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J20

Mastic asphalt tanking/damp proofing

This guide provides an introduction to writing specifications for mastic asphalt tanking/damp proofing and should be read in conjunction with the guide Introduction to Writing Architectural Specifications. Together these guides provide an in depth reference for the development of specifications based on a simple framework that can be applied to projects of all sizes.

Contents

This guidance note covers the prescriptive specification of mastic asphalt tanking/damp proofing. Reference should be made to the following sections for the specification of repair works to existing works and the provision of mastic asphalt waterproof finishes to roofs.

- C45 Damp proof course renewal/insertion.
- J21 Mastic asphalt roofing/insulation/finishes.
- J22 Proprietary roof decking with asphalt finish.

Design Considerations

Mastic asphalt tanking/damp proofing construction comprises a number of elements working in conjunction with each other:

- Structure: providing resistance against water pressure and other loads.
- Waterproofing layer: mastic asphalt, may also incorporate a separating layer.
- Protective Layers: protecting mastic asphalt from damage, typically comprising screed over horizontal tanking and brick/blockwork adjacent to vertical tanking.

The design, configuration and specification of the overall construction will vary depending on whether tanking is applied externally or internally to the primary structure. The most appropriate solution will be determined by the specific requirements of the project.

Structural and protective elements of the construction will be specified separately within the Contract Specification/ Documentation. The specification of mastic asphalt itself is limited to the selection and specification of the correct material composition and its installation.

The specification of mastic asphalt should be undertaken in consultation with suppliers and reference to relevant British Standards, Statutory Regulations and current best practice.

Mastic Asphalt

Composition of Mastic Asphalt

Mastic asphalt comprises asphaltic cement and a suitably graded mineral, normally limestone. Asphalt cement can be formed using a combination of bitumen, lake asphalt and asphaltite materials. The principal characteristics of mastic asphalt are permeability and ductility.

Performance in relation to these characteristics is determined by the type of asphaltic cement and mix of aggregates used in the formulation of the mastic asphalt. The appropriate composition therefore depends upon the functional requirements of the finished mastic asphalt, i.e. the level of waterproofing required and whether the mastic asphalt is subject to loading or abrasion.

Mass

The mass of mastic asphalt will varying depending upon the type of asphalt cement and the grades and proportions of aggregate used. As a guide BS 6925 provides a notional mass of 2.4kg/m2 per 10mm thick. It is however recommended that the exact mass is confirmed within the mastic asphalt manufacturer.

While the mass of mastic asphalt will need to be taken into consideration when designing the building structure it is unlikely to be a determining factor in the selection of the most appropriate type of mastic asphalt.

Durability

Mastic asphalt where protected from wear (i.e. abrasion) is very durable and does not degrade. Properties include:

- Impervious to water and dampness.
- Non combustible, due to its high content of inert material.
- Vermin and rot proof.
- Resistant to sulphates in soils.
- Resistant to dilute industrial liquors, chemicals and acids.
- Is capable of withstanding some degree of movement due to its thermoplastic properties.

In environments where there is the risk of exposure to concentrated acids and chemicals specialist mastic asphalt products are available. In these circumstances and where movement in the structure is anticipated consult with the mastic asphalt manufacturer to ascertain the correct asphalt product and, or, limitations of the selected product.

British Standards

There are two British Standards relating to the use of Mastic Asphalt for waterproofing in both building and engineering works:

- BS EN 12970: Mastic asphalt for waterproofing. Definitions, requirements and test methods.
- BS 6925: Specification for mastic asphalt for building and civil engineering (limestone aggregate). Note the standard does not cover polymer modified mastic asphalts.

BS EN 12970 does not provide guidance on the suitability of the different mastic asphalt mix types for common applications, unlike BS 6925. Because of this BS 6925 is still widely used and referenced by manufacturers when stating the performance of polymer modified mastic asphalt products.

<u>BS EN 12970: Mastic Asphalt Types</u>

BS EN 12970 identifies two classes of mastic asphalt:

- Fine Aggregate Mastic Asphalts: generally utilised for waterproofing where the asphalt surface is protected from abrasion and damage.
- Coarse Aggregate Mastic Asphalts: generally utilised for waterproofing where asphalt provides a wearing surface or some level of protection, i.e. is not protected.

The standard categorises each class of asphalt further into one of five types based upon their performance characteristics, with the higher numbered asphalt type providing the higher level of performance:

- Fine Aggregate Mastic Asphalts: types 1 to 5.
- Coarse Aggregate Mastic Asphalts: types i to v.

BS 6925 : Mastic Asphalt Types

Four types of mastic asphalt are defined within BS 6925 by their suitability for given end uses:

- R988: roofing.
- F1076: flooring.
- T1097: tanking and damp proof coursing.
- F1451 flooring (coloured).

Each type of mastic asphalt is further categorised based on the type of asphalt cement utilised:

- B: Bitumen only.
- T25: bitumen with 25% (+/- 5%) lake asphalt.
- T50: (R988 only) bitumen with 50% (+/- 5%) lake asphalt.

For each type BS 6925 sets out the proportions and grades of limestone aggregate and mix of asphalt cement together with required performance characteristics.

Hardness/Indentation Test

The performance of mastic asphalt can be impaired by overheating when it is re-melted ready for laying. To check the properties of the mastic asphalt have not been affected during the re-heating process mastic asphalt can be tested. The appropriate method of testing will depend on the standard to which the mastic asphalt has been specified:

- BS 6925 stipulates that the 'hardness number' to be achieved by T1097 mastic asphalt, when tested in accordance with BS 5284, should be no less than 40 at 25 degrees C.
- BS EN 12970 states that that asphalt can be tested using one of two methods, plate or cube tests,. The type of test used and the required level of performance depend upon the type of asphalt specified.

Substrates & Adhesion

During the application of mastic asphalt moisture and air present in , or on the surface of, the substrate is rapidly heated by the hot asphalt to a high temperature. The expanded gases that are produced as a result of this process (water vapour and expanded air) can become trapped under the asphalt as it is laid. As these gasses try to escape through the mastic asphalt they cause bubbles or 'blows' to form in the asphalt layer.

Where the surface of the substrate has a coarse finish gases are generally able to escape better across the surface of the substrate as the asphalt is laid. As a result asphalt should not be laid onto smooth surfaces. Likewise substrates need to be dry to minimise the amount of water vapour created.

Additional measures may also be taken to help minimise 'blows', these are:

- The provision of a separating membrane to horizontal surfaces that allows the air and water vapour to escape laterally beneath the asphalt as it is applied. Separating membranes must be non-compressible and not affected by moisture, e.g. glass fibre membrane.
- The application of a high bond primer to vertical surfaces to improve adhesion of the asphalt.

Where 'blows' occur these can be rectified by piercing them to let out the gases and then working over the affected area of asphalt to eliminate any voids formed.

The first layer of asphalt will typically provide a good dry and smooth surface for the second coat to adhere to. The majority of 'blows' are therefore likely to occur during the laying of the first layer of asphalt, however inter-blistering can also occur between coats where they are not fully adhered. This is usually caused by the presence of dirt or dust on the previous coat which prevents full adhesion between the two layers.

Because of this subsequent coats need to be applied as soon as possible after the preceding coat. This helps to minimise the risk of the preceding surface becoming contaminated with dirt and dust. The sequencing and temporary protection of the works as they proceed also needs to be considered in order to further mitigate potential issues of surface contamination.

Protection

Fine aggregate mastic asphalts utilised for waterproofing are not formulated to provide abrasive resistance abrasion and are prone to damage from wear as well as point loading. Where tanking is applied externally protection also needs to be provided to prevent damage during the backfilling activities and any subsequent excavation. As a result fine aggregate mastic asphalt must be protected from damage at the earliest opportunity.

Horizontal asphalt needs to be protected with a cement sand screed of minimum 50mm thickness. The screed needs should be laid at the earliest opportunity to protect the mastic asphalt from damage during the asphalting of vertical surface and other activities.

Vertical asphalt should protected by a brickwork or blockwork wall. The wall must be built against the vertical asphalt leaving a gap of 40mm which must be filled in with compacted mortar as work progresses.

Joints

As well as providing a means for helping to control 'blowing', the laying of mastic asphalt in coats allows each coat to be staggered along joints. This staggering allows the proceeding coat to act as a strapping for the following coat and helps stop the joint from opening up when subject to movement.

Layers should be staggered by differing distances depending upon whether the mastic asphalt is laid vertically, horizontally or sloping. Joints must be clean before the application of subsequent layers to ensure full adhesion is achieved and no weak points in the joint arise.

Specification Guidance

Form of Specification

Except where the wider works are specified on a performance basis, the specification of mastic asphalt tanking and damp proofing will generally be prescriptive in nature. This is due to the limited scope of materials to be specified and the comprehensive nature of associated British Standards.

This guide covers the prescriptive specification of mastic asphalt tanking and damp proofing.

Scope

The Scope provides a brief description of the works specified within the particular section and details any contractual matters that are relevant to them. Care should be taken to avoid repeating particulars already included within the Contract Preliminaries.

Scope of Specification

To help the reader quickly understand which elements of the works are covered in this Works Section it is useful to provide a brief description of items specified, e.g. *mastic asphalt tanking to basement floor and walls.*

Form of Specification

State whether the specification is performance based or prescriptive together with any contractual requirements or information that relate to the Works Section. Do not include any requirements or information already set out within the Contract Preliminaries.

Where the specification is prescriptive in nature requirements placed on the Contractor may include:

- The selection, supply and incorporation into the works of all listed accessories and sundry items in conjunction with Manufacturer's recommendations.
- The selection, supply and use of all minor items required for the installation of specified materials.

It is normal for the terms of a contract or the Contract Preliminaries to state that the Contractor may offer equivalent and, or, substitute products. Where this is not applicable to all Works Sections an appropriate statement must be provided.

Competence

For mastic asphalt installations it is important to ensure the Contractor's operatives have sufficient experience in the installation of similar works, and these works were undertaken to a high standard. Add an appropriate statement requiring a certain level of experience, qualification or training, i.e *operatives are to provide at least 6 reference of previous work of a similar nature undertaken by them within the last year*.

Execution of the Works

Any general requirements or information relating to the application of mastic asphalt tanking and damp proofing which are not contained within the Contract Preliminaries should be listed.

These may comprise a list of all instructions, guidance and standards concerning handling, storage, installation and maintenance of materials that the Contractor is to comply with while executing the works must be given. This may include:

- Installation instructions and recommendations provided by the manufacturer(s), where these are available, and, or, the Mastic Asphalt Council (MAC).
- British Standards and Codes of Practice, *e.g. CP 102:1973 Code of practice for protection of buildings against water from the ground.*
- Workmanship clauses provided within the Specification.

Note that guidance provided by the Mastic Asphalt Council (MAC) and CP 102 differ. Confirmation must be sought from the mastic asphalt manufacturer as to which guidance should be adhered to. Where both sets of guidance, or elements of each, are relevant it may be advisable to set out all requirements within an appropriate set of Workmanship clauses.

Alternatively a statement should be included that sets out which documents take precedence or confirms whether compliance with the most or least onerous condition is required.

Product

Within prescriptive specifications the Contractor needs sufficient information to:

- Gain a clear and full understanding of the required works.
- Price the works.
- Order all materials, products and systems required in the execution of the works.

The level and type of product information provided will vary depending on the scope of the project, the type of contract and the nature of the works.

The different mastic asphalt tanking and damp proofing that might be specified within this Works Section can be grouped by type of construction and substrate, *e.g. mastic asphalt tanking (vertical).*

Mastic Asphalt

Mastic asphalt can be specified by stipulating the type of mastic asphalt using the classifications provided within BS 6925 and BS EN 12970.

- Asphalt: *e.g. T1097/B to BS 6925.*

Alternatively asphalt can be specified by providing product reference and manufacturer's details:

- Manufacturer: Name of manufacturer, website and telephone number.
- Reference: Product/system reference name and, or, code.

In both instances the following details should also be stated:

- Coats: confirm required number of coats separately for horizontal and vertical/sloping surfaces.
- Minimum Total Thickness: confirm required minimum thickness of mastic asphalt separately for horizontal and vertical/sloping surfaces.

Accessories/Related Components

Sundry items (e.g. bonding primers and separating membranes) may be specified in two ways:

- *Primer: reference J20.4100.*
- *Primer: manufacturer's product reference.*

The last option is suitable where only a reference is required and, or, the final selection of the product can be undertaken by the asphalt manufacturer.

Additional Information

Additional descriptive or performance related information can be provided where it is felt that this will aid the Contractor in understanding the scope of works, how they are to be achieved and the required level of workmanship. Examples may include:

- Location: It may be advantageous to indicate location where mastic asphalt tanking and water proofing is to be provided so that the Contractor can assess potential issues of access and sequence of working.
- Substrate: State the type of substrate mastic asphalt is to be applied to/cover. This assists the contractor in establishing the scope of preparatory works required prior to lay apply the asphalt.

Where additional information is provided it should be grouped together with the relevant item or clause.

Accessories

Where related components are specified in detail all necessary information needed to order the correct materials or products must be provided. Information to be provided includes:

- Manufacturer: Name of manufacturer, website and telephone number.
- Reference: Product/system reference name and, or, code.
- Fixing: Where separating membranes are specified the method fixing should be outlined.

Check with the manufacturer of the principal materials, products and system to ensure that the selected components are compatible with other systems.

Workmanship

Additional requirements relating to the installation of specified materials and products can be provided within Workmanship Clauses. Requirements typically relate to:

- Scope of works, e.g. extent of tanking.
- Additional design information, e.g. tanking around penetrations, etc
- Quality control, e.g. permissible tolerances and condition of substrates
- Method of working, e.g. sequencing of works.

Due to their conflicting recommendations, where the manufacturer's guidance refers to both the Mastic Asphalt Council and CP 102 guidelines it may be advisable to clearly restate requirements within a comprehensive set of clauses.

Notwithstanding this, additional requirements may be provided that expand upon, alter, confirm or emphasise requirements already outlined within the reference documents (i.e. where work needs to be undertaken to an historic building in a particular manner).

Preparation of Substrates

Poor adhesion of mastic asphalt to the substrate can occur because of:

- Contamination of the substrate surface.
- Insufficient key offered substrate surface.
- 'Bowing' at the time of laying.

The regularity of the substrate surface also impacts on the ability to lay asphalt to the correct thickness and provide necessary quality of finish.

Because of this the Contractor should ensure that the substrate is prepared appropriately. Where appropriate stipulate the requirements, examples include:

- Horizontal surfaces are laid to specified levels and tolerances.
- All substrates are free from holes, ridges, indentations and sharp arrises.
- All substrates are clean, dry and free from dust, oil, grease and any other contaminants.
- In situ concrete substrates have a wood float finish.

Where recommended instruct the Contractor to apply a bonding agent to substrates in accordance within the manufacturer's instructions.

Preparation of Vertical & Sloping Surfaces

Vertical and sloped surfaces need to provide a suitable key for asphalt tanking. The surface of substrates must be finished in an appropriate manner and, or, with a high bond primer recommended by the asphalt manufacturer .

Where asphalt terminates on vertical surfaces the top edge of the asphalt must be returned horizontally into a chase 25mm x 25mm in size. This helps prevent the asphalt from de-bonding along its top edge. Chases must be formed with the lower nib chamfered so that the full thickness of the asphalt can be maintained when turned in.

Set out the scope of preparatory works required, including the creation of chases within substrates, application of bonding primers and provision of a surfaces that afford the appropriate key.

Chases

To prevent the de-bonding of vertically applied asphalt along its top edge, the mastic asphalt must be returned horizontally. Depending on the construction utilised, asphalt can be returned and continued horizontally to form a capping or and terminated by lapping into a 25mm x 25mm horizontal chase formed in the substrate.

Care needs to be taken to ensure that where turned into a horizontal chase the mastic asphalt is pushed firmly in and the top edge splayed to shed moisture. To secure the asphalt lap within horizontal chases, the chase must be pointed in with mortar as soon as possible after asphalting is completed.

Where appropriate stipulate the method of securing the top edge of vertical asphalt together with any specific requirements.

Application

Guidance on the thickness of asphalt varies depending upon the sloped of the substrate. Due to differences in guidance provided by CP 102 and the Mastic Asphalt Council (MAC), for clarity its is recommended that the required thickness of mastic asphalt is set out within the specification. MAC guidance is the least onerous and requires:

- Surfaces with a pitch <10 degrees: 30 mm in 3 layers.
- Surfaces with a pitch >10 degrees: 20 mm in 3 layers.

State that the Contractor is to ensure asphalt is built up in layers so that:

- A sound and continuous waterproof membrane free from contamination, 'blowing' and breaches is achieved.
- The full thickness of the mastic asphalt is maintained across all surfaces, at corners and where angles are formed by intersecting planes.
- Top edges laid on surfaces with a pitch greater than 10 degree are terminated within horizontal chases or returned and continued horizontally to form a capping.
- Where localised 'blowing' occurs, asphalt is repaired as work progresses.
- Where excessive blowing occurs, or is likely to occur, to asphalt laid on horizontal surfaces, a separating membrane should be provided and laid.

Fillets

Fillets should be formed by the application of two coats of asphalt to provide a solid fillet with a minimum face of 40 mm and at an angle of 45 degrees.

Where compliance with CP 102 or MAC guidelines is not required within the Scope of Specification, stipulate the method of forming fillets to be used by the Contractor.

Bay Joints

In general bay joints should be kept to a minimum. Where bay joints occur form junctions in accordance with mastic asphalt manufacturer's/MAC recommendations and British Standards to ensure the continuity of the membrane.

Joints in successive coats of mastic asphalt are to be staggered by:

- Surfaces with a pitch <10 degrees: 150 mm.
- Surfaces with a pitch >10 degrees: 75 mm.

Separating Membranes

Where excessive 'blowing' of the first horizontal layer of asphalt occurs, it is recommended that the Contractor is required to provide and install a separating membrane before laying the first coats.

The Contractor should be instructed to supply and install the separating membrane in accordance with the manufacturer's recommendations ensuring that it is free from tears and punctures and that all joints are formed correctly.

Damp Proof Course

Where mastic asphalt tanking is to be lapped with DPC, the DPC material must be compatible with the mastic asphalt and joints formed in accordance with the manufacturer's instructions.

Instruct the Contractor to form joints between the mastic asphalt and DPCs in accordance with manufacturer's instructions so continuity of the waterproof membrane/tanking is maintained.

Penetrations

Where pipes or other such features pass through the tanking or water proof membrane these should be detailed within the Contract Drawings and associated workmanship requirements set out within the specification.

Otherwise, emphasis that penetrations within tanking are not permitted.

Protection of Vertical Asphalt Tanking

Instruct the Contractor to, as soon as possible after completion of horizontal asphalt surfaces, lay a protect cement sand screed over the asphalt ensuring that:

- The screed is compatible with mastic asphalt and that the mastic asphalt is not damaged during the laying process.
- The screed is a minimum of 50mm thick.

Protection of Horizontal Asphalt Tanking

Instruct the Contractor to, as soon as possible after completion of vertical asphalt surfaces, erect a protective brick or blockwork wall ensuring that:

- The wall is built leaving a 40 mm gap between brick/ block face and asphalt surface.
- The 40 mm gap is in-filled with mortar on course by course basis as wall is constructed.

Samples, Tests, Certificates, etc

The following guidance should be read in conjunction with the guidance provided for Samples, Tests, Certificates, etc within Specright's Introduction to Writing Architectural Specifications.

Hardness/Indentation Tests

The method of testing will depend upon depend on the standard to which the mastic asphalt has been specified

Where testing is required, state that the Contractor is to undertake this in strict accordance with the relevant standard and following requirements:

- British Standard: *e.g. BS EN 12697 or BS 5284.*
- Frequency of testing: *e.g. for each type mastic asphalt and, or, every batch.*
- Results to be achieved: *e.g 40 or greater at 25 degrees C.*

Standards & References

Design and Installation

BS 8102	Code of practice for protection of below ground structures against water from the ground
BS 8215	Code of practice for design and installation of damp-proof courses in masonry construction
CP 102	Code of practice for protection of buildings against water from the ground

Manufacturer and Performance

BS 6925	Specification for mastic asphalt for building and civil engineering (limestone aggregate)
BS EN 12970	Mastic asphalt for waterproofing. Definitions, requirements and test methods
BS 5284	Methods of sampling and testing mastic asphalt used in building and civil engineering
BS EN 12697-20	Bituminous mixtures. Test methods for hot mix asphalt. Indentation using cube or cylindrical specimens (CY)
BS EN 12697-21	Bituminous mixtures. Test methods for hot mix asphalt. Indentation using plate specimens

Useful References

Mastic Asphalt Council, Technical Guide, Tanking
(http://www.masticasphaltcouncil.co.uk/tech-guides/)

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