



# Highways Specification

Updated September 2023

# 2023 WORCESTERSHIRE COUNTY COUNCIL SPECIFICATION

<b>1.0 GENERAL .....</b>	<b>9</b>
1.1 Scope of the Specification.....	9
1.2 Substitute and Additional Clauses.....	10
1.3 Working within Existing Highway.....	10
1.4 Typical Test and Supervision Procedure.....	10
1.5 Works Adjacent to Existing Highway Structures.....	10
1.6 Subcontracting of the Works.....	10
1.7 Approval of Drawings Prior to Commencement of the Works.....	11
1.8 Commencement of the Works.....	11
1.9 Works to be to the Director of Environmental Services Satisfaction.....	11
1.10 Variation of the Works .....	12
1.11 Access to the Works.....	12
1.12 Signing, Guarding and Lighting.....	12
1.13 Mud and Other Debris on the Highway.....	12
1.14 Pollution and Obstruction of Watercourses and Sewers.....	12
1.15 Removal of Improper Materials and Workmanship.....	13
1.16 Making Good Damage to Existing Highway.....	13
1.17 Land Drains.....	13
1.18 Archaeological Interests.....	13
1.19 Health and Safety File.....	14
1.20 CCTV Surveys.....	14
1.21 Design Considerations.....	14
1.22 Design of Construction Thickness.....	15
1.23 Safety Requirements.....	15
1.24 Notification of Emergency Contact Details.....	16
1.25 Preliminary Site Works.....	16
1.26 Developer Obligations.....	17
1.27 General Construction Requirements.....	17
1.28 Surface Regularity and Tolerances.....	18
1.29 Construction and Earthworks Materials.....	19
1.30 Plate Bearing Tests.....	20
1.31 Concrete for Ancillary Purposes.....	20
1.32 Traffic Signs & Road Markings.....	20
1.33 Public Utilities within Carriageway.....	21
1.34 Hedgerows & Visibility splays.....	21
1.35 Manufacturer Consistency.....	21
<b>2.0 EXCAVATION &amp; FILLING.....</b>	<b>22</b>
2.1 Topsoil Stripping.....	22
2.2 Excavation to Formation.....	22
2.3 Areas Below Formation.....	22
2.4 Forming Areas of Fill.....	22

2.5 Embankments & Cuttings.....	23
2.6 Granular Material Backfill.....	23
2.7 Backfill Materials and Construction Depths.....	24
<b>3.0 WEATHER CONDITIONS.....</b>	<b>25</b>
3.1 Earthworks Operations.....	25
3.2 Construction.....	25
<b>4.0 PREPERATION OF FORMATION.....</b>	<b>26</b>
4.1 Shaping and Compaction.....	26
4.2 Weather Protection.....	26
4.3 Geotextile Requirement.....	26
4.4 Shared Surface, Access Roads and Industrial Estate Roads.....	27
4.5 Drainage of Sub Grade.....	27
<b>5.0 CARRIAGEWAY FOUNDATION.....</b>	<b>29</b>
5.1 General.....	29
5.2 Sub Formation and Capping.....	29
5.3 Capping Material.....	29
5.4 Sub-Base Materials.....	29
5.5 Capping & Sub-base Depths.....	30
<b>6.0 CONCRETE &amp; GROUT.....</b>	<b>31</b>
6.1 Concrete.....	31
6.2 Concrete Aggregates.....	31
6.3 Storage of Concrete Aggregates.....	31
6.4 Cement.....	31
6.5 Rapid Hardening Cement.....	32
6.6 Sand.....	32
6.7 Water.....	32
6.8 Grout.....	32
<b>7.0 CARRIAGEWAY LAYERS.....</b>	<b>33</b>
7.1 General.....	33
7.2 Bond Coat.....	33
7.3 Base Layer.....	33
7.4 Binder Layer.....	34
7.5 Surface Course.....	34
7.6 Coated Chippings.....	34
7.7 Carriageway Air Void Compaction.....	35
7.8 Geosynthetic Grid Reinforcement.....	35
7.9 Concrete Block Paving.....	35
7.10 Joints in Bituminous layers.....	36
7.11 Road Markings & Road Studs.....	36

<b>8.0 KERBS &amp; CHANNELS .....</b>	<b>39</b>
8.1 Kerb Race and Backing.....	39
8.2 Kerbs - General Requirements.....	39
8.3 Radius Kerb Lines.....	40
8.4 Kerb damage & replacement.....	40
<b>9.0 GULLY GRATES &amp; FRAMES.....</b>	<b>41</b>
9.1 General Requirements.....	41
9.2 Spacing of Gullies.....	41
9.3 Ironwork within Cycleways/Footways.....	42
<b>10.0 GULLY POTS.....</b>	<b>43</b>
10.1 General requirements - Type and Size (Refer to Standard Detail Appendix E).....	43
10.2 Bedding and Surround.....	43
10.3 Gully Connections.....	43
<b>11.0 HIGHWAY DRAINAGE.....</b>	<b>44</b>
11.1 General Requirements.....	44
11.2 Highway Drainage Design Criteria.....	45
11.3 Surface Water Pipes.....	46
11.4 Concrete Surround to Pipes.....	46
11.5 Backfilling.....	46
11.6 Connection to Existing Highway Drainage Systems.....	48
11.7 Soakaways.....	48
11.8 Testing & Cleansing.....	49
<b>12.0 MANHOLE CONSTRUCTION.....</b>	<b>50</b>
12.1 General Requirements (Refer to Standard Details in Appendix E).....	50
12.2 Rungs & Ladders.....	50
12.3 Safety Chains.....	50
12.4 Warning Signs.....	51
12.5 Rocker Pipes.....	51
12.6 Manhole Benching.....	51
12.7 Manhole Cover & Frames.....	51
12.8 Bricks & Blocks.....	52
12.9 Bedding.....	52
12.10 Skid Resistance of Inspection Chamber Covers.....	52
12.11 Flow Control Devices and Manholes.....	53
<b>13.0 HEADWALLS.....</b>	<b>54</b>
13.1 General Requirements.....	54

<b>14.0 FOOTWAYS / CYCLEWAYS .....</b>	<b>55</b>
14.1 Preparation.....	55
14.2 Footway/Footpath/Cycleway – Sub-base.....	55
14.3 Footway/Footpath/Cycleway - Base Course.....	55
14.4 Footway/Footpath/Cycleway - Binder Course.....	55
14.5 Footway/Footpath/Cycleway - Surface Course.....	55
14.6 Bond Coat.....	56
14.7 Crossfalls.....	56
14.8 Edge Supports.....	56
14.9 Block paved Footways & Footpaths.....	56
14.10 Sacrificial construction.....	57
14.11 Public Utility works within a footway.....	57
14.12 Longitudinal Reflective cracking on divorced footways.....	58
<b>15.0 VEHICLE, PEDESTRIAN &amp; CYCLE CROSSINGS.....</b>	<b>59</b>
15.1 Vehicular Crossings.....	59
15.2 Pedestrian Crossings.....	59
15.3 Cycle Crossings.....	59
15.4 Construction Depths.....	59
15.5 Dropped Kerbs and Alignments.....	59
15.6 Tactile Paving.....	60
<b>16.0 VERGES &amp; VISIBILITY SPLAYS.....</b>	<b>61</b>
16.1 Seeding and Turfing - General.....	61
16.2 Initial Ground Preparation.....	61
16.3 Fertilizer Application.....	61
16.4 Seeding.....	61
16.5 Turfing.....	62
16.6 Maintenance of Seeded Areas.....	62
16.7 Maintenance of Turfed Areas.....	62
16.8 Overseeding.....	62
16.9 Edge Support Delineation.....	63
<b>17.0 STRUCTURES.....</b>	<b>64</b>
17.1 General.....	64
<b>18.0 STREET LIGHTING – HIGHWAY LIGHTING, ILLUMINATED SIGNS &amp; ILLUMINATED BOLLARDS.....</b>	<b>65</b>
18.1 Introduction.....	65

18.2 Procedures Summary.....	65
18.3 Method 1.....	66
18.4 Setting Out Column Positions.....	66
18.5 Installation.....	66
18.6 Electrical Testing.....	67
18.7 Inspections by Worcestershire County Council.....	67
18.8 Additional Developer Responsibilities.....	68
18.9 Charges by the County Council.....	68
18.10 Method 2.....	69
18.11 Design Considerations.....	69
18.12 Design Requirements.....	70
18.13 Highway Lighting Equipment Requirements and Installation Standards.....	70
18.14 Setting Out Column Positions.....	71
18.15 Electrical Testing.....	72
18.16 Inspections by Worcestershire County Council.....	72
18.17 Additional Developer Responsibilities.....	72
18.18 Charges by the County Council.....	73
<b>19.0 STREET NAME PLATES.....</b>	<b>74</b>
19.1 General.....	74

## APPENDIX

APPENDIX A – Construction Thicknesses

APPENDIX B – Testing to be carried out by Contractor

APPENDIX C – Worcestershire County Council Highways  
Construction Testing and Inspection Programme for New  
Developments

APPENDIX C1 – Earthworks, Sub-base & Trench Reinstatement

APPENDIX C2 – Compaction Plant

APPENDIX C3 – Earthworks Compaction Table

APPENDIX C4 – Sub-base Compaction Table

APPENDIX C5 – Trench Reinstatement Compaction Table

APPENDIX C6 – Trench Compaction Testing Requirements

APPENDIX D – Bituminous Material, Temperature Guidelines

APPENDIX E – Standard Drawings

## DEFINITIONS

- **The Authority shall mean:** Worcestershire County Council.
- **The Developer shall mean:** The Person, Persons or Firm or Company as defined in the Agreement.
- **The Agreement shall mean:** The Agreement under Section 38 or Section 278 of the Highways Act, 1980 agreed and entered into between the Authority and the Developer.
- **The Specification shall mean:** Worcestershire County Council's Highways Specification for New Developments.
- **Director of Economy & Infrastructure shall mean:** Mr John Hobbs, Director of Economy & Infrastructure, County Hall, Spetchley Road, Worcester WR5 2NP or his appointed representative.
- **The Works shall mean:** The Permanent Construction Works to be executed in accordance with this Specification as detailed on the Drawings and as defined in the Agreement.
- **The Drawing shall mean:** The Plans Section and Details (and any subsequent amendment thereto) approved by the Director of Economy & Infrastructure and referred to in and attached to the Agreement.
- **The Site shall mean:** The Lands owned by the Developer and the Minimum extent of such Public Highways and Public and Private Lands, which in the opinion of the Director of Economy & Infrastructure is necessary and practicable for the proper construction of the Works.
- **Approved Directed and Instructed shall mean:** Approved, Directed and Instructed by the Director of Economy & Infrastructure.
- **B.S. shall mean:** The relevant British Standard current at the time of the execution of the Works.
- **Sewer shall mean:** Sewers, Culverts and Drains of all descriptions (except sub-soil drains) whether for the conveyance of foul sewerage, storm water or surface water.
- **Department of Transport Specification shall mean:** Latest Edition of the Department of Transport Specification for Highways Works hereafter called DoT SHW.
- **Technical Approval for Highway Structure shall mean:** The procedures for technical approval of all highway structures as required by the Director of Economy & Infrastructure.
- **The Testing Consultant:** A laboratory accredited by UKAS for the required tests or otherwise approved by the Director of Economy & Infrastructure.
- **California Bearing Ratio (CBR):** A value derived from a standard test indicating the ratio of the strength of a particular soil compared with the corresponding strength of crushed rock.
- **Subgrade:** Existing natural ground at and below formation.
- **Formation:** The level from which construction commences.
- **Carriageway:** The surfaced area of the road designed primarily for the passage of vehicles.
- **Highway:** A route where traffic has the right to pass. It may be restricted to particular classes of vehicles. The highway consists of the carriageway, cycleway and footway surfaces and includes any verges or vision splays.
- **Manhole:** A chamber constructed at specified intervals along drainage lines to allow access for cleaning or maintenance.



- **Gully:** An open topped pot usually made of concrete constructed at the carriageway edge to drain water from the carriageway. The aperture at the top of the gully is covered with a cast iron grating.
- **Channel:** A narrow strip usually placed at the edge of the carriageway designed to transfer surface water.
- **Cycleway:** The part of the carriageway over which cyclists have right of way.
- **Footpath:** A highway over which the public has right of way on foot only. It is remote from the carriageway.
- **Footway:** The part of the highway adjacent to the carriageway and is a right of way on foot only.

## 1.0 GENERAL

### NOTES FOR GUIDANCE

UNDER CDM REGULATIONS 2015 THE DEVELOPER IS REGARDED AS THE CLIENT, ANYONE WHO HAS INPUT TO THE DESIGN PROCESS IS REGARDED AS A DESIGNER & THE CLIENT MUST APPOINT A PLANNING CO-ORDINATOR TO OVERSEE THE KEY PROCEDURAL STAGES. ALL OF THESE ROLES WITHIN CDM HAVE A CLEAR & PRECISE RESPONSIBILITIES & OBLIGATIONS.

FOLLOWING ADOPTION OF ANY SCHEME THE DEVELOPER MUST PASS TO THE HIGHWAY AUTHORITY THE HEALTH & SAFETY PLAN. DETAILS TO BE SUBMITTED TO INCLUDE AS-BUILT DRAWINGS SHOWING ALL ADOPTED ASSETS. DETAILS TO BE PROVIDED MUST ALSO INCLUDE ANY OTHER INFLUENCING FACTORS FOR FUTURE MAINTENANCE.

PERSONNEL WORKING IN THE HIGHWAY SHOULD POSSESS ALL NECESSARY ACCREDITATION FOR THEIR FUNCTION AS STATED WITHIN THE SPECIFIC WCC TRAFFIC MANAGEMENT & HIGHWAYS APPLICATION.

THE DEVELOPER SHALL COMPLY WITH THE CONTROL & POLLUTION ACT, LAND DRAINAGE ACT & ENVIRONMENTAL PROTECTION ACT IN PREVENTING THE POLLUTION OR BLOCKING OF WATERCOURSES. CONTAMINATED LAND SHALL BE SUITABLY REMEDIATED & HAZARDOUS WASTE DISPOSED OF IN COMPLIANCE WITH CURRENT LEGISLATION & RECORDED WITHIN THE CDM HEALTH & SAFETY FILE.

- ON-SITE WHEEL WASHING EQUIPMENT TO BE PROVIDED IN ACCORDANCE WITH PLANNING CONSENT DECISION NOTICE & HIGHWAY AGREEMENT.
- ANY REQUIRED SIGNAGE, TEMPORARY OR PERMANENT, SHALL BE PROVIDED SO NOT TO DAZZLE, CAUSE DISTRACTION OR GLARE.
- PREVENTION OF NOISE SHALL BE IN ACCORDANCE WITH CURRENT BEST PRACTICE & THE PROVISIONS OF THE CONTROL OF POLLUTION ACT 1974 (OR AMENDMENTS THEREAFTER) & ANY WORKING TIMES SPECIFIED WITHIN PLANNING CONSENT DECISION NOTICE
- DUST, SMOKE & THE ARISING FROM ANY CUTTINGS, SAWING, GRINDING, & DRILLING OPERATIONS SHALL BE CONTAINED OR SUPPRESSED TO ENSURE THAT NO DUST OR DEBRIS ESCAPES AS AIRBORNE POLLUTION.

## 1.1 Scope of the Specification

1.1.1 This specification refers and applies to the design and construction of highways and highway infrastructure constructed by or on behalf of a private Developer where the Council as the Highway Authority will, undertake to adopt the highways and highway infrastructure as highways and highway infrastructure maintainable by the Authority at public expense, at the end of the maintenance period and following inspection and satisfactory completion of works.

## 1.2 Substitute & Additional Clauses

1.2.1 Where any Works proposed to be undertaken by a Developer are deemed by the Director of Economy & Infrastructure not to be covered by the various Clauses of this Specification then the Director of Economy & Infrastructure shall, where he considers it desirable or necessary, issue, substitute or include additional Clauses and all details, drawings, substitutions and additional Clauses so issued shall be read and construed as forming part of this.

## 1.3 Works within Existing Highway

1.3.1 Where it is necessary to break open an existing highway to lay or maintain apparatus, the Developer is required, under Section 50 the New Roads and Street Works Act 1991, to give prior notice in accordance with the requirements of the specific WCC Traffic Management Highway Application.

There is an online process via the Worcestershire County Council website for any applications to use traffic management on the Worcestershire highways. Traffic management on the highways application link:

[http://www.worcestershire.gov.uk/info/20007/travel\\_and\\_roads/688/licences\\_and\\_permits](http://www.worcestershire.gov.uk/info/20007/travel_and_roads/688/licences_and_permits)

Section 278 road space applications and enquiries: [S278roadspace@worcestershire.gov.uk](mailto:S278roadspace@worcestershire.gov.uk)

Any road closure applications: [roadclosures@worcestershire.gov.uk](mailto:roadclosures@worcestershire.gov.uk)

Temporary traffic lights & lane closures: [temptraffilight@worcestershire.gov.uk](mailto:temptraffilight@worcestershire.gov.uk)

Permit plans and general enquiries: [nrswa@worcestershire.gov.uk](mailto:nrswa@worcestershire.gov.uk)

1.3.2 All works within the highway must comply with the Traffic Management Act (TMA) notification requirements. Developers must be aware that standard notification period is three months; therefore, notification must be made to the Highway Authority at an appropriate time to avoid delays.

1.3.3 No work shall be carried out in the public highway until such notices have been received and approved.

## 1.4 Typical Test & Supervision Procedure

1.4.1 Refer to Appendix B & C

## 1.5 Works adjacent to Existing Highway Structures

1.5.1 No Works shall be carried out adjacent or at the approaches to, below, or through, on, or over any existing highway structure without the written permission of the Director of

Economy & Infrastructure. Such permission will be withheld where the Director of Economy & Infrastructure considers the Works or the manner in which the Works are proposed to be carried out may endanger the structural condition, stability or safety of the structure.

#### **1.6 Sub-contracting of the Works**

1.6.1 Should the Developer appoint or intend to appoint any other person, persons, Firm or Company to construct the Works (or any part thereof) on his behalf then he shall, not less than seven days prior to the commencement of the Works submit to the Director of Economy & Infrastructure in writing the name, office, address and 24 hour telephone number of the person, persons, Firm or Company to whom or to which the Works (or any part thereof) will be assigned.

1.6.2 Sub-contracting of the construction of the Works (or any part thereof) shall not in any way relieve the Developer from his obligations and liabilities under the terms of the Agreement and he shall be responsible for the acts, defaults and neglects of the person, persons, Firms or Company to whom or to which the Works (or any part thereof) have been assigned including their agents, servants or workmen as fully as if they were the acts, defaults and neglects of the Developer, his agents or workmen.

#### **1.7 Approval of Drawings prior to Commencement of the Works**

1.7.1 The Developer shall not commence construction of the works until he is advised in writing by the Director of Economy & Infrastructure that the Drawings and Documents including all details contained therein are sufficient and satisfactory in all respects, and that the arrangements and negotiations in respect of the Agreement are satisfactory or have been completed and concluded and the Agreements entered into.

#### **1.8 Commencement of the Works**

1.8.1 The Developer shall not less than seven days prior to the commencement of the Works and after serving all required notices and gaining necessary permission, advise the Director of Economy & Infrastructure in writing of his intention to commence the Works. Work shall not proceed without the Construction Phase Health and Safety file being in place with the necessary Authorities.

1.8.2 The Developer shall not discontinue the Works without prior approval of the Director of Economy & Infrastructure and shall where such approval is given, notify the Director in writing of his intentions for securing, safeguarding and protecting the partially completed Works and indicating the anticipated period of cessation. The Developer shall give not less than seven days' notice in writing to the Director of Economy & Infrastructure of his intention to recommence the Works.

1.8.3 No works shall commence until all approvals have been granted and necessary notice period durations completed as specified within clause 1.3.1 – 1.3.3.

#### **1.9 Works to be to the satisfaction of Director of Economy & Infrastructure**

1.9.1 The Developer shall execute, complete and maintain the Works in strict accordance with the requirements of this Specification to the satisfaction of the Director of Economy & Infrastructure and shall comply fully with and adhere strictly to the directions and instructions of the Director of Economy & Infrastructure.

1.9.2 The decisions of the Director of Economy & Infrastructure in respect of the requirements, provisions and interpretations of these General Conditions and Specification shall be final and binding.

#### **1.10 Variation of the Works**

1.10.1 No variation of the position, alignment, dimensions, levels or construction details of the Works shall be made without the written consent of the Director of Economy & Infrastructure.

#### **1.11 Access to the Works**

1.11.1 The Director of Economy & Infrastructure and any other persons authorised by the Director of Economy & Infrastructure shall, at all times, have access to the Works.

#### **1.12 Signing, Guarding & Lighting**

1.12.1 The Developer shall provide and maintain any necessary watching and lighting, temporary barricades, traffic control, etc., as required for the safe execution of the Works. For emergency use outside normal working hours, the Developer shall prior to the commencement of the Works, provide a sign at every end of the works detailing daytime and night-time telephone numbers and address of the person responsible for site security and traffic safety and control. The Developers must obtain the approval of the Director of Economy & Infrastructure before using any temporary signals on the existing highway. When working on the public highway the developer must provide a sign at each end of the scheme providing details of TM Permit Number for the scheme, contractors name and out of hours contact telephone number.

#### **1.13 Mud and Other Debris on the Highway**

1.13.1 The Developer is reminded that it is an offence under the Highways Act 1980 to deposit or allow materials to be washed onto a Highway and should therefore take all reasonable steps to ensure that the Highway is kept clear of all mud, clay, lime or similar material during the execution of the project. It may be necessary to provide wheel washing facilities to ensure that all vehicles leaving the site are sufficiently clean to ensure that no materials are deposited on the Highway.

1.13.2 The existing public highway must not be used for stockpiling or storing plant, materials or equipment. The use of the existing publicly maintained Highway by plant and machinery is likely to cause damage to the Highway and the Developer/Contractor will be liable for the cost of the reinstatement under Section 59 of the Highways Act 1980 if any damage has been caused to the Highway.

#### **1.14 Pollution & Obstruction of Watercourses & other Sewers**

1.14.1 The Developer shall not during the construction and maintenance of the Works allow any naturally occurring materials, construction, and building materials, chemical, poisonous and inflammable substances, obnoxious solid, gasses or fluids, sewage or other organic and inorganic impurities to be discharged from the Works and cause pollution or obstruction to any canal, river, watercourse, ditch or surface water sewers and drains.

1.14.2 Should the Developer be aware that pollution is being caused by reason of his operations

then he shall immediately cease the operation causing or considered to be causing the pollution and shall as a matter of urgency and without delay inform the relevant Environment Agency and the Director of Economy & Infrastructure of the location and estimated extent of the pollution and the action being taken to alleviate or prevent further pollution taking place. The Developer shall recommence the operations only when he has taken effective preventative measures to the satisfaction of the Environment Agency and the Director of Economy & Infrastructure to ensure that no further pollution will occur.

### **1.15 Removal of Improper material & other workmanship**

1.15.1 The Director of Economy & Infrastructure may during the progress of the construction of the Works order the following should he deem necessary:

- The removal from the site of any materials not complying with the requirements of this Specification.
- The substitution with materials complying with the requirements of this Specification.
- The removal and proper re-execution of any work which in the opinion of the Director of Economy & Infrastructure has not been constructed in accordance with the Drawings and/or to the requirements of this Specification.

### **1.16 Making Good Damage to Existing Highway**

1.16.1 Prior to commencement of the works, the Developer shall arrange for the existing highway network, to be used by construction traffic, in the vicinity of the site to be inspected in the presence of the Director of Economy & Infrastructure representative and a video record of its condition made for future reference.

1.16.2 Where the surface of any existing highway or public area of any kind has been disturbed during the course of the Works, these shall be fully reinstated with similar materials to the satisfaction of the Director of Economy & Infrastructure.

1.16.3 Any damage sustained to the footways, verges, carriageways or existing public highway by delivery vehicles and plant servicing the development shall be deemed to be the responsibility of the Developer. Any damages caused to the highway by the movement of construction traffic to and from a development must be rectified by the developer once construction is completed and following the completion of a pre and post construction highway condition survey to the satisfaction of the Director of Economy & Infrastructure.

1.16.4 Failure on the Developer's part to so do may result in the Council or its Agent carrying out these works and recharging all costs incurred to the Developer. Section 133 Highways Act 1980 provides the Local Authority with rights to make good any damage to the public highway adjacent to a development and recover all costs from the developer.

### **1.17 Land Drains**

1.17.1 The Developer shall replace any land drains which have been disturbed in carrying out the Works and make good the same in a manner and with materials similar to those previously existing or otherwise shall deal with such land drains as the Director of Economy & Infrastructure or Local Land Drainage Authority may direct.

## **1.18 Archaeological Interests**

1.18.1 These will usually have been considered and negotiated through the planning process in relation to building proposals. However, from time to time archaeological discoveries may be made in the course of estate road construction. These must be notified to the Worcestershire Archive & Archaeology Service, The Hive, Sawmill Walk, The Butts, Worcester WR1 3PD Tel 01905 822866.

1.18.2 The Archaeological Adviser will arrange for an inspection and rapid recording or removal of material. Notification will not result in undue delays in construction.

## **1.19 Health & Safety File**

1.19.1 In accordance with the requirements of the Construction (Design and Management) Regulations 2015 (CDM), Developers are required to submit a Health and Safety File to the Council in accordance with condition 12.

1.19.2 The information contained in the file needs to include that which will assist persons carrying

- out work on the highway infrastructure at any time after the completion of the project in question and needs to include:
  - Brief description of the works carried out
  - Record or 'as built' drawings
  - Design calculations and assumptions
  - General details of construction methods and materials used
  - Details of any equipment and maintenance facilities
  - Details of any highway structures including maintenance procedures and requirements
  - Details of the location and nature of all utilities and services including emergency and fire-fighting systems
  - Residual hazards and how they have been dealt with
  - Any hazards associated with the materials used

1.19.3 The file must be submitted as soon as the project has reached practical completion. Failure to submit this information in a timely manner will prevent the issuing of a provisional certificate of completion.

## **1.20 CCTV Surveys**

1.20.1 Prior to final surfacing the Developer is required to carry out a CCTV survey, at his own expense, and provide a visual and written record of the result for any highway drains constructed. Prior to carrying out the survey, the Developer shall ensure that the sewers and manholes are clean and that all debris has been removed from connecting sewers and drains. Prior to final adoption, a further CCTV survey may be required at the discretion of the Director of Economy & Infrastructure.

## **1.21 Design Considerations**

1.21.1 This construction Specification should be read in conjunction with Worcestershire County Council's Streetscape Design Guide.

1.21.2 The design is to take all necessary precautions to ensure that water from privately owned land/properties does not drain directly into the Highway drainage system. It is a requirement of the Highways Act 1980 to ensure that this is the case.

1.21.3 Work will not be allowed to commence until the Director of Economy & Infrastructure has approved the Section 38/278 plans in writing, developer has provided specified approved drawings / agreement contact details & design checking / inspection fees have been paid.

## 1.22 Design of Construction Thickness

1.22.1 Section 38 carriageway construction constituent material depths are shown in Appendix A1. Section 278 Works will be designed in accordance with DMRB standards or as otherwise required by The Director of Economy & Infrastructure.

1.22.2 The Design CBR of the scheme should be derived using laboratory CBR tests in accordance with BS 1377 Pt 4 (1990). The Design CBR is the lower of the long-term and short-term CBR results. This investigation should take place before work commences, i.e., during the approval process, and so CBR test results should be available from the Ground Investigation Report for the development site. If the Developer does not commission site investigation work before technical approval, then he must adopt a Design CBR of 2.5% requiring 450mm Type 1 subbase. Once highway work commences on site the Design CBR must not be increased, i.e., in-situ testing of the formation once on site cannot be used to argue for a reduction in subbase thickness.

1.22.3 During construction, the in-situ CBR must be checked against the Design CBR using the Dynamic Cone Penetrometer (DCP) method as described in Clause 893 of the Draft Specification contained in Section 5 of IAN 73/06 Revision 1. If the type of soil is inappropriate for such testing then a Dynamic Plate test must be used. No fewer than 5 tests are to be carried out and at not more than 60m intervals. Additional tests may be necessary to identify the location of different subgrade conditions. The subgrade CBR value must be equal to or greater than the Design CBR.

1.22.4 If the in-situ CBR is found to be less than the Design CBR, then either the subgrade must be improved to the Design CBR or the foundation must be redesigned.

1.22.5 Where the in-situ subgrade has a measured CBR value less than 2.5%, it must be improved as described in Chapter 5 (paragraphs 5.16 to 5.21) of IAN 73/06 Revision 1 and its Design CBR must be based on the statements in those paragraphs.

1.22.3 Where the development is to be undertaken in areas that exhibit soft ground, buried structures, landfill sites etc special design measures may need to be considered by the developer. The detailed design so produced to cater for these eventualities must be approved by the Director of Economy & Infrastructure prior to any construction works taking place.

1.22.5 Sampling and testing shall be undertaken in accordance with the relevant current British Standards. All laboratory analyses are to be reported on UKAS certificates. It is possible that other reporting formats may be used; however, they must be approved by the Director of Economy & Infrastructure prior to use.



### **1.23 Safety Requirements**

1.23.1 The developer shall be responsible for all safety aspects of the works prior to completion.

1.23.2 The Developer shall be responsible for the Construction (Design and Management) Regulations 2015 in relation to the Development and all works associated with it. The Developer is to ensure that all handling and installation processes are undertaken in accordance with The Health and Safety at Work Act 1974 and Manual Handling Operations Regulations 1992.

1.23.3 Before the commencement of the works, the Developer shall notify the Director of Economy & Infrastructure of the identity of the Planning co-ordinator in accordance with the Construction (Design and Management) Regulations 2015.

1.23.4 The Developers responsibility under the Health and Safety at Work Act is also extended to its sub-contractors, operatives, council Officers and members of the public who may have access to the site. As the street manager the Developer is responsible for the Highway including all matters pertaining to health and safety until such time as Worcestershire County Council formally adopts the Highway.

### **1.24 Notification of Emergency Contact Details**

1.24.1 The Developer/Contractor will erect and maintain an information board on site for the duration of the works. The board will provide the name and contact phone number of a responsible person for the works, who is able to direct any immediate action in connection with works with regard to an emergency event. The person will be available 24 hours a day, 7 days a week to allow notification of dangerous event, incident or accident should they occur. The information board must be clearly visible from the adopted Highway.

### **1.25 Preliminary Site Works**

1.25.1 The Developer is to ensure that the relevant Licences specific to the works have been obtained prior to carrying out any works within the adopted Highway:

1.25.2 The Director of Economy & Infrastructure must be given a maximum 3 months' notice prior to commencement of works within the highway in accordance with the Traffic Management Act 1994 (TMA). Notification to carry out works within the Highway to be made to Worcestershire County Council Streetworks Section as per clause 1.3.

1.25.3 All works are to be carried out to the satisfaction of the Director of Economy & Infrastructure.

1.25.4 The Developer may be required to prove the integrity of the works at any stage of the project that the Director of Economy & Infrastructure may stipulate. If there is a need to prove the thickness of a particular material layer that has been covered prior to inspection then the Developer will be required to undertake coring to indicate the constructed thickness. This work will be undertaken at the Contractors expense.

1.25.5 All Roads and visibility splays shall be set out and laid in accordance with the approved layouts and associated Specification. They are to be maintained in this form until the completion of all works.

1.25.6 At the location(s) where the new development Highway joins the existing Adopted Highway, the new junction bellmouth, visibility splays and footways are to be constructed to finished surfacing levels as soon as practically possible in the construction process. Resurfacing/construction of the existing footway(s)/carriageway(s) are to be extended to include any reinstatements or service trenches connected with the servicing of the new Development. Reinstatement edges are to be cut back to a clean vertical edge and the development constructed up to that point in accordance with standard detail.

### **1.26 Developer Obligations**

1.26.1 The Developer and his sub-contractors shall take full responsibility for the stability and safety of all site operations and methods of construction from commencement through to final adoption.

1.26.2 The Developer/Contractor shall adhere to the provisions of all general or local Act of Parliament and the regulations and bylaws of any local or statutory authority during the construction of the development.

1.26.3 The Developer shall employ a competent and experienced supervisor on site at all times. The supervisor and at least one operative working in the Highway shall be NRSWA accredited.

1.26.4 Sub-contractors engaged on the development will also be covered under the above Clause.

### **1.27 General Construction Requirements**

1.27.1 All materials used in or upon the works are to be in accordance with the appropriate British Standard Specification and Volume 1 of the Highways Agency's Manual of Contract Documents for Highway Works. All materials shall be kitemarked or produced within an approved Quality Assurance Scheme. All materials used within 450mm of finished surface level shall be non-frost susceptible as defined in Clause 602.19 of Highways Agency (HA) Specification for Highway Works.

1.27.2 Kerbs shall be installed prior to the construction of base layers.

1.27.3 Gully and Manhole covers within the Highway including footway ironwork shall not be set to their final level until the completion of the installation of all base course materials.

1.27.4 Any exposed bituminous layer must be protected and kept clean for as long as it remains exposed prior to the construction of the next layer. Where layers have become contaminated the area is to be cleaned to the satisfaction of the Director of Economy & Infrastructure and, before the next layer is placed the area is to receive a tack coat laid in accordance with the requirements of Clause 920 Ss 7 of Volume 1 Manual of Contract Documents for Highway Works & BS EN 13808. If the layer is damaged it shall be removed and replaced with material of suitable specification. Bond coat to be provided between all bound layers.

1.27.5 All road, footway and cycleway bituminous materials shall be machine laid unless the Director of Economy & Infrastructure has approved hand laying methods. The carriageway shall be laid in two passes with the joint being at the centre line of the carriageway. The laying of bituminous materials will not be allowed until all service installation has been completed.

1.27.6 All block work shall be protected from site traffic during the execution of the works. Any damage is to be made good to the satisfaction of the Director of Economy & Infrastructure at the Developers expense.

1.27.7 All highway verges are to be a minimum of 0.6m wide and are to be laid as grassed areas in accordance with Section 17.

1.27.8 A sustainable approach to highway construction with particular emphasis on the use of recycled material is encouraged. Testing for material in recycled coarse aggregate and recycled concrete aggregate is to be undertaken in accordance with Clause 710 of Volume 1 Manual of Contract Documents for Highway Works & Quality Protocol for Production of Aggregates by Waste & Resources Action Programme (WRAP). Worcestershire County Council has a committed approach to the use of recycled materials and can provide an approval process including technical assessment and laboratory appraisals as necessary. It may be possible to use recycled materials within appropriate construction phases provided that they do not affect the structural or performance characteristics of the development. The approval process will be undertaken at the expense of the Developer.

1.27.9 It is recommended that the Developer and his sub-contractors produce and maintain a waste register. The waste register will detail all surplus materials that are disposed of from site. This will allow an analysis to be performed indicating total wastage, hence lost revenue from the project. It will therefore be possible for the Developer to formulate and administer procedures in order to minimise the amount of wastage from site, which in turn will assist in maximizing profitability as well as helping to safeguard the environment.

## 1.28 Surface Regularity & Tolerances

1.28.1 The level of any point on the surface of any pavement course of the carriageway, footway or vehicle crossing after compaction shall be within the tolerances shown with the following table:

### Tolerances in surface levels of Pavement Courses

Course	Tolerance from specified level (mm)
Surface Course	+ / - 6mm
Binder Course	+ / - 6mm
Base Course	+ / - 15mm
Sub-base & Capping	+ 10mm / - 30mm
Blockpaving	Max 2mm difference in level between adjacent blocks

1.28.2 The thickness of any pavement course of the carriageway, footway or vehicle crossing after compaction shall be within the tolerances shown with the following table:

### Tolerances in thickness of Pavement Courses

Course	Tolerance from specified level (mm)
Surface Course	+ / - 6mm

Binder Course	+ / - 6mm
Base Course	+ / - 6mm
Sub-base & Capping	+ 40mm / - 0mm
Surface course including Blockpaving	+ / - 6mm

1.28.3 In addition to tolerance shown in above table the combined macadam surfacing shall not be reduced by more than 6mm in total.

1.28.4 When testing with TRL Rolling Straight Edge on any line, irregularities must not exceed those stated in the following table:

#### Surface Course

Irregularity	4mm	7mm
Permitted number of irregularities over a 75m length	9	1
Permitted number of irregularities over a 300m length	20	2

#### Binder Course

Irregularity	4mm	7mm
Permitted number of irregularities over a 75m length	18	2
Permitted number of irregularities over a 300m length	40	4

1.28.5 Trenches cut through any carriageway must be reinstated such that the finished wearing course profile is +3mm or level with the immediately adjacent surface.

1.28.6 The Developer shall set all fixed surface features, boxes and ironwork in footway, cycleway or carriageway to coincide with the level of the immediately adjacent surface. This work must be undertaken prior to the application of the wearing course.

1.28.7 The difference in level of a fixed surface feature and the adjacent surface shall not exceed

<b>Kerb upstand</b>	125mm (+ or – 5mm)
<b>Vehicular Crossing kerb upstand</b>	20mm (+ or – 3mm)
<b>Pedestrian Crossing kerb upstand</b>	6mm (+0 or -3mm)
<b>Surface adjacent to gully grating</b>	+5mm to +10mm

1.28.8 For a diagrammatic detail of the stepped construction detail refer to Appendix E.

### 1.29 Construction & Earthworks Materials

1.29.1 All materials incorporated into the works shall comply with the relevant current British Standards and/or the current edition of the Department of the Environment and the Highway Agency Specification for Highway Works (SHW) in the Manual of Contract

Documents. This requirement also applies to installation and workmanship. The materials shall be approved by the Director of Economy & Infrastructure and due access shall be allowed to the Director of Economy & Infrastructure for the purpose of sampling and testing.

1.29.2 Definitions of Earthworks materials along with the requirements of compaction of earthworks, sub-base and trench reinstatements are contained within Appendix C1, C2, C3, C4 and C5 (Refer to the Specification for Highway works for compaction requirements)

1.29.3 Details of suitable compaction plant are provided within section C3, C4 and C5 and compaction Tables for materials are provided as follows:

<b>Earthworks</b>	Appendix C3
<b>Sub-base</b>	Appendix C4
<b>Trench Reinstatement</b>	Appendix C5

(Refer to the Specification for Highway Works)

### 1.30 Plate Bearing Tests

1.30.1 Plate bearing testing must be undertaken to ascertain the adequacy of the compacted carriageway capping and sub-base layers prior to the laying of macadam basecourse.

1.30.2 Plate bearing tests to be located at a minimum 25 metres, or as directed by Director of Economy & Infrastructure, (alternating both sides of carriageway). Minimum compaction which must be reached as per table below:

<b>Carriageway Layer</b>	<b>Minimum acceptable Plate Bearing Test Result</b>
Capping	15%
Sub-base	30%

1.30.2 Plate Bearing Test to also be undertaken at carriageway formation level over all drainage trenches located within carriageway. Test to be undertaken centrally on each drainage run or every 25m whichever is the greater.

1.30.3 Minimum Plate size to be 375mm diameter or pro rata to construction depth testing. In determining the plate size to use the depth of the bearing capacity tested is approximately twice the plate size diameter. Eg 375mm diameter plate will determine the bearing capacity down to 750mm depth.

### 1.31 Concrete for Ancillary Purposes

1.30.1 All materials shall comply with the SHW Clause 1704 and BS8500.

### 1.32 Traffic Signs & Road Markings

1.32.1 All traffic signs to be designed & erected in accordance with the current “Traffic Signs Regulations & General Directions”, “Traffic Signs Manual” and any further amendments thereafter.

1.32.2 All traffic signs should comply with BS EN 12899:1 2007. The sign must also be CS badged to the rear.

1.32.3 Road markings must accord with BS EN 1436:2018.

### 1.33 Public Utilities within Carriageway.

1.33.1 Utility depths within carriageways should accord with NJUG guidelines. Table below gives summary of requirements.

Utility main or cable	Required cover from carriageway finished level to top of main or cable. (mm)
Street Lighting	600 *
Water	750 *
Gas	750 *
Cable TV / Communications	450 – 600 *
Electricity LV (Low Voltage)	600 *
Electricity EHV (High Voltage)	600 – 1200 *

\* Utility services cannot be installed within the carriageway construction. If carriageway construction is deeper than dimension stated then it must be deepened accordingly.

1.33.2 Public Utility carriageway duct crossings must be grouped together rather than placed individually. The principles of all residential developments public utility designs must, in all cases, reduce the number of carriageway duct crossings to the minimum required.

### 1.34 Hedgerows & Visibility splays.

1.34.1 Where a vehicle or pedestrian visibility splay is provided adjacent to an existing hedge, the hedge must be cut back so that there is a minimum 0.5m clearance to the visibility splay extents to allow for seasonal growth. Where a new hedge is planted it must be positioned so that it does not obstruct the visibility splay when it reaches its mature growth.

### 1.35 Manufacturer Consistency.

1.35.1 A single manufacturer should be utilised throughout the whole of a scheme for individual assets so as to provide a consistent level of appearance. For example ironwork etc.

## 2.0 EXCAVATION & FILLING

### 2.1 Topsoil Stripping

2.1.1 Turf, topsoil and any other organic and unsuitable materials shall be stripped from all areas beneath proposed carriageways, cycleways, footways and embankments to a minimum depth of 150mm or as directed.

2.1.2 Topsoil shall be suitably stockpiled to a maximum depth of 2m and protected to prevent rainfall scour and loss due to wind. The stockpiles should be stored separately from other materials to avoid cross contamination.

2.1.3 Imported topsoil must conform to BS3882:2015 Cl4.1 Table 1

2.1.4 No material shall be deposited within 5m of any trees or as directed should a tree preservation order be in place.

### 2.2 Excavation to Formation

2.2.1 The proposed area shall be excavated to a depth of 150mm or as directed. Unsuitable material is to be removed and be replaced with approved granular material as described within Section 2. All fibrous material must be removed.

2.2.2 Within 12 hours of the final preparation of the formation level it shall be covered with a minimum 150mm of compacted sub-base in accordance with Clause 5.

### 2.3 Areas of Formation

2.3.1 Areas below formation following the removal of turf etc are to be made up with approved suitable fill as detailed within Appendix C1.

2.3.2 Approved granular fill shall be used to fill any ditches or similar that run beneath the line of the proposed works. The line of ditch should be piped if it is necessary to maintain flow along this drainage path. If this is the case, the Developer should liaise with Worcestershire County Council or the Local Land Drainage Authority. Minimum pipe diameter is 450mm or the equivalent capacity. Minimum 750mm cover from top of pipe to finished road level must be provided.

2.3.3 Approved granular material should also be used to fill isolated deep pockets such as old basement voids. Any vertical walls shall be broken out to below formation level and the granular material placed and compacted within the void to the requirements of C1, C2, C3, C4 and C5.

2.3.4 If existing land drains are encountered (other than 2.3.2) when excavating drainage or carriageway, they shall be diverted or stopped up. Stopped up ends of redundant land drain should be sealed with ST3 concrete.

## 2.4 Forming Areas of Fill

2.4.1 Material used to make up levels to formation shall be placed and compacted in accordance with the requirements of Appendix C1, C2, C3, C4 & C5

2.4.2 Material used to form embankments shall be to the requirements of appendix C1.

2.4.3 Any widening works to carriageways on embankments must be undertaken with approved granular material to the requirements of Appendix C1. The material shall be benched in and compacted in accordance with Appendix C3.

## 2.5 Embankments & Cuttings

2.5.1 Where the level of carriageway construction necessitates either embankments or cuttings being necessary then the excavation, placement & classification of materials shall be in accordance with Highway Agency Standard Specification for Highway Works. Ground testing will be necessary to ascertain the materials slope stability, settlement & heave. The classification of the material will need to be undertaken by a UKAS accredited Geotechnical Engineer under the developer's instruction.

2.5.2 Checking of the proposal must be undertaken by Worcestershire County Council structural engineers and all costs met by the developer.

2.5.3 Embankment and cutting gradients should be initially designed to a 1:3 as a rule however Cl 2.5.1 must be met.

2.5.4 Soiling and compacting of embankments & cuttings shall be carried out to an even surface to a minimum 100mm depth of topsoil. (Compacting of the topsoil shall mean treading and raking in several directions. Vibrating compactors should not be used)

## 2.6 Granular Material Backfill

2.6.1 Suitably approved granular material shall include the following characteristics:

Characteristic	Acceptance Criteria
10% Fines Value	40Kn soaked basis (BS812)
Grading	Well graded 9% passing 63 m sieve
Maximum Particle	Maximum Particle Size 63mm

2.6.2 Recycled Aggregates used in granular fill shall be produced in accordance with WRAP (The Waste & Resources Action Programme) Quality Protocol produced in conjunction with the Environment Agency: Aggregate from Inert Waste. The results of quality control testing of material carried out by the producer of the material shall be in accordance with above document. These must be provided to Worcestershire County Council on request.

2.6.3 Where recycled aggregate, including concrete aggregate, is used in accordance with above it shall not have more than 1% mass of foreign materials including wood, plastic and metal when tested in accordance with BS933-11. Additionally, the threshold limits specified within ADEPT Guidance Note – Managing Reclaimed Asphalt – Highways & Pavements 2019 shall not be exceeded.

2.6.4 Additionally, the material must be free of clay and other contaminants. Alternatively, MOT Type 1 or Type 2 Granular sub-base may be used.



2.6.5 If a granular material other than that specified within S1.5.1 has been placed as fill and exhibits a deficiency in fines including an open textured compacted surface then the following action should be taken:

2.6.6 Spread a fine granular material over the surface and vibro rolled in to fill all prevalent voids prior to the placement of sub-base.

2.6.7 If this is not satisfactory a separating membrane shall be installed prior to the placement of the sub-base.

## 2.7 Backfill materials & Construction Depths

2.7.1 Trench reinstatements on site should accord with the specification for either 6F1, 6F2, 6F5 or W75 material.

2.7.2 Trench reinstatements in the existing Highway are to be undertaken in accordance with the requirements of 'NRSWA Specification for the Reinstatement of Openings in Highways'.

## 3.0 WEATHER CONDITIONS

### 3.1 Earthworks Operations

3.1.1 Working in wet conditions will adversely affect and damage existing ground including the Sub-base and sub grade. If these materials have deteriorated due to trafficking then the material shall be removed and replaced with Type 1 material or material corresponding to Section 2.

3.1.2 No material in a frozen condition may be incorporated into the works.

### 3.2 Construction

3.2.1 No material shall be laid on any surface that is frozen or covered with ice or snow.

3.2.2 Materials incorporating bitumen binders, except Hot Rolled Asphalt, shall not be laid where the temperature of the surface to be covered is below 2°C. If the surface is dry and free of ice or snow then laying may proceed where the air temperature in the shade is at or above 1°C provided the temperature is rising.

3.2.3 Laying of Hot Rolled Asphalt shall cease if the temperature of the surface to be covered is at, or falls below, 5°C or if the still air temperature in the shade falls below 8°C. Attention is drawn to the additional wind chill factor in cold weather working conditions.

3.2.4 Footway and cycleway surface courses cannot be laid in cold, windy or wet conditions unless precautions can be taken to ensure that the material is compacted above its minimum laying temperature.

3.2.5 The Developer is to consider the adverse effects of applying coated chippings to rolled asphalt materials in cold weather conditions. Wind chill factors can rapidly reduce the temperature of the laid material and the Developers attention is drawn to the minimum rolling temperatures contained within Appendix D.

3.2.6 Materials containing cement shall not be laid when the descending air temperature in the shade falls below 3°C and laying shall not be resumed until the air temperature reaches 3°C.

3.2.7 Where fresh concrete or mortar containing Portland Cement has been placed within the works and the temperature is expected to fall below 0°C within a period of up to 48 hours after placing, then suitable insulating blankets should be used to ensure that the materials do not freeze. These blankets must remain in place until the air temperature is at 3°C and rising. The Developer must be made aware that the incorporation of additives or cement replacements may retard the early strength gain. Care should therefore be taken to ensure that damage does not occur after the initial 48-hour period.

## 4.0 PREPERATION OF FORMATION

### 4.1 Shaping & Compaction

4.1.1 Following reinstatement of any defective areas the formation shall be cleaned of any mud and slurry prior to being compacted with a roller of suitable weight and type. The resulting profile shall be properly shaped to an even and uniform surface in accordance with the design levels.

4.1.2 At this stage the Developer shall obtain the approval of the Director of Economy & Infrastructure before further works can proceed.

4.1.3 Any depressions that occur during compaction shall be filled with an approved material and compacted to the required standards.

### 4.2 Weather Protection

4.2.1 The formation shall be adequately protected from the weather and shall not be used by construction traffic. The area should be covered with sub-base as soon as is practicable.

### 4.3 Geotextile & Geogrid requirements

4.3.1 Geotextiles, when used as a separation layer between sub-base & sub-grade, shall be handled and laid as described below.

- They shall be capable of sustaining a minimum tensile load of 15KN/m. The figure shall be ascertained by the Wide Width Strip Test BS EN ISO 10319.
- The geotextile shall have a permeability to water flow at right angle to its plane of not less than 10 litres per m<sup>2</sup> per second under a constant 100mm head of water.
- The pore size shall be between 60 & 300 microns.
- The particular geotextile shall be agreed with Director of Economy & Infrastructure.
- Geotextiles shall be stored so that they are not damaged by sunlight and shall be kept free of contamination and shall not suffer mechanical damage. Where made ground or fill is present, evidence will need to be provided showing that the geosynthetic will be chemically & biologically resistant to those soils and its leachates.
- Geotextiles must be laid with a minimum 500mm overlap. The sub-grade must be smooth prior to laying of the geotextile. No trafficking can take place on the geotextile until the sub-base is provided.
- Where soils are weak an additional geogrid will be necessary – see below.
- The geosynthetic must comply with CE marking requirements & the Quality Control Certificate(s) will be required.

4.3.2 Geogrids, used for reinforcement of un-bound aggregate in weak soils when installed between sub-base or capping layer & sub-grade, shall be handled & laid as described below.

- The quality control strength of the geogrid when tested in accordance with BS EN 10319 & expressed as the lower 95% confidence limit in accordance with ISO 2602-1980, shall be 40KN/m with a peak strain of around 11% in longitudinal and transverse directions.

- In addition, typically the loads of 2% & 5% strain shall be 14KN/m & 28KN/m respectively in longitudinal and transverse directions.
- The ribs of the geogrid shall be of rectangular cross-section in longitudinal and transverse directions with a nominal edge thickness of 1.35mm.
- The geogrid nominal aperture size shall be 30mm x 30mm. However, triangular aperture geogrids are acceptable and must be agreed with Director of Economy & Infrastructure.
- The geogrids must be manufactured from polypropylene sheet, orientated in two directions so that the resulting ribs shall have a high degree of molecular orientation.
- The geogrid shall be inert to all chemicals naturally found in soils and shall have no solvents at ambient temperatures. It shall not be hydrolysis, shall be resistant to aqueous solutions of salt, acids & alkalis and shall be non-biodegradable.
- The geogrid shall have a minimum of 2% finely divided carbon black, as determined by BS2782, well dispersed in the polymer matrix to inhibit attack by ultra violet light.
- The geogrid shall be manufactured in accordance with the Quality Assurance requirements BS EN ISO 9001. If required the developer must provide evidence that the manufacturers Quality Assurance System has been certified to conform with BS EN ISO 9001 by an external authenticating authority.

#### 4.3.3 The following geotextile information will need to be supplied

- Manufacturers name, commercial name of geotextile
- Method of manufacture & constituent materials, mass per unit area
- Nominal thickness
- Dimensions & weight of geotextile roll
- Strength, pore size & permeability

4.3.4 An approved geogrid can also be used to reinforce a thinner than normal pavement foundation as part of a bespoke design agreed with the Director of Economy & Infrastructure. Any proposal to reduce the sub-base thickness must be supported with a report taking into consideration the site investigation, product properties and following design criteria.

Traffic Loading = 1000 standard axles (1 standard axle = 80KN)  
Maximum permitted rut depth = 40mm

4.3.5 Geotextiles and Geogrids shall extend 500mm outside the kerb line.

## 4.4 Shared Surface, Access Roads & Industrial Estate Roads

4.4.1 Shared Surface, Access Roads and Industrial Estate Roads must comply with the above requirements over their entire width.

## 4.5 Drainage of Sub-grade

4.5.1 Adequate drainage shall be provided on all sites to ensure that the water level is maintained at a depth of at least 300mm below formation.

- The subgrade drain pipes must be run to an approved outfall.
- Subgrade drainage may not be required where the formation is not rutted and there is no evidence of free standing water, and

- Where a site investigation has deemed that the highest annual ground water level is 300mm or greater below formation
- Free draining sand and gravel strata are prevalent at formation

4.5.2 Where Subgrade drainage has been found to be required but is impractical to achieve separating membranes shall be placed above and below an additional 150mm layer Of Type 1 sub-base which is to be installed below and extra to the depth required by the Plasticity Index.

## 5.0 CARRIAGEWAY FOUNDATION

### 5.1 General

5.1.1 Refer to appendix A1 for design depths for construction. Sub-base material is to be spread evenly on the formation in layers not exceeding 150mm thick. The material is to be compacted in accordance with the requirements of Appendix C1, C2, C3, C4 and C5. The moisture content of the material is to be within the range optimum  $-2\%$  or  $+1\%$  and must not be segregated.

5.1.2 The full thickness of the sub-base should be continued to 500mm beyond the back of kerb.

### 5.2 Sub Formation & Capping

5.2.1 Capping layers shall be provided to the thickness shown within Appendix A1 unless otherwise directed by the Director of Economy & Infrastructure. Where insitu tests show CBR values less than those predicted at design stage either the whole area of capping shall be increased in thickness or localised soft areas shall be excavated and replaced with a new layer of capping material.

5.2.2 The sub formation shall have the same longitudinal gradient, cross fall and surface level tolerance as the formation.

5.2.3 Any damage to sub formation or capping by the use of construction traffic, or otherwise shall be made good to the satisfaction of the Director of Economy & Infrastructure.

### 5.3 Capping Material

5.3.1 Capping material shall comply with the requirements set out in DoT Specification for Highway Works, Clause 613, Class 6F1 or 6F2. The minimum Ten Per Cent fines Value for 6F2 shall be 50kN. Class 6F5 material may be used in certain circumstances however the specific permission of the Director of Economy & Infrastructure must be attained prior to construction. A minimum CBR value of 15% shall be achieved. CBR value to be ascertained by Plate Bearing Test in accordance with Clause 1.30

### 5.4 Sub-base Material

5.4.1 Type 1 sub-base conforming to SHW Clause 803 to be used. The material is to fully comply with the requirement of SHW clause 803 granular material Type 1 sub-base. A minimum CBR value of 30% shall be achieved. CBR value to be ascertained by Plate Bearing Test in accordance with Clause 1.30.

Grading Envelope for Sub-Base Materials:

BS Sieve Size	Range of Grading % by mass passing
63mm	100
31.5mm	74-100
16mm	44-80
8mm	30-65
4mm	18-42
2mm	13-35
1mm	8-28
0.250mm	0-18
0.063mm	0-9

## 5.5 Capping & Sub-base Depths

5.5.1 Capping & Sub-base thicknesses should be based upon table below:

CBR Value (%)	Sub-base thickness (mm)	Capping thickness (mm)
5% and above	225mm	0mm
3 – 5%	150mm	350mm
1.5 - 3%	150mm	600mm
Less than 1.5% & soft spots	Bespoke foundation design including geosynthetic in accordance with IAN 73/06 & Clause 4.3.2 – 4.3.6	Bespoke foundation design including geosynthetic in accordance with IAN 73/06 & Clause 4.3.2 – 4.3.6

## 6.0 CONCRETE & GROUT

### 6.1 Concrete

6.1.1 Concrete shall be ready mixed concrete complying with Clause 4.5 BS 8500-1 2006 and BS EN 206:2000.

6.1.2 The following table gives details of the Standard Concrete Mixes and their related strengths.

Standardised Prescribed Concrete	Strength Class that maybe assumed for structural design	Characteristic compressive cube strength after 28 days that may be assumed for structural design
ST1	C6/8	8
ST2	C8/10	10
ST3	C12/15	15
ST4	C16/20	20
ST5	C20/25	25

### 6.2 Concrete Aggregates

6.2.1 Aggregates shall comply with DoT SHW, Clause 1702. Maximum aggregate size should be 20mm.

### 6.3 Cold Weather working

6.3.1 No material below 3°C or material containing frost or ice shall be used, and mixing shall not be carried out when the still air temperature in the shade is below 3°C

6.3.2 Concrete shall not be placed against any shutter, reinforcement, previously placed concrete or foundation when it has a surface temperature of less than 3°C

6.3.4 Precautions must be put in place to ensure that the temperature of the concrete is maintained above 4°C until it has cured.

### 6.4 Transport & Placing

6.4.1 Concrete shall be transported and placed so to ensure that segregation or loss of constituent materials does not occur.

6.4.2 All concrete shall be compacted in its final position within 30 minutes of being discharged from the mixer.



6.4.3 Spaces to be occupied by concrete shall be clean and free from standing water. Concrete shall not be dropped from a height of greater than 2 metres.

6.4.4 Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes without forming an approved construction joint.

#### 6.4 Cement

6.4.1 Cement shall comply with BS EN 197 Portland cements or BS4027 Sulphate resisting Portland cement. Ordinary Portland cement shall be used unless otherwise directed by the Director of Economy & Infrastructure.

#### 6.5 Rapid Hardening Cement

6.5.1 Approved rapid hardening cement may be used in lieu of Ordinary Portland cement only with the prior approval of the Director of Economy & Infrastructure. All special conditions stipulated by the manufacturer of the brand concerned as to its use shall be strictly observed.

#### 6.6 Sand

6.6.1 Sand shall be clean washed, sharp, pit or river sand free from clay, organic matter etc and comply with BS EN 12620.

#### 6.7 Water

6.7.1 The Contractor shall be responsible for making his own arrangements with the Water Company for obtaining mains water and he shall comply with all local conditions regarding its use.

6.7.2 If water for the works is not available from a Public Utility Undertaking Supply, the approval of the Director of Economy & Infrastructure shall be obtained regarding the source of supply and manner of its use. If so required, the Contractor shall arrange for tests of the water to be carried out in accordance with BS EN 1008 and it shall only be used if the test results are satisfactory.

#### 6.8 Grout

6.8.1 Cement grout for general use shall be used within one hour of mixing and shall consist of Ordinary Portland or Sulphate Resisting Portland Cement and water mixed in the proportions necessary to ensure that the mix has adequate workability and a suitable consistency for the intended use. Unless as the result of grouting trials or where otherwise directed by the Director of Economy & Infrastructure, the maximum water cement ratio for any grout for general use shall be 0.5.

## 7.0 CARRIAGEWAY LAYERS

### 7.1 General

7.1.1 Refer to appendix A1 for general material Specification requirements and layer thicknesses.

7.1.2 Bituminous materials shall be machine laid, with the exception of small areas, with prior approval of the Director of Economy & Infrastructure.

7.1.3 Where damage occurs to the previously laid bituminous materials then the area shall be rectified to the satisfaction of the Director of Economy & Infrastructure prior to being overlain.

7.1.4 Guidelines for delivery and rolling temperatures are given in Appendix D.

7.1.5 All vertical faces of ironwork within the wearing course depth are to be coated with a cold applied HAPAS approved thixotropic bitumen emulsion or hot bitumen immediately prior to the laying of the wearing course.

7.1.6 All vertical faces of macadam construction layers are to be coated with a cold applied HAPAS approved thixotropic bitumen emulsion or hot bitumen immediately prior to the laying of the specific bituminous construction layer.

7.1.7 Where carriageway rutting or reflective cracking is a particular issue, especially where milling has taken place and re-surfacing is proposed, asphalt reinforcing with coated glass-fibre geotextile should be considered. Where the need is highlighted design, product and manufacturer details should be provided to Director of Economy & Infrastructure for prior approval.

### 7.2 Bond Coat

7.2.1 A bitumen bond coat in accordance with BS EN 13808 Table 4 should be applied between all bound layers. Prior to applying bond coat the surface must be free of any debris and standing water. Bond coats shall have a suitable BBA/HAPAS certificate detailing the performance claims made for them.

7.2.2 The bond coat should be applied to the surface at a rate of spread of:

- At least 0.35kg/m<sup>2</sup> of residual binder for planned or milled surfaces
- At least 0.2Kg/m<sup>2</sup> of residual binder to newly laid or overlaying asphalt surfaces

### 7.3 Basecourse layer

7.3.1 The material shall be AC32 Dense Base 100/150 to BS EN 13108-1. Coarse aggregate to be crushed rock or slag. To accord with Specification of Highway Works Clause 929. The material compaction must ensure that the mean of any 6 insitu air void tests provides a reading in accordance with BS EN 12697-8. See table in Clause 7.6

#### 7.4 Binder layer

7.4.1 The material shall be AC20 Dense Binder 100/150 to BS EN 13108-1. Coarse aggregate to be crushed rock or slag. To accord with Specification of Highway Works Clause 929. The material compaction must ensure that the mean of any 6 insitu air void tests provides a reading in accordance with BS EN 12697-8. See table in Clause 7.6

#### 7.5 Surface Course layer

7.5.1 For residential roads the material shall be HRA 55/14 C SURF 40/60 conforming to the requirements of BS EN 13108-4. Where the laying conditions dictate a more flexible laying material HRA 55/10 C SURF 40/60 conforming to the requirements of BS EN 13108-4 with the approval of Director of Economy & Infrastructure.

7.5.2 For Industrial Access Roads and roads with a hierarchy at and above a Distributor Road status the material shall be HRA 35/14 C SURF 40/60 conforming to the requirements of BS EN 13108-4 & 14/20 Pre-Coated Chippings.

7.5.3 14/20 Pre-Coated Chippings to PD 6618 C.8 to be laid with material specified in 7.5.2 and should accord with the requirements of Clause 7.6. A 150mm Chip free channel to be provided in all instances adjacent to the kerb.

7.5.3 In some circumstances Director of Economy & Infrastructure may request as an alternative to material specified within 7.5.2. the following material Low Texture SMA 10mm (Ultiphalt HD or similar approved).

#### 7.6 Coated Chippings

7.6.1 14/20 Pre-Coated Chippings to PD 6618 C.8 to be laid with material specified in 7.5.2.

7.6.2 A minimum 60 PSV to be attained although Director of Economy & Infrastructure will provide confirmation of the specific PSV to be attained dependent upon the situation.

7.6.3 The binder to coat the chippings shall be 40/60 Grade conforming to BS EN 12591. The target binder content shall not be less than 1.5%.

7.6.4 Grading requirements for 14/20 Pre-Coated Chippings as shown in table below

Test Sieve Size (mm)	Percentage by mass passing sieve test (%)
40	100
32	98-100
20	85-99

14	0-20
6	0-5
0.063	0-1

7.6.5 For chipped HRA roads the following initial texture depth must be met in accordance with Specification for Highway Works Series 900 Table 9/3. The texture depth requirements below must be attained during whole of maintenance period.

Road Type	Surfacing Type	Average per 1000m section (mm)	Average for a set of 10 measurements (mm)
High Speed Roads - Posted speed limit $\geq 50$ mph	Chipped HRA	1.5	1.2
Lower Speed Roads - Posted speed limit $\leq 40$ mph	Chipped HRA	1.2	1.0
Roundabouts on Higher Speed Roads - Posted speed limit $\geq 50$ mph	Chipped HRA	1.2	1.0
Roundabouts on Lower Speed Roads - Posted speed limit $\leq 40$ mph	Chipped HRA	1.0	0.9

## 7.7 Carriageway Air Void Ratio compaction

7.7.1 Air voids of compacted bituminous materials within the carriageway must comply with table below:

Material	Normal Range (%) <sup>a</sup>	1 in 10 max (%) <sup>b</sup>	Absolute max (%) <sup>c</sup>
Dense Base	2-8	8	10
Dense Binder	2-8	8	10
HRA Surfacing	2-6	6	8

a - No result below 2 % will be permitted

b - No more than 1 in 10 results permitted above this value

c - No result above this value will be permitted

## 7.8 Geosynthetic Grid Reinforcement

7.8.1 Polymer coated glass fibre Geosynthetic grid reinforcement will be considered in circumstances to provide surface durability. Its main use is in footway and carriageway re-surfacing as it prevents reflective cracking. Prior to laying manufacturers & product details must be provided and approved by Director of Economy & Infrastructure.

## 7.9 Concrete Block Paving

7.9.1 Carriageway Block paving in the form of precast concrete rectangular blocks of dimensions 200 x 100 x 80mm laid on a laying course in accordance with BS7533-3. Footway block paving shall be 65mm depth.

7.9.2 Blocks shall be manufactured in accordance with BS 1338 and the permitted

colours are to be determined by the Director of Economy & Infrastructure however in majority of cases Brindle will be required.

7.9.3 Blocks shall be laid in a herringbone pattern on a 30mm compacted thickness of category 11 laying course (sharp) sand in accordance with the requirements of BS 7533 Pt3, 1997. The method detailed in 4.3.3.a, of that document shall be adopted for installing the laying course.

7.9.4 Fine silica jointing sand to the requirements of BS 7533 Pt3, 1997 to be swept into the surface of block paving and repeated until such time that all joints are filled.

7.9.4 In certain circumstances (conservation areas for example) the Director of Economy & Infrastructure may request tumbled block paving (tegula). In the majority of cases a Brindle colour will be required although other alternatives will be considered. Blocks shall be manufactured in accordance with BS 1338.

7.9.5 Base & Binder courses below block paving / laying course shall not be punctured.

7.9.6 All ironwork (manhole & gully cover & frames) shall be 150mm depth when located within areas of carriageway block paving.

7.9.7 Block cutting to be undertaken by means of approved guillotine and to no less than ¼ of original block plan size.

7.9.8 Surface regularity to be in accordance with clause 1:29

7.9.9 Permeable block paving construction is not accepted as part of the public highway.

## 7.10 Joints in Bituminous layers

7.10.1 All joints shall be created with a minimum 300mm offset distance from the layer beneath.

7.10.2 Vertical joints must be saw-cut to the full depth of the individual bituminous layer and be stable.

7.10.3 All vertical edge joints shall be painted with cold applied HAPAS approved thixotropic bitumen emulsion or hot applied bitumen immediately prior to the laying of any bituminous layer in accordance with BS 594987:2015.

7.10.4 Care must be taken to ensure that any longitudinal joint is not created within a known wheel tracking path.

## 7.11 Road Markings & Road Studs

7.11.1 Permanent road markings shall be one of the following materials:

- (i) thermoplastic road marking material or paint in accordance with BS EN 1871;
- (ii) permanent preformed road markings in accordance with BS EN 1871.

7.11.2 Prefabricated temporary road markings shall only be allowed for use with temporary traffic management after approval from the Engineer.

7.11.3 The line marking shall be firmly adhered to the underlying surface. The minimum thickness of a new marking shall be 3mm.

7.11.4 The Wear Index at any position in the works shall not exceed 1.6 when assessed in accordance with Annex G of BS EN 1824.

7.11.5 Road marking shall have the following minimum standard of performance as defined in BS EN 1436 for a period of 1 year from the date of application.

Property	BSEN 1436 Reference	Requirement	Value
<b>Colour</b>	Table 6	White	x,y co-ordinates given
<b>Luminance</b>	Table 5	Class B3	0.40
<b>Skid Resistance</b>	Table 7	Class S2	45
<b>Retro-reflectivity</b>	Table 2 Classes of RL for dry markings	Class R4	200
<b>Retro-reflectivity</b>	Table 3 Classes of RL for wet markings	Class RW1	25

7.11.6 The width tolerances and thickness for screed, spray, pre-formed and extrusion white or yellow lines shall be in accordance with the current Traffic Signs Regulations and General Directions. With the exception of Raised Rib edge-line markings, in no case shall any materials be laid more than 6mm thick.

7.11.7 Unless specified all white markings shall be reflectorized with solid glass beads in accordance with BS 6088 by incorporation (except for pre-formed markings) into the road marking mixture and to the wet surface of the marking

7.11.8 Retro-reflectivity shall be measured by means of an approved retrometer.

7.11.9 Yellow material shall comply with Table 5 and Table 6 of BSEN 1436.

7.11.10 The Contractor shall operate a Quality System complying with Scheme No. 7 of the Sector Schemes for Quality Management in Highway Construction – "Application of Road Marking Materials".

7.11.11 Where existing road markings are to be permanently removed from bituminous running surfaces this shall be by mechanical means or forced air abrasive (shot blasting). Hot compressed air (HCA) lance shall not be used on concrete pavements and not on other surfaces without the consent of the Engineer. Obliteration of road markings using bituminous, resinous paint or prefabricated materials will not be permitted.

7.11.12 Where existing road markings on bituminous pavements are to be temporarily obliterated for traffic management or any other purpose the markings shall be completely covered by black tape or covering which shall be able to withstand the traffic load upon it for the required period. Upon removal of the black tape or covering the original markings are to be upgraded to the standard apparent before the temporary obliteration. Temporary covering of road markings on concrete pavements shall not be permitted.

7.11.13 Following the completion of the maintenance period and prior to adoption all road markings must be refreshed.

7.11.14 The cutting of the wearing course for installation of reflecting road studs shall be by milling or diamond cutting methods only.

7.11.15 Road studs shall be depressible rubber inserts let into a cast iron base with reflex lenses which are cleansed by the passage of a vehicle wheel Version 17.09.12 MR/MH 76 under the squeegee action of the depressible rubber. The cast iron base shall be capable of securing a traffic cylinder to BS 873.

7.11.16 Where existing road studs are to be re-used the Contractor shall provide new reflecting inserts.

7.11.17 Non-reflecting road studs shall comply with BS 8442:2015. The studs shall be made from stainless steel or aluminium alloy, not to be 'stick-on' type. Each stud shall be 100 x 100mm. Fixing shall be drilled with Polymer Modified Adhesive.

## 8.0 KERBS & CHANNELS

### 8.1 Kerb race & backing

8.1.1 All kerb and channel Races are to be installed prior to the laying of the base course material.

8.1.2 Kerb Races shall be constructed using ST4 concrete (minimum 50mm slump) to SHW Clause 2602 not less than 150mm thick and 375mm wide at the profile shown in Appendix E. The kerbs shall be backed with ST4 concrete. Width of kerb foundation to be increased by 150mm on kerb radii of 50 metres or less.

8.1.3 All kerb races and backing to be shuttered and poker vibrated.

8.1.4 The installation of expansion joints within the kerb race may be requested in certain circumstances. The expansion joint will consist of an 18mm thick compressible bitumen impregnated fibreboard at distances to be specified by Director of Economy & Infrastructure.

8.1.5 Where a vehicle crossing is provided a step in the kerb race is necessary to accommodate the 255mm depth BN kerb. If the construction is implemented as separate processes, then 16mm dowel bars must be introduced from the lower foundation into the upper foundation.

### 8.2 Kerbs – General Requirements

8.2.1 Kerbs shall be laid to general regularity and with upstands indicated on the drawings contained within the Appendix drawings and in the requirements of BS7533. Current concerns regarding manual handling of precast concrete units shall be taken into account during the design and construction phases of the Development.

8.2.2 Where an asphalt surface course is employed, precast concrete kerbs shall be used. Such kerbs shall be 125mm x 255mm hydraulically pressed, Type HB2, half batter to BS 7263-3 and laid upright. Kerbs are to be bedded in mortar within 25mm of the face of the concrete beam, laid with dry joints and backed with ST4 concrete extending over full width of kerb foundation, to within 50mm of the top of the kerb.

8.2.3 No cut kerb shall be less than 500mm in length.

8.2.4 Joints between kerbs must be between 2-4mm.

8.2.5 Due to laying weather conditions in certain circumstances (see Clause 6.3) it will be necessary to provide suitable protection to laid lengths of kerbing.



8.2.6 Prior to the laying of carriageway and footway asphalt layers adjacent to the kerb, kerb foundation and backing all contactable vertical & horizontal faces must be treated with K170 HAPAS approved bonding coat.

### 8.3 Radius Kerb lines

8.3.1 For curves of radius 12m or tighter, the appropriate manufactured radius kerb shall be used. For radii above 12m the Director of Economy & Infrastructure reserves the right to request the installation of 0.600m length kerb rather than standard 0.914m length.

8.3.2 For curves of radius 50m or less, width of kerb foundation to be increased by 150mm.

### 8.4 Kerb damage & replacement

8.4.1 Where it is considered that there is potential for future damage during the overall construction process it is recommended that kerbs are laid sacrificially and then replaced prior to the completion of the full carriageway and footway construction. Prior to undertaking this the developer must confirm this course of action to the Director of Economy & Infrastructure. Sacrificial construction could consist of a block rather than a full PCC kerb and backing could be Grade ST1 (Lean mix) so that its removal is significantly easier than ST4.

8.4.2 All damaged kerbs, edgings and channels shall be replaced prior to laying of final carriageway or footway wearing course. Where more than 4no kerbs, channels or edgings are damaged in a 10m length the entire 10m length must be replaced. The kerb replacement requirements must include the backing concrete.

8.4.3 Where kerb or edging replacement is deemed necessary following the application of the footway surface course, then the whole of the footway wearing course must be replaced over the entire length of the replacement.

8.4.4 Minor kerb and edging damage, following the installation of carriageway and footway wearing course, may be treated at the discretion of the Director of Economy & Infrastructure with a HAPAS approved epoxy resin repair product rather than replacement.

## 9.0 GULLY GRATES & FRAMES

### 9.1 General Requirements

9.1.1 Gullies located within carriageways (or where vehicles will be present) D400 Type 4 Ductile Iron Captive Hinged Gully gratings and frames shall be kite marked to BS EN 124:1994. It shall have a minimum nominal clear opening width of 0.425m and a minimum waterway area of 1000cm<sup>2</sup>. Hinge to be located on side towards on-coming traffic.

9.1.2 The frames shall be bedded on an epoxy resin based mortar and have at least 2 courses (max 3 course) of Engineering Brickwork Class 'B' to BS3921: 1985. (Refer to standard detail in Appendix E).

9.1.3 An accepted alternative to Engineering Brickwork (as per clause 9.1.2) are Standard or Horseshoe Pre-cast concrete Gully Cover Slab to BS 5911-6.

9.1.4 Gully Frames to be 150mm depth on 'A' and 'B' class roads and Industrial estate roads. All other roads to have 100mm depth frames unless otherwise directed by the Director of Economy & Infrastructure.

9.1.5 All gully frames shall be 150mm depth when located within areas of carriageway block paving.

9.1.6 On carriageway gradients steeper than 1:20 the Director of Economy & Infrastructure reserves the right to request storm pattern gullies.

9.1.7 Linear & Kerb Drainage systems are permitted in certain circumstances with the approval of the Director of Economy & Infrastructure.

### 9.2 Spacing of Gullies

9.2.1 For all high category roads such as distributor road status and above, Gully spacing is to be determined from the requirements of CD 526 (formerly HA 102/00), Design Manual for Roads and Bridges.

9.2.2 For standard residential roads, maximum gully catchments should be based on table below:

Longitudinal Gradient of Carriageway	1:125	1:100	1:80	1:60	1:40 and below
Maximum area of carriageway drained to a single gully	120m <sup>2</sup> (a) (b)	140m <sup>2</sup> (a) (b)	160m <sup>2</sup> (a) (b)	140m <sup>2</sup> (a) (b)	120m <sup>2</sup> (a) (b)

- (a) Maximum distance between any gully is 35m
- (b) Catchment area to include footways

9.24 Gully positions should be designed so that they are not located over any vehicular access and or within a pedestrian desire line. Gully positions should be designed so that they are located upstream of junctions and pedestrian crossings so that surface water does not cross such areas.

9.2.3 Where carriageway sag vertical curves are designed within the carriageway, dual gullies must be provided although the design catchment must not exceed that of a single gully requirement.

### 9.3 Ironworks within cycleways / footways

9.3.1 All road gully gratings situated within cycleways, footways, or other areas where vehicles will not be present, should be D250 Type 3 Ductile Iron Gully gratings and frames shall be kite marked to BS EN 124:1994. It shall have a minimum nominal clear opening width of 0.300m and a minimum waterway area of 750cm<sup>2</sup>.

## 10.0 GULLY POTS

### 10.1 General Requirements – Type & size

10.1.1 Gully pots used for carriageway gullies shall be of precast concrete using Sulphate Resisting Cement (SRC) in accordance with BS 5911-6. PVCu Plastic Gully pots (BBA Approved) can be used with the consent of Director of Economy & Infrastructure.

10.1.2 Gully pots shall have internal dimensions 450mm diameter by 900mm deep and shall be of the trapped type unless otherwise directed by the Director of Economy & Infrastructure.

10.1.3 PVCu plastic gully pots (BBA Approved) of the above dimensions may be used at the discretion of the Director of Environmental Services. The typical detail of this type of gully installation shall incorporate suitable provisions to prevent the pots floating and distorting when the concrete surround is placed and compacted. The installation shall be entirely in accordance with the BBA approval certificate requirements. The Director of Economy & Infrastructure would expect the BBA requirement to at least be equivalent to a concrete base slab provided below the pot bed and surround and which may take the form of a paving slab set on 150mm of ST4 concrete to SHW Clause 2602.

### 10.2 Bedding & Surround

10.2.1 Concrete gully pots shall be installed in accordance with BBA approval requirements. The pots are to be set on and surrounded by 150mm of ST4 concrete sulphate resistant cement to SHW clause 2602.

10.2.2 PVCu plastic pots shall be set on and surrounded by ST4 concrete. The surround shall be 150mm thick with a 150mm bed above the base slab.

### 10.3 Gully Connections

10.3.1 Gully connections lateral to be 150mm diameter in all instances. Lateral connections to be vitrified clayware pipes to BS EN 295-1 2013 or PVC-u twin walled with a smooth internal and ribbed external surface walls with current BBA certification.

10.3.2 Each gully requires an individual lateral connection to the surface water drain. In no circumstances can more than one gully be connected to a lateral.

10.3.3 The maximum length of a lateral connection is 12m.

10.3.4 The whole of the gully lateral connection requires a 150mm ST4 concrete surround when located within a carriageway or an area where trafficked. Concrete setting blocks must be used to provide space below the pipe for the concrete surround.

10.3.5 Concrete protection shall be placed for the whole of the lateral length in one operation and at each joint an 18mm thick bitumen based compressible filler board to BS EN 120 should be placed around the whole of the pipe.

10.3.6 Any disused gully connections must be permanently capped off / grouted. Prior to undertaking these works a CCTV survey is necessary to confirm whether there are any downstream connections which need to be taken into consideration prior to abandonment.

## 11.0 HIGHWAY DRAINAGE

### 11.1 General Requirements

11.1.1 It is usual that the Local Water Company, under a Section 104 Agreement, will adopt new drainage systems. Worcestershire Council will adopt the gullies and connections only in these circumstances subject to satisfactory installation and issue of the Section 104 Vesting Certificate.

11.1.2 Where no public stormwater sewer is proposed, an adequate piped highway surface water drainage system of approved pipe sizes; gradients and materials shall be provided to an approved outfall.

11.1.3 Before entering or breaking into an existing sewer or drain, the Developer must obtain the permission of the responsible Authority to which the connection is made.

11.1.4 Highway surface water drains shall be laid in straight lines at uniform gradients between manholes. Manhole locations must be designed to take into account existing and proposed public utilities. Manholes should be located at any change of vertical gradient or horizontal position; head of all pipe runs; every junction of two or more pipes (other than gully connections) or wherever there is a change of pipe size. Manholes must be located no more than 90m apart.

11.1.5 Surface water drainage should be designed so that any pipe is located a minimum 1.0m distance from any kerb face when located within a carriageway. The outside of any manhole must be located a minimum 0.5m distance from any kerb face when located within any carriageway. Road design (specifically widths) must take these requirements into account at initial design especially where oversize attenuation pipes are required.

11.1.6 Where an outfall drain or pipe unavoidably passes under land which will ultimately be conveyed to a dwelling, or which will ultimately remain undedicated as Highway, an Easement will be required giving the Highway Authority right of access at all times for the purpose of maintenance or repair. Acknowledgement of the presence of such a drain under each affected property must be safeguarded by the incorporation of a suitable Easement within the conveyance of that property by the Developer. The easement must be shown on the Section 38 Agreement coloured layout and subsequently included within the Agreement.

11.1.7 Where an outfall, drain ditch or pipe will discharge into an existing drain or pipe or watercourse not maintainable by the Local highway Authority, written evidence of the consent of the authority or owner responsible for the existing drain etc to such discharge shall be provided to the Director of Economy & Infrastructure.

11.1.8 No highway surface water outfall drain shall pass below any building.

11.1.9 Highway drains laid within the carriageway must have a cover from finished road level to the top of the pipe barrel (including collar) of 1.2m. Where this is not possible please refer to clause 11.3.

11.1.10 The minimum internal diameter highway drain is 225mm (apart from Gully lateral connections which is 150mm)

11.1.11 Pipes above 900mm nominal internal diameter are considered to be highway structures and require review as per Clause 3.8 WCC Streetscape Design Guide.

11.1.12 Highway Drainage Hydraulic Design must comply with Clause 3.12 WCC Streetscape Design Guide.

11.1.12 Geo-cellular Crates are not permitted within an existing or proposed adoptable highway.

11.1.13 All highway drainage should be located within land which is to be adopted by the Highway Authority with the only exception being where the approved outfall is outside of these limits. In this instance, where the highway outfall pipe leaves the adoptable limits it may, by agreement cross third party land and will be subject to required easements / wayleaves and consents which will need to be provided to the Director of Economy & Infrastructure in the form of a Deed of Easement.

11.1.14 Should the circumstances of the easements / wayleaves and consents change following signing of the Deed of Easement then the Director of Economy & Infrastructure must be notified immediately. In these circumstances the Director of Economy & Infrastructure reserves the rights to rescind scheme approval and invalidate the Section 38 or 278 Agreement.

11.1.15 There shall be no physical obstructions or structures located on or above the easement route. Details of any proposed landscaping affecting the easement route must be provided and approved by Director of Economy & Infrastructure prior to implementation of any works.

11.1.16 Private car parking, both individual and shared, should be designed to fall away from the highway to prevent surface water entering the public highway. Where this is not possible private cut off drainage should be introduced to prevent run-off and redirect into a private surface water drainage system.

## 11.2 Highway Drainage Criteria

11.2.1 Highway Drain Standard Return period – 1:5 year design

11.2.2 The highway system must be designed not to flood any part of the highway (or third- party land adjacent) in a 1:30 year return period.

11.2.2 Time of Entry – 4 minutes

11.2.3 The highway system must be assessed in a 1:100yr return period plus a 40% allowance for climate change. Storage (full containment) should be designed via below ground oversized pipes / tanks and be considered on a case by case basis.

11.2.4 Baseline discharge rate must accord with greenfield run off or as determined by the controlling outfall drainage authority. Flow rate to be controlled by suitable flow control device

### 11.3 Surface Water Highway Drains

11.3.1 The following types of pipe may be used for surface highway drains:

- Concrete pipes made to BS EN 1916:2002 & BS5911-5:2004
- Structured PVCu twin walled with a smooth internal and ribbed external surface walls with current BBA certification. Thermoplastics structured wall sewer pipe shall comply with the relevant provisions of BS EN 13476-1 and WIS 4-35-01 and BS EN 13476-2 or BS EN 13476-3. Pipes shall be BSi Kitemarked or have equivalent third party certification.
- Vitrified Clayware pipes to BS EN 295-1:1991 & BS65
- Ductile Iron pipes to BS EN 598 (only with prior consent of Director of Economy & Infrastructure)

11.3.1 Jointing and installation shall be undertaken to Manufacturers Specification. All pipes and fittings shall have gasket-type joints of spigot and socket or rebated form.

11.3.2 In certain circumstances, where cover and/or pipe strength issues are perceived, the use of Ductile Iron Pipes can be considered. The inside of the pipe must have properties which resist contaminant attack. Details of pipe external anti-corrosion lining to be confirmed prior to any approval.

11.3.3 Processed granular bedding, sidefill and surround materials for buried pipelines shall comply with WIS 4-08-02. Recycled materials shall comply with BS 8500-2.

### 11.4 Concrete surround to pipes

11.4.1 All drainage runs irrespective of depth shall have a bed and surround of 150mm of concrete grade ST4 with sulphate Resistant Cement to SHW clause 2602. At each joint bitumen a bitumen-impregnated insulating board to BS EN 622-1 and BS EN 622-4 should be placed around the whole of the pipe for the full width of the concrete surround. The thickness of compressible filler shall be as per table below

Nominal Diameter of Pipe (mm)	Thickness of Compressible Filler (mm)
Less than 450	18
450 – 1200	36
Exceeding 1200	54

11.4.2 Compressible packing for use between pipes and precast concrete setting blocks shall consist of bitumen damp proof sheeting complying with BS EN 14967.

11.4.3 Bituminous materials shall not be put into contact with plastics pipes.

11.4.4 In the case of PVCu pipes, care should be taken to ensure that the pipes do not float when the concrete is placed.

## 11.5 Backfilling

11.5.1 Backfilling shall, wherever practicable, be undertaken immediately when the specified operations preceding it have been completed. Backfilling shall not, however, be commenced until the works to be covered have achieved a strength sufficient to withstand all loading imposed thereon.

11.5.2 Backfilling shall be undertaken in such a manner as to avoid uneven loading or damage.

11.5.3 Filling material shall be deposited in layers not exceeding 225 mm unconsolidated thickness, and then fully compacted to form a stable backfill. It maybe possible to exceed the layer depth specified dependent upon the chosen compaction plant and backfill material however this will purely be at the discretion of the Director of Economy & Infrastructure.

11.5.4 Testing of consolidated trench backfill material must be undertaken at layer depths not exceeding 500mm. Results must be provided to Director of Economy & Infrastructure confirming that a backfill compaction equivalent CBR value of 15% shall be achieved. For more detailed requirements for trench testing, see Appendix C6.

11.5.5 Appendix C5 provides a fully comprehensive table of trench reinstatement compaction requirements however listed below are the main utilised compaction plant and passes based upon a 225mm layer of Granular material backfill.

Plant	No of passes
VIBROTAMPER Mass - 50 kg	Unsuitable
VIBROTAMPER Mass - 50 kg to 75 kg	10
VIBROTAMPER Mass - over 75 kg	8
VIBRATORY ROLLER Below 2000 kg	Unsuitable
VIBRATORY ROLLER 2000 kg – 3500 kg single drum	7
VIBRATORY ROLLER over 2000 kg twin drum	4
VIBRATORY ROLLER Over 3500 kg single drum	6

11.5.5 Backfilling and reinstatement in roads and streets shall be above the level of any pipe surround required, in accordance with the relevant highway reinstatement specification.

11.5.6 Filling material to excavations not situated in highways or prospective highways shall be placed and compacted to form a stable backfill.

11.5.7 Where located within an existing or proposed carriageway, filling material shall comply with the requirements set out in DoT Specification for Highway Works, Clause 613, Class 6F1, 6F2 or 6F5.

11.5.8 Where deep drainage trenches are located within carriageways or where high ground water table issues arise the Director of Economy & Infrastructure can specifically request the use of W75 lower sub-base material for trench backfill. The material has the benefit of having



greater self-compaction properties than 6F1, 6F2 & 6F5 material and therefore can be utilised in situations where accessibility issues as detailed above exist.

Grading Envelope for W75 Materials:

BS Sieve Size (mm)	Range of Grading % by mass passing
125	100
75	0-100
37.5	0-50
10	0-20
0.6	0-5
0.063	0-2

11.5.9 Director of Economy & Infrastructure initial stance, in all circumstances, is that the use of as dug backfill within trenches located below the public highway will not be accepted. Any exception to this will be dependent upon clarification of quality of the excavated material by means of testing and the prevailing weather conditions. This exception can only be undertaken with the specific permission of the Director of Economy & Infrastructure. The use of as dug material backfill will not be considered during October – April in any circumstance.

11.5.10 At the carriageway formation level of the trench, a minimum equivalent CBR value of 15% shall be achieved. CBR value to be ascertained by Plate Bearing Test in accordance with Clause 1.30

## 11.6 Connection to Existing Highway Drainage Systems

11.6.1 If it is proposed to connect a new highway drainage system to the existing highway drainage network, the developer is required to provide a full CCTV survey of the existing system in conjunction with calculations showing that the additional flows can be accommodated. Any works needed to upgrade the existing system will be the responsibility of the developer.

11.6.2 Any proposed discharge to the existing highway drainage network will be restricted to green field run-off rate of the highway area to be drained.

11.6.3 In all occasions the connection of the new highway drain into the existing highway drainage system will be via an adequately sized manhole.

## 11.7 Soakaways

11.7.1 Soakaways as a means of highway drainage discharge can only be utilised with the permission of the Director of Economy & Infrastructure. Principle acceptance for the use of soakaways will only be granted if alternative outfalls such as Water Authority SW sewers, highway drains, watercourses are not available. (Refer to Standard Detail in Appendix E).

11.7.2 Soakaways will only be permitted where suitable ground conditions are available.

11.7.3 The developer must provide a suitable ground investigation report detailing infiltration rates at the specific position of the proposed soakaway. Prior to installing the soakaway, a

further test must be undertaken at the time of construction to validate the design infiltration rate. If the infiltration rate at construction is deemed to be less than that used at design then the design storage must be revised accordingly.

11.7.4 Design of the soakaway should accord with BRE 365 Soakaway Design.

11.7.5 The soakaway cannot be located beneath the highway and should be not less than 5m from any building, wall or structure. A 3m easement to any carriageway should also be provided. No permanent structures, play equipment, steps or significant landscaping should be placed on or adjacent to the soakaway or within the easements.

11.7.6 Design must allow for vehicular access to the soakaway for future maintenance.

11.7.6 Easements easement of 3.0m must be provided around the extremity of the soakaway or the overall depth whatever is the greater.

## 11.8 Testing & Cleansing

11.8.1 The developer should arrange for all pipelines to be tested prior to and following concreting / backfilling.

11.8.2 Prior to the laying of the carriageway surface course a CCTV survey of all highway and Water Authority drainage should be undertaken. A copy of the CCTV survey, report and location plan should be supplied to Director of Economy & Infrastructure for review. Any highlighted faults must be corrected prior to the laying of the carriageway surface course.

11.8.3 On the completion of the works, and also prior to adoption, all drains, manholes, gullies etc., shall be cleaned out, flushed, and left free from all obstructions to the satisfaction of the Director of Economy & Infrastructure.

## 12.0 MANHOLE CONSTRUCTION

### 12.1 Pre-Cast Concrete Manholes

12.1.1 Circular Pre-cast Concrete Manholes sections shall comply with the requirements of BS1917:2002 and BS5913:3 2010.

12.1.2 Circular layout manholes diameters should accord with table below

<b>Nominal Internal Diameter of Largest Pipe in Manhole (mm)</b>	<b>Minimum Nominal Internal Diameter of Manhole (mm)</b>
Less than 375	1200
375 - 675	1500
675- 900	1800
Greater than 900	WCC Engineer to advise

12.1.3 Where manhole is designed with as a Control Manhole with discharge restriction device then minimum internal diameter should be 2700mm however specific scheme layouts can dictate an increase in diameter as agreed with Director of Economy & Infrastructure.

### 12.2 Step Rungs & Ladders

12.2.1 Step rungs should be located so that cover slab access and rungs are aligned.

12.2.2. Step rungs shall be in accordance BS 13101:2002. They shall be 300mm wide at 250mm centres.

12.2.3 Step Rungs shall be plastic encapsulated.

12.2.4 Mild Steel Ladders for vertical fixing shall comply with BS4211 Class A & PD 970. After fabrication the ladder should be hot dipped galvanised in accordance with BS EN ISO 1460.

12.2.5 Stainless Steel Ladders for vertical fixing shall be fabricated to BS 316S31 steel complying with BS 970 Part1.

12.2.6 The first rung of the ladder or first step rung shall be located no greater than 675mm from the top of the manhole cover and frame.

### 12.3 Safety Chains

12.3.1 Safety chains must be provided in all manholes where the outgoing diameter is 600mm or greater.

12.3.2 Safety chains shall be mild steel or stainless steel.

12.3.3 Mild steel safety chain shall be 8mm NS Grade M(4) non calibrated chain in accordance with BS 818-1.

12.3.4 Stainless Steel Safety Chains shall be fabricated to BS 316S31 steel complying with BS 970 Part1. Chain lengths shall be welded and have an internal length not exceeding 45mm and an internal width of 12mm & 18mm.

#### 12.4 Warning Signs

12.4.1 Warning signs must be located in the upstream, downstream and actual manhole containing devices or structures such as tanks, flow restriction devices etc.

12.4.2 Warning Signs shall be designed in accordance with BS 5499:1:2002. utilising sign reference BS EN ISO 710:2012 + A5:2015 with supplementary text specific to hazard as agreed with Director of Economy & Infrastructure.

12.4.3 Sign must be fixed where it can be read without needing to enter manhole and not hinder access.

#### 12.5 Rocker Pipes

12.5.1 a flexible joint should be provided as close as possible to the outside face of the manhole into which a pipe is built. The design must take into account any future movement.

12.5.2 thereafter the recommended length of the next pipe (rocker pipe) should accord with the following table.

Nominal Diameter of Pipe (mm)	Effective length of pipe (m)
150 - 600	0.6
675 - 750	1.0
Exceeding 750	1.25

#### 12.6 Manhole Benching

12.6. 1 Inverts & benching in manholes shall have a screeded finish with a smooth high strength concrete topping applied to a ridged screed finish. This should have a dense & smooth finish. High strength topping (granolithic) shall be produced, laid and finished in accordance with BS 8204:2.

#### 12.7 Manhole covers & frames

12.7.1 All manhole covers and frames intended to be used within the Highway shall be kite marked products to BS EN 124, 1994 and be ductile iron or cast iron. They shall be badged S.W. (Surface Water) and F.W. (Foul Water)

12.7.2 Manhole cover & frames shall be of a non-rocking type. They shall be double triangular with connecting bolts.

12.7.3 Manhole cover & frame minimum cover depth to be 150mm.

12.7.3 The following additional requirements are to be met:

- In carriageways and trafficked footways/Cycleways/ Verges / Footways - Heavy Duty: BS EN 124 reference D400 with a clear opening of 675mm and minimum frame and cover depth of 150mm. Where WCC Standard Detail Manhole Type C is used a cover & frame with a clear opening of 1220 x 675mm should be used.
- In areas where vehicle access is not possible – Medium Duty: BS EN 124 reference C250.

## 12.8 Bricks & Blocks

12.8.1 Concrete bricks or blocks to be used in manholes and chambers shall be precast concrete masonry units, manufactured in accordance with BS 6073-2 (partially replaced by BS EN 772-2, containing a minimum of 350 kg per m<sup>3</sup> of sulphate-resisting cement and having a maximum water : cement ratio of 0.45, a minimum compressive strength of 40 N per mm<sup>2</sup> , and a maximum water absorption of 7%.

12.8.2 Clay bricks to be used in manholes and chambers shall be solid, Class B engineering bricks complying with the relevant provisions of BS EN 771-1.

12.8.3 The shapes and dimensions of special bricks shall comply with the relevant provisions of BS 4729.

12.8.4 All bricks shall have freeze/thaw designation F2.

12.8.5 All bricks shall have active soluble salts content designation S2.

## 12.9 Bedding

12.9.1 The frames shall be bedded on a HAPAS approved & BBA compliant Epoxy Resin Mortar bedding system above two to three courses of Engineering Brickwork Class B to BS3921: 1985 or Pre-cast concrete seating rings.

12.9.2 Alternative bedding materials may be permitted but will require the approval of the Director of Economy & Infrastructure prior to commencement.

## 12.10 Skid Resistance of Inspection Chamber Covers

12.10.1 Inspection chamber covers in the road can be potentially hazardous to motorcyclists and pedal cyclists, as the skid resistance of the cast iron cover can be less than the surrounding road surface. This can be particularly hazardous on bends and at junctions in wet conditions. Covers also become polished over time and this reduces the grip further.

12.10.2 During the design process for Section 278 and 38 schemes the Designer should consider the potential risk for cyclists and motorcyclists at locations such as roundabouts, traffic signal junctions, pedestrian crossings, bends, gradients, and all areas of high friction surfacing within the existing highway and new roads. When the provision of chambers cannot be avoided at such locations the use of anti-slip chamber covers with a minimum PSRV (polished skid resistance value) of 65 should be considered in critical braking areas and where vehicles change direction, i.e. junctions and bends. The use of anti-slip chamber covers should be agreed at specific locations with the Councils Engineer during the scheme design process.

12.10.3 In addition to the anti-slip requirements chamber covers should comply fully with the standards specified in BS EN124 as detailed above.

12.10.4 Worcestershire County Council is only responsible for the maintenance of surface water manhole covers forming part of highway drainage systems. All other inspection chamber covers located within the highway are the responsibility of private utility companies such as electricity, telecom and water suppliers. The Developer must seek the approval of the relevant Statutory Undertaker to use anti-slip chamber covers at specific locations and provide evidence of approvals obtained to the Councils Engineer.

## 12.11 Flow Control Devices and Manholes

12.11.1 The use of a flow control device is subject to the approval of the Director of Economy & Infrastructure. The flow control device must be self-cleansing and require no power input. The device must be constructed in high grade stainless steel.

12.11.2 The developer must provide a site-specific design and specification for the flow control device from the manufacturer prior to adoption.

12.11.3 The use of Orifice plates is subject to the approval of the Director of Economy & Infrastructure. Orifice plates must be made of high-grade stainless steel.

12.11.4 The use of throttle pipes as a flow control is not permitted.

12.11.5 A bypass door / penstock must be fitted within the control manhole which can be operated at surface level. A sump must be provided to act as a catchpit. A weir wall is required within the control manhole with access to the upstream and downstream sections to allow for maintenance.

12.11.6 The position of the flow control device must be in line with the incoming flow.

## 13.0 HEADWALLS

### 13.1 General Requirements

13.1.1 All pipe inlets or outlets to or from open watercourses must be provided with a headwall incorporating any necessary apron, scour baffle, handrails or other works. Suitable designs must be submitted to the Director of Economy & Infrastructure for approval. This may also require structural technical review in accordance with Section 17.

13.1.2 In certain locations, and with the approval of the Environment Agency or Land Drainage Authority, flap valves may be required. Flap valves should be made of heavy-duty plastic (low maintenance type) or other approved by the Director of Economy & Infrastructure.

13.1.3 The invert level of the outlet pipe through the headwall shall be subject to scrutiny and approval by the Director of Economy & Infrastructure to ensure satisfactory flow through the drainage system.

13.1.4 The headwall outlet apron must be set at least 150mm above the natural level of the connecting ditch or watercourse.

13.1.5 The outlet pipe must be directed so as to discharge at an angle of 45° to the direction of flow in the ditch or watercourse.

13.1.6 Where headwalls are located within 6m of the footway, cycleway or carriageway they shall be provided with pedestrian safety railings to the requirements of the Director of Economy & Infrastructure.

## **14.0 FOOTWAYS & CYCLEWAYS**

### **14.1 Preparation**

14.1.1 The formation of the footway/footpath/Cycleway shall be levelled and compacted with a vibrating roller or other approved suitable item of plant to a properly shaped, even and uniform surface. Reference should be made to Appendix C1, C2, C3, C4 and C5, Compaction plant.

14.1.2 The formation shall be treated with an approved weed killer before construction commences. Only trained and certificated operatives will be permitted to use weed killers.

14.1.3 Bituminous materials shall be machine laid; where the Director of Economy & Infrastructure has given his approval, small areas may be permitted to be hand laid.

### **14.2 Footway / Footpath / Cycleway - Sub-base**

14.2.1 The material used shall be granular sub-base material Type 1 SHW clause 803. The thickness shall be 150mm. Where footway crossings are located the thickness should be increased to 200mm.

### **14.3 Footway / Footpath / Cycleway – Base course**

14.3.1 The Footway binder course shall be 100mm compacted thickness AC32 Dense Base 100/150 to BS 13108-1. For Footpaths there is no Base however no vehicular use should be confirmed.

14.3.2 Prior to the laying of all footway asphalt layers adjacent to the kerb, kerb foundation and backing all contactable vertical & horizontal faces must be treated with K170 HAPAS approved bonding coat.

### **14.4 Footway / Footpath / Cycleway – Binder course**

14.4.1 The Footway binder course shall be 60mm compacted thickness AC20 Dense Bin 100/150 to BS 13108-1. For Footpaths the binder should be increased to 75mm of compacted thickness AC20 Dense Bin 100/150 to BS 13108-1 (there is no Base) however no vehicular use should be confirmed.

14.4.2 Prior to the laying of all footway asphalt layers adjacent to the kerb, kerb foundation and backing all contactable vertical & horizontal faces must be treated with K170 HAPAS approved bonding coat.



## 14.5 Footway / Footpath / Cycleway – Surface course

14.5.1 The Footway/footpath surface course shall be 25mm compacted thickness AC6 Dense Surf 100/150 to BS EN 13108-1 or SMA 6 SURF to BS EN 13108-05.

14.5.2 Prior to the laying of all footway asphalt layers adjacent to the kerb, kerb foundation and backing all contactable vertical & horizontal faces must be treated with K170 HAPAS approved bonding coat.

14.5.2 An examination of the surface course will be undertaken prior to adoption to ascertain prevalent defects. Any defects are to be rectified at the Developers expense.

14.5.3 Guidelines for delivery and rolling temperatures are given within Appendix D.

## 14.6 Bond Coat

14.6.1 A bitumen bond coat in accordance with BS EN 13808 Table 4 should be applied between all bound layers. Prior to applying bond coat the surface must be free of any debris and standing water. Bond coats shall have a suitable BBA/HAPAS certificate detailing the performance claims made for them.

14.6.2 The bond coat should be applied to the surface at a rate of spread of:

- At least 0.35kg/m<sup>2</sup> of residual binder for planned or milled surfaces
- At least 0.2Kg/m<sup>2</sup> of residual binder to newly laid or overlaying asphalt surfaces

## 14.7 Crossfalls

14.6.1 The final footway surface shall have a Crossfall of 1:40 towards the carriageway or 1:12 if a vehicular crossing is provided. Vehicular crossings of 1:40 can be provided where the risk of grounding due to the gradient of connecting parking / access or where significant lengths of adjacent parking bays are present however this is only with the approval of Director of Economy & Infrastructure.

## 14.8 Edge Support

14.8.1 The rear of the footway should be demarked by a 150 x 50 hydraulically pressed, precast, bull nosed concrete edging to BS EN 1340:2003 Type EBN with 20mm kerb face.

14.8.2 Where a vehicular crossing is located the rear of the footway a 200 x 50 hydraulically pressed, precast, flat concrete edging to BS EN 1340:2003 Type EF should be provided.

14.8.3 The precast edging must be securely bedded on a foundation of ST4 concrete SHW Clause 2602 - a minimum of 200mm deep and 200mm wide. It shall be backed with ST4 concrete from the back of the bedding to within 50mm (minimum 40mm) from the top of the edging. The foundation should be located on 85mm of granular sub-base material Type 1 SHW clause 803.

14.8.4 Director of Economy & Infrastructure reserves the right to request that the ST4 concrete foundation and backing be shuttered.

#### 14.9 Block paved footways and footpaths

14.9.1 In certain circumstances block paved footways and footpaths can be accepted however this is at the discretion of the Director of Economy & Infrastructure.

14.9.2 Where provided the construction should consist of:

- Brindle Block paving in the form of precast concrete rectangular blocks of dimensions 200 x 100 x 65mm laid on a laying course in accordance with BS7533-3. Other colours can be used at the discretion of Director of Economy & Infrastructure.
- Blocks shall be laid in a herringbone pattern on a 30mm compacted thickness of category 11 laying course (sharp) sand in accordance with the requirements of BS 7533 Pt3, 1997. The method detailed in 4.3.3.a, of that document shall be adopted for installing the laying course.
- Binder course shall be 100mm compacted thickness AC20 Dense Bin 100/150 to BS 13108-1.
- Sub-base shall be 150mm of granular sub-base material Type 1 SHW clause 803. Where footway crossings are located the thickness should be increased to 200mm.

#### 14.10 Sacrificial construction

14.10.1 Where there is known to be further work within the footway such as utility laying etc or there is potential for on-going damage within a development and where safe pedestrian passage is required to be maintained, with the prior approval of the Director of Economy & Infrastructure, a sacrificial construction can be provided.

14.10.2 The construction should consist of the overall standard construction depth made up of granular sub-base material Type 1 SHW clause 803 and a 50mm depth of AC20 Dense Bin 100/150 to BS 13108-1 to provide a sealed surface.

14.10.3 Once the construction has been deemed to have served its purpose the construction should be removed and full construction to be provided in accordance with clauses 14.2 – 14.6.

#### 14.11 Public Utility works within a footway.

14.11.1 Specific attention must be taken to ensure correct compaction when backfilling utility trenches within footways. Where utility main is excavated adjacent to kerb race specific care must be taken not to undermine carriageway sub-base / capping below kerb race. Any such undermining will require full removal of kerb race and re-establishment of sub-base / capping depths and reconstruction of kerb race as directed by Director of Economy & Infrastructure.

14.11.2 Where more than a single utility box is located in close proximity within a footway (such as water stop tap boxes), they should be congregated within a 150 x 50 EF kerb border and in filled with a 150mm depth, brushed finish, ST4 Concrete. 200 x 50 EF to be used where located

within vicinity of a vehicle crossing. See Standard Detail. This detail allows for the surface to be correctly compacted around the utility boxes.

14.11.3 Utility positioning within footways should accord with NJUG guidelines. Table below gives summary of requirements for 2.0m wide footways.

Utility main or cable	Offset from face of kerb to centre of main or cable. (mm)	Required cover from footway finished level to top of main or cable. (mm)
Telecommunications	430	350 *
Water	690	900 *
Gas	960	600 *
Cable TV / Communications	1255	250 – 350 *
Electricity LV	1550	450 *
Electricity HV	1550	450 – 1200 *

\* Utility services cannot be installed within the footway construction and therefore must be depended to accord as necessary.

#### 14.12 Longitudinal Reflective cracking on divorced footways.

14.12.1 Due to prevailing geology in Worcestershire being mostly sandstones & clays, significant reflective surface cracking is experienced due to seasonal movement of the edging foundation on the formation.

14.12.2 To reduce the affect of this, Geogrid is proposed to be laid on the footpath formation extending below the edging kerb race by 0.5m.

14.12.2 A Bi-axial Geogrid to be provided in accordance with 4.3 or as determined by manufacturer.

14.12.4 Due to the constructional process in providing footways, the provision of geogrid is not deemed appropriate in general however WCC reserve the right to request similar formation stabilisation in individual circumstances.

## 15.0 VEHICLE, PEDESTRIAN & CYCLE CROSSINGS

### 15.1 Vehicular crossings

15.1.1 Vehicular crossings are to be provided at the entrances to all garages and residential properties with sufficient width to accommodate a vehicle.

15.1.2 For all vehicular crossing a minimum of three precast concrete kerbs 125mm x 255mm to BS 7263 Part 1 1994 Type BN, in accordance with standard construction drawings shall be installed to provide a vehicular crossing with a minimum width of 3.6m. These dropped kerbs shall be set to show an upstand of 20mm with tolerances as given in Section 1.28.7

### 15.2 Pedestrian crossings

15.2.1 Where pedestrian routes cross carriageways and footways at junctions, two dropped kerbs with tapers shall be provided on each side of the carriageway or junction. Tactile paving shall be installed in accordance with the Drawing Appendix and at the approval of the Director of Economy & Infrastructure.

15.2.2 The dropped kerb shall be set +6mm to +3mm with the carriageway channel level to the tolerances given in Section 1.28.7

### 15.3 Cycle crossings

15.3.1 Where a cycleway adjacent to the carriageway is interrupted by pedestrian or vehicular crossings, the change in level shall be achieved over at least two kerbs, using standard precast concrete kerbs and laid to suit in place of the standard one taper kerb.

15.3.2 The dropped kerb shall be set +6mm to +3mm with the carriageway channel level to the tolerances given in Section 1.28.7

### 15.4 Construction depths

15.4.1 Singular & multiple residential vehicular crossings shall be constructed in accordance with the Drawing Appendix and at the approval of the Director of Economy & Infrastructure.

15.4.2 For commercial and industrial crossings the construction shall be as per Standard Road Specification.

### 15.5 Dropped kerbs and alignments

15.5.1 Dropped kerbs and tapers shall comply with the requirements of BS 7263, Part 1, 1994 figures 2(a) and 2(k) respectively.

15.5.2 Kerbs shall be laid to a flowing alignment and to the construction requirements of Section 10 of this Specification.

## 15.6 Tactile Paving

15.6.1 Blister tactile paving is to be provided at in-line junction crossings & off-line crossings.

15.6.2 Blister tactile paving must align and be in the line of travel. It must abut a minimum 1.2m BN dropped kerb. The back edge must be at right angles to the direction of crossing.

15.6.3 Utility box positions within the footway should be designed / positioned so that they do not obstruct the tactile arrangement.

15.6.4 Tactile layouts shall accord in layout to the Standard Detail Drawings. In-line crossings should have a minimum 1.2m x 1.2m area whilst off-line crossings should have a minimum 0.8m x 1.2m area. Widths above 1.2m to be provided only where the volume of pedestrian movements constitutes this.

15.6.5 400 x 400 x 65mm Blister Tactile Paving Slabs must accord with BS EN 1339:2003.

15.6.6 As an alternative to 15.6.5, 200 x 133 x 60mm concrete block units to BS EN 1338:2003 can be used if approved by the Director of Economy & Infrastructure.

15.6.7 All blister tactile paving for un-controlled crossings to be Buff. All blister tactile paving for controlled crossings to be Red.

15.6.8 Blister paving should be laid on:

- 25mm bed of 1:6 cement / sand mortar
- 100mm ST1 Concrete
- 100mm Type 1 sub-base conforming to SHW Clause 803

## 16.0 VERGES & VISIBILITY SPLAYS

### 16.1 Seeding & Turfing - General

16.1.1 The Developer shall carry out all work in the Specification in accordance with BS 7370 General Landscape Operation or a Standard approved by the Director of Economy & Infrastructure.

16.1.2 Seeding can only be applied when suitable growing season is available. When weather condition / season is not applicable, turf should be provided.

### 16.2 Initial Ground Preparation

16.2.1 The topsoil shall be cultivated to a depth of 100mm avoiding the disturbance of the subsoil, by suitable approved mechanical means or by hand cultivation on banks or confined areas. All stones over 25mm in any dimension, weeds, roots and other undesirable material shall be removed from the location and disposed of at an approved Refuse Disposal Site. Soil shall be brought to a friable tilth by treading, firming and raking. Where applicable the degree of accuracy in determining a level profile shall be determined by boning rods, or other approved means, after firming in accordance with BS 7370. Operations shall not be carried out during periods of inclement weather where the ground is saturated, boggy or frost covered.

### 16.3 Fertilizer application

16.3.1 After final grading all areas to be seeded or turfed shall have a base dressing of an approved translocated, non-residual herbicide & pre-seeding fertilizer applied at the specified rate and in accordance with the manufacturer's instructions. The developer should provide details of the herbicide to be used prior to use. The dressing shall be applied by means of approved fertilizer distributor machinery or by hand in small confined areas and then lightly worked into the surface with harrow or rake 7 days prior to initial cultivation. The final level for seeding shall be 50mm above any adjacent hard surface area and shall be flush with any adjacent hard surface for turfing.

### 16.4 Seeding

16.4.1 After cultivation operations have been carried out, the areas shall be sown with grass seed, which has been stored off the ground in a clean, dry place free from vermin. The Developer shall be required to supply Certificates for all grass seed stating the source, mixture, percentage purity and percentage germination rate and date of purchase. The Director of Economy & Infrastructure will be entitled to take samples of the grass seed mixture for testing. The seed mixture shall meet the requirements of germination and purity laid down in BS 7370. Following an even distribution of seed, the developer shall carry out a light raking or harrowing of the area and ensure consolidation of the seed with the soil by the use of a light roller. All reasonable precautions shall be taken to ensure that pedestrians and other traffic does not cross areas during cultivation or until the grass is established.

16.4.2 The low-growth seed mixture (or similar approved) should accord with the following specification and be spread at a rate of 30g/m<sup>2</sup>:

- 30% Chewing Fescue
- 30% Slender Creeping Red Fescue
- 20% Smooth Stalked Meadow Grass
- 10% Hard Fescue
- 10% Browntop Bent

16.4.3 If the areas fail to germinate within one month then re-seeding will be necessary.

## 16.5 Reinforced Verge Construction

16.5.1 Due to the vehicle over run of verges (particularly where adjacent to shared surface carriageway construction) all verges must be constructed with a UPVC Grass Reinforcement Cellular Paver which can accommodate loadings of 20 tonnes. Construction to accord with Standard Detail Drawing 2020 200 08. In situations where larger vehicles are present or where excessive numbers are expected to over-run the verge construction should accord with Standard Detail Drawing 2020 600 02.

## 16.6 Turfing

16.6.1 After cultivating operations have been carried out, the areas shall be laid to turf, a sample of which has previously been approved by the Director of Economy & Infrastructure. Turf shall be to a uniform size and thickness from an approved supplier. It shall be laid with the use of boards in order that the Developer does not allow the previously laid grass to be walked on. All turf laid down shall be firmed with a wooden turfing hammer to give a uniform even area finishing 25mm above the edge of any adjacent hard area. Turf shall be laid in broken joints in a half band pattern. All turf shall be laid within 24 hours of delivery from the supplier and shall not be damaged or yellowed. Following turf laying an approved top dressing shall be spread and brushed over the turfed area ensuring all joints are adequately filled. To prevent scorching and shrinkage the turf shall not be allowed to dry out during establishment.

## 16.7 Maintenance of seeded areas

16.7.1 During the Spring following seeding, and before the application of any selective weed killer, the grassed area shall be dressed with an approved granular post seeding fertilizer applied at the rate of 50g per sq.m. During the period of establishment, all newly grassed areas shall be cut twice, each cut reducing the growth height by one third. The first and second cuts shall take place when the growth height reaches 75mm. Seeded areas shall be lightly rolled to consolidate the surface one week prior to the first cut. Cutting is to take place using suitable mowing machinery when conditions are not excessively wet or damp. Cutting shall be continued at appropriate intervals until the finished maximum height is 25mm.

## 16.8 Maintenance of turfed areas

16.8.1 During the Spring following seeding, and before the application of any selective weed killer, the grassed area shall be dressed with an approved granular post seeding fertilizer applied

at the rate of 50g per sq.m. During the period of establishment, all newly grassed areas shall be cut twice, each cut reducing the growth height by one third. The first and second cuts shall take place when the growth height reaches 75mm. Cutting is to take place using suitable mowing machinery when conditions are not excessively wet or damp. Cutting shall be continued at appropriate intervals until the finished maximum height is 25mm. During the period of establishment the Developer shall water the turf as often as necessary to ensure it does not dry out prior to establishment.

## **16.9 Overseeding**

16.9.1 When instructed by the Director of Economy & Infrastructure, the Developer shall overseed sparse or thin areas of turf. The turf shall be overseeded using suitable and appropriate cultivars of grass seed approved by the Director of Economy & Infrastructure at the rate of 35g per sq.m. The surface shall be graded or topsoiled as necessary to provide even running levels and a surface suitable for seeding.

## **16.10 Edge Support delineation**

16.10.1 Edge support delineation through pedestrian crossing points and around street lighting columns shall be provided by the installation of 50mm x 150mm Hydraulically pressed, precast, flat topped, concrete edgings to BS EN 1340:2003, Type EF, Figure K3b. Where a vehicular crossing is present a 50mm x 2000mm Hydraulically pressed, precast, flat topped, concrete edging is to be used.



## 17.0 STRUCTURES.

### 17.1 General

17.1.1 Structures that are considered to 'potentially affect' the safety of the highway, whether to be adopted or not and permanent or temporary, where Worcestershire County Council are the highway authority are to follow technical approval procedures as set out in the 'Technical Approval of Highway Structures' BD2 of the Design Manual for Roads and Bridges volume 1 section 1. After April 1st 2010 and unless agreed with the Technical Approval Authority (TAA) Eurocodes must be used for the design and modification of existing highway structures (including geotechnical works)

17.1.2 Technical assessment of any structure should follow the protocols stated within Clause 3.8 WCC Streetscape Design Guide.

17.1.3 Although not exhaustive the following listing provides details of structures which will be subject to Technical Assessment.

- All bridges over or under the highway
- All culverts pipes crossing under the highway greater than 0.9m span
- Pipes or culverted streams or other structures greater than 0.9m span or diameter along the highway either maintained privately or by statutory undertakers.
- Any structures which are not pipes less than 0.9m span/diameter
- Retaining walls greater than 4 feet in height and within 4 yards of the highway boundary as described in section 167 of The Highways Act 1980.
- Any retaining wall within 4 yards of the highway retaining sloping ground.
- Any retaining wall supporting the highway regardless of height.
- Any private cellar or basement under or adjacent to the highway
- Reinforced earth structures with or without hard facings, includes gabion and crib lock walls.
- High masts and lighting columns compliant with the standard for the design of minor structures BD94/07 will be category 0 unless notified otherwise.
- High masts and lighting columns not compliant with the standard for the design of minor structures BD94/07 will be category 1 unless notified otherwise.
- Any part of a building structure overhanging the highway
- Highway sign posts greater than 7m in height.
- Any temporary works which are described as above.
- Structures required to be assessed by the highway authority whether or not maintained by them.

## 18.0 STREET LIGHTING – HIGHWAY LIGHTING, ILLUMINATED SIGNS & ILLUMINATED BOLLARDS.

### 18.1 Introduction

18.1.1 This document is to be read in conjunction with Worcestershire County Council (WCC) Street Lighting Design Guide.

18.1.2 All highway lighting, illuminated signs and illuminated bollards must be designed, specified and installed to (WCC) requirements.

18.1.3 There are 2 methods for developers to achieve the above requirements:

**METHOD 1** - Developer elects to use the design facilities of WCC and its partnering consultant JACOBS. Lighting will be designed to WCC requirements for an agreed fee.

**METHOD 2** - Developer elects to design the highway lighting scheme in house or by using a specialist highway lighting Consultant. In either instance, designers must comply with the competency requirements specified by WCC and comply with the principals outlined in the Street Lighting Design Guide. The design must be submitted to WCC for approval. A fee will be charged for checking all designs submitted by the Developer. If the first submission is found to be unacceptable, an escalating fee will be charged for subsequent submissions.

The design must be approved prior to any installation work commencing on site.

Full details of the above methods are contained in the following sections.

18.1.4 If a developer fails to follow the requirements of either of the above methods, the highway lighting will not be adopted.

18.1.5 Method 1 is recommended as the preferred approach to fulfil WCC requirements as it provides a streamlined approach and reduces the developers' risk.

### 18.2 Procedures Summary

<b>METHOD 1 WCC TO DESIGN</b>	<b>WCC CHARGE</b>	<b>METHOD 2 DEVELOPER TO DESIGN</b>	<b>WCC CHARGE</b>
WCC to design	●	Developer to design	
Developer to set out column positions		WCC to design check	●
Installation of approved scheme		Re-design additional design checks	●++
Supply WCC with Test documents		Developer to set out column positions	
Inspection of approved scheme		Installation of approved scheme	
Additional installation inspections	●++	Supply WCC with Test documents	
Bulk clean and lamp change		WCC to inspect installation	
Light level checks	●	Additional installation inspections	●++
Payment of any commuted sums	●	Bulk clean and lamp change	●
Adoption		Light level checks	●
		Payment of any commuted sums	●
		Adoption	

●++ = Escalating charges

### **18.3 Method 1**

18.3.1 Developer elects to use the design facilities of Worcestershire County Council and its partnering consultant Jacobs. Lighting will be designed to WCC requirements for an agreed fee. If a Developer wishes to use this design service, then a schedule of requirements (SOR) will be issued upon request by Jacobs which would need to be fulfilled.

18.3.2 Commuted sums will be required to cover the future additional maintenance / replacement costs.

18.3.3 Listed Building Consent for attaching highway lighting equipment or illuminated signs to listed buildings may be a requirement where applicable. The Developer will fund and be responsible for the application and obtaining any such Wayleave and Listed Building Consent.

### **18.4 Setting Out Column Positions**

18.4.1 It will be the responsibility of the Developer (or his appointed independent Consultant or lighting contractor) to mark out on the site, the final lighting column positions in accordance with the approved design.

18.4.2 The Developer or his appointed independent Consultant shall deal with any correspondence/queries that may arise either with the Developer or members of the public etc but copies of correspondence/responses must be forwarded to the WCC Street Lighting Section for record purposes. Column positions may not be changed without the prior agreement of Worcestershire County Council.

18.4.3 It will be the Developer's responsibility to ensure that prospective property purchasers are fully aware of the location of all highway lighting equipment. Any subsequent alterations to an approved layout due to site considerations will not be approved unless the Developer can demonstrate that this change has been brought to the attention of owners/prospective purchasers.

### **18.5 Installation**

18.5.1 On sites where highway lighting already exists, the Developer shall be responsible for maintaining lighting provision (by means of temporary lighting if necessary), to the approval of WCC Street Lighting Section.

18.5.2 Existing highway lighting, illuminated signs or bollards shall NOT be disconnected prior to approval from WCC Street Lighting Section. Existing lighting may be the property of a District, Town or Parish Council; therefore early consultation is required to establish ownership of all existing lighting.

18.5.3 Electrical services to all highway lighting are to be supplied by the Distribution Network Operator. Generally Passive Safe equipment and signs and bollards located on islands and roundabouts are to be supplied using private cable from a dedicated local feeder pillar, but unless otherwise specified by Worcestershire County Council, private cables are NOT permitted. Details of the District Network Operator or their agent for this work can be obtained from WCC Street Lighting Section.

18.5.4 Where District Network Operator connections are required all underground electrical are to be installed in ducting as specified by the Distribution Network Operator.

18.5.5 For all private underground services 100mm smooth bore MDPE duct (orange colour) is to be installed to WCC requirements.

18.5.6 Where private underground services are provided in road crossings, additional ducting will be provided at the expense of the developer. Future usage of these ducts will be developed in conjunction with WCC Street Lighting Section

18.5.7 Where the extent of the removal is temporary to facilitate other works, the developer will be responsible for safe storage and subsequent return in original condition and to working operation.

18.5.8 The developer shall be responsible for the implementation of all work required in the removal, replacement or resiting of any existing lighting equipment made necessary by the site works. This work may involve the total removal and disposal of units from site and/or the replacement/resiting of units within the general area affected by the site works.

18.5.9 Installation work is to be carried out by a WCC approved specialist highway lighting Contractor. A list of specialist Approved Highway Lighting Contractors can be obtained from WCC Street Lighting Section. All highway lighting contractors who are approved must hold up-to-date Highway Electrical Sector Scheme certificates of competency, be Members of the National Inspection Council of Electrical Installation Contractor (NICEIC) and the Association of Street Lighting Contractor (ASLEC).

18.5.10 To safeguard Health and Safety, all statutory requirements and any other requirements specified by WCC must be fully complied with. Developers should note that existing lighting points and illuminated signs may be supplied either by private cable or DNO cable. Guidance must be sought from Worcestershire County Council.

18.5.11 Highway lighting columns are to be sited at the rear of and within the footway and within the adoptable area.

18.5.12 All highway lighting columns are to be numbered in accordance with the approved highway lighting standard design drawing NWL 1 of Worcestershire County Council's specifications (available on request).

## **18.6 Electrical Testing**

18.6.1 The Developer must arrange for the highway lighting installation Contractor to electrically test all the highway lighting equipment, including any private cables, installed on the development. The testing must be in accordance with the latest edition of BS7671 at the time of the test and in accordance with the requirements of WCC Street Lighting Section specification

18.6.2 A copy of the completed Test Certificate (ECTIC) that is issued with the Street Lighting Design Guide must be returned within 7 (seven) days of the test readings being recorded. The ECTIC form is available on request.

## **18.7 Inspections by Worcestershire County Council**

18.7.1 WCC Street Lighting Section will carry out a full provisional and final inspection of the highway lighting system upon request by the Developer. Any defect noted on inspection will be identified and referred back to the Developer or his appointed independent Consultant.

18.7.2 Any defects found and notified to the Developer or his appointed independent Consultant must be rectified within eight weeks of the defect report being issued.

18.7.3 Special note should be made of the cost implications under Item 8 for any abortive Inspection visits by the WCC Street Lighting Section.

18.7.4 In advance of the inspection by WCC, the Developer shall undertake lighting measurements to demonstrate that design levels have been achieved in practice. Worcestershire CC is able to offer this service for an additional fee.

18.7.5 All Wayleaves and Listed Building Consents shall be fully agreed and completed and submitted to WCC before inspection can commence.

### **18.8 Additional Developer Responsibilities**

18.8.1 For a minimum period of 12 (twelve) months from the date on which the Worcestershire County Council Development Control Section certifies in writing that the works are acceptable, the Developer shall execute all work necessary to maintain the highway lighting in good repair and rectify any faults as directed by WCC Street Lighting Section. During this time the Developer is fully responsible for all costs associated with the equipment until formal Adoption this includes:

18.8.2 Any damage whether accidental or due to vandalism, all operational and maintenance costs which includes:

- Routine maintenance such as lantern cleaning and regular checking on continuing operation.
- Non-routine maintenance such as replacement failures of lamps, photoelectric cells, electrical control ballasts, fuses
- Electrical energy.

18.8.3 At the time of formal adoption, a complete lamp change will be required. This will be carried out by Worcestershire County Council's maintenance contractor at the Developer's expense.

18.8.4 Worcestershire County Council expects the Developer to maintain the unadopted installation in safe working order and repair all faults within 5 workings days from the fault occurring.

### **18.9 Charges by the County Council**

18.9.1 A fee will be charged to undertake the Highway Lighting design. A quotation will be provided after submission of a detailed Highways layout drawing. These charges will be subject to a minimum charge for each Section 38 or Section 278 Agreement.

18.9.2 The Developer will be required to make a one- off payment to Worcestershire County Council for the following: -

- Section 38/278 Agreements; where enhanced equipment is agreed, a charge shall be made for the additional renewal and maintenance cost as determined by WCC Street Lighting Section.
- Section 278 Agreements; the cost of maintenance and replacement for each highway light and illuminated sign based on a 30 (thirty) year design life period. This cost will apply to each highway unit that is subject to the Section 278 Agreement.
- The Developer will be required to make a payment to WCC for each requested follow-up inspection of the highway lighting system on a development prior to Adoption, after a previous inspection has resulted in faults being reported and then found not to have been rectified.
- Under Section 38 Agreements the Developer will meet the cost for cleaning and the installation of replacement lamps in each highway light, illuminated sign and bollard (bulk change) on completion of Adoption. This cost will apply to each highway unit that is subject to the Section 38 Agreement.

- The scale of charges applying at the date of enquiry for Commuted Sums and for abortive site visits in respect of inspections by the County Council can be obtained from WCC Street Lighting Section.

## **18.10 Method 2**

18.1.1 Developer elects to design the highway lighting scheme in house or by using a specialist highway lighting Consultant.

18.10.2 Designers must comply with the requirements of the Institution of Lighting Engineers' Competency Requirements for Lighting Design Staff meeting the requirements of HD46-06 and the CDM Regulations.

18.10.3 If a Developer does wish to carry out their own highway lighting design, the specification brief for that location must be obtained from Worcestershire County Council Street Lighting Section. The design must then be submitted and approved prior to any installation work commencing on site.

## **18.11 Design Consideration**

18.11.1 The need for communication and co-ordination between Worcestershire County Council's Street Lighting Section and the Developer from an early stage is essential to the success of this process.

18.11.2 Unless stated otherwise, in line with the Street Lighting Design Guide, Worcestershire County Council will require the Developer to provide highway lighting schemes conforming to the most recent appropriate published Codes of Practice standards for roads, footways and cycle tracks that are to be adopted as highways maintained at the public expense.

18.11.3 All highway lighting must be adopted by the relevant Lighting Authority. The Lighting Authority may be Worcestershire County Council or a District, Town or Parish Council. In some instances Worcestershire County Council will act as the design/approval agent for a District, Town or Parish Council.

18.11.4 Where environmental considerations dictate e.g. Conservation Areas, it may be decided by the County Council that enhanced choices of materials are required, reduced standards of highway lighting could be provided or no lighting at all. In such locations the views of the respective District, Town or Parish Council are considered. Developers must advise Worcestershire County Council Street Lighting Section of any special environmental considerations that may affect lighting provision at the time.

18.11.5 Where alternative or special highway lighting lanterns and columns are requested by the Developer and are acceptable to, and approved by Worcestershire County Council a commuted sum will be required to cover the additional maintenance/replacement costs in the future.

18.11.6 Listed Building Consent for attaching highway lighting equipment or illuminated signs to listed buildings may be a requirement where applicable. The Developer will fund and be responsible for the application and obtaining any such Wayleave and Listed Building Consent.

18.11.7 Where new private road or major private access junctions are created, adjustments or additions to the highway lighting along the existing highway may be required, and either a Section 38 or a Section 278 Agreement will be required from Worcestershire County Council Development Control Section.

## **18.12 Design Requirements**

18.12.1 Lighting designs shall be provided in line with the Street Lighting Design Guide. This shall be requested by the developer from the Street Lighting Section via communication with the Development Control Section.

18.12.2 Failure to seek approval of the highway lighting design will prevent the Section 38.

## **18.13 Highway Lighting Equipment Requirements and Installation Standards**

18.13.1 If the Developer wishes to carry out their own highway lighting design on a new development, when requested WCC will issue:

- Worcestershire County Council Street Lighting Design Guide which includes; Approved Equipment List and a list of the relevant Statutes, Regulations, Codes of Practice, Guidance Notes and British/European Standards relevant to WCC requirements.
- Worcestershire County Council Highway Lighting Standard Detail Drawings which includes; Installation Specifications (including street lighting illuminated sign and bollard equipment).
- Worcestershire County Council Electrical Completion Test and Inspection Certificate (ECTIC) form.
- Location and specification of all existing lighting assets in the vicinity of the development.

18.13.2 If a design is submitted without the Developer obtaining the Street Lighting Design Guide from Worcestershire County Council, the design will not be approved. WCC accept no responsibility for additional costs incurred by the Developer for failing to abide by the process.

18.13.3 On sites where highway lighting already exists, the Developer shall be responsible for maintaining lighting provision (by means of temporary lighting if necessary), to the approval of WCC Street Lighting Section.

18.13.4 Existing highway lighting, illuminated signs or bollards shall NOT be disconnected prior to approval from WCC Street Lighting Section. Existing lighting may be the property of a District, Town or Parish Council; therefore early consultation is required to establish ownership of all existing lighting.

18.13.4 Electrical services to all highway lighting are to be supplied by the Distribution Network Operator. Generally Passive Safe equipment and signs and bollards located on islands and roundabouts are to be supplied using private cable from a dedicated local feeder pillar, but unless otherwise specified by Worcestershire County Council, private cables are NOT permitted. Details of the District Network Operator or their agent for this work can be obtained from WCC Street Lighting Section.

18.13.5 Where District Network Operator connections are required all underground electrical are to be installed in ducting as specified by the Distribution Network Operator.

18.13.6 For all private underground services 100mm smooth bore MDPE duct (orange colour) is to be installed to WCC requirements.

18.13.7 Where private underground services are provided in road crossings, additional ducting will be provided at the expense of the developer. Future usage of these ducts will be developed in conjunction with WCC Street Lighting Section

18.13.8 Where the extent of the removal is temporary to facilitate other works, the developer will be responsible for safe storage and subsequent return in original condition and to working operation.

18.13.9 The developer shall be responsible for the implementation of all work required in the removal, replacement or resiting of any existing lighting equipment made necessary by the site works. This work may involve the total removal and disposal of units from site and/or the replacement/resiting of units within the general area affected by the site works.

18.13.10 Installation work is to be carried out by a WCC approved specialist highway lighting Contractor. A list of specialist Approved Highway Lighting Contractors can be obtained from WCC Street Lighting Section. All highway lighting contractors who are approved must hold up-to-date Highway Electrical Sector Scheme certificates of competency, be Members of the National Inspection Council of Electrical Installation Contractor (NICEIC) and the Association of Street Lighting Contractor (ASLEC).

18.13.11 To safeguard Health and Safety, all statutory requirements and any other requirements specified by WCC must be fully complied with. Developers should note that existing lighting points and illuminated signs may be supplied either by private cable or DNO cable. Guidance must be sought from Worcestershire County Council.

18.13.12 Highway lighting columns are to be sited at the rear of and within the footway and within the adoptable area.

18.13.13 All highway lighting columns are to be numbered in accordance with the approved highway lighting standard design drawing NWL 1 of Worcestershire County Council's specifications (available on request).

#### **18.14 Setting Out Column Positions**

18.14.1 It will be the responsibility of the Developer (or his appointed independent Consultant or lighting contractor) to mark out on the site, the final lighting column positions in accordance with the approved design.

18.14.2 The Developer or his appointed independent Consultant shall deal with any correspondence/queries that may arise either with the Developer or members of the public etc but copies of correspondence/responses must be forwarded to the Worcestershire County Council Street Lighting Section for record purposes. Column positions may not be changed without the prior agreement of Worcestershire County Council.

18.14.3 It will be the Developer's responsibility to ensure that prospective property purchasers are fully aware of the location of all highway lighting equipment. Any subsequent alterations to an approved layout due to site considerations will not be approved unless the Developer can demonstrate that this change has been brought to the attention of owners/prospective purchasers.

#### **18.15 Electrical Testing**

18.15.1 The Developer must arrange for the highway lighting installation Contractor to electrically test all the highway lighting equipment, including any private cables, installed on the development. The testing must be in accordance with the latest edition of BS7671 at the time of the test and in accordance with the requirements of WCC Street Lighting Section specification



18.15.2 A copy of the completed Test Certificate (ECTIC) that is issued with the Street Lighting Design Guide must be returned within 7 (seven) days of the test readings being recorded. The ECTIC form is available on request.

### **18.16 Inspections by Worcestershire County Council**

18.16.1 WCC Street Lighting Section will carry out a full provisional and final inspection of the highway lighting system upon request by the Developer. Any defect noted on inspection will be identified and referred back to the Developer or his appointed independent Consultant.

18.16.2 Any defects found and notified to the Developer or his appointed independent Consultant must be rectified within eight weeks of the defect report being issued.

18.16.3 Special note should be made of the cost implications under Item 8 for any abortive Inspection visits by the WCC Street Lighting Section.

18.16.4 In advance of the inspection by WCC, the Developer shall undertake lighting measurements to demonstrate that design levels have been achieved in practice. Worcestershire CC is able to offer this service for an additional fee.

18.16.5 All Wayleaves and Listed Building Consents shall be fully agreed and completed and submitted to WCC before inspection can commence.

### **18.17 Additional Developer Responsibilities**

18.17.1 For a minimum period of 12 (twelve) months from the date on which the Worcestershire County Council Development Control Section certifies in writing that the works are acceptable, the Developer shall execute all work necessary to maintain the highway lighting in good repair and rectify any faults as directed by WCC Street Lighting Section. During this time the Developer is fully responsible for all costs associated with the equipment until formal Adoption this includes:

18.17.2 Any damage whether accidental or due to vandalism, all operational and maintenance costs which includes:

- Routine maintenance such as lantern cleaning and regular checking on continuing operation.
- Non-routine maintenance such as replacement failures of lamps, photoelectric cells, electrical control ballasts, fuses.
- Electrical energy

18.17.3 At the time of formal adoption, a complete lamp change will be required. This will be carried out by Worcestershire County Council's maintenance contractor at the Developer's expense.

18.17.4 Worcestershire County Council expects the Developer to maintain the unadopted installation in safe working order, and repair all faults within 5 workings days from the fault occurring.

### **18.18 Charges by the County Council**

18.18.1 A fee will be charged for checking all designs submitted by the Developer. A quotation will be provided after submission of the detailed layout drawing.

18.18.2 If the first submission is found to be unacceptable, an escalating fee will be charged for subsequent submissions

18.18.3 The Developer will be required to make a one- off payment to Worcestershire County Council for the following:

- Section 38/278 Agreements; where enhanced equipment is agreed, a charge shall be made for the additional renewal and maintenance cost as determined by Worcestershire County Council Street Lighting Section.
- Section 278 Agreements; the cost of maintenance and replacement for each highway light and illuminated sign based on a 30 (thirty) year design life period. This cost will apply to each highway unit that is subject to the Section 278 Agreement.
- The Developer will be required to make a payment to Worcestershire County Council for each requested follow-up inspection of the highway lighting system on a development prior to Adoption, after a previous inspection has resulted in faults being reported and then found not to have been rectified.
- Under Section 38 Agreements the Developer will meet the cost for cleaning and the installation of replacement lamps in each highway light, illuminated sign and bollard (bulk change) on completion of Adoption. This cost will apply to each highway unit that is subject to the Section 38 Agreement.

18.18.4 The scale of charges applying at the date of enquiry for Commuted Sums and for abortive site visits in respect of inspections by the County Council can be obtained from Worcestershire County Council Street Lighting Section.

## 19.0 STREET NAMEPLATES.

### 19.1 General

19.1.1 Street naming and nameplates remain the responsibility of the relevant City or District Council. Developers should contact the relevant City or District Council for requirements and specification details as per the details below.

- Bromsgrove & Redditch Borough Council - [llpgqueries@bromsgroveandredditch.gov.uk](mailto:llpgqueries@bromsgroveandredditch.gov.uk)
- Malvern Hills District Council – Contact the Street naming team at 01684 862147
- Worcester City Council - [snn@worcester.gov.uk](mailto:snn@worcester.gov.uk)
- Wychavon District Council – Online applications are via <https://www.wychavon.gov.uk/planning/other-planning-services/street-naming-and-numbering> or contact 01386 565456.
- Wyre Forest District Council - Contact the Street Scene section on 01562 732928 or on-line information at <https://www.wyreforestdc.gov.uk/housing/street-naming-and-numbering.aspx>

## APPENDIX A – CONSTRUCTION THICKNESSES SUMMARY

### STANDARD RESIDENTIAL ROAD CONSTRUCTION

Layer	Material	Compacted Thickness
Surface course	HRA 55/14 C SURF 40/60	45mm
Binder course	AC20 Dense Binder 100/150	60mm
Base course	AC32 Dense Base 100/150	160mm
Sub-base	MOT Type 1	See table CI 5.5.1
Capping	6F1, 6F2	See table CI 5.5.1

### INDUSTRIAL ROAD CONSTRUCTION

Layer	Material	Compacted Thickness
Surface course	HRA 35/14 C SURF 40/60 & 14/20 Pre-Coated Chippings	50mm
Binder course	AC20 Dense Binder 100/150	60mm
Base course	AC32 Dense Base 100/150	200mm
Sub-base	MOT Type 1	See table CI 5.5.1
Capping	6F1, 6F2	See table CI 5.5.1

### BLOCK PAVING ROAD CONSTRUCTION

Layer	Material	Compacted Thickness
Surface course	Precast concrete rectangular blocks of dimensions 200 x 100mm	80mm
Laying course	Category 11 laying course (sharp) sand	30mm
Binder course	AC20 Dense Binder 100/150	60mm
Base course	AC32 Dense Base 100/150	160mm
Sub-base	MOT Type 1	See table CI 5.5.1
Capping	6F1, 6F2	See table CI 5.5.1

### FOOTWAY CONSTRUCTION

Layer	Material	Compacted Thickness
Surface course	AC6 Dense Surf 100/150 or SMA 6 SURF.	25mm
Binder course	AC20 Dense Binder 100/150	60mm
Base course	AC32 Dense Base 100/150	100mm
Sub-base	MOT Type 1	150mm

**FOOTPATH CONSTRUCTION (NON-VEHICLE ACCESS)**

Layer	Material	Compacted Thickness
Surface course	AC6 Dense Surf 100/150 or SMA 6 SURF	25mm
Binder course	AC20 Dense Binder 100/150	75mm
Sub-base	MOT Type 1	150mm

**FOOTWAY VEHICULAR CROSSING**

Layer	Material	Compacted Thickness
Surface course	AC6 Dense Surf 100/150 or SMA 6 SURF.	25mm
Binder course	AC20 Dense Binder 100/150	60mm
Base course	AC32 Dense Base 100/150	100mm
Sub-base	MOT Type 1	200mm

## APPENDIX B – Testing to be carried out by the contractor

- a) This list is not exhaustive but covers the main items that will usually arise from the construction of Residential Roads. Concrete structures, buried corrugated steel structures, safety fencing, etc will require additional testing.
- b) Tests comparable to those specified in this appendix shall be undertaken for any equivalent work, goods or materials proposed by the Contractor (see sub clause 105.4 of the DoT SHW).
- c) All testing will be carried out at the developer's expense.
- d) (N) Indicates that a NAMAS test report or Certificate is required.
- e) Unless otherwise shown in this Appendix tests for work, goods or materials as scheduled under any one Clause are required for such work, goods or materials in the works.
- f) Where the Contractor uses work, goods or materials for which a testing schedule is not shown in Appendix B2 of the Specification, the Contractor shall use a test and frequency of test on the work, goods or materials as recommended by the Manufacturer and approved by the Director of Economy & Infrastructure.
- g) Cube strengths shall not be required for concrete complying with BS5328 Standard Mixes.
- h) Any testing laboratory or company employed by the developer to undertake construction testing must be UKAS accredited.

## APPENDIX C – Worcestershire County Council Highways Construction Testing & Inspection programming for New Developments

Development Construction Stage	WCC Testing Requirement	Notification of Inspection
Formation Level.	CBR tests, quantity and location to be agreed with Supervising Officer	WCC Officer to Inspect formation & compaction.
Capping of Sub-base	Material / Compaction Testing  Material conveyance tickets with final daily supply total copied to supervising officer on request	WCC officer to inspect Material / Compaction Confirm and agree 6F2 capping required depths based on CBR values with supervising officer prior to commencement of works.
Completion of Sub-base  Granular Sub-base Type 1	Material / Compaction Testing  Material conveyance tickets with final daily supply total copied to inspecting officer on request	WCC officer to inspect.
Base course	Material / Compaction Testing  Material conveyance tickets with final daily supply total copied to inspecting officer on request	WCC officer to inspect.
Binder course	Material / Compaction Testing  Material conveyance tickets with final daily supply total copied to inspecting officer on request	WCC officer to inspect.
Surface course	Material / Compaction Testing  Material conveyance tickets with final daily supply total copied to inspecting officer on request	WCC officer to inspect.
Carriageway Surface regularity	Rolling Straight Edge	WCC officer to inspect
Pipes for drainage and service ducts.	Manufacturers Certificate of conformity	WCC officer to inspect.
Pipe bedding	Material Testing  Material conveyance ticket copied to inspector on request	WCC officer to inspect

Development Construction Stage	WCC Testing Requirement	Notification of Inspection
Filter Media backfill	Material Testing on request	WCC officer to inspect
Precast concrete manhole chambers and ancillaries including covers	Manufacturers Certificate of conformity	WCC officer to inspect
Gullies (Precast Concrete and Plastic)	Manufacturers Certificate of conformity Contractor to provide operative to free and lift gully and I/C covers	WCC officer to inspect
Highway adoptable Drainage Systems	CCTV survey, report and log copied to inspector. Possible Air Test	WCC officer to inspect
Water Authority adoptable sewer systems	Material / Compaction testing of granular trench backfill	Submit evidence of Water Authority approval
Acceptable material (Recycled)	Material testing Suppliers Certificates of conformity	WCC officer to inspect
Precast Kerbs, channels and edgings	Certificates of conformity	WCC officer to inspect
Block paving	Manufacturers Certificates of conformity	WCC officer to inspect
Block paving laying sand	Material testing Suppliers Certificates of conformity	WCC officer to inspect
Bricks & Blocks	Manufacturers Certificates of conformity	WCC officer to inspect

All variations to approved drawings and specifications shall be submitted in writing to the Council's Engineer with supporting revised drawing(s) for approval and prior to work completion.

No surfacing of the development is permitted prior to an inspection, completion of any identified defects and written approval by WCC Inspecting officer.

The developer, when requested, shall provide WCC Inspecting officer with detailed core logs and material testing results taken at agreed locations.

On completion of S278 / 38 works, the developer shall formally request in writing the Provisional Certificate of Completion. All necessary inspections will be undertaken and any arising defective works shall be reported to the Developer. These defective works shall be remedied to the satisfaction of the WCC Inspecting officer prior to commencement of the minimum 12 Month Maintenance period.

Following the 12 Month maintenance period the Developer shall formally request in writing the Final Certificate of Completion. All necessary inspections will be undertaken and any arising defective works shall be reported to the Developer. These defective works shall be remedied to



the satisfaction of the WCC Inspecting officer prior to issuing the Final Certificate of Completion and adoption of the works.

## APPENDIX C1 – Earthworks, Sub-base & Trench Reinstatement

### Materials Compaction Sheet 1

#### Definitions, Classification and General use of Earthworks Materials

The following definitions of earthworks materials shall apply to this and other Clauses of the Specification in which reference is made to defined materials:

- I. Topsoil shall mean the top layer of soil that can support vegetation
- II. Suitable material shall comprise all that which is acceptable in accordance with the Specification for use in the works.
- III. Unsuitable material shall mean other than suitable material and shall comprise:
  - Material from swamps, marshes and bogs;
  - Peat, logs, stumps and perishable materials
  - Materials susceptible to spontaneous combustion
  - Materials in a frozen condition
  - Clay of liquid limit exceeding 90 and/or plasticity index exceeding 65

Materials giving a moisture content greater than the maximum permitted for such materials in the Specification, unless otherwise permitted by the Director of Economy & Infrastructure Representative.

For the purpose of Appendix C3 Earthworks Compaction Table materials are grouped as follows:

‘Cohesive soil’ includes clays and marls with up to 20 percent of gravel or rock and having a moisture content not less than the level of the plastic limit (determined in accordance with BS 1377 Test No 3) minus 4; also chalk having a saturation moisture content of 20 percent or greater.

‘Well graded granular and dry cohesive soils’ includes clays and marls with up to 20 percent of gravel coefficient exceeding 10 and chalk having a saturation moisture content of 15-20 percent, well graded sands and gravels with a uniformity or rock and having a moisture content not less than the level of the plastic limit.

‘Uniformly graded material’ includes sand and gravels with a uniformity coefficient of 10 or less and all silts and pulverised fuel ashes. Any soil containing 80 percent or more of material in the particle size range 0.06-0.002mm will be regarded as silt for this purpose.

The Developer shall only employ that plant which is suitable to the soils that are to be handled. He shall take care to maintain the nature of the suitable material so that when it is placed and compacted it remains suitable in accordance with the Specification.

Where the excavation reveals a combination of suitable and unsuitable material the Developer is advised to carry out the excavation in such a manner that the suitable materials are excavated separately for use in the works without contamination by the unsuitable materials.

Materials for use as sub-base shall comply with the requirements of S6.2.

The compaction of sub-base material shall meet the requirements of Appendix C4 Sub-base compaction table.

For the purposes of Appendix C5 Materials will be grouped as follows:

- Cohesive materials
- Granular materials
- Bituminous materials

These materials shall be strictly in accordance with the Specification. The compaction of the trench reinstatement materials shall meet the requirements of Appendix C5 Trench Reinstatement Compaction Tables.

## APPENDIX C2 – Compaction Plant

1. The depth of a compacted layer is the height by which the embankment is raised by each successive compacted layer.
2. The number of passes is the number of times that each point on the surface of the layer being compacted has been traversed by the item of compaction plant.
3. The compactive effort of each compactor is a function of the mass of the machine and the compaction plant in Appendices C3, C4 and C5 are listed in terms of their masses. Where a smooth wheeled roller has more than one axle the machine shall be assessed on the basis of the axle giving the lowest value of mass per metre width.
4. Vibrating rollers are self-propelled or towed smooth wheeled rollers having a means of applying mechanical vibration to one or more rolls.
5. The requirements of vibrating 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 a hydrostatic transmission. If higher speeds or gears are used an increased number of passes shall be provided in proportion to the increase in speed of travel.
6. Where a mechanical vibration is applied to two rolls in tandem, the minimum number of passes shall be half the number given in the compaction tables (Appendices C3, C4 and C5) for the appropriate mass per metre width of one vibrating roll. If one roll differs in mass per metre width from the other, the number of passes shall be calculated as for the roll of the lower value. Alternatively, the machine may be treated as having a single vibrating roll with a mass per metre equal to that of the roll with the higher value.
7. Vibrating type rollers operating without vibration will be classified as smooth wheeled rollers.
8. Vibrating rollers shall be operated with their vibratory mechanism operating only at the frequency of vibration recommended by the Manufacturer. All such rollers shall be equipped or provided with a device automatically indicating the frequency at which the mechanism is operating.
9. Vibrating plate compactors are machines having a base plate to which is attached a source of vibration consisting of one or two eccentrically weighted shafts.
10. The mass per unit area of vibrating plate compactors is calculated by dividing the total mass of the machine in its working condition by the area of the plate on contact with the surface of the layer being compacted.

11. Vibrating plate compactors shall be operated at the frequency of vibration recommended by the Manufacturer. They shall nominally be operated at travelling speeds of less than 1km/h but if higher speeds are necessary the number of passes shall be increased in proportion to the increase in speed of travel.

12. Vibro tampers are machines in which an engine driven reciprocating mechanism acts on a spring system through the oscillations set up in a base plate.

13. Where combinations of different type of categories of plant are used, the compaction requirements shall be: The depth of layer shall be that shall be that for the type of plant required least depth of layer, and: The number of passes shall be that for the type of plant requiring the greatest number of passes.

14. Where the Contractor uses a lighter type of plant to provide some preliminary compaction only to assist the use of heavier plant, this shall be disregarded in assessing the requirements of Appendix C3.

15. Where materials of widely divergent characteristics are used in embankments and fill area they shall be spread and compacted in separate clearly defined areas in such a manner as to comply with the requirements of Appendix C3.

16. If more than one Class of material is being used in such a way that it is not practicable to define the areas in which each class occurs, compaction plant shall be operated as if only the material which requires the greater compactive effort is required.

17. If in doubt about the choice of appropriate plant, the Developer should contact the Director of Economy & Infrastructure's Representative.

## APPENDIX C3 – Earthworks Compaction Table

Type of Compaction Plant	Category	Cohesive Soils		Well Graded Granular & Dry Cohesive Soils		Uniformly Graded Material	
		D	N	D	N	D	N
Smooth Wheeled Roller	Mass per m width of roll Kg/m	125	8	125	10	125	10
		125	6	125	8	125	8
		150	4	150	8	Unsuitable	
		Over 2100kg up to 2700kg		Over 2700kg up to 5400kg		Over 5400kg	
Vibrating Roller	Mass per m width of roll on a vibrating roller Kg/m	Unsuitable		75	16	150	16
		Unsuitable		75	12	150	12
		100	12	125	10	150	6
		125	8	150	8	200	10
		150	4	150	4	225	12
		175	4	175	4	250	10
		200	4	200	4	275	8
		225	4	225	4	300	8
		250	4	250	4	300	6
		275	4	275	4	300	4
Vibrating Plate Compactor	Mass per unit area of base Kg/sq.m	Unsuitable		Unsuitable		75	6
		Unsuitable		75	10	100	6
		Unsuitable		75	6	150	6
		100	6	125	6	150	4
		150	6	150	5	200	4
		200	6	200	5	250	4
		Over 2100kg					
Vibro-Tamper	Mass	100	3	100	3	150	3
		125	3	125	3	200	3
		150	3	150	3	225	3
		225	3	200	3	225	3
		Over 100kg					

**D** - Maximum Number of Compacted Layers      **N** – Minimum Number of Passes

**#** - For Twin drum machines with both drums vibrating, halve the number of passes.

Small vibrating plate compactors do not comply with minimum requirements therefore are not suitable for formation compaction. Manufacturers plant should be checked against Type & Category to determine suitability.

## APPENDIX C4 – Sub-base Compaction Table

Type of Compaction Plant	Category	Number of passes for layers not greater than:	Number of passes for layers not greater than:
Smooth Wheeled Roller	Mass per m width of roll Kg/m	<b>110mm</b>	<b>150mm</b>
	Over 2700kg up to 5400kg Over 5400kg		
		16 8	Unsuitable 16
Vibrating Roller	Mass per m width of roll on a vibrating roller Kg/m	#	#
	Over 700kg up to 1300kg	16	Unsuitable
	Over 1300kg up to 1800kg	6	16
	Over 1800kg up to 2300kg	4	6
	Over 2300kg up to 2900kg	3	5
	Over 2900kg up to 3600kg	3	5
	Over 3600kg up to 4300kg	2	4
	Over 4300kg up to 5000kg Over 5000kg	2 2	4 3
Vibrating Plate Compactor	Mass per unit area of base Kg/sq.m		
	Over 1400kg up to 1800kg	8	Unsuitable
	Over 1800kg up to 2100kg Over 2100kg	5 3	8 6
Vibro-tamper	Mass Kg		
	Over 50kg up to 65kg	4	8
	Over 65kg up to 75kg Over 75kg up to 100kg	3 2	6 4

# - For Twin drum machines with both drums vibrating, halve the number of passes.

Small vibrating plate compactors do not comply with minimum requirements therefore are not suitable for formation compaction. Manufacturers plant should be checked against Type & Category to determine suitability.

## APPENDIX C5 – Trench Reinstatement Compaction Table

Compaction Plant & Weight Category	Cohesive Materials		Less than 20% granular content		Granular Materials		More than 20% granular content		Bituminous Material		All Bituminous materials & asphalts	
	Compaction passes required / layers compacted thickness up to:		Compaction passes required / layers compacted thickness up to:		Compaction passes required / layers compacted thickness up to:		Compaction passes required / layers compacted thickness up to:		Compaction passes required / layers compacted thickness up to:		Compaction passes required / layers compacted thickness up to:	
	100mm	150mm	200mm	100mm	150mm	200mm	40mm	60mm	80mm	100mm		
Vibro-tamper 50Kg Minimum	4	8*	Unsuitable	4	8*	12	5**	7**	Unsuitable	Unsuitable		
Vibrating Roller 600-1000kg/m twin Drum 1000-2000kg/m single drum 1000-2000kg/m twin drum 2000-3500kg/m single drum Over 2000kg/m twin drum Over 3500kg/m single drum	Unsuitable	Unsuitable Unsuitable	Unsuitable Unsuitable Unsuitable Unsuitable	6 6 3 3 2	Unsuitable Unsuitable 6 5 3 4	Unsuitable Unsuitable Unsuitable Unsuitable Unsuitable	5 6 4 5 3 4	7 Unsuitable 5 7 4 6	Unsuitable Unsuitable 6 8 4 7	Unsuitable Unsuitable Unsuitable Unsuitable		
Vibrating Plates 1400-1800kg/sq.m Over 1800kg/sq.m	Unsuitable 3	Unsuitable 6	Unsuitable Unsuitable	5 3	Unsuitable 5	Unsuitable 7	6 4	Unsuitable 5	Unsuitable 6	Unsuitable 8		

### NOTES

a) Single Drum Indicates vibration on one drum only.	Minimum layer thickness of 75mm	Compaction should be discontinued if any distress to the material is noticed.
b) Twin Drum requires vibration on both drums	Minimum layer thickness of 75mm	
c) Twin Drum Rollers required for bituminous material	Minimum layer thickness of 75mm	

Alternative plant for trenches less than 200mm wide, small excavations and other areas with restricted access		
Vibro Tamper 2.5Kg Minimum	6 passes minimum	6 passes minimum
Percussive Rammer 1.0Kg Minimum	Maximum layer thickness 100mm	Maximum layer thickness 100mm



## APPENDIX C6 – Trench Compaction Testing Requirements

### Clegg Impact Tester Equipment

#### Optional sizes 4.5KG / 10KG / 20KG

4.5KG Popular choice of equipment for testing soil and granular backfill materials up to circa 225mm in layer depth.

10KG / 20KG For testing of harder materials such as granular aggregate backfill materials up to circa 500mm in layer depth.

#### Protocol (Site test procedure)

Undertake test on level ground / backfill materials

Do not undertake test on irregularly large aggregate but of similar backfill material to that being tested.

Remove excessively loose aggregate

Position apparatus vertically and hold steady in position

Undertake tests to manufacturers specifications

Raise and drop hammer from drop height and repeat x 5 times

4<sup>th</sup> reading is the critical reading and representative of compaction value

#### Frequency of tests

Every 25m as a minimum for retrospective testing or as directed by Adopting / Site engineer

Average of 5m intervals during W.I.P within unsupported shallow trench excavations undertaken at appropriate layer thickness in accordance with Clegg hammer weight.

In situations of drainage installation at depth or in unstable ground conditions requiring trench support. Continual tests throughout trench, appropriate to backfill layer thickness and on each movement of individual trench box supports.

#### CBR / CIV Values

CORRELATION with CALIFORNIA BEARING RATIO

Example CBR Value  $10\% \times (0.24 (CIV) + 1)^2$

Based on the above formula a CIV of 10 equates to a CBR of a 11.6%, 15 is 21.2% and 20 is 33.6%

This equation is generally considered appropriate for widespread use. However, since CBR values are particularly subject to high variability, even within one organisation, one soil type, etc, correlations from individual sources may vary from the general equation.

Equivalent CBR values of +15% should be anticipated on granular backfill material however as an absolute minimum requirement at the top of trench backfills at carriageway formation level.

### Typical Impact Values

The lower and upper limits of permissible Impact Values are depicted in Table A, where IV readings A-E are the values obtained on the first to fifth drops respectively.

The critical 4th drop value D in Table A can be used providing the other limits in the table are not exceeded.

Table A

Drop No	IV Reading	Permissible Lower limit	IV Reading Upper limit
1	A	-	No Upper Limit set For 1 <sup>st</sup> 4 drops
2	B	A-2	
3	C	B-2	
Critical Impact Value 4	Critical Impact Value D	Critical Impact Value C-2	
5	E	D-2	D+2

### Trench Reinstatement

It is important to note there will be variations in strength along a trench or within a patch and it is necessary to take sufficient readings to determine average strength as well as locating soft spots.

In a typical one metre square patch at least three readings are required: one in the centre; and two in the corners.

If comparable values are not achieved, then check the remaining two corners.

In trenches a reading can be taken at longer intervals – circa every 5m, or as directed by Adopting / Site engineer depending on overall length. The longer the trench, then the greater the number of readings that will be needed to achieve a representative average.

Usually, it is found that good materials properly compacted, will give consistent readings.

Inconsistent readings generally indicate some problem, requiring further investigation.

### Equipment

Check the base of the hammer after each set of readings to ensure that it is clean.

If material builds up on the hammer it could lead to an uneven indentation and a false reading.

A change in impact sound may also be detected.

During each hammer drop the experienced user will be able to hear if the hammer has dropped cleanly.

A low reading may result if it has rubbed against the inside of the guide tube on the way down.

Provided the other readings are considered satisfactory, the fourth reading can be taken as valid; otherwise, repeat the test.

### Target Impact Values

The Target Impact Values in Table B represents a balance between compacted density and stiffness.

The target value is to be regarded as the lowest value acceptable on the fourth drop under average condition.

**TABLE B**

REINSTATEMENT LEVEL	FOURTH DROP IMPACT	VALUE for 4.5 kg HAMMER	
	Target Value	Typical Range	Highest Likely
Trench Bed	7	7 - 8	30
Top of Fine Fill	10	10 - 17	
Top of Back Fill	18*	17# - 27	
Top of Sub-base	22	24 – 27	
Top of Road Base	30	32 - 34	38

\*Minimum IV for re-used materials

#MinimumIV for imported materials

-

Compaction must always be carried out in full accordance with the reinstatement specification and must not be stopped when the target Impact Value has been achieved.

The impact values shown under the headings 'Typical Range' and 'Highest Likely' in Table B are to be taken as approximate guidelines.

Note: The values in the above Table B apply to tests carried out using the 4.5 kg Hammer. The values will be lower by a factor of approximately 2.1 when using the 20 kg Hammer.

## APPENDIX D – Bituminous Materials, Temperature Guidelines

<b>Materials For specific minimum temperatures for materials reference should be made to BS595987</b>	<b>Material Delivery Max Temperatures (°C)</b>	<b>Material Delivery Min Temperatures (°C)</b>	<b>Rolling Min Temperatures (°C)</b>
H.R.A. WEARING COURSES (50 PEN)	190	140	85
H.R.A. WEARING COURSES (50 PEN) with PCCS	190	155	85
H.R.A. BASECOURSE/ROADBASES (50 PEN)	170	120	85
DENSE/CLOSE GRADED MACADAMS (100 PEN)	160	120	95
DENSE/CLOSE GRADED MACADAMS (200 PEN)	150	110	85

## APPENDIX E – Standard Detail Drawings

Please contact WCC Director of Economy & Infrastructure for DWG or PDF versions of drawings stated below at [HighwayTechSub@worcestershire.gov.uk](mailto:HighwayTechSub@worcestershire.gov.uk)

DRAWING WCC 2023 100 01 Rev B Residential Road Construction

DRAWING WCC 2023 100 02 Rev B Industrial & High Category Residential Road Construction

DRAWING WCC 2023 100 03 Rev B Residential Road Construction (Block Paving)

DRAWING WCC 2023 100 04 Rev B Residential Road Construction (Block Paving – 125mm kerb face)

DRAWING WCC 2023 200 01 Rev A Footway Construction

DRAWING WCC 2023 200 02 Block Paved Footway Construction

DRAWING WCC 2023 200 03 Rev A Vehicular Crossing Construction 1:12

DRAWING WCC 2023 200 04 Rev A Alternative Vehicle Crossing Construction 1:40

DRAWING WCC 2023 200 05 Plan of Alternative Vehicle Crossing Construction 1:40

DRAWING WCC 2023 200 06 Rev A Footpath & Divorced Footway Construction

DRAWING WCC 2023 200 07 Block Paved Vehicle Crossing Construction 1:12

DRAWING WCC 2023 200 08 Verge Margin Construction

DRAWING WCC 2023 300 01 Detail of In-Line Uncontrolled Tactile Paving Crossing (At Junctions)

DRAWING WCC 2023 300 02 Detail of Off-Line Uncontrolled Tactile Paving Crossing (Away from Junctions)

DRAWING WCC 2023 300 03 Layout of Off-Line Uncontrolled Tactile Paving Crossing (Away from Junctions)

DRAWING WCC 2023 400 01 125 x 255 Kerb Type HB Replacement to Existing Carriageway

DRAWING WCC 2023 400 02 125 x 255 Half Battered Kerb

DRAWING WCC 2023 400 03 Tarmac Raised Table Entrance Ramp

DRAWING WCC 2023 400 04 50 x 150 Edging Bullnosed Kerb Type EBN

DRAWING WCC 2023 400 05 50 x 200 Edging Type EF (to be utilised at vehicle crossings)

DRAWING WCC 2023 400 06 50 x 150 Edging Type EF (to be utilised other than at vehicle crossings)

DRAWING WCC 2023 400 07 Jointing into Existing Road Surfacing

DRAWING WCC 2023 400 08 Vehicular & Pedestrian In line dropped kerb Type 255 x 125 BN

DRAWING WCC 2023 400 09 Replacement Dropped Kerb Type BN

DRAWING WCC 2023 400 10 Tarmac to Block Paving Flush Transition Detail

DRAWING WCC 2023 500 01 Typical Manhole Detail Type A

DRAWING WCC 2023 500 02 Typical Manhole Detail Type B

DRAWING WCC 2023 500 03 Typical Manhole Detail Type C  
DRAWING WCC 2023 500 04 Outlet Headwall Detail  
DRAWING WCC 2023 500 05 Rev A Soakaway Chamber Detail  
DRAWING WCC 2023 500 06 Granular Bedding & Sidefill Materials for Flexible Pipes  
DRAWING WCC 2023 500 07 Gully Detail  
DRAWING WCC 2023 500 08 Hessian Bag Headwall Detail & Sections  
DRAWING WCC 2023 500 09 Typical Catchpit Detail  
DRAWING WCC 2023 600 01 Glasdon Neopolitan 150 Bollard Detail  
DRAWING WCC 2023 600 02 Grasscrete GC3 Detail (Heavy Duty Usage)  
DRAWING WCC 2023 600 03 Multiple Arrangement of Utility Boxes within Footway Detail  
DRAWING WCC 2023 600 04 270mm & 600mm Sign LED Illuminated Bollard Base Light & Duct Detail  
DRAWING WCC 2023 600 05 Rev A LED Illuminated Sign General Detail  
DRAWING WCC 2023 600 06 Rev A Illuminated Sign Installation Detail  
DRAWING WCC 2023 600 07 General Cut Out Wiring Arrangement for Lighting Columns & Illuminated Signs  
DRAWING WCC 2023 600 08 Post & 4 Rail Fence  
DRAWING WCC 2023 600 09 Knee Rail Fence  
DRAWING WCC 2023 600 10 Pedestrian Guard Rail

**For further information please contact:**

**By telephone:**

01905 763763

**By post:**

Worcestershire County Council, County Hall, Spetchley Road, Worcester WR5 2NP

**By email:**

customerandcommunity@worcestershire.gov.uk

**Online:**

www.worcestershire.gov.uk

This document can be made available in other formats (large print, audio tape, computer disk and Braille) on request from the Worcestershire Hub using the contact details above.

If you can not understand the contents of this document and do not have access to anyone who can translate it for you, please contact 01905 765765 for help.

বাংলা। আপনি যদি এই দলিলের বিষয়বস্তু বুঝতে না পারেন এবং আপনার জন্য অনুবাদ করার মত পরিচিত কেউ না থাকলে, অনুগ্রহ করে সাহায্যের জন্য 01905 765765 নম্বরে যোগাযোগ করুন। (Bengali)

廣東話。如果您對本文檔內容有任何不解之處並且沒有人能夠對此問題做出解釋，請撥打 01905 765765 尋求幫助。 (Cantonese)

普通话。如果您对本文件内容有任何不解之处并且没有人能够对此问题做出解释，请拨打 01905 765765 寻求帮助。 (Mandarin)

Polski. eżeli nie rozumieją Państwo treści tego dokumentu i nie znają nikogo, kto mógłby go dla Państwa przetłumaczyć, proszę zadzwonić pod numer 01905 765765 w celu uzyskania pomocy. (Polish)

Português. Se não conseguir compreender o conteúdo deste documento e não conhecer ninguém que lho possa traduzir, contacte o 01905 765765 para obter assistência. (Portuguese)

Español. Si no comprende el contenido de este documento ni conoce a nadie que pueda traducírselo, puede solicitar ayuda llamando al teléfono 01905 765765. (Spanish)

Türkçe. Bu dokümanın içeriğini anlayamazsanız veya dokümanı sizin için tercüme edebilecek birisine ulaşamıyorsanız, lütfen yardım için 01905 765765 numaralı telefonu arayınız. (Turkish)

اردو۔ اگر آپ اس دستاویز کی مشمولات کو سمجھنے سے قاصر ہیں اور کسی ایسے شخص تک آپ کی رسائی نہیں ہے جو آپ کے لئے اس کا ترجمہ کر سکے تو، براہ کرم مدد کے لئے 01905 765765 پر رابطہ کریں۔ (Urdu)

کوردی سۆزانی. ننگەر ناتوانی ټینگه له ناوهرۆکی نم بئگه و دستت به ههچ کس ناگت که و ههنگه ټنوه بوت، تکایه تملفون بکه بو ژماره 01905 765765 و داواى رینۆنن بکه. (Kurdish)

ਪੰਜਾਬੀ। ਜੇ ਤੁਸੀਂ ਇਸ ਦਸਤਾਵੇਜ਼ ਦਾ ਮਸ਼ਹੂਨ ਸਮਝ ਨਹੀਂ ਸਕਦੇ ਅਤੇ ਕਿਸੇ ਅਜਿਹੇ ਵਿਅਕਤੀ ਤੱਕ ਪਹੁੰਚ ਨਹੀਂ ਹੈ, ਜੋ ਇਸਦਾ ਤੁਹਾਡੇ ਲਈ ਅਨੁਵਾਦ ਕਰ ਸਕੇ, ਤਾਂ ਕਿਰਪਾ ਕਰਕੇ ਮਦਦ ਲਈ 01905 765765 'ਤੇ ਫ਼ੋਨ ਕਰੋ। (Punjabi)

To the best of our knowledge all information was correct at the time of printing: June 2020