

Hot Melt Code of Practice

Specification and Use of Hot Melt Monolithic Waterproofing Systems for Roofs, Balconies and Walkways

Produced by the Liquid Roofing and Waterproofing Association
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1. FOREWORD

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

Through this Code of Practice the Liquid Roofing and Waterproofing Association aim to provide the building owner, specifier, main contractor and roofing contractor with an understanding of how to select the right quality products and how to ensure the correct specification and application for each individual project.

This Code of Practice also sets out to provide guidance with regard to health and safety, substrate preparation, specification preparation, product application and importantly quality control procedures on site.

The result of unpaid technical cooperation across the UK Hot Melt industry this Hot Melt monolithic waterproofing system Code of Practice can be considered to be the result of professional expert work due to the manner in which this document was created.

The Hot Melt monolithic waterproofing system Code of Practice is intended to be recognised as a code of best practice and as such it should be used to guide behaviour relating to Hot Melt monolithic waterproofing system design, specification, installation and maintenance. However, there will be special cases where additional considerations will need to be made.

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

Hot Melt Monolithic waterproofing systems have delivered a viable waterproofing solution for zero falls, flat, trafficked, extensive, inverted, inverted and bio-diverse roofs for over 40 years.

Consisting of synthetic rubber and natural rubber blended with fillers and compatible bitumen Hot Melt Monolithic waterproofing systems provide excellent waterproofing performance with toughness, flexibility and adhesion over a wide range of temperatures beyond those normally associated with conventional bitumens and asphalts

The membranes are fully bonded to the substrate, self-healing (minor damage), and when detailed correctly are able to withstand building movement well in excess of standard tolerances.

Typically finished with an access sheet prior to the installation of a decorative/amenity surface cover such as paving, decking, rounded ballast or a green roof (extensive, intensive or biodiverse/brown), some Hot Melt Monolithic membranes have a BBA certified life expectancy of "the life of the structure it is applied to" proving clients greater security, reduced building maintenance and whole life cost benefits.

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2. GENERAL

2.1 SCOPE

The Code covers the selection and application of Liquid Roofing and Waterproofing Association (LRWA) members' Hot Melt Monolithic Waterproofing Systems, Health and Safety aspects, procedures for specification of materials and methods, survey and inspection, observation of relevant regulations/legislation, utilisation of competent contractors including Quality Control and training, and maintenance.

2.2 INTRODUCTION

This Code of Practice has been prepared to provide specifiers, clients, suppliers, contractors, and other interested parties with a comprehensive guide for the waterproofing of roofs, balconies and walkways and treatment of associated fittings and constructions, using Hot Melt Monolithic Waterproofing Systems from LRWA members.

This Code of Practice is issued by the LRWA. It is based upon best practice and provides guidance on the specification and use of Hot Melt Monolithic Waterproofing Systems.

Based on the collective experience of LRWA members and that of manufacturers, suppliers, contractors and specifiers within the roofing and waterproofing industry, this Code is published with the intention of improving and maintaining performance and quality standards of Hot Melt Monolithic Waterproofing System materials and their application.

Whilst details may vary depending upon specific circumstances, the principles and methods used should be substantially the same as those set out in this document. In properly maintained structures, the methods set out here are designed to achieve satisfactory performance.

The information provided in this Code should always be used in conjunction with that given by the manufacturer of the liquid systems in use. The manufacturer's detailed literature and instructions for applying the specific Hot Melt Monolithic Waterproofing System should be carefully followed in all cases. The Code is not designed to constitute or provide a work specification.

LRWA acknowledges the participation of the representatives of the National Federation of Roofing Contractors in the preparation of this Code of Practice.

2.3 DEFINITIONS

For the purposes of this Code of Practice, the following definitions apply:

i) FLAT OR PODIUM ROOF

Flat Roof: BS 6229 defines a flat roof as "having a pitch not greater than 10° to the horizontal" and then in Table 6 states that the minimum finished falls at any point on a liquid waterproofing system should be 1:80. It is usual to design roofs with a fall greater than 1:80 to allow for deflection of the structure or for site inaccuracies. Falls of 1:60 or 1:40 are commonly designed with the expectation of achieving a finished fall of 1:80 on the completed roof and reducing the potential impact of future deflection.

The above applies to the use of liquid waterproofing systems in an exposed waterproofing application. There is a note to Table 6 for liquid waterproofing systems as follows "For certain specialist systems designed solely for buried applications, such as garden roofs, podia, and some car parks, specific reference should be made to the manufacturer's documented advice and British Board of Agrément certification". The note to Table 6 is therefore not applicable to exposed waterproofing as it is not a buried application.

Hot Melt Monolithic membranes may be laid to zero falls in accordance with certification from the British Board of Agrément (BBA). In such applications thermal calculations should be carried out in accordance with ETAG 031 'Guideline for European Technical Approval of Inverted Roof Insulation Kits'. Further guidance can be found in the BBA Information Bulletin No.4 'Inverted Roofs – Drainage and U-value Calculations'

Flat roof construction for Hot Melt Monolithic membranes may be of in-situ or precast concrete or timber, all of which may support other materials. Concrete decks may include an over-layer of suitable screed. On timber constructions there will be a structural timber decking over the joists. Plywood, OSB or Cement particle board may also be attached to trapezoidal profiled steel deck.

Flat roofs often provide an ideal location for plant or equipment and suitable maintenance access is then required.

Pitched Roof: It follows then that the industry definition of a pitched roof is one with an angle of slope or pitch exceeding 10° to the horizontal, constructed to form a barrier against climatic conditions.

Podium Roof: a Podium Roof is generally defined as a roof that is used as if it were at ground level i.e. street level over an underground railway station or parking garage.

Podium roofs are constructed from in-situ or precast concrete and finished with paving, a concrete slab and/or green roofing. Street furniture may be attached to the structure through the waterproofing.

See LRWA Guidance Note No.7 'Specifier Guidance for Flat Roof Falls' for further information.

ii) ROOF TYPES

Warm Roof: In the construction of warm roofs the principal thermal insulation material lies immediately beneath the weatherproof covering and on top of the roof deck and any vapour control layer necessary (i.e. above the structural deck). Hot Melt Monolithic Waterproofing Systems are NOT used as the external waterproofing finish.

Inverted Roof: In this type of construction the principal thermal insulation material is applied on top of the weatherproof covering, providing the necessary restriction of heat loss from the building. The position of the insulation above the waterproofing also serves to moderate the temperature variations in the waterproofing layer thus protecting it from the thermal shock associated with variations in temperature. Inverted Roof system can also be referred to as a 'protected membrane', or 'upside down' roof. Hot Melt Monolithic Waterproofing Systems are used as the waterproofing layer below the insulation layer, usually directly over the structural deck. The insulation material used in an inverted roof must be characterised so that the effect of exposure to water can be correctly included in the design thermal conductivity of the material (see ETAG 031 and BBA Information Bulletin No.4). The fire performance of the insulant should also be assessed.

Cold Roof: In this type of construction the principal thermal insulation material is placed below the roof deck, normally at ceiling level. Heat loss through the ceiling is thus restricted keeping the cavity, roof deck and covering at low temperature during winter conditions. The concept is usually concerned with roof structures which include an independent ceiling enclosing an air space between the deck and ceiling. Hot Melt Monolithic Waterproofing Systems are NOT typically used as the external waterproof finish over the structural deck.

Note: Cold roof voids must be ventilated to avoid the build up of interstitial condensation. With increasing insulation requirements the use of cold roof constructions for new flat roof constructions is, therefore, declining.

iii) BALCONIES, TERRACE ROOFS AND WALKWAYS

Wearing Surface

A balcony, terrace or walkway will require some form of walkway, depending on the specific application and use.

Balconies

A balcony is a platform on the outside of a building, with access from an upper-floor window or door and is usually enclosed by a balustrade, railing or parapet. Balconies can project out from the building or can form the roof (or part of a roof) to a room below.

Balconies are frequently of concrete construction and existing balconies may be left exposed or waterproofed with asphalt or have an aesthetic coating. Where a balcony forms part of a roof to a room below, the thermal performance must be considered.

Balconies often have a wearing surface as part of the Hot Melt Monolithic system or can be finished with bonded tiles or loose laid tiles or decking.

This code of practice only covers waterproofing applications. Aesthetic coating systems may follow most of this guidance, but they should be installed in accordance with the manufacturer's instructions.

Terrace Roof

A terrace roof is a flat roof used as an amenity area. These roofs tend to be waterproofed and have separate finishes such as tiles, paving slabs or timber decking boards. They are generally open to public access.

Walkways

Walkways are areas of communal access to flats. Like balconies, walkways can have a wearing surface as part of the Hot Melt Monolithic system or can be finished with bonded tiles.

iv) GREEN ROOFS

By their seamless nature, Hot Melt Monolithic Waterproofing Systems are ideally suited for use in green roofs. Once installed a root resistant membrane is bonded to the Hot Melt Monolithic membrane. Where the Hot Melt Monolithic membrane contains a root resistant compound a standard Access sheet may be installed. The scope of this document does not allow for a full explanation of green roof terminology. Reference should be made to The GRO Green Roof Code, Green Roof Code of Best Practice for the UK published by the Green Roof Organisation (GRO).

v) INSULATION

Insulation is used to restrict heat flows from and, into a structure. When used in an inverted roof it also offers protection to the waterproofing layer from both physical damage and degradation due to exposure to UV and thermal cycling. There are many different types (and manufacturers) of insulation with only specific types being suitable for inverted Hot Melt Monolithic waterproofing systems. Typical features of these products would be high compressive strength (≥ 300 kPa), low water absorption ($<1\%$ by volume), ability to withstand repeated freeze/thaw cycles and feature a profiled lap joint to resist wind uplift, reducing ballast weight and also reducing rainwater cooling.

Suitable types of thermal insulation for inverted roof applications are Extruded Polystyrene (XPS) and certain, 'Low Water Absorption Technology' or 'Modified' types of Expanded Polystyrene (EPS).

Many Hot Melt Monolithic Waterproofing System manufacturers also supply insulation and ancillary products that are approved for use with their systems.

At all times individual manufacturer's recommendations must be sought when selecting and applying a Hot Melt Monolithic Waterproofing System in conjunction with any insulation.

vi) GUTTERS

In Hot Melt Monolithic Waterproofing System flat roof designs internal gutters can be constructed as part of the flat roof deck construction. These will be waterproofed in the same manner as the flat roof area.

vi) UPSTANDS & FLASHINGS

Upstands and Flashings are formed using the Hot Melt Monolithic Waterproofing membrane covered with an access/protection sheet prior to the application of a suitable thermally insulated upstand board. The Hot Melt Monolithic waterproofing should extend a minimum 150mm above the finished roof height (to include any thermal insulation/surface finish).

vii) ROOFLIGHTS

General: For all flat roof systems, out of plane rooflights will be the norm. These comprise an upstand kerb and a glazing element. The upstand kerb will be waterproofed to a suitably protected termination.

Important Notes:

- It is important for the safety of operatives to provide protection around Rooflight openings during installation.
- Rooflight kerb heights must extend 150mm above the finished height of the Hot Melt Monolithic Waterproofing including any insulation and surface finish.

viii) PONDING

Flat roofs are usually constructed with slight falls, typically 1:80, which will allow water to drain away. Minor constructional variations in the plane of the surface will allow the collection of water which has no way of draining. It is therefore advisable to design roof falls greater than the required finished falls to allow for construction tolerances and dead and imposed loads.

However Hot Melt Monolithic Waterproofing systems are not constrained by the same falls requirements as warm flat roofs, where the waterproofing is the upper visible layer. As Hot Melt Monolithic Waterproofing systems are constructed as inverted roofs, the waterproofing is beneath the insulation and any applied finish. A loose laid water control layer is typically installed above the insulation and beneath the ballast/paving/green roof layer, this controls the travel of water within the roof build-up enabling drainage at insulation level and deck level (should any water penetrate this layer).

Note: for the water control layer to operate effectively, the inverted roof should be designed **with a positive fall** And in accordance with BBA Information Bulletin No.4 and the manufacturer's instructions.

ix) PRE-INSPECTION

Prior to the installation of a Hot Melt Monolithic Waterproofing System it is necessary to inspect the roof structure and assess its readiness for application.

Documented bond tests must be carried out on all areas to ensure that suitable bond strength can be achieved to the substrate.

x) POST INSPECTION

All work requires an inspection following the completion of the Hot Melt Monolithic Waterproofing System. Post application inspection should cover such items as:

- application rate - membrane thickness
- reinforcement application
- access sheet application
- flashings and detailing
- adherence to the design specification
- electronic leak detection
- other related matters

xi) ELEMENTS OF HOT MELT MONOLITHIC WATERPROOFING SYSTEMS

Substrate

Any surface which forms the basis of the roof structure e.g. concrete, wood

Primer

Usually a low viscosity product which is applied to improve the adhesion of a Hot Melt Monolithic Waterproofing System to the substrate. A primer is not used to replace adequate surface preparation such as brushing or cleaning, but will on occasions help to consolidate a friable or porous layer. The Hot Melt Monolithic Waterproofing System manufacturer must be consulted to ascertain the correct priming regime.

Waterproofing Membrane (Hot Melt Monolithic Waterproofing System)

A Hot Melt Monolithic product applied in two (nominal) 3mm thick coats which once applied to the roof substrate and cooled will provide protection against water ingress.

Reinforcement

A spunbonded polyester fabric reinforcement, supplied by the manufacturer for installation between the two 3mm coats Hot Melt Monolithic Waterproofing System.

At points of stress concentration such as upstands, movement joint, rainwater outlets and penetrations additional uncured neoprene reinforcement (or a suitably flexible alternative product) is bonded to the substrate beneath the first 3mm thick layer of the Hot Melt Monolithic Waterproofing System. Consult the manufacturer's instructions for their recommendations.

Access Sheet

A reinforced bitumen membrane applied over the finished Hot Melt Monolithic Waterproofing Membrane to facilitate access across the sticky surface and/or to facilitate the installation of a surface finish such as insulation, paving and/or ballast.

Protection Sheet

A reinforced bitumen membrane applied over the finished Hot Melt Monolithic Waterproofing Membrane to provide root protection in green roof systems or where the application demands a more robust product than an Access Sheet.

Thermal Insulation

Extruded or Modified Expanded Polystyrene insulation board, BBA certified for use in inverted applications, installed over the Access or Protection Sheet.

Thermal Sheet

Water Control Layer

A water vapour permeable, thermally bonded tri laminate of polypropylene spun bonded and micro porous that acts to resist the passage of water. The overlap should be in accordance with manufacturer recommendations and laid with the fall of the roof. Loose-laid over the insulation that minimises the amount of rainwater that reaches the waterproofing layer, minimising heat loss due to rainwater cooling and reducing the thickness of insulation required.

Note: for the water control layer to operate effectively, the inverted roof should be designed ***with a positive fall*** And in accordance with BBA Information Bulletin No.4 and the manufacturer's instructions.

Upstand Board

A weather resistant high impact facing board bonded to an extruded polystyrene foam thermal insulation board. Used to prevent cold bridges at parapet walls and/or a decorative finish.

Paving

Individual paving slabs installed on paving spacers over the Thermal Sheet and Thermal Insulation. Provides the wind uplift resistance required to secure the thermal insulation in place. Also provides an aesthetic finish, amenity and/or a means of access.

Ballast

20 – 40mm rounded ballast installed over the Thermal Sheet and Thermal Insulation to a suitable depth to provide the wind uplift resistance required to secure the water control layer and thermal insulation in place. Also provides an aesthetic finish, amenity and/or a means of access.

Green Roof

Intensive, Extensive and/or Biodiverse green roofing systems installed over the Thermal Sheet and Thermal Insulation to a suitable depth to provide the wind uplift resistance required to secure the thermal insulation in place. Also provides an aesthetic finish, amenity, a means of access, environmental benefits, biodiversity, incidental rainfall management and many other benefits associated with green roofing.

3. CERTIFICATION OF HOT MELT MONOLITHIC WATERPROOFING SYSTEM

Hot Melt Monolithic Waterproofing Systems offer a highly durable solution to both new build and suitable refurbishment projects.

It is necessary to consider how systems will perform relative to the client's requirements.

3.1 EUROPEAN TECHNICAL APPROVALS (ETAs)

As a requirement of the Construction Products Directive (80/106/EEC), European Technical Approvals (ETA's) have been produced for Hot Melt Monolithic Waterproofing Systems. The work has been undertaken in each member state by national technical committees and approval bodies and the overall co-ordination of the documents has been the responsibility of the European Organisation for Technical Approval (EOTA). The objective has been to produce harmonised technical standards for Hot Melt Monolithic Waterproofing Systems.

A variety of types of Hot Melt Monolithic Waterproofing Systems exist and it was recognised that the ETAs should accommodate these systems in a formalised structure. This has led to the development of, to date, eight separate parts to the ETA, each covering a generic type.

3.2 ETAG and ETA Parts

The primary document ETAG 005 (Part 5 General) gives overall guidance on assessment of fitness for use, including methods of verification and attestation of conformity. The remaining seven parts, known as the Complementary Parts or the ETA Parts, deal with specific requirements for particular families of products and are the generic types (covered in more detail by Guidance Note 3 - Generic Types of HOT MELT MONOLITHIC WATERPROOFING SYSTEM for Roofs, Balconies and Walkways and are:

Part 2: Polymer modified bitumen emulsions and solutions

Part 3: Glass reinforced resilient unsaturated polyester resins

Part 4: Flexible unsaturated polyesters

Part 5: Hot applied polymer modified bitumens

Part 6: Polyurethanes

Part 7: Bitumen emulsions and solutions

Part 8: Water dispersible polymers

Other parts may be added in due course.

It is recommended that only systems holding current Agrément Certification or ETAs for Roofing, Balconies and Walkways should be specified

3.3 National certification

National approval for Hot Melt Monolithic systems in the UK can run in parallel with ETAs and involves Agrément certification from the British Board of Agrément (BBA) (a member of the UEAtc and EOTA). BBA Certificates for the approved systems are based on the same test procedures as detailed in ETAG 005 but also include additional statements on the UK national building regulations and non-regulatory requirements, standards, design and installation details and a durability statement. Current certificates are downloadable from the BBA website www.bbacerts.co.uk

4. HEALTH & SAFETY PROVISION FOR HOT MELT MONOLITHIC WATERPROOFING SYSTEMS ON ROOFS, BALCONIES AND WALKWAYS

The Health and Safety at Work Act deals with fundamental working practices. Other legislation contributes to the welfare of those undertaking the work and those in the vicinity of the work. Whilst the Construction (Design and Management) Regulations may not be a legal requirement on short-term contracts, it is good practice to apply the principles to all roof, balconies and walkways.

It is important to gather as much health and safety information about a project and the site before work begins. A survey of the site should be made by a competent qualified person

4.1 SAFETY DATA SHEETS

Standard 'CHIP' (Chemical Hazard Information and Packaging) Safety Data Sheets issued by product manufacturer are essential reading prior to handling any materials. They contain information under 16 headings which are shown as following:

Primary headings for safety data sheets ex manufacturers:

1. Product and company identification
2. Composition/Information on Ingredients
3. Hazard identification
4. First aid measures
5. Fire fighting 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

4.2 REFERENCE CHECKLIST

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

- Construction (Design and Management) Regulations (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
Fall restraint
 - 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 the roof must be accessed in accordance with the guidance given in 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 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 accidentally killed. Compliance with the current Working at Height (WAH) Regulations and HSE guidance on scaffolding etc will help reduce falls and also injuries to others caused by materials falling from a roof.

'Health and safety in roof work' HSG 33 from HSE Books, 2008, 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.

Also "Working on Roofs" INDG 284 from HSE and Guidance Note 7 from the Work at Height Safety Association (WHSA) is recommended

The Advisory Committee for Roofwork (ACR) has produced several useful roof safety publications that are available to download on www.roofworkadvice.info

Further information/ references can be found on the LRWA Guidance Notes 5 and 6 on "Provision" and "Safe Use" of HOT MELT MONOLITHIC WATERPROOFING SYSTEM on Roofs, balconies and walkways.

4.4 CDM REGULATIONS

The Construction (Design and Management) Regulations 2007 has the main purpose of establishing a safety management network at all stages of a construction project. Obligations are imposed on everyone but principally a CDM Co-ordinator and principal contractor. There must be a safety plan to combat risks at source and this will involve a method statement from suppliers based on their own health and safety plans. LRWA manufacturers of Hot Melt Monolithic Waterproofing Systems are compliant with these aims.

4.5 COSHH REGULATIONS

The Control of Substances Hazardous to Health Regulations 2002 (as amended), are designed to 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 Hot Melt Monolithic Waterproofing Systems will be shown in the CHIP Safety Data Sheets issued by the 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.

5. BUILDING REGULATIONS

5.1 ESSENTIAL REQUIREMENTS:

The chosen specification must be capable of satisfying the Building Regulations/Standards and their subsequent amendments for each country in the UK. There are 3 relevant physical properties that the systems must satisfy for the Building Regulations, namely resistance to fire, fitness of materials and workmanship, and resistance to moisture. The requirements for thermal performance for new work or any thermal upgrade for remedial applications must also be considered. With regard to meeting regulations and eliminating the risk of interstitial and surface condensation.

RESISTANCE TO FIRE:

The system should have been tested by an appropriate testing body to assess its reaction to the external spread and penetration of fire. The system should achieve a designated level of resistance for acceptance. UK Building Regulations make reference to BS 476-3:2004 as the

standard test method or determined in accordance with BS EN 13501-5:2005.

FITNESS OF MATERIALS AND WORKMANSHIP:

Regulation 7 stipulates that building work shall 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 so as adequately to perform the functions for which they are designed; and
- in a workmanlike manner.

RESISTANCE TO MOISTURE:

The systems, being promoted as waterproofing products, must satisfy the requirement of resisting precipitation.

6. SUBSTRATES

6.1 Introduction

The primary objective of a Hot Melt Monolithic Waterproofing System treatment 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 Hot Melt Monolithic Waterproofing Systems is largely dependent upon the suitability and preparation of the substrate. The Hot Melt Monolithic Waterproofing System is applied direct to the substrate.

Some Hot Melt Monolithic Waterproofing System manufacturers supply products for the whole system. This is the preferred option as the manufacturer will have responsibility for the compatibility of the system, but this does not exclude the use of materials from different sources. In either case, the recommendations of the Hot Melt Monolithic Waterproofing System manufacturer are to be followed.

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

Not all systems will be suitable for use on all substrates. Specifiers and users of a Hot Melt Monolithic Waterproofing System must ensure that the substrate is suitable for the chosen system.

6.2 Categorisation of Substrates

Whilst a wide variety of substrates exist, from the point of view of Hot Melt Monolithic Waterproofing Systems application, they may be broadly categorised as follows:

6.2.1 Substrates suitable for direct treatment:

These are substrates which, when correctly prepared, provide a suitable base for a direct Hot Melt Monolithic Waterproofing System application. Substrate preparation can include a requirement for pre-treatments, treatment and removal of biological growths, priming systems and joint treatments. Section 7 gives 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.

6.2.2 Substrates requiring more detailed examination:

These are substrates which require a detailed investigation before a chosen Hot Melt Monolithic 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:

- 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

6.2.3 Substrates unsuitable for Hot Melt Monolithic Waterproofing System treatment:

There are a number of substrates which are not suitable for direct treatment with Hot Melt Monolithic Waterproofing Systems. These substrates will need either to be removed or will require the overall application of a carrier membrane to provide a suitable base for the Hot Melt Monolithic Waterproofing System. Examples of unsuitable substrates include:

- trapezoidal profiled galvanised steel decking.
- Trapezoidal profiled aluminium decking.

6.3 Further Guidance

Consult the individual manufacturer.

7. SPECIFICATION, PREPARATION & APPLICATION

7.1 General

In order to draw up a specification, the following criteria should be taken into account.

The performance of a Hot Melt Monolithic Waterproofing System is dependent 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 consideration of the items within Health & Safety criteria (see Section 4).

Following inspection a peel test should be conducted to ensure suitable adhesion to the roof surface.

7.3. Specification

7.3.1 Preparation

The following list comprises basic guidelines only, it may not be as comprehensive as the information from an individual Hot Melt Monolithic Waterproofing System supplier whose instructions will take priority. It is essential to the long-term performance of the chosen Hot Melt Monolithic Waterproofing System that thorough preparation of the substrate is undertaken as the Hot Melt Monolithic Waterproofing System can only be as good as the substrate condition allows.

i) Cleaning

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 Monolithic Waterproofing System.

ii) General

- 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 Monolithic Waterproofing Systems below.

- Ensure rooflights, vents, gutters and other fittings are capable of being waterproofed.
- Ensure all upstands heights are a minimum of 150mm above the finished roof level, including any applied finish such as ballast, paving or a green roof.
- Agree access and safety requirements.

7.3.2 Installation/Application

- (i) The choice of Hot Melt Monolithic Waterproofing Systems should be made with reference to Section 3 of this Code, i.e. Generic Types.
- (ii) Methods of application of Hot Melt Monolithic Waterproofing Systems are as defined by manufacturer's method statements.
- (ii) Block of Hot Melt Monolithic waterproofing should only be melted in a suitable oscillating air or oil jacketed melter/cooker by a suitable trained operator. The temperature of the melter/cooker should not exceed 230°C. Consult manufacturer for their specific requirements.
- (iv) Hot Melt Monolithic waterproofing should be installed within a temperature range of 160°C to 220°C. Consult manufacturer for their specific requirements.

7.3.3 Accessories and Ancillary Items

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

7.4 Storage

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

Table 1 - Categorisation according to user loads

Category	User Load	Examples of accessibility
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

7.5 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 in the selection of a Hot Melt Monolithic 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. The Table 1 gives the appropriate categories of user loads and examples of the related accessibility.

7.6 Durability and Working Life

The durability of most Hot Melt Monolithic Waterproofing Systems is the design life of the structure. The stated durability of Hot Melt Monolithic Waterproofing Systems must be supported by independent assessment, such as a valid BBA Certificate.

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.

7.7 Climate Effects

The following extract is also 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.

7.8 Surface Finish over Hot Melt Monolithic Waterproofing Systems (where required)

Most Hot Melt Monolithic 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 from which thermal insulation and an applied finish is installed.

7.9 Details and Terminations

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 Monolithic Waterproofing System manufacturer should be sought.

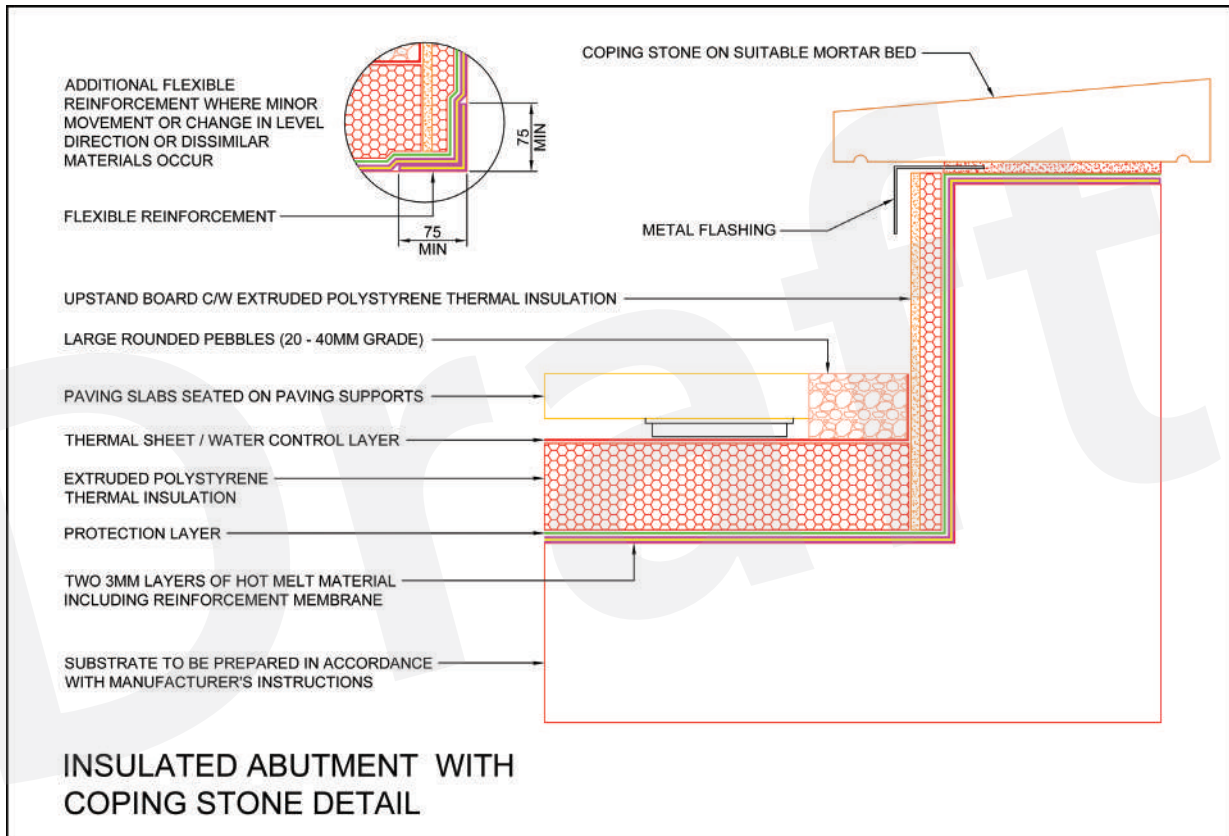


Fig 1

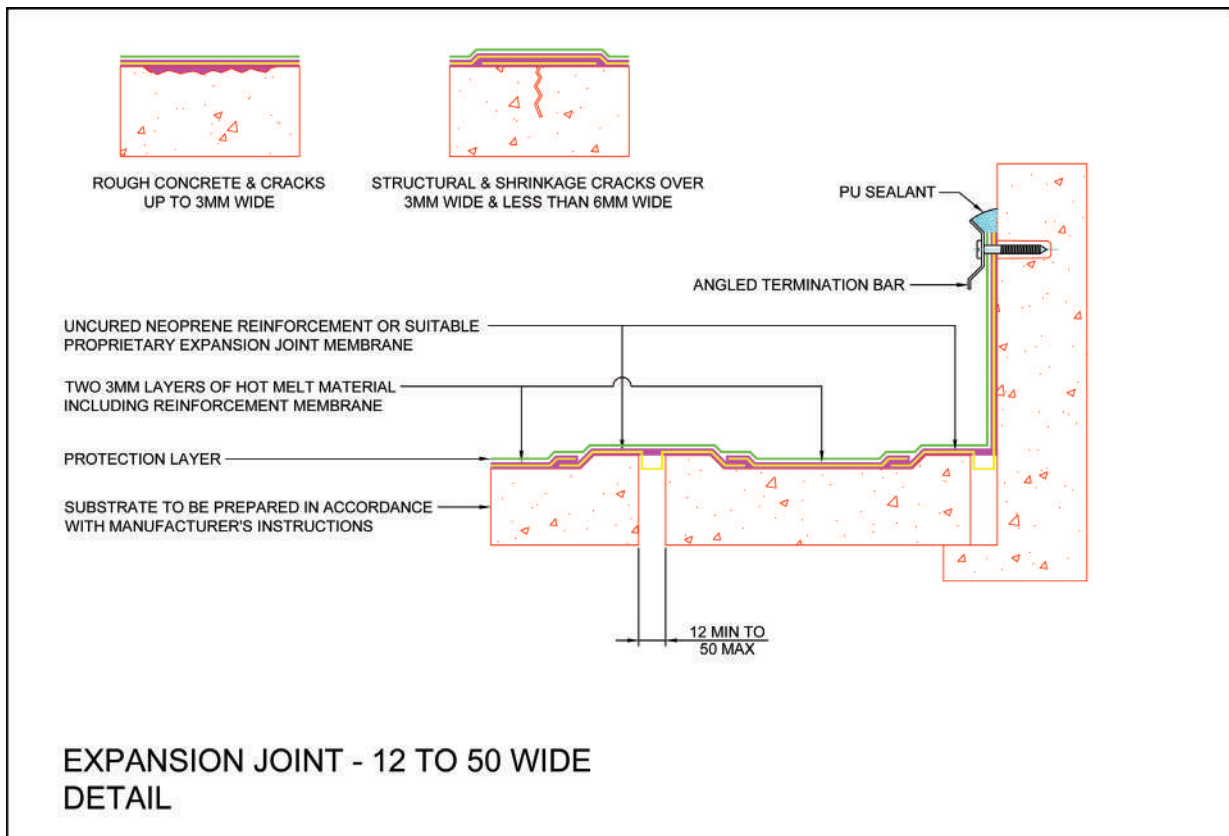


Fig 2

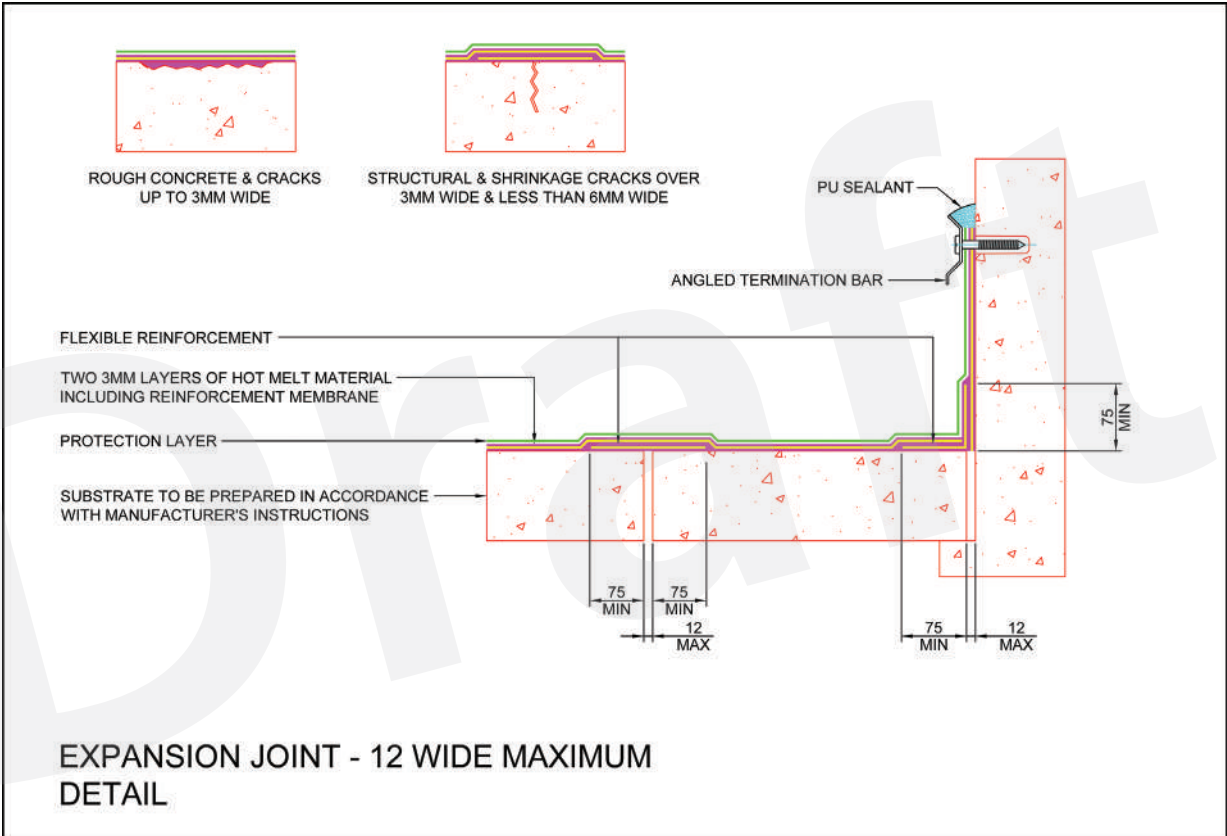


Fig 3

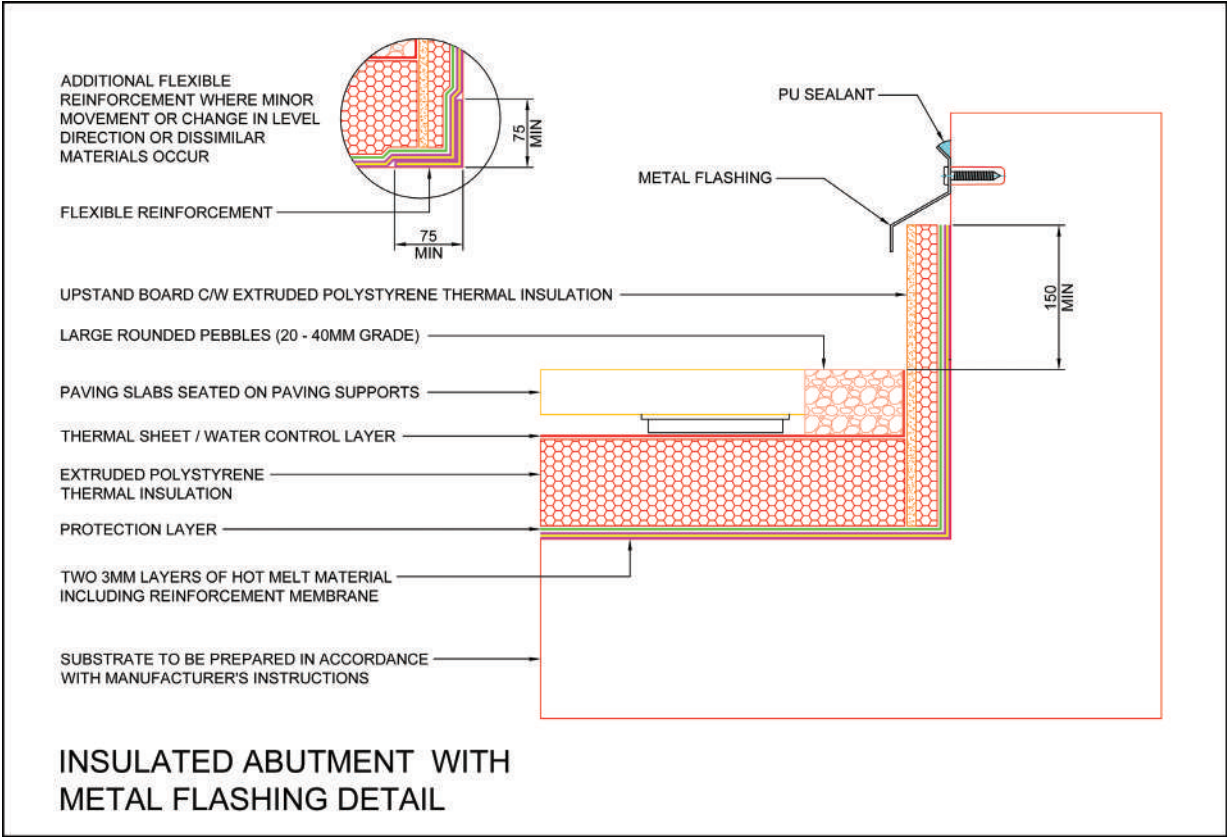


Fig 4

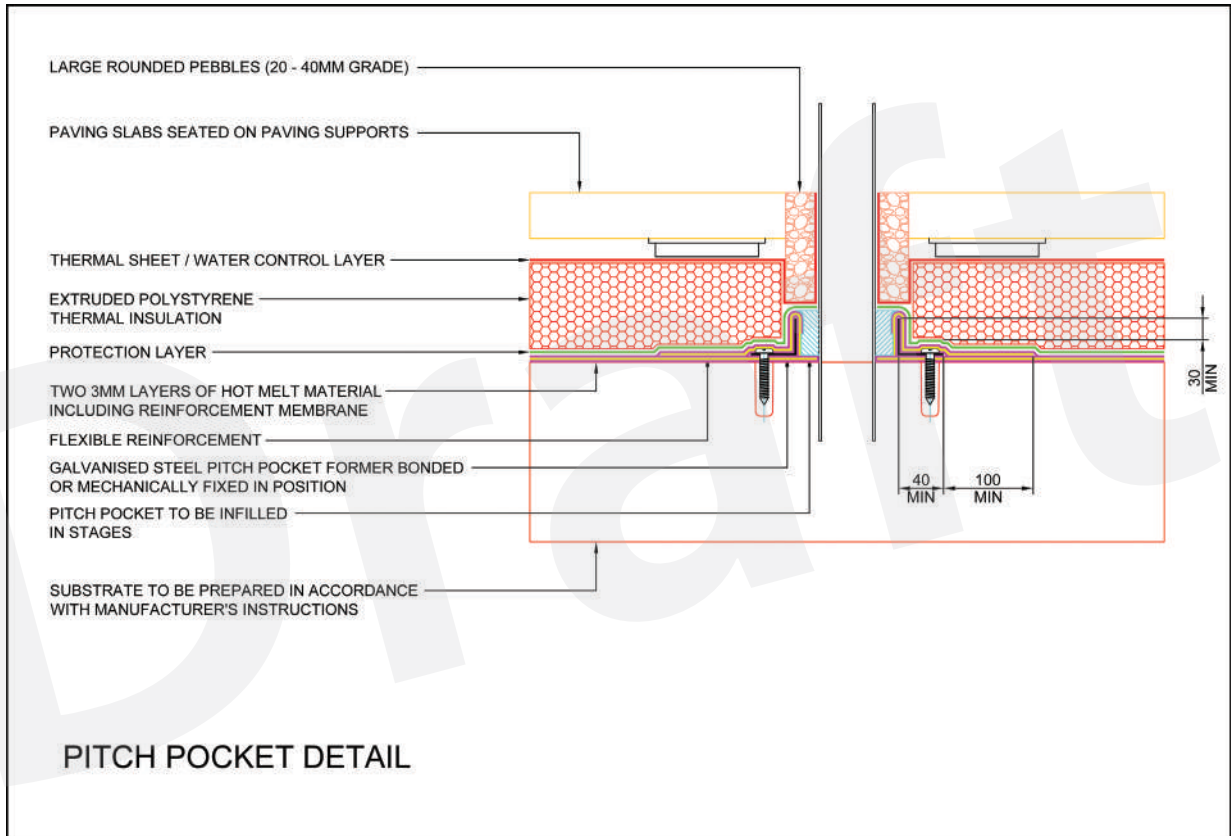


Fig 5

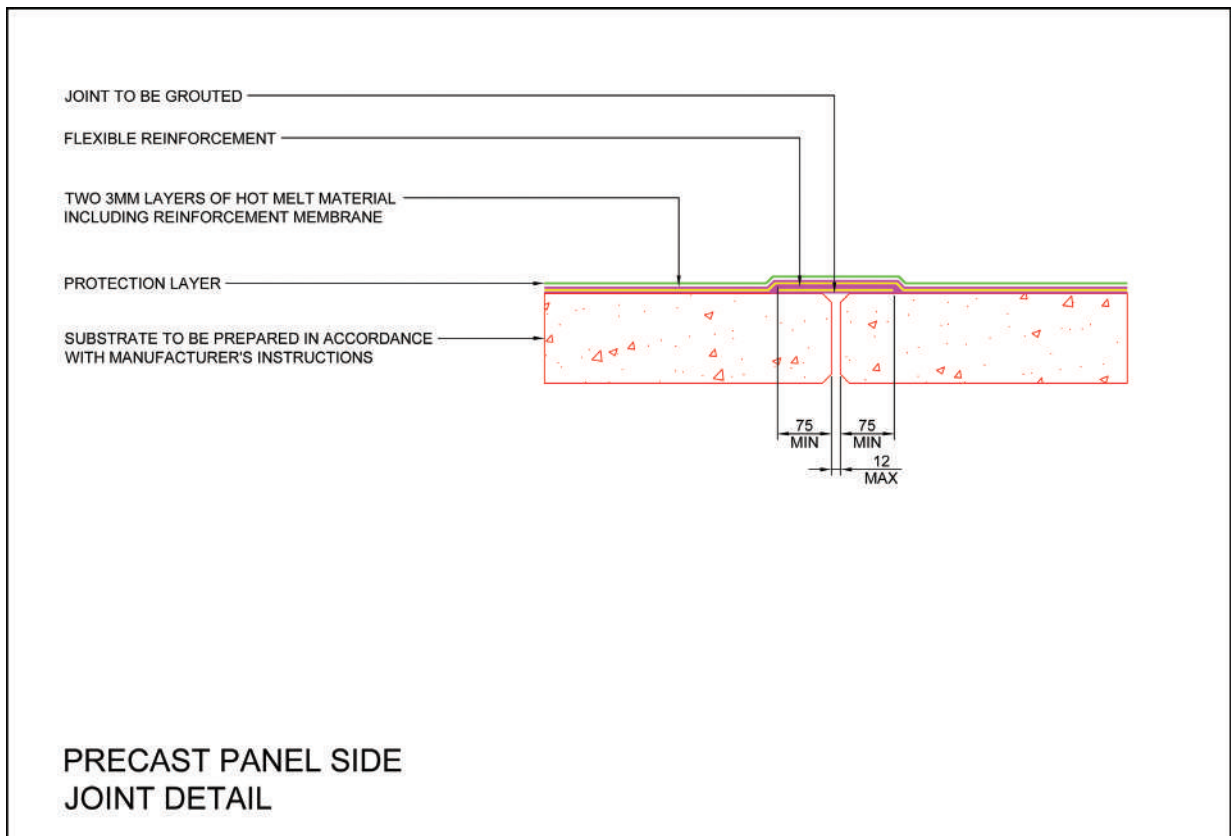


Fig 6

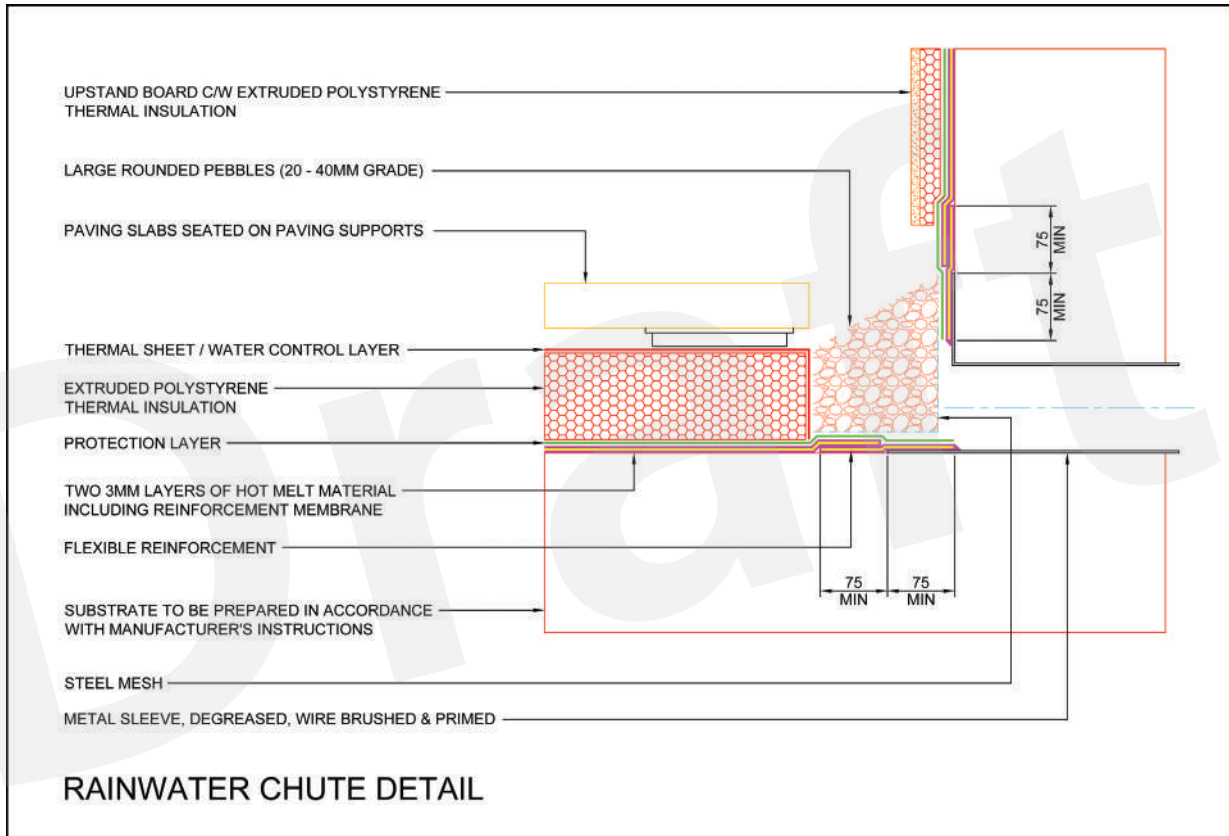


Fig 7

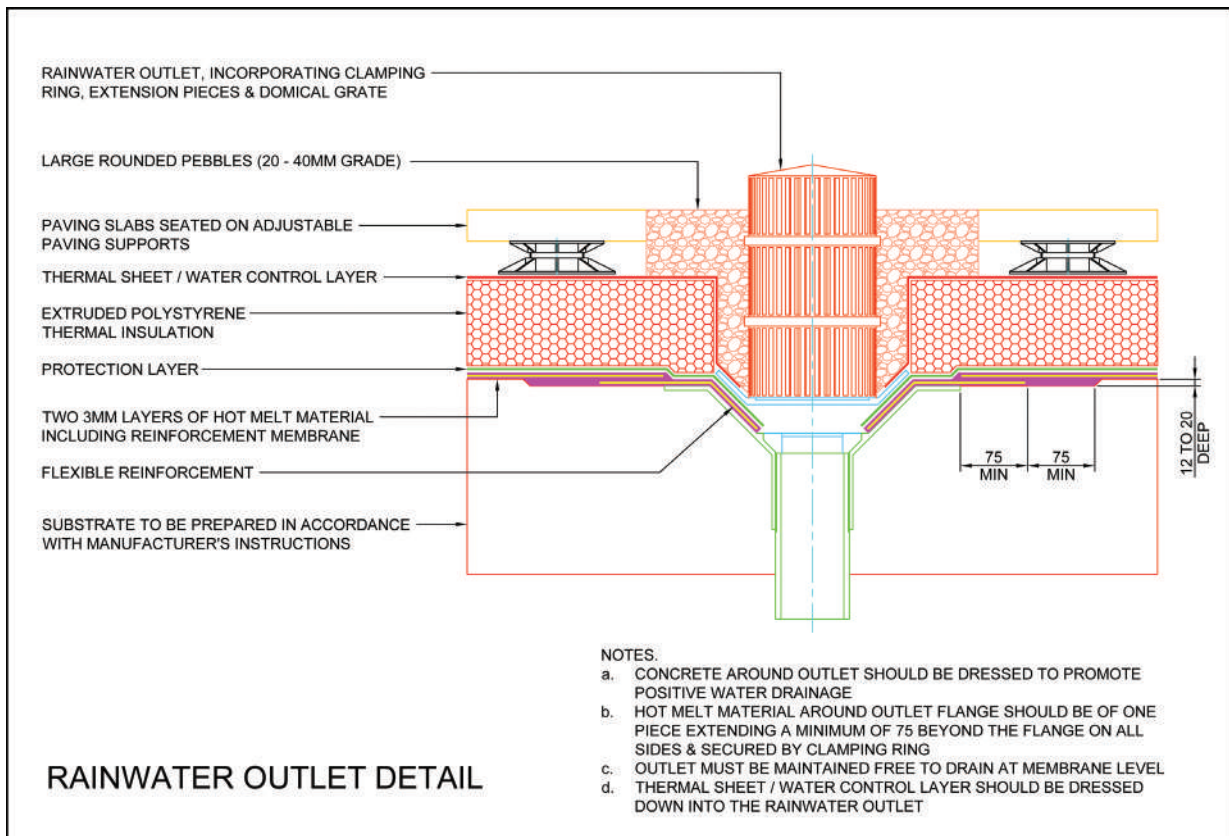


Fig 8

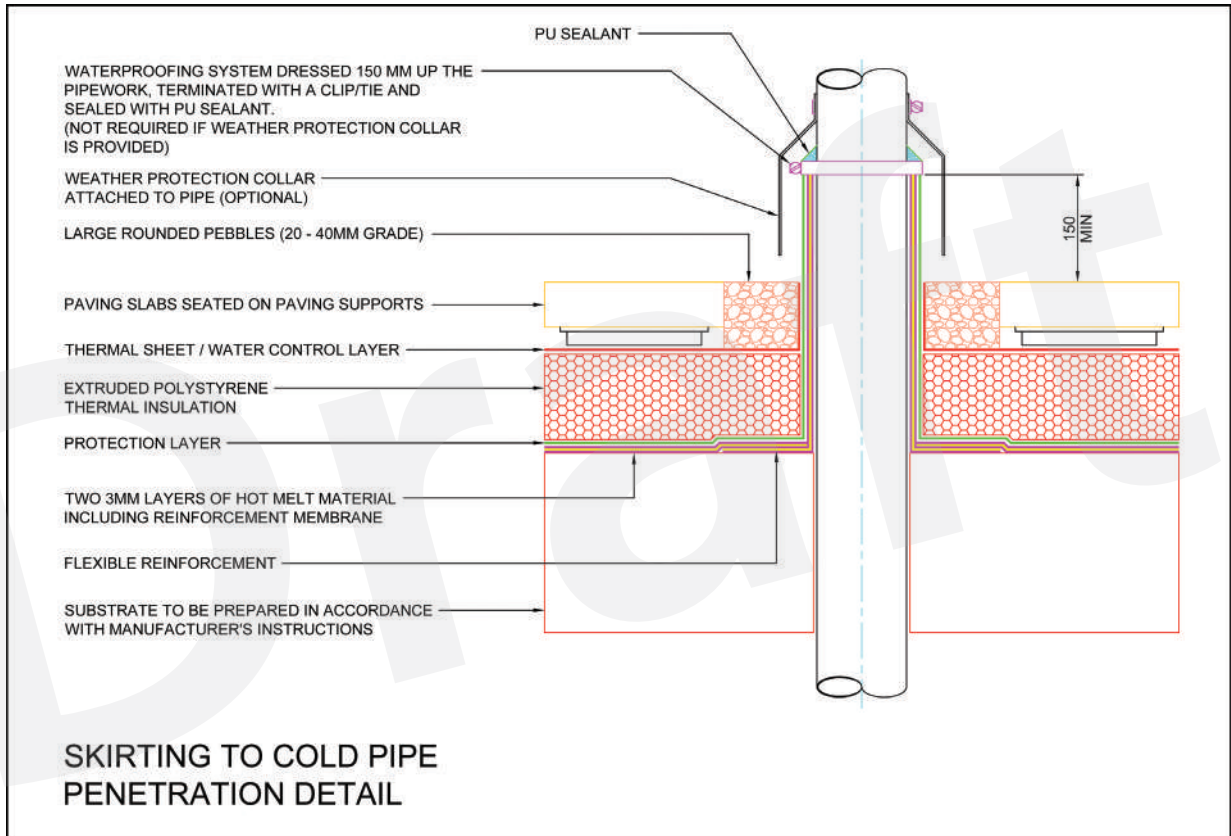


Fig 9

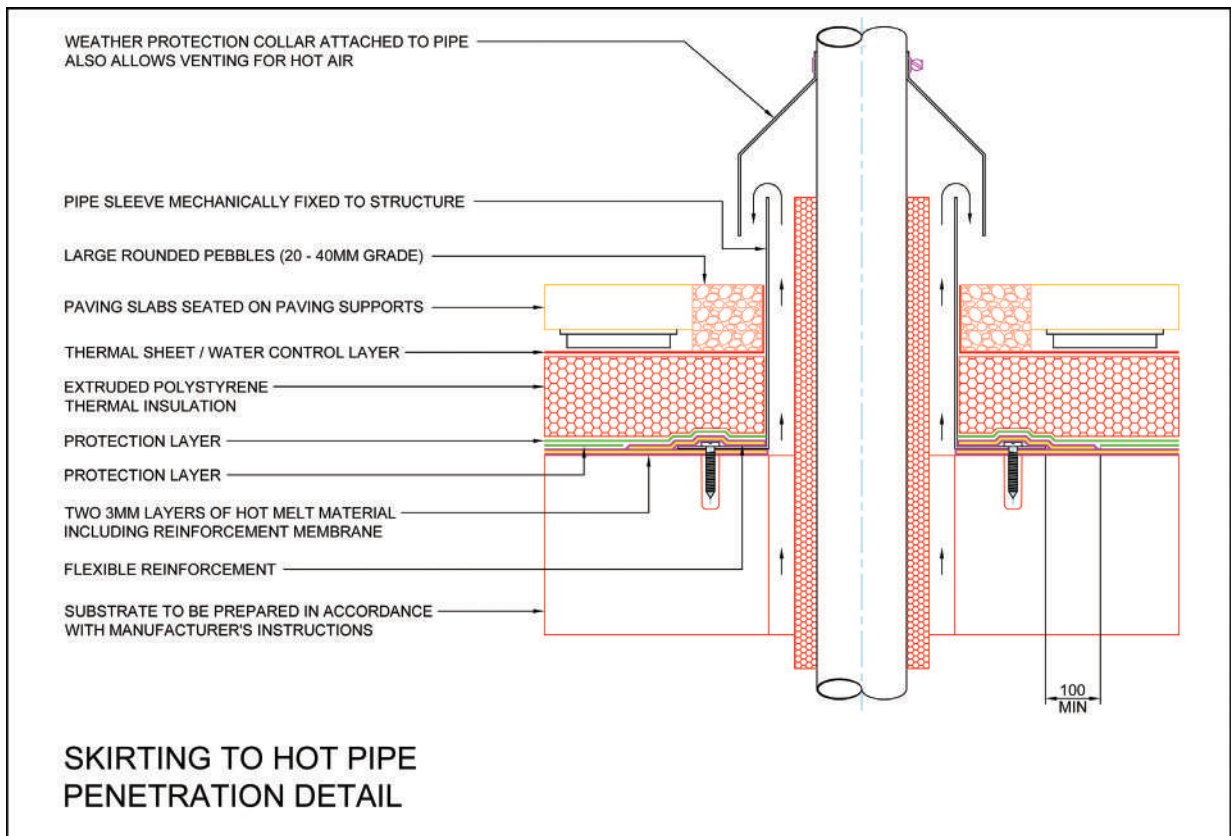


Fig 10

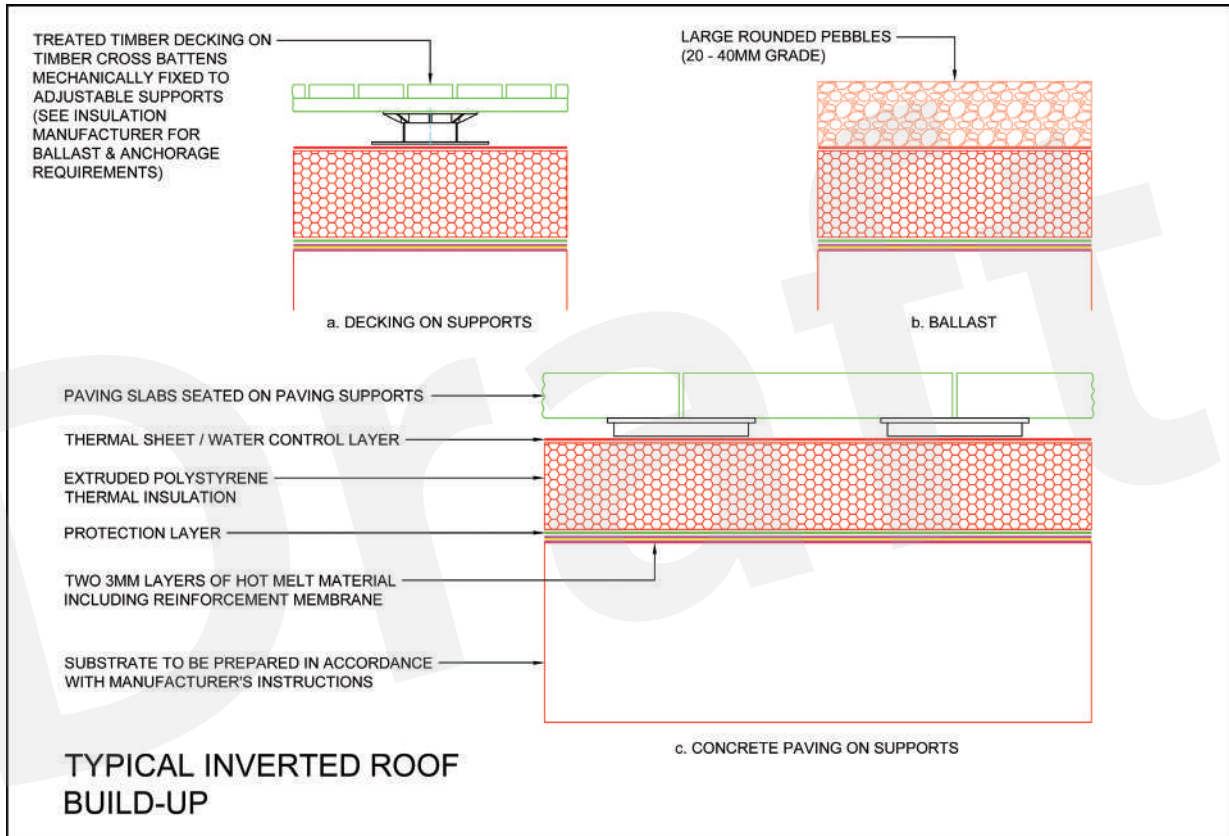


Fig 11

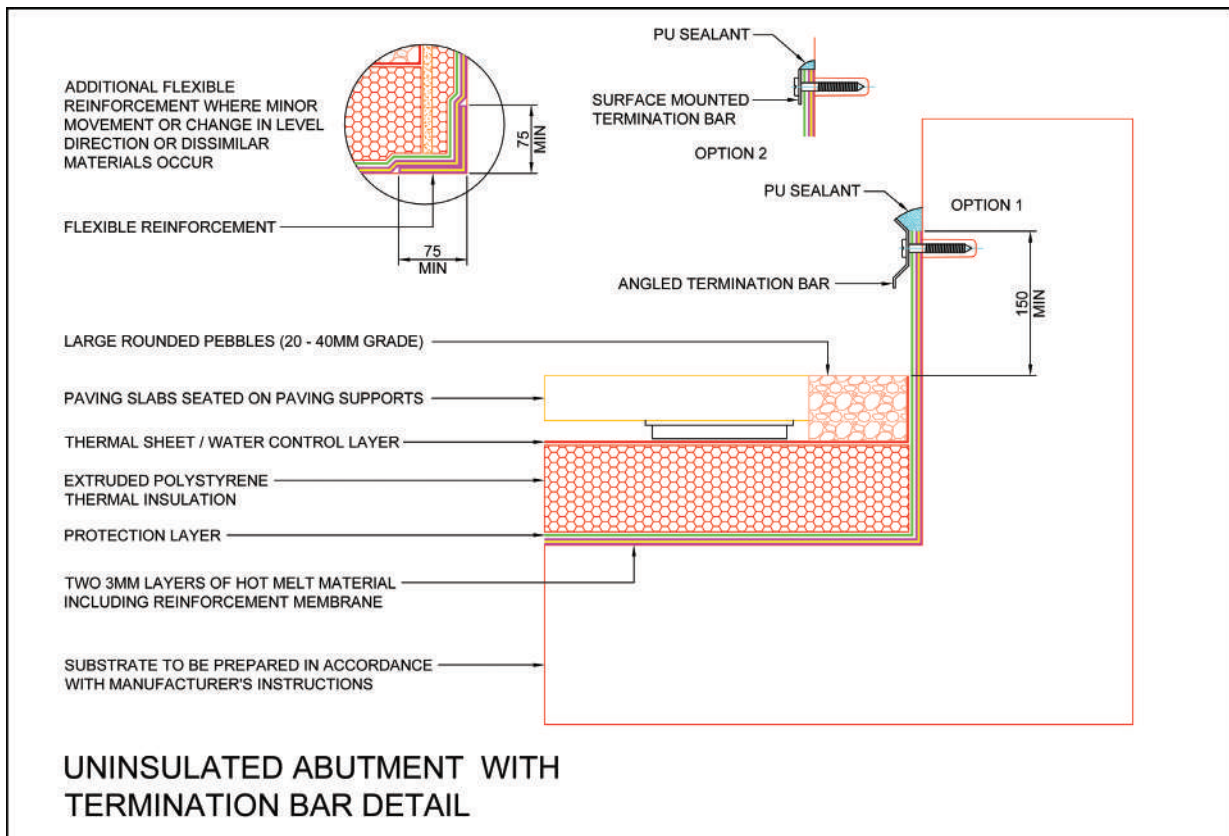


Fig 12

8. QUALITY CONTROL ON SITE

8.1 GENERAL

The selection of a suitable specification based on the particular set of circumstances which 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 scheduled quality control includes 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 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 process would therefore include the following items:

1. Review of the specification and drawings.
2. Provision of suitably trained labour and supervision.
3. Preparation of the substrata with appropriate primer.
4. Carrying out of detail work involving the Hot Melt Monolithic Waterproofing System, e.g. around outlets, upstands etc. and work in relation to flashings, gutters and minor building work.
5. Installation of neoprene reinforcement where required.
6. Installation of first 3mm thick (nominal) coat of Hot Melt Monolithic Waterproofing Membrane.
7. Installation of spunbonded polyester reinforcement within the system.
8. Installation of second 3mm thick (nominal) coat of Hot Melt Monolithic Waterproofing Membrane.
9. Coating thickness control measures for all "layers"
10. Evaluation of site applied check samples
11. Contractor/manufacturer site monitoring provisions during all stages of application, including any necessary installation testing deemed appropriate to the stages of the installation
12. Joint manufacturer/contractor site inspection for guarantee purposes

8.2 COMPLETION

Completion should be considered as the final stage of this organised work programme, and as such not identified as 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. These would cover checks of the following items:

1. Adherence to the manufacturer's or specifier's specification
2. Logging of all material batch data obtained from packaging e.g. numbers, dates etc.
3. Execution of detail work, e.g. flashings, walkways, gutters, minor building work.
4. 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.
5. Hot Melt Monolithic Waterproofing Membrane thickness should be checked regularly using a tyre tread 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.
6. Reinforcement - usage and overlap best checked at appropriate stage.
7. Hot Melt Monolithic Waterproofing Membrane conditions during installation.
8. If guarantees are involved then these will probably require inspection by the manufacturer and the contractor as well as the client or their agent.
9. 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).
10. All rainwater goods and roof situated equipment, e.g. lightning conductors, power lines etc, should be left in appropriate working order. Such items should be checked by a competent person.
11. Manufacturer's/Contractor's guarantees should be sought for the Hot Melt Monolithic Waterproofing System.
12. The Operation and Maintenance Manual will require updating/completing prior to passing to the client for his retention.

9. MAINTENANCE

Guarantees for Hot Melt Monolithic Waterproofing Systems may last for many years, and it is therefore necessary to establish the appropriate maintenance schedule which should be adopted to ensure trouble free performance during its service life.

9.1 GENERAL MAINTENANCE

In normal use Hot Melt Monolithic Waterproofing Systems require no routine maintenance other than periodic inspections to check for damage by accidental impact or by building modifications involving the roof structure.

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 minimize the chances of accidental damage by subsequent foot traffic. In order to prevent damage by excessive localised loading, particularly on roofs incorporating soft insulation, planks or other simple load spreading devices should be placed under ladders or the supports of free standing structures on the roof.

Balconies and walkways will have a greater degree of foot traffic and the degree of wear and required maintenance will differ depending on the usage.

Guarantees/Warranties for roofs, balconies and walkways may also last for many years, and it is therefore necessary to establish the appropriate maintenance schedule and guidelines which should be adopted to ensure trouble free performance during its service life. This may be stipulated in the terms of the guarantee.

Consideration should be given to the need for an annual maintenance inspection to highlight any defects or damage, which can then be isolated for attention.

9.2 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, subject to high dust or other pollutants or other high risk locations 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 capings; 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 roofs are generally limited to inspecting exposed details and surfacing as the main area of the weatherproofing is protected by the insulation and ballast.

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

9.3 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 Monolithic Waterproofing Membrane to the affected areas. Application should be executed in accordance with the manufacturer's specification.

10. TRAINING

10.1 General:

The introduction of many new products into the liquid coatings 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 the materials being applied to the roof are to be allowed to 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 upon a roof, training is a pre-requirement, 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 upon 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:

- National Vocational Qualifications (NVQ's) for Hot Melt Monolithic Waterproofing Systems
- Specialist Apprenticeship Programme
- Experienced Worker Practical Assessment
- The Institute of Roofing
- Supplier training schemes for approved contractors
- Recommendations/specifications ex suppliers as part of training

11. READING REFERENCES

LRWA

Guidance Note No. 1 - Roof, Balcony and walkway Inspection for the Specification of HOT MELT MONOLITHIC WATERPROOFING SYSTEM '
Guidance Note No. 2 - Substrates for Hot Melt Monolithic Waterproofing System for Roofs, Balconies and Walkways
Guidance Note No. 3 - Generic types of Hot Melt Monolithic Waterproofing System for Roofs, Balconies and Walkways
Guidance Note No. 4 - Roof, Balcony and Walkway refurbishment using Hot Melt Monolithic Waterproofing System
Guidance Note No. 5 - Health & Safety Provision for Hot Melt Monolithic Waterproofing System on Roofs, Balconies and Walkways
Guidance Note No 6 - Safe use of Hot Melt Monolithic Waterproofing System
Guidance Note No.7 Specifier Guidance for Flat Roof Falls

European Technical Approvals

ETAG 005 Guideline For European Technical Approval of Hot Melt Monolithic Roof Waterproofing Kits

- Part 1 General
- Complementary Parts 2-8
- Test Methods - known as Technical Reports and numbered from TR-001 - TR-011

ETAG031 Guideline for the European Technical Approval of Inverted Roof Insulation Kits

Building Research Establishment

Digest 180: Condensation in roofs
Digest 312: Flat roof design - the technical options
Digest 324: Flat roof design - thermal insulation
Digest 370: Control of lichens, moulds and similar growths
Digest 372: Flat roof design - waterproof membranes
IP11/81: Maintenance of flat roofs
IP26/81: Solar reflective paints
IP19/82: Considerations in the design of timber flat roofs
IP13/87: Ventilating cold deck flat roofs
IP2/89: Thermal performance of lightweight inverted warm deck flat roofs
DAS 33: Flat roofs - built-up bitumen felt - remedying rain penetration
DAS 34: Flat roofs - built-up bitumen felt - remedying rain penetration at abutments and upstands

British Standards Institution

BS 476-3:2004: Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs
BS 3690-2:1989: Bitumens for building and civil engineering. Specification for bitumens for industrial purposes
BS 4841-3:2006: Rigid polyisocyanurate (PIR) and polyurethane (PUR) products for building end-use applications. Specification for laminated boards (roofboards) with auto-adhesively or separately bonded facings for use as roofboard thermal insulation under built up bituminous roofing membranes
BS 5250:2002: Code of practice for control of condensation in buildings
BS 6100-6:2008: Building and civil engineering. Vocabulary. Construction parts
BS 6229:2003: Flat roofs with continuously supported coverings. Code of practice
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 EN 1263-2:1998: Safety nets. Safety requirements for the erection of safety nets
BS EN 13164: Thermal insulation products for buildings - Factory made extruded polystyrene foam (XPS) products - Specification
BS EN 13163: Thermal insulation products for buildings - Factory made expanded polystyrene foam (EPS) products -Specification
Eurocode 1 , Part 1-4, BS EN 1991-1-4: General actions – Wind actions

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
- Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 CHIP
- COSHH Regulations 1988

BS EN ISO 6946:2007: Business Components and building elements - Thermal resistance and thermal transmittance = Calculation method (ISO 6946:2007)

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

APPENDIX i**Roof Survey Assessment Form**

Project Name:		Survey Date:
Address:		Surveyed by:
		Tel:
		Email:
		Access via:
		Risk Assessment Needed/Completed? Yes/No
Post Code:		Weather:
Roof Name:		Area (m ²):
Tank / Lift Motor Rooms?		Area (m ²):
Height of Building (m):	Parapet Height (m):	Age of Roof:
	Main Area:	Tank / Lift motor Rooms / other (delete or list if other):
Roof Type:		
Warm/Inverted/Cold		
Waterproofing Type		
Core Sample(s): Yes/No		
Roof Build Up		
Notes / Comments:		

Indicate details on Roof Plan/Drawing Sheet

Item	Y/N	Description	Comments
Upstands			
Parapets			
Perimeters			
Drainage / falls			
Penetrations			
Rooflights			
Window sills / Door Thresholds			
Handrails / Balustrades			
Walkways			
Plant			

Items requiring special attention	Additional works

Indicate details on Roof Plan/Drawing Sheet

