structural concrete decks and finishes

(6.7) Pre-start checks

All roof areas concerned should be free of obstruction. All plant that does not belong to the approved contractor, and materials that are not part of the roofing works, should also be removed.

(6.8) Surface contaminant checks

(6.8.1) Curing compounds

Curing compounds are used to control the curing process of the concrete (see clause 6.3.5). The compound forms a membrane that retards the loss of moisture from the concrete. Some compounds are designed to disappear over a period of time. This period may be too long to accommodate waterproofing installation. All visible/ remaining compound should be removed.

(6.8.2) Formwork release agents

Release agents used to prevent concrete from sticking to the formwork. Typically spray applied. Over-applied formwork release agents could transfer from formwork to concrete, so should be removed.

(6.8.3) Chemicals, diesel etc.

Generally, spills will be construction related products or oils, petroleum etc. used in the running or maintenance of machinery on a construction site. These products may have a detrimental effect on bituminous waterproofing and therefore should be removed.

(6.9) Surface preparation of contaminated or defective concrete surfaces

(6.9.1) Contaminated concrete surfaces

Cleaning and preparing a concrete deck generally consists of thoroughly removing dirt, debris and dust by means of sweeping and blow/suction cleaning, prior to applying the surface primer. However, the deck can be affected by surface contaminants that are not easily removed by sweeping, such as oil or diesel spills, laitance, liquid curing compounds or formwork release agents.

When any of these substances have been spilled, applied or have transferred to a concrete surface, or when laitance occurs, it must be removed prior to the application of the waterproofing system.

(6.9.2) Methods of removal/preparation

(6.9.2.1) Chemical cleaning

This may be necessary as a first step to employing blast methods to remove oil, grease and dirt. Starts with scrubbing vigorously with solutions of caustic soda, trisodium phosphate or detergents formulated for use on concrete, then flushing thoroughly with water to remove all traces of the cleaning agent. Solvents must not be used as flushing will tend to dissolve and spread the contaminant.

(6.9.2.2) Scarification

This is a mechanical means of effectively removing dirt build-up and laitance. Water blasting after this scarification will help to remove any aggregate that was loosened during the process.

(6.9.2.3) Grinding

Similar to scarification but generally used to reduce high points in localised areas.

(6.9.2.4) Blast cleaning

Sand blasting or high-pressure water jet is the most effective way to remove laitance or weakened material.

(6.9.2.5) Acid etching

This method is generally not used unless there is no alternative. Proper precautions and personal protective equipment must be used. The manufacturer of the chemical being used should be consulted as to their recommended procedures.

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6. Structural concrete decks and finishes

(6.10) Preparation of detail (upstand) surfaces

Upstands are just as important as the flat areas. It must be ensured that a concrete upstand has a good surface to bond on to.

Along with the usual cleaning and preparation described in clause 6.11.3, the presence of formwork release agents must also be considered. This is a compound sprayed on to the surface of the formwork that will be in contact with the temporary formwork (steel or timber). Its function is to facilitate the release of the formwork once the concrete is ready. Successful release enables the formwork to be re-used repeatedly.

If too much release agent is used, residue will be left on the concrete which will prevent the required adhesion of the Hot Melt waterproofing system. The release agent is generally coloured so is relatively easy to spot, but a peel bond test (see subsection 6.15) is recommended.

If release agent remains, it must be removed prior to the installation of the waterproofing.

(6.11) Surface preparation

(6.11.1) General

Assuming that a successful peel bond test (see subsection 6.15) has been undertaken, evaluate the deck surface and set out a cleaning/ remedial strategy. The deck must always be clean and dry to receive the Hot Melt waterproofing system.

(6.11.2) Drying of substrates prior to waterproofing

If allowed, waterproofing installers will use gas torches to dry the roof surface. Electrically operated hot air machines are also available. LRWA Guidance Note 13 outlines several deck-drying techniques.

(6.11.3) Cleaning methods

(6.11.3.1) Surface brushing

Hand brushing using an appropriate broom may be enough to clean the roof surface in preparation for the waterproofing system.

(6.11.3.2) Air washing

A quicker way to remove dust and debris than surface brushing. A downside is that dust can be made airborne and could cause issues in other parts of the building or adjacent buildings. Usually carried out using high-powered leaf blowers.

(6.11.3.3) Jet/pressure washing

A very effective way of removing dust and debris, particularly in warmer months when the water can dry out quickly. In winter months, when concrete curing is possibly longer, adding more residual water to the roof may be problematic.

(6.12) Treatment of cracks

The treatment of cracks should be carried out in accordance with the waterproofing manufacturer's instructions. The following are a guide only.

(6.12.1) Cracks less than 1.5 mm width

Hairline and narrow cracks usually do not require special treatment.

(6.12.2) Cracks 1.5 mm to 3 mm width

The crack may require local reinforcement with a suitable width of the system reinforcement bedded in the Hot Melt compound.

(6.12.3) Cracks and joints 3 mm to 12 mm width

Cracks of 10-12 mm should be reported to the main contractor prior to waterproofing being undertaken. The crack or joint may require a separate flexible reinforcement membrane bedded in the Hot Melt compound in accordance with the system manufacturer's instructions.

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6. Structural concrete decks and finishes

(6.13) Movement joints

Dealing with movement or construction joints varies from manufacturer to manufacturer.

(6.14) Priming

(6.14.1) General

Before installing Hot Melt waterproofing systems, deck surfaces should be primed in accordance with the waterproofing manufacturer's instructions as required. Clauses 6.14.2 to 6.14.3 outline primers generally used in relation to Hot Melt waterproofing systems.

(6.14.2) Bituminous primer

A primer for Hot Melt waterproofing systems, which is specially formulated to increase bond strength of bitumen-based systems to a wide range of substrates, including concrete, brick, and metal.

(6.14.3) Polymer primer

A synthetic rubber-based primer designed specifically to enhance the adhesion of Hot Melt waterproofing systems to difficult surfaces and speed up the total time of installation due to its quick drying time.

(6.14.4) Priming adhesion and coverage check

Priming adhesion and coverage checks are normally carried out after successful peel bond tests (see subsection 6.15) have been achieved.

All decks and substrates can differ from project to project and can absorb or reject primer at different rates, which can affect coverage rates.

Primers play a large part in the successful bond of Hot Melt waterproofing systems to the deck, so it is important to get the coverage correct. Generally, with a well-prepared deck, a light covering of primer is all that is required.

A simple primer rate mock-up can be used to test optimum adhesion on any given deck. This is done by cleaning and drying a test area on the deck, installing the chosen primer on the test area and leaving to dry.

Once dry, pour 3-4 mm of Hot Melt compound onto the primer and let it cool. Once cool, score the sample twice and peel back (see figures X & Y). Depending on the results, the amount of primer used can be adjusted to achieve a consistent pass rate.

Figure X – Adhesive failure (fail)

Figure Y – Cohesive failure (pass)

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6. Structural concrete decks and finishes

(6.15) Peel bond testing methods

(6.15.1) General

Peel bond tests are a useful guide to establish the cured state of the concrete deck. In-situ concrete can take 28 days to cure properly, or 60 days if the concrete is poured into a structural metal tray, but the weather, concrete mix and effectiveness of curing aids all add variables to this.

Tight contract programs often put pressure on the approved contractor to waterproof before 28 days have passed. Generally, depending on the weather and time of year, 14-21 days is the earliest point for a bond test to be carried out. Specialised primers may allow for bond tests to be carried out earlier and should be approved by the hot melt system manufacturer.

In-situ concrete can be supplied and installed in various specifications and could include additional surface treatments. There is good reason for different specifications, but caution is required as not all variants are compatible with the successful installation of Hot Melt waterproofing systems.

If a manufacturer is in any way concerned with the type of in-situ concrete they should request that the contractor, via the main contractor, confirms the mix of the concrete and which admixes and/or curing compounds have been used.

The reason for this is that some admixes and curing compounds can be detrimental to the successful bond between the in-situ concrete deck and the Hot Melt waterproofing.

Assuming that there are no issues with the inclusion of admixes and there are no surface treatment curing compounds, carrying out a peel bond test should be considered.

The correct conditions, confirmed by a Peel Bond Test, for applying the Hot Melt membrane is a fully cured in-situ concrete deck with a minimum density of 2100kg/m^3 or as required by the Hot Melt system manufacturer, wood float or system/manufacturer's approved finished surface, which is dry, clean, and properly primed.

The ability of the Hot Melt membrane to bond securely to the deck, should always be checked by carrying out a peel bond test. Such a test should always be conducted on each area prior to the application of the membrane. The testing should be carried out at least 48 hours in advance of the actual application, in case any remedial treatment is required, or further curing is necessary.

(6.15.2) Peel bond test procedure

Enough on-site time should be allowed for the peel bond test process.

The primer must be allowed to cure properly in accordance with the Hot Melt system manufacturer's instructions and can vary depending on weather conditions.

Rushed peel bond tests can result in unnecessary failure.

A peel bond test is indicative of the actual area tested. Multiple test areas should be undertaken, either in relation to the date of the pour of each section of deck, or a minimum of one peel bond test per 75-100 m^2 of roof area.

The aim of the peel bond test is to make sure that the deck has fully cured and is ready to receive the Hot Melt waterproofing system. A fully cured deck should result in a successful test.

A typical peel bond test procedure is outlined below, but the Hot Melt system manufacturer's particular requirements must be observed.

1. The surface of the concrete must be dry for the test. If there has been recent precipitation, dew or frost, the area of the test and at least 300 mm beyond, should be squeegeed or towelled dry (or sufficient area beyond to make sure that water does not creep back into the test area). The concrete deck test area can then be dried by using a gas torch in a safe and proficient manner (if the deck is retaining too much moisture drying off the surface may not be enough for a successful test). The method of drying the test area must be achievable for the whole roof area, otherwise it could lead to the ultimate failure of the wider waterproofing system.

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6. Structural concrete decks and finishes

2. Prepare the test area. Over-preparation can lead to a false result. Laitance, dust and loose particles should be removed, leaving the test area prepared and clean. Priming should take place immediately once the surface is prepared.

3. Prime a small area of the deck being tested (approx. 500 x 500 mm). The primer used should be the primer described in the Hot Melt specification. Primer should be evenly applied and left to dry.

4. Once the primer is fully dry, pour a small quantity (3-4 mm thickness) of Hot Melt compound onto the test area and firmly apply using a hard board spreader to the deck. Apply to an area approximately 450 mm x 450 mm, leaving exposed primer showing at the edge.

5. While the Hot Melt compound is still hot, dress a piece of polyester mineral protection layer (preferably mineral finished), slightly smaller than the test area (approx. 400 mm x 400 mm), into the top surface of the Hot Melt compound ensuring it is firmly bedded.

6. The applied Hot Melt compound and protection layer is allowed to cool completely.

7. The staggering of the polymer primer, Hot Melt compound and protection layer proves that the test has been carried out using the correct products for the contractor's photographic documentation.

8. Once the sample has sufficiently cooled, cut a triangular shaped incision through the protection layer in the test patch. Leave enough room to carry out a further triangular shaped incision 24 hrs later to check that the conclusion of the first test is sound. If the membrane can be peeled up easily from the deck, this is an adhesion failure, which means that something is prohibiting the bond between the Hot Melt compound and deck. The reason for this must be investigated further. Possible causes are issues of contamination, laitance on the surface, certain admixes, the surface is too smooth, surface applied curing compounds etc. If the membrane is seen to be bonded to the deck and bonded to the underside of the protection sheet and "legs" can be seen when aggressively pulled apart, this is a cohesive failure of the Hot Melt compound, and the bond is considered satisfactory.

9. Photographic evidence (preferably video) of all successful peel bond tests should be logged by the contractor.

10. Two peel bond tests are preferable for each area of concrete deck to be checked. One test to be carried out on the day and the second 24 – 48 hours later. This will give added assurance that there are no issues with the bond.

(6.16) Overview of leak detection testing requirements

Electronic Integrity Testing (EIT) has become the recognised standard for the purpose of on-site testing and certification of the waterproofing integrity of many flat roof and structural waterproofing systems, including Hot Melt systems.

Roofing and Waterproofing Test Association (RAWTA) members are all independent third party On-Site Test House companies with no ownership or allegiance with waterproofing system manufacturers, suppliers or waterproofing contracting businesses. As such they provide independent testing and certification.

(6.17) Installation checking procedures

(6.17.1) During installation

The installer should regularly check that the membrane is being installed to the correct thickness, which will vary from manufacturer to manufacturer. The simplest method is to use a needle type depth gauge. Checking the amount of Hot Melt product used against the area installed will also provide a guide. The number of checks required should be in accordance with the Hot Melt manufacturer's instructions.

(6.17.2) Post installation

(6.17.2.1) Leak testing

Immediately prior to installing any insulation or surfacing, the integrity of the waterproofing system must be independently checked for leaks. The method of testing should be agreed with the client's representative; however, electronic testing is typically the method of choice.

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6. Structural concrete decks and finishes

Electronic Integrity Testing (EIT) utilises the electrical insulating properties of the waterproofing membrane and partial conductivity of both water and the deck to which the membrane is applied. Any breaks in the waterproofing membrane create a circuit that can be detected. The type of deck and its conductivity will have an impact on the test and should be considered.

(6.17.2.2) The low voltage electronic test (wet)

The wet test method, also known as earth leak detection or "wet test" relies on the electrically conductive properties of water and the insulating properties of the membrane to be effective. This highly accurate test simply identifies pulsed electric fields of microscopic proportions and homes in on the source with a sensitive meter. The (wet) method is considered the quickest and most accurate method of testing, as it accurately locates very small penetrations on main deck areas.

Since its introduction, this has become the preferred test for Hot Melt waterproofing systems as it is highly accurate in detecting breaches and simple to implement, typically replacing the traditional method of flood testing of roofs.

(6.17.2.3) High voltage electronic test

This test, also known as a brush test, or holiday test, utilises a circuit of constant high voltage electricity, nominally in the thousands of volts, delivered from a battery-powered source via a copper brush (or wand for upstands or constricted areas). Although voltages are high, the current generated is extremely low, so it is considered safe.

(6.17.2.4) Electronic Integrity Testing on Hot Melt waterproofing

Testing is conducted on the Access/Protection Sheet installed over the Hot Melt material due to the adhesive nature of the raw Hot Melt which cannot be accessed by foot.

Where the Access/Protection Sheet is adhered directly onto the Hot Melt surface whilst it is still hot, air pockets can be formed between the two layers. Whilst this does not affect waterproofing capability it could potentially mask punctures in the Hot Melt unless they are punctured and resealed. The On-Site Test House operative should identify these locations if found.

Roof leak detection is commonly used in new build construction where clients require peace of mind that the roof is watertight before completion of a project. It is also a useful tool in building leak investigations, as one of a number of methods employed to locate the source of water ingress into a building.

Independent certification may be a warranty requirement, and a copy of this test certificate may need to be submitted to the manufacturer prior to the issue of any guarantee.

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7. Preparation and application

(7.1) General

The performance of a Hot Melt waterproofing system depends on the substrate construction and its condition. Waterproofing should only be carried out on structures that are sound.

(7.2) Preliminary inspection

It is still good practice to inspect the deck prior to the installation of the system, including health and safety criteria (see section 4).

Following the inspection, a peel test should be conducted to ensure suitable adhesion to the deck. Many Hot Melt manufacturers, and even some contractors, now offer a pre-installation checklist for the substrate which checks various items such as moisture, contaminants and curing agents.

(7.3.1) Preparation

The following comprises basic guidelines only. It may not be as comprehensive as the information from an individual Hot Melt waterproofing system supplier, whose instructions take priority.

It is essential to the long-term performance of the chosen system that thorough substrate preparation is undertaken, as the Hot Melt waterproofing system can only be as good as the substrate condition allows.

Remove all dust or loose material, inspect, repair, prepare, make clean and dry. Ensure any repaired area is clean and thoroughly dry before applying the Hot Melt waterproofing system.

Rainwater outlets must be inspected to ensure they are correctly installed, not blocked, sound and free draining. Additionally, water should not be impeded by application of the Hot Melt waterproofing membranes.

If installed, lift metal flashings to enable installation of Hot Melt waterproofing systems below.

Ensure rooflights, vents, gutters and other fittings are capable of being waterproofed.

Ensure all upstands heights are a minimum of 150 mm above the finished roof level, allowing for any finish such as ballast, paving or a green roof.

Agree access and safety requirements.

(7.3.2) Application

The application method is defined by the system manufacturer's method statements.

Blocks of Hot Melt waterproofing material should only be melted in a suitable thermostatically controlled, mechanically agitated oil or air jacketed hot melt cooker, by a suitable trained operator. These can be gas or electrically heated. The temperature of the melter/cooker should not exceed the specific instructions of the Hot Melt manufacturer. Standard bitumen pots that are not thermostatically controlled are not acceptable. The system manufacturer's specific requirements should be followed.

Hot Melt waterproofing should be installed within the manufacturer's specified temperature range.

(7.3.3) Accessories and ancillary items

Items such as trims, vents, rooflights, sealants etc. must be compatible with the Hot Melt waterproofing system. Most manufacturers either supply these items themselves or have recommended suppliers. The guidance of the Hot Melt waterproofing system manufacturer must be followed.

(7.4) Storage

All materials must be stored carefully in accordance with the manufacturers' instructions. Proper site storage must be arranged by the contractor.

(7.8) Surface finish of Hot Melt waterproofing systems

Most Hot Melt waterproofing systems have a final finish to the roof system consisting of a reinforced bitumen membrane access and/or protection sheet. This can be the finished roof surface of the layer upon which thermal insulation and an applied finish is installed.

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7. Preparation and application

(7.9) Walls built onto Hot Melt waterproofing systems

LRWA members frequently respond to requests from designers seeking to hide waterproofing upstand details behind a viewable external wall on roofs, podium decks, balconies or terraces. To achieve this hidden detail the designer suggests that the waterproofing system is installed and dressed up the outside face of the hidden inner leaf of the external wall, within the cavity. The outer exposed leaf is then designed to be built directly off the waterproofing, creating a cavity/void between the two leaves of the external wall.

The main reasons for this are:

- to hide the waterproofing upstand and/or flashing from view.
- to enable waterproofing to be completed ahead of the external face of the wall.
- to enable other trades' works to proceed ahead of, or between, the roofing contractor carrying out the waterproofing.

While these reasons can be understandable in each individual case, there are a number of factors that the principal designer must consider. These are outlined in LRWA Guidance Note 16, which has been produced to raise awareness of key considerations the principal designer should assess when designing and building walls directly off the waterproofing system.

(7.10) Details and terminations

Typical details are included in Appendices (12) to demonstrate the general principles behind the detail. They are not to be considered as construction details. Specific guidance should be sought from the Hot Melt waterproofing system manufacturer.

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8. Quality control on site

(8.1) General

The selection of a suitable specification based on the particular circumstances that prevail on a roof, balcony or walkway is the first stage of a quality programme which will provide a durable system.

The proposed specification should take account of the application requirement, health and safety needs, and the practicality of installation on each site. Quality control should be a consideration at design stage and a feasible programme established covering all aspects of the proposed work.

It is important that quality control is scheduled at every stage of application, including the preparation phase, as post installation inspection is impossible.

Quality control should be considered as part of full programme of organised work rather than an item to be isolated once the project is complete.

Unlike other forms of waterproofing membrane which are produced under factory conditions, Hot Melt monolithic membranes are formulated for application on site. Installation should therefore be thought of as a succession of stages, each of which requires a quality control procedure. Particular note should be made of the weather prevailing during application and the effects of any interruptions to the application process caused by inclement weather.

The quality control process should therefore include the following items:

- Review of the specification and drawings.
- Provision of suitably trained labour and supervision.
- Preparation of the substrate with appropriate primer.
- Carrying out of detail work involving the Hot Melt waterproofing system, e.g. around outlets, upstands etc., and work in relation to flashings, gutters and minor building work.
- Installation of neoprene or similar suitable flexible reinforcement where required.
- Installation of the correct thickness of the Hot Melt compound.
- Installation of the correct reinforcement within the system.
- Coating thickness control measures for all "layers".
- Evaluation of site applied check samples.
- Contractor/manufacturer site monitoring provisions during all stages of application, including any necessary installation testing deemed appropriate to the stages of the installation.
- Joint manufacturer/contractor site inspection for guarantee purposes.

(8.2) Completion

Completion should be considered the final stage of the organised work programme, and not a remote item at the end of the project. It should be thought of as the final check in a series of quality control and procedural processes, covering the following items:

- Adherence to the manufacturer's or specifier's specification.
- Logging of all material batch data obtained from packaging e.g. numbers, dates etc.
- Execution of detail work, e.g. flashings, walkways, gutters, minor building work.
- Once the substrates are covered it is not easy to establish such things as preparation, insulation and material usage there is, therefore, a need to review at all stages.
- Hot Melt waterproofing membrane thickness should be checked regularly using a depth gauge or similar. Additional checks can be carried out by recording material usage at all stages of application. Site applied check samples may require less evaluation.
- Reinforcement - usage and overlap best checked at appropriate stage.
- Weather conditions during installation of the Hot Melt waterproofing membrane.
- If guarantees are involved, then these will probably require inspection by the manufacturer and the contractor as well as the client or their agent.
- The site should be left clean and tidy. All cans, packaging, and equipment should be removed together with scaffold. Scaffold may be left in place if required for final snagging inspection.
- All rainwater goods and roof situated equipment, e.g. lightning conductors, power lines etc. Such items should be checked by a competent person.
- Manufacturer's/contractor's guarantees should be sought for the Hot Melt waterproofing system.
- The Operation and Maintenance Manual will require updating completing prior to passing to the client for their retention.

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9. Maintenance

(9.1) Schedules

The schedule should take into account any guarantee or warranty for the roof, balcony or walkway, which may also last for many years. The terms of the guarantee may stipulate a minimum maintenance schedule.

BS 6229:2018 includes recommendations for maintenance inspections to highlight any defects or damage, which can then be isolated for attention. Refer to BS 6229:2018 and see sub-section 9.3.

In normal use, Hot Melt waterproofing systems require periodic inspections to check for damage by accidental impact or building modifications involving the roof structure. The degree of wear and required maintenance will differ depending on the usage, especially on balconies and walkways that are subject to more foot traffic.

(9.2) Preventing damage

During the course of such inspections, sharp objects such as screws, stones, broken glass and other material should be removed from the surface in order to minimise the chances of accidental damage by subsequent foot traffic.

(9.3) Inspections

Inspections should be carried out at least annually. However, inspections in spring should detect any winter damage, and in autumn should ensure that any leaves and other debris are cleared. Roofs, balconies and walkways in close proximity to trees or in other high-risk locations, or which are subject to large volumes of dust or other pollutants, should be inspected more frequently.

The following is a list of typical roof details, although each individual roof, balcony or walkway may have other areas that require inspection:

- General areas:
  - Remove leaves, paper, silt and any other extraneous debris.
  - Cut back overhanging tree limbs.
- Upstands, flashings, cappings, expansion joint covers and cappings:
  - Check exposed membrane for any damage and ensure the components themselves, sealants, mastics and pointing are in good condition and effective.
- Edge details, drips and waterchecks:
  - Check that edge details are properly secured to provide protection against wind uplift.
- Upstand flashings at walls, kerbs and gutters:
  - Check exposed membrane for any damage and ensure flashings, termination bars, sealants, mastics and pointing are in good condition and effective.
- Penetrations and protrusions, pipes, rooflights and plinths:
  - Check exposed membrane for any damage and ensure sealants, mastics and clips are in good condition and effective.
- Outlets, gutters and rainwater pipes:
  - Check for free flow of rainwater and remove any debris or other extraneous items.
  - If grates are missing, they should be replaced.

The requirements for the maintenance for inverted/ballasted roofs are generally limited to inspecting exposed details and surfacing, as the main area of the weatherproofing is protected by the insulation and ballast.

(9.4) Sealants

Where sealants are used, they may require a separate maintenance cycle.

(9.5) Repairs

In the event of localised damage, or to reinstate a completely seamless barrier following structural modifications, repairs can be made quickly and easily by applying more of the appropriate Hot Melt waterproofing membrane to the affected areas. Application should be in accordance with the manufacturer's specification.

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10. Training

The introduction of many new products into the liquid roof waterproofing market has meant that there is a considerable variety in the choice of materials to be applied to roofs constructed from a wide variety of roofing materials. To ensure that materials applied to the roof can function in the best possible way, it is essential that all persons concerned with the operation, from the estimator to the operative applying the material, have received training in the activities involved.

For any person who is asked to work on a roof, prior training is essential. Not only in the application of the roof coating, but also in the identification of roof faults and the correction of faults prior to applying materials. It is also of paramount importance to both the company and the operative that safety training has been given before being allowed on a roof. The operative must, at all times, work in a safe manner such that neither the operative nor the general public are put at risk during the preliminary work before applying roof coatings or during the roof coating operations.

The responsibility for training the workforce falls fairly and squarely upon the employing company and many manufacturers organise courses for operatives in the application of coating materials. Safety training for the operatives can either be conducted in-company or by an outside organisation (e.g., Construction Skills).

Schemes include the following:

- National Vocational Qualifications (NVQ) Level 2 for waterproof membrane roofing:
  - Specialist Applied-skills Programme (SAP).
  - On Site Assessment and Training (OSAT).
- Supplier training schemes for approved contractors.

More information is available at **http://www.lrwa.org.uk/training/**

The LRWA supports the Construction Skills Certification Scheme (CSCS). Successful completion of the Level 2 Vocational Qualification sees the trained operative issued with the relevant CSCS card.

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11. References

LRWA

Guidance note no 1 – roof, balcony and walkway inspection for the specification of liquid applied waterproofing systems

Guidance note no 2 – substrates for liquid applied waterproofing systems for roofs, balconies and walkways

Guidance note no 3 – generic types of liquid applied waterproofing systems for roofs, balconies and walkways

Guidance note no 4 – roof, balcony and walkway refurbishment using liquid waterproofing systems

Guidance note no 5 – health and safety provision for liquid applied waterproofing systems on roofs, balconies and walkways

Guidance note no 6 – safe use of liquid applied waterproofing systems

Guidance note no 7 – specifier guidance on flat roof falls

Guidance note no 8 - CE marking of liquid applied waterproofing kits

Guidance note no 12 – termination of waterproofing at cils and thresholds

Guidance note no 13 – drying of existing roof substrates prior to the installation of liquid waterproofing systems

Guidance note no 14 – best practice for the installation of water flow reducing layers (WFRL)

Guidance note no 15 – clarification of BS 6229 regarding thermal performance in inverted and blue roofs

Guidance note no 16 – walls built onto waterproofing systems

European Technical Approvals

EAD 030350-00-0402 Liquid applied roof waterproofing kits

EAD 030065-00-0402 Composite roof waterproofing kit

ETAG 031 Guideline for European Technical Approval of Inverted Roof Insulation Kits

Test Methods - known as Technical Reports and numbered from TR-001 - TR-011

British Standards Insitution

BS 5250:2021 Management of moisture in buildings. Code of practice

BS 6100-6:2008: Building and civil engineering. Vocabulary. Construction parts

BS 6229:2018: Flat roofs with continuously supported flexible waterproof coverings. Code of practice
(**Disclaimer:** At the time of writing this Code of Practice, BS 6229 was open for public consultation. Please refer to BS 6229:2025 as information may change upon publication)

BS EN 12056-3:2000: Gravity drainage systems inside buildings - Roof drainage, layout and calculation

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

BS 8579:2020 Guide to the design of balconies and terraces

BS EN 13164: 2012+A1:2015 Thermal insulation products for buildings. Factory made extruded polystyrene foam (XPS) products. Specification

BS EN 13163:2012+A2:2016 Thermal insulation products for buildings. Factory made expanded polystyrene foam (EPS) products. Specification

BS EN 13670:2009 Execution of concrete structures

BS EN 1991-1-4 Eurocode 1 - Actions on structures - Part 1-4: General actions - Wind actions

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11. References

Other sources of information

Construction (Design and Management) Regulations (CDM)

Health & Safety at Work Act 1974

HSG33 Health and safety in roof work

Building Regulations

NFRC Technical Bulletins

European Classification, Labelling and Packaging (CLP) Regulation 2015

COSHH Regulations 2002

BS EN ISO 6946:2017: Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods

BS EN ISO 10456:2007: Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values

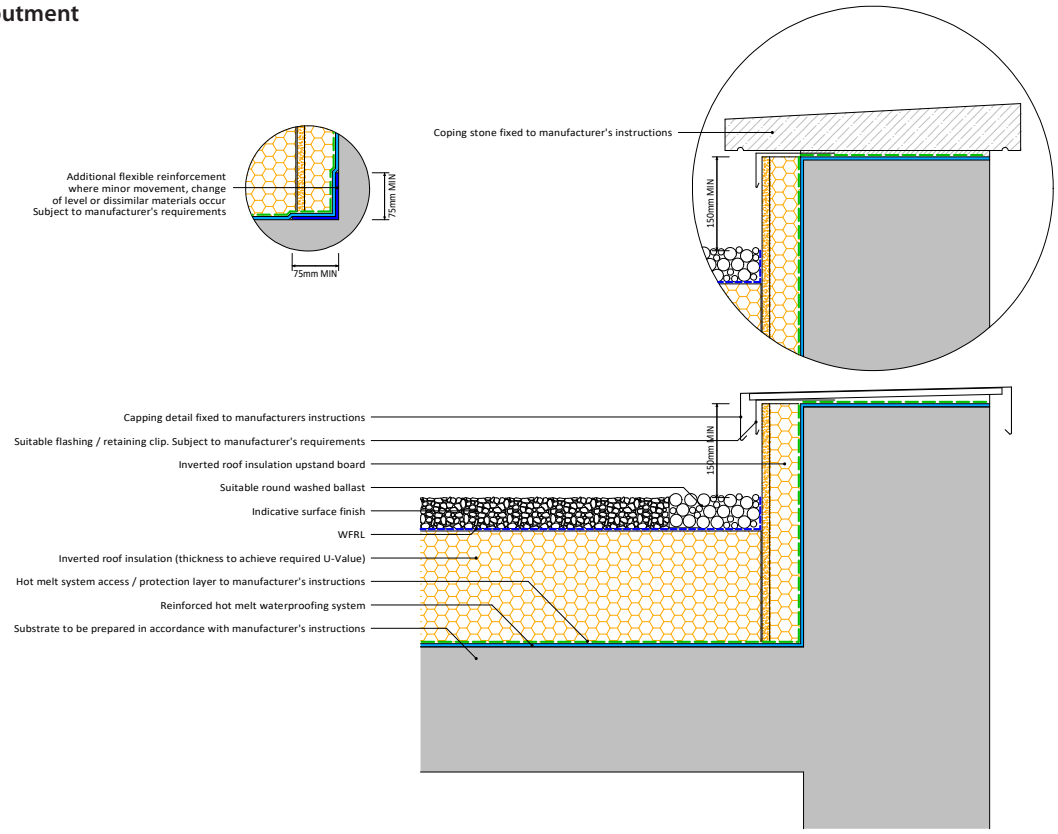
BR443: Conventions for U-value Calculations

BBA Information Bulletin No 4 Inverted Roofs – Drainage and U-value corrections

12. Appendices

The following typical details are included to demonstrate the general principles behind the detail and are not to be considered as construction details. The guidance of the Hot Melt System manufacturer should be sought in all cases.

Insulated Abutment



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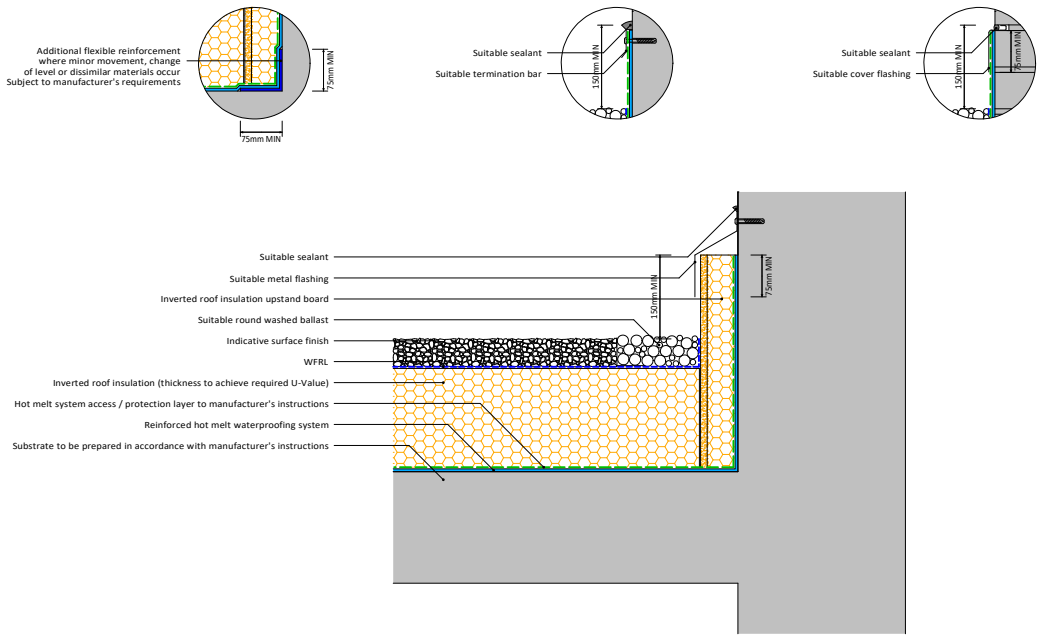
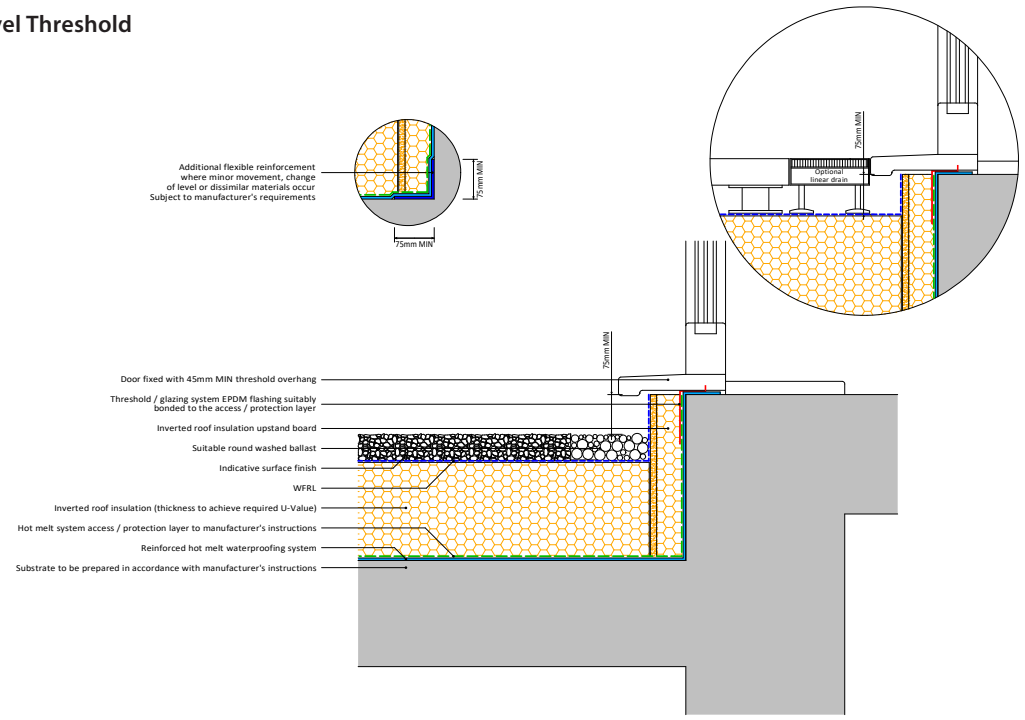
12. Appendices

Insulated Abutment with Metal Flashing



Low or Level Threshold



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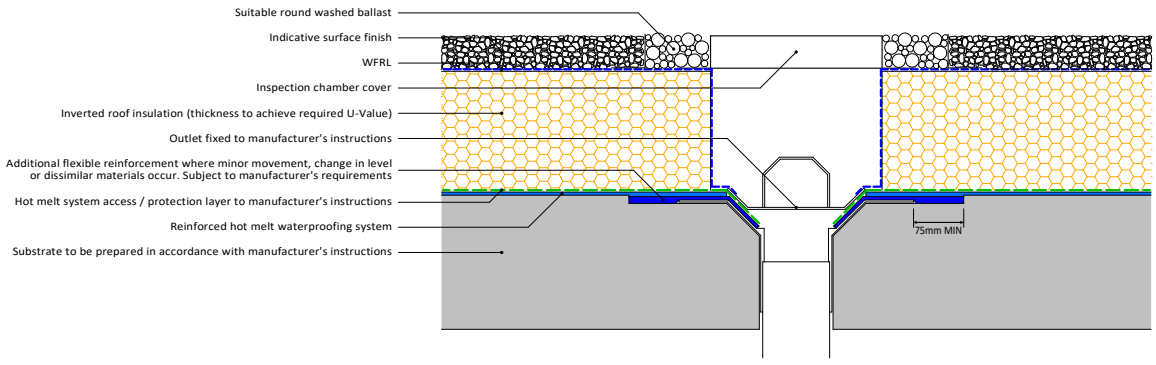
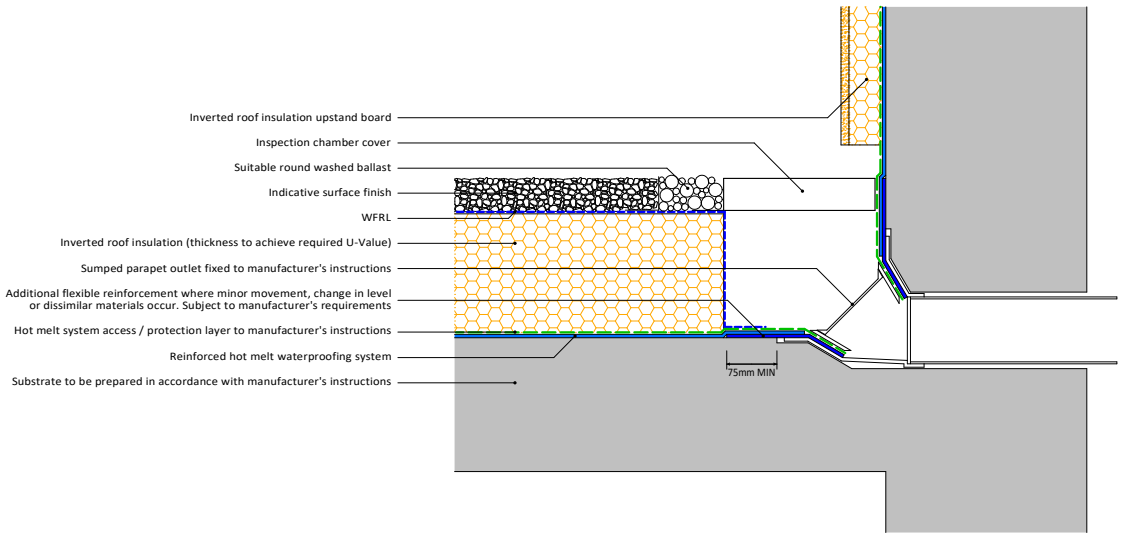
12. Appendices

Outlet



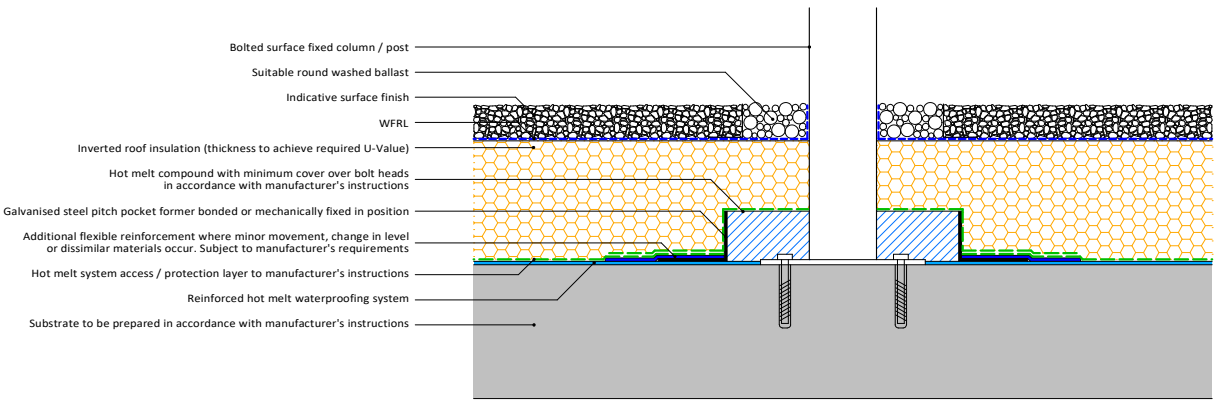
NOTES
a. Concrete around outlet should be dressed to promote positive water drainage
b. Hot melt with additional flexible reinforcement around the outlet flange should be one piece extending a minimum 75mm beyond the flange on all sides and secured by the clamping ring
c. Outlet must remain free to drain at membrane level
d. WFRL should be dressed down into the outlet

Parapet Outlet



12. Appendices

Pitch Pocket



Cold Pipe