VOLUME 5 CONTRACT DOCUMENTS FOR SPECIALIST ACTIVITIES

SECTION 8 TRENCHLESS INSTALLATION OF HIGHWAY DRAINAGE AND SERVICE DUCTS

PART 2

SERIES 8000

SPECIFICATION

INTRODUCTION

This Series of the Specification applies to the installation by trenchless techniques of highway drainage, service ducts, sleeves and culverts of internal diameters or width 900 mm or less.

INSTRUCTIONS FOR USE

1. Remove Series 8000 for Volume 5, Section 8, Part 2 and archive as appropriate.

2. Insert new Series 8000 into Volume 5, Section 8, Part 2.

3. Archive this sheet as appropriate.

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SPECIFICATION

Contents

8001. SCOPE

General

1 (11/06) Trenchless and minimum dig installation is the means of installing, replacing and renovating pipes, ducts and small tunnels with minimal or no excavation from the surface. This section of Volume 5 covers the requirements for trenchless and minimum dig installation of highway drainage, service ducts, sleeves and culverts of internal diameters or width 900 mm or less.

2 (11/06) This Specification is to be read as an addition to the Manual of Contract Documents for Highway Works (MCHW) Volume 1 - Specification for Highway Works (SHW) (MCHW 1). Where the requirements of Series 8000 differ from those in the MCHW 1, Series 8000 shall take precedence. This Series covers installation by the techniques listed below:

Steerable new installation

- Microtunnelling.
- Pipe jacking.
- Directional drilling.
- Thrust boring.

Non-steerable new installation

- Auger boring.
- Pipe ramming.
- Impact moling.

On-line replacement

- Pipe bursting.
- Pipe eating.

Minimum dig new installation

- Mole ploughing.
- Narrow trenching.

Rehabilitation

- Cured in Place Lining.
- Sliplining.

8002. INFORMATION

General

1 (11/06) The approved code of practice on safe work in confined spaces as issued by the Health and Safety Commission recommends that people should not normally enter drains less than 900 mm high. This Specification regards the value of 900 mm as the minimum internal dimension for man-entry.

2 (11/06) This document covers new and existing pipes with internal diameters of 900 mm or less. Work to pipes and service ducts exceeding 900 mm internal diameter are subject to the Technical Approval Procedure as detailed in BD 2 (DMRB 1.1).

3 The installation of pipes, service ducts, sleeves or culverts where the internal diameter of the pipe is 900 mm or less by trenchless techniques is subject to Geotechnical certification as detailed in HD 22 (DMRB 4.1.2).

4 (11/06) All elements to be designed by the Contractor shall be listed in Appendix 1/11.

8003. DEFINITIONS

1 Definitions relating to trenchless techniques are formally defined below.

Auger Boring

2 Method of forming a bore by means of a rotating cutting head. Spoil is removed by helically wound auger flights rotating in a steel casing.

Bore

3 The underground void that is created by the trenchless installation method into which the proposed service pipe will be inserted.

CCTV

4 Closed Circuit Television used to carry out internal inspections and surveys of the service.

Cured in Place Lining

5 A system in which a thin flexible tube of polymer or glass fibre fabric is impregnated with resin and forced into position against the inner wall of a defective pipeline or other conduit before curing the resin to harden the material. The uncured lining may be installed by winch or inverted by water or air pressure.

Depth of Cover

6 Vertical distance from the crown of the service to the ground level.

Directional Drilling

7 A steerable system for the installation of a service using a surface launched drilling rig.

Impact Moling

8 Technique for installation using a non-steerable percussive soil displacement tool to form a bore.

Intermediate Jacking

9 A series of jacks around the diameter of the pipeline inserted at intervals along the drive to allow sequential thrusting of sections of the pipeline. This reduces the maximum thrust required to drive long pipelines. The jacks are removed on completion of the drive.

Launch Pit

10 Also known as jacking pit or drive shaft, it is the place from which the trenchless technique is started. The launch pit is part of the Contractor's temporary works although it may form part of the permanent works after completion of the service installation. The launch pit may utilise existing shafts and chambers.

Man-entry

11 Description of any operation which requires an operative to enter a pipe, duct or bore. The minimum size and other conditions for which this is permissible may be defined by health and safety legislation.

Microtunnelling

12 Microtunnelling is a technique for installing non man-entry tunnels and pipelines by pipe jacking methods behind a remotely controlled steerable tunnelboring machine.

Minimum Dig Installation

13 Techniques for installation of services using open cut methods but without man-entry to the trench.

Mole Ploughing

14 A technique for laying a pipeline by pulling a plough through the ground whilst a continuous length of pipe is fed into the top of the plough and buried from the tail.

Mud Motors

15 A rock drilling system used in directional drilling. High volumes of bentonite, or other slurry, delivered at a high pressure, drive the cutting wheels.

Narrow Trenching

16 A technique for the excavation of a trench approximately 50-100 mm wider than the outside diameter of the pipeline to be installed, usually using either a rockwheel or chain type trencher. Pipe installation is carried out from ground level.

New Installation

17 The installation of a service where no similar service existed previously.

On-line Replacement

18 The breaking up for removal or displacement of an existing service and the installation of a new service in its place.

Overbreak

19 This is the extra excavation over that required to accommodate the external diameter of the pipeline.

Pipe Bursting

20 The replacement of an existing pipe by fragmenting from within using a bursting head which forces the material into the surrounding soil. The new pipe is simultaneously drawn in behind the bursting head.

Pipe Eating

21 An on-line replacement technique based on microtunnelling where the defective pipe is excavated together with the surrounding ground and the new pipe is pulled in behind the excavating head.

Pipe Jacking

22 Pipe jacking is a technique for installing underground pipelines, ducts and culverts using hydraulic jacks to push specially designed pipes through the ground behind a shield at the same time as excavation is taking place within the shield. The technique applies to man-entry size pipelines.

Pipe Ramming

23 A non-steerable system of driving a steel casing into the soil from a drive pit using a percussive hammer. The soil is removed from the casing by augering, jetting or compressed air.

Contaminated Land

24 Contaminated land shall be that designated as such on the Drawings or schedules. This land may contain substances that could give rise to hazards likely to affect human health, the natural environment or the existing highway.

Reception Pit

25 It is the shaft at the end of the installation and is used to recover or reverse the plant used. The reception pit is part of the Contractor's temporary works, although it may form part of the permanent works after completion of the service installation. The reception pit may utilise existing shafts and chambers.

Rehabilitation

26 In-situ restoration of an existing defective service in which the original fabric is retained intact.

Service Pipe

27 This is a general term to include the permanent highway drain, service duct, sleeve or culvert.

Sleeve

28 Pipe installed as external protection to one or more service pipes.

Sliplining

29 Insertion of a new pipe by pulling or pushing it into the existing pipe, usually grouting the annular space. The pipe used may be continuous or a string of discrete pipes.

Slurry

30 Mixture of water and usually bentonite or polymer continuously pumped to the cutting head or drill bit to facilitate the removal of cuttings, stabilize the bore, cool the head and lubricate the passage of the service pipe.

Thrust Boring

31 A method of forming a pilot bore by driving a closed pipe or head into the soil.

Thrust Ring

32 A steel ring that is placed against the end surface of a pipe to ensure that the thrust forces are evenly spread around its circumference.

Thrust Wall

33 A wall constructed normal to the proposed line of thrust designed to dissipate the reaction to the thrust into the surrounding ground.

Upsizing

34 Any method which increases the cross sectional area of an existing service by replacement with a larger service.

8004. GENERAL REQUIREMENTS

General

1 Highway drains and service ducts installed using trenchless methods shall be identified in Appendix 80/1 and shall be constructed from one of the permitted techniques in Appendix 80/1 and in compliance with this Specification.

Method Statements

2 Not less than 14 days before the commencement of the trenchless site operations the Contractor shall provide the Overseeing Organisation with a statement describing in full the arrangements and methods of work he proposes to use in carrying out the site operations and any additional requirements as listed in Appendix 80/1.

3 (11/06) Where the contract requires work on contaminated land, the Contractor shall contact the relevant authorities before submitting his method statement, as required under sub-Clause 8004.2, and agree working practices and procedures.

4 The Contractor shall not amend the statement or any working practice or procedure without notifying the Overseeing Organisation in writing.

Records

5 The Contractor shall keep a daily record in duplicate, in a clear and legible form, of the elements of the work identified in Appendix 80/1. One copy of the records shall be passed to the Overseeing Organisation at the end of each working day. Any unexpected driving or boring conditions shall be noted in the records.

6 The Contractor shall track and record the position and level of the underground equipment relative to a previously agreed reference point.

Ground Movements

7 (11/06) Unless otherwise specified in Appendix 80/1, no heave or settlement shall occur at the ground surface due to the service pipe installation or replacement works.

8 The locations and periods when ground levels shall be measured are as stated in Appendix 80/1. The Contractor shall agree existing ground levels with the Overseeing Organisation prior to commencement of the works. Should any change in level exceed the permitted heave or settlement the Contractor shall immediately ensure the ground remains fully supported and notify the Overseeing Organisation of his intentions.

Monitoring for Adjacent Structures or Services

9 The requirements for survey and monitoring of movements, noise or vibration, for works adjacent to structures or services are specified in Appendix 80/1.

Machinery

10 (11/06) The Contractor shall provide the Overseeing Organisation with a copy of the test certificates to show that the plant used conform to BS EN 50270.

Abandoned Bores

11 In the event of a bore being abandoned it shall be reinstated free of voids and compatible with the surrounding ground. Where grouts are used they shall be applied at a pressure controlled to prevent disturbance to surface levels.

Overbreak

12 The outside diameter of the cutting tool shall not exceed the outside diameter of the service pipe by more than 25 mm.

13 Cavities behind pipejacked installations resulting from over excavation or the removal of obstructions shall be filled with 1:10 cement:pfa mix grout in compliance with Clause 506 at a pressure controlled to prevent disturbance to surface levels. Holes shall be bored through the pipe walls by wet drilling to gain access for the grouting.

Grouting Pipe Inserts

14 Grouts between inserted pipes and sleeves shall consist of two parts fine washed sand to one part cement by weight. Only sufficient water to obtain plasticity shall be used. The grout shall be pumped and shall be continuously stirred or agitated in the container to prevent segregation. The grouting shall be carried out in one continuous operation. Inserted pipes shall be jointed and securely fixed to line and level and secured to prevent flotation or distortion during grouting.

Support Fluid and Lubrication

15 (11/06) Where support, lubrication or drilling fluids are used they shall comply with the requirements of Series 1600 (MCHW 1.1600).

Contaminated Land

16 The presence and nature of the known areas of contaminated land are indicated in Appendix 80/1. Material excavated in these areas shall be handled in accordance with sub-Clause 602.18.

17 If further contaminated land is encountered, the Contractor shall cease work at once and immediately inform the Overseeing Organisation. The Contractor shall agree a revised method of working appropriate to the nature and level of hazards encountered with the Overseeing Organisation and any other appropriate regulatory authority.

18 (11/06) On contaminated land the Contractor shall comply with the safety requirements of the HSE Publication "Protection of Workers and the General Public during Development of Contaminated Land" (1991), the CIRIA Publication "A guide to Safe Working Practices on Contaminated Sites" and BS 10175.

19 The Contractor shall avoid the spillage of lubricating and support fluid outside the immediate area of the installation. Discarded or spilled fluid shall be removed from the site and treated in the appropriate with sub-Clauses 8004.17 and 18.

20 The Contractor shall ensure that fluid used in contaminated ground is not reused and is disposed of off site in accordance with sub Clauses 8004.17 and 18.

Reinstatement

21 Where existing manholes or chambers are used for the installation of the service pipe these shall be reinstated in accordance with Clause 507, unless otherwise indicated in Appendix 80/1.

8005. PIPES FOR DRAINAGE AND SERVICE DUCTS

Pipe Materials

1 Where pipes for drainage are to be installed by jacking techniques they shall be selected from Table 80/1 and shall comply with the Standards and particular requirements therein. The Contractor shall show that the pipes used have a hydraulic flow capacity not less than that specified in Appendix 5/1.

2 Pipes for drainage installed by non-jacking techniques shall be selected in accordance with sub-Clause 501.3.

3 Service ducts shall be selected in accordance with sub-Clause 501.7.

4 Where pipes or service ducts are to undergo end thrust as part of the installation the Contractor shall provide the Overseeing Organisation with evidence of the manufacturer's maximum design end thrust and the maximum angular deflection across the joint at which this has been calculated.

5 (11/06) If steel pipe is installed as part of the permanent works then the exterior of the pipe shall be protected against corrosion in accordance with the Series 1900. The corrosion protection shall be protected against damage during the installation process.

6 (11/06) Concrete jacking pipes below 900 mm internal diameter shall conform to BS EN 1916 and BS 5911-1.

Installation of Pipes

7 Pipes shall be installed on the line and to the levels shown on the Drawings or given in the Schedule in Appendix 5/1.

8 Where the Contractor proposes to install polyethylene services by drawing into the bore he shall connect the pipe to the towing head via a breakaway connector. The connector shall be appropriate for the manufacturer's designed permissible tensile strength for the pipe in use.

9 Where the manufacturer's maximum permitted end load or tensile load has been exceeded, the Contractor shall be responsible for proving the integrity of the services and shall replace the service where this cannot be achieved.

TABLE 80/1: (11/06) **Jacking pipes for the trenchless installation of drainage within the highway**

Material	Usage	Standard
Vitrified Clay	Foul and Surface Water drains	BS EN 295
Concrete	Foul and Surface Water drains of internal diameter 900 mm or less	BS EN 1916 and BS 5911-1

Tolerances

10 (11/06) Unless otherwise stated in Appendix 80/1 alignment of the finished pipeline shall be within a tolerance of ± 50 mm of true line and ± 25 mm of true level at any point in the bore. Any adjustment to the true line and level shall be gradual and the pipe manufacturer's specified permitted draw or angular deflection shall not be exceeded at any individual point.

11 If deviations outside of the range of tolerance given in Clause 8005.10 or as amended in Appendix 80/1 occur then the operations shall require a halt to discover the reason for the deviation before the bore is redirected to the correct alignment.

Jointing of Pipes

12 (11/06) Flexible joints in the service pipe shall be made and tested in accordance with Clause 504 and shall be formed within the thickness of the pipe wall with no internal or external projections. The joint shall be capable of transmitting the axial loads to be expected during the installation. The joint shall remain watertight under the permitted angular deflection. The joint shall be able to ensure directional stability of the pipeline during installation.

Steering of Rigidly Jointed Pipes

13 Rigidly jointed polyethylene and steel pipes shall not be subjected to bends of radius less than 50 times the internal diameter of the pipe for both horizontal and vertical curvature.

Packers

14 The use of packing material between the pipe joints to distribute jacking loads shall be for the pipe supplier to design. If packing material is used, it shall comply with BS EN 312. Packers to the pipe joint shall be resilient enough to take the load/unload jacking strain and strong enough to take the compression generated at the maximum joint stress. Joint packing shall be kept free from moisture prior to installation.

Welding

15 (11/06) All steel welding operations shall only be carried out by skilled welders in compliance with Clause 1801. Welding shall comply with Clause 1801. Welding to joints in steel pipelines shall be full penetration butt welds to BS EN 1011-1 and BS EN 1011-2.

Excavation for Pipes and Chambers

16 Excavation for pipes and service ducts shall be carried out as specified in Clause 502.

17 Excavation for chambers shall be carried out as specified in Clause 502. Where the Contractor's temporary works have reduced the bearing capacity of the material at the base of a proposed chamber, the original bearing capacity of the material shall be restored by some suitable means.

18 Backfilling of excavations shall be carried out as specified in Clause 505.

Connecting to Existing Drains, Chambers and Channels

19 Where described in Appendix 5/1 or Appendix 80/1, existing drains, chambers or channels shall be connected to new drains, chambers or channels in accordance with Clause 506.

20 The Contractor shall ensure that the new pipeline has fully recovered from any temporary distortion in length caused by the installation method prior to connecting into existing drains or chambers.

Testing, Inspection and Cleaning

21 (11/06) In addition to the testing and cleaning as required in accordance with Clause 509, highway drainage and service pipelines shall be internally inspected by CCTV in accordance with Series 9000 (MCHW 5.9, Parts 1 to 5).

8006. SPECIFIC REQUIREMENTS FOR ON-LINE REPLACEMENT TECHNIQUES

Specific Requirements for Pipe Bursting

Lateral connections

1 (11/06) Prior to replacement commencing the Contractor shall carry out a CCTV survey of the pipe to locate all lateral connections. The content of the survey report shall be as specified in Appendix 80/1.

2 (11/06) Lateral connections shall be reconnected to the main pipe in accordance with the requirements of Clause 506.

8007. SPECIFIC REQUIREMENTS FOR MINIMUM DIG TECHNIQUES

Specific Requirements for Mole Ploughing

1 The Contractor shall carry out reinstatement in accordance with the requirements of Appendix 80/1.

Specific Requirements for Narrow Trenching

2 For highway drainage installations the trench shall be backfilled in accordance with Clauses 503 and 515 and HCD Drawing numbers F18 to F21.

3 Trenches for service duct installations shall be backfilled with Class 1, 2 or 3 general fill material complying with the 600 Series.

8008. SPECIFIC REQUIREMENTS FOR REHABILITATION TECHNIQUES

General

1 Linings shall be installed in continuous lengths between points of access to the pipeline.

2 The pipeline shall be cleared of all silt and debris, and any loose fragments of pipe that could fall onto the liner during installation shall be removed.

Specific Requirements for Cured in Place Lining

General

3 Heated water shall not be released into surface water systems until it has cooled to air temperature.

Lining material

4 The design and testing of all lining materials shall be carried out in accordance with Water Industry Specification WIS 4-34-04 as detailed in Appendix 80/1.

5 The cured in place lining shall be in contact with the host pipe for the full length of the installation.

6 Test certificates shall be presented to the Overseeing Organisation to show materials comply with WIS 4-34-04.

Lateral connections

7 (11/06) Prior to starting the lining operation on the cleaned pipeline the Contractor shall carry out a CCTV survey of the pipe to locate all lateral connections.The content of the survey report shall be as specified in Appendix 80/1.

8 (11/06) Lateral connections shall be reconnected to the main pipe in accordance with the requirements of Clause 506.

Specific Requirements for Sliplining

Lateral connections

9 (11/06) Prior to starting the lining operation on the cleaned pipeline the Contractor shall carry out a CCTV survey of the pipe to locate all lateral connections.The content of the survey report shall be as specified in Appendix 80/1.

10 (11/06) Lateral connections shall be reconnected to the main pipe in accordance with the requirements of Clause 506.