

**SHEFFIELD CITY COUNCIL**  
**HIGHWAY CONSTRUCTION SPECIFICATION**

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## 1. INTRODUCTION

THIS DOCUMENT IS TO BE READ IN CONJUNCTION WITH THE SOUTH YORKSHIRE RESIDENTIAL DESIGN GUIDE AND HIGHWAYS ENGLAND'S MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS

### INTRODUCTION

This Materials and Specification Aid is issued for the guidance of developers, and forms the general basis for the methods of construction for Housing Estate Roads and Industrial Estate Roads which the Highway Authority is ultimately required to adopt as highway to be maintained at public expense

### INSPECTIONS

**The Highway Authority shall be notified at least 3 days prior to the commencement of any stage of the works.**

**Notice**

If, as a result of failure to give adequate notice of any stage of the construction works the Engineer is unable to inspect the same, the Developer will be required to carry out tests at his own expense to prove to the Highway Authority's satisfaction that the works comply with the appropriate standard. Otherwise, on completion, the work may not be considered for adoption

**Failure to give adequate notice**

The Highway Authority representative shall be given access to the work in progress and may visit from time to time. Such visits do not absolve the Developer from his responsibility for supervising the work that he is paying for, or from ensuring that it is carried out in accordance with the Specification and approved drawings

**Access for The Highway Authority representative**

### EXISTING SUB-GRADE

All construction details in this document are based upon an assumed CBR of 2%. If agreed in writing with the Engineer, thickness of sub-base and or capping layer may vary if a sub-grade survey indicates that there is an increase or decrease in CBR values.

**Assumed CBR Values**

When the sub-grade is frost susceptible, a minimum construction thickness of 450mm will be required.

**Frost susceptible sub-grade**

### DEFINITIONS

Unless otherwise stated, the definition of terms used in this Specification shall be those shown in BS 6100-4:2008 Building and civil engineering - Vocabulary - Transport

**General**

The Engineer, for the purposes of this Specification, shall be the representative of The Highway Authority

**The Engineer**

Where reference is made in this document to the Contractor, this shall mean the Developer or Party entering into agreement with the Highway Authority in respect of the adoption of the highway.

**The Contractor**

British and European Standards - this term will be used where reference is made to a British Standards Institution or European Standard Specification and the edition current at the time of construction is to be complied with. (See Section 2 – MATERIALS)

**British and European Standards**

## ROAD TYPES

These are detailed in the South Yorkshire Residential Design Guide S1.5, and are summarised below.

Industrial Estate Roads

Principal Streets

Conventional Streets

Shared Spaces with Protected Zones

Shared Spaces with Level Surface

**2. MATERIALS**

Wherever, in respect of any British Standard (BS), a European Standards Certification scheme is available, all materials are required to comply with that standard, or the containers of such materials, shall be marked with a BSI Certification Trademark . The mark of conformity of any other third party certification body accreditation by the United Kingdom Accreditation Service (UKAS) or equivalent shall be an acceptable alternative to this requirement.

**BS/EN Accreditation**

At the date of construction, all articles and materials shall conform to:-

**General**

- A) the above
- B) Highways England's Specification for Highway Works modified or extended by any substitute or additional clauses referred to in this document

And the following:-

**SAMPLES AND TESTING**

Representative samples of all materials proposed to be used in the works shall be submitted for the Engineer's approval not less than three weeks before they are to be used in the works, and shall be in accordance with the Specification for Highway Works. Such approval shall be obtained before any materials are delivered to site. Any materials not conforming to the Specification and requirements will be condemned in which case they must be removed from the site.

**General**

The Engineer will require material to be tested on a routine basis at a rate which will normally not exceed;

**Routine Testing**

One sample per 100t per source for grading & moisture content (naturally sourced material)

**Carriageway**

**Unbound Material**

One sample per 100t per source for constituents (recycled material)

One sample per 100t per source for binder content & grading etc. (hand laid material)

**Bound Material**

One sample per 50t per source for binder content & grading etc. (machine laid material)

One sample per week per source (recovered binder)  
It may be necessary to take samples for each laying operation. If any material is below the quality required; it will be condemned and must be removed.

**Footways**

The Developer shall bear the cost of all sampling and testing required by the Engineer to comply with the Specification.

**Costs**

Porous pipes shall comply with the requirements of BS 5911-114:1992

**Porous Pipes**

Vitrified clay pipes shall comply with BS EN 295 and BS 65:1991. The fittings shall have flexible mechanical joints. They shall be bedded on material conforming to the Specification for Highway Works and in accordance with "Simplified tables of External Loads on Buried Pipelines", issued by The Transport Research laboratory.

**Vitrified Clay pipes**

Plastic pipes fittings and joints shall be in accordance with the requirements of BS 4660, BS EN 1401-1:2009 and the water industry specification WIS 4-35-01.

**Plastic pipes and fittings**

Concrete Pipes and fittings shall comply with the requirements of BS EN 1916:2002 "Concrete pipes and fittings, unreinforced, steel fibre and reinforced"

**Concrete Pipes and Fittings**

Unless otherwise agreed in writing with the Engineer, all pipes shall be:-

**Joints & bedding**

Flexibly jointed.

Bedded on material conforming to Clause 503 of the Specification for Highway Works and BS EN 13242:2002+A1:2007 and designed in accordance with "Simplified Tables of External Loads on Buried Pipelines", issued by the Transport Research Laboratory.

Bricks are to be a Class B Engineering or Concrete Engineering quality complying with BS EN 771:2011+A1:2015, and are to be laid in English bond.

**Bricks for manholes gullies and Soakaways etc.**

## **DRAINAGE IRONWORK**

Drainage ironwork shall comply in all respects with BS EN 124:2005 and be CE marked or equivalent (any certification body accredited to BS EN ISO/IEC 17065:2012).

**BS EN**

Products shall be manufactured by companies who operate to BS EN ISO 9000 Series Quality System Standards.

**Quality assurance**

Ductile iron Class D400 (150mm deep) double triangular to BS EN 124:2005 with 600mm square openings

**Manhole covers and frames**

Must be ductile iron with captive hinge to BS EN 124:2005.

**Gully grates and frames**

Minimum Class D400

**Industrial Estate and Principal Streets**

Minimum Class C250 (100mm deep)

**All other road types**

To be in accordance with BS EN 13101:2002.

**Step irons for Manholes**

**GULLY POTS**

For typical gully details, See STANDARD CONSTRUCTION DETAILS

**General**

All gullies shall be trapped and provided with a rodding eye and fixed chain stopper.

Shall comply with the current British Board of Agrément Roads and Bridges Certificate (BBA Publications).

**Plastic**

Shall comply with the requirements of BS 5911-6:2004+A1:2010 “Concrete pipes and ancillary concrete products. Specification for road gullies and gully cover slabs”

**Precast concrete**

Shall comply with the requirements for road gullies, as specified in BS 65:1991 “Specifications for vitrified clay pipes, fittings and ducts” or BS EN 295 “Vitrified clay pipe systems for drains and sewers”.

**Clay**

Shall be clay trapped gully pots complying with BS 65:1991 and/or BS EN 295 with galvanised bucket. The gullies are to be covered with a hinged pedestrian/cyclist safe grating and frame. HP893 1 as manufactured by: Saint-Gobain PAM UK (Or similar approved). **The frame must be large enough for the bucket to be removed.**

**Footpath gullies**

**CONCRETE**

All concrete shall be in accordance with BS EN 206: 2013+A1:2016 and BS 8500:2015+A1:2016.

**BS EN**

All concrete used shall be made of aggregate, cement and water and shall comply with the conditions given below:-

**Constituent Parts**

To comply with BS EN 197-1:2011- Cement Composition, Specification and Conformity Criteria for common cements or equivalent.

**Cement**

To comply with BS EN 12620:2013 – Aggregates for Concrete + PD 6682-1:2009+A1:2013 – Aggregates, Aggregates for Concrete

**Aggregates**

Where standard mixes are specified, the related strengths shall be as follows:-

**Standard mixes**

C16/20 (ST4 20.0 N/mm<sup>2</sup>)

C20/25 (ST5 25.0 N/mm<sup>2</sup>)

C32/40 (40.0N/mm<sup>2</sup>) Air Entrained – in accordance with Clause 1002 Table 10/3.

The spreading, compacting and finishing of the concrete shall be carried out as rapidly as possible and the paving operation shall be so arranged as to ensure that the time between the mixing of the first batch of concrete and completion shall not exceed those given in Table 10/7 of SHW Clause 1025 (see below).

**Placing**

The concrete shall be transported and placed so that contamination, segregation or loss of constituent materials does not occur.

**Table 10/7SHW Clause 1025**

<b>Temperature of concrete at discharge from the delivery vehicle</b>	<b>Maximum Time from mixing to finishing concrete</b>
Not more than 25°C	3 Hours
Exceeding 25°C but not exceeding 30°C	2 Hours
Exceeding 30°C	No Concreting

Note:

When the temperature of the concrete at the spreader or Hopper Box exceeds 30°C concreting shall cease.

Before concreting works commences, Trial Mixes (Mix Approval) using the aggregates proposed for the work shall be made to ensure that the concrete is sufficiently workable.

*‘Workability of concrete shall be determined by a Slump Test in accordance with BS EN 12350-2:2009, and carried out at the point of placing. The workability shall be maintained at the Optimum within the limits specified in BS EN 206:2013+A1:2016’*

The concrete shall be air-entrained and the total quantity of air as a percentage of the volume of the mix shall be a minimum air content of 3% for a maximum aggregate size of 40.0mm.

Concrete for these purposes shall be of such proportions as to provide a characteristic compressive strength of 40N/mm<sup>2</sup> (C32/40N/mm<sup>2</sup>) at 28 days.

When required by the Engineer the Contractor shall satisfy him that the arrangements for mixing the concrete are adequate to produce a material of the right quality, and shall supply batches of four cube specimens for test purposes.

The concrete shall be air-entrained and the total quantity of air as a percentage of the volume of the mix shall be a minimum air content of 3.5% for a maximum aggregate size of 20.0mm.

Concrete for these purposes shall be of such proportions as to provide a characteristic compressive strength of 25.0N/mm<sup>2</sup> (C20/25 - ST5 25N/mm<sup>2</sup>) at 28 days.

When required by the Engineer the Contractor shall satisfy him that the arrangements for mixing the concrete are adequate to produce a material of the right quality, and shall supply batches of four cube specimens for test purposes.

**Concrete  
carriageways, Bus  
draw-ins, lay-bys,  
In-situ  
channelling,  
Manhole slabs**

**Concrete Manhole  
foundations  
benching and  
concrete rafts**

Concrete grade C16/20 (ST4 20N/mm<sup>2</sup>) shall be used for these purposes

**Pipe bedding and haunching**  
**Bedding and backing of kerbs and edgings.**  
**Manhole surrounds**  
**Gully bases and surrounds.**  
**Steel pedestrian fencing surround.**  
**Pipe saddling.**  
**Trench bases.**  
**Blinding bases of excavations.**

**MORTAR**

Ordinary Portland Cement shall be used unless otherwise specified.

**Cement Mortar**

To be mixed by volume at a ratio 1 of cement to 3 sand. Natural sand on crushed natural stone or combination of both as specified in BS EN 13139:2002 (Aggregates for mortar).

**CONCRETE KERBS CHANNELS AND EDGINGS**

All precast concrete kerbs, channels and edgings shall be hydraulically pressed and shall comply with the requirements of BS EN 1340:2003. Special kerbs (Plasmobility) having dimensions complying with BS EN 1339:2003, may be approved by the Engineer.

**Concrete kerbs channels and edgings**

**ROAD PAVEMENTS**

Sub-base shall be in accordance with the Specification for Highway Works. The source material shall be approved by the Engineer and must comply with the local authority Magnesium Sulphate Soundness test.

**Sub-base**

BS EN 13108-1:2016 Bituminous mixtures. Material specifications. Asphalt Concrete

**AC Dense Base (Roadbase)**

Dense Binder complying with BS EN 13108-1:2016

**Binder course**

**OR**

Hot Rolled Asphalt complying with BS EN 13108-4:2016

Stone Mastic Asphalt complying with BS EN 13108-5:2016

**Surface Course**

**OR**

AC 10 Close Surface Course complying with BS EN 13108-1:2016

**OR**

AC 6 Dense Surface Course to BS EN 13108-1:2016

**OR**

Interlocking Block Paving complying with BS EN 1338:2003  
"Concrete paving blocks"

	Notes
Materials containing limestone or blast furnace slag aggregate shall <u>NOT</u> be permitted in the Surface Course.	<b>Blast furnace slag</b>
When the surfacing course is laid in stages the same aggregate must be used for each stage.	<b>Stage laying</b>
<b>BITUMINOUS BINDERS</b>	
All binders in bituminous materials must be straight-run. Addition of fluxing agents is not permitted without written permission from the Engineer	
Joint sealing compound shall consist of either hot or cold poured material as detailed page 30 - Joints in Flexible Surfacing and to comply with BS 594987:2015+A1:2017 Clause 6.8	<b>Joint sealing Compound</b>

## FOOTWAY PAVEMENTS

The material used shall consist of a compacted layer of Type 1 granular sub-base material and shall comply with the Specification for Highway Works

**Sub Base for footways and margins**

**Surfacing for footways**

**Asphalt**

AC 6 Dense Surface Course to BS EN 13108-1:2016  
With AC20 Binder Course to BS EN 13108-1:2016

**OR**

Precast concrete flags shall comply with the requirements of BS EN 1339:2003, be bedded on sharp sand and cement at a ratio of 6:1 on the prepared sub-base

**PCC Flags**

**OR**

Interlocking Block Paving (Pencil Edge or similar approved)

**Block Paving**

**OR**

Natural stone flags

**Natural Stone flags**

The surfacing for non-vehicular hardened margins shall be 60mm thick concrete block paving bedded on 30mm compacted thickness of sharp sand

**Surfacing for non-vehicular hardened margins**

## CYCLE TRACK

Unless otherwise instructed by the Engineer, cycle tracks will be constructed in similar materials to a footway. Further details can be provided when requested.

**Cycle track construction**

## PAINT FOR METALWORK

Shall be carried out in accordance with the methods recommended in BS 6150:2006+A1:2014, using materials complying with Clause 164 and primed at the works in accordance with BS 5493:1997

## Paintwork

Paintwork specification for handrails and pedestrian guardrails

1<sup>st</sup> coat - Galvanising - Hot dip galvanising minimum thickness of galvanising 70 micron BS EN ISO 1461:2009

De-grease and wash (rinse) and dry

2<sup>nd</sup> coat and preparation "T" wash (or similar)

3<sup>rd</sup> coat - Primer - Zinc phosphate metal primer

4<sup>th</sup> coat - Undercoat 1 - Alkyd undercoat (Grey)

5<sup>th</sup> coat - Undercoat 2 - Alkyd undercoat (White)

6<sup>th</sup> coat - Top Coat - Permaglaze 00 E 55 (RAL 9003) - Signal White\*(or similar approved)

NB 1<sup>st</sup> 2<sup>nd</sup> and 3<sup>rd</sup> coats to be carried out in factory

(\* Top Coat may be grey, green or black to tie-in with existing handrails and pedestrian guardrails and must be agreed with the Engineer beforehand)

**3. SITE PREPARATION AND GENERAL WORKS**

The investigation should gather all data needed for assessing:

**Ground Investigation**

- A. General suitability of the site and neighbourhood for the proposed development works
- B. Physical characteristics of the ground e.g. presence of in-ground obstacles, services, buried conduits, sumps soft spots, cellars etc.
- C. Physical characteristics of contaminated matrices e.g. mineralogy, moisture content, permeability, chemical composition, particle size distribution
- D. Geotechnical characteristics e.g. strength, compressibility, stability of slopes, existing structures, potential for subsidence etc.
- E. The need for design requirements of any foundations, earthworks, temporary works and specialist geotechnical processes associated with the development strategy, taking into account the effect of any previous uses of the site.
- F. Any factors arising from the soil or groundwater conditions that might constrain the construction or implementation of development works including temporary works, excavation, traffickability and drainage.
- G. The quantity, quality and ease of extraction of construction materials (e.g. concrete foundations) suitable for inclusion in the works
- H. Changes in the stability, drainage or other geotechnical aspects of the site and the surrounding ground and buildings which might be initiated by the development works.

In addition, it may be necessary to assess the stability of existing structures, or to evaluate potential failure or instability.

All investigation works shall be carried out in accordance with BS 5930:2015.

Specialist geotechnical processes shall be specified and designed in accordance with appropriate industry standards or relevant Code of Practice.

The lines and levels of the carriageways, footways, verges, drains and all other works shall be properly set out before commencement of the Works.

**Setting out**

The Contractor shall remove buildings to a minimum of 1.5m below formation level) and other obstructions, grub up and remove trees, hedges, bushes, shrubs and clear the site of the works to the satisfaction of the Engineer.

**Site clearance**

Cellars to be excavated and filled to specification

Drawings showing site clearance details together with appropriate schedules and appendices shall be submitted to the Engineer prior to commencement of the works

**Drawings**

The provision of a comprehensive system of sub-soil drainage may be required where proposed roads are in cutting or where there is evidence that the general level of the water table is within 600mm of the carriageway formation level

### **Sub-Soil Drainage**

**4. EARTHWORKS**

All Earthworks are to be carried out in accordance with the latest requirements of Series 600 of the Specification for Highway Works:-

**General**

And the following:-

Drawings showing earthworks details together with appropriate schedules and appendices shall be submitted to the Engineer prior to commencement of the works.

**Drawings**

All topsoil shall be removed from the area required for highway construction.

**Topsoil**

Excavation shall be to correct lines, levels and contours.

**Line & level**

Where rock is met in excavation it shall be cut out to the lines and levels shown on the approved drawings, or as directed by the Engineer. Surface irregularities present in the formation after completion of the rock excavation shall be corrected with a layer of mass concrete grade C16/20 (ST4 20.0 N/mm<sup>2</sup>) laid and compacted to the required levels

**Excavation in Rock**

The incorporation of any of the excavated rock in the works shall be left to the discretion of the Engineer, depending upon the nature and suitability/grading of the rock for this purpose.

All sub-grades are to be proof rolled and checked for soft spots. These shall be cut out as directed by the Engineer and backfilled with granular fill (see below)

**Proof rolling/ Soft spots**

Unless specifically excepted, all excavated or filled surfaces within the area of the highway shall be thoroughly compacted in accordance with Clause 612 of the Specification for Highway Works.

**Compaction**

The Contractor shall carry out any extra rolling and compaction necessitated by:-

- A. The soft or artificial nature of the site
- B. The loose nature of replaced material in drain, sewer, statutory undertakers, or other trenches.
- C. Any subsidence that may occur

At the discretion of the Engineer, on soft ground, 75mm to 125mm single size stone may be laid over the sub-grade, until an adequate foundation is achieved. Engineering fabrics may also be used in these circumstances as directed by the Engineer.

**Soft ground**

No material shall be used for filling under carriageways and footways without the prior approval of the Engineer. Excavated site-dug material will not normally be approved as fill material under carriageways and footway

**Filling**

Granular Fill shall comply with class 6F1/6F2

**Granular Fill**

Capping shall comply with class 6F1/6F2

**Capping layer**

Shall be in accordance with Clause 617 of the Specification for Highway Works and the following;

Trafficking of the sub-grade should be avoided.

Where the Contractor proposes to use the sub-grade for construction plant, he shall:

Stop excavation short of formation level

**OR**

Provide adequate protection to the formation by the use of a capping layer or type 1 sub-base.

If the Contractor damages the sub-grade, the affected areas shall be cut out to a depth as directed by the Engineer and reinstated with approved capping material properly compacted to his satisfaction before any subsequent pavement layers are placed.

**Trafficking of sub-grade**

**Damage to sub-grade**

**5. HIGHWAY DRAINAGE, GULLIES AND GULLY CONNECTIONS**

**This section of the document is concerned only with highway drainage. Sewers are the responsibility of the Sewerage Undertaker and any concerns or queries regarding sewers are to be directed to them.**

**General**

Highway drainage proposals should, as far as possible, use the principles of sustainable drainage systems (SuDS) to deal with surface water drainage. SuDS should be seen as part of an overall strategy that includes flood avoidance, management, resistance and resilience as appropriate to the site.

**Sustainable  
Drainage Systems**

A SuDS Design Statement is required for all Major Developments with surface water drainage. Legislation defines a “*major development*” as any one or more of the following:

- (a) *the winning and working of minerals or the use of land for mineral-working deposits;*
- (b) *waste development;*
- (c) *the provision of dwelling houses where -*
  - (i) *the number of dwelling houses to be provided is 10 or more; or*
  - (ii) *the development is to be carried out on a site having an area of 0.5 hectares or more and it is not known whether the development falls within subparagraph (c)(i);*
- (d) *the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or*
- (e) *development carried out on a site having an area of 1 hectare or more;*

For further information search for “[Sustainable urban drainage design](#)” on Sheffield City Council’s website.

All other drainage works are to be carried out in accordance with the latest requirements of Series 500 of the Specification for Highway Works:-

**Traditional  
Highway Drainage  
Systems**

And the following:-

Drawings showing proposed drainage details together with appropriate schedules and appendices shall be submitted to the Engineer prior to commencement of the works.

**Drawings**

Excavation in any material shall be in open trenches to correct lines and levels, as shown on the approved drawings or to such other lines and levels as directed by the Engineer. Excavations taken out to a greater depth than necessary shall be filled with concrete grade C16/20 (ST4 20.0 N/mm<sup>2</sup>) or the appropriate bedding material, to a level directed by the Engineer. Trenching shall be of sufficient width to enable the pipes to be properly laid and jointed but in no case greater than the width specified in “Simplified tables of external loads on buried pipelines” issued by Transport Research Laboratory. Special care shall be taken to provide a solid and even bed for the barrels of the pipes.

**Excavation  
(General)**

Pits, trenches and other excavations shall be adequately supported, shall not be battered and shall be wide enough to enable the pipes and concrete to be laid accurately and proper refilling and ramming to be carried out.

**(Finish)**

Where solid rock is set in trenches, it shall be cut out to a depth of 150mm below the intended level of the underside of the pipes or  $\frac{1}{4}$  the diameter of the pipe whichever is the greater and replaced with pipe bedding material (as specified on page 5 ; Joints & bedding) to provide a firm bed for the pipes. Any over dig shall be back filled with concrete grade C16/20 (ST4 20.0 N/mm<sup>2</sup>), to permit a uniform depth of bedding material.

**(Rock)**

If any streams or waterways, land drains or sewers are intersected by any part of the Works, they shall be conducted past the same during construction by troughs or other temporary means, and as soon as possible, restored to a condition suitable for the purpose. Land drains shall be provided under the new roads if the nature of the sub-soil appears to warrant their use. (see page 4 ; Porous Pipes)

**Temporary/  
Permanent  
Diversions of  
Ground Water**

Trenches and all other excavations shall be kept free from water until any concrete or other works therein are sufficiently set and the Contractor shall construct any sumps or temporary drains that are deemed necessary. The Contractor shall make good any damage caused by prolonged and/or excessive pumping and shall take all precautions necessary for the safety of adjoining structures and buildings during the time that the trenches are open.

**Prevention of  
Standing Water**

Unless otherwise directed by the Engineer, pipes for carrying surface water shall have flexible joints and be laid in accordance with manufacturers' instructions. All pipes shall be laid true to line and level, with each pipe being separately aligned. Pipe bedding material shall be as described on page 5 - Joints & bedding

**Laying and  
Jointing of pipes**

Where directed by the Engineer, existing highway drains shall be properly extended to receive additional flows from new gullies or channels. Details of expected surface water runoff and drainage calculations will be requested prior to written permission being granted.

**Carrier Drains**

Any gully or branch connections shall be made during the construction of the main drain and a record of their positions kept for future use or reference. Where pipe connections are made to a brick drain, concrete culvert, stone built or lined channel, the pipes shall be well and tightly built into the concrete, brick or masonry work, and be so placed as to discharge in the direction of flow of the main drain or channel, and with the end of the pipe cut to the necessary angle. Where the connections are between piped drains, special connecting pipes shall be supplied, truly laid and properly jointed.

Where pipes are beneath the carriageway or footway, at a depth less than 1.2 metres cover from the finished surface level (or elsewhere if the Engineer considers that the nature of the ground demands it), they are to be bedded on and surrounded with 150mm of concrete grade C16/20 (ST4 20.0 N/mm<sup>2</sup>). In carrying out this

**Shallow Pipework**

work, the Contractor shall take care to pack the concrete under and around the pipes to ensure even bedding and solidity in the concrete. The concrete shall not be thrown directly onto the pipes. The upper surface of the concrete shall be struck off with a wooden screed or template and neatly finished off. The surrounding of pipes with concrete or the refilling of trenches shall not proceed until the drains have been inspected and approved by the Engineer. The flexible joint shall be maintained by forming a break in the concrete bed and surround by the use of flexcell, fibreboard or other approved materials. All pipelines shall be designed in accordance with BS 5911-1:2002+A2:2010 and "Simplified tables of external loads on buried pipelines" issued by the Transport Research Laboratory.

Junction pipes which are laid but are not immediately connected to gullies, shall be fitted with temporary stoppers or seals, and the position of all such junctions shall be clearly defined by means of stakes or trailing wires properly marked or labelled.

All bricks shall be as described on page 5. Brickwork is to be built in English Bond, on mortar (in accordance with the details shown on page 8), finished plumb and true, and flat pointed on the exposed face as the work proceeds. Each brick is to be well bedded and jointed. No half bricks shall be used except as closures. No brickwork shall be built when the outside temperature precludes the proper placing of concrete.

Manholes and Inspection Chambers shall be constructed in the positions shown on the approved drainage drawings, or as directed by the Engineer. The designs and details shall be in accordance with the Standard Details shown in the Highways England Construction Details, Series F - Drainage.

See below regarding setting street furniture to finished levels.

Unless otherwise directed by the Engineer, each gully shall drain a maximum of 200 sq.m.

Individual gullies shall be sited to avoid standing water on the carriageway and to prevent flows that might create danger, damage or give rise to complaints.

All gully connections are to be proved.

Gully pots shall be set on a foundation of and surrounded by 150mm of concrete grade C16/20 (ST4 20.0 N/mm<sup>2</sup>). After the concrete has set and hardened, backfilling shall be carried out and thoroughly compacted.

Covers and frames, shall be set to correct levels on a minimum of one and a maximum of four courses of brickwork (See Bricks for manholes gullies and Soakaways etc. ON PAGE 5) on top of drainage units.

For gullies, the top course shall be laid as headers, as brick on edge.

(REFER TO STANDARD CONSTRUCTION DETAILS FOR

## **Gully connections**

## **Brickwork for manholes gullies and soakaways etc.**

## **Manholes and inspection chambers**

## **Gullies (Drained area)**

### **(Siting)**

### **(Proving Connections)**

### **(Setting gully pots)**

## **Setting covers and frames**

## DETAILS)

To allow for adequate compaction of pavement asphalt layers, street furniture should not be placed until the base course layer is complete. Any chambers or gullies should be covered to prevent ingress of extraneous matter.

### Setting street furniture to finished levels

Street furniture should then be set to finished levels before the surface course is laid.

Where the Engineer is in any doubt as to the efficiency of the drainage works, he may require the Contractor to provide the apparatus, labour and tools for making tests before the trenches are backfilled, or concrete surround/haunching is placed in position. Any defects discovered in testing or otherwise shall be made good as directed by the Engineer and no pipes or fittings of any description shall be covered up until he has given his approval to the same.

### Testing Drains

Only after the drains have been approved by the Engineer shall trenches be backfilled. **The first 300mm of backfill above the crown of the pipe** shall be fill material as specified in "Simplified tables of external loads on buried pipelines" issued by Transport Research Establishment. The approved material shall be compacted in layers, to a density at least equal to that of the undisturbed ground adjacent to the trench. During the filling process, care must be taken to avoid pipes being broken, displaced or moved. When concrete is not used for surrounding the drains, the first layer of filling shall be carefully placed into position by hand and rammed so that no cavities are left under the pipes. **The remainder of the trench** is to be backfilled to formation level or sub formation level where capping is required, with Type 2 sub-base material (or other material approved in writing by the Engineer, which shall contain a minimum 10% of material retained on a 37.5mm BS sieve).

### Backfilling

Timber which has been employed for shoring and supporting shall not be removed until the compacted fill has reached such a level as to render support unnecessary. It shall then be removed as filling proceeds, but they may be left in trenches or other excavations, as directed by the Engineer. Any damage arising from the collapse of trenches must be made good. No material shall be used for filling under the carriageways and footways without prior approval of the Engineer.

### Shoring and support timber

**6. KERBS, FOOTWAYS AND PAVED AREAS**

All works for kerbs, footways, and paved areas are to be carried out in accordance with the latest requirements of Series 1100 of the Specification for Highway Works:-

**General**

And the following:-

Drawings showing details of proposed kerbs, footways and paved areas shall be submitted to the Engineer prior to commencement of the works.

**Drawings**

Concrete kerbs are to be laid to correct line and level on a preformed bed of concrete kerb race, 150mm minimum thickness unless otherwise directed by the Engineer. The concrete is to be carried up the back of the kerbs to within 100mm of the top face for a width of 150mm to form a haunch.

**Laying Kerbs**

Kerbs are to be laid so that joints between kerbs are not greater than 2 - 3 mm in width. Wider gaps may be accepted if kerbs are laid in cold conditions, this to be agreed with the Engineer.

**Joints**

Joints shall be provided in kerbs, channels, edgings and backing, which are laid on or adjacent to a concrete pavement to coincide with the pavement transverse contraction, warping and expansion joints. (For jointing details see Clause 1101.3 of the Specification for Highway Works)

**Concrete pavements**

The surface level of units of kerb, channel, edging and quadrant shall not deviate from the design level  $\pm 6$  mm, nor shall the longitudinal surface regularity deviate more than 3 mm in 3 m when checked with a 3 m straight edge.

**Tolerance**

Where kerbs and/or edgings are found to be out of tolerance that whole length of kerbing/edging is to be removed and re-laid in accordance with the specification.

**Rectification**

For all curves up to 12 metre radius, circular kerbs are to be used and laid true to radius. Curves between 12 metres and 20 metres radius, are to be formed using 450mm straights. Curves in excess of 20m radius are to be formed using full length straight kerbs

**Radii**

Kerb face shall be as specified in STANDARD CONSTRUCTION DETAILS, GENERAL REQUIREMENTS FOR KERBING, CHANNELLING & EDGING. Where special kerbs are used, the kerb face shall be as directed by the Engineer

**Kerb Face**

**CHANNEL BLOCKS**

Channel Blocks 150mm x 150mm (125mm) are to be used when channel gradients are;

- A. between 1.25% (1 in 80) and 0.67% (1 in 150)
- B. or greater than 10% (1:10) ( to prevent scour )

Combined drainage and channel units are to be used when channel gradients are less than 0.67% (1 in 150)

Channel blocks shall abut the front face of kerbs, shall be laid to correct line and level on a 150mm thick bed of concrete, and shall

**Laying**

be properly bonded to the concrete used in the kerb foundations.

(SEE STANDARD CONSTRUCTION DETAILS, GENERAL REQUIREMENTS FOR KERBING, CHANNELLING & EDGING)

Where the kerb radius exceeds 12 metres, channel blocks shall be 450mm in length, but where the radius is less than 12 metres they shall be 300mm in length.

**Radii**

Joints between blocks are not to exceed 2mm in width and are to be properly grouted with cement mortar (for specification see page 8).

**Joints**

## **COMBINED KERBING AND DRAINAGE UNITS**

Combined kerbing and drainage units are to be laid in accordance with manufacturers' instructions.

## **DAMAGE TO KERBS etc.**

Should any damage be done to the finished kerbs, edgings, channel blocks or combined drainage units, or should any movement of the blocks take place during the execution of the works or during the maintenance period, the Contractor shall take out and make good the lengths so affected, including all associated works. New concrete bed and haunch is to be provided for kerbing, edging, channel blocks and combined kerbing and drainage units

**Damage**

**7. FLEXIBLE CARRIAGEWAY AREAS**

All road pavements are to be built in accordance with the latest requirements of the following Series of the Specification for Highway Works:-

700 : Road Pavements General

800 : Road pavements-Unbound, Hydraulically Bound and other materials

900 : Road pavements-Asphalt Bound Materials

1100: Kerbs Footways and Paved Areas

and the following:-

Drawings showing details of proposed road pavement works shall be approved by the Engineer prior to commencement of the works

**GENERAL**

**Drawings**

**BITUMINOUS**

All bituminous materials shall be laid and compacted in accordance with the requirements and recommendations for laying in BS 594987:2015+A1:2017, as appropriate.

All materials shall be placed and spread evenly.

All material shall be spread using a paving machine or a spreader box operated with a mechanism that levels off the material to an even depth. In cases where the Engineer considers that the extent of the work does not warrant the use of mechanical equipment, he may allow hand spreading. In such cases, every precaution should be taken to minimise segregation and to avoid contamination of the material.

**British Standard  
for Asphalt  
Materials**

**Spreading**

The Contractor shall, in his choice of permitted materials for sub-bases, have regard to the nature of those materials and of the sub-grade or any other capping and need to protect them from deterioration due to the ingress of water, the adverse effects of weather and the use of construction plant. The Contractor shall programme the laying and compaction of the sub-base and the subsequent pavement courses and take such steps as may be considered necessary, to afford protection to the sub-base and sub-grade.

**Choice of  
permitted  
materials for sub-  
base**

Compaction shall comply with BS 594987:2015+A1:2017. (Please refer to tables for delivery & rolling temperatures of asphalt extracted from BS 594987:2015+A1:2017 on pages 28 & 29) Asphalt materials shall be laid and compacted in layers which enable the specified thickness, surface level, regularity requirements and compaction to be achieved. Compaction shall be substantially completed before the temperature falls below the minimum rolling temperatures stated in BS 594987:2015+A1:2017

**Compaction of  
asphalt materials**

Rolling shall continue until all roller marks have been removed from the surface.

Asphalt materials should normally be rolled in a longitudinal direction, with the driven rolls nearest the paver. The roller shall first compact material adjacent to joints and then work from the lower to the upper side of the layer, overlapping on successive

passes by at least half the width of the rear roll or, in the case of a pneumatic tyred roller, at least the nominal width of one tyre.

The rolling pattern should be such as to ensure that compaction is as uniform as possible across the road width. In order to achieve this, at least half of the roller passes should be along the edge of the layer.

Rollers shall not be permitted to stand on warm compacted materials.

The recommended roller for all carriageway works shall be BM130 or TV130 or similar approved.

Regulating courses, which may consist of one or more layers of asphalt material, shall have their finished surfaces laid to achieve the appropriate tolerances for horizontal alignments, surface levels and surface regularity, for pavement layers.

Unless otherwise advised in writing by the Engineer, base or binder course macadam can be used for regulating immediately below the surface course. Asphalt materials used shall meet the requirements of the appropriate material as specified.

Where the total depth of regulating course exceeds 150mm then the course shall be laid so that each regulating layer has a compacted thickness of between 75mm and 150mm.

Where any pavement layer does not comply with the specification for regularity, surface tolerance, thickness, texture depth, material properties or compaction, the full extent of the area that does not comply with the specification shall be made good and the surface of the pavement course shall be rectified in the manner described in later paragraphs for each section separately.

Reclaimed asphalt materials may be used in production of asphalt base (roadbase), binder course and surface course. Advice on the types of reclaimed asphalt materials permitted can be obtained from the Engineer

Should any asphalt material become contaminated, The Contractor shall make it good by cleaning it by jet washing. If this proves impractical, the full depth of the top layer as laid shall be removed and be replaced with fresh material laid and compacted in accordance with the Specification.

Reinstatement of openings shall comply with the "Specification for the Reinstatement of Openings in Highways" issued by the Highway Authorities and Utilities Committee. Immediately before asphalt layers are reinstated, the edges of the existing material shall be cleaned of all loose material and be coated with an appropriate hot binder, or equivalent treatment (see Joints in Flexible Surfacing on page 30)

## **Stationary Rollers**

### **Recommended rollers**

### **Regulating**

### **(Tolerances)**

### **(Materials)**

### **(Compacted thicknesses)**

### **Rectification**

### **Reclaimed asphalt materials**

### **Cleanliness of laid bituminous layers**

### **Reinstatement of paved areas**

## SUB-BASE

All road pavements (unbound materials) are to be built in accordance with the latest requirements of Series 800 of the Specification for Highway Works.

and the following:-

The delivery of the material shall be co-ordinated with the rate of laying to avoid interruption to the laying process.

Material up to 225mm compacted thickness shall be spread in one layer so that after compaction the total thickness is as specified.

Material of compacted thickness greater than 225mm shall be laid in two or more layers and the minimum compacted thickness of any such layer shall be 110mm. Where layers of unbound material are of unequal thickness the lowest layer shall be the thickest layer

The sub-base material, at appropriate moisture content, shall be compacted to the requirements set out in the Specification for Highway Works, table 8/4.

Tolerances are +10mm -30mm.

Materials shall be compacted with vibrating rollers without drying out or segregation so that when tested they achieve 93% of the density when compacted in accordance with BS 1377-4:1990. This shall be measured in-situ using a calibrated nuclear density meter at a rate of 1 test per 50 linear metres of carriageway.

Prior to laying the bituminous material the surface of the sub-base shall not have a rut exceeding 10mm measured using a 3m straight edge.

The sub-base shall also be tested for site bearing capacity using dynamic plate loading - lightweight deflectometer tester (previously calibrated against static plate bearing apparatus for the type of aggregate under test.

Frequency of testing to be 1 per 20m per layer (or material type) per day

Plate bearing 1 per 100m (min 2 per site)

The surface of any layer of material shall on completion of compaction and immediately before overlaying be well closed, free from movement under compaction plant and from ridges, cracks, loose material, pot holes, ruts or other defects. All loose, segregated or otherwise defective areas shall be removed to the full thickness of the layer, and new material laid and compacted.

The top 110mm shall be scarified, reshaped with material added or removed as necessary, and re-compacted. The area treated shall be not less than 20m long and 2m wide.

## GENERAL

### Delivery

### Compaction

### Rectification (Refer to General section on page 23)

## BASE (ROADBASE)

All road pavements (asphalt bound materials) are to be built in accordance with the latest requirements of Series 900 of the Specification for Highway Works.

and the following:-

Base (Roadbase) material shall be spread over the sub-base and rolled so as to give the compacted thickness required by Clause 901 of the Specification for Highway Works, and BS 594987:2015+A1:2017 .

Where more than one layer of material is required each layer shall be thoroughly compacted to the correct levels and profile before the material for a subsequent layer is spread.

With coated macadam or asphalt bases (roadbase), the full depth of the top layer as laid shall be removed and replaced with fresh material laid and compacted in accordance with the Specification. Any area so treated shall be at least 5m long and the full width of the paving laid in one operation. Alternatively for low areas in asphalt base (roadbase) to be overlaid with binder course, the Contractor may make up the level with additional binder course material.

## SURFACING

The consolidated thickness of the respective layers of coated materials for the surfacing of carriageways, as previously specified, shall be as indicated in the Standard Construction Details.

The spreading and initial compaction of surfacing material shall be carried out by an Asphalt Finisher unless otherwise agreed in writing with the Engineer.

Laying shall comply with Clause 6.3 of BS 594987:2015+A1:2017. Final compaction shall be completed as described below, shall satisfy the requirements as set out in BS 594987:2015+A1:2017 and shall conform to the levels and cross-sections specified.

Any results falling below 93 PRD will be deemed to have failed.

The coated material, shall be spread to the correct thickness by means of heated tools, and should satisfy the requirements as set out in Clause 6.4 of BS 594987:2015+A1:2017 . Final compaction shall satisfy the requirements set out in BS 594987:2015+A1:2017 and shall conform to the levels and cross-sections specified.

Narrow strips remaining alongside machine work, if laid by hand, shall be rolled at the same time as the machine laid work, with allowance being made for extra surcharge to and compaction of the hand laid material.

The method of laying shall ensure that air voids of:-

Asphalt Concrete

Shall be in the range of 2% to 8%.

**General**

**Compaction**

**Rectification  
(Refer to General  
section on page  
23)**

**Thickness of  
Layers**

**Spreading and  
compaction of  
Coated Materials  
Machine Laying**

**Minimum  
Percentage  
Refusal Density**

**Hand Laying**

**Air voids**

Not more than 1 in 10 results will be permitted above 8% and no result is allowed over 10%.

Compacted Hot Rolled Asphalt material

Shall be in the range of 2% to 6%.

Not more than 1 in 10 results will be permitted above 6% and no result is allowed over 8%.

Material tipped from delivery lorries shall be properly turned and spread to ensure that the material at the bottom of the heap as it falls from the lorry is not left undisturbed.

**Tipping from lorries**

During the whole of the operation, every precaution shall be taken to avoid segregation and to prevent the material becoming contaminated with dust or other foreign matter by the provision of sheeting.

**Segregation and Contamination**

After compaction, the thickness of the surfacing shall measure not less than that specified. The Contractor shall ensure that the specified thickness is laid over the whole area, and, where required by the Engineer, he shall open out sufficient areas of surfacing, each area to measure not less than 300mm square or drill cores to enable actual thicknesses to be ascertained by direct measurement.

**Compacted thicknesses**

In two course work, the thickness of each course shall measure not less than the specified minimum.

Surface courses and binder courses shall have the full depth of the course removed, and replaced with fresh material laid and compacted in accordance with the Specification. The area rectified shall be the full width of the paving laid in one operation, and at least 5m long if binder course, or 15m long if surface course.

**Rectification (Refer to General section on page 23)**

### **BINDER COURSE**

The surface of the binder course shall be thoroughly cleaned of dirt, mud and all other foreign matter by power washing prior to the laying of the surfacing course.

**Preparation of Binder course**

Unless the Engineer rules otherwise, a tack coat of Class K1-40 bitumen emulsion shall be applied to the binder course at the rate of 0.35 to 0.6 l/m<sup>2</sup> and allowed to "break" (turn from brown to black) unless applied by integral spray bar on the paver, before laying the surface course. The emulsion shall not be allowed to accumulate in hollows but shall be dispersed by brushing. The emulsion shall comply with BS 434-1:2001+A1:2016.

**Tack coat**

A tack coat shall be applied to all separate bituminous layers

No traffic shall be allowed on the carriageway during the period between the application of the tack coat and the laying of the surface course.

A reapplication of tack coat may be required if the original application has been stripped by over-running by delivery wagons etc.

Delivery and rolling temperatures are shown in BS 594987:2015+A1:2017 and below.

**DELIVERY AND ROLLING TEMPERATURES**

**Table A.1 Minimum delivery and rolling temperatures for recipe AC, HRA & SMA mixtures**

Material type		Binder grade	Minimum temperature °C	
			On arrival <sup>A)</sup>	Immediately prior to rolling <sup>B)</sup>
AC <sup>C)</sup>	Open surf and bin	160/220	95	75
		250/330	85	65
	Close, fine, medium, dense surf	70/110	130	100
		100/150	120	95
Dense bin, base <sup>D)</sup>	40/60	160/220	110	85
		250/330	100	80
	70/100	130	100	
		125	95	
100/150	120	90		
	110	80		
HRA	Surf <sup>E)</sup>	30/45	140	110
		40/60	140	110
		70/100	125	90
		100/150	120	85
	Reg, bin, base	30/45	130	105
		40/60	130	105
		70/100	125	90
		100/150	120	85
SMA	Surf, reg, bin	40/60	130	100
		70/100	125	90
		100/150	120	85

A) In the lorry within 30 min after arrival on site.

B) Greater compactive effort is required to achieve acceptable air void content as temperatures approach the lower limit.

C) For slag mixtures, temperatures may be 10°C lower than the recommended values.

D) Requirements for temperatures for substantial completion of rolling of designed bin and base asphalt concretes are given in Table 5 below.

E) Requirements for temperatures for substantial completion of rolling when applying chippings to HRA are given in Table 4 below.

*NOTE Temperatures for the supply, laying and compaction of low-temperature warm mix and other reduced temperature asphalts are outside the scope of BS 594987:2015+A1:2017 .*

**Table 4 Minimum rolling temperature HRA mixtures**

Paving grade bitumen	Minimum rolling temperature °C
30/45	90
40/60	85
70/100	80
100/150	75

*NOTE: When using modified bitumen or additives, different temperatures might be applicable.*

**Table 5 Minimum rolling temperatures for designed AC dense, heavy-duty and high-modulus binder course and base (including EME2)**

Paving grade bitumen	Minimum rolling temperature °C
160/220	60
100/150	75
70/100	90
40/60	105
30/45	110
10/20 or 15/25	110

*NOTE 1 Delivery temperatures and rolling temperatures for mixtures other than designed heavy-duty, high-modulus and dense base and binder course AC are given in Table A.1.*

*NOTE 2 Care should be taken to guard against surface cracking occurring as a result of rolling temperatures close to the appropriate minimum temperature. Finishing rolling may be carried out at a temperature below that given in Table 5, but no vibration should be employed.*

*NOTE 3 Rolling should normally be in a longitudinal direction, with the driven rolls nearest to the paver. The roller should first compact the asphalt adjacent to the joints and then work from the lower to the upper side of the layer overlapping on successive roller passes. To achieve uniform compaction, at least half of the roller passes should be along the edges of the layer. The positions at which the roller reverses should be staggered.*

*NOTE 4 Rolling asphalt when it is at an unduly high temperature can result in excessive displacement and cause smooth textures.*

## **Inclement and cold weather working**

### **General**

Laying shall be carried out with due regard to ambient weather conditions so that materials can be properly compacted. If weather conditions are such that the performance of the pavement may be jeopardised, discontinue all operations.

Laying of asphalt materials shall not be carried out if freestanding water is present on the surface to be covered. Laying should also be avoided as far as is practicable during heavy rain. If the wet weather threatens to be prolonged, laying of the coated macadam should be suspended.

### **Rain and standing water**

For cold weather working a minimum of 24 hours' notice is required by the Engineer and generally the following shall apply:-

### **Cold weather working**

Material for use in road pavements shall not be laid on any surface which is frozen or covered with ice or snow.

No road pavement material in a frozen condition shall be incorporated in the Works but it may be used if acceptable when thawed out.

Laying of materials containing bitumen binders shall be carried out with due regard to ambient weather conditions so that materials can be properly compacted. Laying shall cease when the air temperature reaches 0 °C on a falling thermometer, except in calm dry conditions, when laying shall cease if the air temperature reaches -3 °C on a falling thermometer.

When the surface on which asphalt is to be laid is dry and free from ice, laying may proceed at air temperatures at or above -1 °C on a rising thermometer, and only if compaction can be substantially completed before the asphalt cools below the temperature (see also Clause 945 of the SHW).

Additionally, unless the temperature of the surface to be covered is 5°C or more, rolled asphalt surface course shall not be laid when the air temperature in the shade falls below 6°C. Laying operations below this air temperature may be allowed at the discretion of the Engineer

### **Joints in Flexible Surfacing**

When laying new material abutting freshly laid or old material care shall be taken to secure good adhesion between joints by cutting back the exposed joint, for a distance equal to the specified layer thickness, to a vertical face, discarding all loosened material and coating the vertical face completely with a suitable hot bitumen, or cold applied polymer modified intermediate or premium grade bitumen emulsion.

### **Abutting freshly laid or old material**

Further details for:-

- |  |                       |
|--|-----------------------|
| Conventional Streets and Shared Spaces | are given in a) below |
| Principal Streets                      | are given in b) below |
| Patches (all patches)                  | are given in c) below |
| Bituminous emulsion specification      | shown in d) below     |

Manhole covers, kerbs, channels, gullies and similar projections against which asphalt materials are to abut shall be cleaned and painted with a thin uniform coating of 50(40/60) or 85(70/100) Pen hot bitumen or, if approved in writing by the Engineer, cold applied thixotropic bitumen compound of similar grade, before the coated macadam is laid as indicated below. The new material shall be tamped around and against such projections so that, after final compaction, the finished surface shall be left flush or not exceeding 6mm above such projections. Manhole covers and similar fittings shall be adjusted to the correct levels before the surface course is laid.

## Other vertical faces

- |   |   |
|---|---|
| a) On Conventional Streets and Shared Spaces        | The longitudinal centre line joint will require sealing with hot run bitumen or an approved thixotropic cold compound   |
| b) On Principal Streets and Industrial Estate Roads | All vertical joints to be sealed, kerb faces up to the finished water line and all iron work to be painted with hot run bitumen                               |
| c) Patches (all patches)                            | Vertical joints to be painted with hot run or approved cold compound for all patches in all categories of roads and footpaths - minimum size of patch 2m x 2m |
| d) Specification for joints                         | To comply with BS 594987:2015+A1:2017 Clause 6.8 (40/60) or (70/100) penetration hot run bitumen  |

## OR

if approved in writing by the Engineer, cold applied thixotropic bitumen compound of similar grade

e.g. COLAS (BITUKOLD)

- Bitumen cold joint primer or other similar approved

Trafficking of asphalt base (roadbase) or binder courses may be permitted for a period of time before the surface course is laid. They should be blinded with coated grit that shall be carried out either by hand or mechanically with bituminous grit as specified with due regard being paid to the following :-

- (a) On Principal Streets, Conventional Streets and Industrial Estate Roads limestone and blast furnace slag aggregates are not allowed, and permitted aggregates shall have a minimum PSV of 55 if they are not to be covered within 6 weeks.
- (b) On Shared Spaces, limestone and blast furnace slag aggregates are not permitted in if the gradient exceeds 10% (1:10).
- (c) If temporary trafficking causes polishing to the extent that a satisfactory skid resistance is not maintained then the skidding resistance should be restored to a satisfactory level by surface dressing using chippings of minimum PSV of 55, or the application of other surface treatment as approved in writing by the Engineer.

## Trafficking of asphalt Base(Roadbase) and Binder Courses

## Tolerance in surface levels of pavement courses

Road surface	± 6mm except immediately adjacent to gullies surface water channels and manholes where it shall be +6mm/ - 0mm
Binder course	± 6mm
Base(roadbase)	± 8mm
Sub-base	+ 10mm/ -30mm when under base (roadbase), otherwise + 10mm
Formation	+ 20mm/ -30mm

Surface levels shall be checked for compliance with the tolerance requirements using the method described in paragraph 702.4 of the Specification for Highway Works. To meet the requirements, no measurement shall exceed the permitted tolerance.

The finished surface shall be tested with a 3 metre long straight edge, laid longitudinally

### For machine laid

**Surface courses**, the maximum depression under a 3 metre long straight edge shall not exceed 3mm

**Binder courses**, the maximum depression under a 3 metre long straight edge shall not exceed 6mm

### For hand laid

**Surface courses**, the maximum depression under a 3 metre long straight edge shall not exceed 6mm

**Binder courses**, the maximum depression under a 3 metre long straight edge shall not exceed 9mm

Where these figures are exceeded the material shall be treated in accordance with the requirements for Rectification shown for:-

SUB BASE on page 24

BASE (ROADBASE) on page 25

SURFACING on page 25

**NOTE: See separate requirements for Block Paving below**

## BLOCK PAVING

Shall be in accordance with the requirements of and recommendations in BS 7533 and BS EN 1338:2003 except where it is varied by the project specification.

**British standards  
for block paving**

All block paving is to be built in accordance with the latest requirements of the Specification for Highway Works:- Clause 1107 and the following:-

**GENERAL**

**Unless agreed in writing with the Engineer, all block paving shall be concrete block paving**

Pencil edge, fine line or mini-chamfer blocks shall be used

For carriageway construction, sub-base shall be granular type 1 material in accordance with the Specification for Highway Works

Where the sub-base is to be subjected to residential traffic, a 50mm thick course of AC20 dense bitumen binder course shall be laid on top of the sub-base to provide a running surface and protection to the sub-base

Where block paving is to be used for carriageway construction, The Contractor shall also refer to the following sections of this document: -

Page 2 - Section 1 INTRODUCTION (Assumed CBRs)  
and (Frost susceptible sub-grade)

**Sub-grade and  
Sub-base**

Page 4 - Section 2 MATERIALS - ROAD PAVEMENTS  
Page 22 - Section 7 FLEXIBLE CARRIAGEWAYS - SURFACING

**Sub-base and  
Binder course**

The sub-grade, sub-base and binder course shall be prepared so that:-

- (a) the surface levels are within the tolerances given in table 1 below
- (b) the longitudinal falls and crossfalls are such that no depressions hold water

Minimum recommended gradients:-

Longitudinal fall;            1.25% (1:80)

Crossfall;                      2.50% (1:40)

- (c) the surface is tight and dense enough to prevent laying course (sand layer) material being lost into the lower layers during construction and use;
- (d) provision is made to:
  - (1) drain water from any abutting laying course, e.g. by installation of drainage when the laying course is on impermeable foundations;
  - (2) prevent migration and loss of laying course material into the drainage system, e.g. by using a geotextile;

The extent of the site prepared for block laying shall include enough room to provide adequate foundations and backing for any

**Edge restraints**

edge restraint.

Edge restraints should be adequate to support traffic loads and to prevent loss of laying course material from beneath the surface course. Examples are kerbs, combined kerbs and channels, established structures or rigid abutments such as paving blocks fixed vertically, bedded on and haunched with concrete.

Do not vibrate the surface course until the edge restraint, together with any concrete haunching, has gained sufficient strength

Are to be found in Section 14

**Standard  
Construction  
Details**

### **LAYING COURSE (SAND BEDDING LAYER)**

Laying course (and jointing material) shall be naturally occurring sand in accordance with the recommendations given in BS 7533-3:2005+A1:2009 and extracted Tables D.1 to D.4 at the end of this section.

**Material**

The moisture content of the laying course should be as uniform as possible and the material should be moist without being saturated.

**Moisture content**

All material to be used must be stockpiled under a cover.

**Stockpiling**

Construct the laying course so that after compaction it forms a layer approximately 35mm thick below the paving blocks.

**Screeding**

Where closer tolerances than those given in table 1 below for the level of the sub-base have been achieved, or where a binder course has been used, a thinner laying course can be used. However, in no case should the material be less than 25mm thick at any point.

The object of screeding the laying course is to produce a uniform surface, to the specified design profiles and falls, at a uniform degree of compaction. When setting up screeding rails, allowance should be made for the subsequent compaction of the laying course.

If any disturbance of the prepared laying course by pedestrian or wheeled traffic occurs, prior to placing paving blocks, re-screed areas of laying course material.

Construct the laying course the preferred method described below:-

### **LAYING METHOD**

Spread the material loose in a uniform layer to approximately the required final depth below the surface profile. Compact this layer using a vibrating plate compactor. Spread a further layer of material about 15mm thick and screed it to create a loose surface on which the paving blocks can be placed.

**Pre-compaction**

The pre-compaction method is preferable because it helps to ensure uniform density and compaction of the laying course and hence improves surface tolerances.

Where a nominal compacted thickness of 35mm is to be used, if

**Trial areas**

previous experience of a particular material is lacking, a small trial area will be needed to determine the allowance.

The area of laying course prepared should generally be such that its boundary is not less than 1m ahead of the laying face, except at the end of the working period when the boundary should be no more than 1m ahead of the laying face.

### **Block laying boundaries**

The working edge should be protected overnight and it may be necessary to remove an area of blocks prior to screeding for the day's operation.

Table1. Tolerances on surface levels

Layer of pavement		Maximum permissible deviation from design level
Sub-layer	sub-base	+/- 20mm
	binder course (roadbase)	+/- 15mm
Surface course	overall	+/- 6mm
	flatness	10mm under a 3m straight edge 2mm between adjacent blocks
	adjacent to gullies, surface drainage channels and outlets (see note)	+ 6/- 0

## LAYING PAVING BLOCKS

Lay paving blocks so that the surface levels are within the tolerances given in table 1. Make minor adjustments to maintain the bond pattern and ensure that the joints remain wide enough for sand filling

### Surface Course

Details of the bond pattern should be agreed before commencement. Where rectangular blocks are being used in areas subject to vehicular traffic, 45° herringbone bond should be used to minimise creep and to ensure better radial distribution of wheel loads.

### Bond pattern

Follow an order of laying which maintains an open working face and does not trap paving blocks. The first row of blocks should be aligned against the edge restraint or by using a straightedge or string line. Check the alignment of blocks periodically, e.g. by using string lines, and make adjustments where necessary.

### Order of Laying

#### NOTE

Block paving is designed to function with sand-filled joints, which will normally lie in the range of 2mm to 5mm when placed hand tight. The joint width will be influenced by block shape and bond pattern

Lay whole paving blocks first, followed by closures. Complete the area to be laid, as far as possible using whole blocks. Where appropriate, incorporate block shapes designed to assist with the formation of boundaries and with changes in direction. Complete infilling before compaction commences.

### Infilling

Wherever possible, infilling to boundaries and obstructions should be completed as the laying of the surface course proceeds.

Trim paving blocks to shape and size to form boundaries. Do not insert pieces of a size less than one-third of a full block. This can often be achieved by altering the bond pattern slightly at the edges of the paving and trimming some of the paving blocks inboard of the edge blocks.

### Trimming

To work round any obstructions, cut the paving block as necessary to fill in any irregular shape.

### Obstructions

Fully compact the surface course using a plate compactor with a plate area of not less than 0.25m<sup>2</sup>, transmitting an effective force of not less than 75kN/m<sup>2</sup> of plate at a frequency of vibration in the range 75Hz to 100Hz. Alternatively, use any compacting equipment which will achieve the same degree of compaction or better. It is important to fill the lower portion of the block-to-block joint with the laying course material. Carry out compaction as soon as possible after laying but not within 1m of any laying face. Apart from this edge strip, do not leave any area of paving uncompacted at the completion of the day's work

### Compaction of Block Paving

Ensure that the finished surface levels are within the tolerances given in table 1 above.

The contact area of a plate compactor may be measured by standing the plate on a flat smooth level surface and sliding a piece of card in from both front and rear until it meets the position where the plate touches the ground.

## Measuring contact area of plate compactor

After compaction of the surface course, spread sand or crushed rock fines over the surface and brush it into the joints. Materials complying with the grading in table 2 below shall be used. Do not use a sand which might stain the pavement surface, if this is an important consideration.

## Joint Filling

NOTE.1. Filling between the joints is very important. It interlocks the paving and helps impart static load bearing characteristics. The use of dry material will assist in rapid joint penetration.

Vibrate the block paving to ensure complete filling of the block-to-block joint by the surface-applied sand. Where necessary add further sand and re-vibrate the paving. Complete joint filling and final compaction as soon as practicable after laying.

NOTE.2. Where block paving is to be used by industrial vehicles imposing exceptionally high point loads, it is advisable to further compact the entire pavement after joint filling.

NOTE.3. Concrete blocks should not be vacuumed for at least three weeks after laying in order to reduce the risk of jointing sand being lost.

It may be necessary to provide joint stabilisation compound and block surface sealants at the discretion of the Engineer. Table 2 - Laying course sand etc.

The surface course shall be inspected after an early period of traffic use and additional sand filling brushed in where necessary

## Early Trafficking

**Tables D.1 to D.4 from BS 7533-3:2005+A1:2009**

Table D.1 - Laying course application

Laying course material category	Application
I*	Pavements receiving severely channelized traffic, aircraft pavements and bus stations Industrial pavements Loading bays
II	Adopted highways and other roads Petrol station forecourts Pedestrianization projects regular heavy trafficking Car parks receiving some heavy traffic Footways regularly overridden by vehicular traffic
III	Pedestrianization projects receiving only occasional heavy traffic Car parks receiving no heavy vehicles
IV	Private drives Areas receiving pedestrian traffic only Footways likely to be overridden by no more than occasional vehicular traffic

\* In addition for Category I sand the resistance to wear should be measured in accordance with D.1.3 of BS 7533 and be less than the values therein.

Table D.2 - Grading for laying course material for conventional pavements  
[BS EN 12620:2002+A1:2008 G<sub>F</sub>85 0/4 (MP) fine aggregate]

Sieve size mm	Percentage by mass passing %	Change from untreated sample (max.) [%]
8	100	-
6.3	95 - 100	-
4	85 - 99	-
0.5	30 - 70	-
0.25	-	+20
0.125	0 - 5	+10
0.063 (fines content)	See Table D.3	-

NOTE: Sands should be graded by washing, decanting and dry sieving in accordance with BS EN 933-1:2012

Table D.3 - Fines content of laying course material for conventional pavements

Laying course material category	I*	II	III	IV
Percentage by mass passing 0.063mm	1.0	1.5	3.0	4.0
BS EN 12620:2002 fines content category	$f_{1.0}$	$f_{1.5}$	$f_3$	$f_4$

\*See section D1.3 of BS 7533

Table D.4 - Grading for jointing material for conventional pavements  
[BS EN 12620:2002+A1:2008 G<sub>F</sub>85 0/1 (FP) fine aggregate]

Sieve size mm	Percentage by mass passing %
2	100
1	85 - 99
0.5	55 - 100
0.063 (fines content)	0 - 2 (BS EN 12620:2002 fines category $f_2$ )

**8. FOOTWAYS AND VEHICLE CROSSINGS**

**GENERAL**

All footways and vehicle crossings are to be built in accordance with the latest requirements of Series 1100 Kerbs Footways and Paved Areas of the Specification for Highway Works:-

and the following:-

Drawings showing details of proposed footways and vehicle crossings areas shall be submitted to the Engineer prior to commencement of the works.

**Drawings**

**FOOTWAY EDGING**

Precast concrete edgings as previously specified shall be laid closely jointed between footpath surfaces and verges or elsewhere if directed by the Engineer. The edgings shall be solidly bedded on concrete 100mm thick and haunched (both sides) with 75mm thick concrete so as to ensure that it does not move during the footpath construction and shall be laid to correct alignment and level.

**Fixing**

The surface level of units of kerb, channel, edging and quadrant shall not deviate from the design level  $\pm 6$  mm, nor shall the longitudinal surface regularity deviate more than 3 mm in 3 m when checked with a 3 m straight edge.

**Tolerance**

Where kerbs and/or edgings are found to be out of tolerance that whole length of kerbing/edging is to be removed and re-laid in accordance with the specification.

**Rectification**

The Contractor shall be responsible for rectifying any movement that occurs prior to and during the maintenance period.

**FOOTWAYS AND HARDENED MARGINS**

The sub-base for both footways and hardened margins are to be formed with Type 1 sub-base material complying with BS EN 13285:2010 and Clause 803 of the Specification for Highway Works, properly compacted. The completed surface shall be free from irregularities and loose material and is to be true to cross section, line and level.

**Sub-Base**

Note; Sub-Base is to extend under concrete bedding for kerbs and edgings.

**ASPHALT MATERIALS**

Binder courses for asphalt footways shall be dense binder course that shall be laid in accordance with BS 594987:2015+A1:2017 .

**Binder course**

6mm size Dense Surface Course that shall be laid in accordance with BS 594987:2015+A1:2017 and laid evenly on the binder course to give a minimum compacted thickness of 25mm. Where the surfacing abuts kerbs, the final surface shall be between 2mm and 3mm proud of the top of the kerb and shall be true to level and the required crossfall (3% min - 4% max).

**Surface Course for Footways**

Compaction shall comply with BS 594987:2015+A1:2017. (Please refer to tables for delivery & rolling temperatures on pages 28 & 29)

The recommended roller for all footway and footpath works shall be a double drum vibratory roller TV75, BW75ADL (articulated) or similar approved.

### **Compaction of asphalt materials**

### **Recommended rollers**

**FLAGS**

It may be necessary to lay a bonding course to avoid "creep" in large areas on steep gradients.

Bonded courses of flags properly bedded on the prepared base with a 10mm sand and cement mortar bed, closely jointed, and driven into position with a heavy maul. The outer edge of flags, where the footway abuts kerbs, is to be kept level with the latter and the footway shall be laid true to level and required crossfall. The flags shall be laid in courses at right angles to the kerbs.

**BLOCK PAVING**

Block paving may be used as an alternative i.e. 60mm thick blocks (e.g. Pencil Edge, Fine line, Chamferless or Mini-chamfer as approved) on 35mm compacted sand on 150mm of Type 1 sub-base complying with BS EN 13285:2010 and Clause 803 of the Specification for Highway Works.

**VEHICLE CROSSINGS**

Footway Vehicle Crossings subjected to more than private car traffic shall be constructed to the same specification as the adjacent carriageway. Footway vehicle crossings subjected to private car traffic only shall be constructed in accordance with the Standard Details.

**PEDESTRIAN CROSSINGS**

Dropped kerbs to facilitate the passage of wheelchairs and prams, shall be installed at all road junctions and other pedestrian crossing points, as directed by the Engineer. They shall be laid flush and constructed in accordance with the Standard Details.

Blister tactile paving may also be required as directed by the Engineer. Where tactile paving is used it must comply with the recommendations in "*Guidance on the use of Tactile Paving Surfaces*" or succeeding guidance document.

**LAYING AND COMPACTION OF ASPHALT MATERIALS**

Materials shall be compacted as soon as rolling can be effected without causing undue displacement of the material and at no less than the minimum rolling temperature. The material shall be uniformly compacted by an appropriate roller capable of meeting the air void requirements across the full width.

**Compaction**

The method of laying shall ensure that air voids of compacted asphalt materials shall be in the range of 2% - 8%.

**Air voids**

Not more than 1 in 10 results will be permitted above 8% and no result is allowed over 10%.

Delivery and rolling temperatures to be in accordance with the tables shown on pages 28 & 29.

**Delivery and rolling temperatures**

**9. HIGHWAY VERGES AND PLANTING**

**GRASS AND GROUND COVER PLANTS**

All grassed and planted areas are to be built in accordance with the latest requirements of Series 3000 of the Specification for Highway Works where it does not conflict with BS 4428:1989

**General**

And the following:-

Drawings/planting plans indicating species, size, spacing/ m<sup>2</sup> with appropriate schedules and appendices shall be submitted for specific approval for the scheme prior to the commencement of works.

**Drawings**

Topsoil to comply with BS 3882:2015 figure K1 for texture and BS 1377 part 3 pH

**Topsoil**

Depth to be 450mm for shrubs, to be top quality vegetable soil maximum stone content 5% dry weight, not more than 50mm any dimension.

Soil containing Japanese Knot weed and Mares Tail and the like will be rejected.

The surface is to be cultivated down to a minimum depth of 150mm, bring to fine tilth and regulate to evenly running levels. Clear out all weeds, large stones, broken brick, perennial weeds and roots.

**Cultivation**

British conifer bark mulch containing less than 5% wood, minimum thickness of 75mm over entire planted area, supply ENMAG (or similar approved) and mix into bark at a rate of 50 g/m<sup>2</sup>

**Bark mulch and Fertiliser**

Approved fertiliser evenly distributed at not less than 68 grammes per m<sup>2</sup> (20.10.10).

Approved species of plants should be well established and free from disease, with a minimum 3 good growing points.

**Plants**

Size & spacing:-	Ground cover	200 - 300mm - 15/ m <sup>2</sup>
	Shrubs (medium)	450 - 600mm - 6/ m <sup>2</sup>
	Hedging Plants	600 - 900mm -4/Lin-m

The area is to be well maintained free from grass, weeds and litter and watered in dry weather.

**Maintenance**

**GRASS**

Nothing less than 900mm width.

**Minimum width**

Soil depth of 150mm reduced to a fine tilth, free from stones and other debris

**Topsoil**

After settlement, finished level to be 10mm above adjacent concrete edging/kerb.

**Finished level**

Approved fertiliser evenly distributed at not less than 68 grammes per m<sup>2</sup> (20.10.10).

**Fertiliser**

Low maintenance grass seed or turf shall be used.

**Seed**

During the maintenance period all verges are to be maintained in a healthy condition, free from weeds and grass verges are to be cut regularly

**Maintenance  
period**

At the end of the maintenance period there should be 100% cover of planted and grassed areas which are 97% weed free, with no dead or diseased plants.

A tree planting Specification is available on request.

**Tree planting  
Specification**

**10. STREET LIGHTING**

All street lighting works are to be in accordance with the latest requirements of Series 1300 & 1400 of the Specification for Highway Works, Sheffield City Council's document "Street Lighting and other Electrical Equipment"

**General**

And the following:-

The design and installation of street lighting schemes is normally undertaken by The Highway Authority. An early approved design which may include illuminated traffic signs is required to avoid any abortive works.

**Design**

A list of acceptable equipment is available, on request. Developers wishing to deviate from this list should discuss the matter with the Lighting Engineer at the earliest opportunity.

**Acceptable Equipment**

The installation of street lighting should be related closely to the occupation of dwellings and must not be left until the development as a whole is nearing completion.

**Installation**

Where the work is to be carried out by the Developer, the Engineer should be asked to approve the positions of the columns on site prior to erection. The Developer must make all the necessary arrangements with the Electricity Company for the connection of the supply. In accordance with "Street Lighting and other Electrical Equipment" this should ideally be a DNO. Alternatively, subject to receipt of an official order, the Highway Authority will provide and install equipment on behalf of the Developer, and make the necessary arrangements for the connection of the electricity supply.

Lighting columns should be located within the limits of the adopted highway, normally at the back edge of footway or verge. In certain instances, however, it may be acceptable to attach lighting units to buildings, for example in shared surface streets. This will normally require a way-leave agreement between the owner, Electricity Company and the Highway Authority.

**11. COMPLETION OF WORKS**

Grass verges are to be rolled during the progress of the work and during the period of maintenance, and well watered in dry weather. The Contractor shall remove and replace any areas that are not in a healthy condition, up to the end of the period of maintenance. The grass is to be cut on a regular basis and not less than 4 times in 12 months.

**Maintenance of Verges**

**CLEANLINESS OF THE SITE**

The whole of the works shall be left on completion in a clean and tidy condition.

**General**

It is an offence under Section 151 of the Highways Act 1980 to deposit deleterious material on the Public Highway. The Developer must ensure that appropriate measures for cleaning are provided within the site. It is normal for this to be a condition of the planning permission.

**Deleterious matter**

The Contractor is to cleanse the carriageway, footway and verges regularly during the progress of the works, as required during their term of maintenance and once thoroughly immediately before the termination of the maintenance period.

**Cleansing**

**PROVING DRAINS**

On completion of the works all drains, manholes and gullies shall be rodded, flushed with water and left clean and free from obstruction.

**Rodding**

After the drainage system has been cleaned a CCTV survey is to be carried out for approval by the highway authority

**CCTV Survey**

## 12. CDM REGULATIONS

Upon completion of the works (or whenever any section of the site becomes adopted) the Developer **must** supply the council with a Health and Safety File in accordance with the CDM Regulations.

**Health & Safety  
File**

The file must contain information about the project that is likely to be needed to ensure health and safety during any subsequent work such as maintenance, cleaning, refurbishment or demolition. When preparing the health and safety file, information on the following should be considered for inclusion.

- a. A brief description of the work carried out.
- b. Any hazards that have not been eliminated through the design and construction processes, and how they have been addressed (for example, surveys or other information concerning asbestos, contaminated land or buried services).
- c. Key structural principles (for example, bracing or sources of substantial stored energy including pre- or post-tensioned members) and safe working loads for floors and roofs.
- d. Hazardous materials used (for example, lead paints and special coatings).
- e. Information regarding the removal or dismantling of installed plant and equipment (for example, any special arrangements for lifting such equipment).
- f. Health and safety information about equipment provided for cleaning or maintaining any structure and the like.
- g. The nature, location and markings of significant services, including underground cables, gas supply equipment and fire-fighting services.
- h. The nature and location of any retained buried structures (and the like) along with and remedial work carried out to them.
- i. Information and as-built drawings of the development site, including any plant and equipment within the public highway (for example, the means of safe access to and from services and equipment).

There should be enough detail to allow the likely risks to be identified and addressed by those carrying out the work and be proportionate to those risks. Information must be in a convenient form that is clear, concise and easily understandable.

The file should not include things that will not help when planning future construction work, such as pre-construction information, the construction phase plan, construction phase risk assessments or contractual documents.

The Health and Safety File must be provided in an electronic format as agreed with the Engineer

## 13. MISCELLANEOUS

Street lighting, traffic signs, road markings street name plates and other street furniture shall be provided at the expense of the Developer. All these items shall comply with the edition of the relevant British Standard and Specification for Highway Works current at the time of construction and with section 10 of this document.

**Street Lighting signs etc.**

Electrical equipment should also be designed in accordance with SCC's Street Lighting and Other Electrical Equipment specification.

Traffic signs and road markings should also comply with the Traffic Signs Regulations and General Directions 2016.

Street name plates are to be erected prior to occupancy of any property.

**Street name plates**

When requested by the Engineer, grit bins shall also be provided at the expense of the Developer.

**Grit bins**

Grit Bins will generally be required on roads and/or footpaths with a gradient steeper than 1 in 12 (8%) and must be maintained and kept full of grit/salt by The Developer until adoption.

These must not obstruct the footway. This may require additional adopted land to place them on.

Further details can be obtained from the Engineer upon request.

Any retaining wall to which Section 167 of the Highways Act 1980 applies or any other retaining wall or Structure which the Developer intends to offer for adoption by the Highway Authority must be approved by the Engineer. Notes for guidance on such matters are available on request.

**Retaining Walls**

The extents of the adoptable areas are to be clearly defined to the satisfaction of the Engineer.

**Definition of Highway Boundary**

Adoptable parking areas adjacent to roads must be surfaced with a material which is not susceptible to damage by oil droppings and such surfacings should preferably be brindle coloured block paving with approved edge restraint.

**Parking Areas**

**14. STANDARD CONSTRUCTION DETAILS**

**FOOTPATHS, FOOTWAYS AND FOOTWAY VEHICLE CROSSING FOR CAR USE ONLY**

**Surface Course**

**25mm thick**

AC6 Dense Surface Course L/stone 160/220 Pen to BS EN 13108-1:2016  
AC4 Fine Graded Surface Course L/stone 160/220 Pen to BS EN 13108-1:2016 may be used if approved by the Engineer

**Binder Course**

**55mm thick**

AC20 Dense Binder Course L/stone 160/220 Pen to BS EN 13108-1:2016

**Sub-Base**

**150mm thick**

Type 1 Sub-Base to comply with the Specification for Highway Works Clause 803

The sub-grade must be free from extraneous matter. Weeds must be removed and the sub-grade sprayed with total weed killer.

**Note**

Concrete block paving may be used as an alternative i.e. 60mm thick blocks on 35mm compacted sand to BS 7533-3:2005+A1:2009 (and as described in SECTION 6 BLOCK PAVING of this specification) on 150mm thickness of Type 1 sub-base.

**Steep Gradients**

Footpaths with a gradient steeper than 10% (1 in 10) will require: -

1. Handrail (Please see engineer for details)
2. Possibly special surface treatment - required at gradients steeper than 12½% (1 in 8)

**Note :**

**The use of a single drum roller is not permitted.**

**CARRIAGEWAY CONSTRUCTION FOR INDUSTRIAL ESTATE ROADS**

**125mm kerb face – 155mm kerb face at bus stops**

**Industrial Roads**

**Surface Course**

**40mm thick**

SMA 10 Surface Course 40/60 Pen H/Stone PSV 60\* (or 14mm aggregate at the request of the Engineer) to BS EN 13108-5:2016

**OR**

HRA 45/10 High Stone Content Surface Course 40/60 Pen Steel Slag (or 14mm aggregate at the request of the Engineer) to BS EN 13108-4:2016

**Note :**

Limestone and blast furnace slag aggregates are not allowed in the carriageway surfacing course.

**Binder Course**

**70mm thick**

AC 20 Dense Binder Course 100/150 Pen H/Stone to BS EN 13108-1:2016

**Notes**

- 1 Blast furnace slag and limestone aggregate are only allowed in the carriageway binder course if it is to be covered within 6 weeks.
- 2 Coated grit will be required on all binder courses unless laid concurrently with the surface layer to BS EN 13108-1:2016

**Base (Roadbase)**

**120mm thick**

AC 32 Dense base 100/150 Pen base L/Stone to BS EN 13108 -1:2016.

**Sub-Base**

Thickness in accordance with CBR/stiffness modulus value of the sub-grade

**470mm thick**

To be laid unless site investigation indicates that a lesser thickness will suffice. Any variation is to be agreed in writing with the Engineer.

Type 1 Sub-Base to comply with the Specification for Highway Works Clause 803.

Footways are to be as previously described but footway vehicle crossings shall be constructed as the adjacent carriageway

*N.B. \* the Engineer may instruct a higher PSV at approaches to hazardous locations etc.*

**The above is to read in conjunction with Section 7 FLEXIBLE CARRIAGEWAY AREAS**

## CARRIAGEWAY CONSTRUCTION FOR PRINCIPAL STREETS

### 125mm kerb face – 155mm kerb face at bus stops

#### Surface Course

##### **40mm thick**

SMA 10 Surface Course 40/60 Pen H/ Stone PSV 60\* (or 14mm aggregate at the request of the Engineer to BS EN 13108-5:2016. A lesser thickness of SMA may also be permitted if agreed in writing with the Engineer see note 1 below)

##### **OR**

HRA 45/10 High Stone Content Surface Course 40/60 Pen Steel Slag (or 14mm aggregate at the request of the Engineer) to BS EN 13108-4:2016

#### **Note**

Limestone and blast furnace slag aggregates are not allowed in the carriageway surface course

#### Binder Course

##### **50mm thick**

AC 20 Dense Binder Course 100/150 Pen H/Stone to BS EN 13108-1:2016

#### **Notes**

- 1 If a reduction in thickness of Surface Course is approved then the Binder Course thickness shall be increased by appropriate amount.
- 2 Blast furnace slag and limestone aggregates are not allowed in the carriageway binder course unless the binder course is to be covered in 6 weeks.
- 3 Coated grit will be required on all binder courses unless laid concurrently with the surface layer to BS EN 13108-1:2016

#### Base (Roadbase)

##### **100mm thick**

AC 32 Dense Base 100/150 Pen L/Stone to BS EN 13108-1:2016

#### Sub Base

Thickness in accordance with CBR/stiffness modulus value of Sub Grade

##### **470mm thick**

To be laid unless site investigation indicates that a lesser thickness will suffice. Any variation is to be agreed in writing with the Engineer.

Type 1 Sub-base to comply with the Specification for Highway Works Clause 803

*N.B. \* the Engineer may instruct a higher PSV at approaches to hazardous locations etc.*

**The above is to read in conjunction with Section 7 FLEXIBLE CARRIAGEWAY AREAS**

**CARRIAGEWAY CONSTRUCTION FOR CONVENTIONAL STREETS**

**100mm kerb face – 155mm kerb face at bus stops**

**Surface Course**

**30mm thick**

AC 10 Close Graded Surface Course 100/150 Pen H/Stone to BS EN 13108-1:2016

**Note :**

Limestone and blast furnace slag aggregates are not allowed in carriageway surfaces courses.

**Binder Course**

**50mm thick**

AC 20 Dense Binder Course 100/150 Pen H/Stone to BS EN 13108-1:2016

**Notes**

- 1 Limestone and blast furnace slag aggregates are not allowed in the carriageway binder course.
- 2 Coated grit will be required on all binder courses unless laid concurrently with the surface layer to BS EN 13108-1:2016

**Base (Roadbase)**

**90mm thick**

AC 32 Dense base 100/150 Pen L/Stone to BS EN 13108-1:2016

**Sub Base**

Thickness in accordance with CBR/stiffness modulus value of sub-grade.

**440mm thick**

To be laid unless site investigation indicates that a lesser thickness will suffice. Any variation is to be agreed in writing with the Engineer.

Type 1 Sub-Base to comply with the Specification for Highway Works Clause 803.

**The above is to read in conjunction with Section 7 FLEXIBLE CARRIAGEWAY AREAS**

**CARRIAGEWAY CONSTRUCTION FOR SHARED SPACES**  
**WITH PROTECTED ZONE**

**100mm kerb face**

**Surface Course**

**25mm thick**

AC 6 Dense Surface Course 100/150 Pen H/Stone to BS EN 13108-1:2016

**Note :**

Limestone and blast furnace slag aggregates are not allowed in the carriageway surface courses

**Binder Course**

**50mm thick**

AC 20 Dense binder Course 100/150 Pen H/Stone to BS EN 13108-1:2016

**Note :**

Coated grit will be required on all binder courses unless laid concurrently with the surface layer to BS EN 13108-1:2016

**Base (Road Base)**

**70mm thick**

AC 32 – Dense Base 100/150 Pen L/Stone to BS EN 13108-1:2016

**Sub-Base**

Thickness in accordance with CBR/stiffness modulus value of the sub-grade

**390mm thick**

To be laid unless site investigation indicates that a lesser thickness will suffice. Any variation is to be agreed in writing with the Engineer.

Type 1 Sub-Base to comply with the Specification for Highway Works Clause 803.

**The above is to read in conjunction with Section 7 FLEXIBLE CARRIAGEWAY AREAS**

**CARRIAGEWAY CONSTRUCTION FOR SHARED SPACES WITH LEVEL SURFACE  
(i.e. MEWS AND MEWS COURTS).**

**RECTANGULAR INTERLOCKING CONCRETE BLOCK PAVING**

(Pencil Edge, Fine line, Chamferless or Mini-chamfer).

**95mm thick**

60mm thick concrete block paving complying with BS EN 1338:2003 laid on a screeded layer 35mm compacted thickness of naturally occurring sand, (and as described in SECTION 7 - FLEXIBLE CARRIAGEWAY AREAS). Method of laying to be in accordance with BS 7533-3:2005+A1:2009. Other types of block paving may be approved on request.

Unless otherwise approved the blocks shall be 200mm x 100mm.

Colours of blocks to be restricted to Natural, Red, Charcoal, and Brindle (brown, grey, red) in a combination to be agreed by the Engineer.

**Binder Course**

**50mm Thick**

AC 20 Dense Binder Course 100/130 Pen H/Stone to BS EN 13108-1:2016

**Sub-Base**

Thickness in Accordance with CBR/stiffness modulus value of the sub-grade

**340mm Thick** - To be laid unless site investigation indicates that a lesser thickness will suffice. Any variation is to be agreed in writing with the Engineer.

Type 1 Sub-base to comply with the Specification for Highway Works Clause 803

**GENERAL REQUIREMENTS FOR KERBING, CHANNELLING & EDGING**

**KERBING**

All kerbs, channels and edgings must be hydraulically pressed precast concrete to BS EN 1340:2003. Non-standard or special kerb on Mews and Mews Courts to be agreed with the Engineer.

**KERB SIZE**

125mm x 250mm half battered kerbs.

125mm x 150mm bullnose dropped kerbs (centres) on Principal Streets, Conventional Streets and Shared Spaces.

50mm x 150mm flat topped edgings for footpaths

Special kerbs as approved by the Engineer  
(Red, Charcoal, Natural or Brindle).

## **KERB FACE**

125mm on Industrial Estate Roads and Principal Streets  
100mm on Conventional Streets and Shared Spaces with Protected Zone  
30mm (or less) on Shared Spaces with Level Surface  
25mm at vehicle crossings (See typical vehicle crossing detail)  
0mm (6mm max) at pedestrian crossings

## **RADIUS KERBS**

For kerb radii up to 12m use properly formed radius kerbs.  
For radii between 12m and 20m use 450mm long, straight kerbs  
above 20m radius use 900mm long, straight kerbs

## **KERB RACE**

Concrete to be C16/20 (ST4 20.0 N/mm<sup>2</sup>) to the following dimensions:-  
275mm wide x 150mm deep for kerbing  
425mm wide x 150mm deep for kerbing and channelling together  
200mm wide x 100mm deep wet bed concrete for edgings

### **Note:**

**Concrete shall be vibrated with a vibrating poker to ensure adequate compaction**

Wet bed concrete for kerbing, channelling and string courses, to the dimensions shown above may be allowed on short sections as an alternative if agreed in writing with the Engineer.

Kerbs must be bedded on 1:4 sand/cement mortar laid a maximum of 25mm thick and a minimum of 13mm thick.

Kerbs must be properly backed with 150mm concrete as shown on the typical cross section. Edgings are to be haunched both sides with 75mm thick concrete. String courses shall be haunched both sides with 150mm thick concrete.

## **CHANNEL BLOCKS**

Hydraulically pressed concrete blocks size 150mm x 125mm (150mm) shall be used adjacent to kerbs when conditions described in SECTION 6 - KERBS, FOOTWAYS AND PAVED AREAS prevail.

**Dished channels are not permitted.**

Areas that are block paved and edge drained must be steeper than 1.25% (1 in 80). String courses shall comprise 125mm x 255mm precast concrete channel blocks or 125mm (150mm) x 150mm in 450mm lengths

## **MANHOLES AND HIGHWAY DRAINS**

Generally all manholes and highway drains shall be constructed and laid in accordance with current edition of Sewers for Adoption.

Clay pipes and fittings shall be in accordance with the requirements of BS EN 295 and BS 65:1991. Concrete pipes and fittings shall be in accordance with the requirements of BS EN 1916:2002 "Concrete pipes and fittings, unreinforced, steel fibre and reinforced" and shall be fitted with approved flexible joints.

Plastic pipes and fittings shall be in accordance with the requirements of BS EN1401-1:2009, BS 4660:2000 and the water industry specification WIS 4-35-01.

Gully connections shall be surrounded with 150mm thickness C16/20 (ST4 20.0 N/mm<sup>2</sup>) concrete and include a flexible joint on each pipe. Where the cover to a pipeline laid under a carriageway is 1.2m or less, it shall be surrounded with 150mm thickness C16/20 (ST4 20.0 N/mm<sup>2</sup>) concrete.

Where a concrete surround is not required, pipelines shall be laid on a concrete or granular bed designed in accordance with "Simplified Tables of External Loads or Buried Pipelines" issued by the Transport Research Laboratory. Gully connections should not exceed 20m in length

Drain trenches are not to be backfilled until the pipework has been approved by the Engineer which may include air and/or water tests

Trenches in the carriageways are to be backfilled with Type 1 granular material (other materials/aggregates, including recycled or manufactured may be approved in writing by the Engineer)

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