NG SAMPLE APPENDIX 5/1: DRAINAGE REQUIREMENTS

#### [Note to compiler: This should include:]

(i) requirements for box culverts [501.1];

(ii) any additional requirements for drains excluding those constructed using corrugated steel pipes [501.2];

(iii) locations where more than one pipe type is permitted within individual drain or service ducts between consecutive chambers [501.2];

(iv) the basis of the hydraulic design of the system on which the Contractor shall submit his proposals for pipe types and makes [501.3];

(v) a schedule of permitted alternative pipe and bedding combinations including those in the NRA Road Construction Details; [which should be determined in accordance with NRA DMRB HD 140] [503.3] and list of pipelines to be constructed other than in a trench [608.8];

(vi) where sulphate-resisting Portland cement is required for concrete pipes [Table 5/1];

(vii) details of materials in bedding, haunching and surrounding of filter drains if differing from the requirements of Sub-clause 503.3(iv);

(viii) whether joints in surface water drains shall be watertight or partly watertight [504.2];

(ix) where rigid joints may be used [504.3];

(x) backfilling requirements differing from Sub-clause 505.2; level of backfill for trenches in carriageways or other paved areas if differing from the requirements of Sub-clause 505.2;

(xi) grading limits for filter backfill materials in filter drains if differing from the requirements of Table 5/5 [505.3];

(xii) references to drawings showing requirements for connecting existing drains to new drains and details of special connecting pipes [506.1];

(xiii) requirements for sealing, removal or grouting of existing drains [506.3];

(xiv) references to drawings which show chamber types [507.1];

(xv) requirements for concrete to cast-in sub-situ chambers if differing from the requirements of Sub-Clause 507.6;

(xvi) particular requirements for corrugated galvanised steel chambers [507.6];

(xvii) requirements for testing chambers for foul drains for watertightness [507.9] and foul drain surveys by video camera [509.5];

(xviii) details of chamber covers, gratings and frames including grades, depths of frames, hinge and locking requirements, etc. [507.7 to 9] and details for special duty covers for use in carriageways [507.10],

(xix) requirements for minimum waterway area to gratings for catch-pits [507.11];

(xx) requirements for setting existing covers and gratings to level if different from the requirements of Sub-clauses 507.15 and 508.8;

(xxi) whether gullies are to be trapped or untrapped [508.1];

(xxii) details of insitu concrete gullies [508.3];

(xxiii) the classes and sizes of cast iron and steel gully gratings [508.4];

(xxiv) requirements for gully gratings if different from the requirements of Sub-clause 508.4 and 5, including whether gully gratings are to be flat or dished;

(xxv) whether saddles are permitted [508.7];

(xxvi) requirements for the cleaning of chambers, gullies and drains [509.5];

(xxvii) requirements for permeability testing of backfill material where required [509.];

(xxviii) details of connecting existing land drains [511.1];

(xxix) whether severed mole drains are to be intercepted by construction of a land drain [511.4];

(xxx) references to drawings showing requirements for filling to pipe bays and verges if different from the requirements of Sub-clause 512.1;

(xxxi) requirements for thermoplastic structured-wall pipes and fittings if different from the requirements of Sub-clause 518.1;

(xxxii) values of pipe stiffness class, creep ratio and impact resistance for thermoplastics pipes [518.5].

NG SAMPLE APPENDIX 5/2: SERVICE DUCT REQUIREMENTS

#### [Note to compiler: This should include:]

* 1. references to drawings which show chamber types [525.1];
	2. a schedule of service duct requirements [501.5] [similar to those in Appendix 5/1 for pipes];
	3. details of duct construction [524.3]

####  [cross-reference should be made to the NRA Road Construction Details where appropriate];

* 1. whether joints in ducts shall be watertight [524.4];
	2. details of permanent marker blocks and location posts required for service ducts [524.2]

####  [cross-reference should be made to the NRA Road Construction Details where appropriate].

* 1. requirements for permanent marker blocks and location posts [524.6];
	2. colour coding of ducts [524.7].

NG SAMPLE APPENDIX 5/3: SURFACE WATER CHANNELS, SWALES AND DRAINAGE CHANNEL BLOCKS

#### [Note to compiler: State here specific requirements cross-referring to drawing numbers where appropriate, including NRA Road Construction Details listed in Appendix 0/4]

(i) requirements for the construction of surface water channels, swales and drainage channel blocks [510].

NG SAMPLE APPENDIX 5/4 : FIN DRAINS AND NARROW FILTER DRAINS AND GEOTEXTILES FOR FILTER DRAINS

**[Note to compiler: This should include:]**

1. special requirements for fin drains and narrow filter drains [514.1 & 515.1];
2. permitted alternative types of fin drain and narrow filter drain

####  [Normally the choice of type of fin or narrow filter drain should be left to the Contractor];

1. drawing and / or schedule references showing locations and required levels;
2. the maximum permissible 090 determined from the pore size distribution curve of the geotextile [514.5(iv) & 515.3];
3. the permeability of the geotextile [514.5(v) & 515.3];
4. the long term in-plane flow for fin drains [516.2];
5. trench backfill material for fin drain if not as-dug material [514.10];
6. pipe diameters [514.11 & 515.6];
7. D15 particle size for granular material in narrow filter drain Type 8 [515.5];
8. permeability of granular material in narrow filter drain where required [515.5];
9. maximum drain slope angle if different from 15% [514.11 and 515.6];
10. dimensions of fin drains and narrow filter drains if different from the requirements of Sub-clauses 514.11 and 515.6.

NG SAMPLE APPENDIX 5/5: COMBINED DRAINAGE AND KERB SYSTEMS

#### [Note to compiler: Include here:]

1. hydraulic design parameters including design flows [516.5]; [roughness coefficients should not be specified]
2. limiting dimensions [516.6]:
	1. Maximum width and depth of units [if applicable]
	2. Kerb upstand

c. Kerb profile [if applicable];

1. requirements of inlets where used with porous asphalt [516.7];
2. strength requirements [516.8] and class of concrete or mortar bedding/surround;

####  [units should normally be capable of bearing a wheel load of 11.5 tonnes];

1. requirements for junctions, connecting pipes and any other fittings comprising the combined drainage and kerb system [516.11];

NG SAMPLE APPENDIX 5/6: LINEAR DRAINAGE CHANNEL SYSTEMS

#### [Note to compiler: Include here:]

1. drawing reference showing locations, etc.
2. hydraulic design parameters including design flows [517.3]; [roughness coefficients should not be specified]
3. limiting dimensions [517.4]:
4. Maximum width and depth of units [517.4 ]
5. Dimensions of side-entry inlets of units to be used in or adjacent to porous asphalt

####  [517.7];

1. requirements for grade of weathering resistance [517.7];
2. strength requirements [517.8]

####  [units must be specified as Class D or Class C. Class D units must be used where there is a possibility of impact from all types of road vehicle that are permitted on trunk roads including motorways. Class C units must only be installed in locations which are protected from direct traffic loading, e.g. in areas behind safety barriers. Further advice on other permitted classes can be found in Clause 5 of IS EN 1433.]

1. any special fittings required [517.10]

NG SAMPLE APPENDIX 5/7: DRAINAGE AND SERVICE DUCTS: NRA ROAD CONSTRUCTION DETAILS

|  |  |
| --- | --- |
| **Clause No.** | **Road Construction Detail** |
| 503.3 (i) | RCD/500/20 & 21 |
| 503.3 (iii) | RCD/500/20 & 21 |
| 505.7 | RCD/500/20 |
| 507.1 | RCD/500/1 to RCD/500/6 and RCD/500/16 |
| 507.7 | RCD/500/15 |
| 508.1  | RCD/500/11 & 12 |
| 508.4  | RCD/500/14 |
| 509.11 | RCD/50062 |
| 514.10 | RCD/500/41 |
| 519.4  | RCD/500/20 |

NG SAMPLE APPENDIX 5/8: THERMOPLASTICS STRUCTURAL WALL PIPES AND FITTINGS

Information to be provided by the Contractor

The Contractor shall provide the following information, in accordance with Sub-clause 518.2, for the range of pipes and fittings (to be verified by the Certification body - see Sub-clause 518.10):

(i) Technical drawings showing dimensions and tolerances including sealing rings and weight per metre, together with properties, as specified in Sub-clauses 518.3 and 518.5.

(ii) Material specification, as required in Sub-clause 518.2:

**Table 1: Unplasticised Polyvinyl-Chloride (PVC-U)**

|  |  |  |
| --- | --- | --- |
| **Property** | **Test method reference** | **Specification** |
| Tensile Properties | IS EN ISO 6259, IS EN ISO 527-1 |  |
| Vicat | IS EN ISO 2505 |  |
| Longitudinal reversion | IS EN 743 |  |
| K-value | IS EN 922 |  |
| PVC content | IS EN 1905 |  |
| Density | IS EN ISO 1183-3, ISO 4451 |  |
| Heat Reversion | ISO 12091 |  |
| Effects of heating (injection moulded fittings only)fittings only) | IS EN ISO 580 |  |

**Table 2: Polyethylene (PE)**

|  |  |  |
| --- | --- | --- |
| **Property** | **Test method reference** | **Specification** |
| Tensile Properties | IS EN ISO 6259 IS EN ISO 527-1 |  |
| Oxygen induction time | IS EN 728 |  |
| Melt Flow Rate | IS EN ISO 1133 |  |
| Density | IS EN ISO 1183-3, ISO 4451 |  |
| Melt Flow Rate | ISO 4440 |  |
| Heat Reversion | ISO 12091 |  |
| Effects of heating (injection moulded fittings only) | IS EN ISO 580 |  |

**Table 3: Polypropylene (PP)**

|  |  |  |
| --- | --- | --- |
| **Property** | **Test method reference** | **Specification** |
| Tensile Properties | BS EN ISO 6259, BS EN ISO 527-1 |  |
| Oxygen induction time | BS EN 728 |  |
| Melt Flow Rate | BS EN ISO 1133 |  |
| Density | BS EN ISO 1183-3, ISO 4451 |  |
| Melt Flow Rate | ISO 4440 |  |
| Heat Reversion | ISO 12091 |  |
| Effects of heating (injection moulded fittings only) | BS EN ISO 580 |  |

NG SAMPLE APPENDIX 5/9: ATTENUATION

#### [Note to the compiler: This should include]

1. Attenuation design requirements e.g. storm return period and storm duration to be attenuated as per NRA HD 33;
2. Location of attenuation pond with reference to drawings and drainage schedules;

1. Attenuation requirements – Volume to be attenuated, maximum discharge rate;
2. Pond Geometry – Existing ground level, pond invert level, top length and width, side slopes;

1. Requirements for pond lining e.g. Clay Liner, Impermeable Geomembrane;
2. Requirement for bunding around pond – Bund level, Side slopes;

1. Requirement for fencing around pond;
2. Additional water quality treatment requirements – volume to be treated, depressed invert, vegetation.