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Hunter Water Corporation A.B.N. 46 228 513 446
Standard Technical Specification for:

**CONSTRUCTION OF SHORT SEWER
BRANCH MAINS**

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1. GENERAL

1.1 Scope

This Standard Technical Specification details requirements for the construction of gravity branch sewers of nominal diameter DN 150 including associated works such as sidelines and risers.

1.2 Interpretation

Headings are for the convenience of the reader and shall not be used in the interpretation of this Standard Technical Specification.

Unless the context requires otherwise any expression such as "give notice", "submit", "approval", or "directed" means give notice to, submit to, approval by, or directed by the Superintendent of the Contract or other person nominated by the Principal.

2. REFERENCED DOCUMENTS

The following Hunter Water Corporation standard drawings are deemed to form part of this Standard Technical Specification:

- SCP-200 Pipe Support and Trench Fill for DN 150 to 750 Sewers
- SCP-201 Trenchstops and Bulkheads for DN 150 to 750 Sewers
- SCP-203 Pipe Support and Trench Fill in Bad Ground for DN 150 to 750 Sewers
- SCP-300 Sewer Connections and Sidelines up to 1.8m to Invert and Dead Ends for DN 150 to 750 Sewers
- SCP-301 Sewer Connections and Sidelines for DN 150 to 750 Sewers Greater than 1.8m to Invert
- SCP-302 Standard Connection to Common Effluent Pumped (CEP) Sewers
- SCP-303 Insertion of Junction and Repair for DN 150 to 375 UPVC Sewers
- SCP-304 Insertion of Junction and Repair for DN 150 to 750 VC Sewers
- SCP-412 Existing Access Chamber UPVC Internal drop Junction for DN 150 Sewer

3. GENERAL CONSTRUCTION

3.1 Order of Construction

Start construction at an approved point at least one metre from the live sewer. Make the connection to the live sewer after all other works have been constructed.

3.2 Environmental Protection Measures

Implement and maintain environmental protection measures in accordance with STS900.

3.3 Work in Roadways

Obtain and comply with the requirements of the Local Council and the Roads and Traffic Authority whenever work is to be undertaken in a roadway.

4. MATERIALS

4.1 General

Comply with all recommendations of the manufacturers regarding the storage and handling of the materials.

Any damaged material will be rejected.

4.2 Coarse Aggregate

Supply coarse aggregate embedment material in accordance with Standard Technical Specification STS101.

4.3 Bedding Sand

Supply bedding sand embedment material in accordance with Standard Technical Specification STS101.

4.4 High Grade Compaction Sand

Supply high grade compaction sand embedment material in accordance with Standard Technical Specification STS101.

4.5 Select Fill

For select fill use excavated material, free from organic matter and having a particle size no larger than 20mm. The material shall be suitable to allow compaction as specified without causing damage to the pipeline. If material excavated during excavation does not comply, import non-cohesive material.

4.6 Trench Fill

Where the trench is not subject to traffic loading use excavated material for fill in the trench fill zone provided it has a particle size no greater than 75mm across the largest dimension, is free from organic matter and can be placed into a dense mass free of voids and cavities.

For trafficable areas use:

- cement stabilised trench fill in accordance with clause "Cement Stabilised Trench Fill" for all existing roads; or
- crushed rock dust in accordance with Standard Technical Specification STS101; or
- crushed rock in accordance with Standard Technical Specification STS102; or
- as directed by the authority responsible for the trafficable area.

4.7 Cement Stabilised Trench Fill

Cement stabilised trench fill shall comprise a 14:1 sand:cement mix.

4.8 Vitrified Clay Pipes and Fittings

Supply vitrified clay pipes and fittings manufactured in compliance with Section SP7 of the Water Services Specification (WS-Spec) and as indicated for Hunter Water Corporation in the Table of Water Agency Practices. WS-Spec is available from Standards Australia. Use pipes and fittings to Class 4 and with sockets suitable for elastomeric seals. Alternatively use approved polypropylene sleeves for jointing.

4.9 UPVC Sewer Pipes and Fittings

Supply UPVC sewer pipes and fittings manufactured in compliance with Section SP4 of the Water Services Specification (WS-Spec) and as indicated for Hunter Water Corporation in the Table of Water Agency Practices. WS-Spec is available from Standards Australia. Use flexible jointed pipes and fittings to Class SEH.

4.10 Ductile Iron Pipes and Fittings

Supply ductile iron pipes and fittings manufactured in compliance with Section SP2 of the Water Services Specification (WS-Spec) and as indicated for Hunter Water Corporation in the Table of Water Agency Practices. WS-Spec is available from Standards Australia. Use flexible jointed pipes to Class K9, flanged pipes to Class K12 and fittings to Class 14 or Class 16.

4.11 Joint Seals

Supply elastomeric seals manufactured in compliance with Section SP15 of the Water Services Specification (WS-Spec) and as indicated for Hunter Water Corporation in the Table of Water Agency Practices. WS-Spec is available from Standards Australia. Use seals of either ethyl propylene-diene (EPDM) or nitrile-butadiene rubber (NBR).

4.12 Concrete

Supply concrete from plant(s) with third party certified Quality Systems for the manufacture and supply of concrete. Do not use any admixtures in the concrete. Use only one of the following cements:

- Fly Ash Blended Cement conforming to the requirements of Type SR to AS 3972 and containing 20% fly ash to AS 3582 Part 1, "fine grade" only, or
- Blended Cement, other than fly ash, conforming to the requirements of Type SR to AS 3972.

4.13 Reinforcement

Supply reinforcement which complies with AS 1302 Steel reinforcing bars for concrete, AS 1303 Steel reinforcing wire for concrete, and/or AS 1304 Welded wire reinforcing fabric for concrete.

4.14 Polyethylene Sleeving

Use cream coloured polyethylene sleeving, adhesive tape, strap and buckle in accordance with AS 3680. Supply rolls with protective end flanges and perforated at 6.1 metre intervals.

4.15 Geotextile Filter Fabric

Geotextile filter fabric shall be approved inert material, BIDIM A14, manufactured by Geofabric Australia Pty Limited.

4.16 Metal Banded Flexible Couplings

Supply metal banded flexible couplings manufactured in compliance with AS 4327.

4.17 Fasteners

Supply all nuts, bolts and washers in accordance with AS 2528. All exposed boltheads and nuts shall be hexagonal and the length of all bolts shall be such that tightened bolted connections shall have a minimum of 2.5 threads and a maximum of 5 threads protruding from the nut.

All anchors, bolts, nuts and washers embedded in concrete shall be of Grade 316 stainless steel to AS 2837. All bolts, nuts and washers used in the fabrication and/or installation of stainless steel items shall be of Grade 316 stainless steel to AS 2837. All other steel anchors, bolts, washers and nuts shall be hot dip galvanised in accordance with AS 1650. Grade 316 stainless steel to AS 2837 is an acceptable alternative to hot dip galvanised steel.

5. EXISTING SERVICES

5.1 Protection and Maintenance of Services

Take all actions and provide all things necessary to protect and maintain existing services to the satisfaction of the relevant authority or owner. This may include arranging or performing relocation, temporary diversion or support of the service.

5.2 Repair of Services

If a service is damaged during construction, arrange or perform repair to the satisfaction of the controlling authority or owner. Obtain from the authority or owner, a certificate stating that the repair has been carried out to their satisfaction.

If the service is not under the control of an authority and the owner cannot be located within a reasonable time, report the damage, and arrange or perform repair to an approved standard. Do not backfill, cover up or make the repair inaccessible prior to obtaining approval.

6. EXCAVATION

6.1 Safety

Do not commence any excavation until all materials necessary to make the excavation safe are on Site and available for use. This includes any necessary fencing and barriers as well as trench support systems.

6.2 Limits of Excavation

Keep the extent of excavation to the minimum possible to allow efficient construction of the Works while meeting the minimum requirements shown on the Drawings and the relevant Standard Drawings. Keep pipe trench widths within the maximum widths recommended by the pipe manufacturer.

Keep the sides of excavations vertical to at least 150mm above the pipe.

If the minimum cover requirements tabled below cannot be achieved submit a proposal to overcome the problem.

PIPELINE LOCATION	MINIMUM COVER
Areas not subject to vehicular loading	450mm
Footpaths, public reserves, local roadways and other areas subject to vehicular loading but excluding main roadways	600mm
Main roadways	750mm

6.3 Improved Surfaces

Where excavation is required under improved surfaces such as pavements, driveways and kerb and gutter, use tunnelling or boring where the surfaces cannot be satisfactorily reproduced and under existing concrete footway areas and concrete driveways. Ensure backfilling is to a standard to fully support the surface and any likely applied load.

If open excavations are used in improved surfaces, keep the trench width to the minimum allowed. Saw cut neat straight lines at the outer limits of the excavation through bitumen, asphalt and concrete. Remove pavers, blocks or brick pavements by hand, clean them and set them aside for later replacement.

6.4 Explosives

Use of explosives is not permitted.

6.5 Support of Excavations

When removing, raising or withdrawing supports, exercise every precaution necessary to prevent slips or falls and ensure that no damage, disturbance or displacement occurs to the pipes, fittings, geotextile filter fabric, pipe embedment and backfill already installed. Backfill simultaneously with the raising or withdrawal of supports. Ensure that compaction of pipe embedment and backfill material occurs below such trench support and against native ground.

When directed or specified, leave the trench support system in place as permanent support. Cut off the support system at a depth below ground surface that will satisfy the structural requirements of the site.

6.6 Drainage and Dewatering

Keep all excavations free of water. Provide, maintain and operate intercepting works to prevent surface water from entering the excavations; and all equipment necessary for dewatering the excavations and keeping the Works free from water.

Lowering of the water table by well points or other external dewatering methods may only be used if no damage is likely to be caused to adjacent structures and services.

Ensure that all downstream sewerage works that are under construction, completed or in use are protected at all times against the effects of any drainage which is discharged or likely to be discharged from the work.

6.7 Extra Depth Excavation

If extra excavation is required to reach a firm foundation or if excavation has extended deeper than necessary to meet the requirements of this Standard Technical Specification, refill to the required level with an approved non-cohesive material complying with STS101. Place and compact the material in accordance with clause "Backfilling".

Where material has been disturbed to a level deeper than necessary under this Standard Technical Specification, compact the disturbed material to density index not less than 70% for granular (non-cohesive) material or to dry density ratio not less than 95% for non-granular (cohesive) material. If satisfactory compaction of the disturbed material cannot be achieved, remove the material and refill to the required level with an approved non-cohesive material complying with STS101. Place and compact the material in accordance with clause "Backfilling".

6.8 Foundations and Foundation Stabilisation

Where the bottom of an excavation is soft or considered to provide an unacceptable foundation produce a stable foundation by one of the following:

- (a) Use of geotextile surround as shown on Standard Drawing SCP-203 for pipework. For other structures place geotextile fabric across the full excavation width and extending up the sides to minimum level of 600 above the base of the excavation.
- (b) Extra depth excavation in accordance with clause "Extra Depth Excavation".
- (c) Ram ballast into the soft ground until an approved firm foundation is obtained at the design depth. Use ballast comprising clean hard rock of 150mm nominal size having no less than 85% retained by a 150mm sieve and no less than 95% retained by a 100mm sieve, Remove and dispose of any excess material.

6.9 Surplus Excavated Material

Promptly remove and dispose of excavated material which is not required for reuse. Surplus material is the property of the controlling authority or owner of the excavation site.

7. PIPE BEDDING

7.1 General

Provide underlay in accordance with Drawing SCP-200 and/or SCP-203, as appropriate. Place and compact the bedding to support the pipe uniformly along the whole length of the barrel with chases provided for sockets and couplings.

7.2 Concrete Bedding and Encasement

Provide concrete encasement of pipes in accordance with Drawings SCP-200 and SCP-202 where sewers have less than the minimum cover over the top of the pipe barrel as detailed by clause "Limits of Excavation" or where a building approval has been given to construct a structure over the pipeline.

Extend bedding and encasement to finish at the face of pipe joints.

Set pipes to line and level on either bags filled with sand and cement mix or on concrete saddles cast to the outside diameter of the barrel and located near the socket. Ensure that pipes do not move, float or deform while pouring concrete.

Provide a 600mm long pipe immediately upstream and downstream of the concrete bedding or encasement to allow for differential movement.

7.3 Geotextile Surround

Use geotextile surround in accordance with SCP-203 where any portion of the pipe embedment zone is below the natural water table.

8. PIPE LAYING AND JOINTING

8.1 General

After preparing pipe underlay, lay and joint pipes using methods, materials, tools and equipment in accordance with the manufacturer's and/or suppliers instructions and recommendations, the relevant Australian Standards and further requirements of this Standard Technical Specification.

8.2 Junctions, Sidelines and Risers

Install junctions and sidelines in the locations shown on the Drawings and in accordance with Standard Drawing SCP-300 to 304 as appropriate. Where excavation is in rock, extend the trench 450mm beyond the end of the sideline or junction.

Provide junctions for each property that the sewermain passes through and sidelines to each property which can be serviced by a sideline less than twenty metres in length. Locate the junctions and sidelines to provide maximum drainability of the property.

Use vertical risers in accordance with Drawing SCP-301 for all connections to sewer mains greater than 1.8 metres deep to invert. Backfill around risers shall be coarse aggregate to clause "Coarse Aggregate" compacted as for pipe embedment in accordance with clause "Backfilling" to the top of the socket or coupling on the highest branch of the riser, for the full width of trench and for a minimum distance of 500 mm upstream and downstream of the riser centreline. The riser is to be kept vertical. For VC risers install thrust gaskets in addition to joint seals on any vertical sockets above the junction level.

8.3 Dead Ends

Terminate all sewer lines with a slope junction with plugged ends.

8.4 End Plugs

Use approved plugs to seal the open socket ends of all pipelines including junctions, sidelines, dead ends and access chamber inlets. Wherever feasible fix the plugs to the pipes and/or fittings before they are laid.

8.5 Marking Of Sidelines and Dead Ends

Mark the position of each dead end and sideline by placing an identification tape containing the word "sewer" around the pipe at the end socket and bring the tape to ground level as shown on Standard Drawings SCP-300 and 301 prior to backfilling. Use sand or aggregate for select fill and/or trench fill for the final 300 mm of the trench at each dead end and sideline to assist with later probing of the top of the pipe for WAE survey purposes.

8.6 Trench Stops

Construct trench stops in accordance with Drawing SCP-201. Seal the bags in such manner as to prevent ingress of water or leakage of the contained material.

8.7 Bulkheads

Construct concrete bulkheads in accordance with Drawing SCP-201 where shown on the Drawings and at road crossings under each kerb and gutter or at each road shoulder. Take care to avoid deformation of the sewer pipe during concrete placement.

Concrete bulkheads may be used as an alternative to trench stops on sewers of grade greater than 10%.

8.8 Corrosion Protection of Ductile and Cast Iron

If ductile and cast iron items are to be buried, sleeve them with polyethylene fixed with PVC tape complying with clause "Polyethylene Sleeving". Install sleeving in accordance with AS 3681. Do not allow the polyethylene to be exposed to ultra-violet light for more than seven (7) days.

8.9 Bored Pipes Under Roads, Driveways and elsewhere

Where sewer pipes are laid under roads, driveways, footpaths and elsewhere using a bored hole the following conditions shall apply.

For roads and lengths greater than 5.0 metres use an encasing pipe of sufficient strength to withstand all expected loading conditions.

The inside of the encasing pipe shall have a minimum clearance of 25 mm on the maximum outside diameter of the pipe including the pipe socket.

Support the sewer pipe so that it is centrally located inside the encasing pipe. Fill PVC sewer pipes with water to resist flotation during the cement grouting process.

Fully cement grout the annulus between the encasing pipe and the sewer pipe commencing from the downstream end of the bore. Use a stable grout mix of water/cement ratio 1 to 0.67 by weight with fine well rounded sand added to the grout mix at a ratio of 100 kg sand for every 100 kg of cement. Adjust the consistency of the mix by the addition of a superplasticizer such as "Daracem 100". Ensure full penetration and complete filling of the void.

Seal the ends of the encasing pipe with concrete plugs.

Provide a flexible jointed coupling or socketed collar on the sewer pipe at each end of the encasing pipe bore and flexibly joint a 1500 mm long starter pipe to the collar or coupling as the first pipe.

Lengths up to 5.0 metres not in roads may be installed without an encasing pipe. Fill voids greater than 60 mm between the borehole and the sewerpipe with cement grout. Do not joint the pipeline within the borehole. Ensure pipe and sleeving are not damaged.

9. ACCESS CHAMBERS

9.1 Entering Access Chambers

Only allow personnel who have undertaken approved training for entry and working in confined spaces to enter access chambers. When entering and working in access chambers, comply with Hunter Water Corporation's "Procedures for the Safe Entry and Working in Confined Spaces" or approved equivalent.

10. AIR TESTING

Supply and maintain all necessary equipment in a condition which is fit for its intended purpose.

Supply air with a compressor capable of supplying at least 1 m³/minute at 35 kPa. Feed air through a pressure reducing valve capable of reducing pressure to 28 kPa +/- 4 kPa, an airtight line fitted with two 150mm Bourdon type pressure gauge reading from 0 to 50 kPa, a pressure relief valve that may be set to blow off at 32 kPa and a gate valve to the pipeline to be tested. Use pressure gauges which have been calibrated within three months of the testing. The gauges

must read within 2 kPa of each other for 28 kPa tests. Use the gauge reading the lower for the readings.

Perform testing as follows:

- (a) Insert a plug in one end of the line to be tested and a disc with air-hose connection at the other end. Ensure that the force due to the pressure on the disc is not taken by pipe joints, but is taken by struts bearing on the disc or on the end pipe in the line.
- (b) Connect test equipment and carefully increase the air pressure to 28 kPa over approximately one minute. If the pressure cannot be raised to 28 kPa, the test is unsatisfactory.
- (c) Hold the pressure at 28 kPa for three minutes to stabilise the temperature.
- (d) Shut off the air supply and measure the time taken for the pressure to drop from 25 to 18 kPa. The test is unsatisfactory if this time is less than as tabled below;

Nominal Pipe Size (mm)	Minimum Acceptable Time for Pressure Drop 25 to 18 kPa (min)
100	1
150	2

11. BACKFILLING

Following satisfactory testing, provide and install further side-support, overlay and trenchfilling to pipelines in accordance with Drawing SCP-200 and/or SCP-203 as appropriate. Place backfill evenly on either side of pipelines to prevent uneven lateral loading.

Backfill containing boulders, large rocks, logs, stumps, tree loppings, builders refuse, broken concrete and other like material is expressly forbidden.

Keep all dewatering systems operating during backfilling so that no fill material is placed or compacted under water. At all times ensure that the pipes are not damaged or moved during placement and compaction of fill.

Place and compact pipe embedment in layers not greater than 150mm thick and trench fill in layers not greater than 300mm thick, except in roadways use layers not greater than 100mm thick. Compact to the degree noted on Standard Drawing SCP-200 and measured in accordance with;

- for granular fill - the density index determined in accordance with AS 1289.E6.1 based on the field dry density determined in accordance with AS 1289.E3.1 or AS 1289.E3.5 and the maximum and minimum dry densities in accordance with AS 1289.E5.1
- for non-granular fill - the dry density ratio determined in accordance with AS 1289.E4.1 based on the field dry density in accordance with AS 1289.E3.1 and the maximum dry density in accordance with AS 1289.E1.1.

Compact fill material by manual or mechanical tampers. Compact non-granular fill at a moisture content within plus or minus 2% of optimum and granular fill at a moisture content within plus or minus 3% of optimum. Flooding of the fill is not permitted.

12. RESTORATION

12.1 General

Restore as near as practicable to their pre-existing condition, all surfaces, services and/or improvements disturbed, destroyed, removed or damaged during construction of the Works or

during installation of temporary works such as access roads. Improvements shall be deemed to include trees and shrubs, mulched areas, gardens, paving, flagging, proprietary finished areas such as 'pebble crete' and the like, retaining walls, fences and all other structures.

When necessary for the restoration of surfaces, stockpile existing topsoil separately and replace it over the areas where it was previously located when completing backfilling operations. Where there is a shortfall of existing topsoil use approved imported topsoil.

12.2 Pavements

Immediately after backfilling of a trench excavated through a pavement, temporarily restore the surface and maintain it in a trafficable condition until final restoration is completed. Where the original pavement was bitumen or asphalt use a pre-mixed asphaltic material for the temporary restoration. Otherwise use crushed metal or gravel. Complete final restoration of pavements within one month of temporary restoration.

12.3 Turf

Restore areas of established well maintained lawns to the full limits of the disturbed area with approved imported turf. Restoration using sods removed prior to construction will only be approved if the sods are of equivalent standard to imported turf. Also use turf to restore areas where there is significant risk of erosion such as on steep or long slopes.

Following backfilling and initial settlement spread and grade topsoil to achieve a smooth surface free from lumps, stones or other debris and blending into the levels and shapes of the adjoining undisturbed ground allowing for the turf. Mix an approved fertiliser of N:P:K ratio of 10:4:6 (equivalent to "Muiltgro") into the topsoil at a rate of 40g/m².

Lay the turf without gaps on the prepared topsoil surface and lightly top dress and compact. Water regularly until regrowth is established.

12.4 Grassed areas

For grassed areas not requiring restoration with turf, restore by replacing the pre-existing topsoil or approved imported topsoil, to a minimum thickness of 50mm. Seed the affected area with grass seeds of the varieties prevalent in the immediate area. Water and maintain the disturbed area until regrowth is established.

If regrowth fails to occur within six weeks of restoration, reseed and maintain until regrowth is established.

[END OF STS406]