



STANDARD SPECIFICATION FOR DRAINAGE WORK

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P1	S3	04.01.2019	First Issue
C1	D4	15.04.2019	Contract

1.0 GENERAL:

1.1 Compliance with other Specifications.

This Specification shall be read in conjunction with all other relevant drawings and Specifications. The work shall be carried out in accordance with these documents and shall be to the satisfaction of the Supervising Officer (S.O.) and the relevant Approving Authority. All drainage shall generally be in accordance with the British Standard Code of Practice "Drain and Sewer Systems Outside Buildings" BS:EN 752.

All works carried out under this Specification by the Main Contractor, or any Sub-Contractor employed by him, are to comply with all statutory requirements with respect to Health & Safety on site, particularly the provisions of the Construction (Design & Management) Regulations 2015.

1.2 Construction Details

The Contractor shall check all drawings, the Specification, and any other relevant document, and any matters which are not clear shall be referred to the S.O. The Contractor shall give sufficient notice in writing to the S.O. of any further drawings, details, and all other information which may be required for the execution of the work. The Contractor shall co-operate with the S.O. in anticipation of details and information necessary for the satisfactory progress of all work.

1.3 Defective Workmanship

Any work which is not in accordance with this specification shall be rejected and made good to the satisfaction of the S.O.

1.4 Protection

the works shall be protected from damage at all times. Any damage caused to the works shall be made good to the satisfaction of the S.O.

1.5 Sub-Letting

No work shall be sub-let without the written permission of the S.O.

1.6 Sewers for Adoption

All sewers to be adopted shall comply with the requirements of the Water Authorities Association document "Sewers for Adoption" sixth edition.

1.7 Specification for Highway Works

The Department of Environment/Scottish Development Department/Welsh Office, Department of the Environment for Northern Ireland, Specification for Highway Works is referred to in this Specification as the Specification for Highway Works.

1.8 The Building Regulations 2002, Approved Document H

All sewers to be constructed as part of a private development shall comply with the requirements of The Building Regulations 2002, Approved Document H.

2.0 MATERIALS:

2.1 British Standards

All materials used in the Works shall conform to the relevant British Standard Specification latest edition as amended.

In particular:

Ordinary Portland Cement	to BS EN 197
Sulphate Resisting Cement	to BS.4027
Sand, all-in Aggregate, Fine	
Aggregate, Coarse Aggregate	to BS EN 12620
Ready Mix Concrete	to BS EN 206
Precast Concrete Pipes and	
Drainage Fittings	to BS.5911
Vitrified Clay Pipes and Fittings	to BS.65
Ductile Iron Pipes and Fittings	to BS:EN 598
Cast Iron Pipes and Fittings	to BS.437
uPVC Pipes and Fittings	to BS:EN 1452-2&3, BS 4660:2000 & BS:EN 1401-1

Manhole Covers and Gratings	to BS:EN 124
Step Irons	to BS EN 13101
Bricks	to BS EN 772-3&7

2.2 Concrete

Concrete shall be produced, transported, placed and tested in accordance with the Specification for Mass and Reinforced Insitu Concrete. The minimum 28 day cube strength will be 20N/mm².

Aggregates for concrete shall comply with the relevant provisions of BS EN 12620

Sulphate resisting Portland cement shall be used in all cases or consist of a special combination of cement complying with the relevant provisions of BS EN 197 and ggbs or pfa unless the Contractor can satisfy the S.O. that any attack from soils or groundwaters will adequately be resisted by the use of cement to BS EN 197. For pre-cast concrete pipes or manholes complying with BS 5911 a minimum class 3 sulphate resistant cement shall be used by the Contractor unless the S.O. can be satisfied that a lower class will resist attack from soils and groundwater.

Steel reinforcement shall comply with the relevant provisions of the appropriate British Standards BS 4449, BS 4482 and BS 4483

2.3 Brickwork

2.3.1 Engineering Bricks

The engineering bricks shall be sound, hard, well burnt, bricks obtained from an approved yard and shall conform to BS EN 772-3&7 Class B.

2.3.2 Cement

The cement shall be sulphate resisting cement as described in the Specification for Insitu Mass and Reinforced Concrete unless otherwise stated.

2.3.3 Sand

The sand for mortar shall be naturally occurring and complying in all respects with BS. EN 13139, Table 1.

2.3.4 Mortar

All mortar shall be 1:3 cement/sand mix or equivalent using plasticizer with sulphate resisting cement. Mortar shall be made into small quantities and used within one hour of mixing. Mortar which has commenced to set shall not be used or beaten up for re-mixing.

2.3.5 Water

The water shall be clean drinking water free from any matter which would affect the strength of the mortar or have any effect on the appearance of the finished work by discoloration or efflorescence.

2.3.6 Brickwork

Clay bricks shall not be used until completely cold from the kiln.

Bricks shall be laid on a full bed of mortar and all joints filled. Bed and vertical joints shall be of equal and consistent thickness. Bricks shall have frogs laid upwards and filled with mortar to obtain the required crushing strength. The perpend shall be kept vertically in line and no "Bats" or broken bats used except as end closures to a course.

Gauge brickwork shall be gauged four courses to 300mm including joints. All traces of efflorescence shall be removed.

2.3.7 Working in Cold Weather

No brickwork or pointing shall be carried out when the temperature shows a reading less than 2°C unless expressly approved by the Engineer and any damage caused by frost shall be made good at the Contractor's expense.

Where necessary the bricks and the water and sand for mortar shall be preheated to ensure a temperature of 5°C in the brickwork when laid.

Bricks which are set shall not be used. An approved mortar air entraining plasticiser may be used, in accordance with BRS Digest 58, but calcium chloride or other anti-freeze compounds shall not be used.

All new brickwork shall be suitably covered for a period of 3-7 days as required and the temperature of the brickwork shall not be allowed to fall below freezing point.

2.3.8 Protection

All bricks shall be adequately protected whilst in the stack and tops of walls under construction shall be protected to prevent damage from severe weather.

All necessary sheets, felt and boards shall be provided to thoroughly protect the work at all times and any damage occasioned by want of proper protection shall be made good.

Face work shall be kept perfectly clean and free from mortar splashes. Scaffold boards shall be turned back during heavy rain and at the end of the day's work to avoid splashing.

2.4 Backfilling Materials

2.4.1 Selected Excavated Material

Selected excavated material shall consist of uniform readily compatible material free from tree roots, vegetable matter, building rubbish and frozen soil and shall exclude clay lumps retained on a 75mm sieve and stones retained on a 25mm sieve. Selected excavated material shall be used only where agreed with the S.O.

2.4.2 Hardcore

Hardcore shall consist of broken bricks and broken concrete of maximum size 75mm and shall be free of timber, plaster, reinforcement and other deleterious matter. The hardcore shall have sufficient fine material added to ensure that all voids are thoroughly filled.

2.4.3 Natural Stone or Hoggin

Locally obtained natural gravels, quarry waste or hoggin etc., shall be free from vegetable matter and of an easily compatible grading with sufficient fines to ensure all voids are filled. The maximum stone size shall be 40mm and the clay content less than 5%. Not more than 80% of material shall pass a 2.4mm sieve. The material shall only be used with the prior agreement of the S.O.

2.4.4 Granular Material

Granular material shall be in accordance with Type 2 Clause 804 of the Specification for Highway Works and shall comprise natural sands, gravel, crushed rock, crushed slag, crushed concrete or well burnt non-plastic shale. The material shall be well graded, lie within the grading limits of Table 8/3 of that Specification reproduced and appended at the back of this Specification as Table 1 and shall have a California Bearing Ratio of 30% or more.

2.4.5 Lean Concrete

Lean concrete shall be produced in accordance with Clause 1030 of the Specification for Highway Works.

2.5 Pea Shingle for Granular Bedding

Pea shingle for bedding of flexibly jointed pipes should conform to BS EN 1610 annex B Table B.15 and should be single size material or graded material from 5mm up to a maximum size of 10mm for 100mm pipes, 14mm for 150mm pipes, 20mm for pipes from 150mm up to 600mm diameter and 40mm for pipes more than 600mm diameter.

2.6 Pipes

All underground pipes and fittings with a diameter between 100 mm and 300 mm shall be vitrified clay with pipes over 300 mm in precast concrete unless authorised in writing by the S.O.

2.7 Connections

All junctions should be preformed Y or T sections compatible with the main class of pipework. Saddle connections must not be used unless otherwise agreed with the S.O. in writing.

2.8 Road Gullies

Road gullies shall be vitrified clay, precast concrete or plastic and shall comply with the requirements of the relevant B.S and shall be tested for leakage before use. Road gully frames and gratings shall be as indicated on the drawings to the relevant B.S requirements.

2.9 Filter Membrane

Where filter membranes are indicated on the drawings these shall be "Terram" gauge 1000.

2.10 Clay Puddle

Clay puddle shall be impervious to water and be free from sand, grit, stones and other delirious matter

2.11 Storage of Materials

Materials and components shall be stored in such a manner as to preserve their quality and condition to the standards required by the specification. Bricks shall be stacked on level hardstanding and protected.

3.0 WORKMANSHIP:

3.1 General

All drains, manholes, gullies etc., shall be laid to the depths, positions and falls as indicated on the drawings and shall be constructed as detailed and shall be watertight in accordance with the testing procedures set out in this Specification.

3.2 Site Survey

Before commencement of the Works, the Contractor shall check all existing invert levels at points of connection and inform the S.O. if any discrepancies are found.

3.3 Excavations

All excavations shall be to the gradients and levels as shown on the drawings and all shoring necessary shall be provided to ensure the stability of the Works. All trenches are to be of sufficient width to permit the proper construction of the Works and to give a clearance of at least 150mm, or a quarter of the pipe diameter whichever is the greater, between the outside of the barrel of the pipe and the face of the trench or shoring.

Should any ground be disturbed to a depth greater than required, the ground so excavated or disturbed shall be replaced by lean concrete, granular material Type 2 or such other material as the S.O. shall direct, up to the correct formation level, at the Contractor's own expense.

The trench bottom shall be trimmed to form even surfaces and shall be free from mud, etc., before any beddings are laid. The Contractor shall keep all excavations free of water at all times. Trenches shall be excavated to the minimum width necessary to carry out the works.

If the dimensions are exceeded the Contractor shall inform the S.O. and shall provide any additional bedding deemed to be necessary by the S.O. at his own expense.

3.4 Jointing and Bedding

All pipes shall be jointed with an approved flexible joint and shall incorporate a short length of pipe adjacent to all chambers and the face of rigid structures to aid this flexibility. Pipes shall be bedded in one of the following ways :

3.4.1 Class Z Bedding and Surround

This shall consist of a mass concrete cradle of Grade C20 concrete flexibly jointed with 18mm or 36mm boards of compressible materials as appropriate inserted at pipe joints. Where indicated on the drawings or where pipes pass under loadbearing structures (i.e. foundations), a concrete surround to pipes shall be provided and the compressible material shall be carried through the full depth of the concrete.

3.4.2 Class S Bedding

This material shall consist of pea shingle and shall be laid up to 150mm above the crown of the pipe for the full width of the trench as detailed in Clause 2.5.

3.5 Backfilling of Trenches

3.5.1 Initial Backfilling

The first 300mm of backfill material above the crown of the pipe shall be compacted by hand to ensure damage does not occur to the pipe, in layers not exceeding 150mm

3.5.2 Remainder of Backfill

The remainder of the trench shall be backfilled with one of the following materials, depending upon the location of the pipe run and the ground conditions, and shall be as specified on the drawings and described in the relevant clauses of this Specification:

- (a) Selected excavated material
- (b) Hardcore
- (c) Natural stone and hoggin
- (d) Granular Material Type 2
- (e) Lean concrete

The backfill shall be carried out in layers not exceeding 150mm and each layer shall be thoroughly compacted with mechanical rammers. Trench supports shall be removed as the work proceeds and the Contractor shall take every precaution to ensure that the sides of the trench are thoroughly compacted as the supports are removed.

3.6 Backfilling of Manhole Excavations

All voids remaining after the building of the manhole shall be backfilled with similar material as specified for trenches in such a manner as to avoid uneven loading or damage

The compaction of the backfill and the withdrawal of shoring shall be carried out in the same manner as described for backfilling trenches.

3.7 Testing Drains and Manholes

Testing shall be agreed with the S.O. and Local Authority before commencement of the Works. Tests shall be carried out on a completed length of drain up to and including 750mm nominal diameter after backfilling of the trench in accordance with one of the following methods :

3.7.1 Water Test

The lower end of the length of drain under test shall be closed by a properly fitted plug, and a temporary vertical standpipe 1.2 metres high of the same diameter as the run under test shall be connected to the upper end by means of a 90° bend.

Where the head of water at the low end of the run above the crown of the pipe exceeds 6 metres, the run shall be tested in stages so that the maximum head is not exceeded.

The standpipe shall be filled to a head of 1.2 metres and after allowing for an initial fall of level through absorption and displacement of air, an inspection shall be made for leaks.

After one hour, the pipe shall be topped up to 1.2 metres and over the next thirty minutes, the quantity of water added to maintain the original water level shall be measured. The water shall be added at ten minute intervals and the average amount noted. The test shall be considered satisfactory if the level has not dropped by more than the figures shown in the extract of CP.2005 shown in Table 2 appended to the back of this Specification.

3.7.2 Air Test

All branches and openings shall be closed with expanding disc stoppers or air bags. The length of sewer under test shall then be subjected to an internal air pressure equivalent to 100mm head of water by means of a manometer tube.

After the required pressure has been reached, pumping shall cease and the test shall be regarded as satisfactory if the loss of pressure does not exceed 25mm in five minutes.

3.7.3 Larger drains

Sewers greater than 750mm nominal diameter shall be tested via a visual inspection

3.7.4 Failure of Test

If the drain is not satisfactory, the Contractor shall, at his own expense, trace the source of leakage and effect a repair or carry out such remedial works as may be considered necessary by the S.O.

3.8 Bedding of Road Gullies

Road gullies shall be bedded in 150mm minimum thickness of Grade C20 concrete as indicated on the drawings and shall have two courses of Class B engineering brickwork laid in 1:3 cement/sand mortar between the gully pot and frame.

3.9 Manholes

All manholes shall be constructed either of Class B engineering brickwork or precast concrete rings bedded on a proprietary joint sealant.

Benching shall be constructed using Grade C20 concrete finished with 25mm cement/sand rendering (1:3) or 25mm granolithic rendering built up vertically to the level of the top of the incoming pipe and then sloped back in accordance with the details.

All manholes shall have covers as specified and brickwork chambers shall be corbelled as detailed on the drawings to support the cover. Precast concrete manholes shall have wall sections with proprietary joint sealant. Where indicated on the drawings the manhole rings shall be surrounded with 150mm Grade C20 concrete. Where joints in the concrete surround are necessary they shall be placed to allow a minimum overlap of 225mm between the external joint and the joint in the P.C. ring.

Step irons shall be provided at 300mm centres and staggered with the first iron set 450mm below cover level in accordance with the relevant provisions of BS EN 13101.

3.10 Petrol Interceptors

Petrol Interceptors shall be prefabricated and fitted with an oil level alarm in accordance with BS:EN 858-1, bedded on a Grade C20 concrete base. Chambers shall be either surrounded with concrete or pea shingle as specified. Measures shall be taken to prevent flotation during installation and installed to Manufacturers' instructions.

3.11 Soakaways

Soakaways shall be constructed of perforated manhole rings surrounded with graded granular material maximum size 40mm, minimum size 20mm and supported on a Grade C20 concrete base. The diameter and depth of base shall be in accordance with the drawings. Infiltration tests are to be carried out in accordance with BRE Digest 365 in order to assess the receiving grounds acceptability to soakaways.

3.12 Catch Pits

Catch pits shall be constructed of Class B engineering brickwork or precast concrete rings and shall be constructed on a Grade C20 concrete base which shall be 450mm below the level of the lowest invert of the connecting drain.

3.13 Land Drains

The Contractor shall supply "as built" drawings showing the co-ordinates and depth of manholes and pipes.

6.0 SPECIFICATION FOR DRAINAGE WORKS:

TABLE 1

TABLE 8/3	
B.S. Sieve Size	Percentage by Mass of Granular Material Passing Type 2
75 mm	100
37.5 mm	85 - 100
10 mm	45 - 100
5 mm	25 - 85
600 um	8 - 45
75 um	0 - 10

TABLE 2

Nominal Diameter	Allowable drop in Standpipe per 10 metre length/10 minutes
100	25 mm
150	17 mm
225	11 mm
300	8 mm
400	6 mm
450	5.5 mm
500	5 mm
600	4 mm
700	3.5 mm