

DERBYSHIRE COUNTY COUNCIL

ENVIRONMENTAL SERVICES DEPARTMENT

MATERIAL AND CONSTRUCTION SPECIFICATION

FOR

PRIVATE STREET WORKS

AND

HOUSING DEVELOPMENT ROADS

Amended 1997

Developer: Site Address: Date:
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1.1 INTRODUCTION

This document is produced by Derbyshire County Council, as the Highway Authority for Derbyshire (excluding Derby City). The document sets out the Material and Construction Specification which are required to be used in the creation of Private Street Works and Housing Development roads. The document also provides guidance for developers, and is appended to the formal Approvals issued by the County Council prior to works commencing on new housing estates roads.

The County Council will periodically update the document to reflect changes in standards and specifications which are developed.

Any queries relating to this document should be addressed to the Network Development Section of the Environmental Services Department at County Hall, Matlock, Derbyshire. (Telephone No. 01629 580000 - ask for the Area Development Manager dealing with the Borough/District in which the development site falls).

1.2 POLICY

- (i) This Specification is to be followed in the construction of new streets or the making-up of private streets where it is intended that the street shall be adopted by the Council as a Highway repairable at the Public Expense.
- (ii) Where this Specification is issued for the guidance of Developers, the Strategic Director - Environmental Services may, at his discretion require variations on account of special circumstances.

Note The attention of Developers is drawn to section 5 outlining the necessity prior to construction commencing of pre-determining the thickness of carriageway construction by carrying out moisture content, plasticity index and soil bearing tests, at the expense of the developer, and to items 3.1 and 3.2 regarding the testing of materials, and to the appropriate annexes to this Specification.

1.3 Guidelines for Developers on the Ground Investigations Required Prior to New Road Construction

(i) General Requirements

It is the responsibility of each developer to carry out a full survey of the ground conditions along the length of all roads which are to become publicly maintained highways. The developer has the right to select a Testing Laboratory or firm of Geotechnical/Consulting Engineers of their own choice to undertake this work subject to Derbyshire County Council being satisfied that they are competent. All soil tests shall be carried out in accordance with relevant section in British Standard BS1377 and UKAS Accreditation must be held for each Laboratory test.

Developers are advised that the only acceptable soil strength tests are CBR in accordance with BS1377 and Plate Bearing Tests in accordance with The Department of Transport's Design Manual for Roads and Bridges HD 25/94. For the Plate Bearing Test, Kentledge sufficient to provide a force of 50kN must be provided, a plate of minimum diameter of 450mm must be used.

(ii) Requirements for the Site Survey

The purpose of the survey is to ascertain the ground conditions to enable the new road construction thicknesses to be designed, particularly the lower granular sub-base or capping layers. Any unusual features or ground conditions which could affect the long term performance of the road have also to be investigated. Without being too prescriptive, the survey should as a minimum include for trial to be excavated at intervals of approximately 100mm (minimum 2 trial holes if less than 100mm) or whenever the road conditions change. The depth of excavation should be at least to the proposed road formation level. The nature and condition of the soil at each trial hole should be logged in accordance with BS 5930.

At each trial pit location either: -

- a) An in-situ CBR test (BS 1377: Part 9: Subsection 4:3) may be carried out, provided material having a maximum particle size exceeding 20mm is not present in the test area.

or

- b) A bulk representative sample of material is taken for a laboratory CBR test.

or

- c) A Plate Bearing Test as per clause 1.3 (i)

In either case a bulk sample for moisture content determination and soil classification test of the ground at formation level shall also be taken. On 'brownfield' sites, the sample taken should be big enough to enable contamination tests to be carried out in addition.

Where the proposed road is intended to be constructed on filled ground or embankment, these requirements are likely to be inappropriate and further guidance should be sought from the Environmental Services Department.

Where the exposed formation in the trial holes is substantially intact rock .e.g. limestone, sandstone, siltstone, mudstone in slabs or layered then no test is really appropriate and a CBR value exceeding 155 can be assumed. In these cases at the subsequent construction stages, the complete exposed formation will be required to be inspected and approved by Derbyshire County Council before any further work takes place. The Authority reserves the right to require all 'soft' material found in the exposed formation to be removed and replaced with granular sub-base type material.

(iii) Laboratory Tests

The following tests are recommended as a minimum requirement: -

- a) Moisture content (formation at each trial pit) – BS 1377: Part 2 Section 3
 - b) Liquid Limit (LL) - BS 1377: Part 2 Section 4
 - c) Plastic Limit (PL) and Plasticity Index (PI) - BS 1377: Part 2 Section 5
- LL and PL tests are required for each type of soil found on the site.
- d) Laboratory CBR (in no in-situ CBR test) - BS 1377: Part 4 Section 7

See Annex J for further guidance on Lab CBR Testing.

- e) (For 'brownfield' sites) – contaminated land tests – CLEA*

* Contaminated Land Exposure Assessment.

(iv) Reporting of Results

The Report should contain a log of the ground conditions at each trial pit, the test results of any in-situ or Laboratory tests undertaken together with a plan indicating the position of the trial pits. Any recommendations for dealing with the ground conditions encountered can also be included.

2 GENERAL

2.1 Adherence to Drawings

The whole of the work is to be carried out in accordance with detailed plans and sections previously submitted to and approved in writing by the Strategic Director - Environmental Services. No site works should commence prior to such approval being given and any unapproved works are deemed to be at the Developers risk and may be subject to removal and reinstatement to the Strategic Director - Environmental Services requirements.

Any deviation from the approved plans and sections must be agreed by the Strategic Director - Environmental Services in advance of the proposed alterations being carried out.

2.2 Site Inspection

Due notice of the commencement of the work must be given in order that the materials to be used and the execution of the work may at any time thereafter be inspected by or on behalf of the Strategic Director - Environmental Services. If the work is not carried on continuously until completion, notice must be given each time work is stopped or recommenced. Any work executed for which proper notification has not been given to the Strategic Director - Environmental Services or his representative is liable to be rejected.

2.3 Dimensions

The specified thickness of material and layers of material mean the finished thickness after compacting or setting.

2.4 Statutory Undertakers Apparatus and Services

The contractor/developer must temporarily support any gas, water, telecommunications, electricity, sewer or other private service, mains or sewers encountered. Any diversion of existing mains or laying of new mains will be carried out by the undertakers concerned, but the contractor/developer is to grant all facilities and assistance to such undertakers as may be required and relieve the County Council of responsibility for any delay that may occur due to non-completion of such diversion, or for any damage occasioned to such mains by or in consequence of the contractor/developer's operations.

2.5 Adjoining Land

The contractor/developer must make the necessary arrangements with owners or tenants for permission to enter and use any land which may be required for his own purposes and pay all considerations and compensations arising therefrom. All entrances are to be kept open and in reasonable condition.

2.6 Highway Boundary Markers

Where no permanent distinct definition exists between a new highway boundary and adjacent property such as a fence, wall or change in surface construction the developer shall provide and fix on the highway boundary permanent markers to define the boundary. The type, provision and erection of such markers shall be as agreed with the Strategic Director - Environmental Services, but should generally be a continuous line of precast concrete back edgings (150mm x 50mm) in grass areas.

2.7 Completion

The whole of the work is to be completed to the entire satisfaction of the Strategic Director - Environmental Services and on completion the contractor/ developer must leave the site clean and perfect including any adjoining land or property that may have been interfered with.

2.8 Unlawful Deposits on Highways

The developer/contractor is responsible for ensuring that all public highways are kept clear from deposits at all times.

In order to comply generally with Section 149 of the Highways Act 1980, existing roads (and new roads) which are being used by traffic shall be kept clean of all dirt, dust or other materials dropped from plant vehicles or their tyres or tracks, which are being used in connection with the works.

The developer shall take all necessary measures to prevent damage, loss, injury or nuisance caused by:-

- mud, dirt, stones or other material used or generated whilst carrying out the works. This shall include but not be limited to ensuring that no fuel or lubricant, mud, dirt, stones or other material is spilled or deposited on the highway whether or not it is open to traffic.
- smoke or dust generated whilst carrying out the works.

2.9 Environmental Protection Act 1990

It is a requirement of the Act that all places that receive waste for disposal, treatment/storage, whether permanent or temporary outside the limits of the Site, are subject to the Waste Management Licence. The Licence determines the type of waste that may be deposited at the facility. A register of all licensed waste management facilities in Derbyshire is available for public viewing. The Developer may inspect the register on application to the Environment Agency, who can be contacted as follows:-

Telephone: (01773) 520511

Fax: (01773) 520512

To deposit waste, other than at an existing licensed facility the Developer shall undertake the formal proceedings to obtain a Waste Management Licence, from the Environment Agency. The Developer shall not, under any circumstances deposit waste on the site until the Waste Management Licence is issued.

2.10 Highways Agency Specification

Reference to the Highways Agency Specification shall mean the latest edition of Volume 1 of the Highways Agency Manual of Contract Documents for Highway Works as published by the HMSO.

2.11 National Water Council "Sewers for Adoption"

All highway drains designed exclusively for disposal of highway surface water, and to be adopted as part of the Publicly Maintainable Highways, shall be constructed in accordance with the standards laid down in the National Water Council publication "Sewers for Adoption".

Where manholes, sewers and drains are to be adopted by the Local Water Authority, under Section 104 of the Local Water Authority Act 1991, a letter of proof shall be submitted to the County Council.

All ironware for gullies and manholes to be bedded on 2/4 courses of brickwork, where these fall within the adopted highway limits. The use of precast concrete adjuster units are not be permitted.

3 MATERIALS

3.1 General

All materials shall be equal to samples submitted to and approved by the Strategic Director - Environmental Services and shall be in accordance with the appropriate British Standard, Harmonised European Standard or a European Standard where such exists, except as may be hereinafter specified.

3.2 Samples and Testing

Properly representative samples of all materials proposed to be used in the works shall be submitted by the contractor/developer for the Strategic Director - Environmental Services approval before the first deliveries. All deliveries shall be at least equal to the standard of the sample. The Strategic Director - Environmental Services shall have access to all the materials at all times and shall be permitted to take samples when he so desires. The contractor/developer shall make all arrangements and bear all expenses in connection with any tests of materials the Strategic Director - Environmental Services may direct.

For roadworks materials compliance shall be checked by sampling at the rate of 1 per 100 tonnes of Hot Rolled Asphalt or Asphalt Concrete or Stone Mastic Asphalt surface courses and 1 per 150 tonnes of Asphalt Concrete binder course or base. Sub-base shall be sampled at the rate of 1 per 1000 sq m. All test samples up to these frequencies shall be at the Contractor's cost. In addition, any testing required as a result of the Contractor failing to give sufficient notice shall also be at the contractor's cost.

The County Council Highways Laboratory is available to carry out these tests on appropriate payment.

3.3 Cement

Cement shall comply in all respects with BS EN 197-1 for Portland Cement (CEM 1) or BS 4027 for Sulphate Resisting Cement. Use of other Cement Types shall only be permitted with the written permission of the Strategic Director of Environmental Services. It shall be delivered in the original sealed bags of the manufacturer and shall be stored on the site in a suitable building affording adequate protection against the weather. Rapid-hardening cement shall only be used with the written permission of the Strategic Director - Environmental Services.

3.4 Lime (for Mortar)

Lime for mortar shall be semi-hydraulic hydrated lime, complying with BS EN 459-1:2001

3.5 Sand (for Mortar)

Sand for mortar shall be fresh water sand from an approved source and shall comply with BS 1199 and 1200.

3.6 Aggregates for Bituminous Materials

Natural, recovered unbound and artificial aggregates shall be clean, hard and durable and shall comply with BS EN 13043. Where recycled coarse aggregate or recycled concrete aggregate is used in bituminous materials it shall have been tested in accordance with Clause 710 of the Specification of Highway Works and the content of other materials (Class X) including wood, plastic and metal shall not exceed 1% by mass.

3.7 Aggregate (for Concrete)

The fine and coarse aggregate for concrete shall comply with BS EN 12620. All aggregate shall, if required by the Strategic Director - Environmental Services, be washed at the contractor/developer's expense. The various sizes shall be consigned and stacked separately.

3.8 Water

Only fresh, clean water from the water mains or other source approved by the Strategic Director - Environmental Services shall be used for mixing cement grout, mortar or concrete.

3.9 Materials Associated with Concrete Carriageways

The use of concrete carriageways/footways is generally unacceptable for new estate streets unless a specification is specifically agreed with the Strategic Director - Environmental Services in writing prior to commencement of works.

3.10 Stone for Foundations

Stone for hardcore base or sub-base to carriageway shall be hard and durable and either limestone, slag or other approved material, but not a mixture, and from an approved source. It shall be consistent in quality, free from dirt and foreign matter. Slag shall comply in all respects except size and grading with BS 1047. Stones shall be generally angular or irregular in shape.

Unless agreed otherwise by written application to the Strategic Director - Environmental Services, prior to commencement of works all stone for foundations should be Type 1 granular material complying with Annex B.

3.11 Asphalt Concrete

The use of Limestone aggregate in surface courses shall not be permitted.

Shall consist of approved blast furnace slag, granite, or (for binder course and base material only) basalt or limestone, mixed with bitumen.

Asphalt concrete shall accord with BS EN 13108 -1 and shall be obtained from a source approved by the Strategic Director - Environmental Services. Samples of the material shall be submitted for his approval as required.

3.12 Surface Water Drainage Pipes and Fittings

Clay pipes and fittings for surface water drains shall comply with BS 65 and shall be normal pipes or fittings as described therein and shall have flexible joints complying with BS 65.

3.13 Concrete Pipes

Concrete pipes shall comply with BS 5911 with spigot and socket flexible joints.

3.14 Plastic Pipes

In exceptional circumstances and where agreed with the Strategic Director - Environmental Services in advance, UPVC plastic pipework to BS 4962 may be used.

3.15 Bricks

Bricks shall be of approved manufacture from clay and of standard proportions well burnt, hard and truly shaped with sharp arises and free from cracks, lumps of lime, flint and other defects. They shall be equal to a sample which has been approved by the Strategic Director - Environmental Services and shall comply with the requirements of BS 3921.

3.16 Drain Castings

All castings shall be obtained from an approved maker and be of good quality metal free from flaws of any kind, shall have sharp edges and shall comply where not otherwise specified or billed with BS 437.

3.17 Cast Iron Pipes

Cast iron spigot and socket pipes shall comply with BS 437.

3.18 Manhole and Inspection Covers

Cast grey or ductile iron manhole covers and frames shall comply with BS EN124: 1994. Where situated in the carriageway they shall be Grade D400 (heavy duty) double triangular type or other suitable type complying with British Standard requirements as agreed with the Strategic Director - Environmental Services.

3.19 Step Irons

Step irons for building into inspection chambers shall be galvanised malleable cast iron, each weighing not less than 2.15kg (1.00kg in pre-cast concrete manholes). They shall comply with BS EN 13101 2002, and be from an approved maker.

3.20 Gullies

Gullies shall be pre-cast concrete complying with BS 5911, or in exceptional circumstances uPVC/plastic having a current British Board of Agrément Certificate and as accepted by the Highways Agency, all as may be agreed in advance by the Strategic Director - Environmental Services. They shall be at least 750mm deep and 375mm inside diameter, with 150mm internal diameter trapped outlet complete with stoppered rodding eye.

3.21 Gully Covers and Frames

Gully covers and frames shall be of cast grey or ductile iron to comply with BS EN 124 : 1994 and shall be Grade D400.

Where used with the approval of or as required by the Strategic Director - Environmental Services, kerb inlet-type gullies shall be Grade D400. Hinged lid on kerb inlet-type gullies shall be fitted with a locking device.

3.22 Pre-cast Concrete Kerbs

Kerbs shall be hydraulically pressed pre-cast concrete complying with and to the dimensions described in BS7263 and be obtained from an approved source. Straight kerbs shall be supplied in 610/914mm lengths. Circular, tapered or dropped kerbs shall be accurately made to the specified dimensions and/or radii, in 914mm lengths or as shown on the drawings. Short kerbs of 610mm lengths shall only be used where approved by the Strategic Director - Environmental Services.

Unless specifically agreed with the Strategic Director - Environmental Services in writing prior to commencement of works, the use of Kassel Kerbs is not permitted.

3.23 Pre-cast Concrete Edging

Pre-cast concrete edging shall be hydraulically pressed, of approved section normally Type EF, 914mm in length, 50mm wide and 150mm deep (or deeper if and as required), and shall comply with BS 7263.

3.24 Concrete Channel Blocks

Precast concrete channel blocks shall be hydraulically pressed, of 250mm by

125mm section and shall comply with BS 7263. They shall be used in all cases where longitudinal gradient of carriageway is slacker than 1 in 150, and shall be laid with falls to gullies of not less than 1 in 200.

3.25 Concrete Flags

Concrete flags for use in footways shall be hydraulically pressed and shall conform to BS 7263. Flags shall be 63mm thick and sizes shall be approved by the Strategic Director - Environmental Services.

3.26 Chippings for Surface Dressing

Chippings shall comply in all respects with BS EN 13043 'Single -sized aggregates for surface dressing'.

3.27 Concrete For Ancillary Purposes

Concrete for use in laying of kerbs and edgings, pipe surrounds, and for gully and manhole bases and surrounds, shall conform to the requirements of BS 8500 in accordance with specifications for Standard Mixes.

3.28 Cement Mortar

Cement mortar is to comply with Clause 2404 of the Highways Agency Specification where used for brickwork, pipe joints, rendering etc. All mortar is to be fresh as required for use. Any mortar which has commenced to set or which has been mixed for more than one hour shall be rejected.

3.29 Granular Pipe Bedding Material

Granular pipe bedding material shall comply with Clause 503 and Table 5/3 of the Highways Agency Specification and may be either graded or single sized aggregate.

3.30 Grass Seed

Grass Seed mixtures for use in highway verge areas:

1	On heavy or wet soils:	2	On light soil or dry situation:
	30% Chewing fescue		40% Creeping red fescue (Canadian)
	30% Meadow fescue (Canadian)		25% Chewing fescue
	20% Crested dogstail		12½% Hard fescue
	10% Rough stalk meadow grass		12½% Smooth stalked meadow grass
	10% Oregon Browntop		10% Oregon Browntop

3.31 Street Furniture

Bollards and pedestrian barriers used within the highway shall be approved by the Strategic Director - Environmental Services prior to installation.

4 WORKMANSHIP

4.1 Preliminary

The lines and levels of the proposed works shall be set out by the contractor/developer in accordance with the drawings. The Strategic Director - Environmental Services reserves the right to check this setting-out before work is commenced but rectification of any errors in line or level at any time up to adoption will remain the contractor/developer's liability.

4.2 Dealing with Water

The formation and excavation shall be kept free from water during the progress of the works and provision shall be made for all labour, materials, pumps and maintenance necessary for the purpose.

4.3 Excavation

4.3.1 General Excavation:

Existing turf and top-soil shall be removed and if required, stacked as directed: excavate in any material over the site of the works to lines, levels and contours shown on the plans and sections: transport and deposit as directed, if required to make-up low ground. Surplus material not required on site to be disposed to a facility to be provided by the contractor/developer (Refer to item 2.9).

4.3.2 In Drain Trenches:

Excavation for the laying of all surface water and/or foul water drains or sewers shall be to the lines and levels shown on the drawings or as directed by the Strategic Director - Environmental Services. All trenches shall be of a width to give at least 150mm clearance between the outside of the barrel and the face of the trench or sheeting.

4.3.3 "Suitable Material" shall comprise excavated material or other hard material or as may be agreed in writing by the Strategic Director - Environmental Services, samples of which shall be approved prior to use. Such materials must be capable of compaction in the manner specified in item 4.4 to form a stable fill.

4.3.4 "Unsuitable Material" shall mean other than suitable materials and/or shall comprise:- material from swamps, marshes and bogs; peat, logs, stumps and perishable materials; material susceptible to spontaneous combustion; material in a frozen condition; clay of liquid limit exceeding 90 and/or plasticity index exceeding 65; materials having a moisture content greater than the maximum permitted for such materials as considered excessive by the Strategic Director - Environmental Services; materials of a size considered unsuitable for compaction or further incorporation within the works.

4.4 Filling (to Embankments)

Material for use as filling to embankments may be either the suitable material excavated on site or imported material, all to be approved by the Strategic Director - Environmental Services. The material shall be deposited and compacted in accordance with the Clause 612 of the Highways Agency Specification, and this will generally require compaction in layers not exceeding 225mm deep in the loose. Each separate layer of filling shall be compacted to the Strategic Director - Environmental Services' satisfaction with approved mechanical equipment. All turf and topsoil under the site of embankments shall be stripped and any unsuitable material (see item 4.3.4) removed before depositing any filling.

4.5 Formation

Care shall be taken to ensure uniformity of strength in the sub-grade. Any unsuitable material (see item 4.3.4) to be cut out and a layer of approved granular material shall be substituted or added and compacted. The formation is to be shaped to correct contour. No hauling will be allowed over and no materials shall be stored on the finished formation of the carriageway unless and until it has been surface dressed or otherwise satisfactorily covered.

4.6 Excavation for Pipelines and Drainage Structures

The contractor/developer shall provide all necessary timbering, strutting and pumping.

The sides of pits and trenches shall be adequately supported at all times. They shall not be battered, except with the approval of the Strategic Director - Environmental Services. If described in the design documents or instructed by the Strategic Director - Environmental Services supports shall be left in pits or trenches.

Unless approved for use in back-filling, excavated material shall be removed to a tip provided by the contractor/developer. (See also item 2.9)

Soft spots or "over-excavation" in the bottom of drainage excavations shall be removed and the resulting void immediately back-filled with Type 1 sub-base material or Mix ST1 concrete.

Back-filling of trenches shall not proceed until the drains have been tested and passed by the Strategic Director - Environmental Services. Material for back-filling trenches shall consist of either:

- (a) Type 1 granular sub-base or 6F2 material complying with Table 6/1 of the Highways Agency Specification as appropriate.
- (b) Other imported material or the material excavated from the trench, only if specifically agreed with the Strategic Director - Environmental Services.

(Workmanship)

All back-fill to trenches shall be mechanically compacted in layers of 150mm thickness to the satisfaction of the Strategic Director - Environmental Services, all in accord with the details shown in Annex E, before any carriageway or footway material shall be laid thereover.

4.7 Openings in Existing Highways

An application must be made to the New Roads and Street Works Section of the Highway Authority for a Street Works License as sanctioned under Section 50, Schedule 3 of the New Roads and Street Works Act 1991 for:-

- (a) any operations requiring the excavation or opening of the Public Highway;
- (b) forming of a junction for a new estate street under Section 38 of the Highways Act;
- (c) forming of a vehicle crossing under Section 184 of the Highways Act.

This request is in addition to any other approval issued by the Strategic Director - Environmental Services in respect of new estate streets.

4.8 Reinstatements

For pipelines laid under adopted highways in association with Private Street Works contracts, the backfilling and reinstatement shall be in accordance with the requirements of the approved details and/or the Highways Authorities and Utilities Committee (HAUC) Specification.

4.9 Pipe Laying

Pipes shall be laid to straight lines and gradients between manholes and so as to form an angle of not more than 60 degrees between lines of flow. Pipes shall be jointed by a flexible joint of a type recommended by the manufacturer and fitted together in the manner recommended by the manufacturer of the joint.

Pipe bedding material shall be graded or single sized aggregate (see item 3.29) and pipes shall be laid on the pipe bedding material and surrounded in accordance with details shown in Annex E. They shall be laid so that each one is in contact with the bed throughout the length of its barrel. The bed shall be cut away at each socket to give a clearance of at least 50mm so that the socket does not bear upon the bed. The bedding material shall be brought up to half the depth of the pipe and carefully compacted. Approved back-filling material shall then be placed around the pipe and carefully compacted by hand to the top of the pipe and then brought up to a depth of 300mm above the top of the pipe and lightly compacted.

Where pipes are under a carriageway and have a cover of less than 1.25m, or are under a footway or verge and have a cover of less than 1m, they shall be completely surrounded by not less than 150mm of Mix ST1 concrete unless

(Workmanship)

directed otherwise, with separation at the joints by 20mm thickness of Flexcell (or similar approved material) at intervals as recommended by the Strategic Director - Environmental Services representative.

4.10 Gullies

Pre-cast concrete gullies shall be set on a bed of and surrounded with 150mm Mix ST1 concrete. Plastic/uPVC gullies shall be set on a 200mm bed of Mix ST4 concrete and surrounded with 150mm Mix ST4 concrete. The grates and frames shall be firmly bedded in cement mortar (see item 3.28) on not less than two and not more than four courses of 225mm Class 'B' engineering brickwork.

4.11 Brick Manholes

4.11.1 Brick manholes shall generally be of 1.27m x 0.81m internal dimensions and constructed in accordance with drawings approved by the Strategic Director - Environmental Services. The foundations and floors of manholes shall comprise 150mm thickness of Mix ST4 concrete and shall extend at least 150mm beyond the outer face of the brickwork. Glazed stoneware channel pipes of appropriate diameter shall be used to form the invert. Benching shall be properly shaped and shall be of Mix ST2 concrete rendered with two coats of granolithic cement mortar.

4.11.2 The manholes above the base shall be built in Class B engineering bricks to BS 3921 Table 6, 225mm thick in English bond set and pointed in cement mortar (see item 3.28). In good normal ground conditions this thickness is adequate up to a maximum of 3 metres depth. Manholes in excess of this depth or situated in poor ground conditions will be subject to a predetermined specification to suit the requirements of the particular site. When completed the inner face of the manhole shall be true and smooth throughout. Where the depth of the invert exceeds 1.00m below the surface of the ground, galvanised malleable cast iron step-irons of approved pattern (see item 3.19) shall be built in the brickwork every four courses.

4.11.3 Cover slabs shall be 150mm thick, Mix C30 concrete to BS 5328 Section 2 and reinforced either with 14mm diameter mild steel bars spaced at 200mm centres in each direction or with reinforcing fabric of high tensile steel of approved design and manufacture and weighing not less than 4.50kg/m². Such reinforcement shall be placed not less than 40mm nor more than 50mm from the underside of the concrete. The proposed design shall be submitted for approval by the Strategic Director - Environmental Services.

4.11.4 Covers and frames shall be firmly bedded in cement mortar (see item 3.28) or proprietary mix approved by the Strategic Director - Environmental Services on not less than two and not more than four courses of 225mm Class 'B' engineering brickwork.

4.11.5 Backfilling around manholes shall be carried out as for Filling to Embankments (see item 4.4). If the space between the manhole construction and the excavated face is not wide enough to achieve proper

compaction the back-filling shall be carried out using Mix ST1 concrete.

4.12 Pre-cast Concrete Manholes

- 4.12.1 Manholes and inspection chambers in pre-cast concrete shall comply with BS 5911. They shall be bedded on 150mm thick Mix ST4 concrete and surrounded and back-filled with a minimum of 150mm Mix ST1 concrete well punned. When required step irons should preferably be fitted at manufacturer's works.
- 4.12.2 Covers and frames shall be firmly bedded in cement mortar (see item 3.28), or proprietary mix approved by the Strategic Director - Environmental Services on not less than 2 and not more than 4 courses of 225mm thick Class 'B' engineering brickwork.

4.13 Testing of Drains

All surface water drains with watertight joints must be watertight and shall be tested when required at the Strategic Director - Environmental Service's direction. The contractor/developer shall provide the labour, materials and apparatus to apply the test. The method, which may be by air, smoke or water testing, shall be determined by the Strategic Director - Environmental Services and the results must be to his satisfaction. Any section not passing the test shall have the defects made good and shall be retested.

All gully connections shall be surveyed using CCTV. Connections to both the gully and main sewer drain will need to be checked for faults and any defects rectified by the developer.

4.14 Cold or Wet Weather Working

4.14.1 Unbound and Cementitious Materials:

Road pavement materials in a frozen condition shall not be incorporated in the Works but may be used, if acceptable, when thawed.

Road pavement materials shall not be laid on any surface which is frozen or covered with ice.

The temperature of concrete or cement-bound material for use in the roadworks shall not be less than 5°C at the point of delivery. These materials shall not be laid when the air temperature falls below 3°C and laying shall not be resumed until the rising temperature reaches 3°C unless, with the agreement of the Strategic Director - Environmental Services, all surfaces are protected by thermal insulation blankets laid immediately after placing and finishing the concrete. The insulation shall be placed before the temperature of the concrete surface has dropped below 2°C and shall be retained for a minimum of 3 days or until the concrete is assessed to have reached 50% of the specified characteristic compressive strength provided the air temperature is above 0°C and rising at that time.

4.14.2 Bituminous Materials:

Laying of road pavement materials containing bitumen binders may proceed during light precipitation provided that both the surface to be covered and the air temperature are above 0°C, except where otherwise specified herein after. Responsibility for working methods shall remain with the Contractor/Developer including all necessary adjustments to suit changes in weather conditions.

Laying of road pavement materials containing tar or bitumen binders, or mixtures, thereof, may proceed provided that the temperature of the surface to be covered is 0°C or more, the air temperature is at or above -1°C and rising and the surface to be covered is dry, unfrozen and free from ice, snow, salt and grit, except where otherwise specified herein after.

Hot Rolled Asphalt surface course, Asphalt Concrete and Stone Mastic Asphalt surface course shall be laid to the constraints stated above and wind speed/temperature constraints specified in Clause 945 of the Specification for Highway Works (Amendment - November 2006).

5 CARRIAGEWAY, FOOTWAY AND VERGE CONSTRUCTION

5.1 General

- 5.1.1 The representative thickness of the various elements of carriageway construction (i.e. sub-base, base, and surfacing) will be dependent upon the bearing strength of the formation (sub-grade) and the potential traffic category of the street(s) given below:

Category (a) Residential access only.

Category (b) Through routes on major/minor collector roads.

Category (c) Local distributor, industrial estate roads or special routes.

- 5.1.2 The strength of formation is to be determined by soil bearing (California Bearing Ratio) tests, with samples taken over the site of the proposed carriageways. The County Council's Highways Laboratory (tel: 01773 852268) offers a testing service, although the report of any UKAS/NAMAS approved geotechnical laboratory will be considered. All testing is to be carried out at the developers expense and the laboratory report shall include CBR values, soil type, plasticity index and moisture content of each sample. Alternative testing methods must be agreed with the Strategic Director - Environmental Services where site conditions preclude a CBR laboratory test.
- 5.1.3 Tables I to IV give various thicknesses of the elements of carriageway construction and are intended as a guide only. The Strategic Director - Environmental Services's decision on the type and depth of construction and traffic classification of the street(s) shall be final.

5.2 Preparation of Formation

The formation shall be well-cleaned, free from mud and slurry, properly shaped and compacted by rolling to an even and uniform surface. Soft spots and defective areas shall be cut out and made good with Type 1 or 6F2/6F5 material, or other as may be agreed. No traffic or storage of materials shall be permitted on the finished formation until it has been partly surfaced with bituminous macadam, or otherwise suitably covered. All necessary sub-soil drainage shall be provided to prevent the water table from rising to within 600mm of the formation level as directed by the Strategic Director - Environmental Services including any changes considered necessary during the course of the works to secure compliance with this requirement.

5.3 Capping Layers and Sub-base

- 5.3.1 Sub-base layers shall be Type 1 granular material of the required thickness agreed by the Strategic Director - Environmental Services, complying with Annex B. Sub-base material shall not be laid until the formation has been approved by the Strategic Director - Environmental Services.
- 5.3.2 Where the carriageway construction is to include a capping layer, this shall consist of 6F2/6F5 material complying with Table 6/1 of the Highways Agency

Specification (samples to be submitted to the Highways Laboratory for certification, to ensure compliance). The finished, compacted surface of the capping layer shall have an equivalent CBR value of greater than or equal to 15% to be verified by plate bearing tests as per Clause 1.3 (minimum 300mm nominal size plate).

5.3.3 Where the CBR value of the formation is between 2% and 5% the capping layer shall be at least 350mm thick and where it is 2% or less the layer shall be at least 600mm thick. In particularly poor ground or where the Strategic Director - Environmental Services deems it necessary, additional capping layer thicknesses may be required as may geotextile matting. Where a capping layer is employed a minimum sub-base thickness (Type 1 granular material) of 170mm will be required for Category (a) roads, 230mm (Category b) and 275mm for Category (c) roads.

5.3.4 Table I - Carriageway Sub-base

Traffic Category (ref. item 5.1.1)	Subgrade CBR (%)	Sub-base thickness (mm)
(a)	below 2	550
	2	400
	3 and greater	300
(b) & (c)	below 2	600
	2	450
	3 and greater	350

5.4 Carriageway Base

Carriageway base shall be machine laid (unless otherwise approved by the Strategic Director - Environmental Services site representative). Base material shall not be laid until the sub-base has been approved and the base material shall be similarly approved before any other surfacing material is laid subsequently.

5.4.1 Table II - Carriageway Base

Traffic Category (ref. item 5.1.1)	Asphalt concrete 32 dense base 100/150 recipe (BS EN 13018 - 1) (125 pen bitumen grade binder)	Thickness (mm)
(a)	Clause 906 SR (0/32mm aggregate)	85
(b)	Clause 906 SR (0/32mm aggregate*)	130
(c)	Clause 906 SR (0/32mm aggregate*)	180

5.5 Carriageway Surfacing

Carriageway surfacing shall be machine laid (unless otherwise approved by the Strategic Director - Environmental Services's site representative).

5.5.1 **Table III - Carriageway Binder Course**

Traffic Category (ref. item 5.1.1)	Asphalt concrete 20 dense/open binder 100/150 recipe (BS EN 13018 - 1) (125 pen bitumen grade binder)	Thickness (mm)
(a)	Clause 906 SR (0/20mm aggregate)	60
(b)	Clause 906 SR (0/20mm aggregate)	60
(c)	Clause 906 SR (0/20mm aggregate)	60

5.5.2 **Table IV - Carriageway Surface Course**

Traffic Category (ref. item 5.1.1)	Asphalt concrete 14/10/6 close/open/dense surface 100/150 (BS EN 13018 - 1) (125 pen bitumen grade binder) Or SMA 10(stone mastic asphalt) Surface course 40/60 to BS EN 13108 – 5 – design of mixture to be approved by The Laboratory Engineer not less than 1 week before laying commences. A list of approved sources for Stone Mastic Asphalt can be obtained from the Highways Laboratory.	Thickness (mm)	PSV (min)**
(a) & (b)	Clause 906 SR (0/10mm aggregate) Or Clause 937 SR (0/10mm aggregate)	30	55
(a) & (b) road gradient 10% or more	Clause 906 SR (0/10mm aggregate) Or Clause 937 SR (0/10mm aggregate)	30	60
(c)	Clause 937 SR (0/14mm aggregate) Or Hot rolled asphalt surface course 40/60 Schedule 1A to Clause 910 SR (specification - 30/14F material at 40mm thick and 35/14F at 50mm thick. If high stone content HRA is used then specify 55/14F at 50mm thick. 14/20 coated chippings to Clause 915 SR).	40	60**

* The use of 0/32mm aggregate is specified on the basis that carriageway base is

applied in 2 layers where the total thickness of the layer exceeds 150mm.

- ** Higher PSV's may be required where the 'site category' of road (refer HD 36/06) influences the need for a skid resistance that exceeds the minimum requirements.
- *** The PSV of the course aggregate will be 50. Therefore, the minimum PSV will be achieved by the coated chipping.

Additional Notes

- i) All macadam and SMAs (Tables II, III and IV) must be compacted to achieve air void content of 8%.
- ii) The air void content can be assessed at the same time of laying by the use of a Nuclear Density gauge for base and binder course layers only. It must be noted that results using this method should be used for guidance purposes only.
- iii) The air void content for each layer is to be determined by extracting cores from the laid materials and measurement of core density (BS EN 12697-6 2003, Procedure C: Bulk density-sealed specimen) and maximum density of bituminous mixtures (BS EN 12697-5:2002, Procedure B:Hydrostatic procedure).
- iv) The core positions are to be agreed with the Strategic Director - Environmental Services.
- v) Limestone will not be permitted in any surface course.
- vi) The nominal thickness of the layer and minimum thickness of the layer at any point shall conform to the thicknesses given in Table 6A to Table 6D of BS 594987: 2007 as applicable.
- vii) Compaction shall be undertaken in accordance with BS 594987: 2007 as appropriate according to the scale and nature of the works.

This testing shall be carried out by a Laboratory that holds UKAS Accreditation for these tests and at the contractor's cost.

5.5.3 General

Binder course material is to be spread and rolled to the required contours and levels (see Annex A for permitted tolerances) checked by camber board and straight edge and compacted to the required thickness by a roller capable of achieving the required compaction.

All flat places to be broken out and repaired with similar material and again rolled until properly compacted. The binder course is to be approved by the Strategic Director - Environmental Services before the surface course is laid. Where the binder course is to be used as a running surface open to traffic for more than 14 days on category (b) or (c) roads, limestone aggregate shall not be used.

Where any new bituminous surface is applied to an existing bituminous surface (laid more than 1 day previously) then the surface shall be thoroughly cleansed, swept, and tack coat applied in accordance with BS 594987: 2007.

Surface course material, shall be similarly laid and compacted to the appropriate thickness, to the required contours and to the permitted tolerances (Annex A).

Except where permitted otherwise all coated macadam shall be laid using an approved self-propelled paver operated by fully trained operatives.

Hot bituminous material shall be laid in accordance with BS 594987: 2007. Where there is no British Standard for the particular material it shall be laid in accordance with the requirements and recommendations of BS 594987: 2007.

5.6 Private Driveways

Within 6 metres of the limits of a new road (or over the entire driveway, parking and manoeuvring area when the plot slopes down towards the new road), private driveways shall be constructed of a solid, bound material (not loose chippings) generally to the satisfaction of the Local Planning Authority.

5.7 Footways

5.7.1 Formation

The preparation of the formation shall be carried out in the same manner as specified for carriageways and in accordance with item 5.2.

5.7.2 Sub-Base

A 200mm bed of Type 1 or Type 2 granular material or other approved material is to be spread as foundation over the area of the footway and thoroughly compacted.

5.7.3 Footway Surfacing

Binder course material shall comprise asphalt concrete 20 dense binder course 160/220 recipe to comply with BSEN 13108-1, (refer to Clause 906 SR) (190 pen bitumen grade binder) to be laid, rolled and compacted to a thickness of 50mm.

Surface course material shall comprise asphalt concrete 6 dense surface course 160/220 to comply with BSEN 13108-1 (refer to Clause 906 SR) (190 pen bitumen grade binder) and shall be laid rolled and compacted to a thickness of 20mm and to proper cross and longitudinal falls. Limestone aggregate is not permitted in surface course. Prior to laying of surface course the existing surface shall be prepared and tack coat applied in accordance with item 5.5.3.

The finished levels of all courses to comply with the permitted tolerances in Annex A.

Core testing for all footways required as directed by the Strategic Director - Environmental Services.

5.7.4 Concrete Flag Surfacing

In exceptional circumstances and after specific approval by the Strategic Director - Environmental Services precast concrete flag paving may be used. The flags shall comply with Item 3.25 and shall be laid on a 100mm thickness of concrete ST2 mix on a bed of granular sub-base 75mm thick after compaction. The slabs are to be of such sizes as to properly break joint, but in no case is the length to exceed 914mm.

The paving is to be bedded over the whole surface on lime mortar 14mm thick and close jointed in fine mortar. The lime mortar is to be gauged in the proportion of one of best grey lime to two parts of sand. No closers to be used less than 450mm in width.

5.8 Surface Dressing

Where surface dressing is required for any purpose, it shall comply with Annex C and be to the satisfaction of the Strategic Director - Environmental Services.

5.9 Verges

5.9.1 Grass verges and service strips are to be made up with not less than 75mm depth of selected top soil after removal of all hard or otherwise unsuitable material. Rake level to give fine tilth, sow with grass seed (as item 3.30) at a seeding rate of 12 gm/m² and hand roll to correct slope and level.

5.9.2 Where only small verge areas are involved (e.g: in visibility splay areas), turf shall be used instead of grass seed, under the direction of the Strategic Director - Environmental Services site representative.

5.10 Kerbing

5.10.1 Kerbs shall be precast concrete, hydraulically pressed from an approved manufacturer, laid on a 150mm deep by 350mm wide kerb race backed with 150mm Mix ST2 concrete.

Straight and radius kerbs are to be 125mm x 255mm half-battered type HB2, laid true to line and level and showing a 125mm (\pm 6mm) face above the channel.

5.10.2 In exceptional circumstances where precast concrete internal or external radius kerbs are not manufactured to suit an approved layout, then either the nearest corresponding available radius or straight kerb shall be saw cut to fit the desired radius or short (610mm long) kerbs may form the radii at the direction of the Strategic Director - Environmental Services, the (minimum length of cut to be not less than 450mm).

- 5.10.3 Kerbs to footway crossings are to be type BN 125mm x 155mm with taper kerbs type DR1/DR2 (255mm to 155mm height) located at each side.
- 5.10.4 Channel blocks are to be laid on a 150mm deep kerb race and haunch of Mix ST2 concrete (Road gradient 1 in 150 or slacker).

5.11 Edgings to Footways

Precast concrete edgings type EF 50mm x 150mm or larger as required shall be provided to separate the footways and verges and as necessary to support the back of footways. The edging to be laid on a 50mm bed of, and haunched along its full length with Mix ST2 concrete.

5.12 Footway Vehicle Crossings

- 5.12.1 Vehicle crossings are to be provided across footways and verges to all double gateways or openings having a width of 1.5m or more. They shall be constructed in not less than 200mm thickness of Type 1 (Annex B) sub-base material. The binder-course and surface course materials and thicknesses shall be as that used for adjacent footway surfacing as specified in items 5.7.3.
- 5.12.2 A length of not less than 3.6m of 125mm x 150mm type BN dropped kerbs (or more as necessitated by site conditions and/or as directed by the Strategic Director - Environmental Services) shall be laid across the entrance flanked on each side by a single 125mm x 255mm/155mm taper kerbs.
- 5.12.3 Footway crossing for general use by commercial vehicles or to industrial premises shall be of the same depth of construction as the adjacent carriageway and shall, if required, be constructed as carriageway between appropriate radius kerbs.
- 5.12.4 Levels at the back of footways at vehicle crossings, shall be the same as the back of footway levels on either side of the crossings except where directed otherwise.

5.13 Dropped Kerbs at Junctions

At all new street junctions a minimum of 1.8 m of type BN dropped kerbs flanked on each side by taper kerbs are to be provided adjoining the kerb radii to facilitate the passage of aged and disabled persons and perambulators, pushchairs, wheelchairs. The dropped kerbs must be laid flush as possible to the adjacent carriageway surfacing with a maximum upstand of 6mm.

Tactile pavements to be laid on 100mm type 1 sub-base, 100mm ST2 concrete and surrounded with PCC edgings.

All such crossings shall incorporate tactile paving in accordance with the Department of Environment, Transport and the Regions; Mobility Policy Branch -

document "Guidance on the use of Tactile Paving Surfaces" and as instructed by the Strategic Director - Environmental Services site representative.

5.14 Existing Services

The tops of all stop tap boxes, manhole covers, fire hydrants, etc, are to be raised or lowered as required to finish flush with the adjacent footway or carriageway finished surface. All damage to any Statutory Undertakers mains or apparatus is to be made good. All alterations to and siting of hydrant boxes shall be to the satisfaction of the Derbyshire Fire Services.

5.15 Weedkiller

Weedkiller shall not be used.

5.16 Timber

All timber for fencing works is to comply with BS 1722.

5.17 Road Lighting

Road lighting shall be provided by developers to individual specifications prepared by the Strategic Director - Environmental Services, or his Agent Authority, for which purpose five extra copies of the approved deposited plan(s) are required. Conditions and outline of service provided are in Derbyshire County Council's Policy and Standards Document Section 19.

5.18 Sewerage

- 5.18.1 Sewers, whether foul, surface water or combined, are the responsibility of the Regional Water Authority. In some districts the District Council acts as agent for the Water Authority. A letter of proof shall be submitted to the County Council where any sewer, drains and manholes are to be adopted by the Local Water Authority under Section 104 of the Water Industry Act 1991.

Any sewer which the developer wishes to be adopted by the Water Authority must be designed and constructed in accordance with the "Developers Guide and Specification" issued by the relevant Authority. A letter of proof shall be submitted to the County Council where any sewers, drains and manholes are to be adopted by the Local Water Authority under Section 104 of the Water Industry Act 1991.

- 5.18.2 In the exceptional case of a drain constructed to carry nothing but road-water (no yard or roof drains) then that system or part system will form part of the highway works to be adopted by the County Council. Such highway drains are to be constructed in accordance with "Sewers for Adoption".

- 5.18.3 The following general principles should be adopted in designing such a highway drain:-

- (i) It is desirable wherever possible to site the drain in the verge rather than the carriageway.
- (ii) Where within the carriageway the drain shall be so located to ensure that all access points are positioned away from the centre of the carriageway (to facilitate future maintenance).
- (iii) Minimum internal diameter for pipes whether for main drains or for gully connections shall be 150mm, and no less than 225mm between the manholes unless otherwise agreed with the Strategic Director - Environmental Services.
- (iv) Wherever possible the cover over a pipe should be at least 1.25m (see Item 4.9 for protective measures to pipes where reduced cover is necessary).
- (v) Gradients should where practicable be sufficient to achieve a self cleansing velocity of 0.75m per second.
- (vi) Manholes shall be built at every change of alignment or gradient at the head of every drain or branch, at every junction of two or more drains (excluding gully connections) and wherever there is a change in size of drain. They should normally be spaced at intervals not greater than 90m and under no circumstances should spacing exceed 110m.
- (vii) Gullies shall be so spaced that the maximum impermeable area drained by each gully shall not exceed 160m² unless specifically agreed in writing with the Strategic Director - Environmental Services prior to works commencing. Additional gullies at junctions, low points or other sensitive areas shall be installed to the satisfaction of the Strategic Director - Environmental Services representative.

5.19 Service Strips

- 5.19.1 Where shared surface roads with grass service strips have been accepted by the Strategic Director - Environmental Services at the design stage, construction shall be as for verges (item 5.9). A 125mm high kerb face will be required to offer maximum protection to the grassed strip from vehicles overrunning.
- 5.19.2 The rear of the service strip shall be demarked by a continuous line of 50mm x 150mm precast concrete back edgings constructed in accordance with item 5.11, laid flush with the driveway and footway surface and just below the ground level in grassed areas.
- 5.19.3 It is the Developers responsibility to ensure that the service strip remains clear of all unauthorised plants, shrubs, trees, rocks, planters and any other obstruction not expressly permitted in writing by the Strategic Director - Environmental Services, until the roads are adopted as publicly maintainable highway. The developer shall explain to each property purchaser the significance of the service strip and the need to keep the area clear. On final inspection of the roads any infringement of the service strip will prejudice adoption of the road.

5.20 Statutory Undertakers Equipment

- 5.20.1 In addition to the provisions of item 2.4 above, it is the developers responsibility to liaise with all Statutory Undertakers in respect of the installation of their apparatus within the limits of the prospectively adoptable highway and ensure that adequate provision is made prior to the final surfacing of the new carriageways and footways for the installation of such equipment.
- 5.20.2 Where trenches are excavated in the new streets after surface course has been applied, and prior to the adoption, the entire width of surfacing kerb to kerb (or kerb to back edging in the case of footways) shall be re-laid. The Strategic Director - Environmental Services reserves the right to postpone the adoption of any new street where there is evidence that a Statutory Undertaker has not yet installed their equipment.
- 5.20.3 For the purposes of this specification, the term 'Statutory Undertaker' refers to companies providing gas, water or electricity, as well as telecommunications companies and other cable installers.

Statutory Undertakers Appropriate to the County Area are as follows:-

Bechtel Water Technology Limited, British Telecom Plc, Cable and Wireless Telecommunications Ltd, Diamond Cable Communications, East Midlands Electricity, Energis Communications Limited, Fibreway, IPM Communications Plc, NYNEX Cable Comms Limited, National Transcommunications Limited, North West Electricity Board, North West Water Limited, Servco Gulf Engineering Limited, Severn Trent Water Limited, South Staffordshire Water Plc, The National Grid Company Plc, Transco, Yorkshire Electricity Plc, Yorkshire Water Limited and Youlgreave Waterworks Co.

A. SURFACE LEVELS OF FLEXIBLE PAVEMENT COURSES

The level of any point on the surface of the courses of the carriageways or footways, i.e. the true level as specified shall, on completion of compaction conform to that shown in the following table:-

TABLE OF PERMITTED TOLERANCES

	Surface of Course	Tolerance from true surface level	Max Depression under 3m straight edge placed longitudinally
Carriageway	Sub-grade	+0 -50mm	-
	Capping layer	+0 -30mm	-
	Sub-base	+10mm -30mm	-
	Base	+/- 8mm	10mm
	Binder course	+/- 6mm	10mm
	Surface course	+/- 6mm	6mm
Footway	Binder course	+/- 6mm	6mm
	Surface course	+/- 3mm	3mm

The thickness of a course shall be regarded as the vertical interval between the true surface of that course and the true surface of the course immediately below it.

NOTE: The sum of the deviation in the level of the different layers shall not result in a reduction of the nominal surface course thickness by more than 12.5% from that specified.

B GRANULAR SUB-BASE MATERIAL

Type 1 Granular Subbase shall comply with the requirements of Clauses 801, 802, and 803 of the Specification for Highway Works (Amendment November 2006). Compaction of this material can be assessed using plate bearing tests as per clause 1.3 (minimum 300 mm nominal size plate). Compaction is satisfactory if equivalent CBR values equal to or greater than 30% are obtained. Any testing of Subbase required by the Strategic Director's representative will be at the Contractor/Developer's cost.

C SURFACE DRESSING

C.1 SURFACE DRESSING (GENERAL)

For surface dressing which is relatively rich in binder or a surface which has previously been surface dressed, or a close textured surface which has not previously been surface dressed, the rates of spraying, spread and the type and nominal grading of the aggregate shall be as directed by the Strategic Director - Environmental Services.

C.2 SURFACE DRESSING WORKS (ACCESSWAYS AND ACCESS ROADS)

Surface dressing will only be considered at the discretion of the Strategic Director - Environmental Services and only on minor culs-de-sac (Accessways and Access Roads). Material specification and buying methods shall accord with the TRL document Road Note 39 or as may otherwise be agreed with the Strategic Director - Environmental Services.

F. LOCATION, SPECIFICATION AND CONSTRUCTION OF MATERIALS WITHIN HIGHWAYS FOR AREAS OF SPECIAL TREATMENT

F.1 CONCRETE BLOCK PAVING

F.1.1 Carriageways

- (i) These requirements are intended to cover roads to adoption standard to be constructed in concrete block paving for limited areas only and as may be agreed in writing by the Strategic Director - Environmental Services. The Highway Authority reserves the right to levy a commuted sum payment from the developer to offset the additional costs which the maintaining Authority may incur in cases where block paving is used.

In the event that any blocked area is to be left at base level i.e. unblocked, for a period of more than 28 days, the developer will be required to lay a temporary, 60mm thick, binder course layer.

Clay pavers will not be acceptable.

- (ii) Concrete paving blocks shall comply with BS6717.
- (iii) All block paving in the carriageway, subject to vehicular traffic shall have a nominal thickness of 80mm. Unless otherwise approved by the Strategic Director - Environmental Services, blocks shall be 200mm x 100mm in size and laid to a 45° herring-bone pattern and channels to be formed using either 2 rows of stretcher bond or soldier bond. Blocks shall be of established standard colours, readily available from local manufacturers, and approved by the Strategic Director - Environmental Services.
- (iv) The thicknesses of sub-base and base shall be the same as that required for flexible construction in accordance with Tables I and II (items 5.3.4 and 5.4.1).
- (v) Unless otherwise described in the construction approval or agreed to by the Strategic Director - Environmental Services edge restraint to the block paving shall be provided in advance of laying the block paving.
- (vi) Construction of block paving shall be generally in accordance with BS7533: Part 3: (1997) "Code of Practice for Laying Precast Concrete Paving Blocks and Clay Pavers for Flexible Pavements", with a sand laying course target thickness after compaction of 30mm.
- (vii) Gaps left at the edges of block paving, including against obstructions with a paved area, which are smaller than a quarter of the original plan size of the unit i.e. the minimum size of block permitted, shall be filled and

compacted to the full depth of the paving block with a granolithic sand-cement mortar.

F.1.2 Footways and Footway Vehicle Crossings

- (i) Footways and footway vehicle crossings may be constructed with concrete block paving.
- (ii) The foregoing requirements for block paving in carriageways shall apply for footway construction, except for the following:
 - (a) block paving shall be of minimum thickness of 60mm;
 - (b) sub-base thickness shall be 200mm;
 - (c) sand laying course target thickness shall be 50mm. Sand zone to be specified.

F.1.3 It may be necessary to re-sand the joints prior to adoption if requested by the Strategic Director - Environmental Services.

F2 OTHER MATERIALS

F.2.1 The use of the following surfacing materials in carriageways, footways, vehicle crossings and margins will be permitted only in special circumstances and subject to a pre-determined specification to suit the requirements of the particular site.

- 1 Concrete Paving Edge
- 2 Natural Stone Paving Flags
- 3 Natural Stone Setts
- 4 Brick Setts
- 5 Concrete (various finishes)
- 6 Stone mastic asphalt
- 7 Hot rolled asphalt
- 8 Proprietary surfacing materials

F.2.2 Where specialist or more regular or expensive maintenance will be required to care for a modified surface treatment, the Highway Authority reserves the right to levy a commuted sum payment from the developer to offset the additional costs which the maintaining Authority may incur.

Clause 906SR Asphalt Concrete**General**

- 1 Asphalt concrete (Macadam type) mixtures shall conform to BS EN 13108-1. Conformity shall be established in accordance with BS EN 13108-20 and BS EN 13108-21.
- 2 Asphalt concrete (Macadam type) shall be produced in plants that are registered to the BS EN ISO 9001 'Sector Scheme for the Production of Asphalt Mixes'.
- 3 The traffic category shall be as stated in Appendix 7/1.
- 3a Asphalt Concrete shall be subjected to acceptance testing by the Overseeing Organisation's Laboratory as detailed in Clause 925SR. Where samples are found to be out of specification the Engineer may reject the material. In such cases the Contractor may be required to bear the cost of removal of the defective material, and replace it free of charge (in accordance with the Conditions of Contract).

Constituent Materials

- 4 The binder shall be paving grade bitumen conforming to BS EN 12591 and shall be produced in plants that are registered to the BS EN ISO 9001 'Sector Scheme for the Production of Asphalt Mixes'.
- 5 The preferred paving grades for asphalt concrete are 30/45, 40/60, 70/100, 100/150, 160/220 (see Note 1).
- 6 The grades used for blending shall be no harder than 30/45 pen nor softer than 160/220 pen and shall conform to BS EN 12591. The producer shall be able to demonstrate that the plant is capable of adequately blending the bitumens. Measures for ensuring consistency of proportioning of the blend shall be included in plant quality management systems. These shall include evidence of type tests carried out on a laboratory blend of the bitumens to demonstrate conformity to BS EN 12591. The quality assurance/management systems shall also include the steps to be taken to demonstrate the continuing adequacy of the process following significant changes being made to those parts of the plant involved in the process of bitumen blending. No grades of bitumen harder than 70/100 pen shall be blended in the mixer (see Notes 2 and 3).
- 7 Coarse aggregate shall be material substantially retained on a 2 mm test sieve, conforming to all appropriate requirements of BS EN 13043 and consisting of one of the following.
 - i) Crushed rock of one or more of the following groups: basalt, gabbro, granite, gritstone, hornfels, limestone, porphyry or quartzite.

- ii) Gravel of one or more of the groups in i) or flint, crushed or uncrushed, or combinations of both types.
 - iii) When gravel other than limestone gravel is used, 2% by mass of the total aggregate of either hydrated lime or cement shall be used as a filler.
 - iv) Blast furnace slag.
 - v) Steel slag, either electric arc furnace slag or basic oxygen slag, with a compacted bulk density between 1,60 Mg/m³ and 1,80 Mg/m³ when tested in accordance with BS 812-2.
- 8 The flakiness category of aggregates for all macadam type mixtures shall be F_{35} .
- 9 The fines content for coarse aggregates shall be:
- i) for crushed rock/slag: f_{NR} ; and
 - ii) for gravel: f_1 (see note 4)
- 10 Where there is a requirement specified for AAV and/or PSV for the course aggregate component of the mixture, the values apply to the aggregate proportion retained on the 4 mm sieve (see notes 5 and 6).
- 11 The resistance to polishing of coarse aggregate shall have a minimum declared PSV category specified in Appendix 7/1. The resistance to abrasion of coarse aggregate shall have a maximum AAV as specified in Appendix 7/1.
- 12 The fine aggregate shall substantially pass a 2 mm test sieve and be of one of the following types:
- i) fines produced by crushing material from one of the groups specified in sub-clause 7 of this clause;
 - ii) sand; or
 - iii) a mixture of i) and ii).
- 13 The fines content for fine aggregates shall be:
- i) for crushed rock/slag: f_{NR} ;
 - ii) for sand: f_{10} (see note 7)
- 14 If added filler is used in dense and closed graded mixtures it shall consist of crushed rock, crushed slag, hydrated lime, cement or other material approved by the specifier.

The grading of added filler shall be in accordance with BS EN 13043:2002, **5.2.1**.

The loose bulk density in kerosene of added filler, with the exception of hydrated lime, shall be in accordance with BS EN 13043:2002, **5.5.5** (see notes 8 and 9).

15 Where reclaimed asphalt is to be used in asphalt concrete mixtures the following requirements shall apply.

- i) All reclaimed asphalt shall be classified in accordance with BS EN 13108-8.
- ii) The reclaimed asphalt shall conform to the following categories:
 - foreign matter – category F5;
 - binder properties, for additions greater than 20% of mixture – category P₁₅ (see note 10).

In accordance with BS EN 13108-1:2006, **4.4**, unless otherwise indicated, the amount of reclaimed asphalt added to the mixture shall not exceed the following.

- reclaimed asphalt shall not be used in surface courses;
- all other materials 50%.

Where, in accordance with BS EN 13108-1:2006, **4.2.2.2** or **4.2.2.3**, the level of reclaimed asphalt addition requires the determination of combined binder properties, the penetration method shall be adopted (see note 11).

16 Additives permitted for inclusion may include fibres, pigments and adhesion agents, the suitability of which shall be demonstrated in accordance with BS EN 13108-1:2006, **4.1**.

Mixture Specifications

17 Binder content - to convert the B_{act} target values within PD6691 back to a B_{min} declared value from BS EN 13108, the following formula shall be used:

$$B_{min\ declared} = \frac{P_b \times B_{act}}{2,650}$$

where:

P_b is the mean particle density of the aggregate mixture, in megagrams per cubic metre (Mg/m³), determined in accordance with BS EN 1097-6.

The B_{min} declared value calculated from this formula shall be in divisions of 0,2. A B_{min} declared value of 0,1 division, such as 5,3%, shall be rounded down to the nearest 0,2 value i.e. 5,2% (see notes 12, 13 and 14).

Recipe dense base and binder course (see note 15)

- 18 The aggregate grading and binder content at the target composition shall fall within the appropriate envelope given in Table 906/1. Binder shall conform to BS EN 12591 with the grade as indicated in Table 906/2.

Table 906/1 Target limits for composition for recipe dense base and binder course mixtures AC D dense/HDM base/bin XX/YY rec

Previous nomenclature	BS	32 mm base	32mm binder course	20mm binder course
New EN nomenclature		AC32 dense base	AC32 dense bin	AC20 dense bin
Test sieve aperture size Mm		% by mass passing	% by mass passing	% by mass passing
40		100	100	-
31,5		99-100	99-100	100
20		80-86	80-86	99-100
10		-	-	61-63
6,3		52	52	47
2		27-33	27-33	27-33
0,250		11-15	11-15	11-15
0,063 dense		6	6	6
0,063 HDM		8	8	8
Aggregate type			Binder Content B_{act}	
Limestone		4,0	4,6	4,6
Basalt		4,0	4,7	4,7
Other crushed rock		3,9	4,6	4,6
Blast furnace slag of bulk density in Mg/M ³				
1,44		4,4	5,4	5,4
1,36		4,8	5,8	5,8
1,28		5,2	6,2	6,2
1,20		5,8	6,6	6,6
1,12		6,2	7,0	7,0
Steel slag		4,0	4,2	4,2
Gravel		4,4	5,0	5,0

NOTE The specified binder content B_{act} is both minimum and maximum binder content for categorization purposes.

Table 906/2 Binder grades for dense base and binder course mixtures

Binder grade (XX/YY in product descriptions)
160/220
100/150
40/60
30/45

Recipe close graded surface courses – see note 16

- 19 The aggregate grading of the target composition shall fall within the appropriate envelope given in table 906/3. The binder content of the target composition shall conform to Table 906/3.

Binder shall conform to BS EN 12591 grade 70/100, 100/150 (preferred grade), 160/220 or 250/330.

Table 906/3 Target limits for composition for close graded surface course mixtures AC D close surf XX/YY

Previous nomenclature	BS	14 mm close graded surface course	10 mm close graded surface course
New EN nomenclature		AC 14 close surf	AC10 close surf
Test sieve aperture size	Mm	% by mass passing	% by mass passing
20		100	-
14		100	100
10		77-83	100
6,3		52-58	62-68
2		25-31	25-31
1		14-26	14-26
0,063		6	6
Aggregate type		Binder content B_{act}	
Basalt		5,1	5,3
Other crushed rock		5,1	5,2
Blast furnace slag of bulk density in Mg/m ³			
1,44		5,6	6,2
1,36		6,0	6,6
1,28		6,6	7,2
1,20		7,0	7,6
1,12		7,6	8,2
Steel slag		4,8	5,0
Gravel		5,4 ^{A)}	5,4 ^{A)}

NOTE The specified binder content B_{act} is both minimum and maximum binder content

for categorization purposes.

^{A)} Higher binder contents may be necessary with some gravel types.

Recipe dense surface course (see note 17)

20 The aggregate grading of the target composition shall fall within the appropriate envelope given in Table 906/4. The binder content of the target composition shall conform to Table 906/4.

Binder shall conform to BS EN 12591. Guidance on the selection of binder grades is given in Table 906/5.

Table 906/4 Target limits for composition for dense surface course mixtures AC D dense surf XX/YY

Previous BS nomenclature	6 mm dense surface course
New EN nomenclature	AC 6 dense surf
Test sieve aperture size	% by mass passing
Mm	
10	100
6,3	98
4	-
2	42-56
1	24-46
0,250	11-19
0,063	4-8
Aggregate type	Binder content B_{act}
Basalt	6.3
Other crushed rock	6.2
Blast furnace slag of bulk density in Mg/m ³	
1,44	6.6
1,36	7.0
1,28	7.6
1,20	8.0
1,12	8.4
Steel slag	5.6
Gravel ^{A)}	5.4

Table 906/5 Guidance on selection of binder grades

Previous BS nomenclature	6 mm dense surface course
New EN nomenclature	AC 6 dense surf
70/100	✓
100/150	((A)
160/220	(
150/330	(
A) Preferred grade	

Temperature of the mixture

- 21 When using paving grade or hard paving grade bitumens, the temperature of the mixture at any stage, measured in accordance with BS EN 12697-13, shall not exceed the limits of Table 906/6.

Table 906/6 Maximum temperature of the mixture

Paving grade of binder	Temperature °C
10/20, 15/25	200
30/45	195
40/60	190
70/100	180
100/150, 160/220	170
250/330	160

When using modified bitumen or additives, different temperatures may be applicable, and these shall be documented and declared as part of the regulatory marking (see note 18).

Clause 910 SR Hot Rolled Asphalt Surface Course (Recipe Mix)

General

1. Hot Rolled Asphalt shall conform to BS EN 13108-4. Conformity shall be established in accordance with BS EN 13108-20 and BS EN 13108-21. Hot rolled asphalt shall be subjected to acceptance testing by the Engineer's Laboratory as detailed in Clause 925 SR. Where samples are found to be out of specification the Engineer may reject the material. In such cases the Contractor may be required to bear the cost of removal of the defective material, and replace it free of charge (in accordance with the Conditions of Contract).
2. Hot Rolled Asphalt shall be produced in plants that are registered to the BS EN ISO 9001 'Sector Scheme for the Production of Asphalt Mixes'.

Binder

3. The binder shall be paving grade bitumen conforming to BS EN 12591, polymer modified bitumen conforming to BS EN 14023 or a blend of one of these with natural bitumen in accordance with BS EN 13108-4: 2006, Annex B.

The grades used for blending shall be no harder than 30/45 pen nor softer than 160/220 pen and shall conform to BS EN 12591. The producer shall be able to demonstrate that the plant is capable of adequately blending the bitumens. Measures for ensuring consistency of proportioning of the blend shall be included in plant quality management systems. These shall include evidence of type tests carried out on a laboratory blend of the bitumens to demonstrate conformity to BS EN 12591. The quality assurance / management systems shall also include the steps to be taken to demonstrate the continuing adequacy of the process following significant changes being made to those parts of the plant involved in the process of bitumen blending.

Aggregate

4. The coarse aggregate shall have a minimum declared PSV as specified in Appendix 7/1, and shall have a maximum declared AAV as specified in Appendix 7/1. The coarse aggregate shall be material substantially retained on a 2mm test sieve, conforming to all appropriate requirements of BS EN 13043 and consisting of one of the following:-
 - (i) Crushed rock of one or more of the following groups: basalt,

gabbro, granite, gritstone, hornfels, porphyry or quartzite.

- (ii) Gravel of one or more of the groups in a) or flint, crushed or uncrushed, or combinations of both types.
- (iii) Blast furnace slag.
- (iv) Steel slag, either electric arc furnace slag or basic oxygen slag, with a compacted bulk density between 1.60 Mg/m^3 and $1,80 \text{ Mg/m}^3$ when tested in accordance with BS 812-2.

5. The flakiness category for coarse aggregates shall be F_{35} .

Fines Content

6. The fines content for coarse aggregates shall be f_4 .

Fine Aggregate

7. The fine aggregate shall substantially pass a 2mm test sieve and be of one of the following types:

- (i) sand;
- (ii) fines produced by crushing material from one of the groups specified in 4;
- (iii) a mixture of (i) and (ii)

8. For surface course mixtures the grading of the fine aggregate shall conform to the category below:

- (i) for Type F surface course mixtures 0/2mm G_{A90} .

9. The fines content for fine aggregates shall conform to the fines category below:

- (i) for Type F surface course mixtures f_{10} .

10. Added filler shall consist of limestone, hydrated lime or cement. The grading of added filler shall be in accordance with BS EN 13043: 2002, 5.2.1.

The loose bulk density in kerosene of added filler, with the exception of hydrated lime, shall be in accordance with BS EN 13043: 2002, 5.5.5.

Reclaimed Asphalt

11. Reclaimed asphalt shall not be used in Hot Rolled Asphalt Surface Course.

Additives

12. Additives permitted for inclusion may include fibres, pigments and adhesion agents, the suitability of which shall be demonstrated in accordance with BS EN 13108-4: 2006, 4.1.

Composition, Grading and Binder Content

13. The grading and binder content of the target composition of Recipe surface courses shall conform to Table 910/1 and Table 910/2. (See also 16)

14. Recipe surface course mixtures shall be one of the following from Table 910/1: 0/2F, 15/10F, 30/10F, 30/14F, 35/14F.

The soluble binder content from Table 910/2 shall be:

- schedule 1A for crushed rock mixtures;
- schedule 2A for gravel mixtures;
- schedule 3A for slag mixtures.

Table 910/1 Limits for target composition for surface course mixtures, Type F mixtures - recipe target aggregate gradings HRA%/D F surf XX/YY/rec													
Column No.	1	2	3	4	5	6	7	8	9	10	11	12	13
D mm	0/2F		15/10F	30/10F	0/10F	55/10F		30/14F		35/14F		55/14F	
Sieve	Passing sieve % by mass												
20	-		-	-	Not used in the UK	-		100		100		100	
14	-		100	100		100		93-100		95-100		98-100	
10	-		100	93-100		98-100		67-83		62-81		42-63	
6,3	100		82-88	67-83		42-63		-		-		-	
2	98-100		79	65		41		65		61		41	
0,5	80-90		59-83	49-68		29-43		49-68		44-63		29-43	
0,25	40-65		24-61	19-51		9-31		19-51		16-46		9-31	
0,063	14,0		12,0	9,0		6,0		9,0		8,0		6,0	

Table 910/2 Limits for target composition for surface course mixtures, Type F mixtures - recipe mixtures - binder content HRA%/D F surf XX/YY/rec

Column No.	1	2	3	4	5	6	7	8	9	10	11	12	13
D Mm	0/2F		15/10F	30/10F	0/10F	55/10F		30/14F		35/14F		55/14F	
Binder content % B _{act} (m/m) of total mixture for:													
Crushed rock or steel slag													
Schedule 1A ^{A)}	10,2		8,8	7,7		-		7,7		7,3		-	
Gravel													
Schedule 2A ^{A)}	10,2		8,8	7,4		-		7,4		7,0		-	
Blast furnace slag:bulk density													
Schedule 3A ^{A)}													
1,44 Mg/m ³	-		9,0	7,8		-		7,8		7,6		-	
1,36 Mg/m ³	-		9,0	8,0		-		8,0		7,6		-	
1,28 Mg/m ³	-		9,2	8,0		-		8,0		7,8		-	
1,20 Mg/m ³	-		9,2	8,2		-		8,2		7,8		-	
1,12 Mg/m ³	-		9,4	8,2		-		8,3		8,0		-	

Temperature of the Mixture

15. When using paving grade bitumens, the temperature of the mixture at any stage, measured in accordance with BS EN 12697-13, shall not exceed the limits of Table 910/3.

Table 910/3 Maximum Temperature of the Mixture

Paving grade of binder	Temperature ° C
30/45	200
40/60	190
70/100	180
100/150	170

When using modified bitumen or additives, different temperatures might be applicable, and these shall be documented and declared as part of the regulatory marking.

Target Binder Content

16. To convert the B_{act} target values within 910SR back to a B_{min} declared value from BS EN 13108, the following formula shall be used:

$$B_{min\ declared} = \frac{P_b \times B_{act}}{2,650}$$

where:

P_b is the mean particle density of the aggregate mixture, in megagrams per cubic metre (Mg/m^3), determined in accordance with BS EN 1097-6.

The B_{min} declared value calculated from this formula shall be in divisions of 0,2. A B_{min} declared value of 0,1 division, such as 5,3%, shall be rounded to the nearest 0,2 value i.e. 5,2%.

Coated Chippings for Application to Surface Course

17. Coated chippings shall comply with Clause 915 SR. The size, the minimum Polished Stone Value (tested in accordance with BS EN 1097-8) and the maximum Aggregate Abrasion Value (tested in accordance with BS EN 1097-8), shall be as described in Appendix 7/1. The Overseeing Organisation's Laboratory maintains an approved list of aggregates for coated chippings, the aggregates must be selected from this list.

Clause 937 SR Stone Mastic Asphalt Surface Course

1 General

Stone Mastic Asphalt shall conform to BS EN 13108-5. Conformity shall be established in accordance with BS EN 13108-20 and BS EN 12108-21.

Stone Mastic Asphalt shall be produced in plants that are registered to the BS EN ISO 9001 'Sector Scheme for the Production of Asphalt Mixes', described in Appendix A. The PSV, AAV and Traffic Category shall be as specified in Appendix 7/1.

Stone Mastic Asphalt shall be subjected to acceptance testing by the Overseeing Organisation's Laboratory as detailed in Clause 925SR. Where samples are found to be out of specification the Engineer may reject the material. In such cases the Contractor may be required to bear the cost of removal of the defective material, and replace it free of charge (in accordance with the Conditions of Contract).

Constituent materials

2 Binder

The binder shall be paving grade bitumen conforming to BS EN 12591, polymer modified bitumen to BS EN 14023 or a blend of one of these with natural bitumen in accordance with BS EN 13108-4:2006, Annex B.

Bitumen shall be produced in plants that are registered to BS EN ISO 9001 'Sector Scheme for the Supply of Paving Grade Binders', described in Appendix A.

3 Paving grades

The preferred paving grade for SMA is 40/60. The following grade is also suitable for hand laid material: 100/150.

The binder shall be paving grade bitumen conforming to BS EN 12591, polymer modified bitumen conforming to BS EN 14023 or a blend of one of these with natural bitumen in accordance with BS EN 13108-4:2006, Annex B.

The grades used for blending shall be no harder than 30/45 pen nor softer than 160/220 pen and shall conform to BS EN 12591. The producer shall be able to demonstrate that the plant is capable of adequately blending the bitumens. Measures for ensuring consistency of proportioning of the blend shall be included in plant quality management systems. These shall include evidence of type tests carried out on a laboratory blend of the bitumens to demonstrate conformity to BS EN 12591. The quality assurance/management systems shall also include

the steps to be taken to demonstrate the continuing adequacy of the process following significant changes being made to those parts of the plant involved in the process of bitumen blending. (See NOTE 1)

Aggregates

4 Coarse aggregate - Type of coarse aggregate

The coarse aggregate shall be material substantially retained on a 2mm test sieve, conforming to all appropriate requirements of BS EN 13043 and consisting of one of the following:-

- (i) Crushed rock or crushed gravel of one or more of the following groups: basalt, gabbro, granite, gritstone, hornfels, porphyry or quartzite.
- (ii) Steel slag, either electric arc furnace slag or basis oxygen slag with a compacted bulk density between 1,60 Mg/m³ when tested in accordance with BS 812-2.

5 Particle shape

The flakiness category for coarse aggregates shall be F_{20} .

6 Fines content

The fines content for coarse aggregates shall be f_4 . (See NOTES 2 & 3)

7 Fine aggregate - Type of fine aggregate

The fine aggregate shall substantially pass a 4 mm test sieve and be of one of the following types:

- crushed material from one or more of the groups specified in 4; or
- flint gravel.

8 Fines content

The fines content category for fine aggregates shall be f_{22} . (See NOTE 4)

9 Added filler

Added filler used in the SMA shall consist of crushed rock, crushed slag, hydrated lime, cement or other material approved by the specifier. The grading of added filler shall be in accordance with BS EN 13043:2002, 5.2.1. The loose bulk density in kerosene of added filler, with the exception of hydrated lime, shall be in accordance with BS EN 13043:2002, 5.5.5. (See NOTE 5)

10 Reclaimed asphalt

Reclaimed asphalt shall not be used in Stone Mastic Asphalt surface course.

11 Additives

Additives permitted for inclusion may include fibres; special fillers, pigments and adhesion agents. The suitability of such additives shall be demonstrated in accordance with BS EN 13108-5:2006, 4.1.

Composition

12 General

The binder content categories in BS EN 13108 involve a correction for the density of the aggregate in the mix. The principle is that the binder content category in the standard is based on an aggregate density in the mixture of 2,650 Mg/m³. If the aggregate is denser than 2,650 Mg/m³ the actual binder content in the true mixture is reduced proportionally, or if the aggregate is less dense it is increased. This has the intention of giving the same binder volume in mixtures regardless of aggregate density.

A consideration of UK mixtures and aggregates indicated that this approach might have been detrimental, as some of the denser aggregates in practice needed higher binder contents for durability. For this reason, the binder contents in the example specifications in this guidance document are those which are required as actual soluble binder contents on analysis of the finished mixture, with no density correction. This is the same as the way in which binder content was specified in BS594 and BS 4987. They are referenced as B_{act} .

For the purpose of CE marking, these actual binder contents will need to be corrected back to determine the B_{min} defined in BS EN 13108.

To convert the B_{act} target values within PD 6691 back to a B_{min} declared value from BS EN 13108, the following formula shall be used:

$$B_{min \text{ declared}} = \frac{P_b \times B_{min \text{ target}}}{2,650}$$

where:

P_b is the mean particle density of the aggregate mixture, in megagrams per cubic metre (Mg/m³), determined in accordance with BS EN 1097-6. (See NOTE 6)

The B_{min} declared value calculated from this formula can only be in divisions of 0,2. A B_{min} declared value of 0,1 division, such as 5,3%, shall be rounded to the nearest 0,2 value, ie 5,2%.

13 Grading and binder content

The grading and binder content of the target composition of surface courses shall conform to Table 937/1.

Table 937/1 Limits for target composition for SMA mixtures

D Mm	6	10	14	20
Sieve	Passing sieve % by mass			
31,5	-	-	-	100
20	-	-	100	94-100
14	-	100	93-100	-
10	100	93-100	35-60	25-39
6,3	93-100	28-52	22-36	22-32
4	22-45	-	-	-
2	20-34	20-32	16-30	15-26
0,5 ^{A)}	-	-	-	-
0,25 ^{A)}	-	-	-	-
0,063	8-14	8-13	6-12	8-11
Binder content Percentage (m/m) of total mixture ^{B)} B_{act}	7,0	6,5	6,0	5,4

^{A)} The 0,25 and 0,500 mm sieve are not included in BS EN 13108-5 but have traditionally been used in the UK for control of these mixtures, and it is advised that values are recorded.

^{B)} Mixtures containing polymer modified bitumens conforming to BS EN 14023 may be specified with a binder content reduced by up to 0,5%.

Void content

14 Surface course

The void content of impact compacted specimens of the mixture at target composition prepared and tested as detailed in Table 4 of PD6691:2007, shall be as follows:-

The average void content category of a set of three specimens shall be: $V_{min 1,5}$;
 $V_{max 5}$

15 Binder drainage

The binder drainage of loose specimens of the mixture at target composition determined in accordance with BS EN 12697-18:2004, Clause 5, Schellenberg method, shall be as follows.

The average binder drainage category of a set of specimens shall be Do,3.

16 Temperature of the mixture

When using paving grade bitumens, the temperature of the mixture at any stage, measured in accordance with BS EN 12697-13, shall not exceed the limits of Table 937/2.

Table 937/2 Maximum temperature of the mixture

Binder grade	Temperature °C
40/60	200
100/150	170

When using modified bitumen or additives, different temperatures may be applicable. These shall be documented and declared as part of the regulatory marking. Guidance on suitable minimum temperatures at delivery and for compaction is found in BS 594987.

Further Guidelines on In-situ and Laboratory CBR Test (particularly where the ground contains particles which are greater than 20mm size).

- i) Whichever method of test is employed, a surcharge load of 13kg representing a pavement thickness of 450mm shall be used and stated on the test report.
- ii) Where the formation contains particles exceeding 20mm in size, a Laboratory CBR test shall be carried out and the sample should be prepared in accordance with BS 1377: Part 1: Section 7.6.5. except for the following overriding requirement: -

If the fraction retained on the 20mm test sieve is greater than 25%, the oversize material should be broken down in size until the fraction retained on the 20mm test sieve is less than 25%. The fraction now passing the 20mm test sieve can be tested in accordance with BS 1377: Part 4. If the oversize fraction is more than 50%, a CBR of 5% can be assumed without further testing. However the complete exposed formation at construction stage will require to be inspected and approved by Derbyshire County Council before further work takes place as with 'rock' formations.

The sample should be compacted in a CBR mould in accordance with BS 1377: Part 4: Section 7.2.4.4 – Method (5) using a 2.5kg rammer, at or wetter than the moisture content of the material in the trial hole. If it is considered appropriate, a soaked CBR test may be undertaken, the choice being left to the developer. Both ends of the specimen are to be tested.

The results shall be reported as required in BS 1377: Part 4: Section 7.6.