

TRUNK ROAD INFRASTRUCTURE TECHNICAL SPECIFICATION No. 03

UNDERGROUND SERVICES



ACT
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Territory and Municipal Services

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PREFACE

The Australian Capital Territory has adopted the Austroads Guides for provision and management of road and transport infrastructure. The Territory and Municipal Services Directorate has issued a revised series of documents to reflect this development in infrastructure standards and specifications for practice in the ACT.

This present document is part of the ACT Trunk Road Infrastructure Technical Specifications (TRITS) series spanning the broad scope of road infrastructure development and management in the ACT:

- TRITS 01 – Roadworks
- TRITS 02 - Earthworks
- TRITS 03 – Underground Services
- TRITS 04 – Flexible Pavements
- TRITS 05 – Rigid Pavements
- TRITS 06 – Kerbs and Footpaths
- TRITS 07 – Segmental Paving
- TRITS 08 – Incidental Works
- TRITS 09 – Landscape
- TRITS 10 – Bridges and Related Structures
- TRITS 11 – Pavement Marking
- TRITS 12 – Street Lighting
- TRITS 13 – Traffic Signals
- TRITS 14 – Road Signs
- TRITS 15 – Road Furniture

This ACT Trunk Road Infrastructure Technical Specification No.03 - UNDERGROUND SERVICES prescribes the detailed practices for provision of underground services in the ACT. It is issued to clarify any exceptions or additional requirements for implementation in the ACT, and to identify relevant complementary documents.

In many areas of road infrastructure construction and management, the ACT has adopted the relevant specifications of the NSW Roads and Maritime Services (formerly RTA NSW). The relevant RMS documents are identified and referenced in these ACT Trunk Road Infrastructure Technical Specifications.

The works must be carried out according to the referenced RMS specifications with the exception of items detailed in the Technical Exception Clauses.

Where any differences in practice exist between the RMS Specifications and this Trunk Road Infrastructure Technical Specification, the latter will prevail.

The ACT Government replaces RMS where applicable as the Road Authority. ACT replaces NSW where applicable as the place where the work is conducted. Equivalent ACT authorised organisations and legislation replace NSW's where applicable. Roads ACT's authorised representative is equivalent to RMS's principal.

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I INTRODUCTION

The works covered by this Section of the Specification comprise the construction of all piped underground services for water supply, sewerage, stormwater drainage, service conduits and subsoil drains. The construction of open earth drains is not included, these works being covered by Section 2 "Earthworks".

2 REFERENCE DOCUMENTS

Work carried out and testing performed under this Specification shall comply with the requirements of the following Standards to the extent that they are relevant and not overridden by the Specification.

2.1 LEGISLATIVE DOCUMENTS

Environment Protection Act, 1997

Road Transport (Safety and Traffic Management) Act, 1999

Road Transport (General) Act, 1999

Occupational Health and Safety Act, 1989

Scaffolding and Lift Act, 1957

Dangerous Goods Act, 1975

Dangerous Goods Regulation, 1978

Scaffolding and Lifts Regulations, 1950: Regs: 95,95(Cofferdams and Caissons); 97(Trenches); 98 (Shafts, Wells and Tunnels).

2.2 GUIDELINES

ACT Urban Services - Urban Stormwater Standard Engineering Practices

AUSTROADS Bridge Design Code

2.3 RELATED TECHNICAL SPECIFICATIONS

ACTEW Water Supply and Sewerage Standards

2.3.1 Australian Standards

AS 1074 Steel Tubes and Tubulars for Ordinary Service

AS 1111 ISO Metric Hexagon Commercial Bolts and Screws

AS 1112 ISO Metric Hexagon Nuts, including thin nuts, slotted nuts and castle nuts

AS 1214 Hot Dip Galvanised Coatings on Threaded Fasteners (ISO Metric Coarse Thread Series)

AS 1254 Unplasticised PVC (uPVC) Pipes and Fittings for Storm or Surface Water Applications

AS 1260 PVC Pipes and Fittings for Drain, Waste and Vent Applications

AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1302	Steel Reinforcing Bars for Concrete
AS 1303	Hard Drawn Steel Reinforcing Wire for Concrete
AS 1304	Welded Wire Reinforcing Fabric for Concrete
AS 1432	Copper Tubes for Water, Gas and Sanitation
AS 1477	PVC Pipes and Fittings for Pressure Applications
AS 1554	Structural Steel Welding Code
AS 1579	Arc welded Steel Pipes and Fittings for Water and Waste Water
AS 1597	Precast Reinforced Concrete Box Culverts
AS 1646	Rubber Joint Rings for Water Supply, Sewerage and Drainage Purposes
AS 1718	Water Supply Copper Alloy Screw down Pattern Taps Specified by Dimensions
AS 1741	Vitrified Clay Pipes and Fittings with Flexible Joints – Sewer Quality
AS 2032	Code of Practice for Installation of uPVC Pipe Systems
AS 2053	Non Metallic Conduits and Fittings.
AS 2129	Flanges for Pipes, Valves and Fittings
AS 2280	Ductile Iron Pressure Pipes and Fittings
AS 2439	Perforated Plastics Drainage and Effluent Pipe and Fittings
AS 2544	Grey Iron Pressure Pipes and Fittings
AS 2566.1	Buried Flexible Pipelines – Structural Design
AS 2638	Cast Iron Sluice Valves for Waterworks Purposes
AS 2648.1	Underground Marking Tape – Non detectable tape
AS 2701.4	Methods of Sampling and Testing Mortar for Masonry Constructions – Method for Determination of Compressive Strength
AS 2865	Safe Working in Confined Space
AS 2977	Unplasticised PVC (uPVC) Pipes for Pressure Applications – Compatible with Cast Iron Pipe Outside Diameters
AS 3500	National Plumbing and Drainage Code – Compendium
AS 3500.0	Glossary of Terms
AS 3500.1	Water Supply
AS 3500.2	Sanitary Plumbing and Drainage
AS 3500.3	Stormwater Drainage

AS 3578	Cast Iron Non Return Valve for General Purposes
AS 3600	Concrete Structures
AS 3680	Polyethylene Sleeving for Ductile Iron Pipelines
AS 3681	Guidelines for the Application of Polyethylene Sleeving to Ductile Iron Pipelines and Fittings.
AS 3705	Geotextiles – Identification, Marking and General Data
AS 3706	Geotextiles – Methods of Test
AS 3725	Loads on Buried Concrete Pipes
AS 3972	Portland and Blended Cements
AS 3996	Metal Access Covers, Road Grates and Frames
AS 4058	Precast Concrete Pipes (pressure and non-pressure)
AS 4060	Loads on Buried Vitrified Clay Pipes
AS 4087	Metallic Flanges for Wastewater Purposes
AS 4139	Fibre reinforced Concrete Pipes and Fittings
AS 4680	Hot-dipped galvanised (zinc) Coatings on Fabricated Ferrous Articles
AS 4791	Hot-dipped galvanised (zinc) Coatings on Ferrous Open Sections, Applied by an Inline Process
AS 4792	Hot-dipped galvanised (zinc) Coatings on Ferrous Hollow Sections, Applied by a Continuous Specialised Process

3 TESTING

A Testing Authority shall be employed by the Contractor to carry out all testing. The Authority shall hold a current NATA (National Association of Testing Authorities) Registration for the relevant tests, and a copy of results forwarded to the Principal without delay.

4 STORMWATER DRAINAGE

Stormwater Drainage (concrete) shall be constructed according to [ACT edited RMS R11](#).

Stormwater Drainage (plastic flexible pipe) shall be constructed according to [ACT edited RMS R23](#).

5 SUBSOIL DRAINS

Subsoil Drainage shall be constructed according to [ACT edited RMS R33](#).

6 WATER SUPPLY MAINS

All water supply work is to be carried out in accordance with the current [ActewAGL Water Supply and Sewerage Standards](#).

The following Hold Points are to be released by the Superintendent during construction of the works. Additional inspections may be required by ActewAGL field staff in accordance with the latest [ActewAGL Water Supply and Sewerage standard](#).

Hold Point 3.1

Process Held:	Commencement of Excavation for Water Pipes.
Submission Details:	At least five (5) working days prior to the excavation of the water pipes the Contractor shall submit to the Superintendent details of the proposed pipes, pipe jointing, bedding material, valves and fittings, concrete to be used demonstrating conformance of products of this Specification.
Release of Hold Point:	The Superintendent will consider the submitted documents prior to authorising the release of the Hold Point

Hold Point 3.2

Process Held:	Placement of backfill material.
Submission Details:	At least two (2) working day prior to acceptance testing. Completed section of water main with all joints exposed ready for pressure testing.
Release of Hold Point:	The Superintendent will inspect the new pipes and fittings and observe the pressure testing prior to authorising the release of the Hold Point

7 WATER SERVICES

All water services work is to be carried out in accordance with the current [ActewAGL Water Supply and Sewerage Standards](#).

The following Hold Points are to be released by the Superintendent during construction of the works. Additional inspections may be required by ActewAGL field staff in accordance with the latest [ActewAGL Water Supply and Sewerage standard](#).

Hold Point 3.3

Process Held:	Commencement of Excavation for Water Services.
Submission Details:	At least five (5) working days prior to the excavation of the water services the Contractor shall submit to the Superintendent details of the proposed pipes, pipe jointing, bedding material, water meter and water meter structures to be used demonstrating conformance of products of this Specification.
Release of Hold Point:	The Superintendent will consider the submitted documents prior to authorising the release of the Hold Point

8 SEWERAGE

All sanitary drainage work is to be carried out in accordance with the current [ActewAGL Water Supply and Sewerage Standards](#).

The following Hold Points are to be released by the Principal during construction of the works. Additional inspections may be required by ActewAGL field staff in accordance with the latest ActewAGL Water Supply and Sewerage Standard.

Hold Point 3.4	
Process Held:	Commencement of Excavation for Sewer Drainage.
Submission Details:	At least five (5) working days prior to the excavation of the sewer drains the Contractor shall submit to the Principal details of the proposed pipes, pipe jointing, bedding material, concrete to be used demonstrating conformance of products to the criteria in Section 3.0 – Stormwater Drainage of the Specification.
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point

9 CONDUITS

9.1 GENERAL

The works covered by this Section of the Specification includes the installation of conduits for telecommunications, gas, and electrical services both under road pavements and within the road verge area. Trenching for conduits shall be in accordance with the [Underground Services in a Shared Trench agreement](#) between the respective Service Authorities.

Prior to excavation of trenches for services conduits the Contractor shall liaise with the Service Authorities to confirm the servicing and co-ordination requirements of the Authorities.

9.2 MATERIALS

Unless otherwise specified, conduits for gas shall be heavy duty sewer uPVC pipe complying with requirements of [AS 2053](#) and shall be of the diameter specified.

Unless otherwise specified, conduits for telecommunications and TransACT shall be heavy duty uPVC conforming to requirement of [AS 2053](#) and coloured white and of the diameter specified.

Unless otherwise specified, conduits for electricity shall be heavy duty uPVC conforming to requirement of [AS 2053](#) and coloured orange and of the diameter specified.

Only standard pits specified and supplied by each service authority shall be used.

Embedment material must be compliant with [AS 2566.1](#).

Hold Point 3.5	
Process Held:	Commencement of Excavation for Conduits.
Submission Details:	At least five (5) working days prior to the excavation of conduits the Contractor shall submit to the Superintendent details of the proposed pipes, pipe jointing, pipe colour, bedding material to be used demonstrating

	conformance of products to the criteria in Section 3.07.1 of the Specification.
Release of Hold Point:	The Superintendent will consider the submitted documents prior to authorising the release of the Hold Point

9.3 CONSTRUCTION

9.3.1 Clearing and grubbing

Clear, grub and dispose of debris along the alignment of conduits as specified in **TRITS 02 - Earthworks**.

9.3.2 Excavation

9.3.2.1 General

The Contractor must comply with **Scaffolding and Lifts Regulations 1950: Regs: 95, 96(Cofferdams and Caissons); 97(Trenches); 98(Shafts, Wells and Tunnels)**. To assure that appropriate safeguards and measures are undertaken for securing the safety and health of persons engaged in excavation work.

The Contractor shall set out the trench alignment clearly marking the specified end points of the trench with pegs. The Principal will inspect the set out of the trench prior to the commencement of excavation.

The Contractor shall meet with each service authority representative on site to locate all existing services and obtain clearances for potholing and construction. If an existing service is damaged due to the construction the Principal and/or Contractor shall notify the appropriate service authority and the ACT Government immediately. Any damage to existing services shall be repaired at no expense to the ACT Government.

Before commencing excavation the Contractor shall expose all crossings and connection points on existing services. The levels of each crossing and connection point shall be surveyed and any variations to the levels given or any difficulties in being able to achieve the required grades of new pipelines shall be reported to the Principal.

Hold Point 3.6

Process Held:	Commencement of excavation for any services trenches.
Submission Details:	At least one (1) working day prior to the proposed commencement of each trench the Contractor shall provide notification to the Principal that the trench alignment has been set out on site and verification that the levels of existing crossover points and connection points will allow construction as specified.
Release of Hold Point:	The Principal will inspect the site and any documentation submitted prior to authorising the release of the Hold Point

Before commencing excavation, strip and stockpile topsoil as specified in **TRITS 02 – Earthworks**.

Excavate trenches to the depths and widths specified in **Section 6.3.3 – Trench Dimensions** to allow installation of the respective services to the line, levels, grades and covers specified. Ensure a uniform fall to the discharging end of the pipeline. Allow in the excavation for the depth of bedding material as necessary and for the widening or deepening of trenches at valves or structures.

The trench shall be at a graded at a minimum of 0.5% fall. Conduits under roads and other objects shall project at least 1000mm beyond obstructions such as kerb, subsoil drains, stormwater and water mains. The trench shall be excavated beyond these obstructions.

The length of trench opened up ahead of service laying shall be as short as the construction programme permits.

Open excavations and open ends of pipework are to be left in a safe and secure state outside working hours.

Every accessible part of an excavation work into which a person is liable to fall a distance of more than 1.8m shall be provided with a suitable barrier to a height of at least 900mm and as close as reasonably practicable to the edge.

Trenching for pipes shall be to trench conditions in accordance with [AS 2566.1](#).

9.3.2.2 Trenches across existing roads, road reserves or footways

Where it is necessary for the Contractor to construct services across existing roads, road reserves or footways, the Contractor's attention is drawn to the requirements of the [Road Transport \(Safety and Traffic Management\) Act, 1999](#) and the [Road Transport \(General\) Act, 1999](#). The Contractor is required to obtain a Road opening Permit covering the necessary openings and comply with all the conditions covered in the issue the permit. The Contractor shall prepare a Temporary Traffic Management (TTM) plan, if required, and obtain approval of the plan prior to any work on the road.

A copy of the Road Opening Permit and Temporary Traffic Management Plans approved by the relevant Statutory Officer in accordance with [TRITS 01 - Roadworks](#) shall be provided and approved by the the Principal prior commencing any excavation work across existing roads, road reserves or footways. A copy of this signed plan shall be kept on site at all times.

Hold Point 3.7

Process Held:	Commencement of excavation of trenches in roads, road reserves or footways.
Submission Details:	At least three (3) working days prior to proposed excavation of any services trench in roads, road reserves or footways the Contractor shall provide a copy of the Road Opening Permit and the Approved Temporary Traffic Management Plan(s).
Release of Hold Point:	The Principal will consider the submitted documents prior to authorising the release of the Hold Point

As a temporary measure prior to hotmix asphaltting the Contractor shall backfill with a temporary layer of asphaltic concrete (Cold Mix) over the road or pathway opening surface. The Cold Mix shall be installed so as to form a raised hump to allow for compaction by traffic. The Contractor shall monitor the performance of the Cold Mix installed and if the surface level of the Cold Mix compacts so as to create a step of more than 30mm to the top of the existing pavement level the Contractor shall add more Cold Mix as appropriate.

9.3.2.3 Trenches adjacent trees and other existing services

Unless otherwise specified do not excavate by machine within one (1) metre of existing services or within three (3) metres of existing trees marked to remain.

Trees are to be protected as specified in [ACT edited RMS R179](#) prior to commencement of works.

Support and protect all trees, shrubs, pipes and structures in or adjacent to trenches to the satisfaction of the relevant Authorities.

9.3.3 Trench dimensions

9.3.3.1 Width

Trench excavation generally shall comply with the principles prescribed in the following Codes of Practice for the various types of pipe:

- uPVC Pipes [AS 2566.1](#)
- Buried Flexible Pipelines [AS 2566.1](#)

Generally the cut or embankment formation shall be completed to subgrade level before the trench is excavated to the required depth including provision for bedding. Pipes shall be installed to “trench” conditions in accordance with the above Codes of Practice.

Widths of trenches will vary depending on the number and type of services in the trench and should maintain clearances are required by services authorities. Trench widths at a minimum must be to AS 2566.1. Shared trench width shall be in accordance with the **Underground Services in a Shared Trench agreement**. Clearances between services shall be maintained at all lengths.

If a trench is excavated to excess width beyond the dimensions given above, caves in due to inadequate support, or the surrounding natural ground is of poor quality material the pipe may be required to be rectified according to AS 2256.1, or a pipe of higher strength class, or both, without additional payment. The Contractor shall advise the Principal of any such instances prior to placing bedding material and laying of the pipe.

In trenches where shoring is necessary, increase width sufficiently to maintain clearances specified above between face of shoring and pipes.

The width of trenches for curved pipelines shall be adequate to allow correct jointing of rubber ring jointed pipes while providing the minimum clearances from the pipe to the trench walls as given above.

9.3.3.2 Allowance for bedding

Allowance shall be made in the depth of the trench for the bedding type specified.

Bedding must be according to AS 2566.1.

9.3.3.3 Pipe cover

Where pipe invert levels are not detailed, excavate trenches to provide the minimum pipe covers itemised in **Table 9-1 Pipe Cover Depth Requirements**. Where pipes are socketed, cover is measured over sockets.

Table 9-1 Pipe Cover Depth Requirements

Minimum Cover (mm)		
Item	General	Under roads
Control Tubes or Cables	450	600
Telecommunications	450	600
Gas	650	750
Electricity Supply Conduits (Except 50mm diameter conduits inside lease boundaries which shall have 600mm minimum cover))	850 low voltage 1100 to invert for high voltage	950 low voltage 1050 high voltage
Other Conduits (unless specified by Service Authority)		750

Notes on Table 3.1

(i) The minimum cover over pipes under roads is measured from the pavement surface

9.3.4 Use of explosives

The Contractor shall not, without the prior approval of the Principal, use explosives or permit blasting to occur. If approved by the Principal, the use of explosives in trench excavation shall comply with the requirements of **TRITS 02 - Earthworks**.

Where parallel services to be constructed under this Contract are less than ten (10) m apart and excavation by blasting is necessary, complete blasting of both trenches before commencing pipe laying.

9.3.5 Shoring

The Contractor's attention is drawn to regulations in respect of the [Scaffolding and Lift Act, 1957](#). These regulations are administered by the Chief Inspector, ACT Workcover. The Act requires all trenches greater than 2.5m long and 1.6m deep to be shored. Shoring may be either timber shoring or moveable metal shield shoring. Where shoring is required, ladders shall be provided. Alternatively, trenches may be stepped to avoid the use of shoring provided the depth of the deepest trench is not deeper than 1.5m without shoring.

Shoring shall be progressively placed as close as practical to the excavation equipment as excavation occurs. Shoring shall be no more than 3.3m behind the face of excavation.

Excavated material shall be placed no closer than 0.3m from the edge of the trench. In sandy conditions, excavated material shall be placed no closer than 1.0m from the edge of the trench.

The Contractor shall submit details of the proposed method to be used for the construction of all pipes deeper than 1.5m.

Hold Point 3.8

Process Held:	Commencement of trench excavation.
Submission Details:	At least three (3) working days prior to proposed excavation of trenches the Contractor shall provide documentation demonstrating the proposed method of shoring for all pipes and structures deeper than 1.5m.
Release of Hold Point:	The Principal will examine the documentation prior to authorising the release of the Hold Point

9.3.5.1 Timber shoring

The [Scaffolding and Lifts Act, 1957](#) describes the method of timbering and the minimum sizes of timber members to be used.

Timbering, when used, shall remain in place until backfilling is commenced. During backfilling, remove timbering in such a manner as not to cause instability in trench walls or endanger the pipeline or adjacent structures. The Contractor may elect to leave timbering permanently in the trench. However, unless otherwise permitted, no timbering shall be left within 1.2m of finished surface.

If timbering is required to be left in a trench, payment will be made for the value of timber not salvaged. The Contractor shall obtain the approval of the Principal prior to backfilling any trench with timbering left in place.

9.3.5.2 Metal shield shoring

Excavation using a metal shield shoring shall be performed progressively such that the shield is kept within the acceptable distance to the face of excavation as detailed in the [Scaffolding and Lifts Act, 1957](#). Pipe bedding, laying, backfilling and compacting shall be performed within the confines of the shield. As the trench is gradually backfilled the shield shall be progressively raised to provide continuous protection as backfilling occurs. Once backfilling of that section is complete, the shield may be moved along the open trench.

The width of the shield shall be adjusted to suit the width of the excavated trench and locked off. A ladder shall be provided for access into the trench.

9.3.6 Trench foundation

The foundation at the bottom of the trench shall be assessed for conformity to trench fill as defined in [AS 2566.1](#).

Remove or cut back exposed boulders in trench bottoms. Where areas of soft material occur in trench bottoms the Principal may require the use of alternative bedding materials as specified [AS 2566.1](#).

For pipes with sockets protruding beyond the barrel outside surface, chases shall be cut into the bed of the foundation as necessary, in the appropriate positions, so that each pipe is supported along the full length of the barrel and the socket is not subjected to point loading.

Should the excavation reveal material which is unstable, the trench shall be over-excavated to a depth required to remove the unsuitable material and refill with embedment material compacted to the specified relative compaction as directed by the Principal.

Hold Point 3.9

Process Held:	Placement of bedding material in trench
Submission Details:	At least one (1) working day prior to proposed placement of bedding in a trench the Contractor shall provide notification that the foundation of the trench will be ready for inspection.
Release of Hold Point:	The Principal may inspect the foundation prior to authorising the release of the Hold Point

9.3.7 Installation

The Contractor shall set out the location of all conduits, pits and bends and shall notify the Superintendent prior to excavation.

The location of each service conduit within the trench shall be in accordance with the [Underground Services in a Shared Trench agreement](#).

Conduit joints shall be solvent welded connections, unless otherwise approved by the Service Authority.

Bedding to each conduit under a road shall consist of suitable embedment material in accordance with [AS 2566.1](#). The Contractor shall supply and place embedment material between each separate service conduit to the satisfaction of the Service Authorities. Where required by the Service Authorities the Contractor shall supply and install warning tape above the conduits.

The location of pits shall be such as to permit changes in direction of cabling to occur at pits wherever possible.

Where bends in conduits are required only long radius bends shall be used. The total bending radii on a single run between two pits shall not exceed 90 degrees.

Conduits may be curved between pits generally to follow a curved road or structure but only one curve shall be permitted between two pits.

Conduits shall be capped with a non perishable removable cover prior to backfilling to prevent the entry of foreign material.

Install a 2.5mm diameter high tensile draw wire in each conduit length before sealing both ends. Draw wires shall be at least 1m longer than the conduit in which they are installed.

Where conduits cross kerb lines, their locations shall be marked by casting a letter 100mm high into the kerb. The letters used shall be "E" for electricity conduits, "G" for gas conduits and "T" for Telecommunications conduits.

The locations of all conduits shall be recorded and added to WAE drawings.

9.3.8 Backfilling

Backfilling relates to the construction of the embedment zone as identified within [AS 2566.1](#), which includes the bedding, haunch and side support and overlay.

Compaction requirements for backfilling shall be in accordance with [Table 3.2](#) and [AS 2566.1](#).

Table 9.2 Compaction Conformance Requirements

Item	Compaction Requirement
Overlay Zone – not under Roads, Paths and Driveways	90% MMDD
Overlay Zone - under Roads, Paths and Driveways	90% MMDD subbase material DI 70%.for bedding material
Backfill – not under Roads, Paths and Driveways	Same as existing ground
Backfill - under Roads, Paths and Driveways	90% MMDD deeper than 600mm below sub-base 95% MMDD - top 600mm below sub-base
Backfill pipes adjacent to kerbs	90% MMDD

Trenches are to be backfilled promptly after laying of pipelines. Any damage caused to pipes by floating or the like due to delay in backfilling or inadequate protective measures will be the Contractor's responsibility and will not be the subject of an extension of time. Backfilling shall comply with the following requirements:

9.3.8.1 Trenches under roads, paths and driveways

Unless otherwise specified, this requirement applies to trenches across or along the lines of roads either existing, to be constructed as part of this Contract or shown to be constructed in the future as well as trenches under existing footpaths or driveways.

Place and compact materials in layers not exceeding 150mm loose thickness. Material lower than 600mm below subgrade level shall be compacted to at least 90% of modified maximum dry density. The top 600mm below road subgrade levels shall be compacted to at least 95 % of the modified maximum dry density. Reinststate pavements to at least the standard of the existing structure. Compact as specified for new pavements.

The provisions of this clause shall apply to trenches under any stone pitching or other structures.

9.3.8.2 Support to pipes and structures

Where an existing pipe or other structure crosses a trench it shall be supported by a plug of compacted granular material extending from the trench floor to the springing line of pipe or underside of structure and for a distance of 1 m along the trench on both sides. Where it is impracticable to compact material under the structure the Contractor may use concrete of minimum strength 20 MPa placed on one side only and vibrated until it flows under the structure and appears on the other side. No additional payment will be made for the support of pipes or structures where their existence is indicated on the drawings.

9.3.8.3 Trenches adjacent to kerbs

Trenches adjacent to kerbs (where the trench excavated edges are within 0.5m behind the back of kerbs). Backfill remainder of trench to the final surface level using spoil material free of stones with a maximum size of 100mm diameter in layers not exceeding 400mm in compacted depth by a method which achieves a density of 90% of modified maximum dry density for the full depth of the trench.

9.4 RESTORATION OF GRASSED AND PREPARED AREAS

Where relatively short trenches cross existing lawns and when these trenches will be backfilled within two (2) days, turf may be cut out and stack neatly to one side. Water turf as necessary. On completion of backfilling, replace turf and restore lawn to its original condition. In other cases supply and lay turf as specified in [TRITS 09 - Landscape](#).

Where trenches cross areas which have been prepared for sowing, separate topsoil and place to one side of trench. Place other excavated material on the opposite side of the trench. On completion of backfilling, replace topsoil and restore surface to original condition.

9.5 DISPOSAL OF SURPLUS SPOIL

Dispose of surplus spoil as specified in [TRITS 02 - Earthworks](#).

9.6 CONFORMANCE CRITERIA

9.6.1 Materials

The Contractor's conditions of purchase of pipes shall require the provision of access to the manufacturers facilities for the Superintendent to enter the supplier's factory and place of testing to observe the processes of manufacture and testing.

The Contractor shall obtain copies of test certificates for stormwater pipes from the manufacturer which are readily identifiable with the batch they represent. A copy of the test certificates shall be provided to the Superintendent upon request.

9.6.2 Compaction conformance

Compaction conformance requirements for work carried out under this Clause of the Specification are summarised in [Table 3.2](#).

Conformance of bedding and support material is conditional upon it achieving the specified compaction requirements.

9.6.3 Tolerances

Conduits shall be within 50mm of design line and no more than 20mm above minimum cover level at all points.

The Contractor shall test completed conduits for ovality. Pipes 100mm diameter and above are to be tested using a proving tool to a design approved by the Superintendent. The proving tool shall be constructed using laminated or solid hardwood or other suitable approved durable material machined to shape and size as specified and drilled through the centre to take a galvanising rod with eye bolts at each end. The proving tool diameter shall be the mean bore of the pipe as specified by the Manufacturer minus 6% with a tolerance of +/- 0.1mm.

The diameter of proving tool specified above shall apply to a minimum length of 80mm.

The test of ovality shall be undertaken by the Contractor in the presence of the Principal's representative at least 14 days after compaction of completed backfill. A Service Authority representative may request to be present at the testing. Conduits not meeting the above criteria shall be rectified at the Contractors expense and retested.

9.6.4 Sampling and testing

All laboratory testing of work carried out under this Section of the Specification shall be performed in accordance with procedures specified herein.

Work under this Specification shall be subdivided into lots or discrete work areas. The Superintendent shall have the right to reject a lot which is visually non-homogeneous and/or non-representative.

Prior to testing the Contractor shall work the lot to ensure uniform moisture content and compaction of all material within the lot.

The test/s then taken shall be considered to represent the total volume of material placed within the lot.

When density tests are carried out on a lot, the number of results falling below the specified value shall not exceed the limits set out in [Table 3.2](#).

Table 9.3 Compaction Conformance Requirements

Number of Tests Per Lot	Max. results 0-2% below	Max. results more 1-2% below	Max. results more than 2% below
1-2	Nil	Nil	Nil
3-5	1	1	Nil
6-10	2	1	Nil
10	20%	10%	Nil

9.6.5 Frequency of testing

The frequency of testing shall be appropriate to verify conformity and shall not be less than that stated in **Table 3.3**. Where no minimum frequency of inspection or testing is stated, the Contractor shall nominate appropriate frequencies in their Inspection and Test Plan(s).

The Contractor shall include in the management review of the Quality System, a review of the appropriateness of the frequency of testing nominated in the Inspection and Test Plan(s). Such review shall take into account the frequency of nonconformity detected, including non-conformities remedied by simple reworking.

Table 9.4 Frequency of Testing Requirements

Characteristic Analysed	Test Method	Minimum Frequency Of Testing
Compaction		
Compaction and moisture content for Transverse trenches less than 1200mm wide (under roads, paths and driveways)	AS 1289.5.2.1; AS 1289.5.4.1	One test per two layers per road crossing.
Compaction and moisture content for Transverse trenches greater than 1200mm wide (under roads, paths and driveways)	AS 1289.5.2.1; AS 1289.5.4.1	Two tests per two layers per road crossing.
Compaction and moisture content for Longitudinal trenches (under roads, paths and driveways)	AS 1289.5.2.1; AS 1289.5.4.1	One test per two layers per 50 linear metres or part thereof.
Compaction and moisture content for Trenches elsewhere	AS 1289.5.2.1; AS 1289.5.4.1	One test per two layers 100 linear metres or part thereof.
Backfill Material Properties		
Backfill Material Grading	AS 1289.3.6.1	One per 100m ³ or part thereof
Backfill Material Plasticity	AS 1289.3.3.1	One per 200m ³ or part thereof

9.6.6 Nonconforming work

- (a) General

A nonconformance report shall be submitted to the Superintendent for any nonconformance detected. Work shall not proceed on any nonconforming item until the Superintendent has approved the disposition for the nonconformance.

(b) Nonconforming Compaction

Where a lot is nonconforming for compaction on the basis of inspection or test results, further compactive effort shall be applied to the lot or nominated parts of the lot until the specified standard is achieved. Scarify the area for the full depth of the layer and add water as necessary. Mix mechanically to ensure uniform distribution of moisture before commencing rolling.

10 EXCAVATION BY BORING

Where excavation by boring is required by the Contract or where the Contractor proposes and the Principal approves excavation by boring, then the excavation by boring shall be in accordance with the following requirements.

10.1 WET OR DRY BORING

Unless otherwise specified the bored hole shall be formed by wet or dry boring without simultaneous insertion of a sleeve within the bore. Where the existing surface is disturbed by the boring operation, the Contractor shall reinstate the surface to the original condition to the satisfaction of the Principal.

Where wet boring techniques are used, disposal of polluted water shall meet with the requirements of the [Water Pollution Act](#).

Minimum cover to the bored hole shall be as specified in [Table 3.1](#) measured from underside of sub base layer in the case of flexible pavements and base layer in the case of rigid pavements. Minimum spacing between bores shall be:

Up to 200mm dia.	200mm
250mm to 400mm dia.	One diameter
Greater than 400 mm dia.	400 mm

10.2 PITS

Pits for the boring equipment shall be kept to the minimum size which will allow the work to proceed. Backfilling of these pits shall comply with trench backfill requirements as specified and shall also include compaction of bedding prior to laying pipework or conduits away from the section inserted in the bore.

Where excavation of the pits for installation of the bore results in an excavated depth below pipe invert in excess of the normal bedding thickness, this excess depth shall be backfilled in accordance with relevant pipe or conduit type.

10.3 BORE SIZES

The bored hole shall be the minimum size to permit installation with a maximum size of 50mm greater than the largest diameter of the pipe or conduit to be installed. Unless the gap between the installed pipe or conduit is less than 10mm for bores up to 125mm or 20mm for greater diameter bores, the void between the pipe or conduit and the outside of the bored hole shall be completely backfilled using an approved grout unless otherwise specified by the Principal. The gap is measured between the outside of the barrel of socketed or parallel sided pipes and the bore diameter (and not between the socket and the bore diameters).

10.4 GROUT

Approved grouts shall be bentonite and well graded sand in the ratio 1:3 by volume with sufficient water to provide a fluid mix on agitation. Grout shall be inserted at the lower end of the bore and pumped/poured in until it flows from the higher end of the bore. Adequate means of restraint shall be provided to prevent displacement or flotation of the inserted pipe or conduit during the backfilling operation.

10.5 INSTALLATION

Pipes and conduits shall be installed in the bored hole in a manner which does not damage the pipe or conduit or its joint system. When necessary, because of over stressing within the pipe or joint, a higher strength class of pipe or design of joint shall be provided in accordance with the manufacturers requirements and to the approval of the Principal. Adequate connections shall be provided between pipes to allow their withdrawal should testing show failure of the pipe or conduit system. In the event of failure of the pipes including wall buckling, damage, etc., or their joint system the Contractor shall remove and/or replace the bored section at his cost to the satisfaction of the Principal.

Where rigid concrete, vitrified clay, fibrous cement or other material pipes or conduits of a brittle nature are used, install flexible joints at each end of the bored section in accordance with AS4060 , Clause 7.3.1 (Ancillary Structures).

10.6 TOLERANCES

Where pipes and conduits are installed for other than gravity flow systems, the final alignment of the pipe or conduit shall grade evenly to a nominated high point external to the bored section such that the system will drain. The vertical alignment shall be within ± 30 mm of design grade over 10m and the horizontal alignment shall be within ± 50 mm of design alignment.

Where the pipe or conduit is for a gravity flow system, the pipe shall fall continuously towards the design outlet with a minimum grade of 0.3% and other vertical and horizontal tolerances as above.

11 MEASUREMENT AND PAYMENT

Payment shall be made for all activities associated with completing the work detailed in this Specification in accordance with Pay Items 303PI-P3;304PI-P10;305PI-P14; 306PI-P4, 307PI-P2, 308PI-P5 and 309PI-P3 inclusive.

Unless specified otherwise a lump sum price for any of these items will not be accepted.

The Contractor shall allow in the pay items generally for the costs associated with all testing required to prove conformance of the works as specified.

If any pay item for which a quantity of work is listed in the Contract has not been priced by the Contractor, it shall be understood that due allowance has been made in the prices of other pay items for the cost of the activity which has not been priced.

Pay Item 303PI Backfilling Under Roads, Paths and Driveways

The unit of measurement shall be the compacted volume in cubic metres measured in place.

This pay item is an extra over amount for backfill of trenches which are constructed under roads, paths and driveways with subbase material as specified in Section 3.8.2.

Pay Item 303P2 Trenching for Service Authorities

The unit of measurement shall be per linear metre of excavated trench.

This pay item shall include excavation and backfilling of trenches for conduits, and cabling for service authorities including telecommunications, gas and electricity. The trench width and depth shall be as specified in the drawings or by the service authorities and shall vary depending on the number of services in each trench.

This pay item shall include coordination with service authorities, excavation in all types of material encountered including rock, backfilling and removal of surplus spoil.

No additional payment will be made for excavation of rock.

This pay item does not include the cost of supply and installation of conduits or cabling and backfill required under roads, paths and driveways as specified in Section 3.8.2.

A separate pay item shall be included in the Contract for each trench type.

303P2.1	Local low voltage electricity only
303P2.2	High Voltage electricity only
303P2.3	Street lighting electricity only
304P2.4	Gas only
303P2.5	Telecommunications only
304P2.6	Shared trench with gas and telecommunications
304P2.7	Shared trench with electricity, gas and telecommunications

Pay Item 303P3 Removal of Unsuitable Material from Trenches

The unit of measurement will be volume in cubic metres removed from the trench.

This pay item is an extra over amount for removal of unsuitable material from all trenches described in Section 3. This pay item includes extra-over excavation, removal of material from trench and disposal of material to tips off site.

Pay Item 303P4 Existing Services Location

The unit measurement of payment will per service to be located.

This pay item shall include locating existing services, organising clearances to existing services with service authorities, excavating to expose existing service at crossing points or connection points, surveying the level of the service and backfilling the hole.

A separate pay item shall be included in the Contract for each service.

303P4.1	Sewer
303P4.2	Stormwater
303P4.3	Gas
304P4.4	Electricity
304P4.5	Other

Pay Item 304P1 Sewer Pipe

The unit of measurement shall be linear metre of pipe installed and backfilled measured along the centreline including all fittings. Length is measured from the centre of sewer structures.

This pay item shall include survey and setting out, excavation of trenches in all types of material encountered including rock, over excavation of trench for required depth of bedding material, overbreak of trench due to ground conditions, protection of the works from surface runoff, shoring, dewatering, additional excavation at structures, disposal of surplus spoil, bedding, laying, jointing, jointing, wrapping of DICL pipes if specified, joint deflections or curvature of the pipe, backfilling and compaction.

No additional payment will be made for excavation in rock or over excavation of trenches.

This pay item does not include backfill required under roads, paths and driveways as specified in Section 3.8.2.

A separate pay item shall be included in the Contract for each pipe material, class of pipe, pipe diameter and depth range.

The pay item description is 304P1. A. B. C. D where:

A = Pipe Type	1 = Concrete sewer pipe
	2 = uPVC sewer pipe
	3 = Vitrified clay sewer pipe
	4 = DICL

B = Pipe Class

C = Nominal pipe diameter in millimetres

D = Depth range	1 = 0 to 1.5m depth
	2 = 1.5 to 3.0m depth

- 3 = 3.0 to 4.5m depth
- 4 = 4.5 to 6.0m depth
- 5 = greater than 6.0m

If a depth range is not specified it is assumed that the rate includes excavation and backfill in all depth ranges. For Example 304P1.3.4.150.2 = Vitrified clay sewer pipe, Class 4, 150mm diameter, Depth range 1.5m to 3.0m

Pay Item 304P2 Sewer Pipe Fittings

This pay item shall include supply of fittings and installation onto a pipe line including jointing and all work to the pipe in order to make the connection.

A separate pay item shall be included in the Contract for each sewer pipe fitting.

The unit of measurement for the following shall per fitting installed.

- 304P2.1 100x150mm diameter slope junction.
- 304P2.2 100x225mm diameter slope junction.
- 304P2.3 100x300mm slope junction
- 304P2.4 100x375mm slope junction
- 304P2.5 100x30 degree bend.
- 304P2.6 Buried vertical riser 0.45m high.

The unit of measurement for the following is per linear metre.

- 304P2.7 Extra over the rate for pipes for flexible jointing at maintenance holes.
- 304P2.8 Extra over Pay Item 304P2.4 for additional height of vertical riser above 0.45m.

Pay Item 304P3 Flexible Joints

The unit of measurement shall be per lineal metre.

The pay item shall be an extra over rate for the supply and installation of short lengths of pipe (as specified in the ACTEW Standards).

A separate pay item shall be included in the Contract for each size of sewer pipe.

The pay item description is 304P3.A where:

A = Pipe Size

For example, 304P3.150 = 150mm diameter pipe flexible joint

Pay Item 304P4 Pipe and Trench Protection

The unit of measurement shall per cubic metre of placed concrete.

This pay item shall include supply and placement of concrete bedding and concrete encasement of the pipe. A separate pay item shall be included in the Contract for each trench protection type.

- 304P4.1 Concrete bedding.
- 304P4.2 Concrete encasing.

Pay Item 304P5 Maintenance Holes

The unit of measurement shall be per maintenance hole constructed.

This pay item is for the construction of a standard manhole 1.45m deep from cover to underside of base. This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, supply and placement of concrete, forming of benching, supply and placement of step irons, supply and placement of precast cone and class B cover, backfilling and compaction around the structure and testing for approval.

A separate pay item shall be included in the Contract for each maintenance hole type.

304P5.1	Standard 1050mm diameter maintenance hole
304P5.2	Extra over Pay Item 304P4.1 for depth in excess of 1.45m. Measurement is in metres.
304P5.11	Standard 1200mm diameter maintenance hole
304P5.12	Extra over Pay Item 304P4.11 for depth in excess of 1.45m. Measurement is in metres.
304P5.21	1500mm diameter maintenance hole
304P5.22	Extra over Pay Item 304P4.21 for depth in excess of 1.45m. Measurement is in metres.

Pay Item 304P6 Additional Items for Maintenance Holes

This pay item shall include supply of all materials and installation with a sewer maintenance hole.

A separate pay item shall be included in the Contract for each additional item for maintenance holes.

The following are extra over rates for maintenance holes for vertical drops of the diameters as listed and includes window box, concrete encasing, DICL pipe and flexible pipe joints.

304P6.1	150mm diameter pipe to depth of 0.45m. Measurement is per vertical drop
304P6.2	Extra over Pay Item 304P5.1 for vertical drops in excess of 0.45m height. Measurement in metres.
304P6.11	225mm diameter pipe to depth of 0.45m. Measurement is per vertical drop.
304P6.12	Extra over Pay Item 304P5.11 for vertical drops in excess of 0.45m height. Measurement in metres.
304P6.21	300mm diameter pipe to depth of 0.45m. Measurement is per vertical drop.
304P6.22	Extra over Pay Item 304P5.21 for vertical drops in excess of 0.45m height. Measurement in metres.
304P6.31	375mm diameter pipe to depth of 0.45m. Measurement is per vertical drop.
304P6.32	Extra over Pay Item 304P5.31 for vertical drops in excess of 0.45m height. Measurement in metres.

The following are extra over rates for maintenance holes for each gatic cover type. Measurement is per gatic cover.

304P6.41	Class C gatic heavy duty cover
304P6.42	Class D gatic heavy duty cover

The following are extra over rates for maintenance holes for other miscellaneous works.

304P6.51	Construction of ladder in maintenance hole. Measurement is per linear metre length of ladder.
304P6.52	Construction of landing in maintenance hole. Measurement is per landing.
304P6.53	Construction over existing sewer excluding fees payable to the Sewer Authority.

Pay Item 304P7 Maintenance Shafts

The unit of measurement shall be per maintenance shaft installed.

This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding including concrete base, supply and placement of maintenance shaft unit, supply and placement of endcap, supply and placement of Class B cover and surround, supply and placement of 450mm diameter pipe and bedding, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

A separate pay item shall be included in the Contract for each maintenance shaft type.

Pay Item 304P8 Rodding Points

The unit of measurement shall be per rodding point installed.

This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding including concrete thrust block, supply and placement of long radius bend and riser pipe, supply and placement of inspection cover, supply and placement of metal cover and surround, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

A separate pay item shall be included in the Contract for each rodding point type.

304P8.1	Rodding point for 100mm diameter pipe.
304P8.1	Rodding point for 150mm diameter pipe.

Pay Item 304P9 End Caps

The unit of measurement shall be per end cap installed.

This pay item shall include the supply and installation of end caps for temporary dead ends and sewer ties. The pay sub-item for temporary end caps shall include the supply and installation of end caps and concrete anchor block. The pay sub-item for sewer ties shall include the supply and installation of an end cap, marker tape and marker stake.

A separate pay item shall be included in the Contract for each end cap type.

304P9.1	150mm diameter sewer main - temporary uPVC end cap.
304P9.2	225mm diameter sewer main - temporary uPVC end cap.
304P9.3	300mm diameter sewer main - temporary uPVC end cap.
304P9.4	375mm diameter sewer main - temporary uPVC end cap.
304P9.11	100mm diameter sewer tie - uPVC end cap and marker.
304P9.12	150mm diameter sewer tie - uPVC end cap and marker.
304P9.13	225mm diameter sewer tie - uPVC end cap and marker.

Pay Item 304P10 Trench Stops and Scour Stops

The unit of measurement shall be per trench or scour stop installed.

A separate pay item shall be included in the Contract for each trench and scour stop type.

The pay item for scour stops shall include over-excavation of pipe trench for the scour stop, concrete formwork, supply and placement of concrete, filter pipe, compressible membrane, supply and installation of flexible pipe joint either side of scour stop and additional cost of backfilling pipe trench over that of a straight uninterrupted pipe length.

304P10.1	Scour stop on 150mm diameter sewer main.
304P10.2	Scour stop on 225mm diameter sewer main.
304P10.3	Scour stop on 300mm diameter sewer main.
304P10.4	Scour stop on 375mm diameter sewer main.

The pay item for trench stops shall include over-excavation of pipe trench for the trench stop, supply and placement of sand bags, filter pipe, and additional cost of backfilling pipe trench over that of a straight uninterrupted pipe length.

304P10.11	Trench stop on 150mm diameter sewer main.
304P10.12	Trench stop on 225mm diameter sewer main.
304P10.13	Trench stop on 300mm diameter sewer main.
304P10.14	Trench stop on 375mm diameter sewer main.

Pay Item 304P11 Works by the Sewer Authority

This pay item shall include payment to the Sewer Authority for all works to existing live sewer services including connection of new pipes to existing pipes and structures, construction of house tie connections to existing mains, raising or lowering existing maintenance hole covers and disconnection of existing sewer mains.

This pay item also includes works by the Contractor to existing sewer structures and pipes in preparation for and restoration of the works by the Sewer Authority. This may include any coordination with the Sewer Authority, excavation, exposing existing services, backfilling of the work, provision of any items required by the Sewer Authority for performing the works.

A separate pay item shall be included in the Contract for each work type.

The unit of measurement for the following shall be a Provisional Sum

304P11.1 Works by the Sewer Authority to existing sewer services.

The unit of measurement of for the following shall be a Lump Sum for the works.

304P11.2 Works by the Contractor on existing sewer services, excluding works by the Sewer Authority.

Pay Item 304P12 CCTV Camera Testing

Allow for all costs associated with carrying out Closed Circuit Television (CCTV) Camera testing of newly laid pipes to the satisfaction of ActewAGL.

Pay Item 305P5 Flexible Joints

The unit of measurement shall be per lineal metre.

This pay item shall be an extra over rate for steel reinforced concrete stormwater pipes for the supply and installation of 1.22m lengths of steel reinforced concrete pipe.

A separate pay item shall be included in the Contract for each size of stormwater pipe.

The pay item description is 305P5. A where:

A = Pipe Size

For Example 305P5.600 = 600mm diameter steel reinforced concrete pipe flexible joint.

Pay Item 305P7 1050mm diameter Manholes

The unit of measurement shall be as described in the following sub-items.

This pay item is for the construction of a standard manhole 1.45m deep from cover to underside of base. The pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, supply and placement of concrete, forming of benching, supply and placement of step irons, supply and placement of precast cone and class B cover, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

A separate pay item shall be included in the Contract for each 1050mm diameter manhole type.

305P7.1 Standard 1050mm diameter cast in situ maintenance hole. Measured per unit.
305P7.2 Extra over per metre depth in excess of 1.45m for Pay Item 305P7.1.
Measurement is per metre.
305P7.3 Extra over Pay Item 305P7.1 for Class D heavy duty gatic access covers. Measured per item.

Pay Item 305P8 Special Chambered Manholes

The unit of measurement shall be an item per standard special chambered manhole completed.

This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, reinforcement, supply and placement of concrete, forming of benching, supply and placement of step irons, supply and placement of access shaft or precast cone including and class D gatic access cover, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

Pay Item 305P9 Standard Stormwater Sumps

The unit of measurement shall be as described in the following items.

This pay item is for the construction of a standard stormwater sump up to 1.8m deep from cover to underside of base.

This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, supply and placement of concrete,

supply and placement of step irons, supply and placement of precast lid and class B access cover, forming of inlet and matching to kerblines, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

A separate pay item shall be included in the Contract for each standard stormwater sump type and extra over rates associated with the construction of standard stormwater sumps.

305P9.1	Standard single Type R Sump. Measurement is per unit.
305P9.2	Extra over Pay Item 305P9.1 for depth in excess of 1.8m. Measurement is per metre.
305P9.3	Extra over Pay Item 305P9.1 for single sided plantation type inlet structure including concrete apron. Measurement is per unit.
305P9.4	Extra over Pay Item 305P9.1 for double sided plantation type inlet structure including concrete aprons. Measurement is per unit.
305P9.11	Standard Double Type R Sump. Measurement is per unit.
305P9.12	Extra over Pay Item 305P9.11 for depth in excess of 1.8m. Measurement is per metre.
305P9.21	Standard Triple Type R Sump. Measurement is per unit.
305P9.22	Extra over Pay Item 305P9.21 for depth in excess of 1.8m. Measurement is per metre.
305P9.31	Standard Quadruple Type R Sump. Measurement is per unit.
305P9.32	Extra over Pay Item 305P9.31 for depth in excess of 1.8m. Measurement is per metre.
305P9.41	Standard Single Type QS Sump. Measurement is per unit.
305P9.42	Extra over Pay Item 305P9.41 for single sided plantation type inlet structure including concrete apron. Measurement is per unit.

Pay Item 305P10 Grated Inlet Sumps

The unit of measurement shall be per grated inlet sump completed.

This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, supply and placement of concrete, supply and placement of step irons, supply and placement of metal grate and surround, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

A separate pay item shall be included in the Contract for each grated inlet sump inlet size.

The pay item description is 305P10 A, B where:

A = Length of Grate, mm

B = Width of Grate, mm

For Example 305P10.900.600 = 900mm x 600mm rectangular grated inlet sump.

Pay Item 305P11 Surcharge Structures

The unit of measurement shall be per structure completed.

The pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, reinforcement, supply and placement of concrete, supply and placement of step irons, supply and placement of grated inlet and class D gatic access cover, backfilling and compaction around structure.

No additional payment will be made for excavation in rock or over excavation.

Pay Item 305P12 Dead Ends

The unit of measurement shall be per end cap or sealing disc installed.

This pay item shall include the supply and installation of end caps or sealing discs for temporary and permanent dead ends and stormwater ties. The pay sub-item for end caps and sealing discs shall include the supply and installation of end caps or sealing disc. The pay sub-item for stormwater ties shall include the supply and installation of an end cap, marker tape and marker stake.

A separate pay item shall be included in the Contract for each end cap type.

305P12.1	150mm diameter stormwater main - uPVC end cap.
305P12.2	225mm diameter stormwater main - uPVC end cap.
305P12.11	100mm diameter stormwater tie - uPVC end cap and marker.
305P12.12	150mm diameter stormwater tie - uPVC end cap and marker
305P12.13	225mm diameter stormwater tie - uPVC end cap and marker
305P12.14	300mm diameter stormwater tie - uPVC end cap and marker

A separate pay item shall be included in the Contract for each sealing disc type.

The pay item description is 305P12.21. A where:

A = Pipe Size

For Example 305P12.21.525 = 525mm diameter stormwater pipe dead end with sealing disc.

Pay Item 305P13 Headwalls

The unit of measurement shall be per headwall installed.

This pay item shall include setting out, excavation where not associated with new pipe work, control of surface runoff, shoring, dewatering, disposal of surplus spoil, bedding, formwork, supply and placement of concrete, backfilling and compaction around the structure.

No additional payment will be made for excavation in rock or over excavation.

A separate pay item shall be included in the Contract for each end headwall type.

The pay item description is 305P13. A. B. C. D where:

A = Culvert Type P = Pipe culvert

B = Box culvert

B = Diameter of pipe, mm or width of box culvert, mm

C = Number of pipes or height of box culvert, mm

D = Number of cells (Box culverts only)

For Example 305P13.P.900.2 = precast concrete headwall for twin 900mm diameter stormwater pipes.

Pay Item 305P14 Scour Stops

The unit of measurement shall be per scour stop installed.

This pay item shall include over-excavation of pipe trench for the scour stop, concrete formwork, supply and placement of concrete, filter pipe, compressible membrane and additional cost of backfilling pipe trench over that of a straight uninterrupted pipe length.

A separate pay item shall be included in the Contract for each scour stop pipe diameter.

The pay item description is 305P14. A where:

A = Nominal pipe diameter, mm

For Example 305P14.450 = 450mm diameter stormwater pipe with concrete scour stops.

Pay Item 305P15 CCTV Camera Testing

Allow for all costs associated with carrying out Closed Circuit Television (CCTV) Camera testing of newly laid pipes to the satisfaction of Department of Urban Services.

Pay Item 306P3 High-end Risers

The unit of measurement shall be per number of high end risers installed installed.

This pay item shall include supply and installation of subsoil drain high end risers including cast iron cover and marker.

No additional payment will be made for excavation in rock or over excavation of trenches.

Pay Item 307P1 Gas Conduits

The unit of measurement shall be linear metre of pipe installed and backfilled measured along the centreline.

This pay item shall include survey and setting out, excavation of trenches in all types of material encountered including rock, over excavation of trench for required depth of bedding material, overbreak of trench due to ground conditions, protection of the works from surface runoff, dewatering, disposal of surplus spoil, bedding, supply of varying diameter uPVC pipes, laying, jointing, backfilling, compaction, supply and installation of draw wire.

No additional payment will be made for excavation in rock or over excavation of trenches.

Pay Item 307P2 Telecommunications Conduits

The unit of measurement shall be linear metre of pipe installed and backfilled measured along the centreline.

This pay item shall include survey and setting out, excavation of trenches in all types of material encountered including rock, over excavation of trench for required depth of bedding material, overbreak of trench due to ground conditions, protection of the works from surface runoff, dewatering, disposal of surplus spoil, bedding, supply of varying diameter (white) uPVC pipes, laying, jointing, backfilling, compaction, supply and installation of draw wire.

No additional payment will be made for excavation in rock or over excavation of trenches.

Pay Item 307P3 Electrical Conduits

The unit of measurement shall be linear metre of pipe installed and backfilled measured along the centreline.

This pay item shall include survey and setting out, excavation of trenches in all types of material encountered including rock, over excavation of trench for required depth of bedding material, overbreak of trench due to ground conditions, protection of the works from surface runoff, dewatering, disposal of surplus spoil, bedding, supply of uPVC pipes (orange), laying, jointing, backfilling, compaction and supply and installation of draw wire.

No additional payment will be made for excavation in rock or over excavation of trenches.

A separate pay item shall be included in the Contract for each electrical conduit type and configuration.

307P3.1	1 x 140mm diameter.
307P3.2	2 x 140mm diameter.
307P3.3	3 x 140mm diameter.
307P3.4	4 x 140mm diameter.
307P3.5	1 x 50mm diameter
307P3.6	2 x 50mm diameter
307P3.7	3 x 50mm diameter

Pay Item 307P4 Endcaps

The unit of measurement shall be the number of each item installed.

This pay item shall include supply and installation of uPVC endcaps for all types of conduits.

The following is the list of pay sub-items under pay item 307P4.

307P4.1	50mm diameter
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307P4.2	100mm diameter
307P4.3	140mm diameter

Pay Item 308P1 Water Pipe

The unit of measurement shall be linear metre of pipe installed and backfilled measured along the centreline .

This pay item shall include survey and setting out, excavation of trenches in all types of material encountered including rock, over excavation of trench for required depth of bedding material, overbreak of trench due to ground conditions, protection of the works from surface runoff, shoring, dewatering, additional excavation at structures, disposal of surplus spoil, bedding, laying, jointing, tracing wire for plastic pipes, wrapping of DICL pipes if specified, joint deflections or curvature of the pipe, backfilling and supply and placement of marker tape and compaction.

No additional payment will be made for excavation in rock or over excavation of trenches.

This pay item does not include backfill required under roads, paths and driveways as specified in Section 3.8.2.

A separate pay item shall be included in the Contract for each pipe material, diameter and depth range.

The pay item description is 304P1. A. B. C. D

A = Pipe Type	1 = uPVC sewer pipe
	2 = DICL
	3 = PE

B = Nominal pipe diameter in millimetres

C = Depth range	1 = 0 to 1.5m depth
	2 = 1.5 to 3.0m depth
	3 = 3.0 to 4.5m depth
	4 = 4.5 to 6.0m depth
	5 = greater than 6.0m

D = Joint type	S = Socket/Spigot
	F = Flange

If a depth range is not specified it is assumed that the rate includes excavation and backfill in all depth ranges.

For Example 308P1.1.150.2.S = uPVC water pipe, 150mm diameter, Depth range 1.5m to 3.0m, Socket/Spigot

Pay Item 308P2 Water Pipe Fittings

The unit of measurement shall be per fitting installed.

This pay item shall include supply of fittings, jointing and all work to the pipe in order to make the connection.

Excavation, bedding and backfill for the fitting shall be included in Pay Item 308P1.

A separate pay item shall be included in the Contract for each pipe fitting type.

The pay item description is 308P2. A. B. C. D. where:

A = fitting type.	BE = Cast iron or DICL bends
	FH = Fire Hydrant
	HT = Cast iron or DICL Hydrant Tee connection
	HB = Cast iron or DICL Hydrant Bend connection
	RE = Cast iron or DICL Reducer (or Taper)
	SV = Sluice Valve including valve box, 225 dia concrete pipe with concrete kerbing and concrete marker or indicator plate as required
	TE = Cast iron or DICL Tee connections

B = size	For A =	BE	Nominal pipe diameter, mm
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FH	1 =	Standard spring hydrant including 75mm dia riser, hydrant box, 225 dia concrete pipe with concrete kerbing and hydrant marker or indicator plate as required
2 =		High capacity hydrant including hydrant assembly, 150 dia 90° duck foot bend and mass concrete block as detailed on

Standard Drawing WSS - 016

HT	Nominal diameter of main pipe, mm (tee is 75mm)
HB	Nominal diameter of main pipe, mm
RE	Nominal diameter of larger pipe, mm
SV	Nominal diameter of pipe, mm
TE	Nominal diameter of main pipe, mm

C is either	For A =	BE	Bend angle, degrees
		RE	Nominal diameter of smaller pipe, mm
		TE	Nominal diameter of side pipe, mm

D =Joint type(where Applicable)	S =	Socket & Spigot
	F =	Flanged
	M =	Mixture of S & F (as specified on drawings)

For Example 308P2.BE,150,11¼ = Bend, 150mm diameter, 11.25 degree bend; and
 308P2.HT.300 = Hydrant tee from 300mm diameter pipe
 308P2.TE.300.150.F = Tee Connection 300mm main pipe, 150mm tee, flanged.

Pay Item 308P3 Water Pipe and Fittings Insitu Concrete Work

The unit of measurement shall per cubic metre of placed concrete.

This pay item shall include the supply and placement of concrete for concrete encasement of the pipe and for unreinforced concrete thrust blocks.

The following pay sub-items under pay item 304P3 are all extra over items for sewer pipe

308P3.1	Thrust Blocks at all bends, tees, hydrant bends and dead ends. Rate shall include any additional excavation, removal of additional spoil, formwork, supply and placement of concrete.
308P3.2	Concrete encasing of water pipe.

Pay Item 308P4 Scour Stops and Trench Stops

The unit of measurement shall be per scour or trench stop installed.

A separate pay item shall be included in the Contract for each trench and scour stop type.

The pay item for scour stops shall include over-excavation of pipe trench for the scour stop, concrete formwork, supply and placement of concrete, filter pipe, compressible membrane and additional cost of backfilling pipe trench over that of a straight uninterrupted pipe length.

The pay item description is 308P4. SS. A where:

SS = Scour Stop

A = Pipe Size, mm

For Example 308P4.SS.150 = 150mm diameter water pipe with concrete scour stops. The pay item for trench stops shall include over-excavation of pipe trench for the trench stop, supply and placement of sand bags, filter pipe, and additional cost of backfilling pipe trench over that of a straight uninterrupted pipe length.

The pay item description is 308P4. TS. A where:

TS = Scour Stop

A = Pipe Size, mm

For Example 308P4. TS .150 = 150mm diameter water pipe with trench stops.

Pay Item 308P5 Works by the Water Authority

This pay item shall include payment to the Water Authority for all works to existing live water services including connection of new pipes to existing pipes, construction of house tie connections to existing mains, and disconnection of existing water mains.

This pay item also includes works by the Contractor to existing water pipes in preparation for and restoration of the works by the Water Authority. This may include any coordination with the Water Authority, excavation, exposing existing services, backfilling of the work, provision of any items required by the Water Authority for performing the works.

A separate pay item shall be included in the Contract for each work type.

The unit of measurement for the following shall be a Provisional Sum

304P10.1 Works by the Water Authority to existing sewer services.

The unit of measurement of for the following shall be a Lump Sum for the works.

304P10.2 Works by the Contractor on existing water services, excluding works by the Water Authority.

Pay Item 309P1 Water Service Pipes

The unit of measurement shall be linear metre of pipe installed and backfilled measured along the centreline.

This pay item shall include survey and setting out, excavation of trenches in all types of material encountered including rock, over excavation of trench for required depth of bedding material, overbreak of trench due to ground conditions, protection of the works from surface runoff, dewatering, disposal of surplus spoil, bedding, laying, jointing, tracing wire, wrapping of DICL pipes if specified, joint deflections or curvature of the pipe, backfilling and compaction.

No additional payment will be made for excavation in rock or over excavation of trenches.

This pay item does not include backfill required under roads, paths and driveways as specified in [Section 3.8.2](#).

A separate pay item shall be included in the contract for each pipe material and pipe diameter.

The pay item description is 309P1. A. B where:

A = Pipe Type 1 = Copper
 2 = PE
 3 = uPVC

B = Nominal pipe diameter in millimetres

For Example 309P1.1.20 = Copper pipe, 20mm diameter

Pay Item 309P2 Tapping of Water Main

The unit of measurement shall be per tapping for each water tie pipe size.

This pay item shall include supply and installation of tapping band, main cock and elbow union.

A separate pay item shall be included in the Contract for each water service pipe diameter.

The pay item description is 309P2. D where:

D = Nominal water tie diameter in millimetres

For Example 309P1.20 = Tapping for water service pipe size of 20mm diameter.

Pay Item 309P3 Water Meter

The unit of measurement shall be per water meter assembly installed.

This pay item is for the supply and installation of water meter assembly kit from the Water Authority. This pay item shall include excavation in all types of material, removal of excess spoil material, installation of bends in water service, connection of ball valve and water meter, path box for residential developments or construction of meter box for larger developments in accordance with the **Standard Drawings**, backfilling and compaction around the structures.

A separate pay item shall be included in the Contract for each water service pipe diameter.

The pay item description 309P3. D

D = Nominal water tie diameter in millimetres

For Example 309P3.20 = Water meter for water service pipe size of 20mm diameter.

12 SCHEDULE OF HOLD POINTS

Hold Points	Clause	Description
3.1	3.2	Setout of Trenches for all Services
3.2	3.2	Road Opening Permits for Excavation in Roads, Road Reserves or Footways.
3.3	3.2	Inspection of Trench Foundations
3.4	3.4	Methods of Shoring.
3.5	4.1	Submission of Details of Sewer Materials
3.6	5.1	Submission of Details of Stormwater Materials
3.7	5.4	Inspection of Reinforcement in Concrete Reinforced Structures.
3.8	6.1	Submission of Details of Subsoil Drain Materials
3.9	7.1	Submission of Details of Conduit Materials
3.10	8.1	Submission of Details of Water Main Materials
3.11	8.7	Inspection and Testing of Completed Water Mains
3.12	9.1	Submission of Details of Water Service Materials

13 REFERENCES

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14 STANDARD DRAWINGS

WSS-016 Water mains DNI00-DN750 typical details