



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

## Section 5 – The Specification for Highway Work



## Contents

1. General
  - 1.1. The Specification
  - 1.2. Guidance For Designers
2. Introduction (Series 000)
  - 2.1. Appendix 0/2: Specific Minor Alteration
3. Preliminaries (Series 100)
  - 3.1. Appendix 1/5: Testing to be Carried Out by the Developer
  - 3.2. Appendix 1/7: Site Extent and Limitations on Use
  - 3.3. Appendix 1/9: Control of Noise and Vibration
  - 3.4. Testing to be carried out by the Developer
  - 3.5. Appendix 1/12: Setting Out and Existing Ground Levels
  - 3.6. Appendix 1/17: Traffic Safety and Management
  - 3.7. Appendix 1/18: Temporary Diversions for Traffic
  - 3.8. Appendix 1/19: Routeing of Vehicles
  - 3.9. Appendix 1/21: Information Boards
  - 3.10. Appendix 1/23: Risks to Health and Safety from Materials or Substances
4. Site Clearance (Series 200)
  - 4.1. Appendix 2/2: Filling of Trenches and Pipes
  - 4.2. Appendix 2/4: Explosives and Blasting
5. Road Restraint Systems (Vehicle and Pedestrian) (Series 400)
  - 5.1. Road Restraint Systems (Vehicle and Pedestrian)
6. Drainage & Service Ducts (Series 500)
  - 6.1. Appendix 5/1: Drainage
  - 6.2. Appendix 5/2: Service Ducts
  - 6.3. Appendix 5/4: Fin Drains and Narrow Filter Drains



- 7. Earthworks (Series 600)
  - 7.1. Appendix 6/1: Acceptability & Testing etc. of Earthworks Materials
  - 7.2. Appendix 6/2: Dealing with Class U2 Unacceptable Material
  - 7.3. Appendix 6/3: Excavation, Deposition, Compaction (other than dynamic compaction)
  - 7.4. Appendix 6/4: Class 3 Material
  - 7.5. Appendix 6/7: Sub-formation, Capping, Preparation & Surface Treatment of Foundations
  - 7.6. Appendix 6/8: Topsoiling
  - 7.7. Appendix 6/9: Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments
  
- 8. Road pavements – General (Series 700)
  - 8.1. Appendix 7/1: Permitted Pavement Options
  - 8.2. Appendix 7/2: Excavation, Repair and Reinstatement of Existing Surfaces
  - 8.3. Appendix 7/4: Bituminous Sprays
  
- 9. Kerbs, Footways and Paved Areas (Series 1100)
  - 9.1. Appendix 11/1: Kerbs, Footways and Paved Areas
  
- 10. Traffic Signs & Road Markings Series 1200)
  - 10.1. Appendix 12/1: Traffic Signs General
  - 10.2. Appendix 12/3: Road Markings and Studs
  
- 11. Road Lighting Columns and Brackets (Series 1300)
  - 11.1. Appendix 13/1: Information to be provided when specifying Lighting Columns and Brackets



- 12. Electrical Work for Road Lighting and Traffic Signs (Series 1400)
  - 12.1. Introduction
  - 12.2. Appendix 14/1: Site Records
  - 12.3. Appendix 14/3: Temporary Lighting
  - 12.4. Appendix 14/4: Electrical Equipment for Road Lighting
  - 12.5. Appendix 14/5: Electrical Equipment for Traffic Signs
  
- 13. Protection of Steelwork against Corrosion (Series 1900)
  - 13.1. Appendix 19/5: General Requirements, Protection against Corrosion
  
- 14. Landscape and Ecology (Series 3000)
  - 14.1. Appendix 30/5 : Grass Seeding, Wildflower Seeding and Turfing



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 1 – General





<b>1. General</b>	
1.1. The Specification .....	2
1.2. Guidance For Designers.....	2



## 1.1. The Specification

The model specification for the construction and improvement of roads in Hertfordshire shall be the following:

“The Highways Agency - Manual of Contract Documents for Highway Works”

- Volume 1 Specification for Highway Works (SHW);
- Volume 2 Notes for Guidance on the Specification for Highway Works;
- Volume 3 Highway Construction Details.

## 1.2. Guidance For Designers

The Highways Agency from time to time updates these documents. The designer will be expected to use the most recent version of the documents as exist at the time the detailed design and specification for the highway works are submitted to HCC for approval, in accordance with the requirements of the relevant legal agreement.

In the same way, references to British Standards and European Standards contained therein should be taken to include the successor standards where the original reference becomes superseded.

In compiling the specification for a development, the designer shall comply with the requirements of the model specification documents, with the exception of any modifications to it that are listed in Section 5 of this document and the Chapters contained therein.

The SHW refers to numbered appendices, in which site specific specification and design information should be included. A full list of the appendices and guidance on their contents can be obtained from Volume 2, ‘Notes for Guidance’. The designer shall prepare all necessary appendices for the scheme and design proposals. The designer or scheme promoter must make these available for HCC approval.

The contractor should not cover any part of the permanent works without giving HCC an opportunity to inspect the works and ensure that it complies with the specification. The contractor, designer or scheme promoter must give written notice, in accordance with the requirements of the relevant legal agreement with HCC, of the intention to cover part of the Works.

If the contractor, designer or scheme promoter fails to give sufficient notice, HCC may require the contractor to uncover the works, unless it can be demonstrated to the satisfaction of HCC that the buried works comply with the specification.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 2 – Introduction (Series 000)







## 2. Introduction (Series 000)

2.1. Appendix 0/2: Specific Minor Alteration .....	2
--	---



## 2.1. Appendix 0/2: Specific Minor Alteration

Clause No.	Title
002	<p>Delete the second paragraph and insert the following:                      “Where the specification refers to the ‘Overseeing Organisation’ this shall be taken to mean HCC or its agents.                      Where the specification refers to ‘The Contractor’ this shall be taken to mean either:</p> <ul style="list-style-type: none"> <li>• The scheme promoter, or any person, company or organisation working on behalf of the scheme promoter;</li> <li>• A contractor appointed by HCC.</li> </ul> <p>Where the specification refers to the ‘Contract’ this shall be taken to mean either:</p> <ul style="list-style-type: none"> <li>• The legal agreement(s) enabling the Works, typically a s38 for new roads and a s278 for off-site highway works, including any conditions contained therein, under which the scheme promoter is given permission to construct the works;</li> <li>• Any contract entered into by HCC for its Works.</li> </ul>
202.1	<p>At the start of the Clause insert the sentence “The removal of trees, bushes and hedges shall only take place with the prior consent of the Local Planning Authority”.</p>
202.2	<p>Delete the words “or blasted”.</p>



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 3 – Preliminaries (Series 100)





### 3. Preliminaries (Series 100)

3.1.	Appendix 1/5: Testing to be Carried Out by the Developer .....	2
3.2.	Appendix 1/7: Site Extent and Limitations on Use .....	2
3.3.	Appendix 1/9: Control of Noise and Vibration.....	2
3.4.	Testing to be carried out by the Developer .....	3
3.5.	Appendix 1/12: Setting Out and Existing Ground Levels .....	15
3.6.	Appendix 1/17: Traffic Safety and Management.....	15
3.7.	Appendix 1/18: Temporary Diversions for Traffic .....	17
3.8.	Appendix 1/19: Routeing of Vehicles .....	17
3.9.	Appendix 1/21: Information Boards .....	18
3.10.	Appendix 1/23: Risks to Health and Safety from Materials or Substances .....	18



### 3.1. Appendix 1/5: Testing to be Carried Out by the Developer

Where the specification (including British Standards) allows for the provision of test certificates, the Contractor shall in each case submit to HCC such test certificates, when requested.

All testing shall be undertaken by a UKAS approved laboratory.

Cube strength tests are not required for concrete complying with Clause 2602.

See 3.4 below for general guidance on material testing requirements. This table should not be regarded as exhaustive and thus other testing may be required by HCC.

### 3.2. Appendix 1/7: Site Extent and Limitations on Use

The Contractor shall obtain the written approval of HCC to the siting of all huts, equipment, stacks or heaps within the highway boundary. On completion of the works, the huts, equipment etc. shall be removed and the sites made good to the satisfaction of the HCC.

The Contractor shall at all times keep all roads, streets, private entrances, verges, cycle tracks, paths, footways, drains and sewers in the area of the works in a safe, clean, and passable state. All waste or superfluous material on the site shall be cleared away by the Contractor as the works progress.

The Contractor shall not light bonfires within the confines of the site boundary.

All works and storage areas are to be fenced off whilst works are proceeding and the fencing removed only when the works are completely finished and the area is suitable for use by the public.

In all operations the Contractor shall have regard to factors that may affect the environment and shall seek to carry out all operations in a manner that will have minimal adverse impact on the environment.

### 3.3. Appendix 1/9: Control of Noise and Vibration

The Contractor should obtain the noise control requirements from the Local Planning Authority.

The Contractor shall comply with the general requirements of BS5228. All noise assessments shall be made in accordance with Annex E (Noise Monitoring) of BS5228: Part 1. Note that Annex E includes the specification for the noise monitoring equipment to be used. All measurements of Leq shall be taken over a minimum period of fifteen minutes.

All compressors shall be sound reduced models fitted with properly lined and sealed acoustic covers which shall be kept closed when the machines are in use. All ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers.

All vehicles and mechanical plant used for the purpose of the works shall be fitted with effective exhaust silencers and shall be maintained in good and efficient working order so that extraneous noise from mechanical vibrations, squeaking, hissing etc. shall be reduced to a minimum. Machines in intermittent use shall be throttled down to a minimum or shut down during the periods between work.



The Contractor shall take all steps necessary to limit vibration caused by plant and machinery used on the site. In particular no machine which uses a system of dropping a heavy weight, whether power assisted or by gravity, on the surface of paving or foundation will be permitted for the purpose of breaking up.

### 3.4. Testing to be carried out by the Developer

Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
Series 300					
306	Permanent fencing				
	- Concrete Components	Cover to reinforcement	1 per consignment (Max 1 per 100) BS1722 Annex A3-3		Quality management scheme applies
308	Gates and Stiles				
	- Reinforced Concrete Posts	Cover to reinforcement	1 per consignment (max 1 per 100)		Quality management scheme applies
Series 500					
501	Pipes for drainage and service ducts (not exceeding 900mm diameter)				
	- Vitrified clay				Product certification scheme applies
	- Concrete PC / SRC				
	- Concrete Pre-stressed				
	- Iron cast				
	- Iron-ductile				
	- UPVC				
	- GRP				
	- Plastics				BBA certification applies
- Other materials					
503	Pipe bedding				
		Grading	1 per 500 tonnes (min 3)		
		Soluble sulphate content (N)	1 per source		
		Los Angeles Abrasion			
506	Sealing existing drains				
	- Concrete grout			Required	
507	Chambers				
	- Precast concrete				Product certification scheme applies
	- Manhole steps				
	- Steel fittings				



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
	- Covers, grates and frames				Product certification scheme applies
	- Cover bolts				Quality management scheme applies
508	Gullies and pipe junctions				
	- Precast concrete				Product certification scheme applies
	- Clay				
	- Cast iron and steel				
509	Water tightness of joints	Air test	All pipes with water tight joints		

Series 600					
601	Acceptable material				
631-637	Class 1				
640	Imported granular fill	Grading / uniformity coefficient	1 per 500m <sup>3</sup>		
		mc / MCV (N)	1 per week		
	IC only	Los Angeles Abrasion	Weekly		
	As found granular fill		Test as for Imported General granular fill if noticeably different from material described in geotechnical report		
	Class 2				
	General cohesive fill	Grading mc / MCV / PL Undrained shear strength (N)	1 per 500 m <sup>3</sup>		
	Class 4				
	Landscape Fill	Grading / mc / MCV(N)	1 per 500 m <sup>3</sup>		Testing only required if material to be used in the construction of slopes or bunds



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
	Class 5A				
	Topsoil, existing on site	Grading	To be determined by visual inspection		
	Class 5B				
	Imported Topsoil	As required in BS3882		Required	
	Class 6				
	Selected granular fill	Grading / uniformity coefficient	1 per 400 tonnes		Suggest separating out the different types of Class 6 materials as per SHW table 6/1
		PI / LL (N)	Daily		
		Los Angeles Abrasion / SMC (N)	Weekly		
		Omc / mc, mc or MCV (N)	1 per 400 tonnes		
		Organic matter / water soluble of total sulphate content	Weekly		
		PH / chloride ion content (N)	Weekly		
		Resistivity (N)	Source		
		Undrained and drained shear parameters (N)	Source and monthly		
602	Earthworks materials beneath surface of a road or paved central reserve	Frost heave (N)	Source and 1 every 4 months		
609	Geotextiles	Manufacturers Tests of physical properties		Required	Product test certification to be obtained from manufacturers
612	Compaction of fills	As per Table 6/1 of SHW	Minimum of daily or per layer		NDG acceptable for end product compaction testing
618	Topsoiling and grass seeding	Rate of spread of fertiliser	1 per 100m <sup>2</sup>	Required	
		Rate of spread of seeding			
		Chemical analysis of fertiliser	1 per source		





Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
		Grass seed germination and purity (manufacturer's test)	1 per source and mix variety	Required prior to sowing	

Series 700					
705	Sub-base and base material beneath surface of a road or paved central reserve	Frost heave (N)	Source and 1 every 4 months	Required	

Series 800					
801	Unbound sub-base material (other than slag) adjacent to cement bound materials, concrete pavements, structures or products	Soluble Sulphate content (N)	Source 1 per 400 tonnes or per location if less than 400 tonnes	Required	
803	Granular sub-base material Type 1	Grading plasticity index (N)	1 per 400 tonnes	Required	
		Los Angeles Abrasion (N)	1 per source		
		Soundness (N)	1 per source		
		Water absorption (N)	1 per source		

Series 900					
901, 925, 926	Aggregate for bituminous materials				
	- Hardness	Los Angeles Abrasion (N)	Source		
		Aggregate Impact value (N)	Source		
	- Durability	Soundness (N)	1 per source		
		Water absorption (N)	Source		
	- Cleanness	Sieve test (mass passing 75mm sieve) (N)	Source		
	Crushed rock gravel	Flakiness index (N)	Source		



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
	Blast furnace slag	Bulk density (N)	Source		
		Stability (N)			
		Sulphur content (N)			
	Steel slag	Bulk density	Source		
	Coarse aggregate for wearing courses	PSV (N)	1 per source		
		AAV (N)	1 per source		
	Binders for bituminous materials	Penetration (N) Softening point (N)	1 per 750 tonnes		Quality management and product certification schemes apply
903-914 916, 925 926, 930 932-934	Bituminous mixtures	Grading (N) Binder content (N)	1 per 100 tonnes (or less)		
921	Surface texture	BS-EN 13036- 1 Volumetric Patch Test (N)			
927	Compacted bituminous material	Percentage refusal density test (N)	As required in BS4987 Part2		

Series 1100					
1101	Precast concrete kerbs, channels, edgings and quadrants	Transverse strength	Source (BS EN 1340:2003)	Required	Product Certification
1107	Concrete & clay block paving	Compressive strength		Required	Product Certification

Series 1200					
1202	Permanent traffic signs			Required	Certification that the traffic sign is capable of passing the test in BS EN 12899: 2007 is required
1207	Anchorage in drilled holes to supports of traffic signs	Loading test on site			



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
1210	Holding down bolts and anchorages to bases of permanent bollards			Required	Certification that the holding down bolts and anchorages are capable of complying with the performance requirements of BS EN 12899: 2007 is required
1212	Thermoplastic road marking materials	Tests specified in BSEN1436	Per source	Required	Quality management and product certification schemes apply
1214	Permanent traffic cones and traffic cylinders	Tests specified in BS EN 13422: 2004: Part8	2 of each size and category / type	Required	Certification that permanent traffic cones and cylinders have been tested and comply with BS EN 13422:2004 is required
	Temporary cones, cylinders FTD's and other delineators		2 of each size and category type	Required	Certification that at least 1 in 500 of a batch of management traffic cones, cylinders, FTD's and other delineators passed the test in clause 1214 is required

Series 1300					
1305	Anchorage for use in drilled holes	Tensile load (manufacturer's tests)		Required	To provide well attested and documented evidence
1306	Anchorage in drilled holes to columns with flange plates	Loading test on site	1 per 50 plates		



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
1310	Welding	Welding procedures (Manufacturer's tests)	(Every seven years)		Quality management scheme applies
		Welder qualification (manufacturer's tests)	(Every two years)		
		Production testing (manufacturer's tests)	(Clause 1310 (7.1.4))		
	Welded joints	Destructive testing			
1313	GFRP laminates	Loss of ignition	1 per 200 production columns		
		Colour fastness	1 per batch		
		Electric strength			
		Water absorption			
		Impact strength			
1314	Brackets for laminated GFRP lighting columns				
	Polyurethane foam	Bulk density	1 per batch		
		Surface hardness			
		Apparent bulk density	2 per batch		
		Impact strength			
		Flexural stress			

Series 1400					
1421	Cable				Product certification scheme applies
1424	Lighting Units	Tests specified in Clause 1424	Each unit	Required	Product certification scheme applies Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
	Networks	Tests specified in Clause 1424	Each network	Required	Certification that the installation complies with BS7671 (the IEE Wiring Regulations) is required

Series 1700					
1702 1703 1704	Cement			Required	Certificate to be provided monthly for each type of cement. Quality management and product certification schemes apply
	Portland			(BS-EN 197-1, 2000)	
	Portland – blast furnace			Required (BS-EN197-1, 2000)	
	Sulphate-resisting Portland			Required (BS4027)	
	Portland pulverised fuel ash			Required (BS-EN197-1, 2000)	
	Low heat Portland			Required (BS-EN197-1, 2000)	
	High Slag blast furnace			Required (BS EN197-1, 2000)	
	Pulverised-fuel ash	Colour index	Monthly	Required	Certificate to be provided monthly Product certification scheme applies
	Ground granulated blast furnace slag			Required (BS-EN 15167-1, 2006)	Certificate to be provided monthly. Product certification scheme applies



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
	Cements (all types)	Chloride content	Monthly		Tests to be carried out by the manufacturer and results included on the test certificates required above
	Pulverised-fuel ash	Sulphate content	Monthly		
	Ground granulated blast furnace slag	Acid-soluble alkali content	Daily (PC) Weekly (pfa ggbs)		
	Aggregates	Grading	Weekly	Required	Results of routine control tests by the manufacturer / supplier to be provided Product certification scheme applies
		Shell content (N)	Source		
		Flakiness index (N)	Source		
		Los Angeles Abrasion (N)	Source		
		Drying shrinkage (N)	Source		
		Chloride content (N)	Source		
		Sulphate content (N)	Source		
	Water	Tests specified in BS EN 1008:2002			
		Chloride content	Source		
		Sulphate content	Source		
		Acid-soluble alkali content	Source		
	Admixtures	Chloride content	1 per consignment	Required (BSEN 480-1:1998)	Product certification scheme applies
		Sulphate content	1 per consignment		
		Acid-soluble alkali content	1 per consignment		
	Concrete	Cube strength (N)	Reinforced concrete -- two cubes from 20 m <sup>3</sup> or 20 batches		



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
			whichever represents the lesser volume – min 2 per day		
			Mass concrete – two cubes from 50 m <sup>3</sup> or 50 batches whichever represents the lesser volume – min 2 per day		
			Additional cubes for special purposes		
1707	Fresh concrete	Workability (slump or compacting factor or Vebe)			
		Air content	Each batch		
		Cement content			
		Water / cement ratio			
	Precast concrete manufactured off-site	Manufacturer's tests			Contractor to make available records of tests by the manufacturer
1710	Precast concrete manufactured off-site	Manufacturer's tests			Contractor to make available records of tests by the manufacturer
1711	Grout	Bleeding	1 per mix		
		Free expansion	1 per mix		Only applicable if an expanding agent is used
		Cube strength	3 cubes from each batch		
	- Admixtures			Required (BS-EN 480-1)	
1712	Reinforcement				
	- Steel Bars			Required (BS4449)	Product certification scheme applies
	- Steel wire			Required (BS4482)	
	- Steel			Required	



Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
	fabric			(BS4483)	
1713	Fabricated reinforcement			Required	Certification that fabricated reinforcement complies with the routine inspection / testing requirements of BS 4466 is required if the fabrication is not covered by a product certification scheme listed in Appendix B
1716	Reinforcement jointing systems	Permanent elongation characteristic strength (Manufacturer's tests)		Required for each type of connection	
1717	Reinforcement metal arc welding	Welding procedure approval (BS EN 17660-1:2006)	As required in (BS EN 17660-1:2006)		
		Welder approval (BS EN 17660-1:2006))			

Series 2400					
2401	Masonry cement			Required (BS EN413-1:2004)	Quality management scheme applies
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2402	Sand			Required per consignment (BS EN 13139:2002)	





Clause	Work, Goods or Materials	Test	Frequency of Testing	Test Certificate	Comments
		Chloride content	Monthly		Test to be carried out by the manufacturer and results included on the test certificate
2403	Water	Tests specified in BS EN 1008:2002			
2404	Mortar admixtures			Required (BS-EN 480-1)	Product certification scheme applies
2405	Lime			Required (BS EN 459-1)	
2406	Bricks				
	- Clay	(Soluble salt content Efflorescence Compressive strength Water absorption Initial rate of suction) (BS3921)			
	- Calcium silicate			Required (BS EN 771-2, 2003)	
	- Concrete			Required (BS6073: Part 3)	
2407	Blocks				
	Concrete			Required (BS6073: Part 1)	

Series 2600					
2601	Bedding mortar materials				
	- Bedding Mortar	Flow cone test	Each batch		
		Flow between glass plates			
		Compressive strength			
		Expansion test			
		Water absorption			
		Elastic stability	1 per source		
		Flow cone test Compressive strength	Each load		



## Notes

- Tests comparable to those specified in this chapter will be necessary for any equivalent work, goods or materials proposed by the Contractor;
- (N) Indicates that a UKAS sampling and test report or certificate is required;
- Unless otherwise shown in this chapter, tests for work, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works;
- Cube strength tests are not required for concrete complying with Clause 2602;
- Unless otherwise shown in this chapter, test certificates for works, goods or materials as scheduled under any one Clause are required for all such work, goods or materials in the Works.

### 3.5. Appendix 1/12: Setting Out and Existing Ground Levels

Prior to the commencement of the Works, the Contractor shall ensure that suitable setting out stations, including level datum benchmarks, are established and agreed with HCC.

The Contractor must maintain the above setting out reference points throughout the duration of the Works.

### 3.6. Appendix 1/17: Traffic Safety and Management

Where work is carried out on the highway the Contractor must obtain the approval of the HCC Network Management Group for their traffic management proposals and the times when traffic management will be allowed. This will be done in consultation with the Police.

The Contractor's traffic management proposals shall allow for the requirements of both vehicular and pedestrian traffic. The developer should establish whether his traffic management will affect any bus routes and make adequate provision for buses in his proposals if required.

Temporary bus stops must be provided where access to an existing stop is restricted by the works. The need for and location of temporary bus stops must be agreed with HCC.

The HCC Network Management Group may direct the times at which the Contractor can work on the highway. In particular, work may not be allowed during peak traffic hours, at weekends, bank holidays or at night. However, there are some locations where the HCC Network Management team may require particular works to be carried out at night only.

Traffic management shall be in accordance with Chapter 8 of the TSM and Safety at Street Works and Road Works.

Where traffic management equipment remains on the carriageway during the hours of darkness, signs must be illuminated as per the requirements of Chapter 8 of the TSM. Bottled gas lighting may be used but in all cases electrical lighting will be preferred. Gas bottles must be protected, such as with sandbags.

All works shall be carried out in accordance with TSRGD, Road Traffic Regulation Act and the Highways Act.



Compliance with Clause 117 and Appendix 1/17 shall not relieve the scheme promoter of the obligations and liabilities under any provisions of the Highways Act or any other relevant legislation.

The Contractor must maintain access to all properties during the Works unless expressly agreed with the HCC Network Management Group.

Access for emergency vehicles shall be maintained through all phases of the Contractor's traffic management proposals.

"No Road Marking" signs must be provided on every approach to areas where the road markings have been removed.

Traffic shall not run on planed surfaces without the prior agreement of the HCC Network Management Group.

Temporary 'Give Way' signs are to be erected where the road markings indicating a Give Way have been removed.

HCC shall have the unqualified right to instruct work, persons and / or sub-contractors on any matter relating to traffic safety and management including their immediate removal from site.

A safety zone, preferably 1.2m wide, should be provided between the works and any pedestrian or vehicular traffic. The safety zone shall not be entered or encroached on by materials, plant or anything else being used in connection with the work except for:

- Traffic management related operations and equipment;
- Vehicles entering or leaving the area.

The Contractor shall allow for the occasional use of the safety zone by broken down vehicles, which would otherwise impede the flow of traffic past the works, or in an emergency when required by HCC or the police to divert traffic past an obstruction in a trafficked lane.

Vehicles shall only enter or leave coned off areas at approved access points. Non-essential vehicles, particularly private cars, shall not enter a coned off area (except when such areas are designated as residents parking areas and cars are displaying appropriate authorisation).

All warning signs, used in connection with the works, shall be a minimum of 750mm high, unless agreed otherwise with HCC.

Unless agreed by the HCC Network Management Group, all warning and mandatory signs shall have a mounting height of 1.2m. This will be increased to the relevant height when over footway / footpath, cycle track or bridleway. The Contractor shall forward details of his proposed method of mounting signs to the HCC Network Management Group for approval. The sign position shall be visible to traffic and not obstructed by street furniture, structures and traffic management equipment.

All traffic cones in connection with the works shall be at least 750mm high.

Before opening any traffic lane or lanes the following conditions shall be met:

- Temporary ramping to longitudinal joints shall be a 1 in 20 or flatter relative to the transverse plane of the road surface;



- Temporary ramping to transverse joints shall be a 1 in 20 or flatter relative to the longitudinal plane of the road surface;
- The maximum drop in levels within 3m of a trafficked lane shall be 400mm unless protected by a safety fence or barrier;
- All personnel, plant, items of equipment and materials must have been cleared from traffic lane(s) and the safety zone;
- Those areas to be trafficked shall be hand or suction swept where the Contractor's activities have made it necessary in the opinion of HCC.

The Contractor shall provide the HCC Network Management Group with the name, address and telephone number of a member (or members) of staff who can be contacted at all times outside normal working hours by HCC and the police and used in any emergency affecting the Works. They shall be competent and have authority to take any necessary action.

If temporary traffic control signals are to be used then they shall not be powered by a generator between 19:00 and 08:00 hours. During this period the power supply shall be by suitable batteries capable of providing a continuous 24 hour operation. Alternatively, by connection to a mains source of supply in which case it is the responsibility of the Contractor to arrange with the appropriate authority for the connection to be made. Supply cables shall not conduct currents in excess of 110V AC and these cables shall be suitably protected where they are laid on the highway. If the power source for temporary traffic signals is taken from the existing street lighting supply then temporary traffic signs, 543 and 517 of the TSRGD, are to be illuminated by an independent power source during the hours of darkness. This power source shall not be from a generator.

The Contractor shall be responsible for ensuring that any traffic management system is inspected and maintained. Diversion routes are to be inspected every 4 hours and any damaged or displaced traffic management equipment replaced immediately.

The Contractor shall take all necessary steps to avoid creating a dust nuisance. If in the opinion of HCC the Contractor is not dealing adequately with the control of dust, the Contractor may be instructed to carry out such additional measures as HCC considers necessary, at the Contractor's expense.

HCC has the authority to close crossings and accesses, if they become hazardous or the Contractor does not promptly remove any detritus. Any losses and expenses incurred as a result shall be borne by the Contractor.

Any existing signing that conflicts with any signs for a diversion route are to be partially covered up or adjusted to suit. These shall be agreed with the HCC Network Management Group.

### 3.7. Appendix 1/18: Temporary Diversions for Traffic

The contractor or scheme promoter must obtain the approval for any diversion of traffic from the HCC Network Management Group. This will be done in consultation with the police.

### 3.8. Appendix 1/19: Routeing of Vehicles

HCC Network Management Group may specify the routes used by traffic travelling to and from the site. Routes should avoid residential areas if possible.



### 3.9. Appendix 1/21: Information Boards

HCC may require the Contractor to provide information boards warning motorists of the Works and the likely duration. Such boards should be erected two weeks prior to the Works and be maintained throughout the duration of the Works.

HCC may require the Contractor to provide and deliver works publicity letters or leaflets to affected parties to inform stakeholders and members of the public of the details of the intended works and disruption that may be caused.

### 3.10. Appendix 1/23: Risks to Health and Safety from Materials or Substances

The Contractor shall not use any substances hazardous to health when conditions such as wind speed and direction prevail which in the opinion of HCC constitute a hazard.

The Contractor shall take all additional measures such as screening and signing necessary in the opinion of HCC to protect members of the public whilst using substances hazardous to health.

The Contractor's attention is drawn to COSHH and CDM.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 4 – Site Clearance (Series 200)





4.	Site Clearance (Series 200)	
4.1.	Appendix 2/2: Filling of Trenches and Pipes .....	2
4.2.	Appendix 2/4: Explosives and Blasting .....	2



#### 4.1. Appendix 2/2: Filling of Trenches and Pipes

Trenches or ditches under the carriageway must be filled with well-graded granular fill and the ditch must be piped under the carriageway if flow is to be maintained.

Well-graded granular material must also be used for the infill of isolated pockets such as old sumps or basement voids.

Redundant pipes or ducts under the carriageway must be removed if they lie within a depth of 1m below the formation, or they show evidence of collapse.

#### 4.2. Appendix 2/4: Explosives and Blasting

The Contractor shall not use explosives on site without the permission of the Highway Authority. Permission will not normally be granted.





# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 5 – Road Restraint Systems (Vehicle and pedestrian) (Series 400)





5. Road Restraint Systems (Series 400)

5.1. Road Restraint Systems (Vehicle and Pedestrian) .....2



### 5.1. Road Restraint Systems (Vehicle and Pedestrian)

Where the Designer wishes to use safety fencing or barriers as part of temporary or permanent works, approval must be obtained from HCC for the type and location of the barrier to be used.

It is in the interest of the Designer to involve a Road Restraint Systems (RRS) contractor early to avoid problems before construction and to process any departures from standards that may be required.

All RRS, as defined in the BS EN 1317, shall conform to TD19 (DMRB 2.2.8), Series 400 of MCHW Volume 1, and Volume 5, Chapter 5.

The Designer shall submit for approval by HCC Appendix 4/1 MCHW Volume 2 Series 400 and drawings showing details of proposed RRS:

- Containment Level;
- Working Width Class;
- Setback;
- Terminals Performance Class.

Where different types of RRS are proposed in one length, they shall be connected by transitions as detailed in Chapter 8 of the TD19. Details of the transitions shall be highlighted as in paragraph 5.3 above.

The Designer shall also submit together with the drawings, copies of the *Road Restraints Risk Assessment Process* (RRRAP) (or similar for roads with speed limit less than 50mph) and Push Tests results for post foundations proposed. Post foundations shall normally be concrete with sockets.

The Designer shall specify new RRS conforming to the requirements of TD19 where proposals to alter, replace or connect into existing RRS is required. If a transition is required to connect into the existing RRS, the details shall be as described above.

If a contractor has been appointed for the installation Appendix 4/2 MCHW Volume 2 Series 400 and drawings showing the proposed system shall be submitted at the same time as the documents required above.

If a contractor has not been appointed yet, the details described above shall be submitted for approval before construction begins.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 6 – Drainage and Service Ducts (Series 500)





## 6. Drainage and Service Ducts (Series 500)

6.1. Appendix 5/1: Drainage.....	2
6.2. Appendix 5/2: Service Ducts .....	4
6.3. Appendix 5/4: Fin Drains and Narrow Filter Drains.....	4



## 6.1. Appendix 5/1: Drainage

### General

For the basis on which the scheme promoter or designer should design the drainage see [Section 4, Chapter 4: Road Drainage](#).

Pipes of diameter greater than 900mm are considered to be structures. The approval procedure for structures is detailed in [Section 3, Chapter 6: Design Checks and Safety Audits](#) and [Section 4, Chapter 5: Structures - Details](#).

All concrete units shall be constructed from sulphate-resisting Portland cement to BS4027.

When requested, the scheme promoter or designer must provide HCC with the following information:

- Pipe size;
- Pipe type and material;
- Bedding detail and material;
- Minimum and maximum depth of each pipe;
- Minimum and maximum invert level of each pipe;
- Chamber cover level and depth to invert;
- The invert level of inlet and outfall pipes within each chamber;
- Gully grate levels;
- Trench width; and
- Pipe design loading.

Most details would be expected to be shown on a general layout plan for drainage.

### Pipelines

In general pipes should be constructed from thermoplastic, vitrified clay or concrete.

Pipelines are to be watertight (except filter drains) and tested to a stable pressure of 100mm head of water as described in Clause 509 of the SHW.

Before adoption HCC may request an air test or closed circuit television survey on any part of the constructed drainage system. The system should be flushed with water and left clean.

Perforated filter drains should not be used under the carriageway.

HCC may request that filter drains be tested for their permeability.

### Gullies

Gullies shall be trapped and fitted with a stopper and chain.

Gully pots should be either pre-cast concrete or plastic.

Pre-cast concrete gullies should have a 150mm surround of ST2 concrete. Plastic gully pots should have a 150mm surround of ST4 concrete.

Typical gully details are shown in diagram 5.5.6.3.

### Gully Grates and Chamber Covers

Covers and grates shall conform to BSEN124.

Gully grates shall be grade C250.

Chamber covers in the carriageway shall be grade D400. In the verge covers can be grade B125 except where vehicles are likely to run onto the verge then C250 or D400 should be considered.

### Pipe Bedding

Pipe bedding requirements for drains can be determined from HA40. Where the scheme promoter or designer does not wish to use HA40 to determine his preferred bedding detail, the following criteria will generally be acceptable for thermoplastic carrier drains:

- Pipes under the carriageway or areas that may be subject to vehicle loading should be surrounded by ST2 concrete as per the detail in diagram 5.5.6.1. Where the drain is laid under an existing carriageway the trench should be backfilled to formation level with sub-base material;

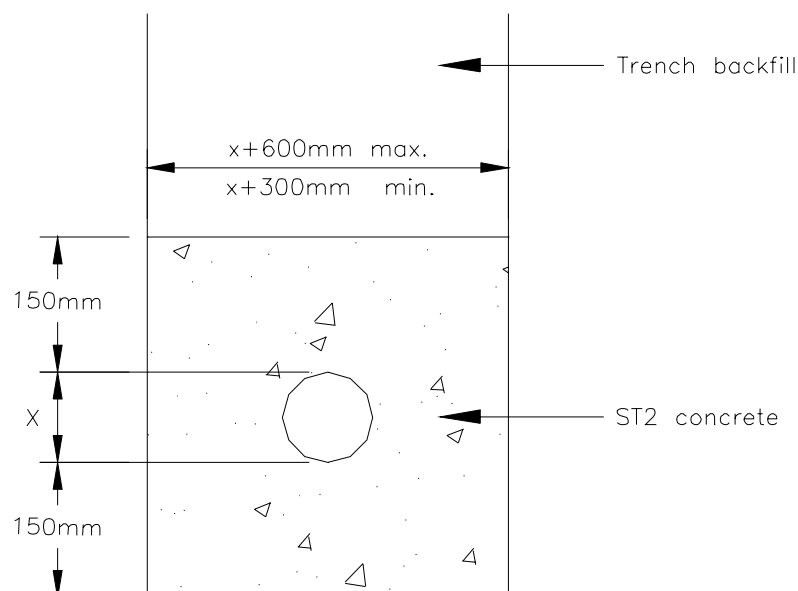


Diagram 5.5.6.1: Pipe surround under carriageway

- Pipes in areas that will not be subject to vehicle loading should be surrounded with granular pipe bedding material, to Clause 503.3 of the SHW, as detailed in diagram 5.5.6.2;

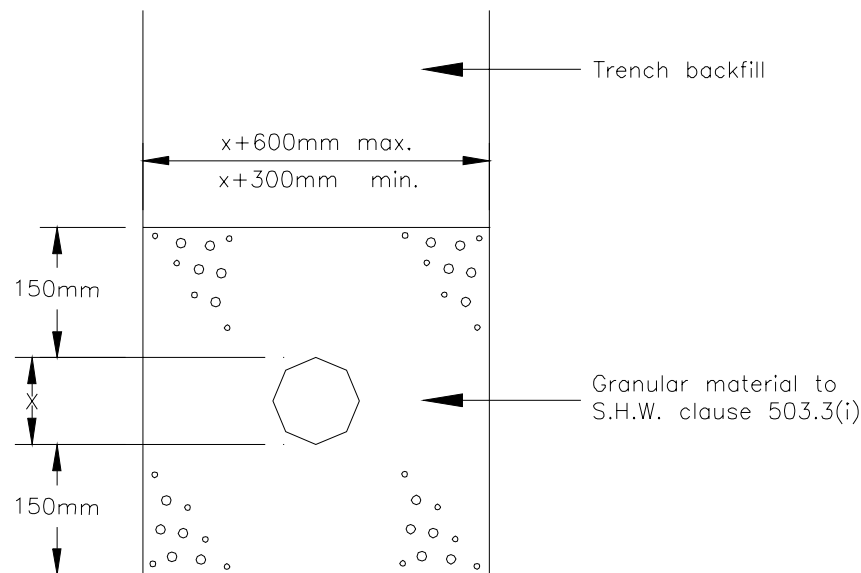


Diagram 5.6.1.2: Pipe surround under verge

All of the bedding types given in HCD drawing F2 are acceptable for thermoplastic perforated filter drains, laid in verge, at a depth below ground of at least 900mm.

## 6.2. Appendix 5/2: Service Ducts

For the details of ducts and chambers for street lighting, electrical or traffic signal installations, see [Section 4, Chapter 1: Road Design Criteria](#), [Chapter 4 Road Drainage](#), [Chapter 15 Lighting – Detail](#), [Chapter 17 Traffic Signals](#) and [Section 5, Chapter 12: Electrical Work for Road Lighting and Traffic Signs](#), [Chapter 12 Traffic Signs \(Series 1400\)](#).

Installations for statutory undertakers should be in compliance with their specification.

## 6.3. Appendix 5/4: Fin Drains and Narrow Filter Drains

The designer is responsible for designing the fin drain or filter drain where required, see [Section 4, Chapter 4: Road Drainage](#). The drain should conform to the requirements of the HCD.



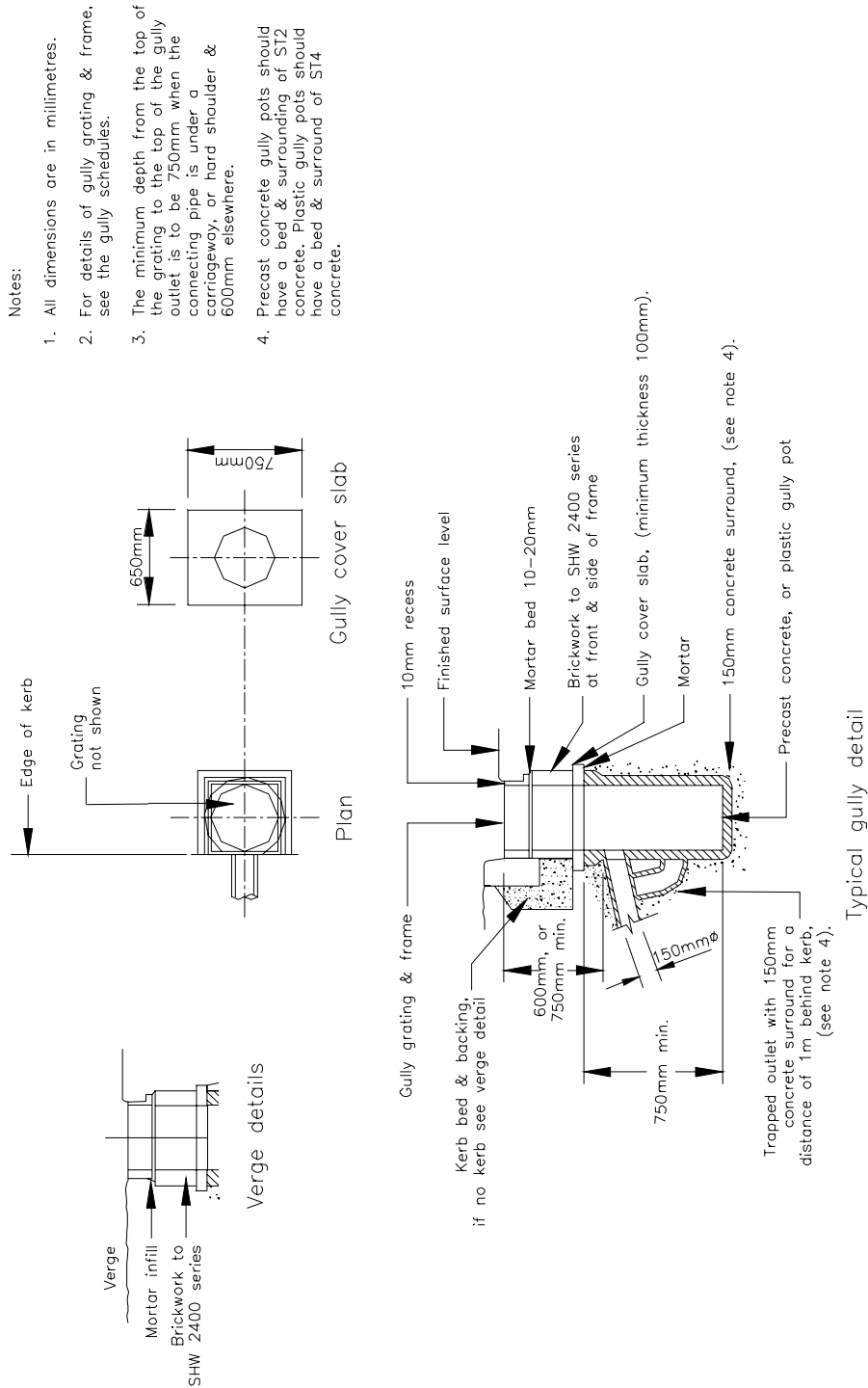


Diagram 5.6.1.3: Typical gully details



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 7 – Earthworks (Series 600)





## 7. Earthworks (Series 600)

7.1.	Appendix 6/1: Acceptability & Testing etc. of Earthworks Materials .....	2
7.2.	Appendix 6/2: Dealing with Class U2 Unacceptable Material .....	2
7.3.	Appendix 6/3: Excavation, Deposition, Compaction (other than dynamic compaction).....	2
7.4.	Appendix 6/4: Class 3 Material .....	2
7.5.	Appendix 6/7: Sub-formation, Capping, Preparation & Surface Treatment of Foundations.....	2
7.6.	Appendix 6/8: Topsoiling.....	2
7.7.	Appendix 6/9: Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments.....	3

#### 7.1. Appendix 6/1: Acceptability & Testing etc. of Earthworks Materials

Refer to [Section 4, Chapter 8: Earthworks](#) for further information.

In general, earthworks material should have a water soluble sulphate content less than 0.25 grams of sulphate per litre, when tested in accordance with BS1377: Part 3.

Where the sub-grade underneath carriageway is frost susceptible, such as chalk or silt or lime/cement stabilised soil, the overall depth of construction shall be at least 450mm. This can be achieved by increasing the depth of sub-base or providing a capping layer.

#### 7.2. Appendix 6/2: Dealing with Class U2 Unacceptable Material

The details for dealing with U2 material i.e. contaminated land are given in [Section 4, Chapter 8: Earthworks](#).

#### 7.3. Appendix 6/3: Excavation, Deposition, Compaction (other than dynamic compaction)

In general 'End-product Compaction' of earthworks materials will be required.

A 'nuclear density gauge' may be used to measure the field dry density.

Where embankments are required in areas that may be subject to flooding, they shall be constructed from approved granular material.

Where embankments are used for the foundation of widened carriageways or footways, they should be constructed from approved granular material. The material should be laid and compacted in layers, with benches constructed into the existing embankment. For embankment slope steeper than 26.5° a geotextile should be used in conjunction with the above granular material and benches.

#### 7.4. Appendix 6/4: Class 3 Material

When chalk is used in bulk earthworks it should not be used during the months of October to March, unless otherwise agreed with HCC.

#### 7.5. Appendix 6/7: Sub-formation, Capping, Preparation & Surface Treatment of Foundations

Capping material should be Class 6F1, 6F2, 6F3 or 6F4, as defined in the SHW.

Recycled or in-situ material should be used for the capping layer when available, unless otherwise agreed by HCC.

#### 7.6. Appendix 6/8: Topsoiling

Refer to [Section 4, Chapter 8: Earthworks](#) for further information.

Unless otherwise agreed in the interests of encouraging species diversity, the scheme designer, promoter or contractor should use as much of the existing topsoil from site as possible. The disposal and importing of topsoil should be minimised.

Areas of topsoil should be rolled with a hand roller and then lightly raked and seeded. For seeding requirements see [Section 5, Chapter 14: Landscape and Ecology](#).



### 7.7. Appendix 6/9: Earthwork Environmental Bunds, Landscape Areas, Strengthened Embankments

For guidance on landscape areas see [Section 2, Chapter 3 Environment and Landscape](#) and [Section 4, Chapter 20: Landscape](#).

For guidance on using geosynthetics or other techniques to improve ground conditions see [Section 4, Chapter 8: Earthworks](#).



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 8 – Road Pavements – General (Series 700)





## 8. Road Pavements – General (Series 700)

8.1.	Appendix 7/1: Permitted Pavement Options.....	2
8.2.	Appendix 7/2: Excavation, Repair and Reinstatement of Existing Surfaces .....	3
8.3.	Appendix 7/4: Bituminous Sprays.....	3

## 8.1. Appendix 7/1: Permitted Pavement Options

Details of carriageway construction are also contained in [Section 4, Chapter 1 Road Design Criteria](#).

This chapter relates to all carriageway construction types, with the exception of block paved surfaces. Block paved areas are to be laid in compliance with Series 1100 of the Specification for Highway Works (SHW) and BS7533.

The road pavement shall be constructed in accordance with HD26 and as described in this chapter. Construction shall be in compliance with Series 700 and the appropriate Clauses of the [Series 800: Road Pavements - Unbound, Cement and Other Hydraulically Bound Mixtures](#), [Series 900: Road Pavements - Bituminous Bound Materials](#) and [Series 1000: Road Pavements - Concrete Materials](#).

All materials shall be manufactured and laid in accordance with the relevant British Standard or in the case of thin surface course systems in accordance with Clause 942 of the SHW.

When requested levels and dips are to be taken by the Contractor and witnessed by HCC.

The grid for checking surface levels of pavement courses shall be:

- Longitudinal dimension : 10m
- Transverse dimension : 2m

A 3m long rolling straight edge should be used to measure longitudinal surface regularity. For Local Distributor or higher category roads the surface regularity shall be that for Category A Roads. Other roads shall have a Category B Road surface regularity.

The transverse surface regularity shall be measured using a 3m straight in up to 50 locations as directed by HCC.

The determination of compaction on dense base and binder course asphaltic concrete shall be determined by Percentage Refusal Density (PRD) in accordance with sub-Clause 929. However the scheme promoter or designer may propose in-situ nuclear density testing in the Backscatter mode for compliance testing. HCC will reserve the right to instruct either form of testing. Reference densities at 93% PRD are to be supplied to HCC for each mixture of base and binder course he intends to use.

The surface texture is to be measured using the Sand Patch Method described in BS598. The texture depth should be either 1.2mm or 1.5mm depending on traffic speeds. The measurement of the texture depth must be completed prior to the section of road being opened to traffic.

Gravel aggregates are not permitted in any bituminous construction.

All ironwork that requires resetting shall be set to new levels prior to the surfacing being laid.

When pre-coated chippings are required to be rolled into the surface course, these should be 20mm nominal size with a Polished Stone Value (PSV) greater than 55. On the approach to junctions or other areas of braking the PSV should be increased to 65.



Where necessary, a chip free drainage channel, 250mm wide, should be provided at the edge of the carriageway.

Where practical the Contractor should use reclaimed bituminous materials in the production of base and binder course materials.

Consideration should be given to the longevity of the proposed surface material with particular attention given to its suitability with respect to road type end use. Preference shall be given to Hot Rolled Asphalt (HRA) with pre-coated chips over thin surface course systems or Stone Mastic Asphalt (SMA) materials unless otherwise agreed with HCC.

## 8.2. Appendix 7/2: Excavation, Repair and Reinstatement of Existing Surfaces

Where a trench is required in an existing bituminous pavement, the thickness of bituminous material required in the reinstatement will be as per the requirements for new carriageway, laid out in [Section 4, Chapter 1 Road Design Criteria](#).

Below the bituminous layers the trench should be reinstated with 300mm of capping material and 150mm of sub-base material, both fully compacted.

A cross section of a typical trench reinstatement in bituminous material is shown in diagram 5.8.2.1. The same overlap of materials should also be used where any new carriageway, cycle track or footway / footpath construction meets any existing construction.

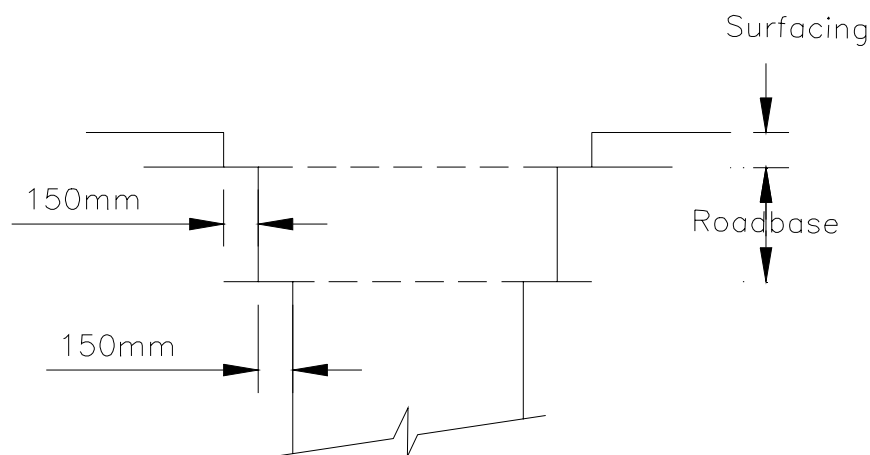


Diagram 5.8.2.1 Trench reinstatement in existing carriageway

There should not be a need to dig a trench in any new pavement provided as part of the development. Where a trench is necessary, it should be dug prior to the laying of the binder course and surface course layers of the pavement.

Reinstatements and repairs shall also comply with the 700 & 1000 Series of the SHW.

## 8.3. Appendix 7/4: Bituminous Sprays

Prior to laying bituminous material, the existing surface shall be sprayed with tack or bond coat.

Tack coat should be Class K140 to BS434. The rate of spread should be between 0.35 & 0.55 litre/m<sup>2</sup>.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 9 – Kerbs, Footways and Paved Areas (series 1100)





9.	<b>Kerbs, Footways and Paved Areas (Series 1100)</b>	
9.1.	Appendix 11/1: Kerbs, Footways and Paved Areas .....	2



## 9.1. Appendix 11/1: Kerbs, Footways and Paved Areas

Details of footway, footpath and cycle track construction are given in [Section 4, Chapter 1: Road Design Criteria](#).

Concrete surfacing will not normally be acceptable.

Block paving on footways, footpaths and cycle tracks should normally be laid in herringbone pattern.

Prior to laying sub-base material the formation shall be sprayed with an approved weed killer.

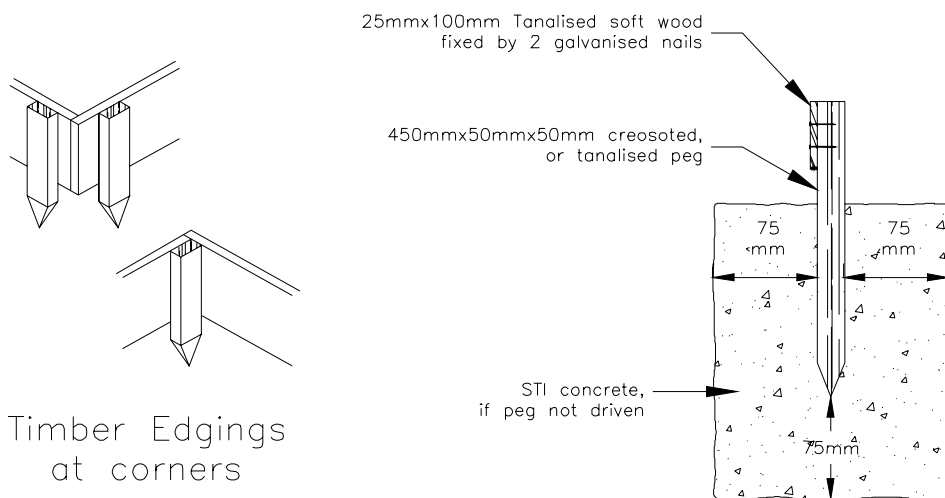
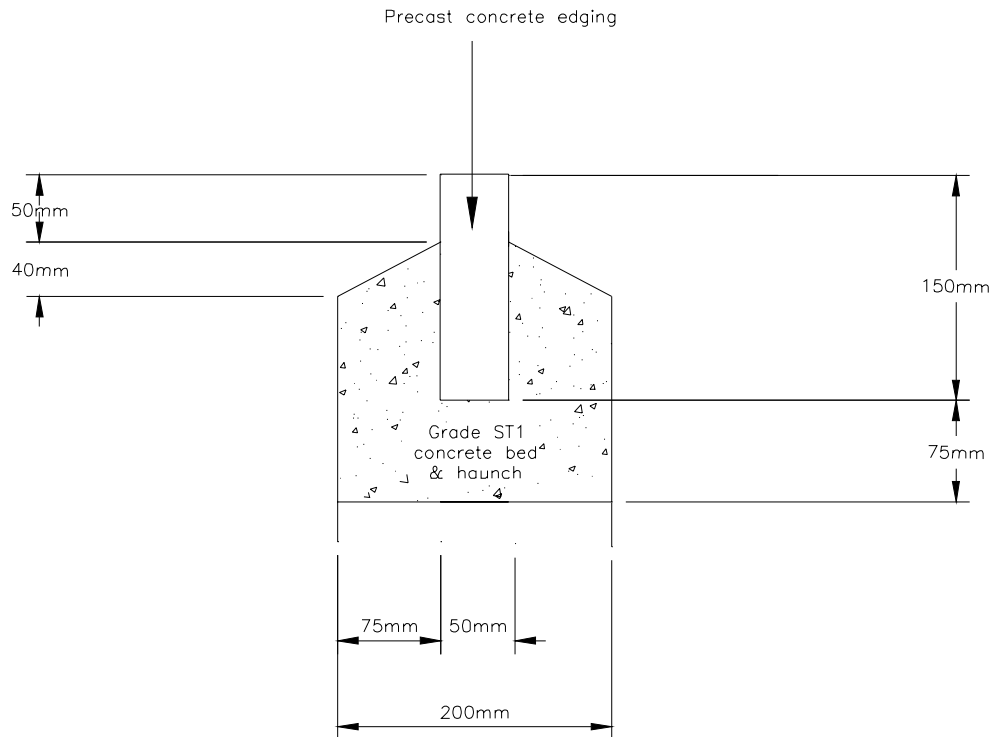
Surfacing shall be laid to true levels and crossfalls. The tolerances in surface levels of lower pavement courses should be:

- Sub-base:  $\pm 10\text{mm}$
- Binder course:  $\pm 3\text{mm}$

Paved areas such as carriageway, footway, footpath or cycle track, must be restrained by kerbs, edgings, setts, etc.

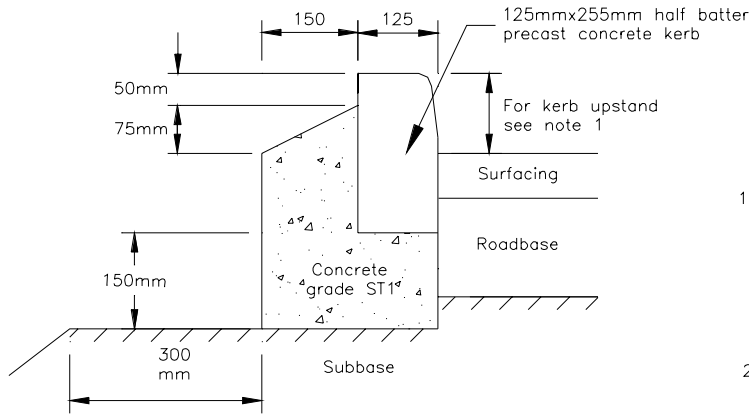
The type of kerb, in terms of material and profile, should be in keeping with the local character of the area surrounding the scheme. The Contractor will need to obtain the approval of the Local Planning Authority and HCC for the kerbs they proposes to use. Kerbs bonded to the carriageway will not normally be acceptable.

Diagrams 5.9.1.2 and 5.9.1.3 show the typical edging and concrete kerb and channel block detail respectively.



TYPICAL EDGING DETAILS

Diagram 5.9.1.2: Typical Edging Details



Notes:

1. Where footway/cycle track is adjacent to the carriageway the upstand should be 125mm. An upstand of 40mm will be sufficient where adjacent properties, footways & cycle tracks are to be separated from an area of shared surface block paved carriageway.
2. At dropped kerb vehicular crossings the upstand should be 25mm. At crossings used by pedestrians, or cyclists the upstand should be zero.

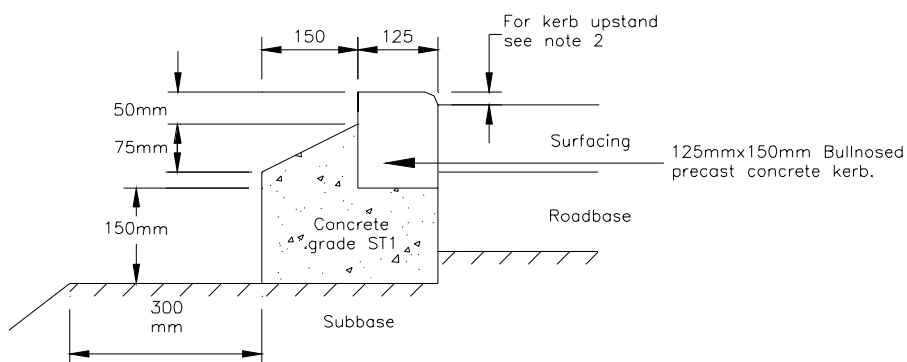
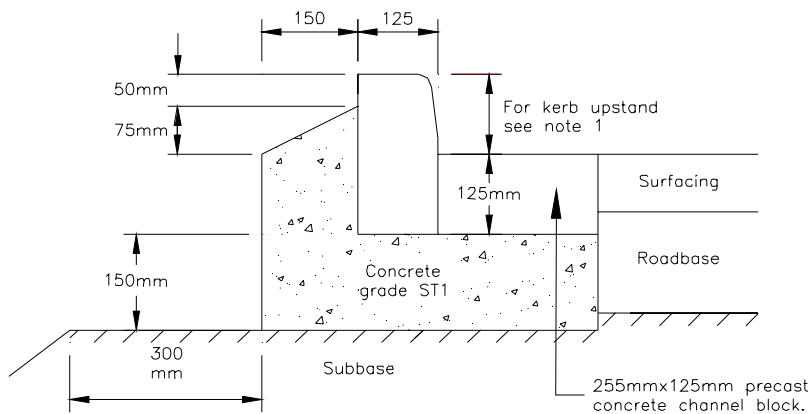


Figure 5.9.1.3: Typical concrete kerb and channel block detail



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 10 – Traffic Signs and Road Markings (Series 1200)





## 10. Traffic Signs and Road Markings (Series 1200)

10.1.	Appendix 12/1: Traffic Signs General .....	2
10.1.1.	General .....	2
10.1.2.	Posts (Large Base or Straight) .....	2
10.1.3.	Sign Plates .....	3
10.1.4.	Housing of Electrical Equipment.....	3
10.1.5.	Erection .....	3
10.1.6.	Temporary Covering of Signs .....	4
10.1.7.	Sign Lighting .....	4
10.1.8.	Illuminated Bollards.....	4
10.2.	Appendix 12/3: Road Markings and Studs.....	5
10.2.1.	Road Markings .....	5
10.2.2.	Removal of Road Markings .....	6
10.2.3.	Road Studs.....	6





## 10.1. Appendix 12/1: Traffic Signs General

See also [Section 4, Chapter 16: Traffic Signs and Road Markings](#).

Signs, posts, cones, bollards etc. shall comply with the requirements of BS EN 12899.

### 10.1.1. General

Where a new sign is to replace an existing then the existing sign and post(s) are not to be removed until the new sign arrangement is erected, unless otherwise agreed by the Highway Authority.

### 10.1.2. Posts (Large Base or Straight)

Steel posts, brackets and all exposed ferrous metal work shall, before leaving the factory be protected against corrosion by:

- Column to be hot dip galvanised in accordance with the requirements specified in BS EN 1461:1999;
- Column treated with Mordant Solution (type t) "t" wash HA item155 Ref: 150-23;
- Applying "High Build" thermoplastic polymer coating similar to "Abcite" or equivalent, Min mdf 350 microns. The coating is to cover the full length of the post externally and be in colour RAL 6005 generally and RAL 9005 in conservation areas;
- The coating should provide a minimum of 30 years protection;
- The coating is to be applied by the same process and in the same colour to any brackets.

Alternatively the developer may use:

- A hot dipped galvanised post to a minimum thickness of 100 microns, with root protection of glass flaked paint both internally and externally up to 150mm above ground level;
- If this option is used the post must be further protected by painting with a final finish as detailed in 13.3 to 13.12.

The contractor may propose other protective finishes, for approval by the Highway Authority. Alternatives will only be considered if sufficient evidence is supplied with regard to the protection and lasting properties of the finish.

Colour to be 693 Aircraft Grey to BS381C (or 18B29 to BS4800 for use in conservation areas).

All posts shall be complete with matching caps (where applicable) and base-plates (except for raft foundations). Base-plates shall have a minimum area equal to the square root of five times the area of the post.



#### 10.1.3. Sign Plates

Sign plates shall have a warranted life of not less than ten years.

Sign stiffeners shall be riveted to the sign plate and provide a flush finish without piercing or damaging the sign face material.

The back of each sign is to be marked with its associated drawing number and sign reference in characters not larger than 15mm in height.

The whole of the back surface of the sign shall be covered with an aircraft grey non-reflective plastic sheeting unless in a conservation area where it shall be conservation grey.

Signs shall be stiffened such that post fixings may be positioned at any point across the width of the sign without the need for drilling.

#### 10.1.4. Housing of Electrical Equipment

Each lighting unit shall be provided with one housing for the associated electrical equipment within the base of the large base post.

The depth, measured from the face of the switchboard to the front shall be no less than 100mm. The housing shall have an aperture of not less than 400mm x 115mm and be fitted with a weatherproof metal door having a vandal-resistant lock with key. The door and housing shall have the same finish as the post, both inside and out.

Keys for the doors shall be provided, for the Highway Authority, on the basis of one per ten doors the number of doors being rounded up to the nearest ten. A back board of non hygroscopic rot resistant hardwood not less than 12mm thick x 500mm x 80mm shall be securely fixed to back of the compartment by countersunk screws and on this board the electrical equipment shall be mounted.

The housing shall be earthed in accordance with Institution of Electrical Engineers recommendations and an earthing point, with screw and shake proof washer, provided within the base housing in a location accessible from the door opening.

On a large base post, a service entry opening of 100mm x 75mm shall be provided in the side of the base housing with the lower edge of the opening being 450mm below finished ground level.

The lower edge of the door in the housing shall be at least 150mm above finished ground level.

The interior and exterior of the housing and all holes for cables, bolts, access, etc. shall have a smooth finish with no sharp edges.

#### 10.1.5. Erection

The exact position of each sign shall be agreed on site by the Highway Authority.

Where illuminated signs have a base housing, the post with the housing shall, be the one farthest from the carriageway edge and in every case the access opening shall be away from the direction flow of the nearest traffic lane.



#### 10.1.6. Temporary Covering of Signs

In certain circumstances, it may be necessary to cover signs temporarily to avoid causing confusion to traffic. In such circumstances, the contractor shall be responsible for covering the signs. This must be agreed with HCC.

#### 10.1.7. Sign Lighting

HCC is pursuing an energy reduction strategy to help reduce the counties impact on the environment. Innovative and new technologies are consistently evaluated and implemented throughout the department. Any suggestions to implement such new technologies will be warmly received.

HCC recognises the changing environment in which they operate. All Standards and guidelines stated are subject to being the most up to date at publication. Should the standards change or be superseded then the most up to date standards should be used.

LED lanterns should be used in place of the fluorescents, for larger signs where this may not possible an appropriate low wattage alternative should be used.

All lighting must comply with the BS EN 12899-1:2007 or the most up to date standard.

All lighting unit arms, brackets and fittings shall be made of galvanised steel and finished as specified for posts, or other materials approved by the Highway Authority.

Where a road crossing is needed to power signs an extra low voltage supply should be used via a slot cut, the supply should be fed from the switch line of the nearest lamp column, using a double pole isolator and 6mm cable.

Solar powered signs can on approval of HCC' be used as an alternative to an electrical supply wherever possible. However if the location of the sign is likely to be hit i.e. existing equipment has had a high knockdown rate in that area, then the solar option is not feasible.

Any solar powered sign should be modular in nature with replaceable, upgradeable parts. The preferential solar powered sign will also have replaceable LED arrays and all LED drivers must be accessible and replaceable. Further details can be sought on the use of solar powered signs from HCC.

#### 10.1.8. Illuminated Bollards

Guidance for the use of signs on bollards can be seen in [Section 4, Chapter 16: Traffic Signs and Road Markings](#).

The bollard must be categorised as IR2 TTB or IR3 TTB as part of BS EN 12899-2:2007 4.1.3.4 Classification of impact resistance.

The bollard must conform to the Illumination requirement set out in BS EN 12899-2:2007 4.2.3.2 Mean luminance and uniformity of luminance.

The bollard must be independently tested and have independent certification of its ability to comply with BS 12767 passive safety, BS 8442 retro reflective self righting bollards.

The bollard must be authorised by the DfT for use on the highway.



The Bollards must have 3m's diamond graded reflective material or equivalent and be in accordance with BS EN 12899-2:2007 and hold the 10 year manufacturer's de-lamination guarantee.

Any solar powered bollard should be modular in nature with replaceable, upgradeable parts. Further details can be sought on the use solar powered bollards from HCC.

Any bollards lit through mains electricity should be supplied via an extra low voltage slot cut, the supply should be fed from the switch line of the nearest lamp column, using a double pole isolator and 6mm cable.

## 10.2. Appendix 12/3: Road Markings and Studs

### 10.2.1. Road Markings

Road markings will generally be made of thermoplastic material, unless otherwise agreed with the Highway Authority.

Road markings should be reflectorised with solid glass beads, conforming to BSEN1423, applied to the wet surface of the material.

In addition to the SHW, road markings shall also comply with the performance requirements of BSEN1871 and BSEN1436. When requested by the Highway Authority, materials shall undergo a road trial in accordance with BSEN1824 and have attained a role over class P1.

The specification for lining performance may vary at different sites. The contractor should contact the Highway Authority for site specific requirements.

The Developer is responsible for any testing required by the Highway Authority to ensure compliance with the relevant British Standards. Such testing is only likely to be requested for larger areas of lining.

In general, white road markings should have the following minimum performance standard as defined in BSEN1436:

Property	BS ref.	Class	Value
Luminance	Table 2	B2	$\beta \geq 0,30$
Skid Resistance	Table 7	S2	$SRT \geq 50$
Retro-reflectivity	Table 3 dry	R2	$R_L \geq 100$
Retro-reflectivity	Table 4 wet	RW1	$R_L \geq 25$
Retro-reflectivity	Table 5 rain	RR1	$R_L \geq 25$

Table 5.10.2.1: performance standards for white road markings



In general, yellow road markings should have the following minimum performance standard as defined in BSEN1436.

Property	BS ref.	Class	Value
Luminance	Table 2	B1	$\beta \geq 0,20$
Skid Resistance	Table 7	S1	$SRT \geq 45$
Retro-reflectivity	Table 3 dry	R1	$R_l \geq 80$

Table 5.10.2.2: performance standards for yellow road markings

When a road marking is required, by the Highway Authority, to have an increased wet night visibility, the line shall be Class RW3,  $R_l \geq 50$ .

When a road marking is required, by the Highway Authority, to have an increased skid resistance, the line shall be Class S4,  $SRT \geq 60$ .

#### 10.2.2. Removal of Road Markings

Existing road markings that require removal shall be removed mechanically. All arisings should be removed during the process. Removal using hot compressed air should not be used.

#### 10.2.3. Road Studs

Road studs shall comply with the requirements of BS EN1463.

Reflecting road studs will generally be depressible, self wiping, long type, either metallic or non-metallic. In some circumstances the Highway Authority may prefer to use adhesive road studs for their greater reflectivity. The contractor should agree the type of stud to be used with the Highway Authority. Adhesive studs will be laid to the manufacturer's recommendations.

The projection of the stud above the carriageway shall be no more than 18mm when depressed, nor 25mm when not depressed. Each stud shall be laid to an approved template to ensure uniformity of fixing.

The holes to receive the studs shall have vertical sides, not exceeding the length or width of the stud by more than 50mm and shall be cut by milling machine.

The stud shall be bedded on no more than 12mm of hot sand carpet asphalt and grouted in position with the same material, up to the surface of the carriageway. Alternatively, the stud can be bedded on fine graded wearing course and grouted in hot bitumen.

Bituminous sand carpet shall comply with BS594, Part 1.

Asphaltic cement: Table 1, Column 1.

Composition: Table 3, Column 3/1, for 0% coarse aggregate.

Fine graded wearing course shall conform to BS4987, part 1 in accordance with tables 34, 35 and 36 of that standard.

Hot filled bitumen shall consist of 75% slag dust and 25% bitumen, 60/80 penetration.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 11 – Road Lighting Columns and Brackets (Series 1300)





## 11. Road Lighting Columns and Brackets (Series 1300)

11.1. Appendix 13/1: Information to be provided when specifying Lighting Columns and Brackets .....	2
11.1.1. Columns and Brackets .....	2
11.1.2. Heavy Duty Columns (for use with Festive Lighting).....	4
11.1.3. Folding Columns .....	5
11.1.4. Numbering of Columns .....	5
11.1.5. Erection of Steel Columns .....	5



## 11.1. Appendix 13/1: Information to be provided when specifying Lighting Columns and Brackets

Refer to [Section 4, Chapter 15: Lighting – Detail](#) for further information.

### 11.1.1. Columns and Brackets

All components and brackets supplied must be manufactured by a company accredited under the quality assurance scheme ISO9001 and the Contractor must, when requested to do so, supply to the Engineer a copy of the appropriate accreditation documentation prior to any purchases or erection of lighting columns and brackets under the contract.

All columns and brackets shall be manufactured, supplied and installed in accordance with the requirements of BSEN40 with a minimum design life of 25 years.

Design of the columns shall include for a sign loading of 0.3 m<sup>2</sup> x 1.8 shape coefficient mounted 2500 mm above ground level for 5/6 metre columns & 0.60m<sup>2</sup> for 8/10/12 metre columns symmetrical & off-set 300mm for 5/6m columns & 500mm for 8/10/12 metre columns.

All lighting columns and brackets shall carry a unique identification mark which indicates the name of the manufacturer, the year of manufacture and an identification number to enable details of the column and bracket to be determined throughout the design life of the column. This information shall be clearly visible after erection of the column.

The lighting columns and brackets shall be manufactured from steel which meets the requirements of BSEN40-5 2000. All columns shall be of tubular steel design and shall be manufactured from the following:

- Hot finished circular hollow sections to EN10210 Part 1 Grades S275 & S355 JOH;
- Cold formed circular hollow sections without subsequent heat treatment to the dimensional requirements of EN10219 Part 2 and the chemical and mechanical properties of EN10219 Part 1 Grades S275 & S355 JOH.

The hot finished feedstock material shall comply with the yield, tensile and elongation requirements of the required grade specified in BSEN10025: 1993 Table 5.

The thickness of the circular hollow section used in the manufacture of the columns shall be purchased such that the negative tolerance is limited to –6%.

The manufacturer shall provide suitable scale drawings detailing the appearance and all measurements including tube diameters of the proposed columns and brackets. These shall be submitted for approval prior to the delivery of any columns or erection of such under the contract.

The column base to shaft joint shall be of a swaged and welded construction with an internal centralising washer.

The lighting column base compartment shall comply with the requirements of BSEN40 and shall have a minimum opening of:

- 500 mm x 100 mm (clear opening) for 5 m and 6 m columns;
- 600 mm x 115 mm (clear opening) for 8m 10m and 12m columns.





Door openings shall be free from irregularities and burrs and all doors shall have a suitable earthing lug on their internal face.

The door shall wrap around with a single clamp fixing arrangement and M8 tri-head stainless steel bolts.

The same pattern of door lock is to be used throughout on all columns supplied and the door shall come assembled on the column.

All columns shall be provided with an earth lug at the bottom left-hand side of the gear compartment to fit the earth wire.

All lighting column welding procedures must be approved in accordance with the requirements of BSEN288 and all welders must be approved to the requirements of BSEN287. Welding is then carried out in accordance with BSEN1011.

Lantern arrangement and mounting height should be in accordance with the options set out in BS5489-1:2003 and that of any existing installations that abut or form part of the design area. In addition there may be local geometric, maintenance and environmental constraints that apply. Details of any existing lighting and supply source can be obtained from the Highway Authority.

Lantern Mounting Height	Maximum Bracket Projection
15m	2.5m
12m	2.0m
10m	1.5m
8m	1.0m
6m	Post Top (No bracket)
5m	Post Top (No bracket)

Table 5.11.1.1: Maximum bracket projection

There shall be no sharp edges within the columns or bracket arms which could damage electrical cables either during installation or while in service.

A full length baseboard at least equivalent to the door size of treated Hardwood shall be provided and fixed in the base compartment and shall be of sufficient size to accommodate all control equipment and service cut-outs.



Columns and brackets shall be structurally designed to be capable of accepting lanterns with the following maximum weight and windage:

Column Height/Type	Windage	Weight
5 m post top	0.08 m <sup>2</sup>	9.0 kg
6 m post top	0.08 m <sup>2</sup>	9.0kg
8 m post top	0.13 m <sup>2</sup>	15.0kg
10 m post top	0.13 m <sup>2</sup>	15.0 kg
12 m post top	0.13 m <sup>2</sup>	15.0 kg
5m hockey stick integral style ( 0.3m projection )	0.08 m <sup>2</sup>	9.0kg
6m hockey stick integral style ( 0.3m projection )	0.08 m <sup>2</sup>	9.0 kg
8m side entry ( 1.0m projection)	0.13m <sup>2</sup>	15.0 kg
10m side entry ( 1.5m projection )	0.13m <sup>2</sup>	15.0 kg
12m side entry ( 1.5m projection )	0.13 m <sup>2</sup>	15.0 kg

Table 5.11.1.2: Maximum windage and weight

- Terrain category 111 for 5m & 6m columns
- Terrain category 11 for 8m, 10m & 12m columns
- 10 min Mean Wind Velocity 22.00 m/sec
- Maximum Altitude 132 Metres
- Rationalised Wind Factor 350 n/mm<sup>2</sup>
- Rationalised Wind Region Extra Light

All columns shall be galvanised to BSEN1461 and shall be free from imperfections including porosity. Galvanising shall be fettled and rasped to remove all spikes and sharp edges and leave a smooth finish prior to finishing application.

Columns supplied under this specification will be periodically checked for compliance with the specifications.

Manufacturer's recommendations shall be adhered to regarding method of off-loading, storing and assembling the columns and brackets and for securing the brackets to the columns.

#### 11.1.2. Heavy Duty Columns (for use with Festive Lighting)

5 - 6 metre columns shall be designed to carry the following alternative loads:

- Twin hanging baskets with a wet soil weight of 20kg for each single basket mounted at 3.0m from ground level to top of mounting bracket;
- Single luminaire weighing 15kg and a windage of 0.2m<sup>2</sup>.



8/10/12 metre columns shall be designed to carry a sign loading of 0.6m<sup>2</sup> x 1.8 shape coefficient mounted 4 metres above ground level & single luminaire weighing 15kg and a windage of 0.2m<sup>2</sup>.

The columns should also be design to carry one of the following:

- Twin hanging baskets with a wet soil weight of 20kg for each single basket mounted at 3 metres from ground level to top of mounting bracket; or
- Twin banner loaded on spring mounted banner arms 2.032 metres high x 0.762 metres 2.5 metres from ground level to bottom of banner; or
- Christmas decoration 1.5m<sup>2</sup> x 35 % solid weighing 20kg mounted 4 metres from ground level to bottom of decoration.

#### 11.1.3. Folding Columns

Folding columns require to be based hinged.

Columns must comply with standard column specification for HCC.

Columns used for footpaths where normal vehicle access is not possible should be fold-down (base hinged) columns with base doors; this should be accessible without the need of the column to be folded.

#### 11.1.4. Numbering of Columns

Columns shall be identified by a number in accordance with a schedule provided by the Highway Authority.

The number shall be self-adhesive, reflectorised material, not less than 50mm in height. Columns with three phase circuits shall have a phase disc fitted as agreed with the Highway Authority.

#### 11.1.5. Erection of Steel Columns

Steel columns shall:

- Be unloaded, slung, stacked assembled and erected strictly in accordance with the manufacturer's instructions;
- Be located on a stone flag or a layer of concrete grade ST4, 75mm thick, except when planted in rock or hard material when directed by HCC;
- Be placed in a hole with steep sides allowing a minimum of 100mm clearance all round the base of the column for the full excavation depth;
- Have concrete to grade ST5 consolidated in 150mm layers laid from the stone flag to the cable entry slot. The cable hole for the bracket shall be temporarily plugged and be in the correct position relative to the road so that the bracket, when fixed in its correct position, will align correctly with the cable hole;
- Have care taken in erecting each column to ensure that the cable entry at the base is in the correct position;
- Have lanterns attached to the column only after the columns have been erected in their final positions for a period of not less than 24 hours. The luminaire shall be correctly



- orientated with the road (together with any optical components) in accordance with the manufacturer's instructions;
- Have the door facing away from the direction of traffic flow, i.e. when accessing the column it is between the operative and traffic. On footways the column door may, with the agreement of the Highway Authority, face across the footway.



## Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 12 – Electrical Work for Road Lighting and Traffic Signs (Series 1400)





## 12. Electrical Work for Road Lighting and Traffic Signs (Series 1400)

12.1.	Introduction.....	2
12.2.	Appendix 14/1: Site Records .....	2
12.2.1.	Requirements for Scheme Acceptance into Maintenance.....	2
12.3.	Appendix 14/3: Temporary Lighting .....	2
12.4.	Appendix 14/4: Electrical Equipment for Road Lighting.....	2
12.4.1.	Luminaires for Columns .....	2
12.4.2.	Photoelectric Controls.....	3
12.4.3.	Control Gear.....	4
12.4.4.	Lamps .....	4
12.4.5.	Ignitors.....	5
12.4.6.	Cut-outs.....	5
12.4.7.	Miniature Circuit Breakers .....	6
12.4.8.	Sub-fuses .....	6
12.4.9.	Fuse in Cut-out for Columns and Signs .....	6
12.4.10.	Wiring of Columns .....	6
12.4.11.	Earth Protection of Columns, Signs and Feeder Pillars.....	7
12.4.12.	Earth block (Columns, Signs and Belisha Beacons) .....	7
12.4.13.	Feeder Pillars.....	7
12.4.14.	Group Switching Control Equipment .....	8
12.4.15.	Underground Cables.....	8
12.4.16.	Earth Rods .....	8
12.4.17.	Cable Jointing Kit .....	9
12.4.18.	Joint marker .....	11
12.4.19.	Excavation of trenches .....	11
12.4.20.	Cable Laying to Columns and Signs .....	11
12.4.21.	Ducts.....	11
12.4.22.	Termination of Cables .....	12
12.4.23.	Earthing of cable armouring .....	12
12.4.24.	Thrust Boring.....	12
12.4.25.	Subway Cornice Lighting System .....	12
12.4.26.	Tests on Completion.....	13
12.4.27.	Switching on Lighting .....	13
12.5.	Appendix 14/5: Electrical Equipment for Traffic Signs .....	14
12.5.1.	Wiring of Signs - Large Base Post.....	14
12.5.2.	Earth Protection of Signs Post .....	14



## 12.1. Introduction

HCC has a number of standard detail drawings for electrical installations and equipment. The scheme designer or promoter should liaise with the HCC to obtain the drawings relevant to his proposed installation.

See also [Section 4, Chapter 15: Lighting – Detail](#).

## 12.2. Appendix 14/1: Site Records

### 12.2.1. Requirements for Scheme Acceptance into Maintenance

The following documentation shall be provided for scheme acceptance:

- Certification that all outstanding works are complete;
- Electrical test certificates, as required under BS7671;
- Column structural certificates where required;
- As installed drawings;
- Details applicable to entering the installation onto HCC's street lighting inventory, in electronic format and grid referenced;
- Maintenance Manual and Health and Safety File complying with the CDM requirements.

HCC may inspect the works to ascertain that all aspects of the installation meet with the requirements of this guide.

## 12.3. Appendix 14/3: Temporary Lighting

Where the scheme promoter's works affect existing road and sign lighting, he must provide adequate temporary lighting to the satisfaction of HCC.

It will not normally be acceptable for lighting to be powered by a generator overnight. The scheme promoter must make provision for another means of supply.

## 12.4. Appendix 14/4: Electrical Equipment for Road Lighting

### 12.4.1. Luminaires for Columns

Luminaires shall:

Be of a type currently acceptable to HCC and comply with BSEN60598;

- Have associated control gear fitted within the luminaire canopy;
- Be supplied complete with suitable lamp holder ready wired to a connector block with flexible cord with not less than 0.75mm<sup>2</sup> conductors insulated with non-hygroscopic heat resisting material;
- Be wired between the socket and the terminal block with colour coded cable;
- Be snugly attached to the bracket without any gap between the bracket and the root end of the lantern;



- Be supplied and protected with packing material to enable reasonable stacking when stored for future use.

#### 12.4.2. Photoelectric Controls

Photo-Electric Controls shall:

- Comply with BS5972;
- Comply with BS2011 vibration (photocells on group switching columns only);
- Generally be one piece units;
- Be capable of controlling the particular discharge lighting load of each individual circuit (2 x 400 W SON);
- Be pre-set at the factory and not capable of adjustment on site and shall switch on when the ambient dusk lighting has reached a level of 35 lux on and 18 lux off having a differential not greater than 1 to -0.5 negative switching;
- Be designed so that in the case of a fault occurring in the control circuit the unit shall fail safe in the "ON" position;
- Be designed to fit onto the twist lock socket which is provided with the lantern;
- Be indelibly marked with the manufacturer's identification mark, model number and, switch on level;
- Include a delay device so that the lamps are not switched on by transient changes in the illuminance, switching delay 10 - 20 seconds;
- Be provided with sealant rings to prevent dirt and moisture from entering into the photo-control unit and lantern;
- Sensor drift shall be zero over six years;
- Power consumption shall be 1 W or less;
- Cells for individual columns shall have a guarantee of 6 years and for group switching columns the guarantee shall be 10 years;
- Cells for group switching columns shall have synchronous switching and the switching shall be by means of a relay (Triac or relay switching is acceptable for individual unit photocells);
- Operational temperature range shall be -20 °C to + 80 °C and shall be protected to IP67.





#### 12.4.3. Control Gear

All control gears shall be electronic and have the capacity to be dimmed.

Capacitors shall:

- Comply with BSEN61048/BSEN61049;
- Be fitted in the luminaire;
- Be totally enclosed and proofed against condensation;
- Be supplied complete with discharge resistors and sealed in cable tails or shrouded terminals;
- Be fitted with an earth stud or terminal. The provision of an earth terminal on the capacitor clip will not meet the earthing requirements;
- Correct the power factor to not less than 0.85 lagging.

#### 12.4.4. Lamps

Lamps shall:

- Be new and supplied by a reputed manufacturer;
- Have the date they are installed stamped or written on the lamp cap in indelible ink;
- Be supplied and protected with packing materials to enable reasonable stacking for storage purposes.

High Pressure Sodium Lamps shall incorporate an integrated antenna, have a Zr Al getter, be of the SON/T plus type and shall be supplied with an external ignitor, regardless of whether a thermal switch is incorporated in the lamp.

Low pressure sodium lamps shall be of the SOX-E or SOX plus type.



Lamps shall not have less than the following design lumen outputs at 100 hours burning:

Cosmo	Fluorescent	SON/T lamps
140w 16,500 lumens	55w PLL 4,800 lumens	400w 55,500 lumens
90w 10,450 lumens	42w PLT 3,200 lumens	250w 33,000 lumens
60w 6,900 lumens	36w PLL 2,900 lumens	150w 17,500 lumens
45w 4,300 lumens	32w PLT 2,400 lumens	100w 10,500 lumens
	24w PLL 1,800 lumens	70w 6,600 lumens
	18w PLL 1,200 lumens	50w 4,400 lumens

Table 5.12.4.1: Lumen outputs

#### 12.4.5. Ignitors

Ignitors shall:

- Be compatible with the lamp and located within the luminaire canopy;
- Be totally enclosed and proof against condensation;
- Be supplied complete with sealed in cable tails and shrouded terminal.

#### 12.4.6. Cut-outs

Wiring between the terminal block in the lantern and the cut-out in the base of the columns shall be 3 core or 4 core polyvinyl chloride insulated and sheathed flexible cable of 300/500 volt grade to BS6004, having a copper conductor size of not less than 1.5mm<sup>2</sup> for columns up to and including 8m high, and not less than 2.5mm<sup>2</sup> for columns above 8m.

Cut-outs for cable terminations in columns and signs shall:

- Incorporate a double pole fuse carrier suitable for a fuse to BS88 in the phase conductor for each lantern on the column;
- Have terminals large enough to take the service cables specified in straight terminations or looped services up to and including 25mm<sup>2</sup>;
- Be securely fitted to the backboard by means of preferably 3 No. stainless steel screws;
- Double arm columns shall be fitted with a double pole twin fuse cut outs.



#### 12.4.7. Miniature Circuit Breakers

- Miniature circuit breakers shall be for use on 240V single phase supply;
- A "lock off" facility shall be provided. Type C mcb's shall be supplied.

#### 12.4.8. Sub-fuses

Sub-fuses for cable terminations in columns and signs shall:

- Consist of a substantial moulded plastic enclosure with separate terminals for live and neutral conductors, incorporate a fuse-carrier suitable for a fuse to BS88;
- Live and neutral terminals shall be shrouded;
- Be constructed so that the removal of the carrier requires isolation supply;
- Be designed primarily for use in street lighting columns;
- Have terminal large enough to take the service cables specified in straight terminations or looped services;
- Be securely fitted to the back board by means of at least 2 No. stainless steel screws, (Pozidriv or Phillips).

#### 12.4.9. Fuse in Cut-out for Columns and Signs

Each lamp circuit shall be protected by a high rupturing capacity type fuse to Class Q to BS88 of approved manufacture and design, particularly in regard to the ability to be fitted without removal of the fixing screw and be of the following ratings:

- 400w SON/T lamps      16A
- 250w SON/T lamps      10A
- 150w SON/T lamps and less      6A
- All fluorescent lamps      4A
- Cosmopolis lamps      6A

Appropriate fuse discrimination must be achieved in accordance with BS7671 (sign fuses 4A, sub-fuses 6A and cut-outs feeding sub-fuses 16A/10A as appropriate).

#### 12.4.10. Wiring of Columns

Three core cable colour codes (for columns on group switched networks and columns that are not supplying a feed):

- Luminaire live: brown
- Luminaire neutral: blue
- Luminaire earth: green/yellow



Four core cable colour codes (for columns supplying a sub feed):

- Luminaire live: brown
- Luminaire neutral: blue
- Photocell load: black
- Luminaire earth: green/yellow

#### 12.4.11. Earth Protection of Columns, Signs and Feeder Pillars

General:

- All metalwork (other than current carrying parts) shall be earthed;
- Earthing shall be carried out in PVC insulated copper cable of correct colour-coding;
- All earth connections shall be made by means of a crimped lug type termination;
- Earth labels shall be fitted to all main earthing terminals (unit earth stud, earth block or CET).

On HCC Cable Networks:

- A separate 16mm<sup>2</sup> protective conductor shall be taken from the column earth stud and bonded to the incoming cable earthing system;
- A separate 16mm<sup>2</sup> protective conductor shall be looped between incoming and outgoing cables.

On Local Electricity Company service:

- A separate 16mm<sup>2</sup> protective conductor shall be taken from the earth block and bonded to the earth stud on the column;
- A separate 16mm<sup>2</sup> protective conductor shall be taken from the earth block and bonded to the Electricity Company's cut-out.

#### 12.4.12. Earth block (Columns, Signs and Belisha Beacons)

Earth block shall:

- Be made of brass;
- Have provision to terminate 4 No. conductors separately;
- Be fitted securely to the backboard by 2 No. stainless steel screws (Posi-drive or Phillips).

#### 12.4.13. Feeder Pillars

Feeder Pillars shall:

- Be fabricated from 3mm thick sheet steel (5mm for larger pillars);
- Be hot dipped galvanised;
- Be fitted with hinged doors;



- Provided with a concrete slab as an access platform;
- Be provided with a concrete foundation. The base of the feeder pillar shall be below finished level and the ground thoroughly compacted;
- Have the roots treated with bituminous paint internally and externally. Galvanised pillars to have a two pack etch primer prior to being painted;
- Be bolted to the foundation with 'Kemfast' chemical fixing system;
- Be filled with fine shingle to ground level after the cables have been installed and then sealed with an approved sealant;
- Have engraved labels fitted in 50mm letters, the text HCC, and an electrical hazard warning sign fixed on the external door. "Danger 240 Volts" for single phase pillars and "Danger 415 Volts" for three phase pillars. Sizes 75mm x 115mm for small control pillars and 150mm x 225mm for the remainder.

All pillars to be treated on site to BS4800 with the same coats and colours as columns

#### 12.4.14. Group Switching Control Equipment

Group switching control equipment shall include for the isolator, protective equipment and its enclosure, cable reduction boxes and terminals, RCD socket and associated equipment, wiring and fixings.

Control will be initiated by a photocell(s) for each phase mounted on a 5m pole adjacent to the feeder pillar. Terminals for outgoing cables shall normally cater for conductors up to 25mm on single phase or 50mm on three phase. Pillars shall incorporate a separate earth terminal. Outgoing circuits are to be identified. Live terminals are to be shrouded.

Three phase panels shall have a "Danger 415v" label on the outside of the panel and have an IP rating of at least 34.

#### 12.4.15. Underground Cables

Underground cables shall be XLPE/PVC/SWA/PVC 600/1000v grade to BS6346 with stranded copper conductors.

The insulation of each core shall be of the correct colour for the complete length of the cable (brown - live / blue - neutral for 2 core cables and brown / blue / black - phases / blue - neutral for 4 core cables).

The cables into (and out of) a unit shall be labelled to indicate where the cable comes from or what it supplies respectively. The supply source point of isolation shall also be indicated. The labelling shall take the form of "Critchley" K-type markers on universal carrier strip fixed to the cable with tie-wraps or similar cable labels. Labelling to be as the following examples e.g. from/to column 23 to be indicated as 'L/C-23' or to bollard 345 as 'BOL-345'.

#### 12.4.16. Earth Rods

Earth rods are to be manufactured from copper clad steel (copper to be bonded to steel core) and 16mm in diameter. Cable clamps to have a similar aluminium bronze body and a phosphor bronze screw.

Rods are to be driven into the ground to a depth of 3.6m and be located in an earth rod core and surround housing.

All rods and installations are to conform to the IEE Wiring Regulations.

Earth rods shall be tested by the approved method as stated in IEE Wiring Regulations (fall in potential method where possible). The maximum allowed resistance being 20 ohms.

#### 12.4.17. Cable Jointing Kit

The joint shall be assembled from a kit complying with BS6910. The kit shall consist of:

- A two-part casing;
- Casing sealing material;
- Resin and hardener, cold pour variety;
- Individually packaged conductor connectors;
- Conductor insulating material;
- Earth/armouring continuity strap and clamps;
- Complete and easy to follow instructions for assembly;
- Other material and items required for a satisfactory completion of the joint.

The joint diameter shall not be greater than three times the cable diameter.

The length of the joint casing shall not exceed 500mm longitudinally and protrude more than 150mm for a branch of the joint.

The casing shall:

- Have a filler hole large enough to visually inspect and confirm clearance so that conductors, connectors, continuity straps and clamps shall be totally surrounded by filling compound;
- Be either self-locking or held by the sealing material round the joint area. Supplementary clamping should not be used;
- Be strong and rigid enough to contain the compound during pouring and setting without deforming or fracturing;
- Be large enough to enclose conductors, connectors, continuity straps and clamps with clearance for adequate insulation.

Sealing material shall be used external to the casing, if required, to prevent leakage of the compound during pouring and setting.

Joint Filling Compound may be either polyurethane, acrylic or epoxy resin.

The resin and hardener shall be supplied, preferably in a two compartment one-piece flexible container, with a breakable seal between the two compartments. The components shall be mixed, by breaking the seal and kneading together, without exposure before pouring.



Alternatively, the hardener may be added to the resin in a flexible container, which may then be sealed and the component kneaded together without exposure before pouring.

Where two or more containers are required to fill a joint casing the filling compounds from each container shall mix to form a homogenous compound.

The compound shall meet the requirements of the Electricity Council Research Centre ERRC/M687 Appendix 1.

The compound temperature during setting shall not exceed the maximum permissible continuous operation cable temperature.

Clear instructions shall be attached to or painted on the compound container of precautions to be taken with the compound including instructions in the event of an accident or contact with:

- The compound before it was set;
- The resin;
- The hardener.

Connectors shall be mechanically and electrically sound.

Connectors shall not:

- Loosen;
- Oxidise;
- Corrode;
- Be affected by temperature changes;
- Impair the physical and electrical characteristics of the cable.

Bared conductors, connectors, continuity straps and clamps shall either be insulated or held apart by spacers before joint filling.

The insulation of spacers shall:

- Be suitable for use with the joint filling compound;
- Absorb the joint filling compound to become totally non-porous and exhibit similar electrical and physical characteristics as the compound.

All strands of a stranded conductor, strap or armouring shall be held captive by the connector clamp provided with the kit.

Armour bonding by clamping direct into the inner cable sheath is unacceptable. Armouring shall be clamped onto a ring to protect the inner cable sheath and conductors from compression.

The jointing kit shall be tested to the requirements of the Electricity Council, Engineering Recommendation C64.

Certification by a Test House approved by the DfT shall be provided to confirm compliance with specification.



The scheme provider shall provide HCC with a reasonable opportunity to inspect the joint:

- Before filling;
- Before burying.

The following information should be provided by the scheme provider, if requested:

- Cable sheath material;
- Conductor material;
- Conductor size;
- Special features, e.g. Max temperature, Tension, Water Pressure, Shelf life other than specified, Chemical contaminants.

#### 12.4.18. Joint marker

Joint marker shall:

- Be a 300mm concrete cube;
- Be installed flush with ground level and directly above joint;
- Have on the face of the cube the text "Joint".

#### 12.4.19. Excavation of trenches

Excavation of trenches shall be carried out after levelling and before topsoiling. The depth of trench shall provide the cover to cables or ducts as required in the SHW. Trenches shall have a minimum width of 200 mm.

#### 12.4.20. Cable Laying to Columns and Signs

Cable shall:

- Be laid in ducts under all carriageways, footways, footpaths, cycle tracks, vehicular crossings and driveways likely to be used by heavy vehicles;
- Be laid elsewhere in a bed of sand and backfilled to SHW. The trench shall be free of water when the sand and cable are laid in it. Where deemed necessary by HCC, interlocking cable tiles shall be provided and laid along the centre line of the cable;
- Be laid slightly "snaked" in trenches;
- Have a minimum length of 1m left as a loop at all feeder pillars.

#### 12.4.21. Ducts

Ducts shall be thick walled low density polyethylene. The nominal diameter should be 100mm, orange colour with 'Street Lighting' permanently embossed. A draw rope shall be retained within the duct attached to external marker blocks and the ends sealed.

All duct joints shall be sleeved and sealed.





#### 12.4.22. Termination of Cables

Any aluminium armoured cables used, are to be covered with Denso paste before they are connected.

#### 12.4.23. Earthing of cable armouring

Cable armouring shall:

- Be bonded at all joints without significant increase in resistance as compared with that of an unjointed cable run;
- Form the sole earth continuity circuit;
- Form a bond between adjoining cables.

#### 12.4.24. Thrust Boring

No thrust bore shall be attempted without prior consultation with Statutory Undertakers and approval from HCC.

Thrust bores shall generally be driven at a minimum vertical depth of 1.5m below formation level giving due consideration to the camber of the carriageway.

The sides of all excavations shall be battered or adequately supported.

Unless otherwise stated each bore shall accommodate one 100mm plastic duct complete with suitable draw wire.

A pre-cast concrete duct marker 150 x 150 x 150mm shall be planted at each end of the bore and on the centre line.

#### 12.4.25. Subway Cornice Lighting System

All parts of the units are to be manufactured from galvanised steel, with the exception of the front panel, which is cast aluminium. All visible parts are to be finished with a white stove enamelled finish. The lantern shall have two clear polycarbonate sheets, one of 9mm thickness and the other 1mm thick, this sheet being at the front. It shall also utilise two PLL compact fluorescent lamps, with the control gear integral in the fitting. The lantern will also have its maintenance number inside, as agreed with HCC. The lanterns are to be connected to each other by galvanised 35mm diameter conduit, which runs between the 100mm infill panels.

The cabling of the system is to be carried out on an 'alternative fitting' basis, with two circuits separately fused along each side. Cable terminations in the units shall be by means of crimp connections.

The final infill panels on each cable run shall be cut to size to suit the subway and any conduit requirements.

The joint at the infill panels to the subway wall and roof shall be sealed with mastic of off-white colour.

#### 12.4.26. Tests on Completion

On completion of the installation works, before local Electricity Company connections are made, and before acceptance of the installation by HCC, tests shall be carried out by the scheme promoter to comply with the requirements of the IEE Regulations:

- Insulation resistance at a test voltage of 500V to be not less than 1 megaohm;
- Earth loop impedance test at each feeder pillar, column or sign;
- Continuity of protective conductors including main and supplementary equipotential bonding;
- Check that all fuses and single pole control devices are in the line conductor;
- Volt drop test at the furthest point from the supply and when on load;
- Cable sheath insulation pressure test one minute duration at 1000V DC between columns or signs before terminating for all network installations, without breakdown (defined as leakage greater than 2 milliamps);
- Earth electrode resistance;
- Insulation of site-built assemblies;
- Operation of residual current devices;
- Any other test deemed necessary by HCC.

Upon completion of testing a weather proof UV resistant label shall be fitted in the unit which clearly indicates the month and year that the unit was tested. The label shall show the month and year of test, as well as:

- Be 65mm in diameter;
- Have black text on a yellow background;
- Be made of a non-degradable material;
- Be either fixed to the backboard or tie-wrapped to the internal cabling.

The instruments used must be currently UKAS calibrated and copies of calibration certificates provided for HCC if requested.

It should be noted that columns requiring Local Electricity Company services require the test certificates to be provided before the supplies are installed or connected. In some circumstances this may apply to pillars.

#### 12.4.27. Switching on Lighting

No lighting shall be switched on or left in operation during the hours of darkness unless HCC has given approval.



## 12.5. Appendix 14/5: Electrical Equipment for Traffic Signs

Requirements that are common to both traffic signs and road lighting installations are described above.

### 12.5.1. Wiring of Signs - Large Base Post

Wiring between the terminal block in the lantern and the components in the base of the sign shall be 3 core, ordinary PVC insulated and sheathed flexible cords of 300/500 volts grade to BS6004, have a copper conductor size of not less than 1.5mm<sup>2</sup> and shall be of the following colour coding - Brown, Blue and Green/Yellow.

Wiring in base compartments of signs shall be kept in a neat and orderly manner by means of 4 No. Tie-wraps and be kept to one side of the control equipment.

### 12.5.2. Earth Protection of Signs Post

Generally as for columns, except that the earth conductor from the lantern shall be the earth core contained in the multi-core cable.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 13 – Protection of Steelwork Against Corrosion (Series 1900)





## 13. Protection of Steelwork Against Corrosion (Series 1900)

13.1.	Appendix 19/5: General Requirements, Protection against Corrosion .....	2
13.1.1.	Road Lighting / Traffic Signs.....	2
13.1.2.	Traffic Signals and Intelligent Transport Systems .....	2
13.1.3.	Highway Structures / Bridges .....	3
13.1.4.	Surface preparation and protection.....	3
13.1.5.	Quality Assurance .....	3
13.1.6.	Required Durability.....	3
13.1.7.	Colour .....	3

### 13.1. Appendix 19/5: General Requirements, Protection against Corrosion

The scheme promoter or designer may propose other protective finishes for approval by HCC. Alternatives will only be considered if sufficient evidence is supplied about the protection and lasting properties of the finish.

#### 13.1.1. Road Lighting / Traffic Signs

The contractor should either:

- Pre-treat galvanised external surface with “T” Wash application to be fully in accordance with Technical Data Sheet (shop applied). Followed by a one coat application of thermoplastic cross-linked copolymer using an in line electrostatic spray to the external surface of the column providing a uniform thickness of not less than 600µm with colour to BS4800, 12D45 and 18B29 for conservation areas. Other specific areas may require the final colour and finish to be determined on an individual basis; or
- Pre-treat galvanised external surface of the column and the internal root to 250mm above ground level with “T” Wash application to be fully in accordance with Technical Data Sheet (shop applied). Followed by the application of:
  - one coat of two pack micaceous iron oxide Item 121 to the external surface of the column and the internal root to 250mm above ground level minimum dry film thickness 100µm (shop applied);
  - one coat of two pack glass flake epoxy to the external and internal root to 250mm above ground level minimum dry film thickness 200µm colour black (shop applied); and
  - one coat two pack high solid polyurethane finish item 168 to the external surface of the column from ground level minimum dry thickness 50µm colour with colour to BS4800, 12D45 and 18B29 for conservation areas.

Other specific areas may require the final colour and finish to be determined on an individual basis.

All lighting columns shall be packed at contact points for transport and storage to protect the finish.

All post top columns shall have a 76.1mm diameter 100mm plain spigot unless otherwise specified by the Engineer.

Strimmer guards to be provided in grass verges when requested by the scheme promoter or designer.

#### 13.1.2. Traffic Signals and Intelligent Transport Systems

Steel poles, brackets and all exposed ferrous metal work for traffic signals & ITS works shall be protected against corrosion before leaving the factory by:

- Hot dipped galvanized (minimum thickness 100 microns) prior to the application of plastic coating;



- Equipment shall not be supplied with pre-drilled holes for push button units. Once drilled on site, holes shall be de-burred and treated with a suitable zinc rich paint or suitable rust-inhibiting paint as agreed by HCC.

#### 13.1.3. Highway Structures / Bridges

Finishes for exposed ferrous metal work on bridges and other highways structures will be agreed during the technical approval procedure. For more information please see [Section 2, Chapter 11: Structures](#) and [Section 4, Chapter 5: Structures - Details](#).

#### 13.1.4. Surface preparation and protection

Finishes for bridge steelwork shall be carried out in accordance with: [Manual of Contract Documents for Highways Works, Specification for Highway Works, Series 1900](#).

#### 13.1.5. Quality Assurance

All paints to be used on structural steelwork should have a current BBA HAPAS Road and Bridges Certificate or equivalent.

#### 13.1.6. Required Durability

The durability requirements will be determined by the exposure condition and accessibility of the steelwork on an individual basis.

The minimum durability requirement of applied paint systems will be; maintenance free for 12 years, only minor maintenance required from 12 years and major maintenance after 20 years.

#### 13.1.7. Colour

Colours will be agreed from available colours specified in BS4800.

The final colour and finish will be determined on an individual basis and will be suitable for the type of structure and location.



# Roads in Hertfordshire: Highway Design Guide

3rd Edition

Section 5 – The Specification for Highway Work

Chapter 14 – Landscape and Ecology (Series 3000)







## 14. Landscape and Ecology (Series 3000)

14.1.	Appendix 30/5 : Grass Seeding, Wildflower Seeding and Turfing.....	2
-------	--	---



#### 14.1. Appendix 30/5 : Grass Seeding, Wildflower Seeding and Turfing

All areas of topsoil should be seeded. The rate of sowing should be greater than 20g/m<sup>2</sup> and the sown area watered regularly until the growth is substantial.

Grass seed shall be a tested mixture from an approved source and certificates of purity and germination made available, when requested by HCC.

In most urban locations the grass seed mixture should be Type A or B below. Type A is used generally except where the topsoil or sub-soil is clayey when Type B should be used instead.

	Type A	Type B
Smooth Stalk Meadow Grass ( <i>Poa pratensis</i> )	28%	57%
Creeping red fescue ( <i>Festuca rubra rubra</i> )	28%	33%
Chewings fescue ( <i>Festuca rubra commutata</i> )	28%	0%
Browntop ( <i>Agrostis tenuis</i> )	9%	4%
White clover ( <i>S.100</i> )	7%	6%

Table 5.14.1.1: Grass seed mixtures

In some situations, particularly rural sites, it may be more appropriate to use a specific seed mix that reflects the indigenous plant species. Guidance can be obtained from HCC or the Local Planning Authority.