

General information Index

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Definition of mastic asphalt

Mastic asphalt is a type of asphalt composed of suitable graded mineral matter and asphaltic cement in such proportions as to form a cohesive, impermeable mass, solid or semi-solid under normal temperature conditions, but sufficiently fluid when brought to a suitable temperature to be spread by means of a hand float or by mechanical means without compaction.

Authority & quality marks

All manufacturing members of MAC produce mastic asphalt which carries the BSI kitemark and hold current licences for the use of the mark from the BSI. Each company operates under a BS EN ISO 9002 quality system accepted by BSI.

Mastic asphalt made by MAC manufacturing members is legibly marked with;

- a) the registered name or trade mark of the manufacturer
- b) the number of the British Standard
- c) the type number e.g. R988, F1076 & T1097
- d) the grade e.g. Grade IV in the case of flooring

NOTE: The above text is required by BSI-QAS.

Composition & manufacture

The materials used in manufacturing mastic asphalt are:

- a) asphaltic cement, which consists of bitumen asphaltite, lake asphalt, or blends of these with one another.
- b) polymers for the modification of the asphaltic cement.
- c) limestone fine aggregate which is crushed to a finely graded powder.
- d) coarse aggregate: either crushed stone, e.g. granite, limestone or naturally occurring siliceous material e.g. grit.
- e) pigments, binders, modifiers and special aggregates.

Characteristics of mastic asphalt

CONTROL OF WATER VAPOUR

The vapour resistivity of mastic asphalt can be assumed to be not less than 100 000 MN s/ (g m). For condensation control calculations a factor of 20 000 MN s/ (g m) may be taken (i.e. the ratio of the vapour resistivity of the material to that of still air) see also BS 6229:1982.

RESISTANCE TO WATER

Mastic asphalt is impervious to water.

RESISTANCE TO BIOLOGICAL ATTACK

Mastic asphalt is vermin-proof and rot-proof.

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FIRE

Because of its high mineral content, mastic asphalt is virtually incombustible. Indicative tests have been performed on samples of insulated mastic asphalt roof decks in accordance with the procedures specified in (draft) European Standard prEN 1187-1 and prEN 1187-2. No significant flame spread was observed and no flame penetration occurred in either test. **MASTIC ASPHALT FULFILS ALL THE EXTERNAL FIRE RESISTANCE REQUIRED FOR A ROOF COVERING AND ACHIEVED THE HIGHEST RATING (P60) WHEN TESTED AS DESCRIBED IN BS 476: PART 3:1975.**

THERMAL CONDUCTIVITY

Mastic asphalt has a thermal conductivity, (λ) value, of between 0.43 W/m K and 1.15 W/m K. A (λ) value of 0.50 W/m K may be assumed for design purposes.

THERMAL EXPANSION

Mastic asphalt is thermoplastic and is capable of accommodating normal movements encountered in well-designed building structures.

COEFFICIENT OF CUBIC EXPANSION

The coefficient of cubic expansion is $15 \times 10^{-5}/^{\circ}\text{C}$.

TOXICITY

Mastic asphalt is non-toxic and is generally suitable for use in contact with potable water.

ODOUR

Mastic asphalt is odourless after laying.

MASS

The mass of mastic asphalt varies due to a number of factors such as the differing proportions of constituents utilised in its manufacture and the nature and quality of coarse aggregate incorporated. For practical and load calculation purposes, however, their mass can be taken to be 2.4 kg/m² per mm of thickness.

asphalt thickness (mm)	mass (kg/m ²)
10	24
13	31
15	36
20	48
25	60
30	72
35	84
40	96
45	108
50	120

COMPRESSIVE STRENGTH

When mastic asphalt is fully confined it has the same compressive strength as the containing material. When not confined, the compressive strength is dependent upon a number of factors including the temperature to which it may be subjected. Advice on individual cases should be sought from a manufacturer or the Mastic Asphalt Council.

DURABILITY

'Asphalt roofing properly designed and laid should prove capable of lasting 50-60 years' BRE Digest 144 Asphalt and built-up felt roofings: Durability.

SLIP RESISTANCE

Slip resistance for mastic asphalt flooring can be measured: see relevant section.

RECYCLING

Mastic asphalt can be recycled.

Materials

MASTIC ASPHALT

The British Standard for mastic asphalt roofing, tanking and flooring is BS6925:1988 Specification for mastic asphalt for buildings and civil engineering (limestone aggregate).

The British Standard for mastic asphalt paving is BS1447:1998 Specification for mastic asphalt (limestone fine aggregate) for roads, footways and pavings in buildings.

Proprietary grades of polymer modified mastic asphalt are produced for roofing and paving applications. These high performance materials, which either have independent test certificates (i.e. BBA or other accredited body) or are performance tested to a MAC criteria are available to MAC approved contractors.

COARSE AGGREGATE

Coarse aggregate for paving grades should be crushed rock etc. conforming with 5.3.1 of BS 1447:1988.

Coarse aggregate for grade IV flooring should be clean igneous or calcareous rock or siliceous material conforming to the limits given in table 5 of BS 6925:1988.

PRE-COATED CHIPPINGS

Pre-coated chippings for paving grade mastic asphalt should conform with A.3.1/4 of BS 1447:1988.

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SEPARATING MEMBRANE

The separating membrane should be one of the following and should be laid directly under the mastic asphalt:

- a) Sheathing felt comprising a base of flax or jute, or other suitable fibres, impregnated with bitumen.
- b) Glass fibre tissue.

ISOLATING MEMBRANE

The isolating membrane to be laid over the mastic asphalt should be one of the following:

- a) Waterproof building paper or a single layer of roofing felt where cementitious materials are to be laid onto mastic asphalt.
- b) A non-woven polyester fleece, weight 130gm/m² to 140gm/m² where extruded polystyrene is to be laid onto mastic asphalt in the inverted roof construction.

FILTER MEMBRANE

A non woven polyester fleece laid over extruded polystyrene insulation in inverted roof specifications when required by the insulation manufacturer.

BITUMEN

Oxidised bitumen for bonding felt vapour control layers and insulation boards.

VAPOUR CONTROL LAYER

The vapour control layer should be a single coat of polymer modified mastic asphalt conforming to BS 6925:1988 Type R 988 or a roofing felt in accordance with BS 8217:1994.

RIGID THERMAL INSULATION BOARDS

Rigid thermal insulation boards used on warm deck roofs and inverted roofs should be supplied and laid by the roofing contractor and be selected from a list or information sheet supplied by MAC.

In a warm deck roof construction, it is essential that the choice of thermal insulation and its method of attachment is considered in relation to any vapour control layer.

Due to the nature of mastic asphalt it is not practicable to lay over insulation boards on slopes over 5° or vertical surfaces.

INSULATING SCREEDS

Several proprietary screeds are available and may be one of the following:

- a) Lightweight aggregate formed from expanded clay or sintered pulverised fuel ash, bonded with a cement binder
- b) Cellular aerated concrete

EXPANDED METAL LATHING

Bitumen coated plain expanded metal lathing in accordance with BS1369: Part 1:1987

HIGH-BOND PRIMER

A modified synthetic rubber latex emulsion, applied to provide a key for the mastic asphalt to vertical and sloping surfaces other than timber.

BITUMINOUS PRIMER

A primer applied to surfaces to provide good adhesion of felt vapour control layers and the like.

SAND FOR RUBBING

Rubbing sand should be clean sand from natural deposits, predominantly passing a 600µm sieve and retained on a 212µm sieve.

STONE CHIPPINGS (BEDDED)

Stone chippings for use as a protective topping should be washed, crushed rock, normally 10mm to 14mm nominal size aggregate, bedded in a proprietary gritting solution over the mastic asphalt membrane.

STONE AGGREGATE

Stone aggregate for use as a protective topping should be 20mm nominal size aggregate loose laid over mastic asphalt, but suitably secured around rainwater outlets, internal and external angles and roof perimeters.

BALLAST

Ballast for use on inverted roofs should be clean, rounded aggregate graded 20mm to 40mm and as free as practicable from fines, in accordance with the insulation manufacturer's recommendations.

CONCRETE PAVING SLABS FOR INSULATED INVERTED ROOF

Concrete paving slabs for use as walkways or as paving on terrace decks should conform to BS 7263 and be laid in accordance with manufacturer's instructions.

CONCRETE PAVING SLABS FOR COLD ROOFS (UNINSULATED ASPHALT)

Concrete paving slabs should be bedded in a cement/sand mortar bed on a loose laid isolating membrane, leaving a suitable margin at perimeters to accommodate movement.

POROUS CONCRETE TILES

Porous concrete tiles should be fully bonded in hot bitumen in accordance with the manufacturer's instructions.

OTHER WALKWAY TILES

Tiles for walkways or terrace deck paving should be bedded in a bonding compound compatible with mastic asphalt and fixed in accordance with tile manufacturer's recommendations.

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SOLAR REFLECTIVE PAINT

Solar reflective paint should be free from materials deleterious to mastic asphalt i.e. metallic pigments, non-compatible solvents or water-based emulsions.

CHEMICAL AND OIL-RESISTING PROTECTIVE PAINT

A purpose-made coloured and protective coating based on a synthetic resin in solution with industrial ethanol which does not attack/abuse mastic asphalt surfaces.

Successful contracting

GENERAL

Consultations and exchange of information between all parties concerned with the building operations should be arranged at an early date, so that each may have full knowledge of the particulars of the work and be able to co-operate in producing the conditions required by the end user to complete a satisfactory job.

EXCHANGE OF INFORMATION

The designer should provide in good time all relevant information to those responsible for laying the mastic asphalt and to others whose work may be affected, including whichever of the following is applicable:

- a) Description, situation and address of site and means of access
- b) Those conditions of contract which may practically affect this particular work
- c) Location levels and dimensions of the areas to be asphalted
- d) The construction including the deck and any preparations
- e) Falls and drainage arrangements
- f) Any penetrations, fixtures or attachments
- g) Provision for safe access
- h) Nature of traffic and surface finish required
- i) Any vapour control layer
- j) Provision for temporary storage of materials and location of plant including limitations for loading the structure
- k) Any special application, e.g. reservoir roof or roof top garden
- l) Date for the completion of preliminary work
- m) Dates for the start and completion of various sections of the contract
- n) Any conformance testing required
- o) Requirements relating to samples of mastic asphalt for testing purposes
- p) Requirements for supervision and inspection
- q) Details of any guarantee required, e.g. company or insurance-backed guarantee.
- r) Allowance should be made for the curing and drying of the base concrete or screed before the mastic asphalt is laid, where appropriate.

PROVISION OF UTILITIES, FACILITIES AND MATERIALS

To prevent misunderstanding, particularly at the tendering stage and to avoid possible situations detrimental to installation, it should be made clear whether or not the following will be provided and by whom:

- a) Adequate clean, dry lockable storage space protected from frost (if necessary)
- b) Secure storage compound for gas bottles having a fence not less than 2 metres high
- c) Adequate ventilation in confined areas
- d) Adequate artificial lighting, if required
- e) Provision of a suitable level site for the mixers, blocks and where relevant, coarse aggregate, as close as possible to the work
- f) Unloading and hoisting facilities, if required
- g) Provision of scaffolding, hoists, ladders and safety equipment, temporary lighting, power, water and temporary protection
- h) Adequate protection of the mastic asphalt against damage prior to and during laying and during the course of subsequent building operation
- i) Facilities for the removal of rubbish and surplus material.

GENERAL DESIGN CONSIDERATIONS

DESIGN OF THE BASE

Surfaces to which mastic asphalt is to be installed should be prepared to a true and even surface free from irregularities such as abrupt changes in levels, hollows, ridges, dips, concrete, mortar or plaster droppings. The building design should therefore enable the mastic asphalt to be applied to a reasonably uniform thickness.

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

Any substrate to receive mastic asphalt should be reasonably dry, even, free from dust, laitance, grease, dirt, projecting nail heads, sharp arrises or holes.

The designer should study the need for movement joints in the structure. Movement joints should be continued at upstands, walls and edges of buildings.

TOLERANCES

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

DAMP-PROOF COURSES

It is not the responsibility of the Mastic Asphalt Council to design the position of, or the material for, damp-proof courses. However, it is envisaged that one will be incorporated into elements of a building, as may be required by Building Regulations.

It is essential that a waterproofing membrane does not override a damp-proof course in vertical applications.

Ideally, damp-proof courses should be positioned one brick course above the chase into which mastic asphalt is applied, with the exposed course of brickwork normally being protected with a cover flashing extending 75mm down the face of the mastic asphalt skirting.

Where site restraints dictate that it is necessary to install a chase at the same level as the damp-proof course, there is a risk of damage occurring to the continuity of the damp-proof course, and special care is required during installation and cutting the chase.

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PROTECTION

COMPLETION OF LAYING

The mastic asphalt finish should not be subjected to traffic until the material has cooled to the temperature of the surrounding atmosphere.

PRIOR TO HANDOVER

Prior to handover, it is essential that the mastic asphalt application is fully protected from:

- a) Mechanical and impact damage, including damage from contractor's plant, equipment and materials
- b) Careless handling of scaffolding or other builders' accessories
- c) Trafficking by following trades
- d) Contamination by spillage or solvents, diesel fuel and paints
- e) Concrete, mortar, cement grout or plaster mixed directly on the mastic asphalt finish

Inspection, sampling and testing

INSPECTION

The work should be inspected before asphalting is commenced, while in progress, and after completion, special attention being paid to the following:

- a) General condition of the base
- b) Correct laying of separating membrane
- c) Cleanliness of plant for remelting
- d) Correct temperature of material prior to laying
- e) Use of correct kind of dust to assist removal of material from the buckets, wheelbarrows etc.
- f) Making good all blows
- g) Correct thickness
- h) Correct treatment of junctions and skirtings
- i) Removal of mastic asphalt tailings
- j) Correctness of finished level and specified finish

SAMPLES

Sampling of mastic asphalt where required should be carried out in accordance with BS 5284:1993.

TESTING

Testing of mastic asphalt should be carried out in accordance with BS 5284:1993.

The requirements of samples for testing should be agreed between the parties concerned during the exchange of information.

References

BSI PUBLICATIONS

BRITISH STANDARDS INSTITUTION, London.

- BS 476: Fire test on building materials and structures
- BS 476 : Part 3 : 1975 External fire exposure test
- BS 747 : 1994 Specification for roofing felts
- BS 1105 : 1981 (1994) Specification for wood wool cement slabs up to 125mm thick
- BS 1447 : 1988 Specification for mastic asphalt (limestone fine aggregate) for roads, footways and pavings in building
- BS 1521 : 1972 (1994) Specification for waterproof building papers
- BS 3837 Expanded polystyrene boards
- BS 3837 : Part 1 : 1986 (1996) Specification for boards manufactured from expandable beads
- BS 3837 : Part 2 : 1990 (1996) Specification for extruded boards
- BS 4841: Rigid polyurethane (PUR) and polyisocyanurate (PIR) foam for building applications
- BS 4841 : Part 3 : 1994 Specification for two types of laminated board (roofboards) with auto-adhesively bonded reinforcing facings for use as roofboard thermal insulation for built-up roofs
- BS 5250 : 1989 (1995) Code of practice for control of condensation in building
- BS 5268 Structural use of timber
- BS 5268 : Part 2 : 1996 Code of practice for permissible stress design, materials and workmanship
- BS 5268 : Part 5 : 1989 (1997) Code of practice for the preservative treatment of structural timber
- BS 5268 : Part 7 : Section 7.2 : 1989 Joists for flat roofs
- BS 5284 : 1993 Methods of sampling and testing mastic asphalt used in building and civil engineering
- BS 6100 Glossary of building and civil engineering terms
- BS 6100 : Part 1: Section 1.3: Subsection 1.3.3: 1987 (1997) Floors and ceilings
- BS 6100 : Part 1: Section 1.3: Subsection 1.3.2: 1989 (1997) Roofs and roofing
- BS 6229 : 1982 Code of practice for flat roofs with continuously supported coverings
- BS 6367: 1983 Code of practice for drainage of roofs and paved areas
- BS 6399 Loading of buildings
- BS 6399 : Part 3 : 1988 Code of practice for imposed roof loads
- BS 6566 Plywood
- BS 6566 : Part 1 : 1985 (1991) Specification for construction of panels and characteristics of plies including marking
- BS 6566 : Part 2 : 1985 (1991) Glossary of terms
- BS 6566 : Part 3 : 1985 (1991) Specification for acceptance levels for post-manufacture batch testing including sampling
- BS 6566 : Part 4 : 1985 (1991) Specification for tolerances on the dimensions of plywood panels
- BS 6566 : Part 5 : 1985 (1991) Specification for moisture content
- BS 6566 : Part 6 : 1985 (1991) Specification for limits of defects for the classification of plywood by appearance
- BS 6566 : Part 7 : 1985 (1991) Specification for classification of resistance to fungal decay and woodborer attack
- BS 6566 : Part 8 : 1985 (1991) Specification for bond performance of veneer plywood
- BS 6925 : 1988 Specification for mastic asphalt for building and civil engineering (limestone aggregate)
- BS 7263: Precast concrete flags, kerbs, channels, edging and quadrants
- BS 7263 : Part 1 : 1994 Specification
- BS 8102 : 1990 Code of practice for protection of structures against water from the ground
- BS 8204: Screeds, bases and in situ floorings
- BS 8204 : Part 1 : 1987 Code of practice for concrete bases and screeds to receive in situ floorings
- BS 8204 : Part 2 : 1987 Code of practice for concrete wearing surfaces
- BS 8204 : Part 5 : 1994 Code of practice for mastic asphalt underlays and wearing courses
- BS 8215 : 1991 Code of practice for design and installation of damp-proof courses in masonry construction
- BS 8217 : 1994 Code of practice for built-up felt roofing
- BS 8218 : 1998 Code of practice for mastic asphalt roofing
- CP 3 Code of basic data for the design of buildings
- CP 3 : Chapter V : Part 2 : 1972 Wind loads

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