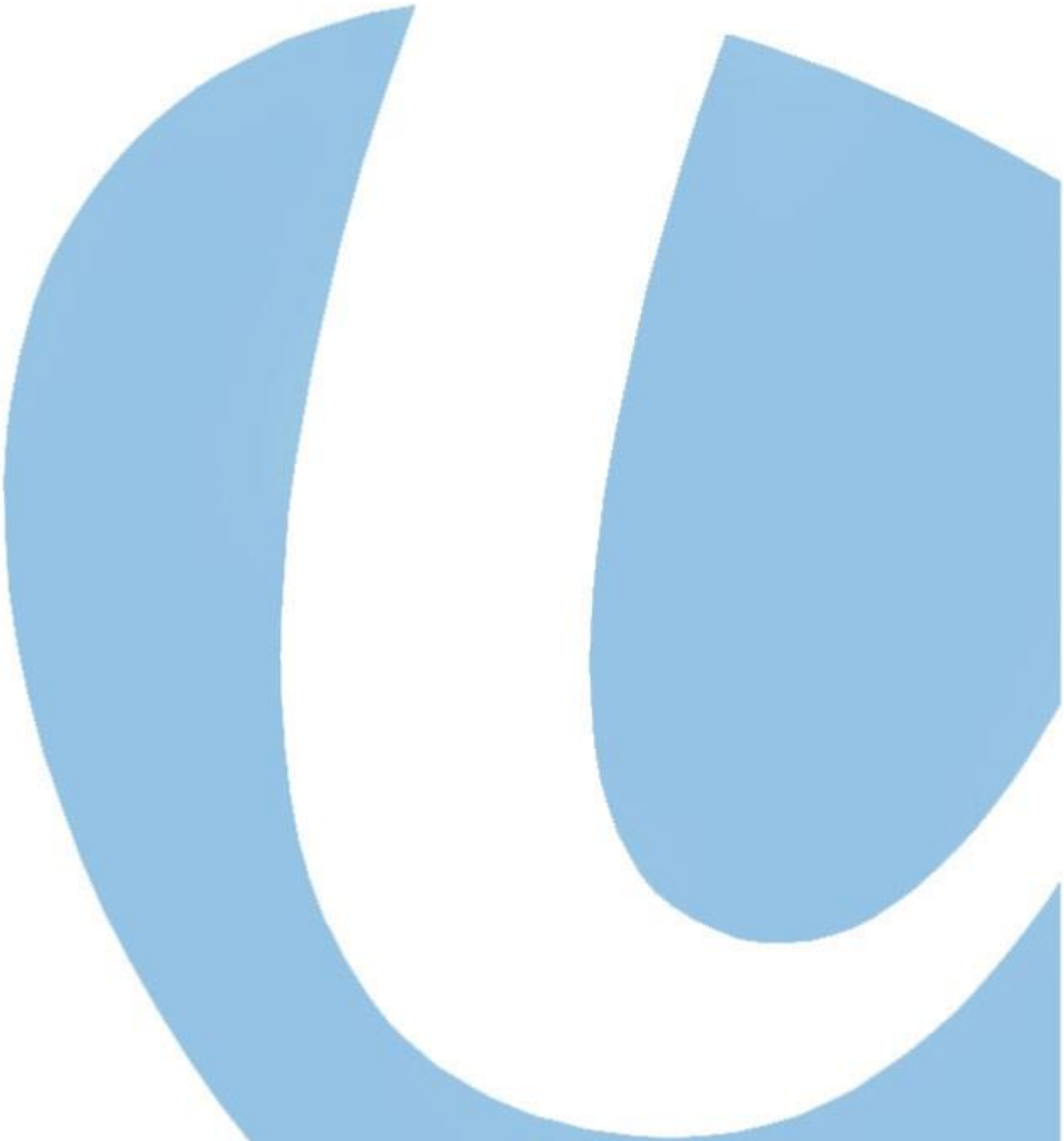
Standard Specification

UUCESWI

Issue 7 December 2018



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AMENDMENT SUMMARY

Issue	Date	Details	Prepared by	Verified by
7	Dec 2018	Minor update for AMP7 early start programme	D McKinley - Bourne	S Dempsey
6	March 2018	General update, Appendix VIII deleted and Section 6 of CESWI reinstated	D McKinley - Bourne	S Dempsey
5	Feb 2015	General update	D McKinley - Bourne	S Dempsey
4	Feb 2014	Headings of unamended clauses added. General update	D McKinley - Bourne	S Dempsey
3	March 2012	Updated to align with CESWI7, appendices incorporated. Title changed from 'UUCESWI6'.	D McKinley - Bourne	S Dempsey
2	March 2008			
1	Jan 2006	First issue. Aligned with CESWI6		

Standard Specification

UUCESWI

CONTENTS

UU APPENDICES

INTRODUCTION

This document, UUCESWI (issue 7, December 2018), is the UU company standard specification for civil engineering. It comprises company-specific amendments and additions to *'The Civil Engineering Specification for the Water Industry (Seventh Edition) (CESWI 7)'* published by WRc plc on behalf of UK Water Industry Research Ltd.

SECTION 1 GENERAL

Section 1 of CESWI 7 is not used. General requirements shall be as detailed in UU Standard Specification S01 '*General Requirements'*.

SECTION 2 MATERIALS

2.1 MATERIALS IN CONTACT WITH POTABLE WATER

(iii) Add 'and UU Supplementary guidance for the selection of water pipes in land potentially affected by contamination'.

1. *(Amend to read as follows)* Requirements for materials, substances and products in contact with potable water shall be as detailed in UU Standard Specification S01 *'General Requirements'*.

2.2 ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPES AND FITTINGS

No UU amendments or additions.

2.3 ADMIXTURES FOR CEMENT OR GROUT

(i) Amend to read as follows 'BS 8500-2 prohibits the use of air-entraining admixtures in standardised prescribed concrete and restricts the use of admixtures in designated concrete'.

3. For concrete in contact with potable water the Contractor shall provide a declaration confirming that any cement admixture used does not contain chemicals other than those given in the *'List of authorised cement admixture components'* in annex 2 of the DWI *'List of approved products for use in public water supply in the United Kingdom'*.

2.4 AGGREGATES FOR CONCRETE

1. *(Amend as follows) In table replace* 'BS EN 13055-1' *with* 'BS EN 13055'.

5. Aggregates shall be free from deleterious impurities including organic matter, earth, loam, clay, clayey, shaly or decomposed rock. They shall be hard, strong and durable. Aggregate shall be free from matter liable to produce staining or which could mark the finished concrete. The supplier shall demonstrate that the aggregate does not contain pyrites.

6. Freeze/thaw resistant aggregates as defined in BS 8500-2 Clause 4.3.2 shall be used in concrete subjected to exposure class XF3 or XF4.

2.5 AGGREGATES FOR HIGH STRENGTH CONCRETE WEARING SCREEDS

No UU amendments or additions.

2.6 AGGREGATES FOR MORTAR

No UU amendments or additions.

2.7 ASPHALT CONCRETE

No UU amendments or additions.

2.8 BIOLOGICAL PERCOLATING FILTER MEDIA

(ii) Delete note.

2. *(Amend to read as follows)* Filter media shall conform to the grading limits set out in Table 1 of BS 1438 for aggregate size 32/50. Sieve analysis tests shall be undertaken by the Contractor when required by the Contract Administrator. Sampling and testing shall be carried out in accordance with BS 1438. The following percentages of fine material will be permitted when media is sampled and tested after placing:

BS ISO 3310-1/BS ISO 3310-2 test sieve	% by weight passing
14 mm	0 – 2.5
2 mm	0 – 1.0
0.063 mm	0 – 0.5

2.9 BITUMEN ROAD EMULSIONS

1. *(Amend to read as follows)* Anionic and cationic bitumen road emulsions shall conform to BS 434-1 and BS EN 13808 respectively.

2.10 BITUMINOUS COATINGS

No UU amendments or additions.

2.11 BITUMINOUS JOINTING STRIP

2. The jointing strip shall be sweated onto the precast segments before erection.

2.12 BOARDS FOR PANELLING

1. *(Amend as follows) In table delete* 'Expanded polystyrene boards, expandable beads BS 3837-1'.

2.13 BOND BREAKING COMPOUND FOR DOWEL BARS

No UU amendments or additions.

2.14 BRICKS AND BLOCKS

5. *(Amend to read as follows)* Precast concrete blocks to be used below damp-proof course level shall conform to PD 6697 Table 15.

2.15 CAST STONE

No UU amendments or additions.

2.16 CEMENT

(iii) Delete 'or BS 4027'.

1. *(Replace table as follows)*

Cement Type	Standard
Portland cement (CEM I)	BS EN 197-1
Portland-composite cement (CEM II)	BS EN 197-1
Blast furnace cement (CEM III)	BS EN 197-1
Pozzolanic cement (CEM IV)	BS EN 197-1
Composite cement (CEM V)	BS EN 197-1
Very low heat special cements	BS EN 14216
Masonry cement	BS EN 413-1

2.17 CEMENT GROUTS

No UU amendments or additions.

2.18 CLAY PUDDLE

No UU amendments or additions.

2.19 COMPRESSIBLE FILLER AND PACKING FOR PIPELINES

No UU amendments or additions.

2.20 CONCRETE – GENERAL

(v) Amend to read as follows 'Except for prescribed mixes it is the concrete producer's responsibility to minimise the risk of alkali-silica reaction using the methods described in BS 8500-2 Annex B'.

1. *(Amend to read as follows)* Concrete shall be specified, produced, transported and assessed in accordance with BS 8500-2.

4. *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 8' *with* 'BE EN 206 Clause 8'.

5. *(Amend as follows) Replace* 'BS EN 206-1:2000 Annex B' *with* 'BE EN 206 Annex B'.

6. In the absence of information on the aggressive chemical environment of the ground and groundwater an ACEC class of AC-4 shall be assumed for the selection of mix proportions (and additional protective measures) for concrete in contact with the ground.

7. Refer also to Section 4.0 of this specification.

2.21 CONCRETE CONTAINING PFA OR GGBS

3. Mixes containing more than 50% GGBS or 30% PFA by weight of cement shall not be used in concrete subject to abrasion (eg inverts prior to degritting, scraper wheel tracks,

areas swept by compressed gate seals, sludge storage aprons).

2.22 CONCRETE – READY-MIXED

2. *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 7.38' *with* 'BE EN 206 Clause 7.3'.

2.23 CONCRETE – POROUS NO-FINES

3. Aggregates for no-fines concrete shall be rounded gravel. Limestone aggregate shall not be used.

4. Also refer to Clause 4.4.

2.24 CONCRETE – AIR-ENTRAINED

1. *(Amend as follows) Replace* 'BS 8500-1: 2006 Table A.8' *with* 'BS 8500-1 Table A.9.

2.25 CONCRETE – CHLORIDE CONTENT

1. *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 5.2.7' *with* 'BE EN 206 Clause 5.2.8'.

2.26 CONCRETE – PIPES AND FITTINGS

(iii) Concrete pipes manufactured in the UK employ DC-3 concrete or better. Additional protective measures will be required for ground conditions AC-4z and AC-5.

4. Unreinforced and reinforced concrete pipes and fittings shall be made from DC-3 or higher quality concrete to BS 8500-2.

2.27 CONNECTORS FOR TIMBER

No UU amendments or additions.

2.28 COPING UNITS

No UU amendments or additions.

2.29 COPPER PIPES AND FITTINGS

No UU amendments or additions.

2.30 COVER BLOCKS AND SPACERS FOR REINFORCEMENT

No UU amendments or additions.

2.31 DAMP-PROOF COURSES

No UU amendments or additions.

2.32 DOORS, FRAMES AND LININGS

2. *(Amend as follows) Replace* 'BS 4787' *with* 'BS 4787-1'.

4. Doors providing direct access to drinking water contact tanks and service reservoirs shall conform to Water UK *'Specification for the Security of Service Reservoirs'* and shall conform to 'Security Rating 4' as designated by the Loss Prevention Council (LPC).

2.33 DOWEL BARS

No UU amendments or additions.

2.34 DRAW CORD

No UU amendments or additions.

2.35 DRESSED NATURAL STONE KERBS, CHANNELS, QUADRANTS AND SETTS

No UU amendments or additions.

2.36 DUCTILE IRON, CAST IRON AND STEEL PIPES, FLANGES AND FITTINGS

(xii) See Clause 5.14 for protection of pipes.

3. *(Amend to read as follows)* Steel pipes and fittings shall conform to BS EN 10224-L275 Option 1:S or SAW or American Petroleum Institute (API) 5L Grade X46. Joints shall conform to BS EN 10311. The minimum thickness of steel plate for the fabrication of pipes and fittings shall be 6.3 mm.

4. *(Addition to clause)* Flanges shall have a minimum pressure rating of PN16.

7. *(Amend to read as follows)* Cement mortar linings for potable water pipelines shall comply with the requirements of BS EN 545. A seal coat shall be applied to pipes and fittings up to 800 mm nominal diameter. The seal coat shall comply with the requirements of BS ISO 16132.

2.37 ELECTRODES, FILLER RODS AND WIRES FOR WELDING

2. *(Amend as follows) Replace* 'BS EN 1600' *with* 'BS EN ISO 3581'.

3. *(Amend as follows) Replace* 'BS EN ISO 14171' *with* 'BS EN ISO 14171 and BS EN ISO 14174 respectively'.

2.38 EXPANDED METAL ANGLE BEADS

No UU amendments or additions.

2.39 FERTILISER

No UU amendments or additions.

2.40 FIELD GATES

2. *(Amend to read as follows)* Timber field gates and posts shall conform to UU Standard Detail F13 on drawing STND-14-003.

2.41 FIXING ACCESSORIES FOR BUILDING PURPOSES

1. *(Delete)*

2.42 FIXINGS FOR METALWORK

(iv) Delete 'CIRIA Technical Note TN75 deals with loading tests on fixings in concrete'.

2. *(Amend as follows) Replace* 'X5 CrNiMo 17-12-1' *with* 'X5 CrNiMo 17-12-2'.

(v) Amend to read as follows 'The safe working load and any testing requirements for fixings in concrete or masonry should be described in the Contract'.

4. Axial and shear loading tests on structural fixings in concrete or masonry shall be carried out in accordance with BS 5080-1 and BS 5080-2 respectively.

2.43 FLASHINGS

No UU amendments or additions.

2.44 FLEXIBLE COUPLINGS

1. *(Amend as follows) Delete* 'WIS 4-41-01 and'.

2.45 FLOOR TILES

1. *(Amend as follows) In table replace* 'BS EN 649' *with* 'BS EN ISO 10581' *and* 'BS EN 654' *with* 'BS EN ISO 10595'.

2.46 FOAMED CONCRETE

No UU amendments or additions.

2.47 FOAM SWABS

2. The swab length shall be 1.5 times its diameter. Swab diameter shall be as follows:

Pipes with outside diameter ≤ 230 mm - internal diameter + 25%.

Pipes with outside diameter > 230 mm - internal diameter + 75 mm.

2.48 GABIONS AND ROCK FILLED MATTRESSES

No UU amendments or additions.

2.49 GASKETS FOR FLANGED AND PUSH-FIT JOINTS

(iii) In general the use of flanged pipe joints should be avoided on buried pipework.

1. *(Amend to read as follows)* Gaskets for buried flanged pipe joints shall be full face type. The dimensions of gaskets shall conform to BS EN 1514-1.

2.50 GENERAL FILLING MATERIALS

(i) Replace 'BRE Digest 276' with 'BRE Digest 522'.

(ii) The definition of waste is interpreted in Section 2(1) of the Environmental Permitting Regulations as follows:
'Waste', except where otherwise defined means anything that –
(a) is waste for the purposes of the Waste Framework Directive, and
(b) is not excluded from the scope of the Directive by Article 2(1) of that Directive.

4. Materials shall not be considered to be waste after use.

5. Backfill material shall not be capable of:

- Causing deterioration of construction materials within the expected lifetime of the asset
- Permeating construction materials to an extent that could affect the supply of 'wholesome' water
- Causing the land to be classified as 'contaminated land'
- Causing damage to the environment

6. Blastfurnace slag shall not be used.

2.51 GLASS FOR GLAZING

No UU amendments or additions.

2.52 GLASS REINFORCED PLASTICS (GRP) PIPES AND FITTINGS

2. GRP pipes for pressure applications shall be filament wound.

2.53 GLASS REINFORCED PLASTICS PRODUCTS

2. *(Amend as follows) At beginning of second sentence replace* 'The material …' *with* 'Material for moulded and hand lay-up uses …'.

3. *(Amend as follows) Replace* 'BS 2787-10' *with* 'BS EN 59'.

2.54 GLAZING MATERIALS

1. *(Delete)*

2.55 GRANULAR SUB-BASE MATERIAL

1. *(Replace table as follows)*

Test sieve	Percentage by mass passing		
	Type 1	Type 2	803X
75 mm	100	100	100
37.5 mm	85 – 100	85 – 100	100
20 mm	60 – 100	60 – 100	100
10 mm	40 – 70	45 – 100	85 – 95
5 mm	25 – 45	25 – 85	30 – 60
600 µm	8 – 22	8 – 45	8 – 22
75 µm	0 – 10	0 – 10	0 – 10

7. *(Amend to read as follows)* Recycled material shall conform to BS EN 13242. Blastfurnace slag shall not be used.

2.56 GRASS SEED

No UU amendments or additions.

2.57 GRUMMETS

No UU amendments or additions.

2.58 GULLIES AND GULLY COVER SLABS

No UU amendments or additions.

2.59 GULLY COVERS, GRATINGS AND FRAMES

(ii) Add 'BS 7903 provides guidance on the additional requirements that need to be specified to ensure that the supplied product is fit for purpose'.

1. *(Amend to read as follows)* Gully covers, gratings and frames shall conform to BS 7903, BS EN 124-1 and the relevant part of BS EN 124 set out in the table below:

Material	BS EN 124 Part
Cast iron	2
Steel or Aluminium	3
Reinforced concrete	4
Composite	5
PP, PE or PVC-U	6

2.60 HANDRAILS AND BALUSTERS

(vi) 1.4401 is the steel number for X5 CrNiMo 17-12-2 stainless steel.

3. *(Amend as follows) Replace* 'BS 2782-10' *with* 'BS EN 59'.

6. Self-closing and lockable gates shall be provided at openings in handrails at ladder heads.

(vii) The use of stainless steel and aluminium should be avoided in non-secure locations.

7. Fixings for galvanised mild steel handrails and balusters shall be mild steel, galvanised to BS EN ISO 1461.

(viii) For design requirements refer to Appendix VII.

8. Fixings for GRP and stainless steel standards and fittings shall be X5CrNiMo 17-12-2 stainless steel to BS EN 10088-3.

9. Toe boards shall be fitted to handrailing in elevated areas. Toe boards shall be 100 mm high with a 10 mm (maximum) gap between the underside of the toe board and the top of the walkway and shall be constructed from the same material as the handrailing. Steel and aluminium toe boards shall have a minimum thickness of 6 mm. GRP toe boards shall be formed from proprietary sections.

10. Access provisions to wet wells, where considered necessary, shall be constructed from stainless steel.

2.61 HYDRANTS

1. *(Addition to clause)* Hydrants shall have a metal outlet and shall be squat pattern with an overall height not exceeding 342 mm. They shall have a captive valve and shall be capable of passing a 150 mm diameter foam swab.

6. *(Amend as follows) Delete* 'not less than'.

7. Hydrants on mains of greater than 200 mm diameter shall be on a branch with a vertically controlled gate valve.

8. The length of the branch connection for PE hydrant tees shall not exceed 200 mm.

2.62 IMPORTED TOPSOIL

3. Also refer to UU Standard Specification S08 *'Environmental Management'*.

2.63 IMPORTED TURF

No UU amendments or additions.

2.64 INDUSTRIAL FLOORING, WALKWAYS AND STAIR TREADS

(vi) The use of stainless steel and aluminium should be avoided in non-secure locations.

5. Clamp-type grating fixings, ie top and bottom clips connected by a through-bolt, shall not be used.

(vii) For design requirements refer to Appendix VII.

6. Clips and fixings for stainless steel and GRP components shall be X5CrNiMo 17-12-2 stainless steel to BS EN 10088-2&3.

7. Stainless steel plate or mesh flooring shall be manufactured from grade X5CrNiMo 17-12-2 steel conforming to BS EN 10088-2.

2.65 JOINERY TIMBER

No UU amendments or additions.

2.66 JOINT FILLER BOARD

5. *(Amend as follows) Replace* 'ASTM D3575-08' *with* 'ASTM D3575-14'.

2.67 JOINT SEALING COMPOUNDS AND SEALANTS

3. *(Delete)*

7. Two-part polysulphide-based sealants shall conform to BS EN ISO 11600. Pouring grade shall be applied to horizontal upward-facing joints and gun grade to joints of any other aspect or inclination. Other two-part polymer-based sealants of gun or trowel grade shall conform to the physical and test requirements of BS EN ISO 11600. Two-part polysulphide based sealants for movement joints in brickwork shall be an approved colour.

8. Silicon based building sealants shall conform to BS EN ISO 11600.

9. Joint sealants on the face of water retaining structures in contact with the process water/effluent shall be an appropriately resistant two-part elastomeric sealant.

10. Sealants used in fuel storage areas and other areas subject to spillage of fuels or oils, shall be resistant to the fuel/oil product.

2.68 JOINT SEALS AND LUBRICANTS

No UU amendments or additions.

2.69 JOIST HANGERS

No UU amendments or additions.

2.70 LADDERS

(iii) The use of stainless steel and aluminium should be avoided in non-secure locations.

5. *(Amend as follows) Replace* 'BS 2782-10' *with* 'BS EN 59'.

2.71 LEAD

No UU amendments or additions.

2.72 LIME FOR MORTAR

No UU amendments or additions.

2.73 LINTELS

No UU amendments or additions.

2.74 MANHOLE COVERS AND FRAMES

(iv) Add 'For manhole covers installed in the highway BS 7903 provides guidance on the additional requirements that need to be specified to ensure that the supplied product is fit for purpose'.

1. *(Amend to read as follows)* Manhole covers and frames shall conform to BS 7903, BS EN 124-1 and the relevant part of BS EN 124 set out in the table below:

Material	BS EN 124 Part
Cast iron	2
Steel or aluminium	3
Reinforced concrete	4
Composite	5
PP, PE or PVC-U	6

(vi) Add 'The information required by BS 7903 Annex A should be stated in the Contract'.

4. Covers shall be removable by a single worker. Where available in the size/strength class combination required hinged manhole covers shall be used.

5. Covers shall be securely fitted so as not to be dislodged by grass-cutting machinery, etc.

6. Access covers providing direct access to drinking water shall conform to Water UK *'Specification for the Security of Service Reservoirs'* and shall conform to 'Security Rating 4' as designated by the Loss Prevention Council (LPC).

7. Manhole covers and frames situated in public highways shall be a minimum Class D400 in accordance with BS EN 124-1. Those situated in Category 1, 2 and 3 roads, as defined in the HAUC *'Specification for the reinstatement of openings in highways',* shall have a minimum frame depth of 150 mm. For Category 4 roads and fields a minimum frame depth of 100 mm shall apply.

2.75 MANHOLE STEPS

2. Step irons for use in brickwork shall have a tail length of 230 mm. Step irons for use with in situ concrete shall have a tail length of 115 mm.

2.76 MARKER TAPE AND MARKER POSTS

1. *(Amend to read as follows)* '…corrosion resistant tracing system (for non-metallic pipes) …'

7. All buried cables shall have traceable marker tape laid within the same trench.

2.77 MASTIC ASPHALT

No UU amendments or additions.

2.78 MECHANICAL COUPLINGS FOR PIPELINES AND FITTINGS

(iii) Add 'Type 1 fittings may be

required in unusual circumstances'.	2. *(Amend as follows) Replace* 'WIS 4-24-01' *with* 'BS 8561, BS EN 12842 or BS EN 14525 as appropriate'.
	2.79 METAL LATHING
	No UU amendments or additions.
	2.80 METAL TIES
(i) Delete note.	1. *(Amend to read as follows)* Metal ties shall be stainless steel conforming to BS EN 845-1 with a minimum tensile strength of 510 N/mm^2. Ties for cavity walls shall be vertical twist strip type. The tie length shall be sufficient to provide the minimum embedment length recommended by the manufacturer.
	2.81 MINERAL AGGREGATES FOR FLAT ROOFS
	No UU amendments or additions.
	2.82 MORTAR
	5. Mortar for pressure pointing existing brick sewers shall comprise the following by mass: 1 part CEM I cement to BS EN 197-1 2 parts PFA to Clause 2.111.1 1 part sand to BS EN 13139 aggregate size 0/2 mm Mortar shall be mixed with water to achieve a 0.35 water/ solids ratio and used within 1 hour of mixing.
	2.83 NAILS
	No UU amendments or additions.
	2.84 NATURAL STONE
	No UU amendments or additions.
	2.85 NON-MAN ACCESS CHAMBERS
	No UU amendments or additions.
	2.86 NUTS, SCREWS, WASHERS AND BOLTS
	1. *(Amend as follows) In table delete* 'BS 4395-1 or'.
	7. Mild steel nuts, bolts and washers for use in non-immersed applications shall be galvanised to BS EN ISO 1461. For immersed conditions stainless steel fixings shall be used.
	8. Fixings and fasteners for use on demountable components, except where in contact with potable water, shall have an anti-seize compound smeared on the threaded section.

9. Bolts and nuts shall be in accordance with the following standards:

a) General bolting requirements to BS 3692, Grade 8.8

b) High strength friction grip bolts, nuts and washers to BS EN 14399 used as ordinary high strength bolts in accordance with BS EN 1993-1-8, hardened steel tapered washers shall be used on all slopes exceeding 30°.

c) Holding down bolts and nuts to BS 3692 grade 8.8 but purpose made with either normal bolt head or screwed both ends with two extra nuts.

d) Lock nuts for grade 8.8 bolts: thin nuts to BS 3692.

e) Round washers to BS 4320 Form A made from BS EN 10139 grade DC01 cold rolled strip steel in the hard condition chamfered on one outside edge.

f) Taper washers shall be made from BS EN 10139 grade DC01 cold rolled strip steel in the hardened condition to similar dimensions and tolerances as shown in BS 14399.

g) Load-indicating washers shall be a type that allows the bolts to be reliably tightened to the minimum shank tensions specified in BS EN 1993-1-8.

h) Accessories for use with load indicating washers: bolts, hardened steel washers, hardened steel taper washers and nuts to BS EN 14399 and special nut face washers, shall be obtained from load indicating washer manufacturer for use in assemblies where load indicating washers are not under the bolt heads.

2.87 PACKINGS FOR TUNNELS

No UU amendments or additions.

2.88 PAINTS AND PAINTING MATERIALS FOR BUILDINGS

5. *(Amend as follows) In table delete* 'Ready-mixed aluminium BS 4756, Type II'.

2.89 PERMANENT FENCING

(iii) The site security category should be stated in the Contract.

2. The Security Risk Category for a given site will be stated in the project specific requirements and the security fencing requirements confirmed.

(iv) A list of items to be defined at the time of enquiry or order is stated in an Annex to each part of the British Standard.

3. Where small stock (eg. sheep, pigs) have access, fencing shall conform to BS 1722-2 – Rectangular wire mesh fencing.

Where cattle have access, fencing shall conform to BS 1722-2 – Strained wire fencing.

Local advice should be sought where horses have access to

the fencing. Strained wire fencing is not suitable for use with horses as it is not easily visible to them and they are prone to injure themselves. Post and rail is preferred although this must be of sufficient strength.

Where stock do not have access to the fence and there are no open tanks or chambers on site, fencing shall conform to BS 1722-7 – Wooden post and rail fencing.

2.90 PIPE SURROUND MATERIALS

(iii) Embedment class T is detailed in the Highways Agency 'Manual of Contract Documents for Highways Works', Volume 3, Section 1, Drawing F1.

1. *(Amend to read as follows)* Processed natural and recycled aggregate for bedding, sidefill and surrounds to buried pipelines shall conform to the table below:

Standard	BS EN 13242
Resistance to fragmentation	LA_{50}
Class X materials (recycled aggregate)	X_{1-}
Acid soluble sulfate	$AS_{0.8}$
Total sulfur	S_1
Fines content Coarse, gravel Coarse, crushed rock and recycled aggregate Fine and all-in, gravel Fine and all-in, crushed rock and recycled aggregate	 $f_{1.5}$ f_4 f_3 f_{11}
Grading category Graded aggregate Single sized aggregate Fine aggregate All-in aggregate	 $G_c85/15$ $G_c80/20$ G_F80 G_A80
Grading tolerance category	$G_{TC}NR$
Crushed or broken particles (rigid pipes > 550 mm diameter)	$C_{50/10}$

2. *(Amend to read as follows)* Gradings for processed natural and recycled aggregate for bedding, sidefill and surrounds to buried pipelines shall conform to the tables below:

BS EN 1295-1 embedment classes B, S and F

Pipe nominal diameter (mm)	Graded	Single size
Not exceeding 100	-	4/10
100 – 150	2/14	4/10 or 6.3/14
150 – 300	2/14 or 4/20	4/10, 6.3/14 or 10/20
300 – 550	2/14 or 4/20	6.3/14 or 10/20
Over 550	2/14, 4/20 or 4/40	6.3/14, 10/20 or 20/40

BS EN 1295-1 embedment class N and Highways Agency embedment class T

Pipe nominal diameter (mm)	Fine	All-in
Not exceeding 150	0/1, 0/2 or 0/4	0/6.3 or 0/10
150 – 550	0/1, 0/2 or 0/4	0/6.3, 0/10 or 0/20
Over 550	0/1, 0/2 or 0/4	0/6.3, 0/10, 0/20 or 0/40

3. Blastfurnace or steel slag shall not be used as pipe bedding, sidefill or surround material. Pulverised-fuel ash shall not be used in contact with ferrous pipes. Metallic fittings on plastic pipework in contact with pulverised-fuel ash shall have type P1 protection in accordance with Clause 5.14.

4. As-dug material for use as pipe bedding, sidefill or surround shall conform to WIS 4-08-02.

2.91 PIPES FOR DUCTS

4. *(Replace table as follows)*

Duct	Colour
HV electrical power cables (> 1000 V)	Red
DNO supply cables	Red
Other electrical power cables	Black
Electrical signal and telecoms cables	Grey
Cable TV	Green
Street lighting	Orange
Motorway communications	Pink

5. Minimum radius of bends for ducts shall be 750 mm.

2.92 PIPES FOR LAND DRAINAGE AND TEMPORARY DRAINS

No UU amendments or additions.

2.93 PLASTER

No UU amendments or additions.

2.94 PLASTIC CHAMBERS AND RINGS

No UU amendments or additions.

2.95 PLASTIC SHEETING

No UU amendments or additions.

2.96 PLYWOOD

No UU amendments or additions.

2.97 POLYETHYLENE PIPES AND FITTINGS

(viii) The application area (U or UD) and any restriction on the type of structured wall pipe should be described in the Contract.

3. *(Amend as follows) Delete* 'for use with cold potable water'.

4. *(Addition to clause)* Electrofusion fittings shall not be used on pipes in excess of 355 mm external diameter or on systems subject to a pressure in excess of 10 bar. Type testing shall include the tolerance to contamination test described in WIS 4-32-14.

(ix) Dispensation may be given for the use of electrofusion fittings in special circumstances. Required safeguards may include; installation and warranty by the fitting manufacturer or third party inspection of welds.

6. De-rated PE100 shall not be used in lieu of PE80.

7. Polyethylene barrier pipes and fittings for water supply shall conform to BS 8588.

8. Polyethylene (PE) and polypropylene (PP) structured wall pipes and fittings for drainage and sewerage shall conform to the following table:

Standard	BS EN 13476-1 and WIS 4-35-01
Type	A to BS EN 13476-2 or B to BS EN 13476-3
Minimum ring stiffness class	SN8
Maximum diameter (DN/ID)	900 mm
Impact test	Annex G
Maximum long term deformation	6%

2.98 PRECAST CONCRETE SLABS AND COVER FRAME SEATING RINGS

No UU amendments or additions.

2.99 PRECAST CONCRETE FLAGS AND PAVING BLOCKS

No UU amendments or additions.

2.100 PRECAST CONCRETE KERBS, CHANNELS, EDGINGS AND QUADRANTS

2. Kerbs manufactured from other materials shall conform to the shape, dimension and performance requirements of BS EN 1340.

2.101 PRECAST CONCRETE MANHOLES AND SOAKAWAYS

1. *(Amend as follows) Delete* 'of circular cross-section'.

2.102 PRECAST CONCRETE BOX CULVERTS

No UU amendments or additions.

2.103 PRECAST CONCRETE SEGMENTS FOR TUNNELS AND SHAFTS

1. *(Amend as follows) Replace* 'as defined in BS 8500-1' *with* 'as a minimum'.

2. *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 8.2.1' *with* 'BE EN 206 Clause 8.2.1'.

12. All joints shall be watertight.

2.104 PRECAST CONCRETE SETTING BLOCKS FOR PIPES

No UU amendments or additions.

2.105 PRECAST CONCRETE TANKS

No UU amendments or additions.

2.106 PRESTRESSED CONCRETE PIPES AND FITTINGS

No UU amendments or additions.

2.107 PRESTRESSED PRECAST CONCRETE FLOORS

No UU amendments or additions.

2.108 PROFILED STEEL SHEETING

No UU amendments or additions.

2.109 PROPYLENE CO-POLYMER PRESSURE PIPES

No UU amendments or additions.

2.110 PTFE TAPE

No UU amendments or additions.

2.111 PULVERISED-FUEL ASH

1. *(Amend to read as follows)* Pulverised-fuel ash (PFA) and fly ash for use as a Type I (essentially inert) addition to concrete or grout shall conform to the general requirements of BS EN 450-1 with limits on the following specific properties only:

Property	Limit
Moisture content Fineness	Not exceeding 0.5 % Not exceeding 60 %

Sulfuric anhydride (SO_3) content	Not exceeding 3 %
Loss on ignition	Not exceeding 12 %

2. *(Amend to read as follows)* Pulverised-fuel ash (PFA) for use as a Type II (pozzolanic) addition to concrete, grout or mortar shall conform to BS EN 450-1 fineness category S, loss on ignition category A or B.

4. Pulverised-fuel ash (PFA) for use in grout for annulus grouting shall be pre-blended and bagged before delivery to site.

2.112 RAINWATER PIPES AND GUTTERS

No UU amendments or additions.

2.113 ROLLED ASPHALT

No UU amendments or additions.

2.114 ROOF COVERINGS

No UU amendments or additions.

2.115 SAFETY CHAINS IN SEWERS

3. *(Amend to read as follows)* Stainless steel safety chain shall have a breaking force of 30 kN and a proof force of 15 kN when tested in accordance with BS EN 818-1.

2.116 SAMPLE TAPS

No UU amendments or additions.

2.117 SANDS

No UU amendments or additions.

2.118 SEWER LININGS

1. *(Amend as follows) In table replace* 'WIS 4-34-04' *with* 'BS EN ISO 11296-4'.

2.119 SOIL, WASTE AND VENTILATING PIPES

No UU amendments or additions.

2.120 STEEL REINFORCEMENT

No UU amendments or additions.

2.121 STEEL SHEET PILES

1. *(Amend to read as follows)* Materials and tolerances for steel sheet piles shall be in accordance with the Institution of

Civil Engineers *'Specification for Piling and Embedded Retaining Walls'*.

2. *(Delete)*

2.122 STILES, BRIDLE GATES AND KISSING GATES

No UU amendments or additions.

2.123 STRUCTURAL STEEL

1. *(Amend as follows) In table replace* 'BS 4-1' *with* 'BS EN 10365'.

2.124 SURFACE BOXES AND GUARDS

(i) Amend to read as follows 'Particular requirements from the options listed in Annex A of BS 5834-1, Annex B of BS 5834-2 and Annex A of BS 5834-4 should be described in the Contract'.

1. *(Amend to read as follows)* Surface boxes shall conform to BS 5834-2.

2. *(Delete)*

3. *(Amend to read as follows)* Guards and plinth units shall conform to BS 5834-1.

(ii) Delete note, the scope of BS EN 124 does not include surface boxes.

5. *(Amend to read as follows)* Surface boxes to be installed in carriageways or other areas with frequent passage of vehicles shall be Grade A to BS 5834-2. Surface boxes to be installed in all other areas shall be a minimum of Grade B to BS 5834-2.

(iii) Delete note.

(iv) Delete note.

6. *(Delete)*

7. *(Amend to read as follows)* Utility chamber units and base units shall conform to BS 5834-4.

8. *(Amend to read as follows)* Utility chamber units and base units to be installed in carriageways or other areas with frequent passage of vehicles shall be Grade A to BS 5834-4. Utility chamber units and base units to be installed in all other areas shall be a minimum of Grade B to BS 5834-4.

10. *(Amend to read as follows)* Surface boxes providing direct access to areas of potable water shall conform to Water UK *'Specification for the Security of Service Reservoirs'* and shall conform to 'Security Rating 4' as designated by the Loss Prevention Council (LPC).

2.125 SYNTHETIC RESIN ADHESIVES

No UU amendments or additions.

2.126 TIMBER AND PRESERVATION OF TIMBER

2. *(Amend to read as follows)* Solid wood panels (SWP) and laminated veneer lumber (LVL) shall conform to BS EN 13353 and BS EN 14279 respectively.

3. *(Addition to clause)* Creosote shall not be used for the preservative treatment of timber.

4. Timber for use in the permanent works in a marine environment shall be greenheart. The length of tight end splits shall not exceed 1.5 times the nominal calliper measure. Holes for bolts shall have a diameter not more than 2 mm greater than the diameter of the bolts to be used. Recesses for washer plates shall have dimensions not more than 20 mm greater than the washer plate dimensions. The use of reclaimed timber is acceptable provided that all exiting bolt holes are securely filled to at least 150 mm depth in the dry and finished flush.

5. In addition to the requirements of 2.126.4 above timber piles for marine use shall have a deviation from straightness not exceeding 1 in 75. Tight ring shakes shall not exceed 75 mm in diameter, tight side splits shall not exceed 40 mm penetration measured perpendicular to the face of the timber. Timber with significant cup shakes, star shakes or side splits shall not be used. The points of piles shall be protected by mild steel or cast and shoes and the heads protected by tight fitting mild steel rings.

2.127 TREES AND SHRUBS

1. *(Amend to read as follows)* Refer to UU Standard Specification C08 *'Landscape Works'*.

2.128 TYING WIRE

No UU amendments or additions.

2.129 UNPLASTICISED PVC PIPES AND FITTINGS

(ii) Delete note.

1. *(Amend as follows) In table replace* 'WIS 4-31-08 (12.5 bar and 16 bar only)' *with* 'BS ISO 16422 (including joints)'.

(iv) The application area (U or UD) and any restriction on the type of structured wall pipe should be described in the Contract.

4. *(Amend to read as follows)* PVC-U structured wall pipes and fittings for drainage and sewerage shall conform to the following table:

Standard	BS EN 13476-1 and WIS 4-35-01
Type	A to BS EN 13476-2 or B to BS EN 13476-3
Minimum ring stiffness class	SN8
Maximum diameter (DN/ID)	900 mm
Impact test	Annex G
Maximum long term deformation	6%

2.130 VALVES AND PENSTOCKS

1. *(Amend as follows) In table replace* 'BS EN 12334' *with* 'BS EN 16767'.

2. *(Amend to read as follows)* Valve and penstock parts in contact with potable water shall conform to Clause 2.1.

4. *(Amend to read as follows)* Unless otherwise stated all valves shall be clockwise closing except tee-key operated gate valves on water networks pipelines which shall be counter-clockwise closing. All valves shall have the direction of closing permanently cast or stamped on the handwheel or body as appropriate.

5. Valve extension spindles shall be solid galvanised mild steel fabricated in single lengths. The maximum distance between supports shall be 2 m. Extension spindles and caps for buried valves shall terminate within 200 mm of finished ground level. Within structures, extended spindles shall terminate not more than 200 mm below the relevant operating surface.

6. Handwheels, valve caps and spindle couplings shall be positively located and secured on spindles, friction location is not acceptable.

7. Valves shall incorporate gearing to allow manual operation against the design differential pressure referred to in the data sheet or 1 bar, whichever is the greater, with an operating effort at the handwheel rim (push/pull) not exceeding 250 N. Bypasses may be employed for pressure equalisation where access and operating conditions allow.

8. Where situated remote from the valve, operating handwheels shall be positioned at a nominal height of 1 m above operating floor level. Extension spindles shall be supported by guide brackets or floor pedestals.

9. Air valves shall be double orifice type, 16 bar rated and shall be provided with an isolating valve.

2.131 VITREOUS ENAMEL TANKS

2. *(Amend as follows) Replace* 'BS EN 15282' *with* 'BS EN ISO 28765'.

4. *(Amend as follows) Replace* 'BS EN 15282' *with* 'BS EN ISO 28765'.

5. *(Amend as follows) Replace* 'BS EN 15282' *with* 'BS EN ISO 28765'.

2.132 VITRIFIED CLAY PIPES PIPELINE FITTINGS

No UU amendments or additions.

2.133 WALL TIES

No UU amendments or additions.

2.134 WATER

No UU amendments or additions.

2.135 WATER FITTINGS AND APPLIANCES

1. *(Amend as follows) In table replace* 'BS EN 111' *with* 'BS EN 31' *and delete* 'BS 1010-2' *and* 'BS EN 37'.

2. Capillary fittings shall be of integral solder ring pattern (lead free). Type A and B compression fittings shall be used with half hard pipes. Type A or B compression fittings for use on underground pipework shall be of gunmetal alloy.

3. Supports to copper pipes shall be flanged cast brass clips with countersunk brass screws.

4. Chromium plating to exposed copper pipes and fittings shall conform to the requirements of BS EN ISO 1456 service condition 3.

5. Pipe fittings for use with polyethylene tubing shall be compression fittings of copper, copper alloy or plastics. Supports to plastics pipes shall be polypropylene clips.

2.136 WATERSTOPS

No UU amendments or additions.

2.137 WET-MIX MACADAM

1. *(Amend as follows) In table replace* 'BS 410' *with* 'BS ISO 3310-1 and BS ISO 3310-2'.

2.138 WINDOWS

No UU amendments or additions.

2.139 WINDOW SILLS

No UU amendments or additions.

2.140 WOOD FLOORING

No UU amendments or additions.

2.141 WOOD TRIM

No UU amendments or additions.

2.142 WROUGHT ALUMINIUM AND ALUMINIUM ALLOY

1. (*Amend as follows) Replace* 'BS 754-1' *with* 'BS EN 754-1', 'BS 755-1' *with* 'BS EN 755-1' *and* 'BS 1559-1' *with* 'BS EN 1559-1 & 4'.

2.143 PERCOLATING FILTER DRAINAGE TILES

1. Clay tiles shall be vitrified clay arched tiles approximately 300 x 300 x 140 mm high.

2. Concrete tiles shall be constructed from DC-4 or FND4 concrete to BS 8500-2 and shall be of a maximum size of 750 x 750 x 130 mm high.

3. All tiles shall be slotted to allow underdrainage and ventilation.

2.144 ROAD MARKING PAINT AND ROAD SIGNS

1. Permanent road markings shall be from thermoplastic materials conforming to BS EN 1871.

2. Permanent road signs, bollards, their posts and fittings shall conform to BS 8442 and BS EN 12899-1.

2.145 WEIR PLATES AND SCUM BOARDS

1. Weir plates and scum boards shall be fabricated from rigid, corrosion proof materials.

2. Weir plates shall be completely watertight to the supporting structure including connections.

3. Weir plates shall be fabricated to allow vertical adjustment of ± 25 mm. The initial set position shall be central.

2.146 FABRIC MEMBRANES, GEOGRIDS AND FILTER FABRICS

1. Geotextile membranes shall be produced from synthetic fibres and be resistant to all naturally occurring soil acids, alkalis and bacteria.

2. Details of proposed geotextile materials shall be submitted to the Contract Administrator for approval.

2.147 STAINLESS STEEL

(i) Where other grades of stainless steel are required they should be described in the Contract.

1. Except where otherwise stated all stainless steel shall be grade X5CrNiMo 17-12-2 (1.4401) to BS EN 10088.

2. Stainless steel for use in a marine environment shall be a minimum grade of X2CrNiMo 17-12-2 (1.4404) to BSE EN 10088.

2.148 MATERIALS FOR THE REPAIR OF CONCRETE STRUCTURES

1. Materials and systems for the repair of concrete structures shall conform to the standards in the following table:

Material	Standard
Concrete surface protection	BS EN 1504-2
Structural and non-structural repair	BS EN 1504-3
Structural bonding	BS EN 1504-4
Concrete crack injection	BS EN 1504-5
Reinforcement anchoring	BS EN 1504-6
Reinforcement corrosion protection	BS EN 1504-7

2.149 IN-LINE ANTI-FLOODING DEVICES

(i) In-line anti-flooding devices include flap gates, flap gates with float and non-return gullies.

1. In-line anti-flooding devices shall have the following characteristics:

- Quick reaction to backflow
- Effective seal
- Resume normal free operation of the drain immediately on relief of excess pressure on the downstream side of the device
- Operate under flood conditions where the pipe is laid flat
- Low head loss
- Pressure release mechanism
- Resistance to blockage from solids, rags and other domestic detritus
- Resistance to corrosion
- Reliability and minimum maintenance
- Ease of access and removability of operational parts for cleaning and maintenance

2. Ball valves shall not be used for in-line anti-flooding devices.

2.150 ROCK ARMOUR AND ROCK SCOUR PROTECTION

1. Rock armour and rock for scour protection shall be hard durable igneous or metamorphic rock with a density not less than 2500 kg/m^3. All rock shall be angular, free from lamination and weak cleavage planes and shall be resistant to disintegration by the action of air, water, wetting and drying, freeze-thaw and impact from wave action. All rock shall be capable of being handled and placed without fracture or damage.

SECTION 3 EXCAVATION, BACKFILLING AND RESTORATION

3.1 EXCAVATION

(xi) The definition of waste is interpreted in Section 2(1) of the Environmental Permitting Regulations as follows:
'Waste', except where otherwise defined means anything that –
(a) is waste for the purposes of the Waste Framework Directive, and
(b) is not excluded from the scope of the Directive by Article 2(1) of that Directive.

2. *(Amend to read as follows)* Excavation in roads and streets shall be carried out in accordance with the HAUC *'Specification for the reinstatement of openings in highways'*.

4. *(Addition to clause)* Any slippage of faces of excavation that causes a weakening of support for existing or proposed pipelines, structures or roadways shall be excavated and made good.

8. *(Delete)*.

9. Excavation of trenches shall comply with the recommendations of CIRIA Report 97 *'Trenching Practice'*. Where ground support systems are used they shall provide active support.

10. Before commencing excavation in carriageways a vertical saw cut shall be made through the carriageway construction at each side of the excavation. Trench boxes shall not be used for excavations in carriageways. The maximum length of trench open at any one time shall not exceed 25 m.

11. All practical measures shall be taken to reduce vibration induced settlement resulting from sheet piling.

12. Material arising from excavations shall not be considered to be waste after re-use.

13. Excavated material shall be stockpiled in areas remote from watercourses or areas prone to flood.

14. Sea bed trenches for marine outfall installation shall be dredged to within a level tolerance of ±250 mm.

3.2 RELAYING TURF

No UU amendments or additions.

3.3 TOPSOIL FOR RE-USE

5. Also refer to UU Standard Specification S08 *'Environmental Mangement'*.

3.4 DEALING WITH WATER

5. Any groundwater control system required shall be installed prior to the commencement of excavation and shall be maintained continuously until backfilling has been completed.

3.5 TEMPORARY DRAINS

No UU amendments or additions.

3.6 BACKFILLING

(i) Amend to read as follows 'Any special requirements for

3. *(Amend to read as follows)* Filling material to excavations in unpaved areas shall be selected fill conforming to Clause 2.50

backfilling around structures, mains or services should be described in the Contract'.

placed and compacted in accordance with Table 6/1 of the Highways Agency *'Specification for highways works'*.

6. Reinstatement around all apparatus encountered during the works shall be in accordance with the requirements of the appropriate affected bodies. Existing surrounds shall be reinstated over the full width of the excavation. Particular attention shall be given to the replacement or provision of any protective slabs or identification tapes.

7. Backfilling to water retaining structures shall not commence until they have passed their watertightness test.

3.7 REINSTATEMENT OF MAINTAINABLE HIGHWAYS

(iv) Blank templates for Tables A and B are included in Appendix IX.

1. *(Amend to read as follows)* The Contractor, in conjunction with the Contract Administrator, shall be responsible for agreeing with the Highway Authority the reinstatement method and type as well as the permanent wearing course material, based on the provisions of the HAUC *'Specification for the reinstatement of openings in highways'*. Tables A and B in the project specific specification specify any known or agreed requirements and shall be read in conjunction with the HAUC Specification. Notwithstanding the information in Tables A and B all reinstatements shall be appropriate to the actual existing highway construction found.

5. The Contractor shall, in conjunction with the Contract Administrator, record the highway construction encountered during excavation.

6. Permanent reinstatement (Method A) shall be carried out on all excavations. Interim reinstatements shall not be used unless specifically authorised by the Contract Administrator.

7. The Contractor shall allow the Highway Authority to carry out inspections of trenches, backfilling operations, interim and permanent reinstatements.

8. Trench reinstatement shall be carried out in stages so that the length of trench not having full reinstatement at any one time shall not exceed 50 m. Traffic shall not be permitted to run on trenches not having full reinstatement.

9. The total width of permanent reinstatement shall be the interim reinstated width plus 75 mm each side, except for modular surfaces where the effective width shall be taken.

3.8 REINSTATEMENT OF NON-MAINTAINABLE HIGHWAYS

2. The Contractor shall reinstate non-maintainable highways, footpaths and other paved surfaces to not less than their original condition. Reinstatement shall be laid to conform with adjoining surfaces and to the satisfaction of the Contract Administrator.

3. All reinstatement works shall be properly keyed and bonded to existing areas and surfaces. Materials shall match existing materials in terms of texture, colour and type.

3.9 REINSTATEMENT OF UNPAVED LAND

(i) Delete note.

1. *(Amend to read as follows)* Refer to UU Standard Specification C08 *'Landscape Works'*.

(ii) Delete note.

2. *(Delete)*

(iii) Delete note.

3. *(Delete)*

(iv) Delete note.

4. *(Delete)*

(v) Delete note.

5. *(Delete)*

3.10 TREES

(i) Delete note.

1. *(Amend to read as follows)* Refer to UU Standard Specification C08 *'Landscape Works'*.

2. *(Delete)*

3. *(Delete)*

4. *(Delete)*

3.11 REINSTATEMENT IN HIGHWAYS AND ROADS USING FOAMED CONCRETE

No UU amendments or additions.

3.12 LAND DRAINS

6. Interceptor land drains shall be connected into existing land drains or discharged into a water course at a point agreed by the Contract Administrator, EA and landowner or occupier of the land. Existing drains shall be connected to interceptor drains by purpose-made junctions. The Contractor shall ensure that intercepted drains are clear at the point of connection. Where land drains are intercepted by excavations they shall be re-laid on suitable support beams.

7. Interceptor drains shall be backfilled with clean, hard gravel consisting of either 6.3/14 or 10/20 single size or 4/20 graded granular material conforming to BS EN 12620. Trenchless methods of drain laying shall not be used.

8. Outfalls to watercourses shall be as UU Standard Detail STND/00/006. The final 1.5 m of pipe shall be rigid and non-porous.

9. In all other respects the laying of land drains shall be in accordance with Section 5.

3.13 FILLING ABOVE GROUND

No UU amendments or additions.

3.14 BLASTING

(ii) Replace 'Clause 309' with 'Clause 308'.

No UU amendments or additions.

3.15 PILING

1. *(Amend as follows) Delete* 'in 1996'.

3.16 DEMOLITION

(iii) Items to remain the property of UU should be described in the Contract.

1. *(Amend to read as follows)* Demolition of tanks and other structures shall be carried out in accordance with BS 6187 and HSE guidance. All demolished structures, where not removed, shall be reduced to 0.9 m (1.5 m in highways) below finished ground level.

2. Tanks, basements and other chambers shall have all organic material removed and drainage holes made in the base equivalent to 1 m² for each 10 m² of area. They shall then be filled in accordance with Clause 3.6 using non-selected fill.

3. Where the ends of reinforcement are exposed by demolition, or partial demolition, of any existing structure the exposed ends are to be protected by cutting back a minimum 30 mm and refilling with a cementitious repair mortar.

4. Where redundant pipework is not to be grouted in accordance with Clause 5.23 all open ends of redundant pipes shall be plugged with GEN4 mass concrete. The plug depth shall be twice the pipe diameter.

5. Redundant items shall remain the property of UU where required. All other surplus materials shall be removed from site by the Contractor.

3.17 PLACING OF FILTER MEDIA TO BIOLOGICAL PERCOLATING FILTERS

1. Stone filter media shall be screened on site immediately prior to placing using a vibrating mesh of hole size 20 mm. Only material retained shall be used. Material passing through the mesh shall be disposed of by the Contractor.

2. Stone filter media shall be placed using conveyors operating at shallow angles. The maximum free drop height of material shall be 1.75 m. Direct tipping from wagons onto the filter bed is not permitted. The bottom layer shall be carefully placed to avoid damage or displacement of filter tiles. Build-up of media shall be achieved in layers of depth not exceeding 0.75 m placed over the whole plan area of each filter. The Contractor shall undertake a trial placing of media.

3. Plant of any description shall not stand on or run over placed media.

4. Light movable conveyors may stand on placed media provided the maximum pressure applied to the media is less than the safe loading capacity determined by the Contractor. Tarpaulins shall be placed underneath conveyor interchange points to control dust.

3.18 REINSTATEMENT OF WALLS, FENCES AND HEDGES

1. Any section of wall, fence or hedge damaged or removed during the works shall be replaced by a similar type. Hedges shall be replaced in accordance with UU Standard Specification C08 *'Landscape Works'*.

3.19 PLACING OF ROCK ARMOUR AND ROCK SCOUR PROTECTION TO MARINE OUTFALLS

1. The design and installation of rock armour, rock scour protection, filter and under layers shall be in accordance with CIRIA C683 *'The use of rock in hydraulic engineering'* and BS EN 13383-1.

2. Rock shall be placed in a manner to avoid damage to the outfall pipe and diffuser. The final level of rock sall be within a tolerance of -0 mm, + 250 mm.

3. With the exception of rock scour protection to the diffuser riser all rock shall be overlain with suitable as-dug material. The final level shall match the adjacent undisturbed sea bed profile within a tolerance of -0 mm, +250 mm.

SECTION 4 CONCRETING AND FORMWORK

4.1 SUPPLY OF INFORMATION

1. *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 7.2 and BS 8500-2:2006 Clause 5.2' *with* 'BS EN 206 Clause 7.2 and BS 8500-1 Clause 5.2'.

4.2 INITIAL TESTING

1. *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 9.5, Clause 10 and Annex A' *with* 'BE EN 206 Clause 9.5, Clause 10 and Annex A'.

4.3 IDENTITY TESTING

1. *(Amend to read as follows)* The Contractor shall carry out identity testing for consistence (slump) and air content (if appropriate) in accordance with BS 8500-1 Annex B on all concrete delivered to the Works. Unless otherwise specified the frequency of testing shall be sufficient to provide a minimum of one representative result per delivery vehicle.

2. *(Amend to read as follows)* Identity testing for strength is required on all structural concrete delivered to the Works. Identity testing shall be carried out in accordance with Clause 2.20.5.

3. Making, curing and testing of cubes or cylinders shall be in accordance with BS EN 12390-2 & 3.

4. The Contractor shall provide on site a suitable temperature controlled water tank to store cubes that are waiting to be tested.

5. Copies of concrete cube test results shall be supplied to the Contract Administrator within 3 working days of the test.

4.4 POROUS NO-FINES CONCRETE

2. Testing of no-fines concrete shall be carried out. The minimum strength of the chosen mix shall be 2.75 N/mm^2 at 28 days.

3. Prevention of contamination is required to the no-fines concrete including protection from further concrete pours cast against no-fines concrete.

4. Porous no-fines concrete shall not be used as a drainage underblanket to water retaining structures.

4.5 TRANSPORTING, PLACING AND COMPACTING

6. Twenty-four hours before it is intended to pour concrete, a 'Permission to pour' certificate shall be submitted to the Contract Administrator. When the Contract Administrator is satisfied that the pour is ready for concreting, the signed certificate will be returned to the Contractor. If the pour is not concreted within 24 hours of the Contractor receiving a signed certificate from the Contract Administrator, the above procedure shall be repeated with the Contractor submitting a new certificate.

7. The recommendations in CIRIA Report R135 *'Concrete deep lifts and large volume pours'* shall be followed where appropriate.

8. It is recommended that shutters for lift heights greater than 3 m should incorporate windows in suitable places to allow placing and vibration. Concrete shall not be allowed to free fall a height greater than 3 m.

4.6 CONCRETING IN COLD WEATHER

1 (c) *(Amend as follows) Replace* 'BS EN 206-1:2000 Clause 5.2.8' *with* 'BE EN 206 Clause 5.2.9'.

4.7 CONCRETE TEMPERATURE

3. Notwithstanding the requirements of sub-clause 1, fresh concrete temperatures at the point of delivery to the Works for roads shall not exceed 30°C, and for structures designed to BS EN 1992-3 shall not exceed 25°C.

4.8 CURING

4. Curing membranes for use on surfaces which will be in contact with water to be used for potable supply shall have appropriate water industry approval.

5. Curing membranes shall not be used where they will cause unacceptable surface discoloration or are incompatible with subsequent surface treatment.

4.9 RECORDS OF CONCRETING

3. Copies of these records shall be supplied to the Contract Administrator at the end of each week.

4.10 CONSTRUCTION OF FORMWORK

6. *(Amend to read as follows)* All exposed vertical and horizontal arrises shall be finished with a 25 x 25 mm chamfer, extending to 150 mm below finished ground level, except for:

- Weir tops.
- Stair nosings.
- Horizontal arrises abutting flooring, covers or stair heads.
- Where the concrete forms a step on an access route.

4.11 CLEANING AND TREATMENT OF FORMS

No UU amendments or additions.

4.12 STRIKING OF FORMWORK

4. *(Amend as follows) Replace* 'BS EN 197' *with* 'BS EN 197-1'.

4.13 SLOPING FORMWORK

No UU amendments or additions.

4.14 CUTTING AND BENDING OF REINFORCEMENT

No UU amendments or additions.

4.15 FIXING OF REINFORCEMENT

3. *(Amend to read as follows)* Concrete cover shall not be less than the nominal cover minus 10 mm nor greater than the nominal cover plus 15 mm (Δc in BS 8500-1; A3).

4.16 SURFACE CONDITION OF REINFORCEMENT

No UU amendments or additions.

4.17 LAPS AND JOINTS

No UU amendments or additions.

4.18 WELDING OF REINFORCEMENT

(i) The required welding procedure should be stated in the Contract.

1. *(Amend to read as follows)* Reinforcement shall not be welded on site except where described in, or permitted under, the Contract.

4.19 BUILT-IN ITEMS

3. Where box-outs are used in water retaining structures they shall be properly formed and treated as construction joints in accordance with Clause 4.20. Continuity of reinforcement not affected by the item to be built-in shall be retained. Diagonal trimming reinforcement bars shall be provided to the box-out corners and compensation bars provide for that affected by the built-in item. Concrete to fill the box-out shall be placed in a manner to ensure full compaction and a watertight final installation.

4. Built-in pipes shall incorporate a puddle flange which shall be overlapped by the reinforcement. A hydrophilic waterstop is not acceptable in lieu of a puddle flange.

5. To improve their bond to the concrete the external surface of vitrified clay and concrete pipes shall be roughened; the external surface of PVC-U and PE pipes shall be painted with solvent cement then dipped into dry sand.

4.20 CONSTRUCTION JOINTS

1. *(Delete)*

(iii) Positions and details of construction joints should be stated in the Contract.

8. Where hydrophilic expanding waterstops are used in construction joints they shall be adhered to the concrete surface using appropriate adhesive.

4.21 SURFACE FINISHES PRODUCED WITHOUT FORMWORK

0. Concrete surfaces produced without formwork shall be finished as below:

Screeded	as Clause 4.21.1
Wood float	as Clause 4.21.2
Steel trowel	as Clause 4.21.3
Power float	as Clause 4.21.4

3. *(Addition to clause)*

Trowelled finish to receive applied floor finishes

A hand or power trowel shall be used to give a uniform smooth, but not polished, surface free from trowel marks and other blemishes and suitable to receive the flooring material.

Trowelled finish for wearing surfaces

When the concrete is sufficiently hard steel trowelling, by hand or machine, shall be used to produce a hard closed polished finish. Finished surfaces must be uniform, smooth and free from trowel marks or other blemishes.

Brush finish

After the concrete has set sufficiently the top surface shall be trowelled smooth then receive a light brush finish.

4.22 SURFACE FINISHES PRODUCED WITH FORMWORK

(iv) See guidance notes to Clause 12.5.

5. *(Addition to clause)* Cast concrete surfaces to water treatment structures, water network structures and reservoirs in contact with water identified as aggressive to concrete shall be formed using formwork lined with a Type III CPF liner.

4.23 WEARING SCREEDS

No UU amendments or additions.

4.24 TIE BOLTS FOR FORMWORK

3. *(Addition to clause)* The finished face shall be uniform in colour after work has been completed and it has dried out.

6. Ties that remain embedded in the concrete shall have a device to prevent rotation during the release of formwork.

4.25 TOLERANCES FOR CONCRETE SURFACES

1. *(Amend as follows) In table replace* 'Screeded' *with* 'Surface to receive screeding'.

2. For finishes other than to receive screeding or rough the permissible limit for abrupt changes between adjacent pours shall be 3 mm.

4.26 GROUT QUALITY CONTROL TESTING

No UU amendments or additions.

4.27 FIBRE REINFORCED CONCRETE (FRC)

No UU amendments or additions.

4.28 CONCRETE REPAIRS

No UU amendments or additions.

4.29 ON-SITE CONCRETE BATCHING

1. The Contractor shall not set up a site batching plant without first seeking the approval of the Contract Administrator.

SECTION 5 CONSTRUCTION OF PIPELINES AND ANCILLARY WORKS

5.1 PIPELAYING GENERALLY

(i) Delete 'Ductile iron: BS 8010 Section 2.1'.

6. *(Addition to clause)* Anti-flotation measures shall not cause point loading of the pipe.

7. *(Addition to clause)* Traceable marker tape shall be laid up to a maximum depth of 1.5 m. For pipes with a crown depth greater than 1.8 m, plain marker tape shall be laid 100 – 300 mm above the pipe in addition to the traceable marker tape. Lengths of tape shall be adequately connected to ensure continuity of conductor. 'Genny' connection points shall be provided within any chambers along the pipe.

9. All ferrous pipelines, and PE pipelines with an internal diameter greater than 610 mm, shall be laid with a minimum depth of cover of 900 mm in all scenarios. PE pipelines an internal diameter not exceeding 610 mm shall be laid with a minimum depth of cover of 750 mm, except where there is a risk of damage from, for example, agricultural activities in which case the minimum depth of cover shall be 900 mm. Wherever possible the cover to any pipeline shall not exceed 1200 mm.

10. Pipes crossing below ditches shall be protected by 150 mm of concrete and be laid at a depth to provide at least 300 mm cover from the true cleared bottom of the ditch to the top of the concrete.

11. The spacing of supports to above ground GRP pipe installations shall not exceed 6 m centre to centre. There shall be a minimum of two supports per pipe, one of which shall be an anchor. For pipes with more than two supports the support closest to the middle of the pipe shall be used as the anchor. Anchors shall be spaced at a maximum distance of 12 m centre to centre.

5.2 PIPE BEDDING

(ii) Amend to read as follows 'Details of pipe bedding, surround and sidefill should be described in the Contract including the required degree of compaction if relevant.'

No UU amendments or additions.

5.3 CONCRETE PROTECTION TO PIPES

2. *(Amend to read as follows)* Concrete provided as a protection to pipes in non aggressive ground shall be GEN3, minimum 150 mm thick. Elsewhere the cement type and mix design shall be selected to suit the sulphate content and pH of the ground and groundwater.

5.4 PIPE SURROUND

(iii) The required degree of compaction should be described in the Contract if relevant.

4. Surround to GRP pipes shall be embedment type 1 or 2 as shown on UU standard detail drawing STND/05/001.

5.5 PIPELAYING IN HEADINGS

No UU amendments or additions.

5.6 THRUST BLOCKS

No UU amendments or additions.

5.7 PIPE JOINTING GENERALLY

3. *(Amend to read as follows)* Where PE pipes are used for pressurised mains butt fusion welding shall be used. Mechanical or electrofusion joints shall only be used where butt fusion welds cannot be made.

5.8 WELDED JOINTS IN POLYETHYLENE PIPES

1. *(Amend as follows) Delete* 'using equipment specified in WIS 4-32-16'.

4. The minimum lengths for spigot ends for electrofusion welding shall be as in the table below:

Pipe outside diameter (mm)	Minimum spigot length (mm)

180 and below	350
180 – 400	500
400 and above	1000

5. Prior to commencing site welding of polyethylene pipes and fittings the Client requires to check the welder's qualifications, welding procedures and correct calibration and operation of the welding machine. The Contractor shall submit dummy welded joints for testing by the Client and shall also periodically submit site production joints as instructed by the Contract Administrator.

6. Only welders with appropriate certification shall be permitted to carry out on-site welding.

7. A specialist pipe surface preparation tool shall be used to scrape the pipe surface. It shall be capable of removing the oxidised surface of the pipe in excess of the insertion depth before welding is attempted.

5.9 FLANGED JOINTS

2. Flanged pipe joints shall not be used on buried pipework except where necessary adjacent to fittings.

5.10 OGEE JOINTS

No UU amendments or additions.

5.11 WELDED JOINTS IN STEEL PIPES

No UU amendments or additions.

5.12 CEMENT MORTAR JOINTS

No UU amendments or additions.

5.13 RUN LEAD JOINTS

No UU amendments or additions.

5.14 PROTECTION OF FERROUS PIPES, JOINTS AND FITTINGS

(iii) Replace 'BS 7361' with 'BS EN 13636'.

(v) Refer to UU Standard Specification S03 'Mechanical Specification' for protection of above ground pipework.

1. *(Addition to clause)* The minimum external protection to buried ductile iron pipes shall consist of 400 g/m^2 of zinc/aluminium coating plus 100 microns of high performance epoxy coating.

2. *(Addition to clause)* External protection shall be type P1.

5. After installation damaged areas of surface coating to unburied ferrous pipework shall be made good. Any uncoated unburied ferrous shall be prepared and painted with two coats

of protective paint of minimum dry film thickness (DFT) of 80 microns. Unburied pipework includes that within chambers.

6. Steel pipes and fittings shall be lined and coated with a fusion bonded epoxy coating in accordance with BS EN ISO 21809-2 with a minimum dry film thickness (DFT) of 500 microns.

5.15 CUTTING PIPES

No UU amendments or additions.

5.16 PRECAST CONCRETE MANHOLES

5. The jointing material shall be Class M12 mortar.

5.17 BRICKWORK MANHOLES AND CHAMBERS

2. A relieving arch shall be constructed over pipe entries and exits exceeding 300 mm diameter.

5.18 INVERTS AND BENCHING

2. *(Amend to read as follows)* Where the finished surface is to be in situ concrete the concrete shall be Grade GEN3. Benching in manholes, chambers and wet wells shall have a steel trowel finish, channel surfaces shall have a fair worked finish.

5.19 PIPES AND JOINTS ADJACENT TO STRUCTURES

1. *(Addition to clause)* Adequate restraint shall be incorporated into the arrangement of the flexible pipe joint in order to accommodate the longitudinal thrust that may arise from any construction, operational, or maintenance activity. (Refer also to Appendix VII, Clause 12.11).

5.20 WATERTIGHTNESS OF MANHOLES AND CHAMBERS

No UU amendments or additions.

5.21 SETTING MANHOLE COVERS AND FRAMES

1. *(Amend to read as follows)* Manhole and surface box frames shall be set to the required level on Class B engineering brickwork or on precast concrete frame seating units. The frames shall be set to level, bedded and haunched over the base and sides of the frame in epoxy resin or polyester resin. Where traffic loading is to be introduced, or reinstatement work up to the frame is to be carried out, within 48 hours of the bedding material being laid rapid hardening epoxy resin or polyester resin mortar shall be used.

2. *(Amend to read as follows)* Packing material for setting ironwork to level shall consist of steel shims up to a maximum total thickness of 40 mm. The shims shall be a minimum of 200 mm long and shall be sufficiently wide to support the frame over the full width of its base.

3. *(Delete)*

5.22 CONNECTIONS TO EXISTING SEWERS

(i) Delete note.

2. *(Addition to clause)* Saddle connections shall generally be fitted at 45° to both the horizontal and longitudinal axes of the main pipe. In situ holes in concrete and clayware pipes shall be formed using proprietary hole cutting methods.

4. Connection to brick sewers shall be made by cutting existing brickwork back to a clean vertical face. Damaged and loose bricks within 1 m of the face shall be replaced with Class A engineering bricks bedded in Class M12 mortar.

5. All connections shall be surrounded with GEN3 concrete minimum 150 mm thick.

5.23 SEWERS AND MANHOLES TO BE ABANDONED

1. *(Addition to clause)* Grout for filling abandoned sewers shall be Class G4. Grouting shall proceed such that no length of sewer shall be filled until all upstream connecting lengths have been completed.

2. *(Amend to read as follows)* Shafts of manholes on abandoned sewers shall be broken down to a level of 1 m (1.5 m in highways) below finished ground level. The remaining void shall be filled with foamed concrete in accordance with Clause 2.46. The supplier's recommendations on maximum lift to avoid foam collapse shall apply.

3. When sewers are to be abandoned and not grouted, both ends of any length to be abandoned shall be sealed with a concrete plug formed from GEN4 mass concrete for a minimum length of twice the pipe diameter. All branches to the sewer length shall be located and sealed in a similar manner.

4. Seals at the lower end of each run of sewer shall be fitted with a flexible breather pipe fixed at the sewer soffit and turned vertically upwards to 600 mm above the soffit level of the higher end of the sewer length.

5. Lengths of sewers and manholes to be abandoned shall be surveyed by CCTV or by man-entry where conditions permit.

5.24 JUNCTIONS AND LATERALS ON SEWERS

No UU amendments or additions.

5.25 MARKER AND INDICATOR POSTS

(i) Replace 'water mains' with 'pipeline'.

1. *(Amend to read as follows)* Marker and indicator posts shall be erected on water mains and pumped sewers to show the location of valves and other fittings and at boundaries.

5. The provison of marker posts for buried cables shall be in accordance with WIMES 3.02.

5.26 TOLERANCES FOR PIPELINES

No UU amendments or additions.

5.27 CABLE DUCTS

3. *(Amend as follows) Replace* '150 mm above slab level' *with* 'approximately 75 mm above finished floor level'.

4. Ducts and openings for cables and other services shall be sealed in accordance with WIMES 3.02.

5. Cable ducts shall be laid with a minimum cover of 750 mm (900 mm in agricultural land) to the top of the duct. Telemetry ducts shall be laid with a minimum cover of 600 mm (900 mm in agricultural land) to the top of the duct

5.28 INSTALLATION OF VALVES

4. *(Delete)*

5.29 WASHOUTS

2. *(Delete)*

3. *(Delete)*

5.30 ALTERNATIVE PIPE INSTALLATION TECHNIQUES

(i) Delete '(3rd Edition)'.

No UU amendments or additions.

5.31 CONNECTIONS TO EXISTING WATER SUPPLY PRESSURE PIPELINES

No UU amendments or additions.

5.32 TEMPORARY WATER SUPPLY MAINS

No UU amendments or additions.

5.33 WATER MAINS TO BE ABANDONED

No UU amendments or additions.

5.34 CABLE DRAW PITS

1. Draw pits shall conform to the watertightness requirements of Clause 5.20.

2. Covers and frames shall have a minimum opening of 750 x 750 mm and otherwise conform to Clause 2.74.

3. The minimum internal plan dimensions of pits shall be 750 x 750 mm.

4. The minimum depth of pits, from underside of cover slab to top of the floor shall be 1500 mm for pits containing HV cables and 1000 mm for other pits.

5. The minimum clearance between the outside face of ducts and the pit walls, roof or floor shall be 100 mm. The minimum clearance between the outside face of ducts containing instrumentation cables and ducts containing power cables shall be 300 mm.

SECTION 6 BUILDING WORKS

(i) Amend to read as follows 'This Section is intended only for the basic architectural requirements of small-scale buildings. Where significant building works are included in the Contract a specification should be developed in line with the National Building Specification'.

(ii) All buildings should be designed in accordance with the Building Regulations even if formal approval is not required.

(iii) Building design drawings and specifications should be prepared by architecturally qualified persons such as RIBA or BIAT members. The design should be fully coordinated with all other disciplines, including structural, mechanical, process and electrical engineering.

6.1 BRICKWORK AND BLOCKWORK GENERALLY

No UU amendments or additions.

6.2 BRICKWORK AND BLOCKWORK, JOINTING AND POINTING

No UU amendments or additions.

6.3 CAVITY WALLS

No UU amendments or additions.

6.4 DAMP-PROOF COURSES

No UU amendments or additions.

6.5 CORBELLING

No UU amendments or additions.

6.6 BONDING TO CONCRETE

No UU amendments or additions.

6.7 UNDERPINNING

No UU amendments or additions.

6.8 CENTERING AND LAGGING

No UU amendments or additions.

6.9 BRICKLAYING AND BLOCKLAYING IN COLD WEATHER

No UU amendments or additions.

6.10 PREPARATION FOR PLASTERING

No UU amendments or additions.

6.11 FIXING OF PLASTERBOARD

No UU amendments or additions.

6.12 PLASTERING

No UU amendments or additions.

6.13 PLASTERING IN COLD WEATHER

No UU amendments or additions.

6.14 CONCRETE FLOOR FINISHES

(i) Delete 'and BS 8204-4'.

1. (*Amend as follows) Delete* 'and BS 8204-4'.

6.15 FLOOR TILING

No UU amendments or additions.

6.16 TERRAZZO FLOOR FINISHES

No UU amendments or additions.

6.17 EXTERNAL RENDERING

No UU amendments or additions.

6.18 WALL TILING

No UU amendments or additions.

6.19 CARPENTRY AND JOINERY

No UU amendments or additions.

6.20 STRUCTURAL STEELWORK

9. *(Amend as follows) Replace* 'BS EN 1714' *with* 'BS EN ISO 17640' *and* 'BS EN 571-1' *with* 'BS EN ISO 3452-1'.

10. *(Amend as follows) Replace* 'Appendix F in BS 466: 1984' *with* 'BS ISO 12488-1'.

6.21 ROOFS

No UU amendments or additions.

6.22 TIMBER FLOORS

No UU amendments or additions.

6.23 DOOR FRAMES

No UU amendments or additions.

6.24 WINDOWS

No UU amendments or additions.

6.25 GLAZING

No UU amendments or additions.

6.26 PAINTING

No UU amendments or additions.

6.27 SLATING AND TILING

No UU amendments or additions.

6.28 LIGHTWEIGHT CONCRETE ROOF SCREEDS

No UU amendments or additions.

6.29 ASPHALT ROOFING

No UU amendments or additions.

6.30 BITUMEN FELT ROOFING

No UU amendments or additions.

6.31 PLUMBING

1. *(Amend as follows) Replace* 'BS 6700, BS EN 806-2 and BS EN 806-4' *with* 'BS 8558 and BS EN 806-1 to 4'.

6.32 OPENINGS IN WALLS, FLOORS AND CEILINGS

No UU amendments or additions.

6.33 TOLERANCES FOR BUILDING WORKS

No UU amendments or additions.

6.34 ELECTRICAL INSTALLATIONS

No UU amendments or additions.

6.35 PROFILED STEEL CLADDING

No UU amendments or additions.

6.36 PRECAST CONCRETE FLOORS

No UU amendments or additions.

6.37 COMPOSITE FLOORS

No UU amendments or additions.

SECTION 7 TESTING AND DISINFECTION

7.1 CLEANSING AND SWABBING OF PIPELINES

1. *(Amend to read as follows)* On completion of construction, and before any testing or disinfection, internal surfaces of pipelines shall be cleaned thoroughly. The method of cleaning shall not damage the pipe or any lining.

2. *(Amend to read as follows)* Prior to the hydraulic test on a water main or wastewater rising main, a foam swab shall be passed through the main to remove as much air as possible from it. Water shall be introduced into the pipe slowly but with sufficient flow and pressure to overcome any elevations in the line. Once started, the swabbing operation shall be carried out without interruption. For water mains, swabbing shall be repeated and shall continue until the wash water becomes 'clear' (as defined in UU Standard Specification C05 *'Mains Cleaning'*). When swabbing is complete, the source used to

drive the swab shall be disconnected and the main left full at static pressure.

4. All cleansing of potable water mains shall be in accordance with UU document 60133 *'Mains Hygiene Practices'*.

5. The Contractor shall provide swabs, and any temporary pipework required, for the swabbing of water mains.

7.2 PRECAUTIONS PRIOR TO TESTING PIPELINES

4. Testing shall be carried out before the installation of trace heating or lagging.

7.3 TESTING METHOD, PROGRAMME AND NOTIFICATION

(i) The programme and method of testing and swabbing should be stated in the Contract.

1. *(Delete)*

7.4 TESTING NON-PRESSURE PIPELINES

4. Air or water tests shall be carried out on each non-pressure pipeline prior to any flow being discharged into the pipeline.

5. A light line survey shall be carried out on pipelines constructed from GRP or structured wall PVC-U, PE or PP pipes. The survey shall be carried out after backfilling to the pipeline is complete. The measured deformation shall not exceed 3%.

7.5 WATER TEST FOR NON-PRESSURE PIPELINES

No UU amendments or additions.

7.6 AIR TEST FOR NON-PRESSURE PIPELINES

No UU amendments or additions.

7.7 CCTV INSPECTION OF PIPELINES

2. CCTV shall be recorded using digital resolution of 400 x 480 pixels or greater. This can be achieved using SVHS, DAT or by encoding directly to a removable hard-disk drive.

3. A data generator shall electronically generate and clearly display in the viewing monitor and video recording a continuous record in alphanumeric form the following information as a minimum:

- Automatic update of the camera's position in the pipeline in metres from adjusted zero.
- Pipeline dimensions.
- Manhole or chamber references.

4. At the start of each manhole length or pipeline section the following additional information shall be electronically generated and displayed:

- Date of survey
- Road name/location
- Direction of survey
- Time of start of survey
- Pipeline use

5. Correct adjustment of the recording equipment shall be demonstrated by recording, at the commencement of each shift and each new disc/tape (where possible), the Marconi Resolution Chart No 1 with colour test band for a minimum of 30 seconds.

6. When sufficient data has been collected (circa 5Gb) data shall be written to DVD using +R or –R format disks. The file format and resolution shall be selected from the following, giving due regard to the pipe size. N.B. 260 lines is only likely to be suitable for smaller pipes:

Format	Resolution	Minimum bit rate
MPEG 1	260 lines	1.2 Mbs
MPEG 2	350 lines	Variable 3.5 – 8 Mbs
MPEG 3	400 lines	Variable 5 – 8 Mbs

7. DVDs shall contain a menu of sewer lengths included, identified by pipe ref, manhole numbers, street name and town. These should be hyperlinked to the appropriate .mdb and .mpg files held on the disk.

8. The DVDs to be used for data storage shall be new and of best quality high grade.

9. DVD disks shall be supplied complete with standard 141 mm x 124 mm x 10 mm jewel cases. The jewel case cover insert shall list the survey area content included on the disk. The case spine insert shall show only the unique DVD reference using centred text.

10. The completed survey report shall be supplied on a CD ROM or other suitable and agreed media in PRISM format and presented in accordance with the format laid down in the WRc *'Manual of Sewer Condition Classification'*.

The CCTV Survey Report shall include the following items:

Item	No. of copies to be supplied
Site coding sheet	1
DVDs	2
Magnetic media (Diskette)	1 (interim validated data)

Final data (to be supplied on CD-ROM)	2
Annotated drawings	1

7.8 INFILTRATION

2. *(Addition to clause)* Refer to Clause 11.11 for allowable infiltration rates into tunnels and shafts.

7.9 TESTING OF DUCTILE IRON, PVC, GRP AND STEEL PRESSURE PIPELINES

(v) Amend to read as follows 'The System Test Pressure (STP) should be described in the Contract. The STP should be calculated using the expressions in BS EN 805'.

1. *(Addition to clause)* The pipeline shall be tested using the 'water loss' method.

3. *(Amend to read as follows)* Before commencing a test, valves shall be checked and sealed, the main shall be filled with water (usually in conjunction with swabbing the main) and the air shall be released. Once filled with water, pipelines shall be left under natural static pressure for 24 hours, so as to achieve conditions as stable as possible for testing. Any residual pressure in the main prior to testing, which exceeds the natural static head, may invalidate the test.

6. In sectional tests the maximum length of pipeline under test shall not exceed 1000 m.

7. All those involved in undertaking pressure testing of mains shall be registered by EUSR as having completed an approved technician training course in hydrostatic pressure testing or pipeline commissioning and shall be able to demonstrate prior experience of testing mains of similar material and diameter.

7.10 TESTING OF POLYETHYLENE PRESSURE PIPELINES

(ii) Amend to read as follows 'For other material/SDR combinations the System Test Pressure (STP) should be described in the Contract'.

1. *(Amend to read as follows)* The testing of polyethylene pressure pipelines shall be carried out in accordance with the procedures in IGN 4-01-03. The pipeline shall be tested using a Type II test. The System Test Pressure (STP) shall be as below:

Material	SDR	PN (bar)	STP (bar)
PE80	26	5	7.5
PE80	17	8	12
PE80	11	12.5	17.5
PE100	26	6	9
PE100	21	8	12
PE100	17	10	15
PE100	11	16	20

2. *(Amend to read as follows)* Clauses 7.9.2, 7.9.3, 7.9.5, 7.9.6 and 7.9.7 shall apply.

3. Prior to commencing testing, the volume of water required to reach test pressure shall be calculated for the scenarios of 0% air in the system and 4% air in the system. If a volume of water greater than the value calculated for 4% air is pumped into the pipe without reaching the test pressure the test shall be abandoned as soon as practically possible. Approval shall then be sought from the Client before restarting the pressure test. This is a safety requirement.

7.11 DISINFECTION OF WATER MAINS

1. *(Amend to read as follows)* After satisfactory completion of swabbing and hydraulic testing, pipelines intended for conveying potable water shall be disinfected in accordance with UU document 60133 *'Mains hygiene practices'*.

7.12 CLEANSING OF STRUCTURES

No UU amendments or additions.

7.13 TESTING OF CONCRETE ROOFS

No UU amendments or additions.

7.14 TESTING OF CONCRETE STRUCTURES DESIGNED TO RETAIN AN AQUEOUS LIQUID

(i) The chemistry of the test water may have an effect on the ability of cracks to autogenously heal.

3. *(Amend to read as follows)* Not withstanding the satisfactory completion of the above test, any visible leakage shall be stopped.

6. Blank flanges, where required, shall be supplied by the Contractor for testing purposes.

7. Measurement of water surfaces during testing shall be carried out by hook gauge with a vernier attachment.

8. Testing shall be carried out after the completion of any box-outs.

7.15 DISINFECTION OF STRUCTURES FOR POTABLE WATER

1. *(Addition to clause)* Refilling of tanks shall be carried out in accordance with UU WP/S/001/17/05. Bacteriological and chemical sampling and testing shall be carried out on each structure prior to Agreement to Operate.

2. *(Delete)*

3. *(Delete)*

7.16 WATER FOR TESTING, SWABBING AND DISINFECTION

2. The Contractor shall make his own arrangements with UU for obtaining water and shall comply with UU conditions for drawing water from existing mains. The maximum rate of supply will not exceed 15 l/sec unless stated otherwise. It may be necessary to draw water at night in order to achieve the maximum flow from existing mains.

3. Where necessary the Contractor shall arrange to transport water by tanker to those parts of the site where a mains water supply is not available or if the existing supply is of inadequate pressure.

7.17 DISPOSAL OF WATER FROM CLEANSING, TESTING OR DISINFECTION

1. *(Amend to read as follows)* The Contractor shall dispose of all water associated with testing, cleaning and disinfection in accordance with UU WP/S/001/17/05.

7.18 TESTING OF NON-CONCRETE STRUCTURES FOR RETAINING AQUEOUS LIQUIDS

No UU amendments or additions.

7.19 COMPACTION TESTING OF PIPE EMBEDMENT

(i) In situ testing methods are described in BS 1377-9.

1. If a required degree of compaction is specified by the designer in Clause 5.2 or 5.4 in situ testing shall be carried out to demonstrate that the required degree of compaction has been achieved.

SECTION 8 ROADWORKS

8.1 ROAD FORMATIONS

No UU amendments or additions.

8.2 SUB-BASE CONSTRUCTION

2. Where a capping layer is required it shall be protected and compacted in the same manner as the sub-base.

8.3 WET-MIX MACADAM CONSTRUCTION

No UU amendments or additions.

8.4 LEAN CONCRETE CONSTRUCTION

No UU amendments or additions.

8.5 LAYING COATED MACADAM

No UU amendments or additions.

8.6 LAYING HOT ROLLED ASPHALT

No UU amendments or additions.

8.7 WATERPROOF UNDERLAY FOR CONCRETE CARRIAGEWAYS

No UU amendments or additions.

8.8 REINFORCEMENT OF CONCRETE CARRIAGEWAYS

No UU amendments or additions.

8.9 LAYING CONCRETE CARRIAGEWAYS

No UU amendments or additions.

8.10 LAYING KERBS AND CHANNELS

No UU amendments or additions.

8.11 FOUNDATIONS FOR FOOTWAYS

No UU amendments or additions.

8.12 LAYING CONCRETE PAVING FLAGS

No UU amendments or additions.

8.13 LAYING PAVING BLOCKS

No UU amendments or additions.

8.14 TOLERANCES FOR FINISHED CARRIAGEWAY SURFACES

No UU amendments or additions.

8.15 FIXING OF GULLIES

No UU amendments or additions.

8.16 LINING AND SINAGE

No UU amendments or additions.

8.17 CONCRETE FOOTWAYS

No UU amendments or additions.

SECTION 9 SEWER RENOVATION

(iii) Amend to read as follows 'Attention is directed to the following standards; BS EN ISO 11296-1 General, BS EN ISO 11296-2 Lining with continuous pipes, BS EN ISO 11296-3 Lining with close fit pipes, BS EN ISO 11296-4 Lining with cured-in-place pipes'.

9.1 ISOLATION OF FLOWS

No UU amendments or additions.

9.2 PREPARATORY SURVEY

6. For non-man entry schemes, the survey shall be by means of CCTV.

7. Sewers to be lined shall be internally surveyed by the Contractor to establish the critical cross-section profile of the sewer and any other relevant information. The survey information and details of the critical cross-section profile shall be submitted to the Contract Administrator for approval.

9.3 PREPARATION OF SEWERS

(ii) All substrate surfaces should be described in the Contract.

4. *(Amend to read as follows)* Loose and unsound brickwork and mortar shall be removed and the remaining surface cleaned and prepared. Damaged brickwork shall be repaired using Class A engineering bricks and Class M12 mortar with all joints completely filled before other phases of rehabilitation. Any brickwork repair shall marry into the profile and construction of the existing sewer.

5. *(Delete)*

9.4 JOINTING GENERALLY

No UU amendments or additions.

9.5 CONNECTIONS

3. *(Amend as follows) Replace* 'BS EN 13566-4' *with* 'BS EN ISO 11296-4'.

4. At least 24 hours shall be allowed between the completion of lining and the reconnection of laterals and other pipe cutting.

9.6 CHAMBERS

No UU amendments or additions.

9.7 RELEASE OF CURING WATER

No UU amendments or additions.

9.8 ANNULUS GROUTING GENERALLY

1. *(Addition to clause)* Adequate venting shall be provided to ensure the whole of the annulus and brick interstices are filled with grout. A minimum of two air vents, equally spaced, shall be provided. The vents shall be plugged when grouting is complete.

3. *(Addition to clause)* Records shall be submitted to the Contract Administrator daily.

5. *(Addition to clause)* Grouting shall be carried out at least once per shift.

7. In man-entry sewers, grout shall be injected through a minimum of three holes per 5 m length of lining. The holes shall be at the haunches and crown of the lining section. In non man-entry sewers the distance between grout injection points shall not exceed 50 m. Grouting shall progress from downstream to upstream and from the lowest to the highest grouting holes.

8. Details of grouting and strutting proposals shall be submitted, in writing, to the Contract Administrator for approval.

9. The distance grout is to travel, whether in hose or annulus, shall not exceed 100 m. Segregation of grout shall be prevented from taking place during pumping operations.

10. Grouting of Type 1 linings shall be undertaken in a single operation to a level above the soffit of the crown unit.

9.9 INSPECTION AFTER GROUTING

No UU amendments or additions.

9.10 LINING THROUGH FLOW CONTROL DEVICES

No UU amendments or additions.

9.11 INSPECTION AFTER RENOVATION

(iii) Amend to read as follows 'The sampling and acceptance procedure for cured-in-place lateral connection collars should be stated in the Contract'.

9.12 LINING TEMPLATE

No UU amendments or additions.

9.13 LINING DESIGN

No UU amendments or additions.

9.14 TOLERANCES FOR PREFORMED LININGS

3. All preformed lining units shall be within the tolerances stated by the manufacturer. Lining units shall readily fit together within the existing sewer.

4. The manufacturer of the lining units shall supply a standard unit of agreed dimensions for each different lining cross-section. All units subsequently delivered will be checked for fit, tolerance and joint deflection limitation against these standard units. Standard units shall be clearly marked and dated by the Contract Administrator, Contractor and manufacturer.

9.15 CUTTING AND PROTECTION OF LININGS

5. Holes shall be formed by drilling and precautions taken to avoid de-lamination and spalling. Details of the proposed cutting methods shall be submitted to the Contract Administrator for approval.

6. Where lining units are cut, the exposed face of the lining shall be suitably treated to ensure that the integrity and long term durability of the unit is maintained.

9.16 MAN-ENTRY PREFORMED GRP AND GRC UNITS

No UU amendments or additions.

9.17 CURED-IN-PLACE LINING SYSTEMS

1. *(Amend to read as follows)* Cured-in-place linings shall be designed, manufactured, constructed, tested, inspected and certified in accordance with BS EN ISO 11296-4 and UU document 41084 *'Sewer renovation by cured in place lining and resin injection systems'*.

3. For sewers with running infiltration a pre-lining shall be installed prior to lining eversion.

4. The lining shall be everted from upstream to downstream into the prepared sewer.

5. When the resin has cured, the lining ends and any connections shall be cut out and samples removed for quality assurance testing by the Contractor. The installed lining shall generally be free of wrinkles except where a specific degree of wrinkling has been agreed with the Contract Administrator.

9.18 RENDERING AND LOCAL REPAIRS

No UU amendments or additions.

9.19 PATCH REPAIRS

No UU amendments or additions.

9.20 STYRENE FUMES

No UU amendments or additions.

9.21 SPRAY LININGS

(i) Replace 'BS EN 13566' with 'BS EN ISO 11296-1 & 4'.

1. *(Amend as follows) Replace* 'BS EN 13566-4' *with* 'BS EN ISO 11296-4'.

(ii) Amend to read as follows 'The method of testing polymeric spray linings should be stated in the Contract'.

9.22 PLACEMENT OF SEWER LININGS – GENERAL

1. Spacers to aid the placement of units shall be chemically inert and of a strength no greater than the grout used. Spacers shall occupy no more than 5% of the sewer surface area.

2. Lining shall proceed from upstream to downstream with any required sockets facing downstream.

9.23 SLIPLINING AND REPLACEMENT MOLING

1. The use of sliplining, pipe bursting and moling techniques shall be in accordance with WRc *'Sliplining and replacement moling – operational guidelines. Source document'*.

9.24 PRESSURE POINTING OF SEWERS – PREPARATION OF JOINTS

1. Details of methods and equipment to be used for joint preparation shall be submitted to the Contract Administrator prior to work commencing.

2. Areas of unsound mortar shall be cleaned out until sound mortar is found subject to the minimum depth identified in (3) below.

3. Areas of sound mortar shall be raked out to a minimum depth of 25 mm provided damage does not occur to adjacent bricks.

4. Where the mortar strength is such that adjacent bricks are damaged during raking out, the Contract Administrator shall be informed. Following inspection by the Contract Administrator, if extensive areas of brick are likely to be damaged by the raking, and alternative methods of raking have been tried or are impractical, then that area shall be exempt from raking and pointing.

5. The prepared brickwork and joints shall be inspected by the Contract Administrator before the commencement of pressure pointing.

9.25 PRESSURE POINTING OF SEWERS – GENERAL

1. Pressure pointing shall achieve full penetration and shall completely fill brickwork joints and interstices.

2. Mortar shall not be spread over adjoining brick surfaces. Before pointing mortar has set it shall be struck off and finished by trowelling to leave a smooth, dense, flush joint.

3. The sewer shall be kept free from any flows during pressure pointing until the mortar has gained sufficient strength so as not to be damaged by the flow.

4. Before flow is reintroduced to a renovated section of sewer all surplus grout, mortar and other material shall be removed from the sewer.

5. The quantities of pointing mix used and the corresponding areas of renovated brickwork shall be recorded. Records shall be submitted to the Contract Administrator daily.

9.26 VOID GROUTING

1. Void grouting shall only be carried out in any particular section of sewer when all renovation or relining work has been completed and allowed to cure.

2. Void grouting shall be carried out using holes drilled through the full thickness of the sewer and lining where appropriate. Holes shall be of sufficient number and size to ensure the total removal of air and complete filling of voids. As a minimum holes shall be drilled at 5 m intervals along both sides of the sewer at springer level. At the mid-point of the 5 m intervals a hole shall be drilled in the sewer invert.

3. Temporary plugs shall be inserted into the grout holes as each hole is bled. Following completion of the grouting, the plugs shall be removed and the holes filled with Class M12 mortar.

4. Grouting plant employed shall be capable of pressures up to 500 kN/m^2. The pressure used shall be monitored to prevent grout loss to surrounding ground or damage to the sewer. A method of controlling grouting pressure shall be incorporated at the delivery nozzle of the grouting apparatus.

5. Daily records of grout used and pressures obtained throughout the grouting process shall be submitted to the Contract Administrator.

9.27 CORE SAMPLING

1. The efficacy of annulus grouting and pressure pointing shall be tested by core drilling.

2. Cores shall be 50 mm diameter and shall extend through to the outer face of the sewer and 100 mm beyond. Cores shall be taken at locations to be agreed with the Contract Administrator.

3. On completion of core sampling the core hole shall be reinstated by replacing the core previously drilled out in the hole and fixing in place by the use of epoxy resin or by other approved means.

4. If voids are discovered within the annulus further cores shall be taken to establish the extent of the deficiency and the affected area re-grouted.

5. If voids are discovered within the brickwork further cores shall be taken to establish the extent of the void and the void filled by pressure pointing.

6. If voids are discovered behind the outer face of the brickwork further cores shall be taken to establish the extent of the void and the void filled by void grouting.

SECTION 10 WATER MAINS RENOVATION

10.1 PREPARATORY SURVEY

2. The survey shall include a CCTV survey.

3. Water mains to be lined shall be internally surveyed by the Contractor to establish the critical cross-section of the main, the location of bends and tees and other relevant information. The survey information and details of the critical cross-section profile shall be submitted to the Contract Administrator.

10.2 PREPARATION OF WATER MAINS

2. The Contractor shall notify the Contract Administrator that the cleaning of a length of main is complete as soon as it is finished.

3. The Contractor shall CCTV survey the entire length of the cleaned main to demonstrate the effectiveness of the cleaning works to the Contract Administrator.

10.3 IN-SITU LININGS

1. *(Delete)*

2. *(Amend to read as follows)* The in-situ lining of water mains with epoxy resin shall be in accordance with IGN 4-02-02, WIS 4-02-01 and UU *'Specification for epoxy resin & cement mortar linings'*.

3. *(Amend to read as follows)* The in-situ lining of water mains with cement mortar shall be in accordance with WRc *'In situ cement mortar lining – operational guidelines and code of practice'* and UU *'Specification for epoxy resin & cement mortar linings'*.

10.4 SLIPLINING AND REPLACEMENT MOLING

1. *(Amend to read as follows)* The use of sliplining, pipe bursting and moling techniques shall be in accordance with WRc *'Sliplining and replacement moling – operational guidelines. Source document'*.

2. *(Amend to read as follows)* The annulus to all pipe ends, including all cut-outs for fittings and service connections, shall be sealed using polyurethane foam, lightweight concrete or a proprietary annulus sealing material.

3. The use of die drawing techniques shall be in accordance with UU *'Renovation of mains by die drawing'*. The installation of fittings and removal of surplus pipe shall not be carried out until the recovery period is complete.

4. Towing heads/nose cones shall be made from either SDR11 or SDR17 pipe, as appropriate, and shall be available for the inspection and approval of the Contract Administrator prior to the start of insertion.

5. When the pipe bursting process does not use carrier sleeves or ducts a puddle-flanged assembly shall be butt-fusion welded onto the pipe adjacent to the existing main. A concrete anchor block shall be constructed around the puddle-flange to resist any reactive force.

10.5 CONNECTIONS

1. *(Addition to clause)* Connections shall be made in accordance with UU *Distribution Manual*.

2. Prior to the commencement of refurbishment all stop taps shall be shut down and ferrules removed from the main to be refurbished.

3. Cut or disconnected ends of service pipes shall be protected to keep them free of debris. In the event of a blockage the Contractor shall take immediate action to remedy the problem. The use of compressed bottled gas or filtered compressed air for the removal of blockages shall only be used with the Contract Administrator's approval.

4. Service connections shall be carried out using methods that avoid damage to the new lining.

5. Where the supply pipe is laid at less than 650 mm cover the Contractor shall achieve the connection by use of bends. Elsewhere differences in depth should be overcome by

bending or looping the pipe in accordance with UU *'Service laying at variable depth'*.

10.6 LINING THROUGH VALVES

No UU amendments or additions.

10.7 INSPECTION AFTER IN-SITU RE-LINING

3. The survey shall include inspection by CCTV in accordance with UU *'Specification for epoxy resin & cement mortar linings'*.

10.8 BRINGING REHABILITATED WATER MAINS INTO SERVICE

1. *(Amend to read as follows)* Before returning any rehabilitated water main into service the main shall be cleaned and disinfected in accordance with UU document 60133 *'Mains hygiene practices'*.

10.9 RENOVATION BY MAINS CLEANING

1. Renovation by mains cleaning shall be carried out in accordance with UU Standard Specification C05 *'Mains cleaning'*.

10.10 ANNULUS GROUTING

1. Annulus grouting shall be carried out in accordance with the relevant requirements of Clause 9.8.

SECTION 11 TUNNELLING AND SHAFT SINKING WORKS

11.1 HEADINGS, TUNNELS AND SHAFTS

(v) Any restrictions on vehicle movements and working hours should be stated in the Contract.

1. *(Delete)*

2. *(Delete)*

(vi) An assessment should be made of the on site storage requirements for excavated materials.

5. Tunnelling works shall be carried out in accordance with the relevant recommendations and guidance in BS 6164.

6. Where a shield, boring machine or other specialised equipment is used, the procedures recommended by the lining manufacturer for preventing excessive loading being transmitted to the lining shall be adhered to.

11.2 SHAFTS

No UU amendments or additions.

11.3 OPENINGS IN SHAFTS AND TUNNELS

No UU amendments or additions.

11.4 SEGMENTAL SHAFT AND TUNNEL LININGS

No UU amendments or additions.

11.5 UNBOLTED CONCRETE TUNNEL SEGMENTS

No UU amendments or additions.

11.6 BOLTED CONCRETE SEGMENTAL LININGS

4. Longitudinal joints of adjoining rings shall be circumferentially off-set by a third of a segment.

11.7 GROUTING OF SEGMENTS

6. On completion of grouting surplus grout shall be removed and the segments left clean.

7. A record of grouting operations shall be kept as work proceeds. The record shall include the grouting pressure, grout mix and quantity of grout used.

11.8 CAULKING

3. Caulking shall not commence until the primary lining is substantially watertight and the segments free of standing water.

11.9 POINTING OF JOINTS

2. Pointing shall not commence until caulking is complete, the joints watertight and the segments free of standing water.

11.10 SECONDARY LININGS TO SEGMENTS

No UU amendments or additions.

11.11 WATERTIGHTNESS OF SHAFTS AND TUNNELS

(ii) The specified allowable infiltration is equivalent to a Class 5 tunnel as defined in the British Tunnelling Society and Institution of Civil Engineers 'Specification for Tunnelling'. This tunnel class is appropriate for drainage and sewer tunnels and shafts. Tunnels and shafts for other purposes may require a reduced infiltration allowance to be included in the Contract.

1. *(Amend to read as follows)* Tunnels and shafts constructed from concrete segments, secant piling, diaphragm walling or other similar techniques shall be generally watertight with an allowable daily infiltration not exceeding 0.5 litres per square metre of tunnel/shaft lining.

11.12 CONTROL OF GROUNDWATER

No UU amendments or additions.

11.13 PIPE JACKING

No UU amendments or additions.

11.14 MICROTUNNELLING

No UU amendments or additions.

11.15 VENTILATION OF TUNNELS AND SHAFTS

No UU amendments or additions.

11.16 WORK IN COMPRESSED AIR

No UU amendments or additions.

11.17 RECORDING OF INFORMATION

2. The ground conditions encountered during excavation shall be agreed with the Contract Administrator and recorded at least once per shift as work proceeds. The records shall include soil and rock types, their condition and strength, the positions of any interface between different materials or other geographical features and the groundwater conditions.

11.18 TOLERANCES FOR SHAFTS, TUNNELS AND PIPE JACKS

4. Secant piles and diaphragm walls for shaft construction shall have a deviation from vertical not exceeding 1 in 120. Isolated concrete protrusions shall not protrude more than 100 mm from the general line of the shaft face.

APPENDIX VII – SECTION 12 CIVIL AND STRUCTURAL DESIGN

CONTENTS

SECTION 12 CIVIL AND STRUCTURAL DESIGN

12.1 GENERAL REQUIREMENTS

1. Designers shall provide a schedule of operability that shall describe the nature and frequency of all anticipated operating and maintenance access requirements. Designs shall make positive provision for these on a minimum whole life cost basis. New facilities shall not inhibit the safe access or operation of existing facilities.

2. Designers shall use UU Standard Details and Standard Assemblies where these are available.

3. The UK national annexes shall be used when carrying out design using the structural eurocodes.

12.2 STRUCTURES IN THE PUBLIC HIGHWAY

1. Design of structures in the public highway shall be in accordance with the requirements of the relevant parts of the Highways Agency *'Design manual for roads and bridges'*.

12.3 LOADING (ACTIONS)

(i) The BS EN 1991-2 load models to be considered in the design of structures subjected to traffic loading should be stated in the Contract.

1. Actions on structures shall be determined in accordance with the standards in the table below:

Action	Standard
Self weight	BS EN 1991-1-1
Imposed	BS EN 1991-1-1
Actions on structures exposed to fire	BS EN 1991-1-2
Snow load	BS EN 1991-1-3
Wind actions	BS EN 1991-1-4
Thermal actions	BS EN 1991-1-5
Actions during execution	BS EN 1991-1-6
Accidental actions	BS EN 1991-1-7
Loads from traffic	BS EN 1991-2
Actions from cranes and machinery	BS EN 1991-3
Loads on silos and tanks	BS EN 1991-4
Loads from earth and groundwater	BS EN 1997-1

12.4 MOVEMENT

(i) Any specific settlement limits should be stated in the Contract.

(ii) Guidance on anti-flotation measures is given in UU ENG801 'Civil engineering design guidance – anti flotation measures'.

1. Structures and their foundations shall be designed to accommodate or resist as appropriate the effects of movement. Settlements shall not affect the serviceability of the structure, any of its components or interconnecting pipework.

2. Design against sliding and overturning of structures in their temporary or permanent condition shall be in accordance with BS EN 1997-1 using the partial factors specified in the UK National Annex to BS EN 1990.

3. Design against flotation of structures and pipes in their temporary or permanent condition shall be in accordance with BS EN 1997-1 using the partial factors specified in the UK National Annex to BS EN 1990.

4. Ground friction on precast concrete segmental shafts shall be excluded from any flotation calculations unless the Contractor can demonstrate that the ground conditions and his construction method can mobilise this force.

5. The Contractor shall follow the guidance in UU ENG801 *'Civil engineering design guidance – anti flotation measures'*. For each structure the initial assumption for design groundwater level (DGWL) shall be taken as finished ground level local to the structure (or coping level where appropriate).

6. Deviation from the initial assumed design ground water level shall be based on the UU guidance and risk assessment following site specific investigations and determination of other long-term or temporary influences on groundwater level (both natural and anthropogenic). The Contractor shall, for

each structure, detail the design groundwater level in the Geotechnical Design Report (GDR) prepared by the Contractor along with details of the appropriate risk assessment. The GDR shall also include the design to achieve temporary and long-term stability applying the determined DGWL.

7. The DGWL for each structure and method of counteracting flotation shall be included in the Health and Safety File. The DGWL shall be recorded in metres above Ordnance Datum and details of any "removable weight" (e.g. benching, roof slab, backfill on toes or roof) used in the calculation included.

12.5 CONCRETE MIX DESIGN

(i) The ACEC class from BS 8500-1; Table A.2 should be stated in the Contract.

(ii) The exposure class from BS 8500-1; Table A.1 should be stated in the Contract.

(iii) Details of any aggressive sewage, water, chemicals or processes should be stated in the Contract.

(iv) BRE Special Digest 1 gives guidance on appropriate concrete mixes and additional protective measures for concrete in an aggressive environment.

(v) Any structures that can be considered as 'minor structures' should be stated in the Contract.

1. Concrete mixes shall be designed and specified in accordance with the requirements of BS 8500-1 & 2 and the requirements of other relevant standards used by the designer. Mix limits shall be chosen to meet the more onerous of the requirements relevant to each structure. Where possible Designated mixes shall be used. Where suitable Designated mixes are not available Designed mixes shall be used.

2. For the purpose of concrete mix selection and design, concrete structures shall have an intended working life of at least 100 years. For the purpose of concrete mix selection and design the intended working life of minor structures shall be at least 50 years.

3. The designer responsible for the detailed design shall take the information included in the contract specific documentation and specify requirements appropriate for fire resistance, structural requirements and durability. The Contractor shall complete the specification with details appropriate for constructability and other elements of this specification. The Contractor shall ensure that concrete supplied conforms to the requirements detailed in the following documents:

- UUCESWI sections 2 and 4.
- Any project specific amendments or requirements detailed in the project-specific specification.
- The designer's/Contractor's completed specification of requirements for each mix.

12.6 REINFORCED CONCRETE

(i) For water retaining and excluding structures designed to BS EN 1992-3 the tightness class should be included in the Contract.

(ii) See Clause 7.8 for watertightness requirements for

1. The level of 'watertightness' of concrete structures shall be as in the table below:

Structure	Watertightness
All liquid containing concrete works covered by the Environmental Permitting Regulations	Water retaining and excluding

manholes and Clause 11.11 for shafts and tunnels.

(iii) Generally watertight structures may be tested in accordance with Clause 7.14 if this is less onerous than the daily infiltration/leakage allowance.

All tanks, channels, wet wells, containment bunds and reservoirs except as below	Water retaining and excluding
CSO chambers, submersible pump wells, below ground storm tanks and detention tanks	Generally watertight
Other structures	No requirement

2. In situ concrete elements and precast components of water retaining structures shall be designed to BS EN 1992-3 tightness class 1 except for the water compartments of water towers and the roofs to tanks containing potable water where tightness class 2 shall be used. The completed structure shall be tested in accordance with Clauses 7.13 and 7.14.

3. In situ concrete elements and precast components of generally watertight structures shall be designed to BS EN 1992-1 with a crack width in accordance with Table NA.4 of the UK National Annex. The completed structure shall have a daily infiltration or leakage not exceeding 0.5 litres per square metre of wetted surface.

4. In situ concrete elements and precast components with no watertightness requirements shall be designed to BS EN 1992-1 with a crack width in accordance with Table NA.4 of the UK National Annex.

5. Unless justified by specific data T_2 shall be taken as 20ºC for design to BS EN 1992-3.

12.7 ACCESS STAIRS, WALKWAYS AND HANDRAILS

(i) General duty equates to a uniformly distributed load of 5 kN/m^2 on stairs and flooring and a horizontal load of 0.36 kN/m on handrails. Where other loading duties are required details should be given in the Contract.

(ii) For stairs subject to Building Regulations the rise should be limited to between 150 mm and 170 mm.

1. Access stairs, walkways and handrails shall be designed and installed in accordance with BS 4592-0 General Duty.

2. Access stairs shall conform to BS EN ISO 14122-3 with a minimum going of 250 mm and a maximum rise of 190 mm.

3. Suspended floor panels supported on concrete or masonry structures shall preferably be seated on rebates or built-in structural members. Where the use of face-fixed support steelwork is unavoidable this shall be designed in accordance with recognised design methods.

4. External pedestrian paths, steps and stairs shall conform to Building Regulations Approved Document M Section 1.

12.8 STRUCTURAL STEELWORK

1. Structural steelwork shall be designed and detailed in accordance with BS EN 1993-1 and fabricated and constructed in accordance with BS EN 1090-2. Steel frames to buildings shall be galvanised to BS EN ISO 1461. Steelwork located within aerated or oxygenated water as part

of a treatment process shall be stainless steel, grade to Clause 2.147.

12.9 MASONRY

1. Plain and reinforced masonry shall be designed to BS EN 1996-1.

2. Any sludge treatment rooms, or rooms regularly susceptible to spraying / damage by sewage or partially treated sewage / sludges shall have a protection system capable of being washed down with a high-pressure hose and brush.

12.10 STRUCTURAL TIMBER

1. Structural timber shall be designed to BS EN 1995-1.

12.11 PIPELINES AND PIPEWORK

General

(i) BS 9295 contains additional information and guidance on the use of BS EN 1295-1.

1. Structural design of buried pipelines under various conditions of loading shall be in accordance with BS EN 1295-1.

(ii) Additional; guidance on pipe material selection for marine outfalls is included in UU 'UUCESWI – Additional information and guidance'.

2. Materials for marine outfalls, pipelines within water treatment and wastewater treatment works, and on wastewater network projects, shall be selected in accordance with Appendix X.

3. Materials for water network pipelines shall be selected in accordance with UU Technical Guidance 29071 *'Water network pipeline materials selection'*.

4. The colour of buried pipework shall conform to Table 1 of NJUG Publication Volume 1.

5. Surge and fatigue shall be taken into account in the design of pressure pipelines. Plastic pipe materials shall be derated as appropriate in accordance with IGN 4-37-02.

6. Thrust blocks shall be designed in accordance with CIRIA Report R128 *'Guide to the Design of Thrust Blocks for buried pressure pipes'*.

7. The detailing of the pipework layout shall allow for the easy removal of all plant items which require maintenance, eg valves, meters, pumps etc.

(iii) Thrust loads can be generated at bends, tapers, tees,

8. Pipework and fittings shall be restrained as necessary to accommodate longitudinal thrust loads that may arise from any construction, operational or maintenance activities.

blank ends, stepped couplings, valves and other fittings.

Pipes that penetrate tank walls and may be subject to longitudinal thrust due to the hydrostatic head of the tank contents shall be restrained by means of an integral 'cast-in' puddle flange or equivalent positive and permanent means.

9. Isolating valves located in pipework downstream of a tank penetration point shall be positively and permanently restrained. This is to ensure that, in the event of the valve being closed against the head of the tank and the downstream pipework being dismantled, the isolating valve will not detach under the force of the head. Valves installed under such circumstances shall be suitable for 'open end' duty.

10. Non-buried pipework shall be supported in accordance with the manufacturer's instructions. Valves, meters, strainers and other equipment mounted in pipework shall be supported independently of the pipes to which they are connected.

11. Where necessary and appropriate, exposed pipework laid above ground and up to 750 mm below ground shall be protected against freezing. Where pipework requires trace heating, insulating and cladding to prevent contents from freezing or to protect personnel from exposure to excessive temperatures, this shall be done in accordance with UU Standard Specification S03 *'Mechanical Engineering'*.

Wastewater

12. Pipelines conveying wastewater, chemical slurries, sludges, etc., shall be provided with rodding points and / or inspection covers to facilitate clearing of blockages without dismantling the pipework.

13. Sludge pipelines shall not be less than 150 mm ID and bends shall be long radius.

Marine Outfalls

14. The specific gravity of the pipe and any weighting fixed to the pipe shall be a minimum of 1.35 in all maintenance and operational conditions. The weight of rock armour, scour protection and backfill shall not be included in the calculation of specific gravity. For tunnel construction, the buoyant weight of natural ground, not subject to risk of scour over the life of the asset, may be used in anti-flotation calculations.

15. The permanent pipe stability shall be assessed in accordance with DNV-RP-F109 using environmental loading generated from the combination of a 1 in 1 year current and a 1 in 100 year wave or a 1 in 100 year current and a 1 in 1 year wave, whichever is more onerous.

12.12 DRAINAGE

1. The Contractor shall include in his design for a comprehensive site drainage scheme including road drainage (which, except areas potentially contaminated by sewage or sludge, shall normally be shed directly into grassed areas), building drainage and kiosks drainage. On wastewater treatment works, the design should ensure that all drainage streams are returned to the inlet works appropriately treated and balanced if required by the Contractor's design.

2. On wastewater treatment works, process drainage shall be returned to prevent interference with all flow measurement and sampling systems i.e. downstream thereof.

3. Road and site drainage shall conform to the requirements of Highways Agency HD 33/16.

12.13 MANHOLES

1. On process plants manholes shall be provided on gravity pipework at each abrupt change of horizontal or vertical direction, change of pipe diameter or intersection of main pipework. Manholes shall be designed to the requirements of *'Sewers for adoption'*. The minimum allowable manhole size is 1200 mm diameter.

12.14 OVERFLOWS

1. Overflows on process plants shall be sized to pass the maximum possible flow, allowance shall be made for parallel plant items being out of service. Overflows shall be designed to not operate until full utilisation of the plant is achieved.

12.15 OUTFALLS

1. Outfall pipes of 375 mm diameter and above shall be protected by grilles. The clear distance between the bars of grilles shall not exceed 100 mm. Grilles shall be secure but removable by authorised personnel to allow maintenance.

12.16 ROADS AND FOOTWAYS

(i) The vehicle types and sizes to be accommodated by the design should be stated in the Contract.

(ii) 'Grass road' systems can be used for infrequently trafficked areas. Plastic systems should only be used in very infrequently and lightly loaded areas, concrete system should be used where loading from heavy vehicles is possible.

The design of roads (not on public highways) shall be carried out to the following standards:

1. The layout and grading of site access roads shall be designed in accordance with the appropriate guidelines contained in Freight Transport Association document *'Designing for deliveries'*. Loading, parking and turning areas shall be of reinforced concrete construction with falls to suitably designed gullies. Otherwise the choice of surface shall be based upon lowest whole life cost over the life of the works or 40 years whichever is shorter. Kerbs shall not be provided except as specified.

2. The structural design of flexible and rigid site access roads shall be in accordance with the documents within volume 7 of the Highways Agency *'Design manual for roads and bridges'*.

3. The structural design of roads and footways using pavers shall be in accordance with BS 7533-1 or 2 as appropriate.

4. Works roads shall be designed to limit traffic speed to a maximum of 15 mph.

5. Road gradients shall generally not exceed 1 in 12 and under no circumstances exceed 1 in 5.

6. Crest roads on reservoir dams shall have a crossfall away from the reservoir and shall incorporate a kerb / channel on the downstream edge. The water side of the embankment shall be suitably guarded. Drainage facilities shall be provided at regular intervals to prevent erosion of the downstream face of the dam. Drainage from roads and vehicular access bridges shall not discharge into the reservoir.

12.17 FOUNDATIONS

(i) Expanded geotechnical specifications should be included in the Contract as necessary.

1. Rafts, piles etc shall be designed to the requirements of BS EN 1997-1.

2. Ground anchors shall be designed to the requirements of BS 8081 and BS EN 1537.

12.18 CONCRETE / MASONRY BUNDS TO CHEMICAL TANKS

1. Bunds to chemical and oil tanks shall be designed to meet the requirements of Environment Agency documents *'Concrete bunds for oil storage tanks'* or *'Masonry bunds for oil storage tanks'*. They shall be sized to retain at least 110% of the volume of the largest tank located within the bund or, where more than one tank is present, 25% of the total capacity of all tanks, whichever is the greater. Bund walls shall be designed to contain 'jets' issuing from holes in tank sides. Bunds shall be no greater than 1.5 m deep.

2. Bunds shall be watertight.

3. Bunds shall be resistant to attack from the material stored. Where liners are to be used, these shall be installed by a specialist contractor. Liners shall be spark tested in accordance with the manufacturer's instructions.

4. All bunds shall incorporate a sump of at least 300 x 300 x 300 mm deep.

5. All tank valves, pipework etc shall be a minimum of 150 mm above the bund floor. Dosing pumps shall be within the bund above the 110% volume level. No tank pipework shall pass through the bund walls or base. Pipes conveying

chemicals shall be enclosed so as to contain leakage and drain it to the bund or other holding tank. The pipe enclosure shall indicate the name of the chemical within.

6. Bunds shall be provided with high level alarms to the works control system.

7. Indicators shall be readable and valves shall be operable from outside the bund.

12.19 PILING

1. All piling works shall be in accordance with the Institution of Civil Engineers *'Specification for piling and embedded retaining walls'*.

2. Piling works shall be designed and carried out in a manner so as not to generate vibrations that may damage adjacent or local structures or equipment.

12.20 CHEMICAL DELIVERY AND SLUDGE TANKER LOADING AREAS, AND OTHER AREAS WHERE SPILLAGES MAY OCCUR

1. Chemical delivery and sludge tanker loading areas, and other areas where such spillages of contaminating substances may occur, shall be constructed from impermeable materials and shall incorporate bunding to ensure that any spillage is contained and is prevented from entering the general road drainage system. Where required, a blind tank shall be incorporated.

2. Sludge cake storage areas shall be provided with a concrete hardstanding, push walls and bunding in order to facilitate the following:

- efficient removal operations to take place using a front loading tractor
- to allow loading of tankers
- to allow drainage of the area to the works
- to prevent leaching of the sludge to any watercourses or flood water

The hardstanding shall be suitably bunded to prevent run-off of liquors and allow access by wheeled vehicles.

3. Joints in delivery area bunds and sludge cake storage areas shall be avoided. Where this is not possible leakage through joints shall be prevented by the incorporation of a waterbar.

4. Hosing down and line flushing facilities shall be provided in sludge storage areas and their associated dosing / transfer

systems, in chemical delivery areas and in areas where spillages of sewage / sewage sludges are likely to occur, and areas where screenings and grit are collected and transferred. These areas must not be able to drain to surface water drains.

5. On wastewater treatment plants, high-pressure washwater systems utilising final effluent may be viable, however the operating pressure shall be limited so as not to cause danger to personnel.

12.21 BOLTED FIXINGS INTO CONCRETE

1. Bolted systems involving expanding type bolts or fixings shall not be permitted.

12.22 CONCRETE FLOORS AND WALKWAYS

1. Surface treatment and finishes shall be selected to be appropriate to their environment and application. Unless otherwise specified or approved:

- Surfaces to receive foot traffic shall have brushed finish with steel trowel edging.
- Surfaces shall be resistant to chemicals they may normally come in contact with
- External surfaces shall be resistant to frost

2. Screeds shall be designed to BS 8204-2

3. Surfaces that may come into contact with liquids shall be designed with positive falls to local drainage.

12.23 SITE SECURITY

1. Where high-level pipework affords a potential means of access for intruders to the operational site pipe fans shall be fitted.

2. Locks shall be fitted at the following points on all operational sites:

Site entrances
Treated water access points or inspection covers*
Chemical delivery points*
Chemical stores, inspection points, drainage valves*
External valves unless otherwise immobilised (within sites and in isolated locations)*
Fuel delivery / inspection points and drainage valves*
Entrances to buildings
Disused facilities
Sensitive inner areas of buildings*, e.g. those housing:
chemicals

valuables
control equipment
mobile plant and equipment
critical fixed plant

Locks shall also be fitted at all other areas of buildings, equipment housings or chambers where, for security or health and safety reasons, it is necessary to restrict access to authorised persons only*.

Locks for areas indicated with an * above shall be different to those on site entrances.

Where described in the project specific requirements, suitable locks shall be provided.

3. Padlocks for use in aggressive locations (e.g. chemical stores) shall be of the fully removable shackle type and, where possible, protected with a rubber shroud.

12.24 DESIGNING TO AVOID TRIP HAZARDS

1. Cover slabs and concrete plinths shall be designed to either match or be a minimum of 150 mm above adjacent ground levels.

12.25 DESIGN VERIFICATION

(i) The required verification category should be stated in the Contract.

1. The definitions of the Category 0, 1, 2 and 3 type verifications which follow are taken from Highways Agency BD 2/12.

(ii) Where the structure is located in or close to the highway the Highway Authority may require a Category 0, 1, 2 or 3 check on any structure irrespective of its size. This requirement will require negotiation with the Highway Authority.

2. A Category 0 and 1 type verification of the design requires an independent check by another engineer who may be from the design team.

3. A Category 2 type verification of the design requires a check by a checking team, which may be from the same organisation but shall be independent of the design team.

(iii) If the Highway Authority do not require any category checking or if the structure is remote from the highway then, for structures > 7.5 m overall internal span (wall to wall neglecting any intermediate supports), only follow the UU document the 'Design Checking – Requirements for UID Structures' to identify if a Category 2 or 3 check is required.

4. A Category 3 type verification of the design requires a check to be carried out by a checking team from a separate organisation proposed by the designer and agreed by the Contract Administrator.

5. Although the form and detail of the check is for the verifier to decide, his analytical work shall be independent of that of the designer and carried out without reference to the designer's calculations or assumptions. The verifier shall be responsible for the applicability and accuracy of any computer programmes used.

6. The method of analysis and design employed by the designer and the verifier need not be the same. However, the designer and verifier should consult each other to ensure that the results obtained are directly comparable.

7. To meet programme constraints the verification may be carried out in parallel with the design. Elements of the structure may be verified for construction before the whole design is complete.

8. Formal verification certificates shall be issued by the verifier to the Contract Administrator prior to construction of the individual elements of work.

APPENDIX VIII – *DELETED*

APPENDIX IX ROAD REINSTATEMENT TABLES A AND B TEMPLATES

Table A: Reinstatement schedule for excavations in highways						
Location	**Reinstatement reference**	**Construction type**	**Existing construction details**	**Road category**	**Reinstatement method**	**Permanent wearing course material**
Table B: Reinstatement schedule for excavations in footways, footpaths and cycleways						
Location	**Reinstatement reference**	**Construction type**	**Existing construction details**	**Road category**	**Reinstatement method**	**Permanent wearing course material**

APPENDIX X SELECTION MATRIX FOR PIPE MATERIAL ON WATER & WASTEWATER TREATMENT WORKS AND WASTEWATER NETWORKS

For pipes for use on the water network refer to UU Technical Guidance 29071 *'Water network pipeline materials selection'*

Flanged pipe joints shall not be used on buried pipework except where necessary adjacent to fittings.	Pipe Material (10)									
	Ductile iron	Coated steel (8)	PE (solid wall)	PVC-U, PE & PP (structured wall) (6)	PVC-O PVC-U	ABS (4)	GRP	Concrete	Clayware	Ribbed PE
Gravity – buried free surface flow	✓	✓		✓	✓		✓	✓	✓	
Gravity – buried low pressure	✓	✓		✓ (7)	✓		✓	✓ (1)		
Gravity – under structures	✓ (2)							✓ (2)		
Gravity – within building low pressure	✓	✓		✓ (7)	✓	✓	✓	✓		
Rising mains – buried	✓ (9)	✓	✓				✓			
Rising mains – under structures	✓ (2)									
Rising mains – within buildings	✓	✓	✓			✓				
Surface water drains – non pressure only				✓	✓			✓	✓	✓
Land drains and french drains (5)								✓ (3)	✓ (3)	✓ (3)
Marine outfalls (11)	✓ (12)	✓ (12)	✓	(13)			(13)	✓ (14)		

✓ Normally acceptable – when selecting suitable materials the designer should consider the specific requirements of the application eg, pressure, ground conditions, contamination, support systems, and protection (internal and external). Project-specific constraints on choice and requirements should be stated in the Contract. Other materials may be acceptable on a project-specific basis subject to review by UU.

1. Reinforced concrete only
2. With concrete surround
3. Porous or perforated pipe
4. Not UV stable, keep covered
5. Fin drains can be used at structures
6. Maximum internal diameter 900 mm
7. Max working pressures:
   Pipe, welded joints and flexible seal couplings – 1 bar
   Spigot and socket joints – 0.5 bar
   Refer to supplier for maximum test pressures.
8. Includes stainless steel. Thin-walled stainless steel shall not be buried or used for wastewater applications upstream of preliminary treatment.
9. Linings suitable for pH < 4 and pH > 12 shall be used at river crossings, under railway lines, and at other critical locations.
10. Materials in contact with potable water shall have DWI approval – refer to CESWI Clause 2.1. For guidance on material selection for potable water pipes in potentially contaminated land refer to UKWIR 10/WM/03/21 *'Guidance for the selection of water supply pipes to be used in brownfield sites'* and UU *'Supplementary guidance for the selection of water pipes in land potentially affected by contamination'.*

11. Marine outfalls are those which have a length of pipe in a sea or estuary below MHWS. Other materials may be acceptable for outfalls that terminate in the inter-tidal zone.
12. With cathodic protection, galvanising alone is not acceptable.
13. May be acceptable depending on site conditions subject to review by UU.
14. Concrete pressure pipe and plain concrete pipe may be acceptable depending on site conditions subject to review by UU.