

Public

Neath Port Talbot County Borough Council
Cyngor Bwrdeistref Sirol Castell-nedd

Democratic Services
Gwasanaethau Democrataidd

Chief Executive: Steven Phillips

Date:

Dear Member

ENVIRONMENT AND HIGHWAYS CABINET BOARD - THURSDAY, 7TH JULY, 2016

Please find attached the following BACKGROUND PAPERS - Acceptance and Use of the Neath Port Talbot Specification for the Constructions of Roads for Adoption, for consideration at the next meeting of the **Environment and Highways Cabinet Board - Thursday, 7th July, 2016.**

Item

- a) **BACKGROUND PAPERS - Acceptance and Use of the Neath Port Talbot Specification for the Constructions of Roads for Adoption (Pages 1 - 148)**

Yours sincerely

p.p. Tammie Davies

Chief Executive

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SPECIFICATION FOR THE CONSTRUCTION OF ROADS FOR ADOPTION



Neath Port
Talbot County
Borough Council

Cyngor
Bwrdeistref Sirol
Castell-nedd Port
Talbot

SPECIFICATION FOR THE CONSTRUCTION OF ROADS FOR ADOPTION

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SERIES 000 – INTRODUCTION

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SERIES 000

Specification For The Construction Of Roads For Adoption

Introduction

001 Introduction

1. Neath Port Talbot County Borough Council as Highway Authority is committed to adopting all residential estate roads under S38 or S38/S278 of the Highways Act 1980 that served a highway function, from five or more individual dwelling units and have been constructed in accordance with this Construction Specification. Any works that fail to comply with this construction specification will result in the roads not being adopted by the Highway Authority. The specification for the Construction of Roads for Adoption is based on the Specification for Highway Works (SHW). Clause numbers in this Specification correspond with the clause numbers in the SHW. In some cases reference is made to Clauses which appear only in the SHW.
2. All engineering details shall be approved before work starts on site. Sufficient time shall be allowed by the Developer from the granting of planning permission to the proposed start date, as other approvals (such as flood defence consent) might be required. Developers who undertake works, without approved drawings, will be wholly on their own risk and the Highway Authority reserves the right of suitable testing of any such works with all cost being borne by the developer. Tests that fail the Highway Authority reserve the right to require that the development be reconstructed to this specification. This Specification should be used in conjunction with NPTCBC Design Guide for the Layout of Development Roads, obtained from the Highway Development Control section. In the guide road types Major Streets are category A, where General, Minor Access, Shared Surface and Mews would be category B.
3. The purpose of the Specification is to provide a consistent set of standards for design and construction of development roads, which if adhered to, will enable a straightforward system of approval and adoption by the Highway Authority.
4. The Highway Authority, when mentioned in this Specification means the Highway Authority or its Agent.
5. It is an offence for a developer to begin to develop an estate without first either:

- (a) depositing a sum of money with the Highway Authority under the Advance Payments Code which that Highway Authority considers appropriate to cover the cost of completing the roads on the development; or
- (b) as an alternative to (a) above, entering an agreement with the Highway Authority under Section 38 of the Highways Act 1980 to construct the highway in accordance with this specification. The Highway Authority will, under the terms of the Agreement, adopt the highway upon satisfactory completion. Such an Agreement must be supported by either a Bond or a sum of money to be deposited with the Highway Authority.

002 Adoption of Highways

1. The Section 38 Agreement is the preferred method of adoption and is mutually beneficial to the Highway Authority from an administrative viewpoint and the commitment to adopt will assist the developer in the sale of properties.
2. During construction, the Highway Authority will regularly inspect the works and will issue the appropriate certificates (Parts 1 and 2) in accordance with the Agreement allowing the Bond to be reduced.

003 Notice of Commencement of Development Works

1. The Highway Authority shall be given, in writing, a minimum of one week's notice of commencement of works to be carried out as part of the construction of a road intended for adoption.

Other Criteria

004 Technical

All cost associated with the technical approval of the works to be undertaken shall be at no cost to the Highway Authority.

As part of the engineering detail process the Developer shall provide specific information, which at a minimum shall be the following:

- (i) A layout drawing, corrections to public surface water sewer and any highway drains.
- (ii) Street lighting plan of the proposed location of the street lighting and proposed column; lantern type and design calculations.

- (iii) Long section drawings.
- (iv) Cross section drawings.
- (v) General layout drawings.
- (vi) Construction drawings.

Failure to provide the necessary information will result in, no engineering approval being given or adoption taking place.

005 Agreements

Section 38

For work purely within the development and does not form part of the public highway a Section 38 will be required.

Section 38/Section 278

For works that will require an element of both works on land, the developer owns and works on the public highway.

Section 278

For works that will be required solely on the public highway and do not need any land developed outside the public highway.

A copy of this Construction Specification shall be kept on site at all times and made available to all ground workers, engineers or any other staff involved in the management, construction, detailing or the like.

The decision of the Engineer is final in concerns of the construction, layout, design, and compliance etc. with this specification.

006 Inspection of the Development Works

1. The Highway Authority must be informed before construction of any part of a road intended for adoption is commenced, or before any part is covered over. Full facilities must be allowed for inspection of the Works during construction and testing of materials proposed or used.

007 Protection of the Development Works

1. The Works must be protected from the damaging effects of the weather, including extremes of temperature, and from causes such as vibration or shock.
2. The finished surfaces of the Works, both at Part 1 and Part 2 certificate stage, are to be clear of extraneous material e.g. mud on the carriageway.

008 Thicknesses and Tolerances

1. The thickness of material described means the finished compacted thickness.
2. The requirements for tolerances are incorporated in the Specification.

009 Street Lighting

1. Proposals

Two copies of drawings indicating the proposed scheme, and all necessary design calculations showing the average and minimum point illuminance level together with two copies of a specification of all equipment to be used, are to be submitted to the Highway Authority for approval before the scheme is accepted.

2. Layout

The geometry of a road lighting scheme shall comply with the relevant part of BS5489-1:2003 & BS EN 13201-2:2003.

3. Column Supply / Distribution System

The dedicated street lighting system / columns shall be fed from a 230v PME single phase supply, obtained by the Developer from the Local District Network Operator (DNO). Each column where possible will be supplied by an individual 230v, DNO, PME supply. Where no DNO network is available, a dedicated underground NPTCBC cable system shall be installed, via a Public Lighting control pillar, supplied again by an individual 230v, DNO, PME supply. Each circuit supplied from this pillar will be energised 24hrs, via a Dist Bd within the pillar.

All luminaires whether supplied individually from a DNO supply or on a dedicated NPTCBC underground cable system will be controlled by means

of a Telensa Telecell. The network shall employ a system of looped terminations.

4. Commissioning

The Developer shall be responsible for all energy charges incurred between the commissioning date and the commencement of the Maintenance Period.

5. Maintenance Period

Upon commencement of the Maintenance Period the Highway Authority will become responsible for energy payments and basic maintenance costs. The Developer will be liable for repairs/replacements due to structural failure, and failure or defects in the underground cable system.

010 Adoption of Existing Roads

1. An existing road being considered for adoption will be inspected by a Highway Authority representative to establish the works needed to bring the road up to the required standard.

011 Street Works Licence

No work shall be carried out in the public highway without the prior approval of the Highway Authority. For any work that is carried out within the public highway, a licence must be obtained from:

Street Works Co-ordinator
Service Response Centre
The Quays
Brunel Way
Baglan Energy Park
Neath
SA11 2GG
Tel: 01639 686338
E-mail: streetworks@npt.gov.uk

The Street Works Co-ordinator shall be notified by the Developer of all works within the highway. The forms for street works notification, and the traffic lights form, should temporary traffic lights be required as part of the

traffic management of your works, are available at the above address or telephone number.

The Developer should submit the forms at least six weeks before commencing on site, to the Street Works Co-ordinator at the above address, to avoid delays to work commencing on site.

Before any work commences all licences and permissions must be issued and it is the responsibility of the Developer to apply for any licences that may be required in advance. Working within the highway without the appropriate licences is illegal and the Highway Authority will, take appropriate legal action against any developer, who is found to be in breach of the Highways Act 1980.

012 Third Party Insurance

The Highway Authority shall not be held responsible for damage to property or apparatus where such damage arises as a consequence of the work associated with the estate road or any work within the existing highway.

It is the responsibility of the Developer to ensure that they and their Contractor(s) hold adequate third party liability insurance whilst working in the highway, any party undertaking such works must be able to demonstrate possession of valid insurance to the value of £5,000,000 for any one incident, number of incidents unlimited upon demand.

013 Inspection Regime

It is the responsibility of the Developer to notify the Engineer at least two working days before any works to the proposed adopted public highway are to be undertaken, to enable a suitable level of inspection to be arranged. Works undertaken without suitable notification will be carried out wholly at the Developers risk and may be condemned by the Engineer.

The following list is a guide to the works that will require inspection and should therefore be notified to the Engineer, the list is not exhaustive:

- a) Surface water drainage – work to start inspection of drain run and trench backfill.
- b) When any soil tests are undertaken in areas that are proposed to become part of the adopted public highway.

- c) Formation – level, soft spots removed, and ready to receive sub-base.
- d) Sub-base – sub-base material approval required and laying to commence – compliant test data and surface stiffness must be available prior to commencement of base/binder course installation.
- e) Kerblines – kerbing to start and inspection of kerb beam and kerb line.
- f) Base/Binder-course – start of work, inspection of compaction.
- g) Street Lighting – planting of columns.
- h) Footways/Cycleways – inspection of back edgings, formation, sub-base and Binder Course.
- i) Carriageway Surface course – inspection of compaction and finished surface.
- j) Footway/Cycleway Surface course – inspection of compaction and finished surface.
- k) Sand bed and blockwork.
- l) Inspection of the completed estate road to start maintenance period.
- m) End of maintenance period – Final inspection prior to adoption.

Additional non-notified inspections may also occur as and when the Engineer deems necessary.

The Engineer reserves the right to request cores their location and remains at the discretion of the Engineer of all carriageways, cycleways and footways at the Developer's expense before the surface course is laid.

014 Street Name Plates

The Council has the responsibility for street naming and numbering in which your development is located, you shall be required to erect the street nameplates (once the Council has advised you of the name(s) chosen), or you may be required to pay the Council to undertake the task. Please ensure that you consult the relevant Council in good time to facilitate appropriate timeliness of the process.

015 Definitions

The following list of words used in this document has the meanings ascribed to them below. These meanings relate to this document only.

California Bearing Ration (CBR) – A value for comparing strengths of soils; in this specification the design CBR value is obtained from Table 2A – Design of CBR Values.

Carriageway – the surfaced part of the road primarily designed for the use of all vehicle types.

Channel – Narrow strip, generally at the edge of the carriageway, designed to carry and lead away surface water.

Cycleway – that part of the highway over which the public have a right of way by cycle.

Developer – A person or group of person who are responsible for the construction, maintenance etc., of the site within which the proposed adopted public highway is to be built.

Engineer – Service Director – Highways Drainage and Access, their successor or their designated Representative.

Footpath – A way over which the public have a right of way on foot only, not being a footway. A footpath will not be subjected to any possible vehicular overrun.

Footway – that part of the highway, being a way over which the public have a right of way on foot only which is adjacent to a carriageway.

Formation – The level at which highway construction meets natural ground surface or the completed earthworks.

Gully – a pot, generally trapped, constructed in the carriageway edge to drain water from the carriageway.

HAPAS – The Highway Authorities Product Approval Scheme was set up by the Highways Agency, CSS and the British Board of Agreement, with the objective of developing national approval arrangements for innovative products, materials and systems for use in highways and related areas, removing the need for individual authorities to carry out their own assessments and tests.

Highway – The Highway comprises of the carriageway, cycleway and/or footway surface and any verges or visibility splays between the boundaries.

Maintenance Strips – Highway Authority area behind kerbing for kerb maintenance.

Manhole – A chamber and shaft constructed to enable access at intervals along highway drainage and/other service.

Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works (SHW) – The National specification for all construction and maintenance works on public highways. The Specification details all materials and workmanship standards that must be met. This Neath Port Talbot County Borough Council Specification for the Construction of Roads for Adoption clarifies the local interpretation of the SHW.

Section 38 Agreement (S38) – An agreement between the County Council as Local Highway Authority and the Developer under Section 38 of the Highways Act 1980.

Subgrade – Natural ground material at and below formation.

SUDS – Sustainable Urban Drainage Systems.

Tree Preservation Order – A TPO is made by the local planning authority to protect specific trees or particular woodland from deliberate damage and destruction.

016 Area Contacts

The map provided overleaf indicates the areas of responsibility for the Area Offices.

In order to arrange an inspection of works in the first instance, contact should be made by telephoning the Team Leader on of the appropriate area.

Highway Development Control Team Areas



West Team
Contact No. 01639 686397

East Team
Contact No. 01639 686392

SERIES 100 – PRELIMINARIES

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105	Goods, Materials, Sampling and Testing
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117	Traffic Safety and Management
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125	Highway Works Required as a Consequence of Development

SERIES 100

Preliminaries

Clauses 101-104 Not Used

105. Goods, Materials, Sampling and Testing

Goods and Materials

1. The Developer shall submit a list to the Highway Authority of the suppliers from whom he proposes to purchase the goods and materials necessary for the execution of the Works. No change in the list of suppliers and the Developer's proposals shall be made without the prior approval of the Highway Authority.

Sampling and Testing

2. The testing required by the Specification including provision of the associated samples shall be undertaken by the Developer who shall supply to the Highway Authority within 24 hours of the completion of each test, a copy of the results. Where United Kingdom Accreditation Service (UKAS) is required the result shall be reported on an official (UKAS) test report or certificate.

Where required a test certificate, complying with the provisions of the relevant standard or specification where applicable and certifying that the goods or materials have been tested and meet the specified requirements shall be supplied at least four weeks prior to the incorporation of the goods or materials in the Works.

The Highway Authority reserves the right to carry out tests itself on materials supplied to the site.

3. Where required tests shall, except as allowed in sub-Clause 5 of this Clause, be undertaken only by testing laboratories accredited in accordance with BS EN150/IEC17025 for such tests.
4. The Developer shall provide samples of goods and materials and deliver these to the Highway Authority.

5. The Highway Authority operates a Materials Laboratory complying with the above requirements. Details may be obtained from the Highway Authority or Laboratory Manager.

Clauses 106-111 Not Used

112. Setting Out

1. The Developer shall, within three weeks of the Date for Commencement of the Works, carry out a check of the co-ordinates and levels of all permanent ground markers and permanent bench marks and shall supply the Highway Authority with their position and level.
2. The Developer shall keep updated schedules and drawings of all bench marks (which shall be based on Ordnance Datum at Newlyn) used in the setting out and shall make these available.

113. Programme of Works

Programme of Works submitted shall comply with specific requirements stated in Appendix 1.

Clauses 114-115 Not Used

116. Privately and Publicly Owned Services or Supplies

1. The Developer shall satisfy himself as to the exact position of Statutory Undertakers and other publicly and privately owned services or supplies affected by the Works.
2. The Developer shall, during the progress of the Works take all measures required by any Statutory Undertaker or the management of other publicly or privately owned services or supplies, for the support and full protection of all such services or supplies. No such services or supplies shall be interrupted without the written consent of the appropriate authority or owner.

117. Traffic Safety and Management

The Developer shall submit to the Highway Authority for approval any traffic management proposals required to facilitate work on highways open to vehicles. These proposals are to be in accordance with the recommendations in Chapter 8 of the Traffic Signs Manual, and account

shall be taken of the recommendations of the Department of Transport/County Surveyor's Society publication 'Safety at Roadworks : Notes for Guidance'.

Clauses 118-123 Not Used

124. Substances Hazardous to Health

1. In this Clause 'substance hazardous to health' has the same meaning as in Regulation 2 of the Control of Substances Hazardous to Health Regulations 1988.
2. A substance hazardous to health shall only be used or generated in or about the Works with the consent of the Highway Authority.
3. Where any substance hazardous to health is so used or generated, the Developer shall provide the Highway Authority with:
 - (i) a copy of the assessment of the risks created by the use of that substance (as required by Regulation 6 of the 1988 Regulations); and
 - (ii) details of the measures to be taken to prevent or control the exposure of those working with the substance to acceptable levels (as required by Regulation 7 of these Regulations).
4. In addition to anything required to be done by the Developer by or under any relevant legislation the Developer shall prevent, control or monitor exposure of members of the public to any substance hazardous to health used or generated in or about the Works.

125. Highway Works required as a Consequence of Development

1. New or pre-used items shall be provided by the Developer to replace existing items cleared in accordance with sub-clause 201.5. Locations should be shown on the Drawings for approval. Items shall be re-used after inspection and agreement with the Highway Authority's representative.

SERIES 200 – SITE CLEARANCE

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202	Existing Trees, Stumps and Roots
204	Hazardous Materials
205	Japanese Knotweed
206	Use of Herbicides

SERIES 200

SITE CLEARANCE

201. Clearing

1. Underground structures, chambers and foundations shall be demolished to the depths prescribed, properly cleaned out and filled. To permit free drainage, holes shall be made over at 500mm centres over the whole area of slabs, basements etc., which are not removed and which are liable to hold water.
2. Disused soil and surface water drains, sewers, cables and ducts together with any bed or haunch or surround within 1m of formation level shall be removed and over 1m below formation shall be left and filled. The ends of existing drains and sewers no longer required because of alterations to the drainage layout shall be sealed in accordance with Clause 506. All trenches shall be backfilled in accordance with Clause 505.
3. The Developer shall take all measures required by any Statutory Undertaker, the management of other publicly owned services, or owners of privately owned services or supplies for disconnection and proper sealing off all redundant drains, services and supplies.
4. Items belonging to the Highway Authority which are taken up or down as part of the development works shall be carefully dismantled, cleaned and transported to the store nominated by the Highway Authority. Items damaged shall be replaced.
5. Where a new junction is required with the highway, existing street furniture, gulley gratings and kerbing in the proposed junction shall be taken up or down in accordance with sub-clause 4 of this clause, and as directed by the Highway Authority's representative. Gulleys shall be filled with ST1 (page **XX** series 2600) concrete to underside of basecourse. Existing chamber covers shall be raised or lowered as required by the amended levels for the junction.
6. All existing road markings and road studs on carriageways open to traffic shall be removed as soon as they become superfluous or a hazard to traffic and the carriageway reinstated.

202. Existing Trees, Stumps and Roots

1. Tree stumps and roots located beneath carriageways, footways or verges shall be removed. Resulting holes shall, within one week, be filled with acceptable material and be compacted in compliance with Clause 612 and Table 6/1.

203. Not Used

204. Hazardous Materials

1. Hazardous Materials encountered in connection with the development are to be dealt with in accordance with the requirements of the waste control authority for the area in which the materials are found.

205. Japanese Knotweed

1. The Developer shall not cause the relocation of material containing fragments of Japanese Knotweed into or out of the site, or within the site. The Highway Authority shall be notified of the presence of Japanese Knotweed at any location to which or from which the Developer may transport fragments of soil (on the wheels of vehicles for example).

Japanese Knotweed is a notified weed under Schedule 9 of the Wildlife and Countryside Act 1981 and it is an offence to cause it to grow in a new location.

206. Use of Herbicides

Where herbicides are required, the following regulations apply:

- (a) they shall be non-residual herbicides approved by the Ministry of Agriculture Fisheries and Food and detailed in the MAFF Publication "Pesticides approved under the Control of Pesticides Regulations 1986" except that;
- (b) Simazine and Atrazine shall not be included in any herbicide;
- (c) the following details must be submitted to the Highway Authority for approval:
 - (i) herbicide manufacturer
 - (ii) trade name
 - (iii) active chemical constituents

(iv) MAFF registration number

SERIES 500 – DRAINAGE AND SERVICE DUCTS

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509	Testing and Cleaning
517	Minimum Cover for Pipelines and Service Ducts
518	Water in Drainage Excavations
510	Soakaways

SERIES 500

501. Pipes for Drainage and Service Ducts

General

1. Where the term drain is used in this Series, it shall be deemed to include the terms sewer and piped culvert.
2. Only one type of pipe shall be used within any individual drain or service duct between consecutive chambers. The Developer shall ensure that plastics pipes are not subject to deterioration due to sunlight during the period between manufacture and installation in the ground.

Pipes for Drainage

3. Pipes for drainage shall be selected from the alternatives in Table 5/1 and shall comply with the standards and particular requirements therein. Pipes and fittings other than those included in Table 5/1 shall be permitted provided that they hold a current British Board of Agreement Roads and Bridges Certificate stating that they are a suitable alternative for the usage specified in Table 5/1.

On completion of the whole of the drainage works, the Developer shall provide the Highway Authority's Representative with a schedule showing details of all pipe types used, including quality joints and name of manufacturer.

Pipes for Service Ducts

4. Pipes for service ducts shall be selected from the alternatives in Table 5/2 and shall comply with the standards and particular requirements therein. Pipes for service ducts shall have a smooth internal bore without any sharp edges to the ends of pipes. The use of pipes and fittings other than those included in Table 5/2 shall be permitted provided that they hold a current British Board of Agreement Roads and Bridges Certificate stating that they are a suitable alternative to those listed in Table 5/2.

5. Each duct shall be fitted with a pigmented stranded polypropylene or equivalent rot-proof material draw rope of 5kN breaking load and having a design life of not less than 20 years, the ends of which shall be made fast to marker blocks (refer to Drawing No. PSW/C/103). The ends of a duct shall be sealed by removable stoppers immediately it has been laid. The ducts shall be colour coded as follows:

Telecommunications	Grey
South Wales Electricity	Black/corrugated (L.V and H.V.)
Cable Vision	Green
Gas	Yellow
Water	Blue
Street Lighting	Orange

Table 5/1: (05/05) Pipes for Drainage

Materials	Usage	Standard	Particular Requirements
Vitrified clay	Foul drains	BS 65 or BS EN 295	“Normal” pipes as defined in BS 65
	Surface water drains	BS 65 or BS EN 295	“Normal” or “Surface water” pipes as defined in BS 65
	Filter drains	BS 65 BS EN 295	Un-perforated, not exceeding 2.0m in length with spigot and socket open joints OR Perforated with flexible mechanical joints
Concrete (With Portland cement or sulphate-resisting cement when required in Appendix 5/1. Supersulfated cement shall not be used)	Foul & surface water drains not exceeding 900mm internal diameter	BS 5911-1 and BS EN 1916 (Ordinary reinforced or unreinforced)	
		BS 5911-5	
	Surface water drains not exceeding 900mm internal diameter	BS 5911-110	For use with joints complying with sub-Clause 504.4
	Filter drains	BS 5911-114 (Porous with ogee or rebated joints)	
		BS 5911-110	Unperforated not exceeding 2m in length with open joints or castellated rebated joints with the total slot area between castellations being at least 1000mm ² per metre length of pipe OR

			Perforated with circular holes not greater than 10mm nor less than 3mm in diameter
Glass reinforced plastics (GRP)	Foul & surface water drains	BS 5480	Class to be as specified in Appendix 5/1
Iron	Foul & surface water drains	BS 437 (Cast iron) BS EN 598 (Ductile iron)	
Thermoplastics solid wall pipes and fittings not exceeding 900mm diameter Unplasticised polyvinyl-chloride (PVC-U) Polypropylene (PP) Polyethylene (PE)	Foul & surface water drains	BS 4660 or BS 5481 or BS EN 1401 (PVC-U) BS EN 1852-1 (PP) BS EN 12666-1 (PE)	See the UK national forward to the relevant BS EN. The grade appropriate for use without structural calculations shall be used i.e. SN8 for PP & PE and SN4 (SDR41) for PVC-U
	Filter drains	BS 4660 or BS 5481 or BS EN 1401 (PVC-U) BS EN 1852-1 (PP) BS EN 12666-1 (PE)	Perforated with not less than 1000mm ² of holes per metre length of pipe. The perforations shall not reduce the pipe stiffness by more than 5%. Circular perforations not greater than 10mm nor less than 3mm in diameter or rectangular slots not greater than 4mm nor less than 0.6mm in width.
Thermoplastics structured wall pipe and fittings not exceeding 900mm diameter	Surface water drains	Clause 518	Unperforated with watertight joints and with pipe stiffness class, creep ratio and impact resistance as described in Appendix 5/1
	Filter drains	Clause 518	Perforated with not less than 1000mm ² of holes per metre length of pipe. The perforations

			shall not reduce the pipe stiffness by more than 5%. Circular perforations not greater than 10mm nor less than 3mm in diameter or rectangular slots not greater than 4mm nor less than 0.6mm in width.
	Subsoil field drains	BS 4962 or Clause 518	
Corrugated steel	Surface water drains, filter drains not exceeding 900mm internal diameter	AASHTO specification M36M-01 except as otherwise required in sub-Clauses 501.4, 5 and 6.	
All drains exceeding 900mm internal diameter shall comply with Series 2500			

Table 5/2 : Pipes for Ducts

Material	Standard	Particular Requirements
Vitrified clay	BS 65 or BS EN 295	Plain-ended, self-aligning flexible sleeve jointed with internal ends radiused to 3mm minimum
Iron	BS EN 598 (Ductile iron)	
Glass reinforced plastics	BS 5480	Class to be as specified in Appendix 5/2
Thermoplastics solid wall Unplasticised polyvinyl- chloride (PVC-U) Polypropylene (PP) Polyethylene (PE)	BS 4660 or BS 5481 or BS 3506 (Class C) or BS EN 1401, BS EN 1452-1 to 5 as Appropriate class PN10. BS EN 1852-1 (PP) BS EN 12666-1 (PE)	When pipes BS 3506 (Class C) are used, joints shall comply with BS EN 1452-1 to 5 as appropriate.
Thermoplastics single wall corrugated (Restricted to ducts buried a minimum of 600mm below the surface)	BS EN 50086-2-4	Ducts to BS EN 50086-2-4 shall be classified as normal duty, have a degree of protection against ingress of foreign objects classification rating of 3 or 4 and a degree of protection against ingress of water classification rating of 7. Appendix 5/2 shall state the resistance to bending requirements.

Material	Standard	Particular Requirements
Thermoplastics structured wall	BS EN 50086-2-4 and Clause 518	Ducts to BS EN 50086-2-4 shall be classified as normal duty, have a degree of protection against ingress of foreign objects classification rating of 3 or 4 and a degree of protection against ingress of water classification rating of 7. Appendix 5/2 shall state the resistance to bending requirements.
Pipes for use in motorway communications installations shall comply with Series 1500		

502. Excavation for Pipes and Chambers

1. Excavation shall comply with Clause 602 and with the following:
 - (i) soft spots existing below the bottom of an excavation shall be removed and the resulting voids backfilled with Type 1 sub-base material complying with Clause 803 or pipe bedding material complying with Clause 503, both well compacted, or mix ST1 concrete in compliance to Clause 2602.
 - (ii) any excavation greater than the net volume required for the Permanent Works below the level of any pipe surround shall be made good as described in (i) above.

503. Bedding, Laying and Surrounding of Pipes

1. Pipes shall be laid so that each one is in contact with the bed throughout the length of its barrel. The deviation in line and level from that specified at any point shall not exceed 20mm. There shall be no abrupt changes in line or level between chambers. In the case of socketed or sleeve jointed pipes the bed shall be cut away and removed at each socket or sleeve so that the socket or sleeve does not bear on the bed. Pipes shall be laid on setting blocks only where a concreted bed or cradle is used.

2. Pipes complying with BS 4962 : 1989 which are corrugated coilable perforated pipes shall be laid only by automatic single pass drain laying machines.
3. Bedding details are shown on Drawing No. PSW/G/1 and PSW/G/2. Depths are between finished surface and top of pipe.
 - (i) for surface water pipes in carriageway and vehicular crossings (i.e. road loading), refer to Table 5/3.
 - (ii) for surface water in verges, footways and open ground (i.e. field loading) refer to Table 5/3.
 - (iii) for filter drains in field loading conditions any of the pipe bedding types shown on Drawing No. PSW/G/2 can be used. Where a filter drain is likely to be subjected to road loading (e.g. vehicular crossings) it will require a bed Type Z.

Table 5/3

Pipe Type		Depth Range	Bed Type
Road Loading	All	less than 1.0m	Z
		1.0m to 2.4m	S
Field Loading	All except uPVC	less than 0.8m	Z
	uPVC	less than 1.0m	Z
	All except uPVC	0.8m to 2.4m	B
	uPVC	1.0m to 2.4m	T

Drawings PSW/G/1, PSW/G/2

- (iv) Except for filter drains a further surround above the bed, haunch and surround described above shall be provided to a height of 300mm above the top of the pipe consisting of Class 8 lower trench fill material, which is material not containing stones or lumps of clay in excess of 40mm in diameter.
4. Except where the pipeline is to be tested in compliance with Clause 509 before backfilling, the completion of the bedding, haunching and surrounding of the pipes is to be carried out immediately after jointing. The bed, haunch and surround shall be brought up equally on both sides of the pipe ensuring that it is in contact with the underside of the pipe barrel and be carefully compacted in layers not exceeding 150mm

thickness ensuring full compaction next to the trench walls. Pipes shall be maintained to line and level during the bedding, haunching and surrounding operations. Where pipelines are to be tested before being covered the bedding haunching and surrounding material shall only be brought up sufficiently to support the pipeline and the joints shall be left exposed until the test is completed.

5. Duct construction shall comply with the requirements of Drawing No. PSW/G/27.

504. Jointing of Pipes

1. Joints in surface water drains shall be watertight complying with Sub-clause 3 of this Clause. Filter drains shall have joints complying with sub-Clause 6 of this Clause. Ducts need not have watertight joints.
2. Watertight joints shall comply with the appropriate British Standards, the manufacturer's instructions and the following:
 - (i) Joints in uPVC pipes shall not be made with plastic solvent.
 - (ii) Flexible mechanical joints may be used with surface water pipes complying with BS 65 provided that the performance requirements of BS 65 are fulfilled.
 - (iii) Joints in plastics pipes to BS 4962 shall comply with BS 4962.
3. Push fit joints shall have a register to ensure that the pipe is fully pushed into the joint.
4. Where a concrete bed, cradle, arch or surround is used with rigid pipes having flexible joints, joint filler board complying with Clause 1015 (Standards for Highways) shall be placed in contact with the end of the socket at a pipe joint and shall extend through the full thickness of the concrete in contact with the pipe. Such joints in the concrete bed, haunch or surround shall be at intervals not exceeding 5 metres when except where the spacing of joints in the pipe exceeds 5 metres when they shall be at each pipe joint.
5. Joints in pipes for filter drains shall comply with the appropriate British Standard and with the following:

- (i) Non-porous and unperforated concrete and clay pipes with spigot and socket, rebated or ogee joints shall be laid with unsealed joints and with a gap of 10mm between the end of the pipe and the inner end of the socket or rebate. The pipes shall be supported with tarred rope yarn or equivalent flexible jointing material within the sockets over the lower third of the circumference so that there are no vertical steps between one pipe and another. Such pipes shall only be used with Type B filter material as described in Clause 505.
 - (ii) The ends of perforated, castellated or porous concrete pipes with rebated joints and perforated clayware pipes with rebated or with flexible sleeves joints shall be pushed tightly together. The width of slots measured along the length of the pipeline formed by jointing castellated pipes shall not exceed 10mm.
6. Joints in pipes for service ducts shall comply with the appropriate British Standard and with the following:
- (i) Pipes for ducts shall be jointed so that no silt, dirt, grout or concrete surround is able to enter the duct. Pipes with push-fit joints shall have a register to ensure that the pipe is fully pushed into the joint.
 - (ii) Joints in pipes to BS 3506 or BS EN 1452: Part 1 to Part 5 as appropriate.

505. Backfilling of Trenches and Filter Drains

1. Backfilling shall be undertaken immediately after the required operations preceding it have been completed.
2. Trenches other than filter drain trenches shall be backfilled above the pipe surround material with fill complying with the 600 Series, notwithstanding the requirements of Clause 503. For trenches beneath carriageway construction the CBR at formation (or sub-formation) level shall have at least the magnitude of the CBR of the adjacent formation (or sub-formation).
3. Filter drains shall be backfilled with Type A or Type B filter material which shall;

- (i) Be well graded (except for Type B which shall be uniformly graded) and comply with the requirements of Table 5/5 when determined by the washing and sieving method of BS 812: Part 103.
- (ii) For Type B geometrical requirements in accordance with Table 5/5 and BS 1377: Part 2 in conjunction with BS EN ISO 17892: Part 1 and BS EN ISO 17892: Part 2.
- (iii) Have a 10% fines value of not less than 50kN when tested in accordance with BS 812: Part 111 with samples in a soaked condition.
- (iv) Have a water soluble sulphate content of less than 0.38% of sulphate (as SO₃) when tested in accordance with BS 1377: Part 3.

When Type A material is used with pipes other than porous pipes at least 15% of the material shall be larger than the diameter of the hole or larger than 1.2 times the width of slot in the pipe.

- 4. Backfilling shall be deposited and compacted in compliance with Clause 612. Filter material for filter drains shall be deposited in layers not exceeding 225mm loose depth; each layer being compacted.
- 5. Material shall be deposited in even layers and not be heaped in the trench before being spread. Spreading and compaction shall be carried out evenly without dislodging, distorting or damaging the pipe. Power rammers shall not be used within 300mm of any part of the pipe or joint.

Table 5/5: Grading Requirements for Filter Drain Material

	Percentage by Mass Passing Sieve							
	BS EN Sieve Sizes							
	Millimetres							
	63	40	20	10	4	2	0.500	0.125
Type A		100	80-99	50-90	30-75	15-60	0-35	0-4
Type B	98-100	80-99	0-20	0-5				

Table 5/6**Length of Articulated Pipe**

Nominal Pipe Diameter (mm)	Length of Pipe (mm)
450 and less	500 to 750
Greater than 450	750 to 1000

506. Connecting to Existing Drains, Chambers and Channels

1. Where required existing drains shall be extended, connected and jointed to new drains, chambers or channels. All such connections shall be made during the construction of the new drain or other work and their positions recorded by the Developer who shall hand to the Highway Authority's representative a copy of the record of the connections. Where pipe connections are made to existing brick, concrete or stone drains, chambers or channels, the pipes shall be well and tightly built into the concrete, brick or masonry work and be so placed as to discharge at an angle not greater than 60% to the direction of flow of the drain or channel and with the end of the pipe carefully cut to the necessary angle.
2. Before entering or breaking into an existing sewer or drain, the Developer shall give notice of his intention to do so to the authority responsible for the pipeline to which the connection is to be made.
3. Existing drains no longer required shall be sealed with mix ST2 concrete on compliance to Clause 2602 or removed and replaced with general fill material complying with the 600 Series.

507. Chambers

1. Chambers shall include manholes, catchpits, inspection chambers, draw pits and walled soakaways.
2. Foundations to chambers shall be of mix ST4 concrete. Channels for chambers shall be formed and finished smooth in the foundation concrete or constructed of preformed half circle channels, with sides benched in mix ST2 concrete, or mortar complying with Clause 2404. Alternatively for inspection chambers not exceeding 1.3 metres in depth to invert, complete plastics units or other units in equivalent material surrounded by 150mm of mix ST4 concrete may be used.

3. Brickwork shall comply with the 2400 Series and be built with mortar in English bond. The ends of all pipes shall be neatly built into the brickwork and finished flush with mortar.
4. Precast concrete chambers shall comply with BS 911-3 and BS EN 1917. Cast in-situ concrete chambers shall be constructed of mix ST4 concrete complying with Clause 2602.
5. Corrugated galvanised steel chambers shall comply with Clause 501 with in-situ mix ST4 concrete inverts and precast concrete cover slabs complying with BS 5911-3 and BS EN 1917 to Appendix 5/1. they shall be surrounded with well graded granular material with a minimum uniformity coefficient of 6 and a maximum aggregate size of 75mm compacted in accordance with Clause 612.
6. The use of manhole steps will not be permitted unless otherwise agreed with the Engineer in writing. If permitted they shall be used where the depth of the invert of chambers exceed 900mm below the finished surface of the adjacent ground or carriageway. Manhole steps when used shall comply with BS EN 13101 and built as specified in BS 5911: Part 3 and BS EN 1917. Steelworks used for ladders, handholds and other fittings shall comply with BS EN 10095 and be galvanised.
7. Excavation around chambers, except those described in sub-Clause 5 of this Clause, shall be backfilled with general fill material and compacted in compliance with Clause 612. Where mechanical compaction is impractical, the excavation shall be backfilled with mix ST2 concrete. Where there are precast concrete access shafts to precast concrete chambers, the shafts shall be surrounded by a minimum thickness of 150mm of mix ST4 concrete, and the remaining excavation backfilled with general fill material described in Table 6/1 and compacted in compliance with Clause 612.
8. Chamber covers gratings and frames shall comply with BS EN 124, and sub-Clause 10 and 15, and shall be of heavy duty specification in carriageway locations and medium duty outside the carriageway.
9. Chamber cover bolts shall comply with BS 4190 and be galvanised.
10. Frames for chamber covers and gratings shall be set in cement mortar complying with Clause 2404.

11. For all pipe lines the nearest joint to any chamber shall not be more than 500mm from the inner face of the wall and shall not be restricted by concrete. Between this and the next joint, the length of the articulated pipe shall be in accordance with Table 5/6.

508. Gullies and pipe junctions

1. Gullies shall be trapped.
2. Precast concrete gullies shall comply with BS 5911-6 and clay gullies with BS EN 295. In situ concrete gullies shall be constructed of mix ST4 concrete of 150mm minimum thickness, using permanent or removable shuttering. Such shuttering shall have a current British Board of Agreement Roads and Bridges Certificate.
3. Gully gratings, kerb type gully covers and frames shall comply with BS EN 124.
4. Slots in gratings or between gratings and frames shall not be orientated parallel to the direction of traffic except where the slots are less than 150mm long or less than 20mm wide. Frames shall be bedded on mortar complying with sub-Clause 507.16., brickwork shall comply with sub-Clause 507.3 of the Specification for Highway Works.
5. Backfilling to precast gullies shall be in mix ST2 concrete. The remainder of the backfilling shall be in appropriate road pavement materials except that where mechanical compaction of granular sub-base is impracticable mix ST2 concrete shall be used.
6. Gully connection pipes shall be either flexible or rigid not exceeding 0.7m in length with flexible joints for a distance of 2m from the gully in accordance with sub-clause 507.17 of the Specification for Highway Works when entering the chamber.
7. Gully connections to clay pipes shall be made using a saddle junction jointed with mortar to Clause 2404, and surrounded by 150mm of mix ST2 concrete.
8. The following is given as **a guide to gully spacing**. Assuming a road with normal camber, 2.5% cross fall at the kerb, and a width of 7.3m, the spacing is recommended as given in Table 5/7.

Table 5/7

Minimum Gradient	900 sq cm2 grating		Kerb inlet (unmodified)	
	Within 2.5 m of a footway or cycleway	All other locations	Within 2.5m of a footway or cycleway	All other locations
0.66% (1/150)	21	40	12	18
1% (1/100)	26	48	12	18
1.25% (1/80)	29	54	12	18
1.67% (1/60)	33	60	13	13
2.5% (1/40)	40	74	14	20
3.33% (1/30)	47	87	16	20

At low points in the road surface, two gullies are required in close proximity.

Road Gradients for Drainage Purposes

9. Normal cross fall is to be 2.5% (1 in 40) at carriageway edges. Minimum longitudinal fall for machine laid surfacing is to be 0.66% (1 in 150). Refer to Dwg. No. PSW/C/101 and also to Clause 702.

509 Testing and Cleaning

1. Drains required to have watertight joints shall be tested in sections e.g. between chambers, by means of the air test described in sub-Clause 2 of this Clause. If a pipeline is rejected because of a failed air test a water test may be carried out as described in sub-Clause 3 of this Clause as an alternative acceptability test. Before testing, the ends of the pipeline to be tested, including those of short branches, shall be plugged and sealed.
2. For the pipeline air test, air shall be pumped in by suitable means until a stable pressure of 100mm head of water is indicated in a U-tube connected to the system. The air pressure shall not fall to less than 75mm head of water during the period of 5 minutes without further pumping, after an initial period to allow stabilisation. Drains with traps shall be tested to 50mm head of water and permissible loss shall then be no more

than 13mm head of water in 5 minutes without further pumping after the initial stabilising period.

3. For the pipeline water test, the pipes shall be filled with water under a head of not less than 1.2m above the crown of the pipe at the high end and not more than 6m above the pipe at the low end. Steeply graded pipelines shall be tested in sections so that the above maximum is not exceeded. The test shall commence two hours after filling the test section at which time the level of water at the vertical feed pipe shall be made up to produce the required 1.2m test head. The loss of water over a 30 minute period shall be measured by adding water at regular 10 minute intervals to restore the original water level and recording the amounts so added. The drain will have passed the test if the volume of water added does not exceed one litre per hour per linear metre of drain per metre of nominal internal diameter.
4. All pipelines less than 350mm diameter excluding service ducts shall be checked by drawing through each completed length of pipe a spherical mandrel of a diameter 10% less than the nominal bore of the pipes being tested unless an alternative method of checking is agreed.
5. On completion of the whole of the works all chambers, gullies and drains other than filter drains shall be flushed from end to end with water and left free from obstruction. Catch pits chambers shall be left clean and free from silt.
6. Service ducts , and the pipes and filter material of filter drains, shall at all times be left clean and free from silt and obstruction.

510 Surface water channels and drainage channel blocks

1. Surface water channel and drainage channel blocks shall be constructed as described in appendix 5/3 of Volume 2 of the Specification for Highway Works.

511 Land drains

1. Existing land drains which are permanently severed by the works shall be located and connected into a new drain pipe or ditch as described in appendix 5/1 of Volume 2 of the Specification for Highway Works.

512– 516 Not Used

517 Minimum Cover for Pipelines and Services Ducts

1. In areas of fill, no pipelines or service ducts may be constructed until a minimum of 0.5m of cover has been obtained above the soffit of the pipe.
2. Where capping layer is specified, it must be laid prior to excavation for pipelines and service ducts, where there is less than 0.5m of cover.

518 Water in Drainage Excavations

1. Drainage excavations shall be kept free of water in accordance with Clause 602 until any concrete or mortar is sufficiently set.

519 Soakaways

1. In order to comply with “The Ground Water Regulations 1998 – S1 1998 No.2746”, the Natural Resource Wales must be consulted about any new proposals for new soakaways.
2. A soakaway may be placed not less than 5m from the edge of the road pavement construction, or building or structural foundation. It must be on highway land or have access by means of an easement.
3. Soakaways receiving run-off from existing or proposed Highway will be considered for adoption. Soakaways receiving run-off from any other source will not normally be considered for adoption.
4. Alternatives such as stone filled pits and trenches will be considered where the ground can demonstrate to be sufficiently receptive. Manhole covers and frames should be used in their construction to enable the soakaways to be found in the future.
5. Assuming precast concrete rings are used, the diameter and effective depth of the soakaway are obtained from Table 5/8. The effective depth is the depth from the lowest incoming pipe invert to the base slab or winter water table which ever is the lesser. The area drained may be factored to allow for ground permeability, enabling a greater actual area to be drained, depending on ground type. As an alternative the size of soakaway may be calculated in accordance with BRE Digest 365.

6. A trial pit or borehole will be made on the site of the proposed soakaway, and to the same depth. The Highway Authority must be notified one week in advance of the pit being dug. The necessity for an in-situ soil permeability test will be decided by the Highway Authority representative of the excavation. Where a permeability test is required it should be carried out in accordance with BRE Digest 365, to the satisfaction of the Highway Authority.

7. To cover future maintenance, a normal sized soakaway commuted sum of £6,000 for each soakaway on a site, will be paid by the Developer to the Highway Authority.

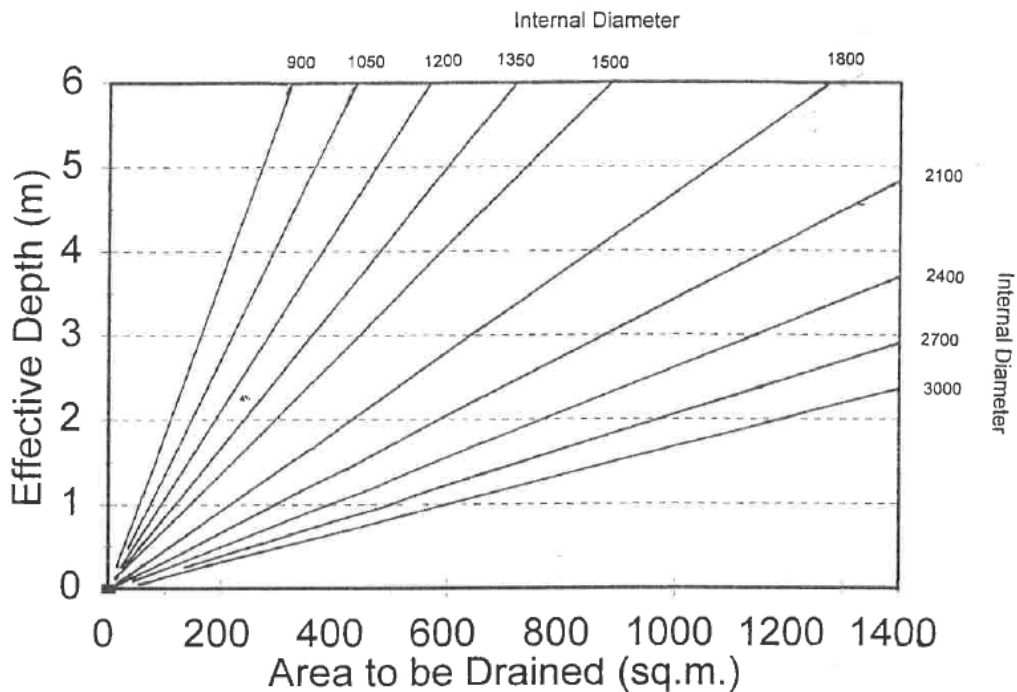


TABLE 5/8 SOAKAWAY REQUIREMENTS

SERIES 600 – EARTHWORKS

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602	General Requirements
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SERIES 600

EARTHWORKS

601 Classifications, Definitions and Uses of Earthworks Materials.

General Classification

1. Earth works materials shall fall into one or the other of the following general classifications:
 - i) acceptable material: material excavated from within the Site or imported on to the Site which meets the requirements of Table 6/1 for acceptability for use in the Permanent Works.
 - ii) unacceptable material class U1A as defined in sub-clause 2(i) and 2(ii)(a-f) of the Clause: material excavated from within the Site which unless processed so that it meets the requirements of Table 6/1, shall not be used in the Permanent Works.
 - iii) unacceptable material Class U1B as defined in sub-Clause 3(i) of this Clause: material excavated from within the Site which, unless processed so that it meets the requirements of Table 6/1 shall not be used in the Permanent Works
 - iv) unacceptable material class U2 as defined in sub-Clause 4 of the Clause: material excavated from within the Site which shall not be used in the Permanent Works.
2. Unacceptable material class U1 shall be:
 - i) material which does not comply with the permitted constituents and material properties of Table 6/1 for acceptable material;
 - ii) material, or constituents of materials, comprising of the following:
 - (a) peat, materials from swamps, marshes and bogs;
 - (b) logs, stumps and perishable material
 - (c) materials in a frozen condition

(d) clay having a liquid determined in accordance with BS1377: part 2 exceeding 90 or plasticity index determined in accordance with BS1377: part 2 exceeding 65;

(e) material susceptible to spontaneous combustion other than unburnt colliery spoil.

(f) Non-hazardous materials not permitted in Table 6/1.

3. Unacceptable material Class U1B shall be:

i) contaminated materials including controlled wastes (as defined in the Environmental Protection Act 1990 Part 11A) whose level of contamination is above that given in Appendix 6/14 or 6/15, but excluding all hazardous waste as defined in the Hazardous Waste (England and Wales) Regulations 2005 and Radioactive Waste as defined in the Radioactive Substances Act 1993.

4. Unacceptable Material class U2 shall be material having hazardous chemical or physical properties requiring special measures for its excavation, handling, storing, transportation, deposition and disposal.

Definitions

5. Argillaceous rock shall mean shales, mudstones and slates composed of clay and silt particles, including unburnt colliery spoil.

6. Pulverised fuel ash shall be solid material extracted by electrostatic and mechanical means from flu gases of furnaces fired with pulverised bituminous coal. A maximum particle size of 3mm will be permitted.

7. Formation shall be the top surface of capping. Where no capping is required, formation shall be the top surface of earthworks at the underside of sub-base.

8. Sub-formation shall be the top surface of earthworks at the underside of capping.

Use of fill material

9. In addition to any grading requirements, the maximum particle size of any fill material shall be no more than two thirds of the compacted layer thickness.

10. Materials with a water soluble sulphate content exceeding 1500mg of sulphate (expressed as SO₄) per litre when tested in accordance with BS 1377: Part 3 shall not be deposited within 500mm of concrete or other cement based materials forming part of the Permanent Works.
11. Materials with a water soluble sulphate content exceeding 300mg of sulphate (expressed as SO₄) per litre when tested in accordance with BS 1377: Part 3 shall not be deposited within 500mm of metallic items forming part of the Permanent Works.
12. Pulverised-fuel ash shall not be placed within the dimension described in Appendix 6/3, below sub-formation or formation.
13. Where pulverised-fuel ash is used, the Contractor shall for each consignment, make available to the Overseeing Organisation a record of the type and source of the material and the name of the power station from which it was obtained and a certificate of results of tests showing that the material complies with the requirements of Table 6/1.

602 General Requirements

1. The developer shall employ only plant and working methods which are suited to the materials to be handled and traversed, and shall be responsible for the nature of acceptable material so that when it is placed and compacted it remains acceptable. Acceptability shall be determined in accordance with table 6/1.
2. Existing topsoil shall be stripped from all areas to be covered by embankment or other areas of fill.
3. Topsoil shall be used as soon as practicable after it's stripping and if not shall be stored in stock piles of heights not exceeding 2m. Topsoil shall not be unnecessary trafficked either before stripping or when in stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling should be kept to a minimum.
4. Excavations for foundations and trenches shall be adequately supported at all times and, except where permitted by the Highway Authority's representative, shall not be battered. Where excavations are permitted to be battered they shall be benched, as agreed by the Highway Authority's representative, prior to backfilling and compaction. Sheeting and other excavation supports shall be removed as filling proceeds.

5. Excavations requiring backfilling shall remain open only for the minimum period necessary.
6. Excavations requiring backfilling in existing paved or other surfaces shall be carried out and reinstated in compliance with Clause 706.
7. The Developer shall keep earthworks free of water including:
 - i) arranging for the rapid removal of water:
 - a) shed onto the earthworks;
 - b) entering the earthworks from any source;
 - ii) lowering and maintaining by appropriate measures the water level in excavations sufficiently to enable the Permanent Works to be constructed.
8. In carrying out the requirements of sub-Clause 7 of this Clause the Developer shall:-
 - i) form the main cuttings, embankments and other areas of fill with appropriate falls and gradients and sealed surfaces;
 - ii) provide where necessary temporary watercourses, drains, pumping and the like;
 - iii) discharge accumulated water and groundwater into the permanent outfalls of the drainage system where practicable;
 - iv) provide adequate means for trapping silt on temporary systems discharging into permanent drainage systems.
9. Where Class U2 hazardous materials are present or are encountered during the progress of the Works, the Developer shall make all necessary arrangements for their safe handling and disposal after consultation with the appropriate environmental health authority and the Health and safety Executive.
10. Subject to the surface level tolerances given in Clause 613 and sub-Clause 616.1, material shall not be frost susceptible if it is used within 450mm of the designated final surface of a road or paved central reserve. Material shall be classified as non-frost susceptible if the mean heave is 15mm or less when tested in accordance with BS 812: Part 124.

603 Forming of Cuttings and Cutting Slopes

1. Cuttings shall be excavated to lines and levels as appropriate to ensure stability of the Permanent Works throughout their design life. The lines and levels of cutting slopes exceeding 2m overall height shall be approved by the highway Authority prior to commencement of construction.
2. Cutting slopes or toes of cuttings shall only be undercut when required for trench or other excavations. Such excavations shall be restricted in extent and shall remain open only for the Permanent Works.
3. The excavation of cuttings may be halted at any stage providing at least 300mm thickness of material is left in place as weather protection above the formation or above the sub-formation, subject to the requirements of Clause 613 and 616.
4. The requirements for the final treatment of cutting slopes exceeding 2m overall height shall be approved by the Highway Authority prior to commencement of construction.

604 Not Used

605 Not Used

606 Watercourses

1. The clearance and modification of existing, or the construction of new watercourses, including ditches, streams, rivers, lagoons and ponds and any protection, lining or revetment, in connection with road construction works shall be as agreed by the Highway Authority and shall comply with sub-Clauses 2 to 4 of this Clause.
2. Clearance of existing watercourses shall include the removal of vegetation, vegetable matter, and all other deposits within the watercourse profile. Materials arising from this clearance shall be dealt with as unacceptable material.
3. New watercourses and cleared existing water courses shall be maintained in a clear condition until the Permanent Works are adopted by the Highway Authority.

4. Redundant watercourses shall be drained and cleared in accordance with sub-Clause 2 of this Clause and material outside the watercourse profile excavated and dealt with as unacceptable material. The excavations shall be to dimensions agreed by the Highway Authority's representative and the whole shall be filled with acceptable material complying with Table 6/1 deposited and compacted in accordance with Clauses 608 and 612. Fill material placed into the water shall be of Class 6A only. Where the surface is to remain exposed it shall be top soiled and grassed in accordance with Clause 618.

607 Explosive and Blasting for Excavation

1. Blasting for excavation shall not be employed except where a method statement has been submitted by the Developer and approved by the Highway Authority.

608 Construction of Fills

1. All fills, including embankments shall be constructed:
 - i) to lines and levels as appropriate to ensure the stability of the Permanent Works throughout their design life;
 - ii) of acceptable material complying with Table 6/1 with only Class 6A material deposited into open water;
 - iii) by depositing, as soon as practicable after excavation, in layers to meet the compaction requirements of Clause 612 as required for each Class of material in Table 6/1, except that material placed into open water shall be deposited by end tipping without compaction;
 - iv) to the requirements of this Clause and any other requirements for fill in this Series.

The design and construction details for fills exceeding 2m overall finished height shall be approved by the Highway Authority prior to commencement of construction.

2. Coarse granular material Class 1C shall, before compaction, be spread in layers by a crawler tractor of not less than 15 tonnes total mass. After compaction each layer shall, if voids remain, be blinded with an approved Class of granular materials complying with Table 6/1 so that all surface

voids are filled before the next layer and before any capping or sub-base is constructed.

3. Embankments and other areas of fill shall, unless otherwise required by the Specification or approved by the Highway Authority's representative be constructed evenly over their full width and their fullest possible extent and construction plant and other vehicular traffic shall be controlled and directed uniformly over time. Damage by constructional plant and other vehicular traffic shall be made good by the Developer with material having the same characteristics and strength as the material had before it was damaged.
4. Where pipes in embankments or in other area of fill are permitted to be constructed other than in trench, the fill shall be brought up to and over them equally on both sides. The fill shall be deposited in even layers and shall not be heaped above the pipe. Spreading and compaction shall be carried out evenly without dislodging, distorting or damaging the pipe. Power rammers are not to be used within 300mm of any part of the pipe or joint.
5. Construction of the last 600mm depth of fill up to sub-formation or formation level as appropriate shall be carried out for the full width of embankments in a continuous operation. Without delay either (i) or (ii) below shall be carried out;
 - (i) form the sub-formation or formation all in accordance with Clauses 613 and 616 followed immediately by:
 - (a) construction of the full thickness of capping or sub-base as appropriate;
 - (b) construction of not less than 300mm thickness of capping or 150mm thickness of sub-base laid as a weather protection layer.
 - (ii) place an additional 300mm minimum compacted thickness of material above sub-formation level as appropriate for the full width of filling to form a weather protection. This weather protection shall be composed of the same material as the sub-formation or formation and compacted in compliance with Table 6/1. The protection layer shall be constructed in a continuous operation.
6. Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face, such faces shall be benched immediately before

placing the subsequent fill. The height of the vertical face of each bench shall not exceed 500mm except where agreed otherwise by the Highway Authority's representative.

7. The requirements for the final treatment of side slopes of embankments exceeding 2m overall height shall be approved by the Highway Authority prior to commencement of construction.

609– 611 Not Used

612 Compaction of Fills

General

1. Compaction shall be carried out in accordance with this Clause as soon as practicable after deposition on all those Classes of fill in Table 6/1 which require to be compacted.
2. 24 hours notice shall be given to the Highway Authority's representative before compaction is to begin.
3. Compaction shall be undertaken using the plant and methods in Table 6/4 appropriate to the compaction requirements as listed in Table 6/1 for the Class of material being compacted.
4. Earth moving plant shall not be accepted as compaction equipment.
5. For materials of Classes 1A, 1B and 2, the number of passes shown in Table 6/4 shall be doubled when such materials occur within 600mm of sub-formation (if capping is required) or formation. Such extra compaction shall be carried out for the full width of the embankment.
6. For items marked with an asterisk in the Method 3 column of Table 6/4, the roller shall be towed by a track-laying tractor. Self propelled rollers are unsuitable.

613 Sub-formation and Capping

1. Capping shall be provided where required by Appendix 7/1.
2. Capping shall be constructed with Class 6F1 or 6F2 material.

3. Capping layer shall consist of one Class of capping material throughout its depth laid in one or more layers of compacted thickness complying with Clause 612, or be formed of two elements of different capping material. Each element shall be formed of one or more layers of the same capping material, each of compacted thickness complying with Clause 612.
4. The sub-formation shall have the same longitudinal gradient, cross fall and surface level tolerance as the formation.
5. No unprotected sub-formation which is to receive capping shall remain continuously exposed to rain causing degradation nor be left uncovered overnight.
6. In cuttings, the following procedure shall be carried out:
 - (i) excavate below formation level to a depth to accept the capping,
 - (ii) trim the surface to form the sub-formation and immediately compact with one pass of:
 - (a) a smooth wheeled roller having a mass per metre width of roll not less than 2100kg or
 - (b) a vibratory roller having a mass per metre width of roller not less than 700kg or
 - (c) a vibrating plate compactor having a mass per m² of not less than 1400kg, and
 - (iii) immediately deposit and compact above it a capping in Class 6F1 or 6F2 material.
7. On embankments and other areas of fill, the following procedure shall be carried out:
 - (i) complete the embankment to form the sub-formation or remove any protection layer and trim the surface to the sub-formation,
 - (ii) compaction with one pass of a smooth wheeled roller, vibratory roller, or vibrating plate compactor complying with sub clause 6(ii) of this Clause, and

- (iii) immediately construct above it, in one or more layers, Class 6F1 or 6F2 capping.

614 - 615 not used

616 Preparation and Surface Treatment of Formation

1. The formation shall, after completion of any sub-grade drainage, and immediately before laying sub-base on areas of completed formation, have a surface level tolerance within +20mm and -30mm relative to its designed level after completion of the following operations as necessary:
 - (i) Any protection layer shall be removed and any soft or damaged areas shall be rectified by excavating them and replacing with acceptable material having the same characteristics and strength as the surrounding material. The surface of the formation shall be trimmed and immediately cleaned free from mud and slurry which shall be dealt with as unacceptable material Class U1.
 - (ii) The formation shall immediately be compacted, in addition to the compaction required for the fill. This additional compaction shall be in accordance with the requirements of table 6/4 Method 6 for the compacted layer thickness of 250mm. Immediately after the additional compaction the formation shall be trimmed to achieve the tolerances of this sub-clause.
2. Where the tolerance in the sub-clause 1 are exceeded, the formation shall be made good as follows:
 - (i) If the surface is too high it shall be re-trimmed and recompactd in accordance with sub-clause 1 of this Clause;
 - (ii) If the surface is too low it shall be corrected by the addition of acceptable material complying with Table 6/1, having characteristics and strength matching the overlain material, deposited and compacted in compliance with Clauses 608 and 612 and sub-clause 1 of the Clause. In cohesive materials Class 2 where this low surface is less than 150mm below formation before additional material is deposited and compacted.
3. After trimming or retrimming if necessary, the formation shall be rolled with one pass of:

- (i) A smooth wheeled roller having a mass per metre width of roll not less than 2100kg or
 - (ii) A vibratory roller having a mass per metre width of roller not less than 700kg or
 - (iii) A vibrating plate compactor having a mass per m² of not less than 1400kg.
4. Where the tolerance in sub-Clause 1 of this Clause cannot be achieved in rock, then an alternative method of treatment to achieve the above tolerance shall be agreed with the Highway Authority's representative.
5. Where the tolerances in sub-Clause 1 of this Clause cannot be achieved in rock, then an alternative method of treatment to achieve the above tolerances shall be agreed with the Highway Authority's representative.

617 Use of Sub-formation or Formation by Construction Plant.

1. Construction plant and other vehicular traffic (except that required for preparation of sub-formation or formation, and for construction of capping or sub-base) shall not be operated on sub-formation to formation unless adequate protection is provided.

618 Top soiling and Grass Seeding

1. Top soiling shall be carried out using class 5 material complying with Table 6/1.
2. The areas to be grassed shall be topsoil, fertilised and seeded. Fertiliser and seed may be applied by hydraulic mulch.
3. Topsoil shall be 150mm thick on verges or other level or near-level surfaces and shall be 125mm thick on embankment and cutting slopes.
4. Topsoil shall not be spread using a tracked vehicle.
5. Topsoil shall have all stones and other debris removed and disposed off site, which have dimensions greater than 50mm equivalent diameter.
6. Immediately prior to sowing of seed, the upper 50mm thickness of topsoil shall be reduced to a fine tilth using a method, approved by the Highway Authority's representative and fertiliser complying with sub-Clause 10 of

this Clause shall be evenly raked in or applied by hydraulic mulch seeding at a rate not less than 75g per m².

7. Seeding shall be carried out by applying a mixture of seed complying with sub-Clause 11 of this Clause at a rate of not less than 20g/m², immediately followed by lightly raking the surface of the topsoil to cover the seed, except that raking shall not be required following hydraulic mulch seeding.
8. Hydraulic mulch seeding shall be applied by a process and consist of a mulch approved by the Highway Authority.
9. Before adoption by the Highway Authority, grassed areas shall be mown regularly to a nominal 75mm height and shall be treated with a selective herbicide, applied by spot spraying only, to eradicate docks, thistles, ragwort and other pernicious agricultural weeds.
10. Fertiliser, including that incorporated in hydraulic mulch shall consist of a compound consisting not less than 10% Nitrogen, 15% Phosphoric Acid and 10% Potash.
11. Grass seed shall be a tested mixture containing the following varieties in the following proportions:-

60% Creeping Red Fescue
30% Smooth Stalked Meadow Grass
10% Brown Top Bent
Rye Grass varieties are not to be included.
12. Transport of soil and soil shall be in accordance with Clause 205.

619 to 626 Not Used

627 Swallow Holes and Other Naturally Occurring Cavities and Disused Mine Workings.

1. Where swallow holes or other naturally occurring cavities or disused mine workings are present beneath or in the vicinity of the Site, these shall be investigated, capped, in filled, or otherwise treated sufficiently to protect and ensure the stability of the Permanent Works over the required design life. Details of any investigations and treatment shall be submitted to the Highway Authority for approval prior to commencement of construction of the Permanent Works. The Developer shall also be

responsible for obtaining such permissions and approvals as may be necessary from other authorities and owners of mineral rights (e.g. British Coal) etc., as may be necessary before commencing any investigation or treatment in accordance with this Clause.

TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS
(See Footnotes)

Class	General Material Description	Permitted Constituents (subject to the requirements of Clause 601)	Materials Properties required for Acceptability (in addition to requirements on use of Fill Materials in Clause 601)				Compaction Requirements in Clause 612
			Property	Defined and tested in accordance with:	Acceptable Limits within:		
					Lower	Upper	
1A	Well graded granular material	Any material or combination of materials	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 1
			ii. uniformity coefficient	See Note 3	10	-	
			iii. Optimum mc	BS1377: Part 4 vibrating hammer method	-	-	
			iv. mc	BS 1377: Part 2	Optimum mc – 2%	Optimum mc + 2%	
1B	Uniformly graded granular material	Any material or combination of materials	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 3
			ii. Uniformity coefficient	See Note 3	-	10	
			iii. Optimum mc	BS1377: Part 4 vibrating hammer method	-	-	
			iv. mc	BS 1377: Part 2	Optimum mc – 2%	Optimum mc + 2%	

TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS
(See Footnotes)

Class	General Material Description	Permitted Constituents (subject to the requirements of Clause 601)	Materials Properties required for Acceptability (in addition to requirements on use of Fill Materials in Clause 601)				Compaction Requirements in Clause 612
			Property	Defined and tested in accordance with:	Acceptable Limits within:		
					Lower	Upper	
1C	Coarse granular	Any material or combination of materials	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 5
			ii. uniformity coefficient	See Note 3	5	-	
			iii. 10% fines value	BS812: Part 111	50kN	-	
Page 58	Cohesive Material	Any material or combination of materials	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 1 (but see also note 4)
			ii. MCV	BS 1377: Part 4	8	13	
3&4	Not Used						
5	Topsoil	Material complying with BS3882	i. Grading	Clause 618	-	Clause 618	No compaction

TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS
(See Footnotes)

Class	General Material Description	Permitted Constituents (subject to the requirements of Clause 601)	Materials Properties required for Acceptability (in addition to requirements on use of Fill Materials in Clause 601)				Compaction Requirements in Clause 612
			Property	Defined and tested in accordance with:	Acceptable Limits within:		
					Lower	Upper	
6A	Granular fill for placement below water	Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, well burnt colliery spoil or any combination thereof	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	No compaction
			ii. uniformity coefficient	See Note 3	10	-	
			iii. plasticity index	BS 1377: Part 2	Non plastic	Non plastic	
6B to 6E not used							
6F1	Capping layer (fine grading)	Any material or combination of materials other than argillaceous rock and un-burnt colliery spoil	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 6
			ii. Optimum mc	BS1377: Part 4 vibrating hammer method	-	-	
			iii. mc	BS 1377: Part 2	Optimum mc – 2%	Optimum mc	
			iv. 10% fines value	BS812: Part 111	30kN	-	

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TABLE 6/1: ACCEPTABLE EARTHWORKS MATERIALS: CLASSIFICATION AND COMPACTION REQUIREMENTS
(See Footnotes)

Class	General Material Description	Permitted Constituents (subject to the requirements of Clause 601)	Materials Properties required for Acceptability (in addition to requirements on use of Fill Materials in Clause 601)				Compaction Requirements in Clause 612
			Property	Defined and tested in accordance with:	Acceptable Limits within:		
					Lower	Upper	
6F2	Capping layer (coarse grading)	Any material or combination of materials other than argillaceous rock and un-burnt colliery spoil	i. grading	BS 1377: Part 2	Table 6/2	Table 6/2	Table 6/4 Method 6
			ii. optimum mc	BS1377: Part 4 vibrating hammer method	-	-	
			iii. mc	BS 1377: Part 2	Optimum mc – 2%	Optimum mc	
			iv. 10% fines value	BS812: Part 111	30kN		

Footnotes to Table 6/1

1. mc = moisture content
2. mcv = moisture condition value
3. Uniformity coefficient is defined as the ratio of the particle size D_{60} to D_{10} on the particle size distribution curve where:

 D_{60} = particle diameter at which 60% of the soil is finer
 D_{10} = particle diameter at which 10% of the soil is finer
4. For materials with a liquid limit greater than 50 determined by BS 1377: Part 2, only grid rollers shall be used.

Table 6/2

TABLE 6/2: GRADING REQUIREMENTS FOR ACCEPTABLE EARTHWORKS MATERIALS										
Class	Percentage by Mass Passing the size shown									
	Size	Size (mm) B.S. Series							Size (microns) B.S. Series	
	500mm	125	90	75	37.5	10	5	2	600	63
1A	-	100	-	-	-	-	-	-	-	Less than 15
1B	-	100	-	-	-	-	-	-	-	Less than 15
1C	100	10-95	-	-	-	-	-	-	0-25	Less than 15
2	-	100	-	-	-	-	-	-	-	15-100
6A	100	-	-	-	-	-	0-85	-	0-45	0-5
6F1	-	-	-	100	75-100	40-95	30-85	-	10-50	Less than 15
6F2	-	100	80-100	65-100	45-100	15-60	10-45	-	0-25	0-12

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Table 6/3 not used

Table 6/4

TABLE 6/4										
METHOD COMPACTION FOR EARTHWORKS MATERIALS										
(This table is to be read in conjunction with sub-clauses 612.5 & 612.6)										
Type of Compaction Plant	Category	Method 1		Method 3		Method 5		Method 6		
		D	N	D	N	D	N	N for D = 110	N for D = 150	N for D = 250
Smooth wheeled roller (or vibrating roller operating without vibration)	Mass per metre width of roll:									
	over 2100kg to 2700kg	125	10	125	10*	u/s	u/s	u/s	u/s	u/s
	over 2700kg to 5400kg	125	8	125	8*	u/s	16	u/s	u/s	u/s
Grid roller	over 5400kg	150	8	u/s	u/s	u/s	8	16	u/s	u/s
	Mass per metre width of roll:									
	over 2700kg to 5400kg	u/s	125	150	10	u/s	u/s	u/s	u/s	u/s
Vibrating roller	over 5400kg	125	12	u/s	u/s	u/s	20	u/s	u/s	u/s
	Mass per metre width of vibrating roll:									
	over 700kg to 1300kg	100	12	150	6	u/s	16	u/s	u/s	u/s
	over 1300kg to 1800kg	125	8	200	10*	u/s	6	16	u/s	u/s
	over 1800kg to 2300kg	150	4	225	12*	u/s	4	6	12	12
over 2300kg	175	4	250	10*	400	5	3	5	11	

TABLE 6/4 (continued)

METHOD COMPACTION FOR EARTHWORKS MATERIALS
 (This table is to be read in conjunction with sub-clauses 612.5 & 612.6)

Type of Compaction Plant	Category	Method 1		Method 3		Method 5		Method 6		
		D	N	D	N	D	N	N for D = 110	N for D = 150	N for D = 250
Vibrating plate compactor	Mass per m ² of base plate:									
	over 1400kg to 1800kg	100	6	150	4	u/s		8	u/s	u/s
	over 1800kg to 2100kg	150	6	200	4	u/s		5	8	u/s
	over 2100kg	200	6	250	4	u/s		3	6	12
Vibro tamper	Mass:	100	3	150	3	u/s		4	8	u/s
	over 50kg to 75kg	150	3	225	3	u/s		2	4	10
Power rammer	over 100kg	150	6	u/s		u/s		5	8	u/s

SERIES 700 – ROAD PAVEMENTS – GENERAL

CONTENTS

<u>CLAUSE</u>	<u>TITLE</u>
701	Pavement Construction
702	Horizontal Alignments, Surface Levels and Surface Regularity of Pavement Courses
703	Cold Weather Working
704	Use of Surfaces by Traffic and Construction Plant
705	Frost Heave
706	Excavation, Trimming and Reinstatement of existing Surfaces
708	Coarse Aggregates
709	Recycling

SERIES 700

ROAD PAVEMENTS – GENERAL

701 Pavement Construction

1. Road pavements shall be constructed from one of the permitted options described in Appendix 7/1 and in compliance with this Series and the appropriate Clauses of the 800, 900 and 1000 Series.
2. For pavement construction purposes, road categories are as detailed in Table 7/1: (See also Clause 000.2)

Table 7/1 – Categories of Road

Category	Type	Maximum Commercial Vehicles/day assumed
A	Industrial estate roads Major Streets	300
B	General Streets, Minor Access Street, Shared Surfaces, Mews.	50

3. The sub-grade shall be prepared after excavation to a width of 0.6m greater than the actual width of the finished carriageway.

702 Horizontal Alignments, Surface Levels and Surface Regularity of Pavement Courses

Horizontal Alignments

1. Horizontal alignments shall be determined from one edge of the pavement surface. The edge of the pavement as constructed and all other parallel alignments shall be correct within a tolerance of +/- 25mm there from, except for kerbs, channel blocks and edge lines which shall be laid with a smooth alignment within a tolerance of ± 13 mm.

Surface Levels of Pavement Courses

- The level of any point on the constructed surface of the pavement courses shall be the design level; subject to the appropriate tolerances stated in Table 7/2. Refer also to sub-clause 508.8.

Table 7/2 – Tolerances in Surface Levels of Pavement Courses

Road surfaces	± 6mm
Base course	± 6mm
Road base	± 15
Sub-bases	+ 10mm - 30mm

- Notwithstanding the tolerances permitted in surface levels of pavement courses, the cumulative tolerance shall not result in a reduction in thickness of the pavement, excluding the sub-base, by more than 15mm from the specified thickness not a reduction in the thickness of the bituminous wearing course by more than 5mm from that specified.
- For checking compliance with sub-Clause 2 of this Clause, measurements of the surface levels of all courses will be taken on a grid of points spaced at 2m laterally and 10m longitudinally. In any length of pavement, compliance shall be deemed to be met for all surfaces, other than the final road surface, when not more than one of 10 consecutive measurements take longitudinally or one in any transverse line, exceeds the tolerances permitted in Table 7/2, provided that this one measurement shall not exceed by more than 5mm the tolerance for the course concerned. For the final road surface, the tolerance given in Table 7/2 shall apply to any point on that surface.

Surface Regularity

- The longitudinal regularity of the surfaces of wearing courses and base courses shall be such that the number of surface irregularities is within the relevant limits stated in Table 7/3.

An irregularity is a variation of not less than 4mm or 7mm of the profile of the road surface as measured by the rolling straight edge, of the type designed by the Transport and Road Research

Laboratory set at 4mm or 7mm as appropriate or equivalent apparatus capable of measuring irregularities within the same magnitudes over a 3m length. No irregularity exceeding 10mm shall be permitted.

6. Compliance with Table 7/3 shall be checked by the rolling straight-edge along any line or lines parallel to the edge of pavement on sections of 300m.

Where the total length of pavement is less than 300m, the measurements shall be taken on 75m lengths.

7. A straight edge 3m long shall be used to check longitudinal surface regularity in the following cases:
 - i. for lengths of less than 75m of wearing course and base course;
 - ii. where the use of the rolling straight-edge or equivalent apparatus is impracticable.

The maximum allowable difference between the surface and the underside of the straight-edge, when placed parallel with, or at right angles to, the centre line of the road shall be:

For pavement surfaces 3mm
 For base courses 6mm

Table 7/3 – Weather Working

Irregularity	Carriageway Surface				Base course			
	4mm		7mm		4mm		7mm	
Length (m)	300	75	300	75	300	75	300	75
Category A & B	40	18	4	2	60	27	6	3

703 Cold Weather Working

1. Road pavement materials in a frozen condition shall not be incorporated in the works but may be used, if acceptable, when thawed.
2. Road pavement materials shall not be laid on any surface which is frozen or covered with ice.

3. The temperature of concrete or cement-bound material in any pavement layer shall not be less than 5°C at the point of delivery. These materials shall not be laid when the air temperature falls below 3°C and laying shall not be resumed until the rising air temperature reaches 3°C.
4. Road pavement material containing bitumen binders shall not be laid if the temperature of the surface to be covered is at or below 2°C. If the surface is dry, unfrozen and free from ice, laying may proceed at air temperatures at or above -1°C, provided temperature is rising.
5. Additionally, unless the temperature of the surface to be covered is 5°C or more, rolled asphalt wearing course shall not be laid when the air temperature falls to 0°C, or -3°C in calm conditions. Laying may proceed when the air temperature rises to or above 1°C provided the surface is dry. When laying is done in the winter months (November, December, January & February) layer thickness of Hot Rolled Asphalt Wearing Course shall be increased by 10mm with an equivalent decrease in layer thickness of basecourse.

704 Use of Surfaces by Traffic and Construction Plant

1. Construction plant and traffic used on pavements under construction shall not damage the subgrade or the pavement courses already constructed.
2. The wheels or tracks of plant moving over the various pavement courses shall be kept free from deleterious materials.

705 Frost Heave

1. Material shall not be frost susceptible if it is used within 450mm of the designed final surface of a road or paved central reserve.
2. Material shall be classified as non-frost-susceptible if the mean heave is 15mm or less, when tested in accordance with BS812: Part 124.

706 Excavation, Trimming and Reinstatement of existing Surfaces

1. The Developer shall not excavate openings in paved areas which have been constructed as part of the Permanent Works except when

such excavations are unavoidable and then only with the prior approval of the Highway Authority's representative.

2. Where such excavations are permitted and where excavation and trimming of existing paved areas and highways not constructed as part of the Permanent Works are required, they shall be carried out and reinstated in compliance with the current edition of the Department of Transport Code of Practice "Specification for the Reinstatement of Openings in Highways"* as required by the New Roads and Street-works Act 1991. In addition, the work covered by this sub-clause shall be carried out by an Undertaker holding a current licence for such work, issued by the Highway Authority.
3. For excavations in non-carriageway surfaces, backfilling shall be carried out in compliance with 600 Series. To allow for settlement, temporary surfacing shall be provided. The permanent surfacing shall be reinstated to the quality and configuration of the original, at a time to be agreed by the Highway Authority's representative.
4. Immediately before bituminous layers are reinstated the edges shall be cleared of all loose material and be coated with a hot bituminous binder. Where new pavement construction abuts an existing bituminous pavement which has to be reduced in level or overlaid to match alignment and levels, the existing surface shall be trimmed by the minimum amount of cold-milling (planning) to a depth which will allow the specified thickness of wearing course to be laid.

707 Not used

708 Coarse Aggregates

1. Where dense bitumen macadam is to be used in wearing course the aggregate abrasion value (AAV) shall not exceed 12 for natural aggregate, or 14 for blast furnace slag.
2. The polished stone value (PSV) of coarse aggregate in wearing course shall be as shown in Table 7/4.

Table 7/4 – Polished Stone Value (PSV)

Category A		Categories B
Within 30m of major junctions and gradients in excess of 10%	Elsewhere	
65	60	55

3. Trafficked block paving shall have a minimum SRV (Skid Resistance Value) of 45 when measured with the Portable Skid Resistance Tester in accordance with Road Research Laboratory Note No. 27. Difficult sites such as roundabouts, gradients of 1 in 20 or steeper and approaches to traffic lights on unrestricted roads shall have a minimum SRV of 65.

709 Recycling

Recycling methods such as Deep Recycling, Retreat and Use of Marginal Materials is permitted in some circumstances. Details must be submitted for approval by the Highway Authority.

Appendix 7/1

Permitted Pavement Options

Category A – Roads

Surfacing	Clause	Material	Grade of Binder	Thickness	Special Requirements
Wearing Course	Cl.911	HRA	50 pen	45mm	
Basecourse	Cl.906	Dense Macadam 20mm size	100 pen or 200 pen	65mm	200 pen binder for hand laid material only
Roadcase	Cl.903 Cl.1038	Dense Macadam OR Cement Bound Material	100 pen or 200 pen	155mm 175mm	200 pen binder for hand laid material only
Sub-base	Cl.803 Cl.1036	Type 1 Sub-base OR Cement Bound Material		150mm 225mm 150mm 150mm	CBR>15% 5%<CBR<15% 2%<CBR<5% CBR<2% See notes 1 & 2
Capping Layer	Cl.613	Capping		- - 350mm 600mm	CBR>15% 5%<CBR<15% 2%<CBR<5% CBR<2% See notes 1 & 2

Appendix 7/1

Permitted Pavement Options

Category B – Roads

Surfacing	Clause	Material	Grade of Binder	Thickness	Special Requirements
Wearing Course	Cl.911	HRA	50 pen	45mm	
	Cl.912	OR Close Graded	See Cl.912	45mm	
Base course	Cl.906	Dense Macadam 20mm size	100 pen or 200 pen	50mm	200 pen binder for hand laid material only
Road case	Cl.903	Dense Macadam	100 pen or 200 pen	70mm	200 pen binder for hand laid material only
	Cl.1038	OR Cement Bound Material		100mm	
Sub-base	Cl.803 or Cl.804 Cl.1036	Type 1 or Type 2 Sub-base OR Cement Bound Material		150mm 225mm 150mm 150mm	CBR>15% 5%<CBR<15% 2%<CBR<5% CBR<2% See notes 1 & 2
Capping Layer	Cl.613	Capping		- - 300mm 450mm 600mm	CBR>15% 5%<CBR<15% 2%<CBR<5% 1%<CBR<2% CBR<1% See notes 1 & 2

Notes

1. Alternative road pavement and foundation thicknesses may be derived from the Design Manual for Roads and Bridges (HD 24/94).
2. Capping and sub-base thickness are established from the California Bearing Ratio (CBR) measurements of the underlying soil. Testing for the CBR shall be in compliance with BS1377 Part 4.

Alternatives to the use of capping material for strengthening the road formation may be used with the approval of the Highway Authority.

- 3 HRA is Hot Rolled Asphalt.
4. Alternative surface treatment such as block paving must be submitted for approval by the Highway Authority.
5. The top 450mm of road construction, including sub-grade, is to be non-frost susceptible. Where CBR requirements indicate a construction depth of less than 450mm, and the sub-grade is frost susceptible, and then capping material can be used to give the required depth. Refer to Clause 705.
6. For details of road category refer to Sub-C1.701.2. The road Type is as detailed in the guide to the layout of development roads, obtained from the Development Control Section.
7. Refer to Sub-C1.508.9 for cross fall and long fall requirements.

**SERIES 800 – ROAD PAVEMENTS – UNBOUND
MATERIALS**

Contents

<u>Clause</u>	<u>Title</u>
801	Unbound Materials for Sub-bases
802	Compaction
803	Granular Sub-base Material Type 1
804	Granular Sub-base Material Type 2

SERIES 800

ROAD PAVEMENTS – UNBOUND MATERIALS

801 Unbound Materials for Sub-bases

1. Blast furnace slag for use in sub-base materials shall comply with BS EN 13285. Materials other than slag when placed within 500mm of cement-bound materials, concrete pavements, concrete structures, or concrete products shall have a water soluble sulphate content not exceeding 1500mg of sulphate (expressed as SO₄) per litre when tested in accordance with BS 1377: Part 3.
2. Unbound material up to 225 mm compacted thicknesses shall be spread in one layer so that after compaction the total thickness is as specified. Unbound material of compacted thickness greater than 225mm shall be laid in two or more layers and the minimum compact thickness of any such layer shall be 110mm. Where the layers of unbound material are of unequal thickness the lowest layer shall be the thickest layer.

802 Compaction

1. Compaction of materials shall be carried out by a method specified in Table 8/1.
2. The surface of any layer of material shall on completion of compaction and immediately before overlaying, be well closed, free from movement under construction plant and from ridges, cracks, loose materials, pot holes, ruts or other defects. All loose segregated or otherwise defective areas shall be removed to full thickness of the layer and new material laid and compacted.
3. For the purposes of Table 8/1 the following shall apply:
 - i. Vibratory rollers are self-propelled or towed smooth-wheeled rollers having means of applying mechanical vibration to one or more rolls. The requirements for vibratory rollers are based on the use of the lowest gear on a self-propelled machine with mechanical transmission and a speed of 1.5-2.5 km/h for a towed machine or a self-propelled machine with hydraulic transmission. If higher gears or speeds are used an increased

number of passes shall be provided in proportion to the increase in speed travel.

- ii. Vibrating-plate compactors shall be operated at the frequency of vibration recommended by the manufacturer. They shall normally be operated at travelling speeds of less than 1 km/h but if higher speeds are necessary, the number of passes shall be increased in proportion to the increase in speed of travel.
- iii. Vibro-tampers are machines in which an engine driven reciprocating mechanism acts on a spring system, through which oscillations are set up in a base-plate.
- iv. Power rammers are machines which are actuated by explosions in an internal combustion cylinder; each explosion being controlled manually by the operator. One pass of a power rammer shall be considered to have been made when the compacting shoe has made one strike on the area in question.
- v. Combinations of different types of plant or different categories of the same plant will be permitted, in which case the number of passes for each shall be such proportion of the appropriate number in Table 8/1 as will together produce the same total compactive – effort as any one operated singly, in accordance with Table 8/1.

Table 8/1: Compaction Requirements for Granular Material

Type of compaction plant	Category	Number of Passes for layers not exceeding these compacted thicknesses		
		110mm	150mm	225mm
Smooth wheeled roller	Mass/metre width of roll: 2700-5400	16	unsuitable	unsuitable
	more than 5400	8	16	unsuitable
Vibratory Rollers	Mass/metre width of roll: 700-1300	16	unsuitable	unsuitable
	1300-1800	6	16	unsuitable
	1800-2300	4	6	10
	2300-2900	3	5	9
	2900-3600	3	5	8
	3600-4300	2	4	7
	4300-5000	2	4	6
	more than 5000	2	3	5
Vibrating plate compactor	Mass/metre width of squared: 1400-1800	8	unsuitable	unsuitable
	1800-2100	5	8	unsuitable
	more than 2100	3	6	10
Vibro-tamper	Mass: 50-65	4	8	unsuitable
	65-75	3	6	10
	more than 75	2	4	8
Power rammer	Mass: 100-500	5	8	unsuitable
	more than 500	5	8	12

803 Granular Sub-base Material Type 1

1. Type 1 granular material shall be crushed rock, crushed slag, and crushed concrete or well burnt non-plastic shale. The material shall lie within the grading envelope of Table 8/2, and not be gap graded.
2. The material passing the 425 micron BS sieve shall be non-plastic as defined by BS 1377: Part 2 and tested in compliance therewith.
3. The material shall be transported, laid and compacted without drying out or segregation.
4. The material shall have a ten per cent fines value of 50kN or more when tested in compliance with BS 812: Part III and BS EN 1097: Part 2. The test sample shall be in a soaked condition at the time of test –

Table 8/2: Sub-base Type 1 Range of Grading

BS SIEVE SIZE, mm	PERCENTAGE BY MASS PASSING
63	100
31.5	75-99
16	43-81
8	23-66
4	12-53
2	6-42
1	3-32
0.063	0-9

The particle size shall be determined by the washing and sieving method of BS 812: Part 103

5. The aggregate source shall have a soundness value greater than 75 when tested in accordance with BS 812: Part 121.

804 Granular Sub-base Material Type 2

1. Type 2 granular materials shall be natural sands, gravels, crushed rock, crushed slag, crushed concrete or well burnt non-plastic shale. The material shall lie within the grading envelope of Table 8/3 and not be gap graded.

Table 8/3: Sub-base Type 2 Range of Grading

BS SIEVE SIZE	PERCENTAGE BY MASS PASSING
63 mm	100
31.5 mm	75-99
16 mm	50-90
8 mm	30-75
4 mm	15-60
1 mm	0-35
0.063 mm	0-9

The particle size shall be determined by the washing and sieving method of BS 812: Part 103

2. The material passing the 0.425 mm test sieve when tested in compliance with BS 1377: Part 2 shall have a plasticity index of less than 6.
3. The material shall have a minimum CBR value of 20% when tested in accordance with BS 1377: Part 4, with surcharge discs. The material shall be tested at the density and moisture content likely to develop in equilibrium pavement conditions, which shall be taken as being the density relating to a uniform air voids content of 5% and the optimum moisture content determined in compliance with BS 5835.
4. The material shall be transported, laid and compacted at a moisture content within the range 1% and above to 2% below the optimum moisture content determined in compliance with BS 5835.
5. The material shall have a ten per cent fines value of 50kN or more when tested in compliance with BS 812: Part 111 and BS EN 1097: Part 2. The test sample shall be in a soaked condition at the time of the test.
6. The aggregate source shall have a soundness value greater than 75 when tested in accordance with BS 812: Part 121.

SERIES 900 – ROAD PAVEMENTS – BITUMINOUS BOUND MATERIALS

Contents

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SERIES 900

ROAD PAVEMENTS – BITUMINOUS BOUND MATERIALS

901 Bituminous Materials

General

1. Bituminous pavement courses shall be made using the materials as described in the 700 series of this Specification.

Aggregates for Bituminous Materials

2. Aggregates shall be clean, hard and durable and shall contain no material which can prevent proper coating or affect the durability of the mixed materials. The maximum Flakiness Index of the coarse aggregate used in Coated Macadams shall be 35. The use of Limestone aggregates, either coarse or fine, will not be permitted in any final wearing course, or long term exposure on a binder course which will have prolonged traffic use.

Hardness

Coarse aggregates shall have the following properties:

- i. A ten per cent fines value not less than 140kN for natural crushed and uncrushed aggregates and 85kN for blast furnace slag when tested in a dry condition in accordance with BS 812: Part 111 and BS EN 1097: Part 2.
- ii. An aggregate impact value not greater than 30 per cent for natural crushed and uncrushed aggregates and not greater than 35 per cent for blast furnace slag when tested in a dry condition in accordance with BS 812: Part 112 and BS EN 1097: Part 2.

Durability

When tested in accordance with BS 812: Part 121 the aggregate shall have a minimum Magnesium Sulphate Soundness Value of 75 per cent.

Cleanness

The fraction of material passing the 0.063mm test Sieve, for fine aggregates, shall not exceed the limits stated in BS EN 13108: Part 7, BS

EN 13108: Part 4 when tested in accordance with the washing and sieving method of BS 812: Part 103.2.

Transporting

3. Bituminous materials shall be transported in clean insulated vehicles and shall be covered while in transit or awaiting tipping. Dust, coated dust or water may be used on the interior of the vehicles to facilitate discharge of the mixed materials.

Laying

4. Wherever practicable, bituminous materials shall be spread, levelled and tamped by an approved self-propelled paving machine. As soon as possible after arrival at site materials shall be supplied continuously and it shall be so operated whenever practicable.
5. The travel rate of the paver, and its method of operation, shall be adjusted to ensure an even and uniform flow of bituminous material across the screed free from dragging, tearing and segregation of the material.
6. Bituminous materials shall be laid in accordance with the requirements and recommendations for laying in BS 594987 as appropriate.
7. Hand placing of bituminous materials shall only be permitted the following circumstances:
 - i. For laying regulating courses or irregular shape and varying thickness.
 - ii. In confined spaces where it is impracticable for a paver to operate.
 - iii. For footways.
8. Hand-raking of wearing course material or the addition of such material by hand-spreading to the paved area, for adjustment of level, shall only be permitted at the edges of layers of material and at gullies and manholes.
9. Hand laid work shall conform with the requirements of this Clause except those relating to pavers.

Compaction

10. Bituminous materials shall be laid and compacted in layer thicknesses which enable surface level and regularity requirements to be met and adequate compaction to be achieved. The minimum thickness of material laid in each paver pass shall be in accordance with BS 594987.
11. Compaction of bituminous materials shall commence as soon as the un-compacted material will bear the effects of the rollers without undue displacements or surface cracking. Compaction shall be substantially completed before the temperature falls below the minimum rolling temperatures stated in BS 594987. Rolling shall continue until all roller marks have been removed from the surface.
12. Compaction shall be carried out using 8-10 tonnes deadweight smooth wheeled rollers having a width of roll not less than 450mm, or by vibratory rollers or by a combination of these rollers. Wearing course and base course material shall be surface finished with a smooth wheeled roller which may be a deadweight roll or a vibratory roller in a non-vibrating mode.
13. Vibrating rollers may be used if they are capable of achieving at least the standard of compaction of an 8-tonnes deadweight roller. They shall be equipped or provided with devices, indicating the frequency at which the mechanism is operating and the travel speed, which can be read from the ground. The performance of vibratory rollers proposed for use shall be assessed by the Developer producing evidence of independent trials indicating to the approval of the Highway Authority's representative that the make and model of Vibratory roller proposed for use under comparable conditions will achieve the required state of compaction.
14. Bituminous materials shall be rolled in a longitudinal direction, with the driven rolls nearest the paver. The roller shall first compact material adjacent to joints and then works from the lower to the upper side of the layer, overlapping on successive passes by at least half the width of the rear roll.

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

Chippings

16. The application of coated chippings to areas wearing course shall be by an approved mechanical spreader capable of distributing chippings to an even rate of spread. Addition of chippings by hand operation shall only be permitted in the following circumstances:
 - i. In confined spaces, where it is impractical for a chipping spreader to operate.
 - ii. As a temporary expedient, when adjustments have to be made to the spreader distribution mechanism.
 - iii. When hand laying of the wearing course is permitted.
 - iv. To correct uneven distribution of chippings.
17. Chippings shall be applied uniformly and rolled into the wearing course surface so they are effectively held and provide the specified texture depth.

Joints

18. Where longitudinal joints are made in wearing courses, the material shall be fully compacted and the joint made flush in one of the following ways; only method (ii) shall be used for transvers joints:
 - i. By using two or more pavers operating the echelon, where this is practicable, and in sufficient proximity for adjacent widths to be fully compacted by continuous rolling.
 - ii. By cutting back the exposed joint, for a distance equal to the specified layer thickness, to a vertical face, discarding all loosened material and coating the vertical face completely with suitable hot bitumen, or cold-applied thixotropic bitumen, or polymer modified adhesive bitumen tape with a minimum thickness of 2mm, before the adjacent width is laid.
19. All joints shall be offset at least 300mm from parallel joints in the layer beneath wherever possible. Joints in the wearing course shall coincide with either the lane edge or the lane marking, whichever is appropriate.

General

20. Bituminous surfaces on which laying is to take place shall be clean, free from standing water and uncontaminated. Where there is a delay between laying successive courses a bituminous tack coat spray, complying with Clause 920, shall be applied to the surface on which laying is to take place immediately prior to laying.

902 Reclaimed Bituminous Materials

1. Up to ten per cent reclaimed bituminous material may be used in the production of bituminous road base, base-course and wearing course. The end product shall comply with the requirements of this Series.

903 Dense Macadam Road-base

1. Dense macadam road-base shall comply with BS 594987 for 28mm nominal size dense road-base and sub-clauses 2, 3 and 4 of this Clause.

Aggregate

2. The aggregate shall be in a surface dry condition prior to mixing unless the macadam is manufactured in a drum mixing plant in compliance with Clause 923. Where a road base is to be trafficked other than by construction traffic before being overlain by the next layer the minimum Polished Stone Value (PSV) of the coarse aggregate shall be given in Table 7/4.

Filler

3. When the coarse aggregate is gravel, 2% by mass of total of aggregate of Portland cement or hydrated lime shall be added. The percentage of fine aggregate shall be reduced accordingly. Cement or lime is not required when the gravel is limestone.

Binder

4. The binder shall be petroleum bitumen complying with BS EN 12591. The percentage of the bitumen shall be grade 100 penetration. The use of grade 200 penetration for hand laid

materials only shall be subject to the prior approval of the Highway Authority's Representative. Where a grit-stone aggregate of Polished Stone Value (PSV) 65 or greater is used the binder content shall be $4.3 \pm 0.6\%$.

904 Not used

905 Not used

906 Dense (Macadam) Base Asphalt Concrete course

1. Dense macadam base course shall comply with BS EN 13108 part 1. It shall be placed in two layers as appropriate and sub-Clauses 2, 3 and 4 of this Clause.

Aggregate

2. The aggregate shall be in a surface dry condition prior to mixing unless the macadam is manufactured in a drum mixing plant in compliance with Clause 923. Where a base course is to be trafficked other than by construction traffic before being overlain by the next layer the minimum Polished Stone Value (PSV) of the coarse aggregate shall be as given in Table 7/4.

Filler

3. When the coarse aggregate is gravel, 2% by mass of total aggregate of Portland cement or hydrated lime shall be added. The percentage of fine aggregate shall be reduced accordingly. Cement or lime is not required when the gravel is limestone.

Binder

4. The binder shall be petroleum bitumen complying with BS EN 12591. The penetration of the bitumen shall be grade 100 penetrations. The use of grade 200 penetration for hand laid materials only shall be subject to the prior approval of the Highway Authority's Representative. Where a grit stone aggregate of Polished Stone Value (PSV) 65 or greater is used the binder shall be $\pm 0.6\%$.

907 Regulating Course

1. Regulating courses, which may consist of one or more layers of a bituminous material, shall have their finished surfaces laid to achieve the appropriate tolerances for horizontal alignments, surface levels and surface regularity, for pavement layers, in accordance with Clause 702.
2. Bituminous materials for regulating courses shall meet the requirements for the appropriate material as given in this specification. Alternative materials specified in BS EN 13108 Part 4 or BS EN 13108 Part 1 may be used subject to prior approval by the Highway Authority's Engineer.
3. Where a regulating course is to be trafficked other than by construction traffic before being overlain by the next layer the minimum Polished Stone Value (PSV) of the coarse aggregate shall be as given in Table 7/4.
4. Where the total depth of a regulating course exceeds 150mm then the course shall be laid so that each regulating layer has a compacted thickness of between 75mm and 150mm.

908 – 910 Not used

911 Rolled Asphalt Surface Course (Design Mix)

1. Rolled asphalt surface course shall be designed in accordance and comply with BS EN 13108-4, and with sub-Clauses 2 to 5 of this Clause.

Binder

2. The binder shall be petroleum bitumen complying with the requirements of BS EN 12591. The penetration of the bitumen shall be grade 50 penetration.

Coarse Aggregate

3. Course aggregate shall be crushed rock or slag with a Polished Stone Value (PSV) not less than 45 when determined in accordance with BS 812: Part 114. The nominal coarse aggregate content shall be 30% by mass of the total mix. The nominal coarse aggregate size shall be 14mm.

Design Requirements

4. The minimum target binder content for the mixture shall be 7.3%. The Marshall stability shall be a minimum of 3kN with a maximum flow of 5mm. The Marshall Quotient shall be a minimum of 1.0.

Design Approval

5. The Developer shall submit the design proposals for approval by the Highway Authority. Where the design has not been previously approved by the Highway Authority the design shall be subject to verification. The cost of verification shall be borne by the Developer.

Coated Chippings

6. Coated chippings shall be 20mm nominal size or 14mm nominal size and shall comply with Clause 915.

912 Close Graded Macadam Surface Course

1. Close graded macadam wearing course shall comply BS EN 13108: Part 1 Clause 7.3 for 14mm nominal size close graded wearing course.

Aggregate

2. The aggregate shall be in a surface dry condition prior to mixing.
3. When determined in accordance with BS EN 1097: Part 8 and BS 812: Part 4, the source rock or slag for coarse aggregate shall have the minimum polished stone value (PSV) as given in Table 7/4 and maximum aggregate abrasion value (AAV) of 12 except for blast furnace slag when the maximum aggregate abrasion value shall be 14.
4. Mixtures of coarse aggregates will not be permitted.

Binder

5. The binder shall be petroleum bitumen complying with BS EN 12591. The penetration of the bitumen shall be grade 200 penetration for hand laid materials only shall be subject to the prior approval of the Highway Authority. Where a grit-stone aggregate

of Polished Stone Value (PSV) 65 or greater is used the binder content shall be $5.6 \pm 0.5\%$.

913 Not used

914 Fine Graded Macadam Surface Course

1. Medium graded macadam wearing course shall comply BS EN 13108: Part 1, for 6mm nominal size medium graded wearing course.
2. The aggregate shall be in a surface dry condition prior to mixing.

Aggregate

3. When determined in accordance with BS EN 1097-8, the source rock or lag for coarse aggregate shall have the minimum polished stone value (PSV) as given in Table 7.4 and maximum aggregate abrasion value (AAV) of 12 except for blast furnace slag when the maximum aggregate abrasion value shall be 14.
4. Mixtures of different coarse aggregates will not be permitted.

Binder

5. The binder shall be petroleum bitumen complying with BS EN 12591. The penetration of the bitumen shall be grade 200 penetration. The use of grade 300 penetration is permitted for hand laid materials in the winter period. Where the gritstone aggregate of Polished Stone Value (PSV) 65 or greater is used the binder content shall be $5.6 \pm 0.5\%$.

915 Coated Chippings for Application to Pre-mixed Surfacing.

1. The chippings and manner of coating, when used for rolling asphalt shall be in accordance with BS EN 13108 Part 4 with Sub-Clauses 2, 3 and 4 of this Clause.
2. The minimum polished stone value (PSV) shall be as given in Table 7/4 and the aggregate abrasion value (AAV) shall be a maximum of 10. The mean aggregate impact value (AIV) when tested in the dry condition for 3 consecutive values carried out at 2 monthly intervals prior to delivery shall be a maximum of 19. The water absorption shall be a maximum of 1.3%.

3. The polished stone value (PSV) shall be determined in accordance with BS 812: Part 114. The polished stone value shall be the mean of the 3 most recent consecutive results relating to the material to be supplied.
4. The coated chippings shall be clean in appearance, detached and free flowing.

916 – 919 Not used

920 Bituminous Sprays

1. The binder shall be a bitumen emulsion class A1-40 or K1-40 complying with the requirements of BS 434: Part 1.
2. The binder shall be applied in accordance with the requirements of BS 434: Part 2.
3. Before binder spraying is commenced, the surface shall be dry, clean and free of all loose and deleterious materials and standing water.

921 Surface Texture of Rolled Asphalt Wearing Courses

1. The surface texture of chipped hot rolled asphalt wearing courses shall be measured in accordance with BS EN 13036 Part 1: Measurements shall be made as soon as possible after the surface has been laid.
2. The requirements for depth are given in Table 9.1

Table 9.1

	Texture Depth
SMTD– For each 1000m length (or total length if <1000m)	0.80mm
For each 50m section	0.65mm

<p>SAND PATCH – For each 1000m length (or total length if <1000m)</p>	<p>1.0mm</p>
<p>For each 50m section</p>	<p>0.8mm</p>

NOTE: SMTD is the Senior Measured Textured Depth measured by the Mini Texture Meter

922 Not Used

923 Not Used

924 Not used

925 Testing of Bituminous Mixtures and their Component Materials.

1. The sampling, testing and analysis of bituminous mixtures shall comply with BS EN 12697, unless otherwise specified.
2. The bulk density of blast furnace slag shall be determined by the compacted bulk density test described in BS EN 1097 Part 3 carried out on oven-dried aggregates passing the 14mm and retained the 10mm BS sieves.
3. Hot sand testing shall be carried out in accordance with BS 598 Part 1.

SERIES 1000

**ROAD PAVEMENTS – CONCRETE AND CEMENT BOUND
MATERIALS**

<u>CLAUSE</u>	<u>TITLE</u>
1001 – 1045	All Requirements

SERIES 1000

**ROAD PAVEMENTS – CONCRETE AND CEMENT BOUND
MATERIALS**

1001 to 1045

Any proposed design and construction of concrete pavements shall be in accordance with the advice of the Highway Authority and in accordance with the Specification for Highway Works.

SERIES 1100

KERBS, FOOTWAYS AND PAVED AREAS

<u>CLAUSE</u>	<u>TITLE</u>
1101	Precast Concrete Kerbs, Channels, Edgings and Quadrants
1102	Not Used
1103	Not Used
1104	Footways and Paved Areas (Precast Concrete Flags and Block Paving)
1105	Footways and Paved Areas (Flexible Surfacing)
1106	Tactile Paving

SERIES 1100

KERBS, FOOTWAYS AND PAVED AREAS

1101 Precast Concrete Kerbs, Channels, Edgings and Quadrants

1. Precast concrete kerbs, channels, edgings and quadrants shall be hydraulically pressed complying with BS EN 1339. They shall be laid and bedded in accordance with BS 7533: Part 4 and Dwg. No. PSW/C/101.
2. Not used.
3. For curves of radius 12m or less, kerbs of appropriate radius shall be used as BS EN 1340.

1102 Not Used

1103 Not Used

1104 Footways and Paved Areas (Precast Concrete Flags and Block Paving)

1. Precast concrete flags shall be hydraulically pressed, complying with BS EN 1339.
2. Flags shall be laid in accordance with BS 7533: Part 4 to a cross-fall of 1 in 32 with joints at right angles to the kerb. Flags shall be bedded on a layer of mortar 10mm to 40mm thick.
3. On circular work where the radius is 12m or less, all flags shall be radially cut to the required line.
4. Precast paving blocks shall be chamfered and shall comply with BS EN 1338 and laid in accordance with BS 7533: Part 3.
5. Where block paving is to be trafficked refer to Clause.708.3.

1105 Footways and Paved Areas (Flexible Surfacing)

1. Flexible surfacing for footways and paved areas shall be made and laid in compliance with BS EN 13108: Part 4, BS EN 594987, BS 1446 to a cross fall of 1 in 32.

2. Construction details are show in Table 11/1.
3. For sub-base requirements refer to the 800 series. For surfacing requirements refer to the 900 series.
4. Limestone aggregate is not permitted in any wearing course.

1106 Tactile Paving

1. Tactile paving surfaces should be provided as show in the DETR publication “Guidance on the use of Tactile Paving Surfaces” available from the DETR mobility unit, Zone 1/11, Great Minister House, Marsham Street, London, SW1P 4DR or on the internet at; www.mobility_unit.detr.gov.uk/guide/tactile/index.htm

Table 11/1**Construction Thicknesses**

Layer	Material	Nominal Layer Thickness (mm)
Wearing Course (for gradients less than 1 in 8.5)	6mm size Medium Graded wearing course BS EN 13108-1, BS EN 13108-7	20
	or	20
	3mm size Fine Graded wearing course BS EN 13108-1, BS EN 13108-7	25
	or Hot Rolled Asphalt sand carpet wearing course, recipe mixture Type F, designation 0/3, 50 pen bitumen binder	
Wearing Course (for gradients greater than 1 in 8.5)	10mm size close-graded wearing course BS EN 13108-1, BS EN 13108-7	30
Base-course	20mm size Dense Base-course BS EN 13108-1, BS EN 13108-7	50
	or 20mm size Open Graded Base-course BS EN 13108-1, BS EN 13108-7	50
Sub Base	Type 1 Cl. 803 or Type 2 Cl. 804	100

Notes:-

1. Details for construction of vehicular crossings are given in Drawing No. PSW/C/102.

SERIES 1200

TRAFFIC SIGNS

1201 Regulations and Standards

1. Regulations

All traffic signs used (including reflectors and road markings, whether permanent or temporary, shall be of the size, shape, colour and type prescribed for that use in the current Traffic Signs Regulations and General Directions and the Zebra, Pelican and Puffin Pedestrian Crossing Regulations and General Directions.

2. Standards

Traffic signs shall comply with BS 8442, BS EN 12899: Part 1 BS EN 1463: Part 1 and BS EN 1463: Part 2.

1202 General Requirements

1. Traffic signs shall comply with this series and the 1400 series.
2. Lit signs shall comply with Category 1 luminance of BS EN 12899: Part 1.

1203 Posts and Foundations

1. Sign Posts shall be galvanised finished with protective bitumen coating on base. For signs of area not exceed 1m² per post, the foundation shall have the following dimensions:-

Foundation depth	0.6m
Thicknesses of ST2 concrete surround to post	0.3m

2. Guidance for the design of a sign foundations may be obtained from Standard Details held by the Highway Authority.

1204-1211 Not Used

1212 Road Markings

Markings shall be of thermoplastic material supplied and laid in compliance with current British Standards.

In unlit areas markings shall be reflectorized using solid glass beads comply with BS EN 1423 and BS EN 1424.

SERIES 1300

1301 General

1. This series shall apply to the supply and installation of lighting columns and brackets within the following dimensional limitations:-
 - (i) Post top columns not exceeding 20m nominal height.
 - (ii) Columns with brackets not exceeding 18m nominal height.
 - (iii) Bracket projections not exceeding 0.25 x normal height or 3m whichever is the lesser.

2. All columns shall be of aluminium construction in compliance with BS EN40 and BD26/04-Design of Lighting Columns (or the most recent publication)

3. Proposed columns are to be designed as to be acceptable to be installed anywhere within the NPTCBC Authority and to accept the specific loadings, as shown on standard detail column drawings (6m)SD/L/TYP E/J, (8m)SD/L/TYP E/K, (10m)SD/L/TYP E/L, (12m)SD/L/TYP E/M, and (6m Collapsible)SD/L/TYP E/R. Should any other type column be required, then prior consultation must be engaged with the Authorities Lighting Manager in the design stage.

4. Where lighting columns are to be in the vicinity of overhead power lines the Developer shall ensure that the appropriate Electricity Authorities are informed and satisfied with the clearances provided and that warning notices are permanently fixed to the columns affected prior to erection. Where applicable raise / lower columns will be installed in these areas with consultation with the Authorities Lighting Manager.

5. Where access on footpaths etc are not accessible by a Mobile Elevated Working Platform (MEWP) the Authority under to Health and Safety will only accept the ALC's Mk 3 Echalon Collapsible Aluminium Column as per standard detail drawing SD/L/TYP E R.

1302 The contractor shall submit the column design and check certificates to the Authorities Lighting Manager for approval

1303 The contractor shall submit the completed data sheets for each type column to the Authorities Lighting Manager for approval. The contractor shall not erect or order the columns until the Authorities Lighting Manager has notified its acceptance of the completed data sheets in writing to the contractor

1304 Identification and Location Markings

1. All lighting columns and brackets shall carry a unique identification mark which indicates the name of the manufacturer, year of production and other information, to enable details of the column and bracket to be determined by a unique design code reference number relating to the appropriate Column and Bracket Data Sheet. The unique reference number shall not be used for any other design of column or bracket.
2. The column identification mark shall be permanent, legible and clearly visible and be:-
 - (i) On a permanent fixed label or
 - (ii) Hard stamped or
 - (iii) Formed in the material of the column on an external face only

It shall be located either within the base compartment or, except in the case of hard stamping, immediately above or below the door. It shall not be located on the door.

All hard stamping shall be made only in a secondary member of the column and shall be done in a manner which will not induce any stressed in the material of the main member of the column.

3. The bracket identification mark shall be permanent and legible and be:-
 - (i) Hard stamped or
 - (ii) Formed in the material of the bracket on an external face only

The mark shall be located either on the lantern spigot or on the underside of the bracket adjacent to the column shaft.

4. In addition, location marks for inspection and maintenance purposes shall be applied to each column.

1305 Foundations

Planted Columns

1. A layer of concrete Grade ST4 75mm thick complying with Clause 2602 shall be placed and compacted in the bottom of the excavation up to the base of the column.
2. The cable entry slot shall be temporarily plugged as necessary in order to prevent any ingress of concrete or filling material during the concreting and backfilling operations.

Columns to be erected into lighting column sleeves in accordance with Standard Detail SD/E/116 and The Specification of Highways Work Series 1305

1306 Not Used

1307 Surface Finishes

1. The surface preparation and protection of lighting columns, brackets and wall mountings shall comply with the relevant clauses in the 1900 Series, of the specification for Highway Works.
2. Foundation bolts and all fixings including chains and locks shall be approved stainless steel in compliance with the 1900 Series of the Specification for Highways Works.
3. The exterior and interior surfaces of the intended planted depth of an aluminium alloy column shaft and a length of 250mm above the ground level shall be coated with a thermoplastic protective layer. The coating shall only be applied after degreasing and after an approved preliminary treatment in order to ensure adhesion.
4. The underside of an aluminium flange plate shall be treated before erection with bituminous paint complying with BS 3416.

1308 Handling, Transport and Erection

1. Lighting columns and brackets shall be handled, transported and stored in such a way as to avoid any structural damage or damage to the surface protection system. Any damage shall be made good.
2. Lighting columns and brackets shall be stored clear of the ground in such a way that contact with cement, ground water, soil or ash not accumulate on any surfaces or inside sections. Suitable packing shall be placed between the columns to allow a free passage of air and dispersion of water.
3. All rivets, bolts, nuts, washers, screws, small plates and small articles generally shall be suitably packed and identified. All such items shall be stored under cover.
4. Columns shall be installed in accordance with the manufacturer's recommendations.

1309 Amendments and Additions to BS 5649: Part 5

Page 3

after para 2

Insert additional paragraphs as follows:-

“The door arrangement shall be such that it can be opened by releasing a single or twin threaded locking fasteners. The fastener shall be of stainless steel.

When the door is secured, the fastener head shall be completely recessed into the door in a circular recess.

The locking fastener shall be suitable for opening with the standard key.

1.2 after paragraph 2

Insert additional paragraph as follows:-

“Where the cable entry slot width of 75mm is provided, the minimum size from the cable entry slot to the base compartment shall be 75mm”.

SERIES 1400

ELECTRICAL WORK FOR ROAD LIGHTING AND TRAFFIC SIGNS

1400 General

1. Materials equipment and workmanship shall comply with the Institution of Electrical Engineers Regulations for Electrical Installations (the IEE Wiring Regulations) and the Rules and Regulations of the Regional Electricity Company. The Developer shall take into account Engineering Recommendation G.39 – Model Code of Practice covering Electrical Safety in the Planning, Installation, Commissioning and Maintenance of Public Lighting and Other Street Furniture.
2. The following definitions shall apply:
 - (i) A Road Lighting Unit shall consist of the following:-
Colum, bracket, wall mounting, Electrical equipment as defined in (iv) below and wiring excluding electrical supply cable.
 - (ii) A Lit Sign Unit shall consist of a traffic sign as defined in Clause 1201.1 and Electrical Equipment and wiring as in (i) above.
 - (iii) Lighting Units shall consist of both Road Lighting Units and Lit Sign Units.
 - (iv) Electrical Equipment for Lighting Units shall consist of the following:-

Luminaires (lanterns for Road Lighting Units), Telensa Telecell, dimming modules, lamps, electronic ballasts, lockable fused isolators, fuses holders and miniature circuit breakers (MCBs).
 - (v) The term luminaires applies to all lighting units as a luminaire designed for road lighting and is used throughout BS 5489: 1:2003 & BS EN 13201-2:2003 Road lighting Lantern is used in this Specification when only Road Lighting Units are referred to.

- (vi) The network is the electrical distribution system installed by the Developer from the District Network Operator interface to the Lighting Units.

1402 Site Records

1. The Developer shall on the completion of the electrical work, show on a set of CAD drawings the position and identification mark of equipment requiring electrical connections, ducts, underground cables and joints, and the type and depth of cables. The Developer must complete the Telensa Data Sheets with the Telensa Telecell reference number / column number and column location for each luminaire and submit to the Authorities Lighting Manager. The Telensa Telecell is provided with 3 removable bar code reference numbers. The 1st to be affixed to the base of the Telecell, the 2nd to be affixed the fused lockable isolator in the base of the column, and the 3rd to be returned to the Authorities Lighting Manager on a as installed lighting drawing in paper format.
2. Locational measurements shall be taken of the underground equipment to the nearest 100mm from the nearest edge of the carriageway or fence line. Offsets to cables and ducts shall be recorded at 20m intervals along their line. Offsets shall be defined longitudinally by distance from a permanent highway feature, a market post or other point.

1403 Location of Lighting Units and Feeder Pillars

1. The position of the Lighting Units and feeder pillars is shown on the approved plans. The exact location shall be determined by the Developer before commencement of any associated ground work. The Developer shall be responsible for recording the agreed location.

1404 Change of Lighting Arrangements

1. No Lighting Unit shall be switched on or off, dismantled, re-sited or removed without the prior approval of the Highway Authority.

1405 Not Used

1406 Not Used

1407 Luminaires

All proposed luminaires to have a LED light source. Luminaires are to be fitted with integral Telensa enabled electronic ballasts with dimming facility. They shall be fitted with a NEMA socket type Telecell which is registered to NPTCBC. All luminaires must have a 13 digit UMSUG Code for energy billing before they will be accepted.

1. Lanterns shall:-
 - (i) Comply with BS EN 60598:
 - (ii) Be fitted in accordance with manufacturer's instructions with no gap between the lantern and the shoulder of any bracket arm.
 - (iii) Have degree of protection of minimum rating IP 66 to BS EN 60529.
2. Traffic sign luminaires shall comply with BS EN 12899: Part 1 and shall also comply with the following:-
 - (i) External lighting luminaires shall be correctly positioned to meet the luminance requirements of the sign.
 - (ii) Mean sign luminance shall be Category 1 of BS EN 12899: Part 1.
 - (iii) Impact strength shall be Category 1 of BS EN 12899: Part 1.

1408 Lamps

1. Lamps shall be compatible with the luminaires used.
2. The light output of the lamp multiplied by the lamp flux maintenance factor for the projected life shall be taken as its lighting design lumens.
3. Lamps shall not be fitted until columns, brackets and sign posts have been erected and the luminaires have been installed.

4. Lamps shall comply with the appropriate British Standard where one exists.

1409 Photo-Electrical Control Units (PECUs)

1. Photo-Electric control units (PECUs) shall comply with BS 5972 and only used on sign light equipment. They shall have differential switch on-switch off levels 2:1 positive switch on 70 lux. They shall be designed so that in the event of a fault occurring in the unit they should cause the load to be switched 'on'.
2. PECUs shall:-

All street lighting luminaries shall be operated via a Telensa NEMA Socket Telecell registered to Neath Port Talbot CBC

- (i) Be secured to the sign light canopy or (b) top of sign post of internally illuminated sign housing
- (ii) Include a delay device to prevent the lamp being switched in response to transient changes in light conditions
- (iii) Be indelibly marked with the (a) manufacturer's identification mark (b) model number and (c) switch on level
- (iv) Be provided with a gasket or grommet to maintain the required degree of protection
- (v) Be installed to the manufacturer's instructions

1410 Not Used

1411 Not Used

1412 Ballasts

1. Only Electronic Ballasts shall be used in street lighting luminaries and sign light and be for 230V operation.

2. The terminals shall be indelibly marked to indicate all wiring connections.

1413 Igniters for Discharge Lamps

N/A due to Electronic Ballasts

1414 Starters for Fluorescent Lamps

N/A due to Electronic Ballasts

1415 Capacitors

N/A due to Electronic Ballasts

1416 Cut Outs, Fuse Holders and Fuses

1. Cut-outs, fuse holders shall have moulded drip-proof housings.
2. Terminals shall be sufficient for the conductors. They shall be clearly labelled to differentiate circuits and phases.
3. When fuse holders are intended to be used as isolating devices, special tools or protective measures shall not be necessary to extract them.
4. Fuse links shall comply with the requirements of either BS HD 60269: Part 2, BS 88: Part 2. They shall be of high breaking capacity type and be of a value specified to protect the circuit.

1417 Base Compartment Fixing Arrangements

1. Electrical Equipment described in Clauses 1412 - 1416 installed in the base of compartment of columns, or posts shall be positioned and fixed in accordance with manufacturer's instructions with corrosion resisting fixing screws.

1418 Feeder Pillars

1. Feeder pillars shall be of galvanised metal construction. They shall comply with IP 34 of BS EN 60529. They shall include a full size back board of varnished marine plywood at least 15mm thick or other approved non-hygroscopic material. They shall be designed

with an internal stainless steel Dist Bd as per drawing SDL/P1. The entry for cables shall be via the root.

2. The pillar doors shall be fitted with tamper-proof locks, all locks being identical in pattern and two sets of keys shall be provided.
3. Circuit details and labelling shall be provided in each feeder pillar.
4. The main earthing terminal in each feeder pillar shall be connected to earth.
5. Feeder pillars shall be mounted on a 150mm thick foundation of Grade ST2 concrete, as described in Clause 2602. After completion of the cabling, the feeder pillar base shall be filled to 25mm below the door with rounded course aggregates conforming with Table 2 of BS EN 12620 graded aggregate 14mm to 5mm.

1419 Wiring

1. Wiring between the terminal block in the luminaire and the Authorities double pole lockable isolator in the base of the column or sign unit shall be Arctic Blue PVC insulated and sheathed, 3 core composite cable 300/500 volt grade to BS EN 50525-2-1, 3183Y AG cable. Phase, Neutral & Earth copper conductors shall all be 2.5mm² in cross sectional area.
2. The connection between the DNO service cut-out and the Authorities secondary double pole lockable isolator, in the base compartment of a column shall be, single core double insulated PVC cable to 6181Y with a minimum cross sectional area of 10mm². These single core cables are to comply with the correct colour coding.
3. All cables shall be correctly colour coded.

1420 Earthing

1. Circuit protective and equipotential conductors shall be installed and shall be green/yellow PVC insulated or sleeved. Where bolted connections are required, these conductors shall be terminated in accordance with manufactures instructions in correctly sized purpose made lugs. Such connections shall be made with non ferrous nuts, bolts and washers.

2. The circuit protective conductor shall be of equal cross sectional area to the associated circuit conductor.
3. A circuit protective conductor shall connect the earth terminal on each luminaire to the main earth terminal associated with the service cut out unit.
4. A separate circuit protective conductor of not less than 6mm^2 cross sectional area shall connect all metal enclosures of all electrical components to the main earth terminal.
5. All extraneous conductive parts shall be bonded to the main earth terminal using an equipotential bonding conductor of 6mm^2 cross sectional area increased if necessary to conform to the District Network Operators requirements when the Lighting Unit is directly serviced by a protective Multiple Earthing (PME) supply.

1421 Underground Ducted Cable

1. Cables shall be PVC insulated and sheathed coloured black 600/1000V grade with steel wire armouring and all conductors shall be of equal cross sectional area.
2. Service ducts shall comply with Clause 501 and be installed in accordance with the appropriate Clauses in the 500 Series and standard details SD/G/27.
3. Cable trenched shall be excavated in accordance with Clause 602 and SD/G/28. The depth of excavation shall be such that the cables laid under verges, footway or open ground shall have a minimum cover of 450mm and under carriageways of 600mm or 300mm below formation whichever is the greater depth.
4. Cables shall be laid without any sharp bends or kinks. If required, additional protection and support shall be provided as directed by the Highway Authority's representative.
5. Where cables are laid across or within 500mm of filter drains they shall be contained within a duct. The duct shall be surrounded with 50mm of Grade ST2 concrete.

6. Cables following the same route shall occupy the same trench with clearance of 50mm between the outer sheath of cables.
7. Cables shall only be laid when the ambient temperature is above 0°C and the cable has been stored at a temperature greater than 0°C for the previous 24 hours.
8. Cables shall not be bent to an internal radius of less than 12 times the external diameter of the cable or less than the radius recommended by the manufacturer whichever is the greater.
9. Sufficient length of cable shall be allowed for its termination. When termination does not proceed immediately following the installation of the cable its end shall be sealed against the ingress of moisture. If such cable ends are buried their positions shall be marked with permanent marker consisting of a 300mm square x 225mm deep pre-cast concrete block having a mark indented into its top surface and recorded on the Site records.
10. When duct trough alignments differ from those of the trench the transition from one to the other shall not exceed 1:30 horizontally or vertically.
11. Cables laid in trench shall be both bedded on and covered by a 75mm thickness of lightly compacted graded sand or equivalent material passing a 2mm BS sieve. Material complying with Clause 1305.5 and compacted to the requirements therein shall then be deposited to a thickness of 175mm prior to further backfilling in compliance with sub-Clause 14 of this Clause.
12. A yellow self-coloured PVC or polythene plastic tape for cable marking not less than 0.1m thick and 150mm wide with the wording "Street lighting" printed along the full length, occupying not less than 75% of its available length and occurring at least 1m intervals, shall be laid approximately 250 mm above any cable except that where several cables are laid in one trench, only one line of marker tapes need be installed.
13. Where cables are required to be laid in ducts the Developers shall swab through the duct prior to drawing the cables with a further draw rope. On completion of cabling ducts shall be left with a draw rope in place and re-sealed. Where cables are laid in troughs they

shall be covered with sand, or equivalent material passing a 2mm BS sieve up to the level of the cover.

14. Backfilling to cable trenches shall comply with Clause 602 and shall whenever practical be undertaken immediately after the specified operations preceding it have been completed. The Developer shall backfill above the cable marking tape, duct or trough with Class 1, 2 or 3 material complying with Table 6/1 and compacted to the requirements therein, except that he shall:-
 - i) Spread and compact the material evenly without dislodging, disturbing or damaging cables, ducts or trough; and
 - ii) Not use power rammers within 300mm of cables, ducts or troughs.
15. Buried cables shall be taken up and removed by the Developer. Conductors shall be disconnected from the equipment in which they are terminated, the terminal screws and glands retightened and the cable with drawn clear of the equipment.

1422 Cable Joints

1. Cable joints shall not be permitted under normal circumstances unless written authority is given by the Highway Authority.
2. Prior to any cable laying, the Developer shall furnish to the Highway Authority evidence of the jointers competence in the use of the adopted cable joint kit. A record shall be kept to enable cable joints to be identified with the jointer responsible for the work.
3. The approval of the Highway Authority is required for the provision of additional joints and they shall not be provided for cables situated in duct or trough.
4. The Developer shall notify the Highway Authority's Representative before jointing commences so that he may have the opportunity of inspecting the whole of the jointing operations. Joining shall only be carried out when all materials used in the jointing are free from visible signs of moisture and joints must be left protected from the weather during the curing period.

5. Joints shall be adequately supported at all times. Backfilling shall not take place until the completed joint is in a fit condition to withstand any stresses which may be imposed upon it and has been approved by the Highway Authority's Representative.
6. A cable joint marker as described in Clause 1421.9 shall be placed over the joint.

1423 Armoured Cable Terminations

1. Cables shall be individually terminated and secured at switches, cut-outs and other electrical apparatus by means of an armour securing clamp to BS 6121: Part 1, BS EN 62444 and a gland plate.
2. The armour securing clamp and plate assembly shall incorporate at least one non-ferrous earthing terminal.
3. All glands shall be shrouded overall with PVC sleeves and the conductor shall be terminated with cable lugs.
5. Phase connections shall be clearly indicated by an agreed colour marking system.

1424 Inspection and Testing to be carried out by the Developer

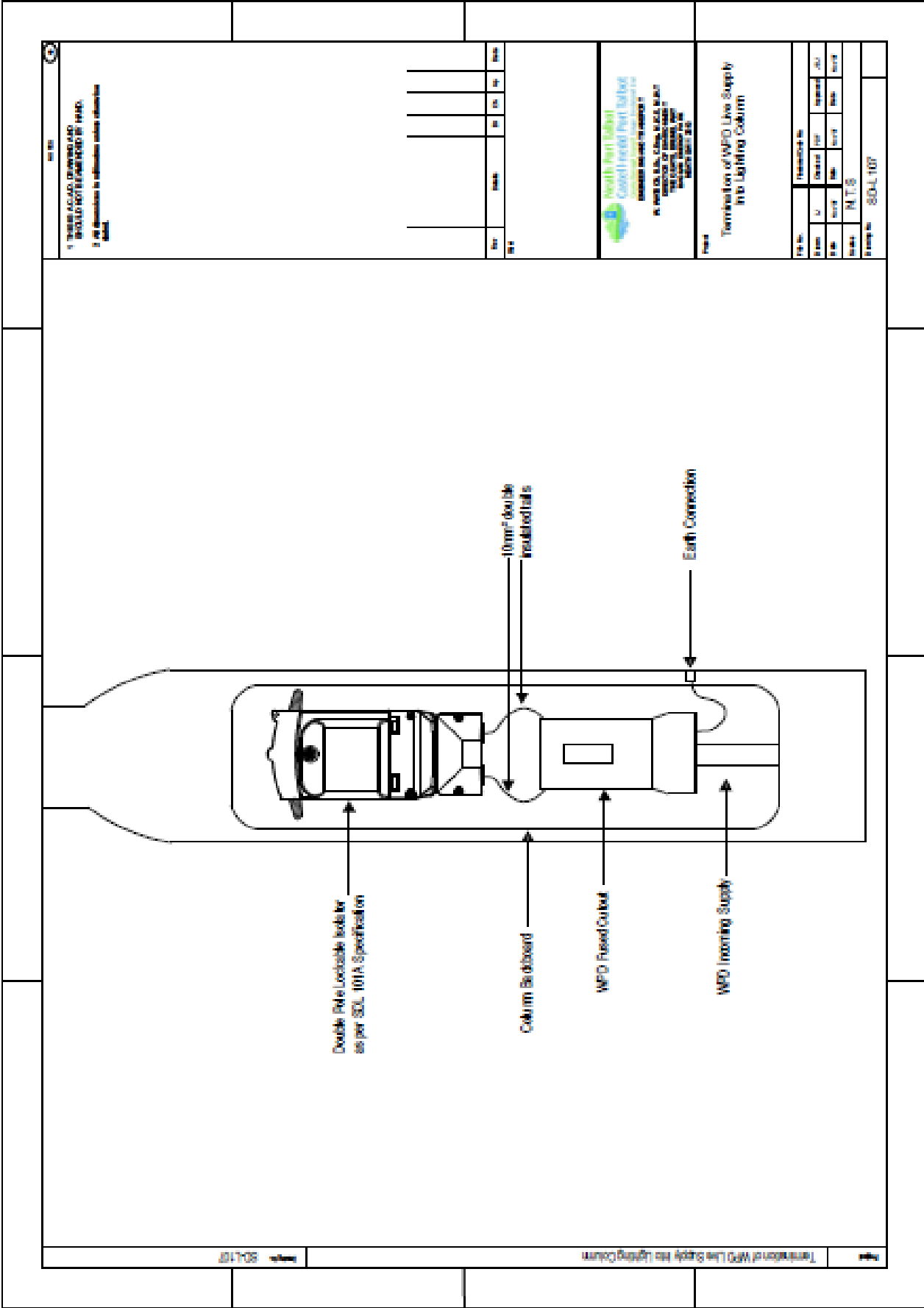
1. Every lighting unit and network, on completion and before being energised, shall be inspected and tested to verify that the requirements of the BS 7671 have been met. The method of testing shall be such that no danger to persons or property damage to equipment can occur even if the circuit tested is defective.
2. The following tests shall be carried out in the sequence indicated below and recorded on a Schedule, the format of which shall be agreed with the Highway Authority and, unless otherwise agreed, be submitted immediately after completion of all the tests, including those on lighting units within each network:-
 - (i) For lighting units (b), (d), (f), (g) apply
 - (ii) For networks (a), (b), (d), (e), (f), (g), (h), (j) apply

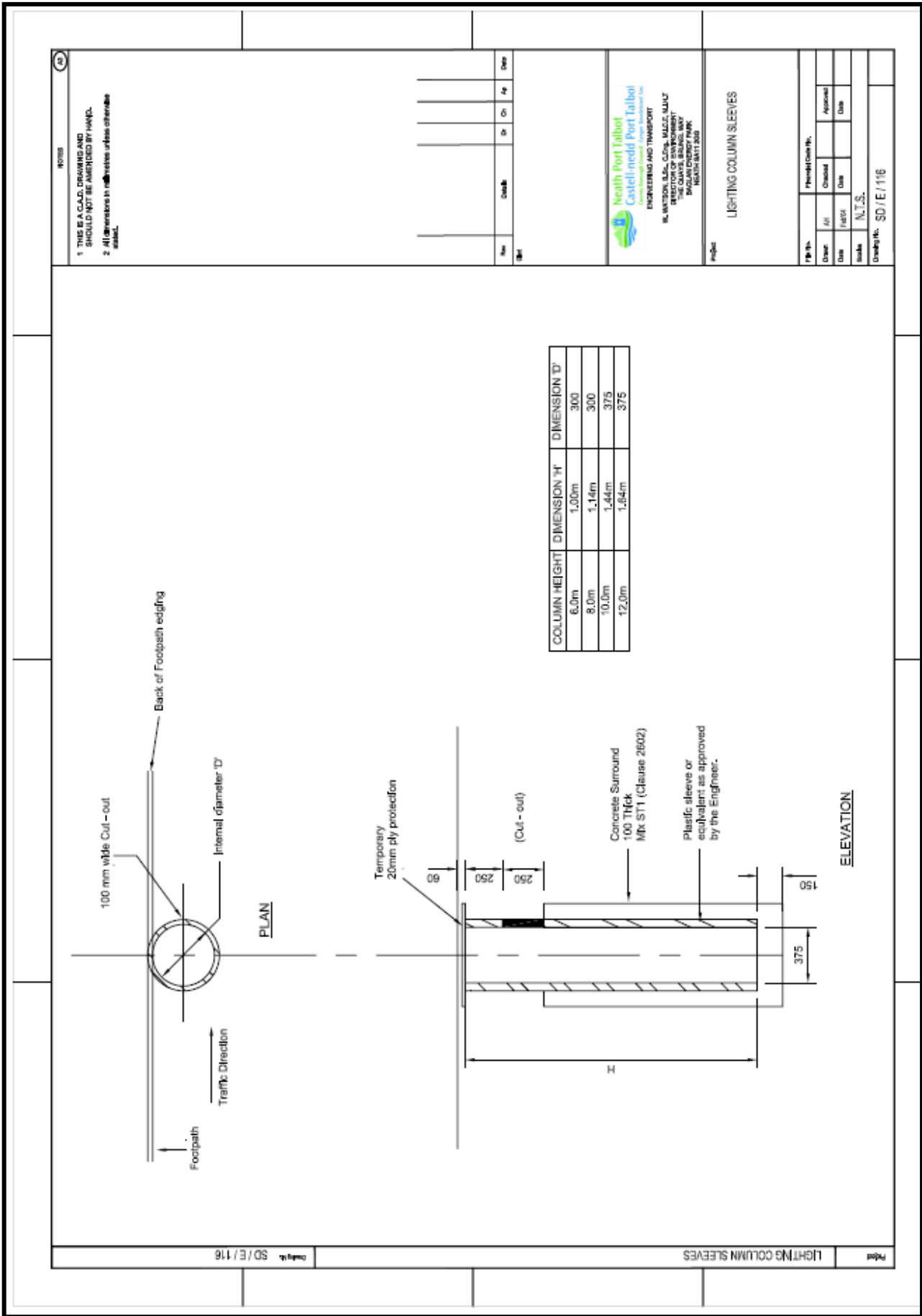
Standard methods of testing are given in BS7671; the use of other methods is not precluded provided they give no less effective results and are approved by the Highway Authority.

- (a) N/A
 - (b) Continuity of protective conductors including main and supplementary equipotential bonding
 - (c) Earth electrode resistance
 - (d) Insulation resistance at a test voltage of 500v to be not less than 1.0 M ohm.
 - (e) Insulation resistance at a test voltage of 500v to be not less than 6 M ohm
 - (f) N/A
 - (g) Polarity
 - (h) Earth fault loop impedance at every cut-out.
 - (j) Operation of residual current devices (if applicable)
3. Voltage readings shall be taken at each feeder pillar and at the terminals of the last current using equipment on each circuit with all equipment energised.
4. The Developer shall give not less than 7 days' notice of his intention to carry out any of the tests specified and the Highway Authority's Representative shall be given the opportunity to witness such tests. The Developer will also be responsible for the provision of the electricity supply into the P.L. Distribution Pillar.

1425 Preparation and Finish of Metal and Other Surfaces

1. Electrical components and ancillary equipment shall be prepared and finished in compliance with Clause 1221.7 and 9 of the Specification for Highway Works.





Notes

- 1 THIS IS A CALD DRAWING AND SHOULD NOT BE AMENDED BY HAND.
- 2 All dimensions in millimetres unless otherwise stated.
- 3 The drawing to be read in conjunction with Appendix 702.
- 4 Concrete edge sawn straight and groove formed in accordance with Clause 1013. Dimensions to comply with Clause 1015, Table 1014.
- 5 Joint seal to be TH-400 or similar approved polyurethane sealant in accordance with Clause 1017.
- 6 Reinforcement to be coated with hot bituminous Mider (Clause 1000).
- 7 Mesh back reinforcement to BS 4483: 1985.

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Revised to

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REINSTATEMENT OF TRENCHWORK THROUGH EXISTING SURFACING

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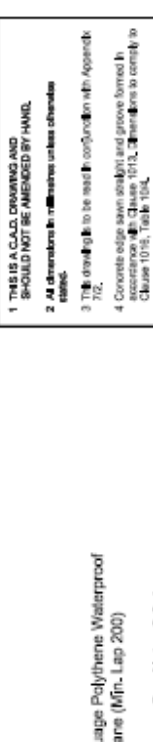
REINSTATEMENT OF TRENCHWORK THROUGH EXISTING SURFACING

Revised to

SD / G / 28

Project

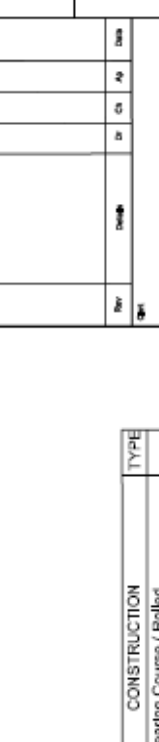
REINSTATEMENT OF TRENCHWORK THROUGH EXISTING SURFACING



BITUMINOUS PAVEMENTS



UNREINFORCED CONCRETE SLAB



REINFORCED CONCRETE SLAB

TRENCH REINSTATEMENT	CONSTRUCTION	TYPE
EXISTING CARRIAGEWAY	40mm. Wearing Course (Rolled Asphalt to Cl. 910)	R1
	60mm. Basecourse (D.B.M. to Cl. 906)	
	40mm. Wearing Course (D.B.M. to Cl. 912)	R2
	60mm. Base Course (D.B.M. to Cl. 906)	
EXISTING CONCRETE CROSSING	Concrete Grade C40 to Cl. 1001 (thickness as existing)	R3
	60mm. Base Course (D.B.M. to Cl. 906)	
EXISTING FOOTWAYS	20mm. Wearing Course (Rolled Asphalt to Cl. 910)	R4
	40mm. Basecourse (D.B.M. to Cl. 906)	
	20mm. Wearing Course (D.B.M. to Cl. 912)	R5
	40mm. Basecourse (D.B.M. to Cl. 906)	
	60mm. Basecourse (D.B.M. to Cl. 906)	R6
		R7

TABLE: to be used with MINOR WORKS only

North Port Tailor
 Castall-neidd Port Tailor
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 JOHN LLOYD BSc, CEng, CIB, FICE, MCIMT
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Rev	Drawn	By	Chk	App	Date

File No.	Trench Code No.
Drawn	Checked
Date	Date
Scale	N.T.S.
Drawing No.	SD / G / 28

Project

REINSTATEMENT OF TRENCHWORK THROUGH EXISTING SURFACING

Revised to

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Revised to

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NOTES

- 1 THIS IS A CAD DRAWING AND SHOULD NOT BE AMENDED BY HAND.
- 2 ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.

PILLAR BACK BOARD DIMENSIONS

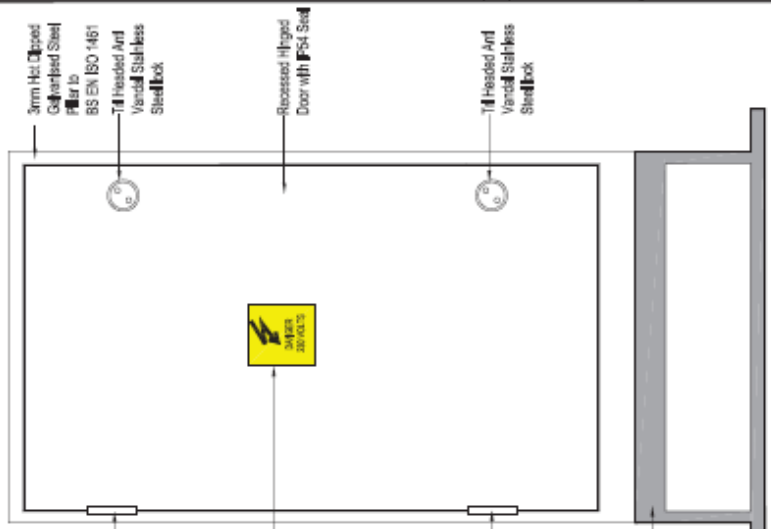
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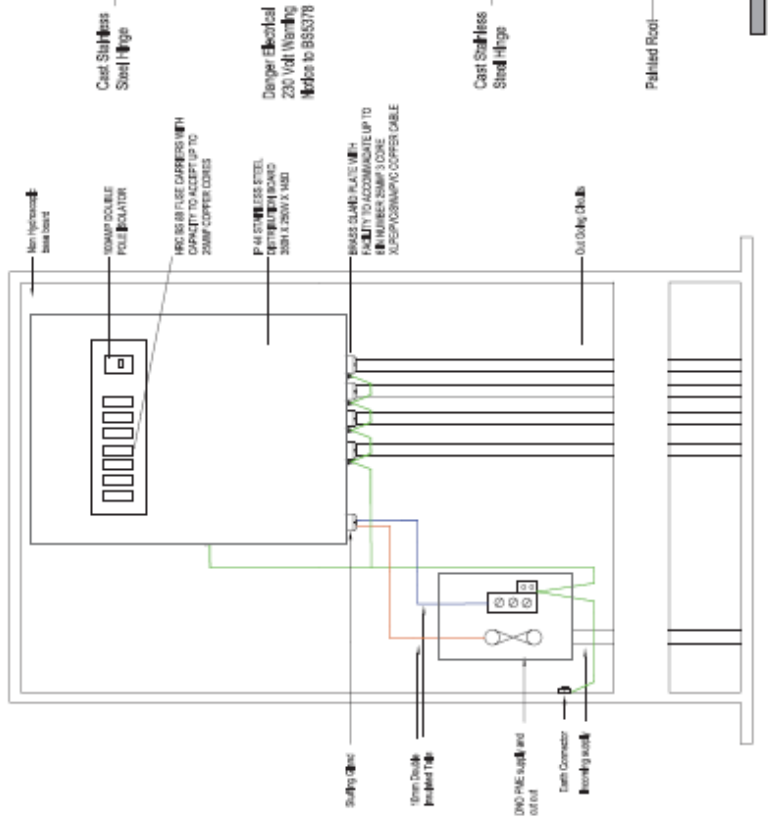
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 IN ANTONIO B.L. CLOS, MAJCE ALBANI
 DIRECTOR OF ENVIRONMENT
 THE QUAYS, BUADE, WAVER
 PORT TALBOT, SAWSWICK
 SAHNTS 8611 2000

PUBLIC LIGHTING PILLAR
 FOR TELENSA CONTROLLED
 STREET LIGHTING INFRASTRUCTURE

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EXTERNAL VIEW OF NEW PILLAR



PROPOSED NPT PRIVATE NETWORK PILLAR FOR TELENSA CONTROLLED INFRASTRUCTURE

A

SDLP 1

PUBLIC LIGHTING - STANDARD PILLAR LAYOUT

A

10

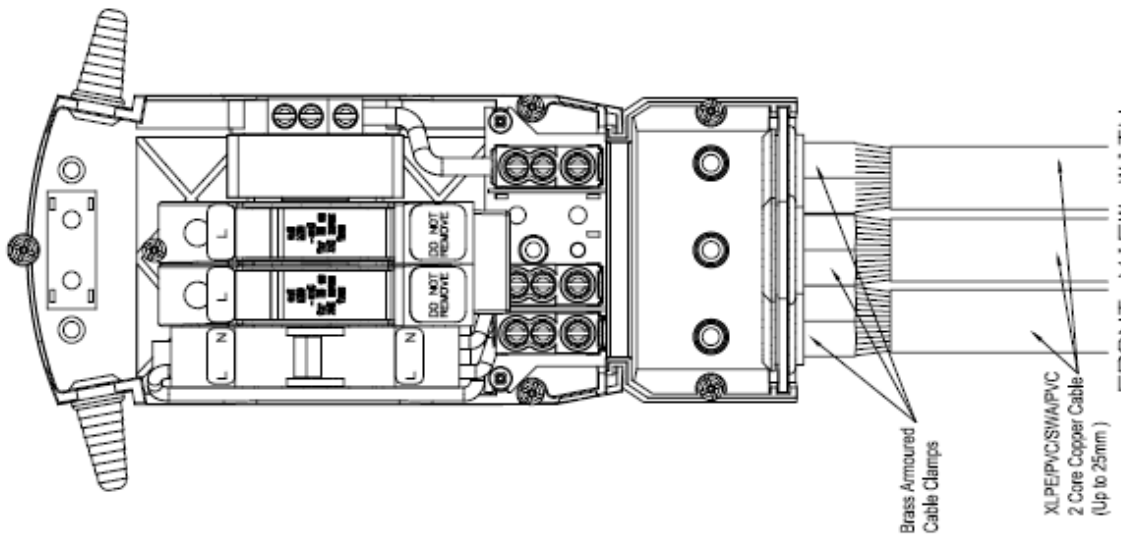
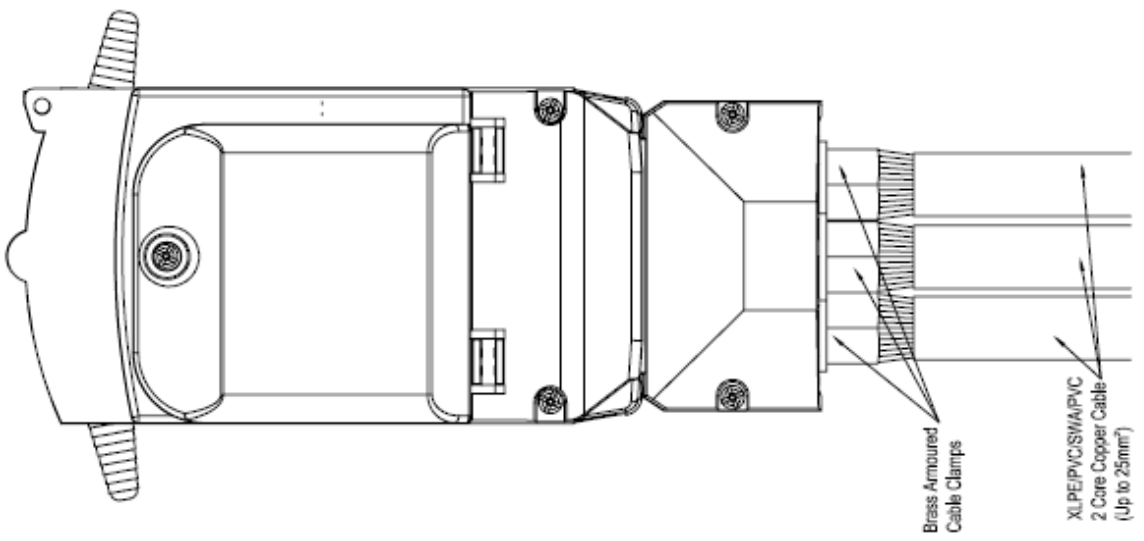
- 1 THIS IS A CAD DRAWING AND SHOULD NOT BE FABRICATED BY HAND.
- 2 All dimensions in millimetres unless otherwise stated.

Rev	Detail	By	Ch	Ap	Date
A	Project Cut out only	J			

Neath Port Talbot
Castell-nedd Port Talbot
Neath Port Talbot Council
 ENGINEERING AND TRANSPORT
 14, NATIONAL BLDG., C/O. M. J. MULLIGAN, M.L.T.
 DIRECTOR OF ENVIRONMENT
 THE GRANGE, BRIDGES WAY
 BRIDGES, NEATH, SA61 2JQ

Project: PUBLIC LIGHTING
 CUT OUT

File No.	Revised Code No.	Checked	Approved
Drawn	J		
Date	16/10/18	Scale	Date
Scale	1:1 to Scale		
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NOTES

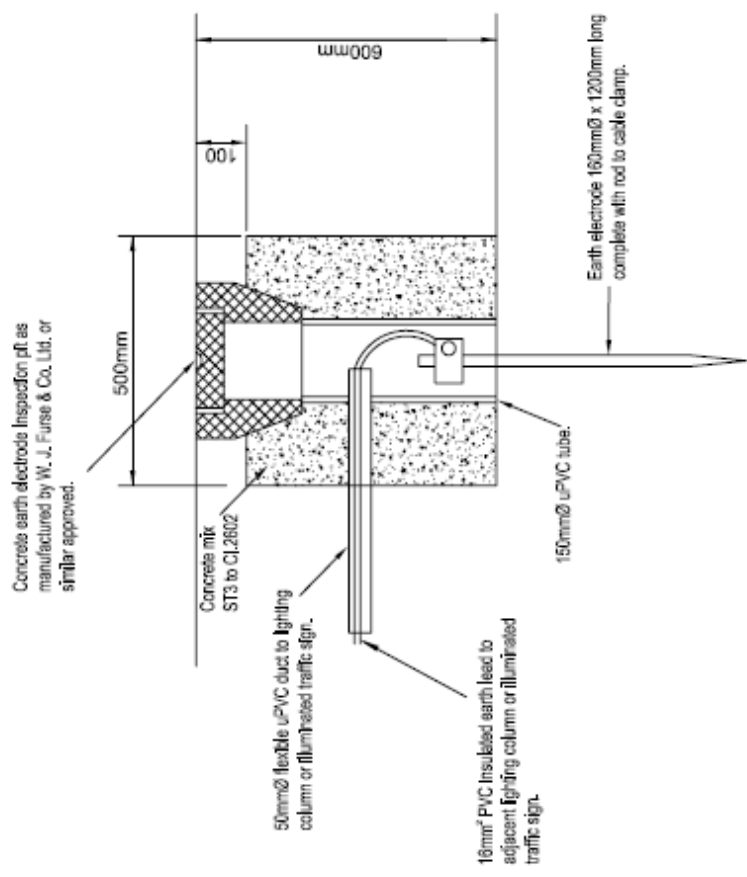
- 1 THIS IS A CAD DRAWING AND SHOULD NOT BE AMENDED BY HAND.
- 2 All dimensions in millimetres unless otherwise stated.

No.	Detail	Dr	Ch	Ap	Date

Neath Port Talbot
 Castell y Castell Port Talbot
 ENGINEERING AND TRANSPORT
 IN. WATSON, B.Sc., C.Eng., M.I.C.E., M.I.U.T.
 DIRECTOR OF ENVIRONMENT
 THE QUAYS, BRIDGES WAY
 NEATH PORT TALBOT
 NEATH, SA11 2BB

Project
**PUBLIC LIGHTING
 EARTH ELECTRODE**

Prepared Drawn No.	
Drawn	LJ
Checked	
Date	Aug 25
Date	
Scale	Not to Scale
Drawing No.	SD 11.1.103



SD 11.1.103

PUBLIC LIGHTING - EARTH ELECTRODE

Project

12755

- 1 THIS IS A CAD DRAWING AND SHOULD NOT BE AMENDED BY HAND.
- 2 All dimensions in metres unless otherwise stated.

No	Drawn	Dr	Ch	Ap	Date

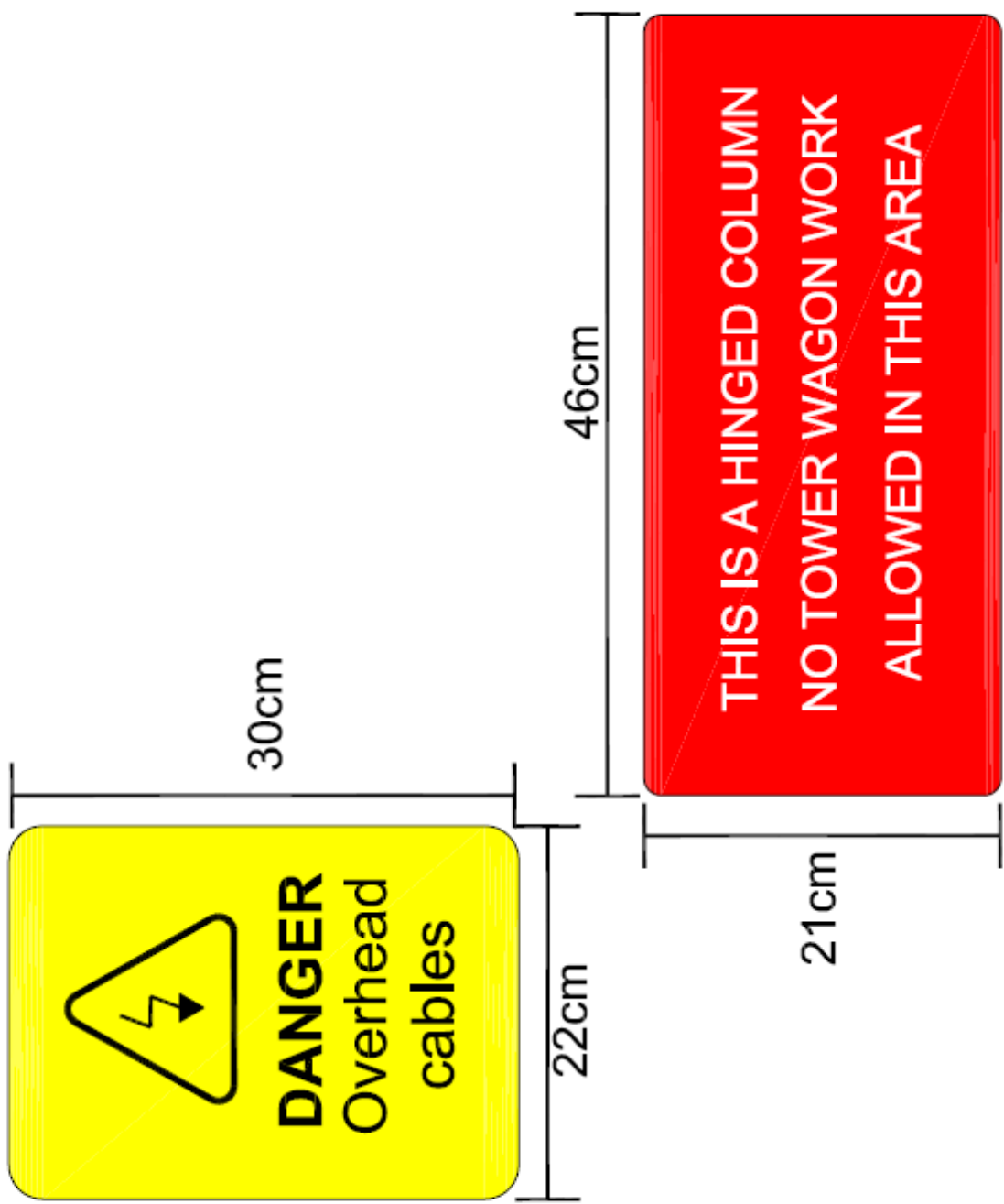
Neath Port Talbot
Castellfreidd Port Talbot
ENGINEERING AND TRANSPORT

PL WENTON, WALSLEY, MOUNTAIN AFB
THE GRANITE BRIDGE, WENTON
EQUINE ENERGY PARK
NEATH SA11 2BB

Project: Standard Detail SD-L108
Warning Notices for Collapsible Columns

Drawn		Checked		Approved	
U1	U2	U3	U4	U5	U6

Scale: NTS
Drawing: SD-L108



Column Specification

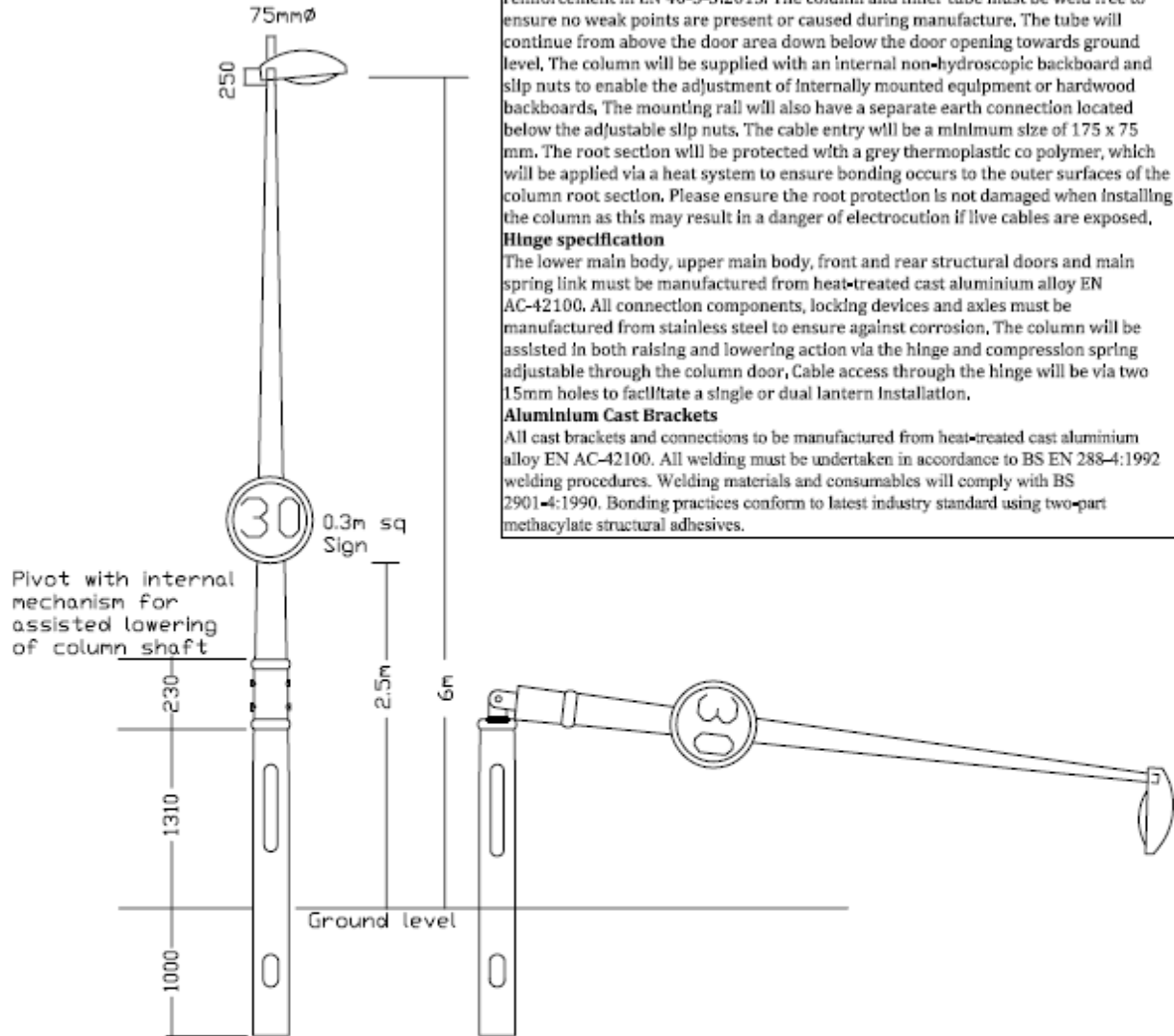
International alloy designation according to EN 573-3:2009 Alloy used: EN AW - 6063 Temper: T6 Chemical symbols:EN AW - AlMg0, 7Si The lighting column will be manufactured from a 6000 series aluminium alloy and equipped with a dual locking flush mounted door complete with separate earth connection. The column will be extruded in one piece to either form a conical shape above the door area or a parallel tube. An internal door opening strengthening tube (not shield) will be fitted to ensure that the door area is sufficiently strengthened, This tube will be fitted using an expansion method and will be press-fitted in accordance with a Type 5 door reinforcement in EN 40-3-3:2013. The column and inner tube must be weld free to ensure no weak points are present or caused during manufacture. The tube will continue from above the door area down below the door opening towards ground level. The column will be supplied with an internal non-hygroscopic backboard and slip nuts to enable the adjustment of internally mounted equipment or hardwood backboards. The mounting rail will also have a separate earth connection located below the adjustable slip nuts. The cable entry will be a minimum size of 175 x 75 mm. The root section will be protected with a grey thermoplastic co polymer, which will be applied via a heat system to ensure bonding occurs to the outer surfaces of the column root section. Please ensure the root protection is not damaged when installing the column as this may result in a danger of electrocution if live cables are exposed.

Hinge specification

The lower main body, upper main body, front and rear structural doors and main spring link must be manufactured from heat-treated cast aluminium alloy EN AC-42100. All connection components, locking devices and axes must be manufactured from stainless steel to ensure against corrosion. The column will be assisted in both raising and lowering action via the hinge and compression spring adjustable through the column door. Cable access through the hinge will be via two 15mm holes to facilitate a single or dual lantern installation.

Aluminium Cast Brackets

All cast brackets and connections to be manufactured from heat-treated cast aluminium alloy EN AC-42100. All welding must be undertaken in accordance to BS EN 288-4:1992 welding procedures. Welding materials and consumables will comply with BS 2901-4:1990. Bonding practices conform to latest industry standard using two-part methacrylate structural adhesives.

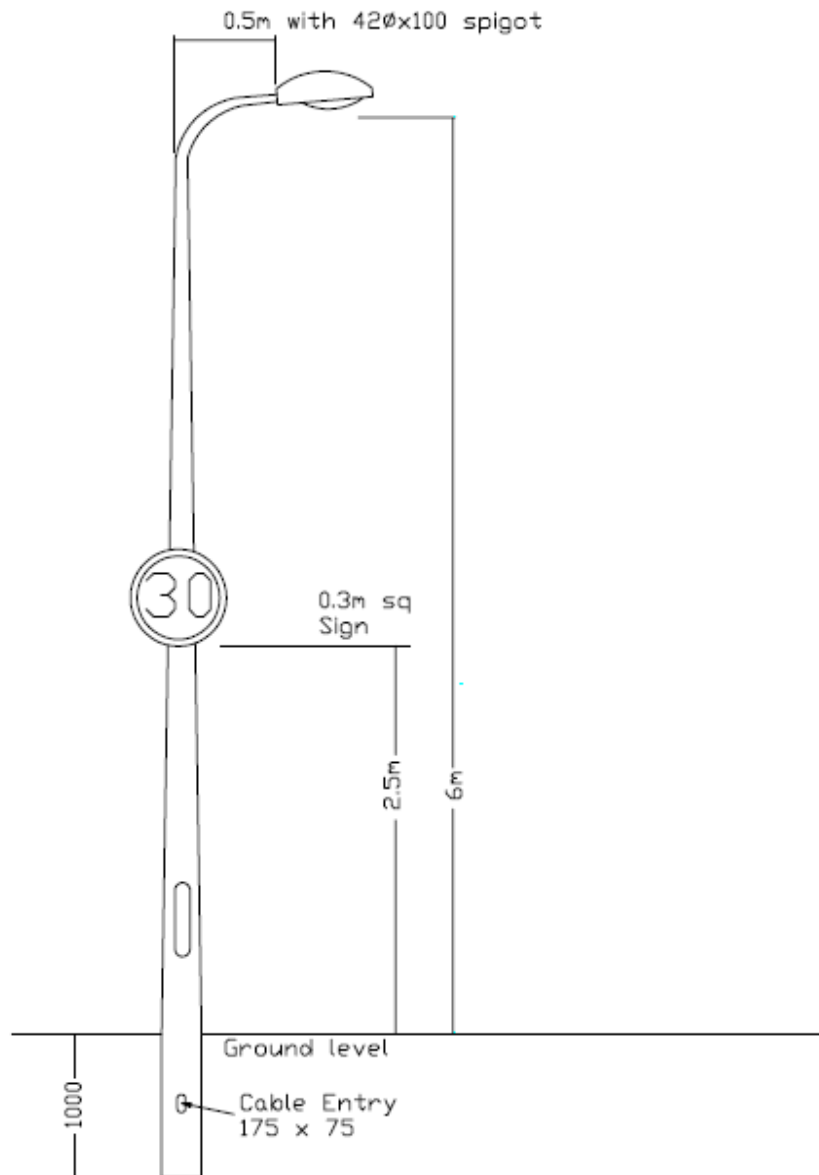


COLUMN TO ACCEPT ALL BELOW ATTACHMENTS :-
 0.3M² SIGN
 LANTERN OF UP TO 14Kg AND 0.2m² WINDAGE
 COLUMN TO EN40 AND DESIGN LIFE 50 YEARS
 & TO BE ERECTED ANYWHERE WITHIN NEATH PORT TALBOT CBC
 INCLUSIVE OF 5Km OF THE COAST

Project:
 6M ALC Mk 3 ECHALON ALUMINIUM
 COLLAPSIBLE ROAD LIGHTING COLUMN
 C/W INTERNAL MECHANISM
 TO LOWER COLUMN SHAFT

Neath Port Talbot
Castell-nedd Port Talbot
 County Borough Council / Cymor Bwrdeistref Sirol
 ENGINEERING AND TRANSPORT
 W. WATSON, B.Sc., C.Eng., M.A.C.E., M.I.H.T.
 DIRECTOR OF ENVIRONMENT
 THE QUAYS, BRUNEL WAY
 BAGLAN ENERGY PARK
 NEATH SA11 2GG

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Scales	N/A				
Drawing No.	SD/L/TYPE R				



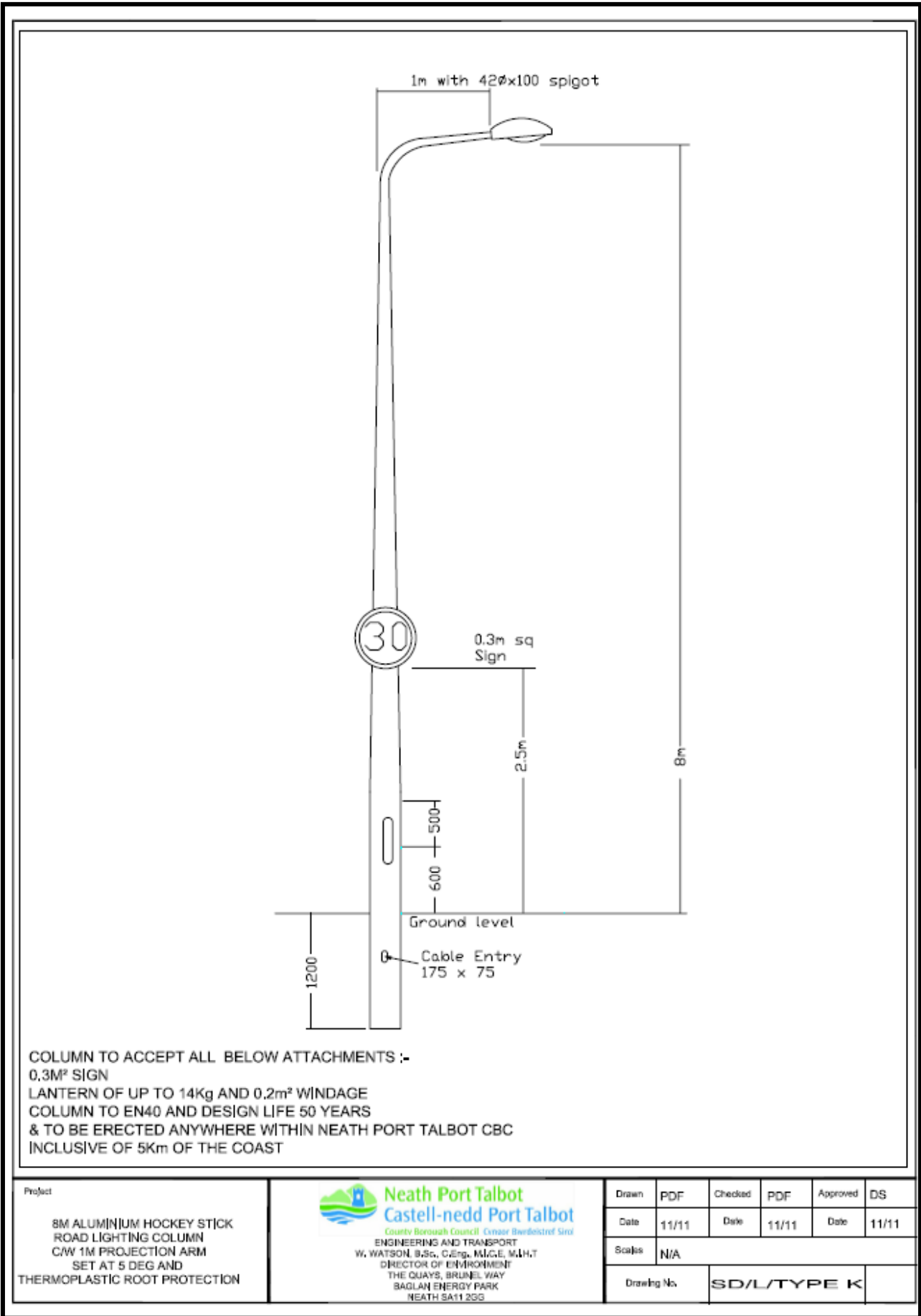
COLUMN TO ACCEPT ALL BELOW ATTACHMENTS :-
 0.3M² SIGN
 LANTERN OF UP TO 14Kg AND 0.2m² WINDAGE
 COLUMN TO EN40 AND DESIGN LIFE 50 YEARS
 & TO BE ERECTED ANYWHERE WITHIN NEATH PORT TALBOT CBC
 INCLUSIVE OF 5Km OF THE COAST

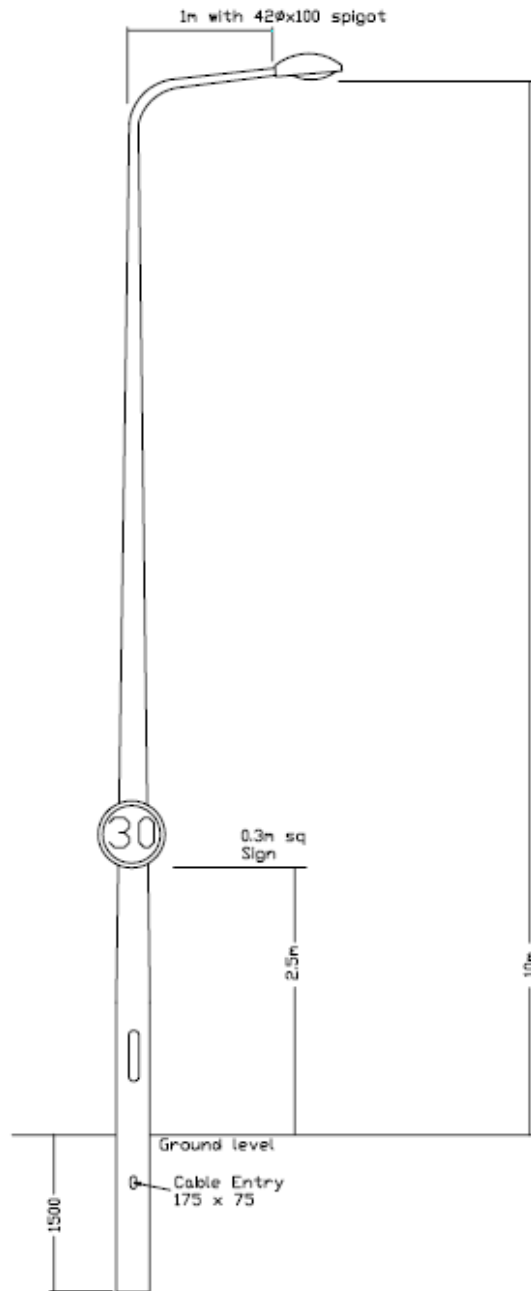
Project
 6M ALUMINIUM HOCKEY STICK
 ROAD LIGHTING COLUMN
 C/W 0.5M PROJECTION ARM
 SET AT 5 DEG AND
 THERMOPLASTIC ROOT PROTECTION



Neath Port Talbot
Castell-nedd Port Talbot
 County Borough Council Cwmwr Bwrdeistref Sirol
 ENGINEERING AND TRANSPORT
 W. WATSON, B.Sc., C.Eng., M.I.C.E., M.I.H.T.
 DIRECTOR OF ENVIRONMENT
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 BAGLAN ENERGY PARK
 NEATH SA11 2SS

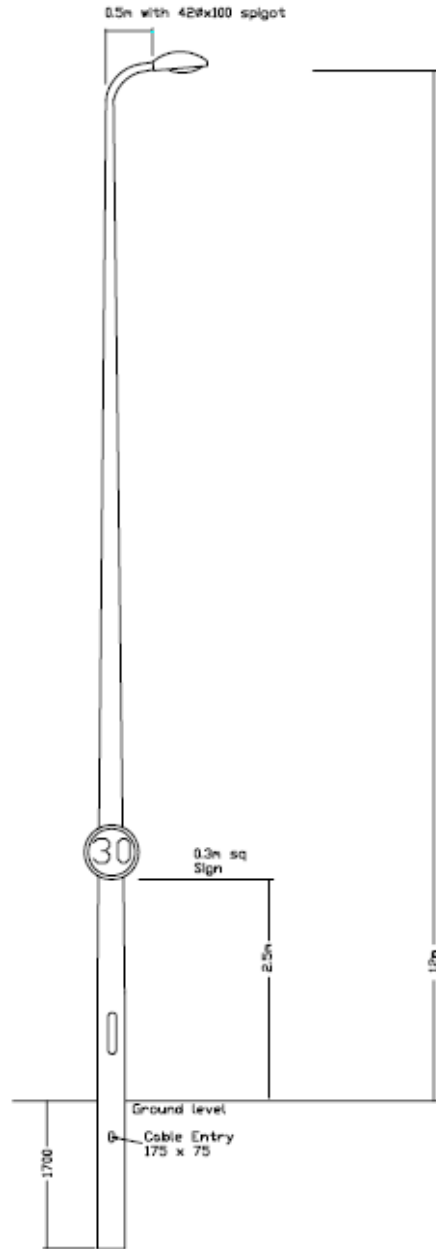
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Scales	N/A				
Drawing No.	SD/L/TYPE J				





COLUMN TO ACCEPT ALL BELOW ATTACHMENTS :-
 0.3M² SIGN
 LANTERN OF UP TO 15Kg AND 0.2m² WINDAGE
 COLUMN TO EN40 AND DESIGN LIFE 50 YEARS
 & TO BE ERECTED ANYWHERE WITHIN NEATH PORT TALBOT CBC
 INCLUSIVE OF 5Km OF THE COAST

Project 10M ALUMINIUM HOCKEY STICK ROAD LIGHTING COLUMN C/W 1M PROJECTION ARM SET AT 5 DEG AND THERMOPLASTIC ROOT PROTECTION	 Neath Port Talbot Castell-nedd Port Talbot <small>County Borough Council Cymor Bardeistref Sirol</small> ENGINEERING AND TRANSPORT W. WATSON, B.Sc., C.Eng., M.I.C.E., M.I.H.T. DIRECTOR OF ENVIRONMENT THE QUAYS, BRUNEL WAY BAGLAN ENERGY PARK NEATH SA11 2SS	Drawn	PDF	Checked	PDF	Approved	DS	
		Date	11/11	Date	11/11	Date	11/11	
		Scale	N/A					
		Drawing No.	SD/L/TYPE L					



COLUMN TO ACCEPT ALL BELOW ATTACHMENTS :-
 0.3M² SIGN
 LANTERN OF UP TO 15Kg AND 0.2m² WINDAGE
 COLUMN TO EN40 AND DESIGN LIFE 50 YEARS
 & TO BE ERECTED ANYWHERE WITHIN NEATH PORT TALBOT CBC
 INCLUSIVE OF 5Km OF THE COAST

Project 12M ALUMINIUM HOCKEY STICK ROAD LIGHTING COLUMN C/W 0.5M PROJECTION ARM SET AT 5 DEG AND THERMOPLASTIC ROOT PROTECTION	 County Borough Council Cymor Barddeistref Sirol ENGINEERING AND TRANSPORT W. WATSON, B.Sc., C.Eng., M.I.C.E., M.I.H.T DIRECTOR OF ENVIRONMENT THE QUAYS, BRUNEL WAY BAGLAN ENERGY PARK NEATH SA11 2GG	Drawn	PDF	Checked	PDF	Approved	DS	
		Date	11/11	Date	11/11	Date	11/11	
		Scales	N/A					
		Drawing No.	SD/L/TYPE M					

SERIES 1700

STRUCTURAL CONCRETE

1701 Concrete

1. Concrete for small structural items such as headwalls and the like shall be in compliance with the 2600 Series.

1701-1703 Not Used

1704 Control of Alkali-Silica Reaction

1. The potential for alkali-silica reaction shall be controlled by compliance with sub-clause 1704.5 of the Specification for Highway Works.

1705-1707 Not Used

1708 Concrete – Surface Finish

1. Formed Surfaces

The finish shall be smooth and uniform. The formwork lining shall leave no stain.

2. Unformed Surfaces

The concrete shall be screeded to produce a uniform surface to the required profile. When the concrete has hardened sufficiently to prevent laitance being worked to the surface, the surface shall be steel trowelled to make it dense, smooth and uniform and free from trowel marks.

1709 Not Used

1710 Curing

1. Concrete shall be protected from the harmful effects of weather such as rain, frost, rapid temperature changes and drying out. The curing period shall be seven days or a period agreed by the Highway Authority's Representative.

1711 Not Used

1712 Reinforcement

1. Reinforcement shall be supplied and erected in compliance with the current Specification for Highway Works.

SERIES 2400

BRICKWORK

CONTENTS

<u>CLAUSE</u>	<u>TITLE</u>
2401	Cement
2402	Aggregates
2403	Water
2404	Mortar
2405	Lime Mortar
2406	Bricks
2414	Cold Weather Working

SERIES 2400

BRICKWORK

2401 Cement

1. Cement shall be one of the following:
 - (i) Portland cement complying with BS EN197: Part 1;
 - (ii) Masonry cement complying with BS EN413: Part 1;
 - (iii) Sulfate-resisting Portland cement complying with BS EN 197: Part 1.

2402 Aggregates

1. Sand shall comply with BS EN13139.

2403 Water

1. Water for the Works is to be obtained from a water company's supply.

2404 Mortar

1. Cement mortar for brickwork, block work and stonework shall be mixed in the proportions 1 of cement to 3 of sand.
2. The chloride ion content of the mortar determined in accordance with BS EN1744-1 shall not exceed 0.3% of the mass of cement for mortar made with Portland Cement and 0.2% for mortar made with sulphate-resisting Portland cement. Calcium chloride or admixtures containing calcium chloride shall not be used.
3. If the work is to be carried out in frosty weather and the bricks are wet when laid, then a cement sand mortar with an air entraining plasticiser shall be used. Admixtures shall comply with either BS EN934-3 and shall not contain calcium chloride.
4. Mortar shall be made in small quantities only as and when required. Mortar which has begun to set or which has been mixed for a period of more than one hour shall be discarded.

2405 Lime Mortar

1. Lime mortar shall consist of one part by volume of hydrated lime complying with BS EN459: Part 1 to 2.5 parts by volume of sand.

2406 Bricks

1. Clay bricks shall comply with BS EN771: Part 1.
2. Calcium silicate bricks (sand lime and flint lime) shall comply with BS EN771: Part 2.
3. Concrete bricks shall comply with BS EN771: Part 3 and BS EN772: Part 2.
4. Bricks beneath frames for chambers and gullies, and for the construction of brick chambers, shall be Class B clay engineering bricks complying with BS EN771: Part 1; or concrete bricks complying with BS EN771: Part 3. Having a average crushing strength not less than 20 N/mm² when used for surface water drainage.

2407 – 2413 Not Used

2414 Cold Weather Working

1. No bricks, blocks or stones shall be laid when the air temperature in the shade is below 3°C unless special precautions are taken. All materials when used shall be free from snow, ice and frost.

SERIES 2600

MISCELLANEOUS

2601 Not Used

2602 Concrete for Ancillary Purposes

General

1. Concrete mixes referred to as ST followed by a number shall mean concrete for ancillary purposes which shall comply with this Clause.
2. Concrete for ancillary purposes shall be a standard mix complying with BS EN206: Part 1 and BS8500, and with the additional requirements of this Clause.

Cement

3. Cement shall be Portland cement complying with BS 8500 see Table A17 of BS8500: Part 1 or Table 1 of BS8500: Part 2 and where required sulphate resisting Portland cement.

Aggregates

4. Aggregates shall comply with BS EN 12620 and the maximum size shall be 20mm. The total acid-sulphate content in the mix expressed as SO₄ shall not exceed 5% of the mass of cement in the mix. Aggregates for small structural items such as headwalls shall comply with Test No. 2 in TRL Report 447.

Workability

5. The workability of the mix shall be defined by its slump and be within either consistence Class S2 or consistence Class S3 of BS EN206: Part 1, BS 8500 as appropriate for this purpose.

Concrete Mix

7. The concrete mix used for each purpose shall be as described in Table 26/1.

Concrete Strength

7. For each grade of concrete the specified characteristic strength in N/mm² shall be as given in Table 26/0.

Table 26/0: Grades of Concrete

Grade	Characteristic Strength (N/mm ²)
ST1	7.5
ST2	10.0
ST3	15.0
ST4	20.0
ST5	25.0

Table 26/1: Concrete for Ancillary Purposes

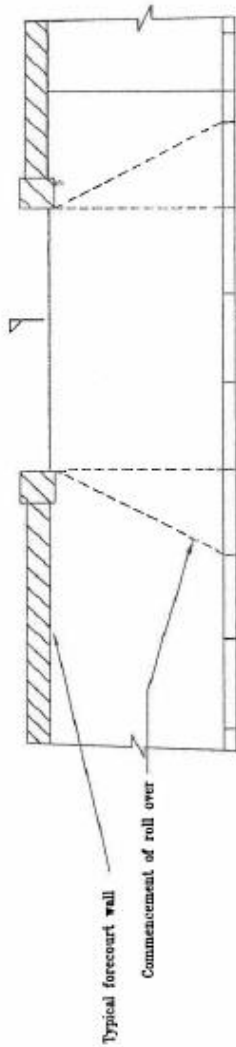
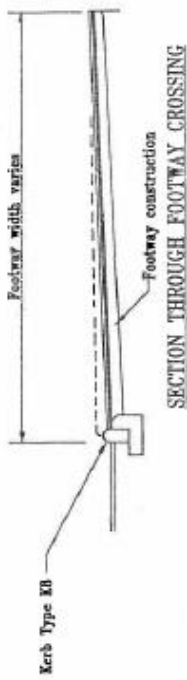
Purpose	Mix	Maximum Water / Cement Ratio
1. Augered foundations for traffic sign posts	ST2	-
2. Foundations for planted lighting columns	ST5	0.60
3. Headwalls for culverts	ST5	0.50
4. Blinding concrete, backfill for structural foundations, and preparation of formation to Clause 616	ST1	-
5. Bedding and backing to precast concrete kerbs, channels edgings and quadrants	ST2	-
6. *Bed to drains Type A. Foundations, channels and benching to chambers	ST4	-
7. *Bed, haunch and surround to drains other than Type A. Surround to chambers and gullies	ST2	-

* Refer to PSW/G/1 and PSW/G/2

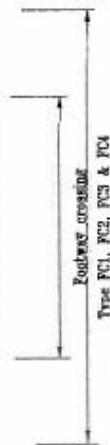
Transporting, Placing and Compacting Concrete

8. Concrete shall be transported and placed so that contamination, segregation and loss of materials does not occur. The maximum temperature of the concrete at any time between mixing and placing shall be no greater than 30°C. Concrete shall be placed and compacted within 2 hours of mixing. After compaction it should not be disturbed within 12 hours.
9. Concrete shall be compacted by tamping or vibrating until it is thoroughly worked around any embedded metal and into corners of formwork or excavations, until a solid mass substantially free from voids is obtained without segregation and with no free water on the surface. The Contractor shall select the workability as described in sub-clause 5 of this Clause to achieve this.
10. Surface finishes and curing for exposed surfaces shall be in compliance with the 1700 Series.

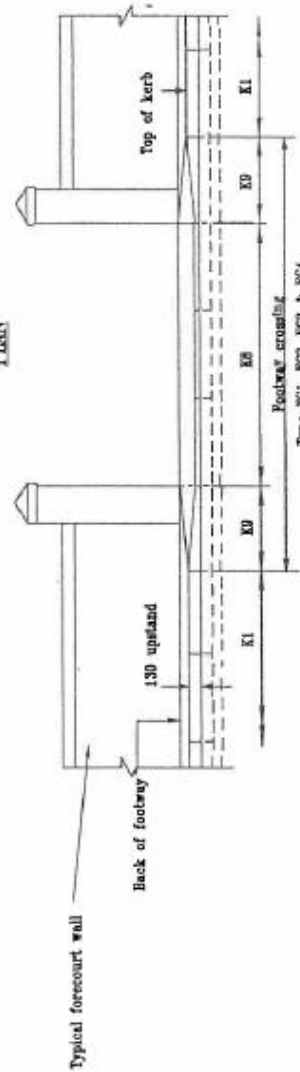
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Width varies to be at least the entrance width and, in order to avoid cutting kerbs up to a maximum of one kerb wider evenly distributed



PLAN



- NOTES
- All dimensions in millimetres unless otherwise stated.
 - Concrete FC2 (light vehicular crossing) to be as FC1 but with sub-base increased to 200.
 - Concrete FC4 (concrete footway crossing) to be as FC1 except construction to comply with 100mm concrete min STD (CI 2862) Reinforcement as approved, plastic sheeting as BS 1211/1972

Note: Concrete shall be surface ground or wire treated with case 1/3 finish to conform as directed.

Rev	Details	Dr	Ch	Ap	Date



Project

FOOTWAY CROSSINGS

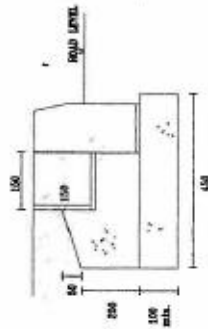
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Issue N.T.S.

Drawing No. PSW / C / 102

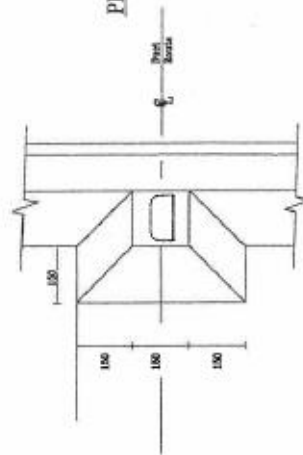
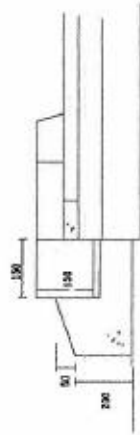
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DUCT MARKER ASSEMBLY
TO PRESENT EDGE

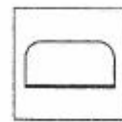
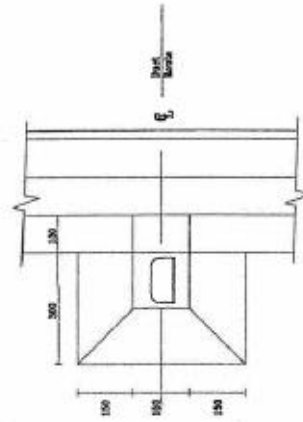


SECTION

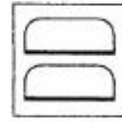
DUCT MARKER ASSEMBLY
TO APPROVED SPALLT EDGE



PLAN



Labeling as marker
shown that is greater
than below road level



Labeling as marker
shown that is greater
than below road level

SERVICE DUCT MARKERS FOR FOOTWAYS AND VERGES

NOTES

- 1 All dimensions in millimetres unless otherwise stated.
- 2 Refer to Reg No. PSW/C/103 for general notes.
- 3 Where ducts are to cut through existing kerbs, carryover verges, etc. to be located at the end of a duct the markings should be a minimum of 100mm from the kerb edge. When ducts below kerbs and to provide a free edge is detailed on this drawing.
- 4 [Cut] end of a duct line on each kerb crossing shall have a duct marker where applicable.

Rev	Details	Dr	Ch	Ap	Beh



Project
**SERVICE DUCT MARKERS
FOR FOOTWAYS AND VERGES**

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Scale	N.T.S.		
Drawing No. PSW / C / 103			

Drawing No. PSW / C / 103

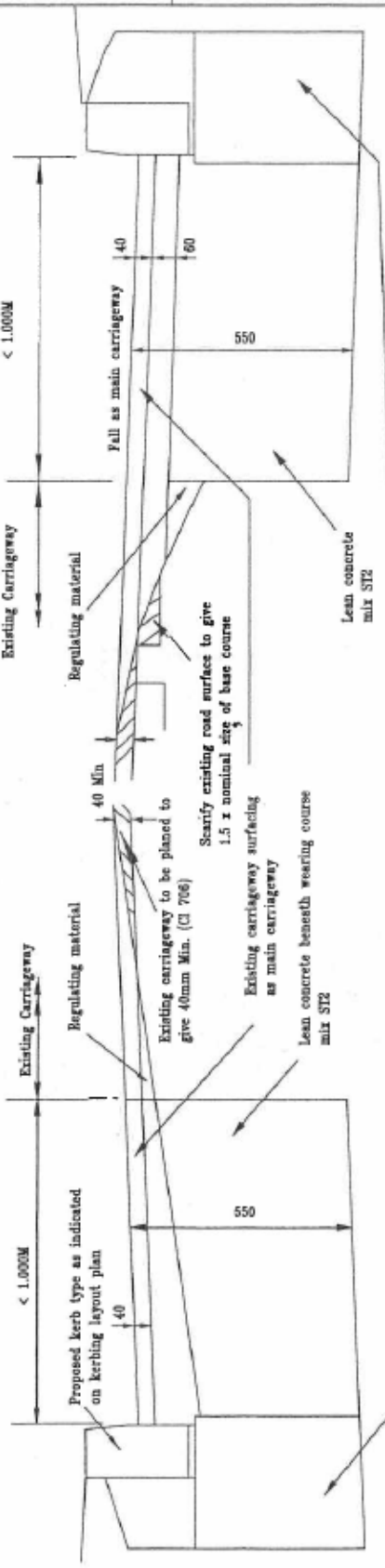
SERVICE DUCT MARKERS FOR FOOTWAYS AND VERGES

Project

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CASE A - Bottom of basecourse below existing carriageway

CASE B - Bottom of basecourse above existing carriageway



Kerb foundation & haunch in concrete mix ST4 to Clause 2602 with medium workability (see Drg. No. PSW/C/101)

Rev	Details	Dr	Ch	Ap	Devs

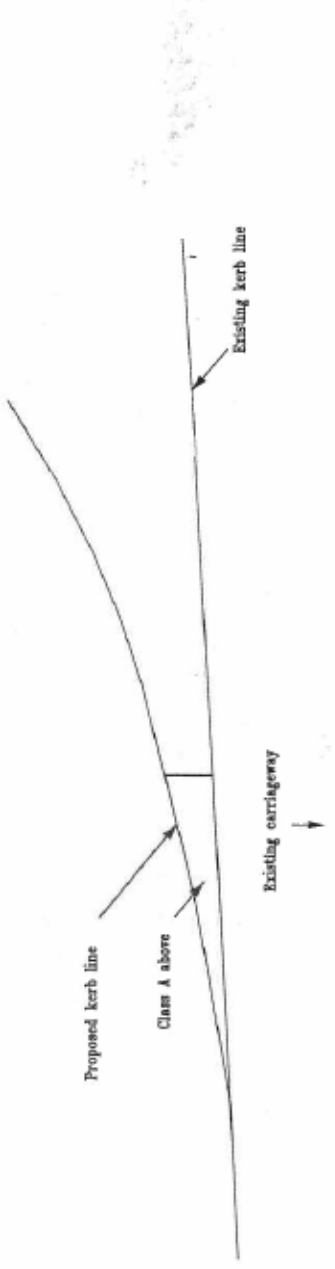


Client

Project

NARROW WIDENING TO EXISTING CARRIAGEWAY

Thermal Code No.	
Item	Checked
Item	Checked
Date	Date
Scale	N.T.S.
Drawing No.	PSW / C / 105



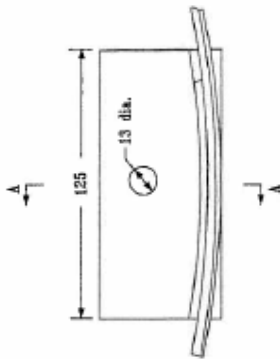
PLAN

PSW / C / 105

NARROW WIDENING TO EXISTING CARRIAGEWAY

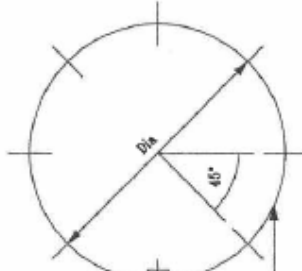
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PLAN OF ONE BASEPLATE



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PLAN OF RETAINING HOOP

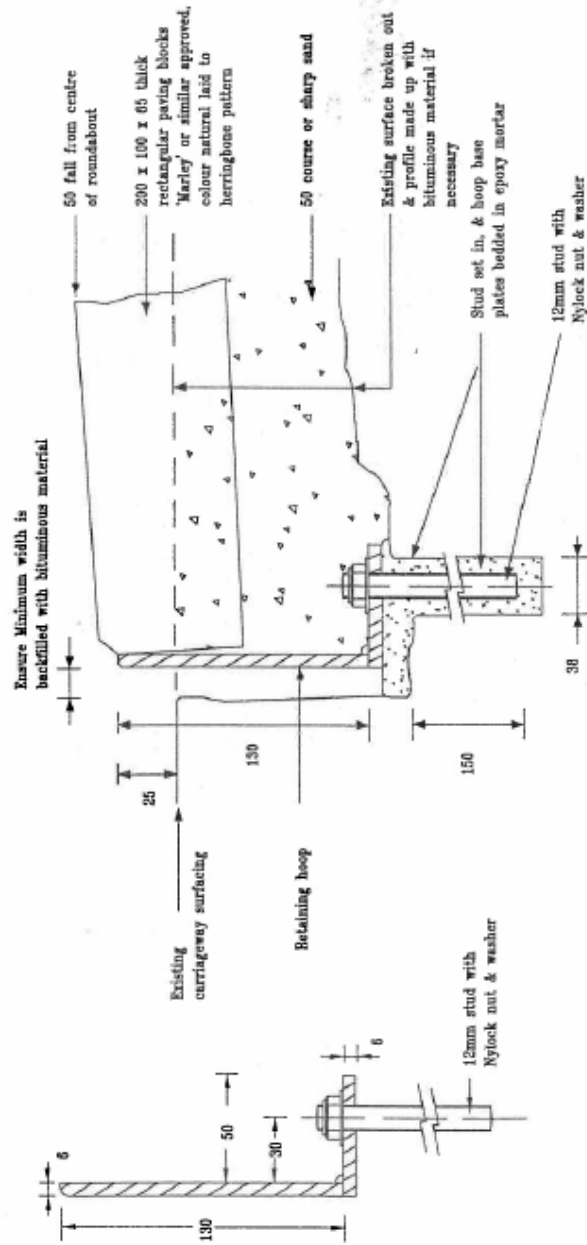


TO BE SUPPLIED WITH EACH HOOP

- 2.0M length of 12# M. S. studding 1 No.
- M12 Nylock nut 10 No.
- Washer M12 flat round 10 No.

8 No. baseplates spaced symmetrically around circumference
Hoop to be fabricated from self coloured mild steel

SECTION A - A THROUGH RETAINING HOOP AND BASEPLATE



NOTES

1. All dimensions in millimetres unless otherwise stated.

Rev	Details	Dr	Ch	By	Date



Project

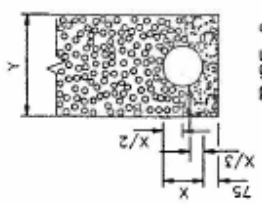
MINI ROUNDABOUT
CENTRAL ISLAND

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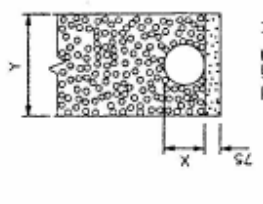
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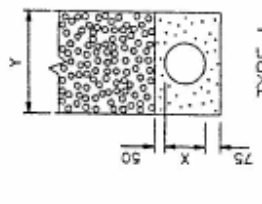
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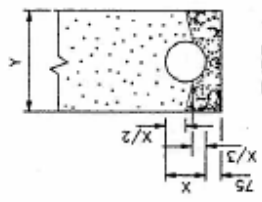
TYPE G



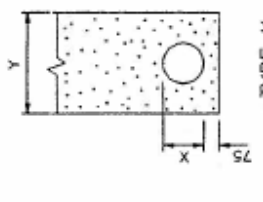
TYPE H



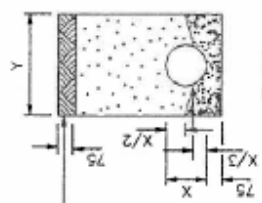
TYPE I



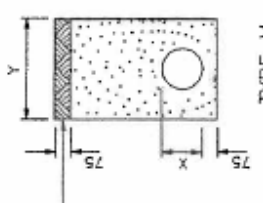
TYPE J



TYPE K






TYPE L



TYPE M

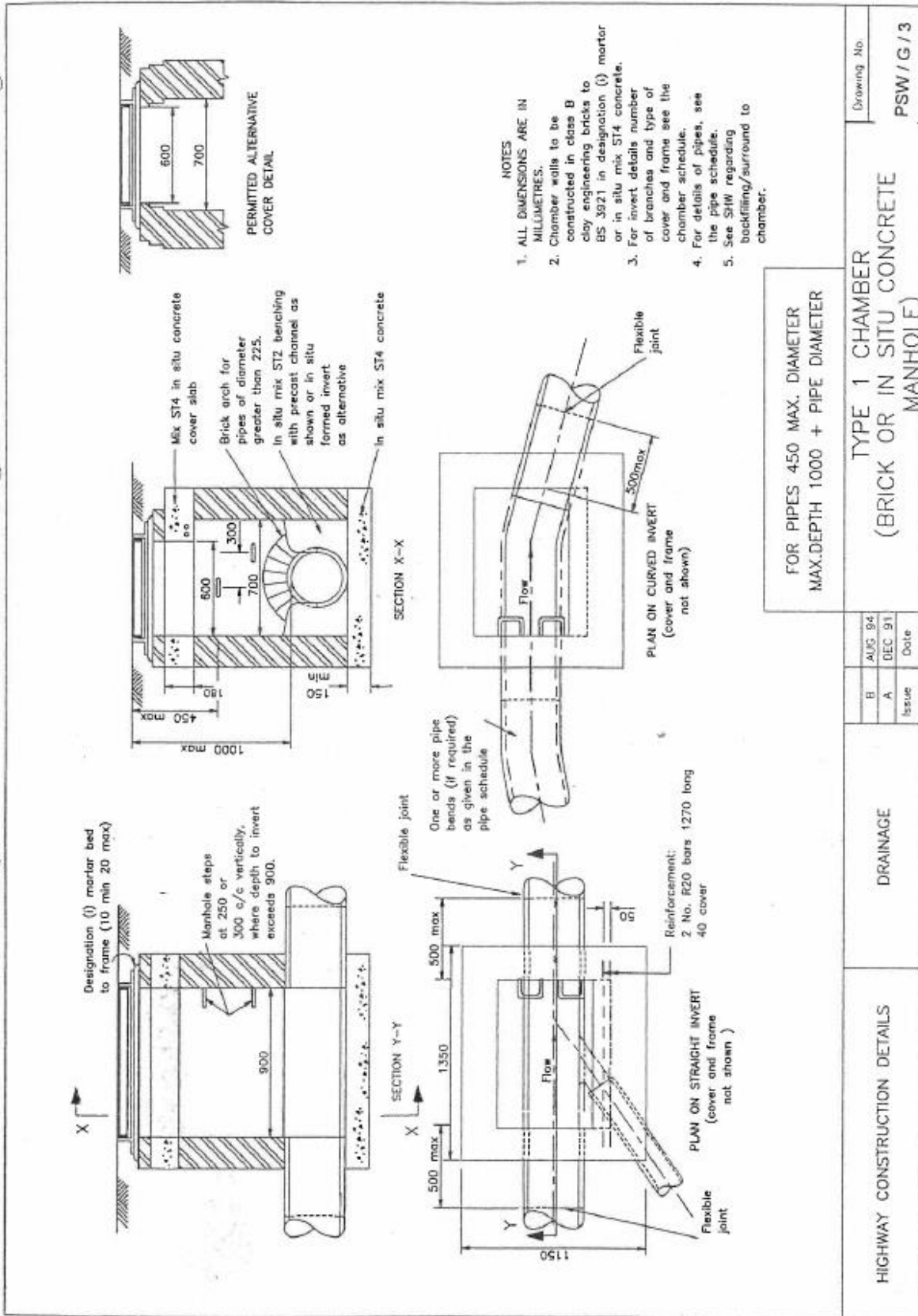
Turf or seed on topsoil as described in Appendix 5/1

KEY

-  Type A or C filter material to S.H.W. Clause 505 or granular material to S.H.W. Clause 503.3(i).
-  Type B filter material to S.H.W. Clause 505.
-  Mix ST2 concrete.

- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Dimension X is the external diameter of the pipe.
 3. This drawing is to be read in conjunction with Appendix 5/1
 4. For details of section of the drain at surface level refer to the 'B' series of drawings.
 5. Pipes shall comply with the requirements for filter drain pipes in Table 5/1 of the S.H.W.
 6. Pipes are to be laid with slots or perforations upwards where a concrete bed is used. For other beds the slots shall be orientated as described in Appendix 5/1.
 7. Minimum drain width Y = X+300 for drains not exceeding 1.5m cover below finished level.
Y = X+450 for drains exceeding 1.5m cover below finished level.

HIGHWAY CONSTRUCTION DETAILS	DRAINAGE	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">B MAR 98</td> <td style="width: 50%; text-align: center;">Date</td> </tr> <tr> <td style="width: 50%; text-align: center;">A DEC 91</td> <td style="width: 50%; text-align: center;">Date</td> </tr> <tr> <td style="width: 50%; text-align: center;">Issue</td> <td style="width: 50%; text-align: center;">Date</td> </tr> </table>	B MAR 98	Date	A DEC 91	Date	Issue	Date	Drawing No. PSW/G/2
B MAR 98	Date								
A DEC 91	Date								
Issue	Date								
FILTER DRAINS — TRENCH AND BEDDING DETAILS									



- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Chamber walls to be constructed in class B clay engineering bricks to BS 3921 in designation (i) mortar or in situ mix ST4 concrete.
 3. For invert details number of branches and type of cover and frame see the chamber schedule.
 4. For details of pipes, see the pipe schedule.
 5. See SHW regarding backfilling/surround to chamber.

FOR PIPES 450 MAX. DIAMETER
MAX. DEPTH 1000 + PIPE DIAMETER

TYPE 1 CHAMBER
(BRICK OR IN SITU CONCRETE
MANHOLE)

Drawing No.
PSW/G/3

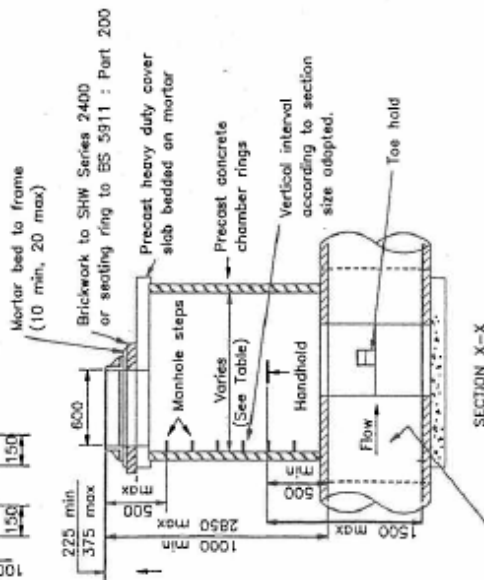
B	AUG 94	Date
A	DEC 91	Date
	Issue	

DRAINAGE

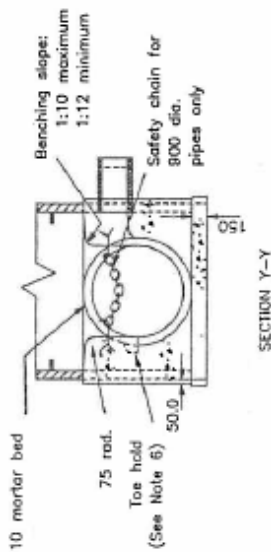
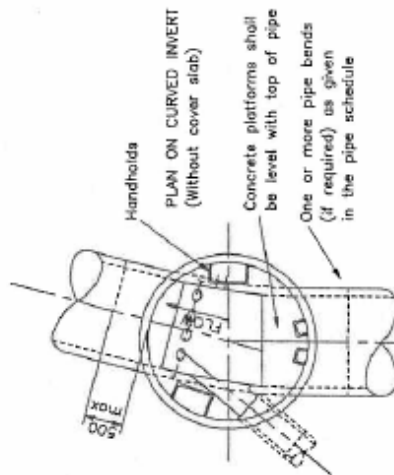
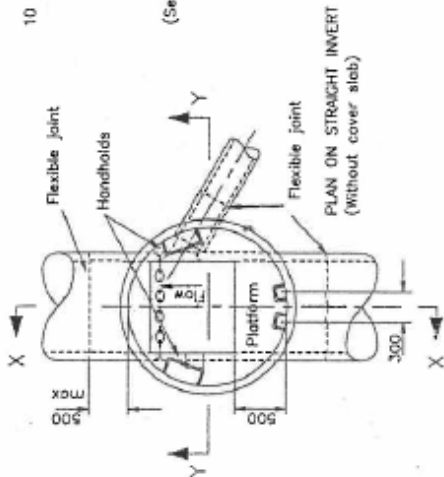
HIGHWAY CONSTRUCTION DETAILS

Chamber Sub Types	Chamber ring dia.	Max Pipe dia.
3a	900	300
3b	1050	450
3c	1200	600
3d	1350	675
3e	1500	900

DETAIL OF TOE HOLD



Integral in situ mix ST4 concrete base walls benching & base slab with precast channel as shown or in situ formed invert as alternative. Walls to extend 50 beyond outer faces of chamber ring. Alternatively precast concrete chamber rings may be bedded in mortar or an in situ mix ST4 concrete base slab 300 greater in diameter than chamber rings.



NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Chamber walls and cover slab to be constructed in precast concrete to BS 5911 : Part 200.
3. For invert details, number of branches, length of ladder and type of cover and frame see the chamber schedule.
4. Mortar to be designation (i) to SHW Series 2400.
5. For details of safety chain and handholds see Drawing Number F10.
6. Toe hold required where pipe is 500 diameter or greater.

FOR PIPES 900 MAX DIAMETER
DEPTH 1000 TO 2850
+ PIPE DIAMETER

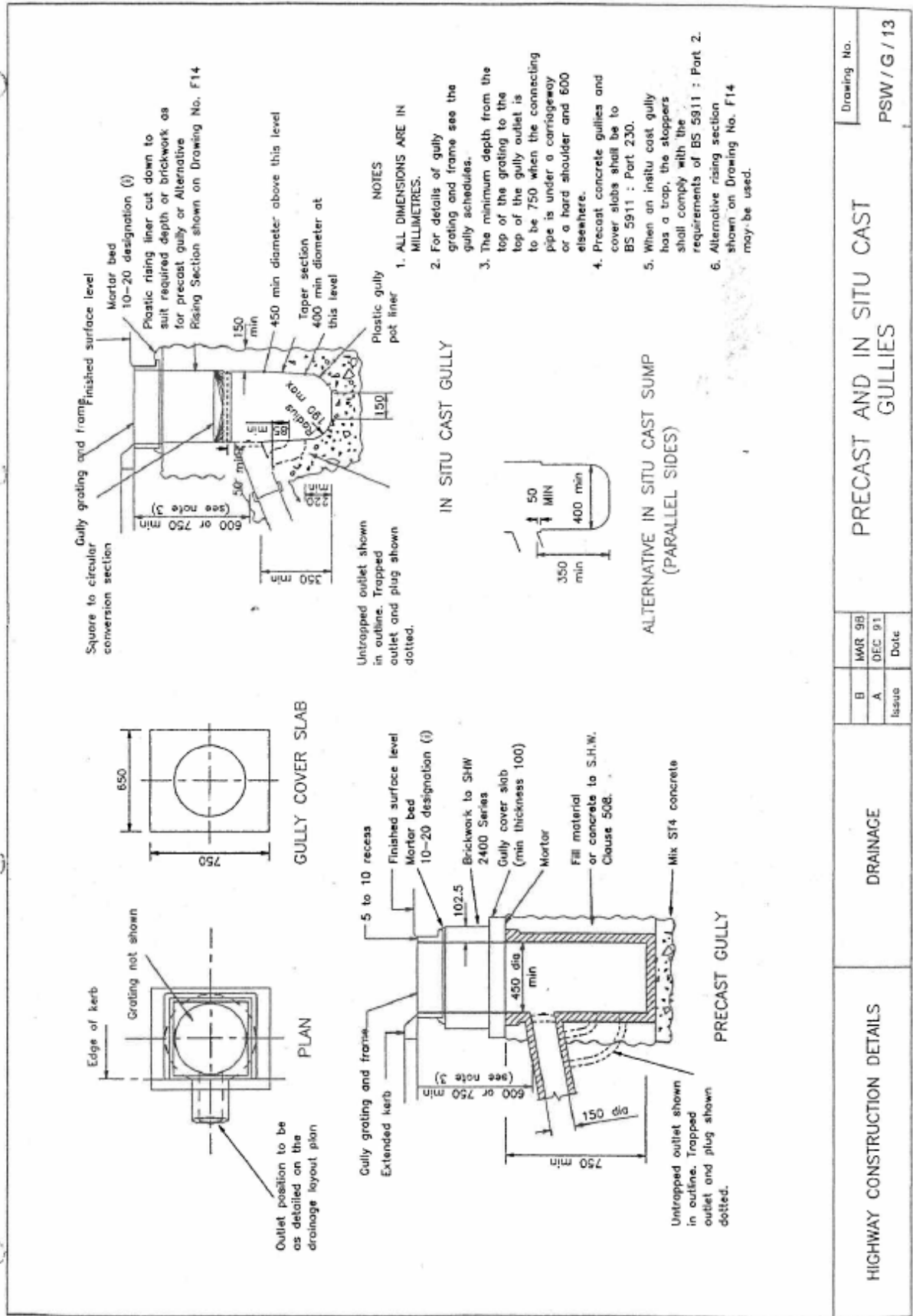
Drawing No.
PSW/G/5

TYPE 3 CHAMBER
(PRECAST CONCRETE MANHOLE)

B	AUG 94	Date
A	DEC 91	Date
Issue		

DRAINAGE

HIGHWAY CONSTRUCTION DETAILS



Drawing No.
PSW/G/13

PRECAST AND IN SITU CAST GULLIES

B	MAR 98	Issue	Date
A	DEC 91		

DRAINAGE

HIGHWAY CONSTRUCTION DETAILS

