

# 05-00- Drainage and Service Ducts

## 05-01 Pipes for Drainage

- a. Drains to be adopted by North Yorkshire Council (NYC) shall all comply with the latest BS or EN code for drainage. NYC permit the use of Plastic Twin Wall pipes, Vitrified Clay & Concrete Pipes to BS 5911 & BS EN 1916 & Kite Marked (ISO 9001 standards) for use in the highways.

**TABLE 05-01**

<b>Pipes for Drainage</b>			
<b>Material</b>	<b>Usage</b>	<b>Standard</b>	<b>Requirements</b>
Vitrified clay	Surface water	BS EN 295-1:2013 BS EN 295-2:2013	
	Filter drains	BS EN 295-1:2013 BS EN 295-2:2013	Open Joints
Concrete	Surface water	BS 5911-1:2021 BS EN 1916:2002	
PVC-U	Surface water	BS EN 13598-1:2020 BS EN 1401-1:2019	
	Filter drains	BS EN 13598-1:2020 BS EN 1401-1:2019	Open Joints
Plastic	Surface Water	BS EN 1852-1:2018 +A1:2022 HAPAS approved or BBA	
	Filter drains	BS EN 1852-1:2018 +A1:2022 HAPAS approved or BBA	Open Joints
	Field drains	BS 4962:1989	

- b. Drainage pipes used in the highway (Roads, Paths & Verges) shall comply with the most onerous of this Specification and the Specification of any adopting Statutory Undertaker. The standard to be used shall be agreed with the undertaker before installation.
- c. The Developer must contact the Lead Local Flood Authority (LLFA) who will review the design from a flood risk perspective. All drainage design information to be sent to [Floodriskmanagement@northyorks.gov.uk](mailto:Floodriskmanagement@northyorks.gov.uk). This will include land drainage, attenuation, culverts, drainage maintenance, connection to watercourses etc. Additional Land Drainage Consent may be required from the Environment Agency, LLFA or Internal Drainage Board.
- d. The Engineer's prior written approval shall be obtained for the use of any plastic pipes (PVC-U) greater than 300 mm diameter within the works. The application for approval shall be supported by a Quality Assurance certificate and conform to BBA - HAPAS Highway Authority Product Approval Scheme.

- e. Clay pipes sizes 150 mm up to 300 mm maximum may be used.
- f. Concrete pipe sizes 300 mm up to 900 mm maximum may be used.
- g. As directed by the Engineer all drainage to be adopted by NYC shall be subject to air or water testing, and a CCTV recording. Records of all testing including CCTV recordings and accompanying written report shall be supplied to the Engineer. Slotted pipes shall only be subject to CCTV testing. In locations with limited cover, NYC may allow the use of Steel pipes that comply with the latest BS or EN code. This must be agreed in writing with the Engineer before works commence.
- h. CCTV recording of highway drainage pipes must be undertaken prior to the surface course. Any defects identified as part of the report and remedials agreed in writing with the Engineer before the works commence. Further CCTV recording prior to adoption may be requested.
- i. All drainage pipes used in the Highway, with the exception of filter drains, shall have the appropriate flexible seal fitted in accordance with the manufacturer's specification. The seal shall be free from any damage at time of fitting.
- j. Slotted pipes shall only be used for ground drainage (French drains) and when used under the highway shall be backfilled with Type B filter stone and have a mat type geotextile e.g., "Terram" laid around the perimeter of the trench.
- k. Protection of the drain or culvert during construction shall be considered during the design.
- l. Where pipes for adoption by NYC are laid with less than 1.2 m of cover, they shall have a concrete bed and surround comprising of no less than 150 mm of ST 4 concrete with compressible "flex cell" type joint material at all bends and every 3 m of length.
- m. Where pipes for adoption by Water Authorities are laid with less than 1.2 m of cover the pipe shall be laid with standard pipe bedding and surround together with a 150 mm thick concrete protection slab including A393 mesh. This detail shall be approved in writing by the relevant Water Authority prior to the pipes being laid on site. Further guidance on this matter can be found in the relevant Water Authority's advice.

#### 05-02 Ducts

- a. Ducts for use in the highway shall comply with the colour requirements of the end service user in accordance with NJUG guidance. They shall be laid straight to the correct line and level for the end service user.
- b. Ducts shall be no less than 100 mm diameter and shall all be laid with a 100 mm concrete surround of ST4 concrete with a minimum slump of 30 mm, unless agreed otherwise in writing by the Engineer prior to installation.
- c. Ducts shall be extended a minimum of 200mm beyond the kerb raft into the footway area. They shall have marker tape laid in sand on-top of the concrete surround which shall indicate the service beneath and, if possible, the undertaker who is using the duct. In some locations the Engineer may request the use of Foam Concrete. This shall be free flowing and self-levelling and comply with the HAUC specification.

05-03 Jointing of Pipes

- a. Jointing of pipes shall be undertaken in accordance with the manufacturer’s guidance and TABLE 05-02 below.

TABLE 05-02

	Joining pipe Size (mm)							
Lateral pipe size (mm)	150	225	300	375	450	525	600	Larger than 600
150	Junction	Junction	Junction	Saddle	Saddle	Saddle	Saddle	Saddle
225	Not Applicable	Junction	Junction	Junction	Saddle	Saddle	Saddle	Saddle
300	Not Applicable	Not Applicable	Junction	Junction	Junction	Saddle	Saddle	Saddle
375	Not Applicable	Not Applicable	Not Applicable	Junction	Junction	Junction	Saddle	Saddle
450	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Junction	Junction	Junction	Saddle
525	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Junction	Junction	Saddle

- b. Junctions shall be formed using purpose made 45° oblique junctions of appropriate size.
- c. Where connections are to be made to an existing pipe, a purpose made saddle shall be used, these must not project more than 5mm into the pipe. The saddle shall have an ST4 concrete surround. Where this is not possible, a section of pipe should be removed and a Y junction fitted using band seals subject to the prior written approval of the Engineer.
- d. Junction pipes that are laid but not immediately connected shall be fitted with temporary stoppers or seals. The position of all such junctions shall be marked with stakes or tracing wires. Saddles may be used to form junctions they shall be manufactured of the same type and class of material as the pipes in the run. They shall comply with the manufacturer’s recommendations.

05-04 Pipe Bedding Material for Surface Water Drains

- a. Materials for pipe bedding or surround shall be a granular material, crushed gravel or rock unless otherwise approved in writing by the Engineer
- b. The aggregate size of pipe bedding material will depend on the diameter of the pipe in accordance with Table 05-03.
- c. All pipes shall have 150 mm thickness of bedding under the barrel, and to both sides. The top of the pipe shall have a level layer of pipe bedding 150 mm thick above the spigot or collar.
- d. All Pipe bedding & surround requirements for drainage works within the adoptable areas shall consist of natural or recycled coarse aggregates complying with BS EN 13242 unless

otherwise agreed in writing by the Engineer prior to works commencing. For all standard bedding and surround details the aggregate shall meet the requirements of table 05-03 below.

- e. All pipe bedding material shall have resistance to fragmentation in Category LA<sub>50</sub> in accordance with BS EN 13242 Clause 5.2 and table 9.
- f. All pipe bedding material shall have a water-soluble sulphate content of less than 0.2% Category SS<sub>0.2</sub> in accordance with BS EN 13242.
- g. Where concrete is specified for pipe beds and surrounds, it shall be in accordance with BS EN 1916:2002. The concrete shall be made with Portland Cement or sulphate-resisting when required. Super sulphated cement shall not be used.
- h. Recycled material for use as pipe bedding shall be tested and certificated in accordance with SHW Clause 710 and NYC Recycled Granular Materials Briefing Note.

**TABLE 05-03**

<b>Coarse Aggregate for Pipe Bedding, Haunching and Surrounding Material to BS EN 13242</b>		
Nominal pipe diameter (mm)	Graded Material	Single Size Material
Not exceeding 140mm	Not applicable	4/10
Exceeding 140 mm but under 400mm	2/14 or 4/20	4/10, 6/10, or 10/20
Exceeding 400mm	2/14, 4/20 or 4/40	4/10, 6/14, 10/20 or 20/40
Exceeding 600mm	Type B filter material	Not applicable

**05-05 Backfilling Material for Sub-soil and Verge Drains**

- a. Sub soil and French drains should be laid with pipe bedding and have a mat type geotextile e.g., "Terram" laid around the perimeter of the trench. The trench shall be back filled with free draining material in accordance with the Specification for Highway Works (SHW). The Back fill shall be Type B filter material in accordance with Series 500 (SHW) and/or NYC standard detail unless agreed otherwise in writing by the Engineer prior to works commencing.

**05-06 Sub Soil Drains**

- a. A trapped system for sub-soil drainage shall be constructed where; -
  - The winter height of the water table is within 600mm of the formation level;
  - The sub-soil is unstable or unsuitable e.g., because it is waterlogged or not permeable;
  - Springs, drains or watercourses are encountered;

- There is the likelihood of water running off or out of adjacent land, particularly land at a higher level, where an approved filter drainage system (French Drain) shall be provided.
- b. Sub-soil drains shall be laid to line and level. The gradients shall be sufficient to produce a self-cleansing velocity of 0.75 m/s with the pipe running at two thirds of the capacity of the pipe.
  - c. Drains shall be properly linked with junction pipes and discharged into trapped catchpits, sump-manholes or trapped road gullies with a minimum sump depth of 300 mm before discharging into the Surface Water drainage system.

#### 05-07 Excavation for Drains

- a. Trenches shall be excavated to sufficient depth and width to enable the pipes to be laid with the specified bedding or concrete surround, or protection slab. The width shall be a minimum of the collar width plus 300 mm.
- b. Trench sides shall be adequately supported at all times and must comply with HSE requirements.
- c. Soft spots or areas of poor ground shall be removed and backfilled with approved backfilling material. The re-engineered ground shall be satisfactory to take the applied loading without any movement.

#### 05-08 Bedding, Laying and Backfilling of Pipes

- a. As dug material shall not be used as trench fill in any circumstances.
- b. Pipes shall be laid with the whole length of the barrel in contact with the pipe bedding. The bedding shall be removed from under the joint to prevent it weight bearing.
- c. Bedding shall be in accordance with 05-04
- d. Concrete surround shall be in accordance with 5-04.
- e. Once the pipes have been laid the bedding shall be brought up evenly on both sides, followed by a level layer 150 mm above the collar.
- f. Trenches shall be brought up to the bottom of capping in one of the materials from Table 5-03 which shall have the appropriate certification of compliance.
- g. All trenches within the adoptable highway including carriageways, footways cycle-tracks and verges within 2 metres of the carriageway shall be backfilled with Type 1 Granular Material (sub-base) shall comply with the requirements BS EN 13285 and with paragraph 803 of the Specification for Highway Works to Clause 07-04 of this Specification. Approved Type 1 Granular Material Sub Base shall be brought up in layers no more than 225 mm thick.
- h. All Trench back fill operations shall be compacted in accordance with Table 6/4 of the SHW Series 600 and advisory notes of this specification.

- i. Where the pipes are laid with a concrete surround care must be taken, especially with plastic pipes to make sure they do not move from line and level. The trench shall not be backfilled until the concrete has set.
- j. Except for gully connections, pipes with concrete surround shall not encroach into the Type 1 Sub Base without the prior written approval of the Engineer.

05-09 Connecting into Existing Sewers, Drains & Manholes

- a. Where required and appropriate, existing sewers and drains shall be properly extended, connecting and jointed to new sewers, culverts, drains or channels. All such connections shall be made during the construction of the new main sewer, drain or other work, and their position recorded by the Developer who shall include this information on the formal As Built Drawings provided to the Engineer on completion of the site.
- b. Where pipe connections are made to a brick sewer, concrete culvert, stone built or lined channel or any other combination all damage done making the connection shall be made good to the satisfaction of the Engineer or relevant undertaker.
- c. New connection channels shall be placed to discharge at an angle not greater than 60° to the direction of flow of the sewer, drain or channel. The end of the pipe shall be cut to the necessary angle. All special connecting pipes shall be true and properly jointed.
- d. Before entering or breaking into an existing sewer or drain, the Developer or their Contractor shall give adequate notice of their intention to do so to the Owner of the apparatus.
- e. Jointing of pipes using junctions or saddles shall be undertaken in accordance with the manufacturer's guidance and TABLE 5-02

05-10 Manhole / Inspection Chamber Construction

- a. Manholes and inspection chambers shall be constructed to BS 5911-3 and standard details Series C. They shall be sized as indicated in TABLE 2-04.

TABLE 05-04

Nominal Bore of Sewer	Chamber Diameter	
	Less than 375 mm	for depths to soffit less than 1.35 m
for depth to soffit 1.35m to 1.5m		1050 mm
for depths greater than 1.5m		1200 mm
375 mm to 450 mm	1350 mm	
500 mm to 700 mm	1500 mm	
750 mm to 900 mm	1800 mm	
Greater than 900 mm	Minimum of pipe diameter plus 900mm Details to be agreed in writing with the Engineer	

- b. The above chamber sizes are minimum sizes. Where multiple pipes enter a chamber, larger diameter chambers shall be used to accommodate the benching.

- a. Developers must refer to the NYC Technical Approval Procedures for all manholes with a diameter greater than 1250mm proposed within the adopted highway. Early discussions are recommended to avoid any potential delays to approvals and thus delivery.
- c. NYC permits the use of pre-made chamber bases that shall be installed to the Manufacturer's Specifications and have the appropriate BS/ EN codes of manufacture.
- d. Where pre-made bases are not used, the foundation for the chamber shall be formed with 225 mm thickness of ST4 concrete.
- e. Inverts shall be laid above the concrete slab and formed in clay ware for pipes up to and including 300 mm. They shall be laid to line and level. Benching of Channels shall be formed in granolithic concrete no less than 38 mm thick.
- f. Brickwork shall be built using class B engineering bricks. The wall shall be a minimum of 2 bricks thick in English Bond. The mortar shall be 1:3 to Clause 17-05. Joints shall be flush or pointed. Pipes shall be flush with the brickwork.
- g. Where the depth to invert is greater than 900mm from top of the cover, steps shall be installed in accordance with BS 13101 and BS 5911-3
- h. Chambers shall be surrounded with 150mm of ST4 concrete unless pre-cast wide wall sections have been used.
- i. All chambers shall be watertight on completion.
- j. All covers must be laid on mortar to Clause 17.05 except where the road is to be surfaced within 5 days when a pre-made rapid set mortar shall be used following the prior written approval of the Engineer. The rapid set mortar shall be 60 minute first set or similar HAPAS approved.
- k. Shallow chambers less than 900mm shall be constructed in brick double skin or single brick with a 150 mm concrete surround of ST4.
- l. The two pipe joints nearest the manhole shall be flexible. The nearest joint shall be within 300 mm of the manhole wall.
- m. Manholes covers should not be located within wheel track areas

#### 05-11 Inspection Covers and Frames

- a. All covers shall be ductile iron.
- b. All inspection covers in the carriageway shall be a minimum of BS EN124 D400. In some instances, a higher standard may be required by the Engineer.
- c. In verges, footpaths or cycle-tracks inspection covers shall be BS EN 124 C250 or higher.
- d. On Classified Roads and Industrial Estates frames shall be 150 mm deep and in some locations the Engineer may require the use of E600 frames.

- e. The final fix of frames prior to surfacing shall be undertaken using a rapid set HAPAS approved premixed mortar that shall reach first set in no more than 60 minutes and shall be faster if required by the Engineer.
- f. Any Premixed mortar from bags or containers shall all be BBA – HAPAS Certificated.
- g. Covers in verge areas shall have a 300mm wide 150mm thick concrete plinth to prevent vegetation encroachment.

#### 05-12 Granolithic Concrete

Granolithic Concrete shall be pre bagged HAPAS approved, which shall have 10mm granite or whinstone aggregate.

#### 05-13 Gullies

- a. Gully pots shall be 900 mm deep by 450 mm wide internally with a 150mm outlet, trapped with a stoppered rodding eye. The use of concrete and plastic gully pots is permitted subject to their compliance with the relevant BS code or British Board of Agrément Roads and Bridges Certificates.
- b. All gullies shall have a minimum of 150 mm surround of ST4 concrete with a 30 mm minimum slump which shall be included beneath the pot. For Plastic Pot installation, the concrete surround shall be compacted in place using a vibratory poker.
- c. At low-points double gullies shall be installed. They shall be a minimum of 300 mm apart; a minimum of 300mm ST4 concrete shall be provide between the pots. They can be placed up to 1 m apart to allow for a service to go between.
- d. Gully pots for footpaths or cycle-tracks shall be a minimum of 600 mm deep by 300 mm wide. In some locations, the Engineer may require larger gully pots e.g. tree lined location.
- e. Gully leads shall not exceed 16 m in length from the last Inspection chamber unless agreed otherwise in writing by the Engineer.
- f. Damaged gully pots and/or leads must be replaced and not repaired using lining.

#### 05-14 Gully Gratings and Frames

- a. All grates and frames shall be marked BS EN 124 and made of ductile iron.
- b. For use in the carriageway, they shall be a minimum D400 with captive hinge. They shall have a minimum opening of 450 mm by 450 mm by 100 mm deep.
- c. On roads with widths greater than 6.0m wide, grates and frames shall be 450 mm by 450 mm by 150mm deep. The Engineer may require these frames to be E600.
- d. The grate shall knock down with the flow of traffic.



- e. For use in footways or cycle-tracks grates and frames shall be C250 with a minimum opening of 350 mm by 310 mm by 75 mm deep with a captive hinge and bike and pedestrian friendly grate.
- f. All gully grates shall be set 5 to 10 mm below the channel or watermark.
- g. All gully grates in pedestrian areas shall be pedestrian friendly, this includes shared surface roads or at pedestrian crossing points.
- h. Gullies in the vicinity of proposed tree canopies should have oversized lids (600x600mm) to ensure water can still drain even with leaf coverage
- i. The final fix prior to surfacing shall use a premade rapid set mortar following the prior written approval of the Engineer. The rapid set mortar shall be 60-minute first set or similar HAPAS approved.
- j. Covers in verge areas shall have a 300mm wide 150mm thick concrete plinth to prevent vegetation encroachment

#### 05-15 Gully Construction

- a. Gully pots shall be set on a foundation of 150 mm of ST4 concrete with a minimum of 150 mm of ST4 concrete surround. The surround shall widen at the top to a minimum of 225 mm to provide a footing for the brickwork.
- b. The Gully grate and frame shall be seated on two to four courses of Class B engineering bricks two courses wide, using 1:3 mortar mix. Alternatively proprietary concrete lifting sections to BS5911 – 6 may be used with two to four sections.
- c. Subject to the prior written agreement of the Engineer, concrete lifter sections may be adapted to provide a suitable base to both grate frame & kerb face. Amendments shall not compromise the structural integrity of the section.
- d. When changing from one material to another the correct fitting as approved by the manufacturer must be used. The contractor must inform the Engineer of their intention to use premixed materials and obtain the Engineers approval before commencing the works.

#### 05-16 Gully Spacing

- a. The spacing of gullies should be designed to take account of the width and gradient of the carriageways and footways. As a general guide the spacing shall not exceed 35 metres on a cambered carriageway.
- b. Gullies shall be provided at or near to tangent points of junctions. Double gullies shall be provided at all low points. Gullies shall be provided to prevent surface water running into private property or ponding at adjacent low points. Gullies within pedestrian crossing points should be avoided and placed upstream.
- c. Gullies shall be provided for footpaths and cycle-tracks when these are not running parallel next to the road kerb. They shall be provided in locations as described in (b.) above. Gullies shall be provided to prevent surface water running out onto a road, into private property or ponding at adjacent low points.

- d. No gully shall collect surface water from more than 160 m<sup>2</sup> of impermeable area comprising of road, footpath and cycle-track.
- e. Houses are only permitted to discharge a maximum of 6 m<sup>2</sup> of surface water run off onto the public highway and this shall be taken into account when placing gullies.
- f. Where footpaths pass between walls, private land or other features that prevent the expected surface water runoff, measures shall be put in place to manage the runoff away from private land. It is expected that this will require the provision of surface water checks or up-stands or channels to an agreed outfall.

#### 05-17 Combined Kerb and drainage systems

See Section 11-06.

#### 05-18 Undertakers Covers in the Carriageway

- a. All covers placed in the road shall comply with BS EN124 D400 as a minimum. In some locations the Engineer may require the use of a higher standard.
- b. All covers shall be set flush with the finished road surface. All covers placed in a footpath or verge shall be laid flush with the surface. Where these are near to a road, they shall be to be a minimum of BS EN124 C250.
- c. All covers in heavy-duty footpath crossings shall be to road specification BS EN124 D400.
- d. Covers should not be located within the wheel track areas.

#### 05-19 Hand Rails and Ladders

- a. Mild steel and solid mild steel bar for hand rails and standards shall comply with the relevant requirements of BS EN 10255 and BS EN 10025 respectively. After manufacture, they shall be hot dip galvanised in accordance with BS EN ISO 1461.
- b. Ladders shall be mild steel and hot dip galvanised after manufacture to BS EN ISO 1461. They shall comply with the relevant requirements of BS 4211 when fitted.

#### 05-20 Bricks and Mortar

- a. Bricks shall be Class B Engineering and complying to BS EN 771-1. Any bricks to be laid as soldier courses shall be solid.
- b. Mortar shall be at a ratio of no more than 1:3 and shall be mixed by machine or by hand to a uniform colour and consistency, with the constituent materials being accurately gauged.
- c. Mortar shall not be used at temperatures of less than 3°C.
- d. If Ironwork is to be lifted less than five days prior to surfacing a premade rapid set mortar shall be used following the prior written approval of the Engineer. The rapid set mortar shall be 60 minute first set or similar HAPAS approved (standard Detail C).

#### 05-21 Existing Land Drains

- a. Existing land drains and springs severed by construction shall be investigated. A scheme of mitigation to deal with the matter shall be provided to and agreed in writing by the Engineer. Works on site shall then be undertaken in accordance with the agreed mitigation.

#### 05-22 Testing and Cleaning of Pipes

- a. All pipes with watertight joints to be adopted by NYC shall be air or water tested to the satisfaction of the Engineer. The testing shall be in accordance with the requirements of SHW as indicated below
- b. Air Tests shall be undertaken as follows:
  - Air shall be pumped into the line until a stable pressure of 100 mm of head of water has been achieved, as indicated on a U tube gauge attached to the system.
  - The air pressure shall not fall to 75 mm of head within a period of 5 minutes.
- c. Water Tests shall be undertaken as follows:
  - The line shall be filled to 1.2 m above the crown of the pipe at the high end, (marked on the manhole prior to filling)
  - the test shall commence 2 hours after filling the section.
  - The loss of water over a 30-minute period shall be measured by adding water at ten-minute intervals to restore the original water level.
  - The amount of water added shall be measured and recorded.
  - The drain shall be deemed to have passed if the water added does not exceed one litre per hour per linear metre of drain per metre of nominal internal diameter.
- d. Any sections not passing any test shall have any defects made good and then be re-tested.
- e. All adoptable drains and gully leads shall be checked with CCTV recording. Records of all testing including CCTV recordings and accompanying written report shall be supplied to the Engineer. Slotted pipes shall only be subject to CCTV testing.
- f. CCTV of drains and gully leads must be undertaken prior to the surface course. Any defects identified as part of the report and remedials agreed in writing with the Engineer before the works commence. Further CCTV recording prior to adoption may be requested.
- g. On completion of the works, or earlier if agreed by the Engineer, all chambers and drains shall be jetted from end to end. On completion all drains shall be clean and free from obstruction.

#### 05-23 Culverts within the highway

- b. Where roads cross a watercourse, ditch, or small stream these shall be piped with a culvert using either a large diameter pipe or a box section culvert. Early consultation with other

Authorities is recommended. Culverts may require permissions from the Environment Agency, LLFA or IDB.

- c. Weight restrictions over an existing or proposed Culvert may be required depending on the adjacent land usage.
- d. The hydraulic design of culverts shall be in accordance with Chapter 12 CIRIA C786.
- e. Where rivers are to be crossed, the proposals shall be discussed with all relevant authorities and parties at an early stage to determine the appropriate crossing. The design for the preferred option shall have secured in writing all necessary permissions prior to any works commencing on site.
- f. Any works in, over, under or near a culvert may require Land Drainage Consent from the Environment Agency, LLFA or Independent Drainage Board (IDB).
- g. All pipes or culverts shall be pre-manufactured pre-cast concrete and shall be of sufficient strength to carry the carriageway loading. They shall be BSI or BBA approved.
- h. Where a pipe or culvert has a dimension greater than 900mm it shall be classed as a "Structure". Where Structures are to be installed, they shall be subject to the Approved in Principle (AIP) processes administered by the NYC Structures Team. Early discussions are recommended to avoid any potential delays to approvals and thus delivery.
- i. Culverts shall not have any dimension less than 450mm when laid under the highway. Should smaller pipes be considered necessary due to exceptional circumstances the prior written approval of the Engineer shall be sought.
- j. No culvert or pipe shall be laid with less than 200mm cover to the finished road level. Should less cover be considered necessary due to exceptional circumstances the prior written approval of the Engineer shall be sought.
- k. All concrete used in the surrounds etc to culverts shall be minimum strength of ST4. In some circumstances, the Engineer may require a "RC mix" to BS 8500-1 to be used.
- l. No culvert shall be trafficked for a minimum of 28 days after construction (including all beds, surrounds and cover slabs) without the Engineer's prior written approval for the use of concrete with a rapid set mix. The rapid set mix concrete shall be used in accordance with the approved details and method statements.
- m. All culverts shall be constructed with headwalls unless they form part of a pipe run. Headwalls shall be constructed in accordance with Section 5.24.

n. TABLE 05-05

The contents of this table apply to both culverts and pipes used as culverts. Where manufacturer's requirements differ from the contents of this table the prior written approval of the Engineer shall be sought for the bed and surround or other protection to be used.

Cover below Finished Road Level	Greater than 1200mm	1200mm to 901mm	900mm to 501mm	500mm to 301mm	300mm to 201mm	Less than 200mm
Pipe bedding to section 2.4	Required	Not applicable				

bed and surround 150mm thick ST4 Concrete	Not applicable	Required	Not applicable		
Cover slab 300mm thick ST4 extending 300mm beyond the pipe each side	Not applicable	Required	Required	Not applicable	Prior Written approval required
Bed under pipe 200mm thick ST4 below the collar extending 200mm beyond the pipe each side (wet laid)	Not applicable		Required		Prior Written approval required
Concrete cover between pipe and underside of macadam extending 450mm beyond the pipe each side with mesh	Not applicable		Required		Prior Written approval required
A393 (10mm) mesh in middle of concrete cover to pipe	Not applicable		Required	Not applicable	Prior Written approval required
2 layers A393 (10mm) mesh set at thirds in concrete cover. Minimum cover 50mm.	Not applicable			Required	Prior Written approval required
Concrete type "RC 32/40 " to be used	Not applicable		Required		Prior Written approval required
red asphalt sand carpet 10mm thick laid between macadam layers and concrete cover	Not applicable	Required			Prior Written approval required
CCTV inspection prior to surface course and prior to adoption	Required				Prior Written approval required

- o. Any amendments to the requirements of Table 5-05 shall be agreed in writing by the Engineer prior to any culvert works commencing on site.
- p. Any culvert longer than 30m shall have an access point or inspection cover fitted. This shall be located clear of any carriageway.
- q. Culverts with less than 900mm cover to the finished road level shall have ducting for Utility Services included within the design. The number of ducts provided shall be sufficient for the requirements of all Utility Services at the design stage plus additional ducts for future use. The prior written approval of all Utility Service Undertakers present in the area shall be provided to the Engineer prior to any culvert works commencing on site.
- r. Any duct with less than 300mm cover shall be made of ductile steel.
- s. Culverts beneath the highway will attract a commuted sum for inspection and maintenance. The expected design lifespan of the Culvert will be 60 years.

#### 05-24 Headwalls

- a. All pipe or culvert inlets or outlets to or from open watercourses shall be provided with a headwall incorporating any necessary apron, scour baffle, security screens or handrails etc. All headwall designs shall be submitted to and approved in writing by the Engineer prior to any headwall works commencing on site.
- b. Security Screens shall be provided to prevent unauthorised access. All security screen designs shall be submitted to and approved in writing by the Engineer prior to any headwall works commencing on site. All necessary measures to prevent any unauthorised access to culverts shall be taken in advance of permanent security screens being installed. All Security Screens shall follow the guidance in Chapter 4 of CIRIA C786 guidance.
- c. In certain locations, and with the approval of the Environment Agency, flap valves may be required. Flap valves shall be made of heavy-duty plastic (low maintenance type) unless the Engineer's prior written consent is obtained for the use of alternative materials.
- d. It shall be the responsibility of the developer to ensure the accurate setting out of invert levels which shall be subject to inspection and approval of the Engineer to ensure satisfactory flow through the drainage system.
- e. Where headwalls are located within 2.0 m of any footway, cycleway or carriageway they shall be provided with pedestrian safety railings. In some locations, additional vehicle restraint systems may be required. All designs shall be submitted to and approved in writing by the Engineer prior to installation.
- f. All headwalls shall have a top level not less than the height of the surrounding ground. Any headwall within 1.0 m of any path shall have a top level minimum 150mm above finished path level. Where a path or cycleway is within 4.0m of the headwall a suitable fence or barrier for safety shall be provided. The design of the fence or barrier shall be submitted to and agreed in writing prior to installation.  
A hard margin and suitable grading of adjacent land/spoil may be required within the design.
- g. Headwalls or associated fences, barriers or vehicle restraints shall not interfere with visibility splays at junctions, accesses or for forward visibility. Where necessary the culvert design shall be amended to ensure there is no encroachment in visibility splays.

#### 05-25 Swales and Soakaways

- a. The use of Swales and Soakaways are limited to locations deemed to be suitable and agreed by the Engineer. The Developer will have to prove the ground is suitable for this method, and that it can accommodate a 1 in 100-year flood event + climate change. The Developer must invite the relevant Flood Risk Engineer to any infiltration testing on site. The Developer will have to pay a commuted sum to NYC for future maintenance of the Swale's or Soakaways.
- b. Road gullies may discharge into a swale with agreement of the Engineer.
- c. Water runoff from the highway to a swale will be via Concrete grips to the top of the swale. And shall have a fall of no less than 1 in 20 to be self-cleansing.
- d. Soakaways will not be allowed under the Carriageway, in the location of statutory undertaker's equipment or within 5m from any building, wall, retaining structure or the edge

of the carriageway. A sump on the manhole is required prior to water entering the Soakaway. The sump will be no less than 1 m deep.

- e. Soakaways must be accessible by 32 Tonne tankers from the highway. A suitable access must be built to allow a tanker to be able to reverse to access the system. A minimum width of the access shall be 3 m wide and wider for any areas where the tanker has to manoeuvre. There shall be Street lighting within the access vicinity.
- f. All iron work and utility cover on the access road and tanks shall be BS EN 124 D400.
- g. The Developer shall work to NYC standard details in the construction of Swales and Soakaways. They must be protected from pollution, silt and debris during construction work for the development. If the Developer fails to do this the Engineer can instruct the Developer to replace the Soakaway or re-profile the swale before adoption.
- h. The Developer shall build islands in the Swale where needed to allow street furniture to be installed. The sections of Swale shall be connected by a minimum 225 mm pipe, (this may be larger if requested by the Engineer) to accommodate the island. The Swale shall be built to allow for the loss of storage for the islands. (Islands can be used for Street lighting, signs and other items of street furniture)

#### 05-26 Plot Drainage

- a. Drainage from individual plots or private sites onto the public highway is limited to a maximum of 6m<sup>2</sup>. When calculating the 6m<sup>2</sup> of plot drainage that is allowed onto the highway, paths, drives or access roads must be taken into account. The private drainage must be separate from the highway drainage.
- b. Plot drainage can be addressed by installing ACO channel drainage systems connected to the private surface water system.
- c. Drive drainage, ACO channels shall not be placed within 200mm of the highway/pin kerb. NYC recommends the use of a stretcher row of block paving between the pin kerb and any drive drainage systems.