PINE RIVERS SHIRE COUNCIL

DESIGN MANUAL

CIVIL INFRASTRUCTURE DESIGN



SPECIFICATIONS

PRSC 500	Sewerage Specifications
PRSC 400	Water Supply Specifications
PRSC 100	Roadworks Specifications
AusSpec	Development Construction Specifications (Roadworks & Drainage)
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PINE RIVERS SHIRE COUNCIL

SPECIFICATIONS



PRSC 500

SEWERAGE SPECIFICATIONS

501 Non-Pressure Sewer Pipeline Construction

- 502 Sewer Pressure Pipeline Construction
- 503 Construction of a Submersible Sewage Pumping Station
- 504 Submersible Sewage Pumping and Ancillary Equipment

PINE RIVERS SHIRE COUNCIL

PRSC 501 - NON-PRESSURE SEWER PIPELINE CONSTRUCTION



PRSC 501 NON-PRESSURE SEWER PIPELINE CONSTRUCTION

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1.0.0 PURPOSE

- **1.1.0** The purpose of this specification is to set down requirements for the construction of sewers, manholes and house drains.
- **1.2.0** These requirements shall also apply to other pipelines which transport water, stormwater, sewage and sludge under gravity. These pipelines shall be found typically in treatment works, or other similar locations and may flow full or partly full.
- **1.3.0** This specification does not apply to the construction of pressure mains.

2.0.0 SCOPE

- **2.1.0** This specification shall apply to works to be constructed by contract, subcontract or direct labour.
- **2.2.0** This specification shall apply to works being constructed directly for the Pine Rivers Shire Council or other authority or for a principal who will hand over the ownership of the constructed works to the Pine Rivers Shire Council or who will retain ownership.

3.0.0 REFERENCES

3.2.0

3.1.0 The following shall apply:-

Sewerage and Water Supply Act with amendments

Standard Sewerage Law

Workplace Health and Safety Act 1995 and Regulations with amendments

Explosives Act 1999 and Regulations with amendments

AS 1726-1993	Geotechnical Site Investigation				
AS 1742	Manual of Uniform Traffic Control Devices				
AS 2124-1992	General Conditions of Contract				
AS 3600-2001	Concrete Structures				
AS 3798-1996	Guidelines on Earthworks for Commercial and Residential Developments				
AS 4373-1996	Pruning of Amenity Trees				
The following shall a use.	pply when the respective materials have been specified or approved for				
AS/NZS 1260-2002	PVC-u Pipes and Fittings for Drain, Waste and Vent Applications				
AS 1289-2000	Methods of Testing Soils for Engineering Purposes (Set)				
AS 1379-1997	Specification and Supply of Concrete				
AS 1477-1999	PVC Pipes and Fittings for Pressure Applications				
AS 1631-1994	Cast Grey and Ductile Non-pressure Pipes and Fittings				
AS 1646.1-2000	Elastomeric Seals for Waterworks Purposes – General Requirements				
AS 1657-1992	Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation.				
AS 1741-1991	Vitrified Clay Pipes and Fittings with Fittings with Flexible Joints - Sewer Quality.				
AS 1830-2002	Grey Cast Iron				
AS 2032-1977	Code of Practice for Installation of uPVC Pipe Systems.				
AS 2033-1980	Installation of Polyethylene Pipe Systems				
AS/NZS 2280-2004	Ductile Iron Pipes and Fittings Pine Rivers Shire Council Design Manual - Severage Works - RSS 561 - Non-Pressure Sever Pingline Construction				
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AS 2566-1982 Buried Flexible Pipelines AS/NZS 2566.1-1998 Structural Design AS/NZS 2566.2-2002 Installation

- AS 2887-1993 Plastics Waste Fittings.
- AS 3571-1989 Glass Filament Reinforced Thermosetting Plastics (GRP) Pipes -Polyester Based - Water Supply, Sewerage and Drainage Applications.
- AS 3680-1989 Polyethylene Sleeving for Ductile Iron Pipelines.
- AS 3681-1989 Guidelines for the Application of Polyethylene Sleeving to Ductile Iron Pipelines and Fittings.
- AS 3690-1989 Installation of ABS Pipe Systems.
- AS 3725-1989 Loads on Buried Concrete Pipes.
- AS 4058-1992 Precast Concrete Pipes (Pressure and Non-Pressure).
- AS 4060- 1992 Loads on Buried Vitrified Clay Pipes
- **3.3.0** The document "Installation of Services within the Boundaries of State Controlled Roads", issued by the Department of Main Roads (latest issue) shall apply to work within the boundaries of state controlled roads.
- **3.4.0** Where materials, not covered by this specification, are specified or approved for use as part of the sewerage works. The relevant Pine Rivers Shire Council specifications shall apply. Where no Pine Rivers Shire Council specification is available an appropriate other specification approved by the General Manager Pine Water shall apply.

4.0.0 DEFINITIONS

- **4.1.0** For the purpose of this specification the following definitions shall apply:-
 - House Drain any pipe (including fittings) normally laid underground, situated within the curtilage of any premises and provided to convey to a sewer the discharge of soil and waste from such premises
 - Sewer any conduit for the carrying off of sewage from any premises which is not a house drain, soil or waste pipe
 - Rigid Pipe pipe manufactured from mild steel, ductile iron or cast iron, vitrified clay, steel reinforced concrete, fibre reinforced concrete.
 - Flexible Pipe pipe manufactured from the family of polyvinyl chloride (PVC), polyethylene (PE), glass filament reinforced thermosetting plastics (GRP), or acrylonitrile butadiene styrene (ABS). unplasticised polyvinyl chloride (uPVC)
 - PVC Pipe / Fittings the family of PVC pipes including PVC-M (Modified PVC), OPVC (Optimised PVC) and uPVC (unplasticised PVC) pipes approved for use in sewerage pipelines.
 - House Connection any pipe (including fittings) laid as part of a sewer for the purpose of providing a connection for a house drain
 - Construction any work necessary for the installation, testing and commissioning of a pipeline, manhole or house drain. The term shall include such operations as excavation, bedding, laying, jointing, testing, backfilling, restoration, forming, concrete pouring, vibrating and stripping.
 - Premises any parcel of land improved or unimproved, for which there is a property description
 - Developer the company, organisation or person to whom approval has been given to carry out the works and who acts as principal for the purpose of works executed by contract
 - Consulting Engineer The registered professional engineering company or registered professional engineer engaged by the developer to carry out the investigation and design of the sewerage works to be constructed by the developer. When engaged for the construction phase, the company or engineer shall act as superintendent for the purpose of works carried out by contract.
 - * Contract, Contractor, Principal and Superintendent as defined in AS 2124
 - General Manager Pine Water the person occupying that position or their nominated representative
 - Pine Rivers Shire Council engineer the engineer employed by the Pine Rivers Shire Council to approve, supervise or inspect sewerage works, or their nominated representative

5.0.0 SPECIFICATION

5.1.0 WORK ON PINE RIVERS SHIRE COUNCIL CONTROLLED PREMISES

- 5.1.1 Before entering these premises in order to carry out approved work, the contractor shall give the General Manager Pine Water at least two working days notice of their intention to do so.
- 5.1.2 The contractor shall exercise due care to prevent interference or damage to improvements existing on the premises or to their satisfactory operation. These improvements may be located above or below ground.
- 5.1.3 The contractor shall preserve all pegs indicating the real property boundaries of the premises in the path of construction and adjacent to the works site. Should such pegs become dislodged or removed during construction, the contractor shall, at their own expense, employ a licensed surveyor to restore the pegs to their original positions. The surveyor shall provide a plan of the restored pegs to the Titles Office with a copy to a Pine Rivers Shire Council engineer.
- 5.1.4 The works site shall be restored to the satisfaction of a Pine Rivers Shire Council engineer.

5.2.0 WORK ON OTHER PREMISES

- 5.2.1 Before entering these premises in order to carry out approved work, the contractor shall obtain the written approval of the owner of the premises to do so.
- 5.2.2 The contractor and their employees shall not trespass on any premises adjoining the site of the works. A list of owners of vacant land within the site of works will be made available by a Pine Rivers Shire Council engineer at the request of the contractor.
- 5.2.3 The contractor shall exercise due care to prevent interference or damage to improvements existing on the premises or to their satisfactory operation. These improvements may be located above or below ground.
- 5.2.4 The contractor shall preserve all pegs indicating the real property boundaries of the premises in the path of construction and adjacent to the works site. Should such pegs become dislodged or removed during construction, the contractor shall, at their own expense, employ a licensed surveyor to restore the pegs to their original positions.

The surveyor shall provide a plan of the restored pegs to the Titles Office with a copy to a Pine Rivers Shire Council engineer.

5.2.5 The premises shall be restored to the reasonable satisfaction of the owner and / or occupier of the premises. At the completion of construction and prior to the constructed works being declared practically complete, the contractor shall obtain a clearance certificate from the owner of each premises. This certificate shall indicate satisfaction at the standard of restoration.

5.2.6 Notwithstanding such clearance being obtained, the superintendent and / or a Pine Rivers Shire Council engineer may instruct the contractor to carry out further restoration work on the premises if the superintendent and / or a Pine Rivers Shire Council engineer consider that the restoration work has not been completed to a reasonable standard. Further, the contractor shall be required to return to the premises to undertake placing further backfill material or other restoration of trenches which may have settled during the defects liability period.

5.3.0 WORKING HOURS

- 5.3.1 The contractor shall comply with the limitation on hours of work imposed by the local laws of the Pine Rivers Shire Council or as amended by any subdivisional permit or other development approval. Construction works shall be limited to between the hours of 7am and 6pm, Monday to Friday and on Saturday between 7am and 12 noon. The contractor shall not be permitted to carry out construction on Sundays and Public Holidays.
- 5.3.2 Where the contractor wishes to carry out construction works outside of the above hours, they shall seek approval of the superintendent and / or a Pine Rivers Shire Council engineer in writing. The request shall include the following information:-
 - I. the hours the contractor wishes to work
 - ii. the duration or period the contractor wishes to work those hours
 - iii. the reason why the contractor wishes to work outside the normal hours
 - iv. the measures the contractor intends to put in place in order to minimise any noise or other nuisance

The request shall be considered and may be refused, accepted, or accepted subject to certain conditions.

- 5.3.3 Notwithstanding Clauses 5.3.1 and 5.3.2 of this specification, the contractor shall comply with the Pine Rivers Shire Council local laws regarding abatement of excessive noise in relation to residential construction sites. The contractor shall also comply with the provisions of the Environmental Protection Act (1994) and relevant Australian Standards relating to noise from a construction site.
- 5.3.4 Should the contractor elect to carry out work outside of the normal award hours and which, in the opinion of the General Manager Pine Water, requires the presence of a Pine Rivers Shire Council engineer, the Pine Rivers Shire Council reserves the right to recover from the contractor any cost which it incurs in making a Pine Rivers Shire Council engineer available.

5.4.0 INFORMATION SUPPLIED TO THE CONTRACTOR

- 5.4.1 The principal shall supply to the contractor sufficient details by way of drawings and specifications to allow the contractor to construct the works to the principal's requirements.
- 5.4.2 Such information will normally be in the form of key or layout plans, detail plans, longitudinal sections of pipelines, standard drawings, results of soil investigations at the works site and any other information which may be considered relevant.
- 5.4.3 In the case of house drains construction the contractor shall be supplied with a house connection plan for each premises.

5.5.0 SETTING OUT

- 5.5.1 The principal shall supply to the contractor sufficient information to accurately locate the works.
- 5.5.2 In the case of sewers and manholes the principal shall supply the contractor with sufficient information to locate the centre of each manhole. The contractor will be supplied with drawings showing the level of the top of the manhole the distance between consecutive manhole positions and the diameter, level and grade of the connecting sewers.
- 5.5.3 In the case of other works the principal will establish datum lines from which the contractor can locate structures and interconnecting pipework. The contractor will be supplied with layout plans, structure details and the diameter, level, length and grade of the pipelines.
- 5.5.4 In both cases the contractor will be supplied with a level datum related to conveniently placed permanent marks or temporary benchmarks. The stated origins for the level datum shall be preserved from damage or interference by the contractor. The contractor shall be responsible for any costs associated with the reinstatement of any permanent mark damaged or removed during the progress of the works.
- 5.5.5 It shall be fundamental to the contract that positions of sewers in relation to the boundaries of premises and to the improvements thereon, shall be maintained unless authorised otherwise by the superintendent in writing.
- 5.5.6 The contractor shall establish offset pegs clear of the immediate working area.

5.6.0 MATERIALS AND WORK STANDARDS

- 5.6.1 The contractor shall supply all the materials required to complete the works in accordance with the issued drawings and specifications. The materials supplied shall comply with the relevant Australian Standard and where necessary shall be approved for use by the Joint Committee in Queensland.
- 5.6.2 Unless the manufacturer has an approved quality system in place, all manufactured items shall be inspected and tested at the place of manufacture by the nominated inspecting and testing authority.
- 5.6.3 The contractor shall employ experienced workers and trades persons on all types of work. The standard of work shall be such as to allow the works to be used for their intended purpose over their expected working life. Licensed trades persons shall be employed on those works governed by statutory regulations.

5.7.0 PIPES

- 5.7.1 The pipe materials and their structural requirements shall be as set out in the specifications and drawings. Pipes shall be provided with flexible joints in accordance with the relevant Australian Standard unless otherwise stated.
- 5.7.2 For the purpose of establishing construction standards, pipes shall be classified as either rigid or flexible. For details of the classifications of pipes refer to the relevant Pine Rivers Shire Council specification definitions.

- 5.7.3 Tests shall be carried out on the soils and groundwater in which the pipes are to be located. These tests may be used in the selection of pipe materials, their structural requirements and any external protection. The results of any such tests will be made available to a Pine Rivers Shire Council engineer by the contractor. Ductile iron pipes and fittings shall be wrapped with polyethylene sleeving in accordance with AS 3680 and AS 3681 as a minimum requirement.
- 5.7.4 Pipes, pipe shorts, pipe stubs and pipe fittings, etc. used in the construction of gravity sewers shall when installed, provide a pipeline bore and especially pipeline invert, free of intrusions or protrusions.

5.8.0 PIPE BEDDING

- 5.8.1 Material used for pipe bedding shall provide adequate support to the bottom and sides of pipes under the conditions reasonably expected to occur during the working life of the pipeline.
- 5.8.2 The pipe bedding used shall be a non-cohesive granular material approved by a Pine Rivers Shire Council engineer and its grading shall comply with the limits indicated in Table 5.0 below, unless otherwise directed by the superintendent and / or a Pine Rivers Shire Council engineer:-

Sieve size	Percentage Passing
9.50 mm	100
4.75 mm	95 - 100
2.36 mm	75 - 95
1.18 mm	30 - 80
0.60 mm	10 - 40
0.425 mm	5 - 20
0.30 mm	2 - 10
0.15 mm	0 - 5

Table 5.0

- 5.8.3 Sand for pipe bedding shall be coarse grained, shall consist of clean, hard, durable uncoated grains, not more than twenty percent passing a 425 micron sieve, and shall be suitable for the particular trench conditions. This material would be expected to be suitable for both dry and wet conditions. Sharp, angular material shall not be used to bed flexible pipes.
- 5.8.4 Materials which occur naturally at the site of the works may be suitable subject to approval from the Superintendent and / or a Pine Rivers Shire Council engineer. Such material shall consist of a uniformly graded sandy loam or other approved material having all particles passing a 9.50 mm sieve.
- 5.8.5 Alternative bedding materials may be approved by the Superintendent and or a Pine Rivers Shire Council engineer where improved drainage of the bedding material is required. The alternative material shall be coarse grained and consist of clean, hard, durable uncoated

grains. All particles shall pass a 5.0 mm sieve and not more than five percent shall pass a 425 micron sieve. This alternative material shall not be used around the house connection branches or other areas where subsequent excavation is likely to result in loss or movement of the bedding material.

- 5.8.6 Decomposed granite and similar materials of a cohesive nature and containing a high percentage of fine material are specifically not approved for bedding material.
- 5.8.7 Pipe bedding shall be placed over the full width of the trench in layers not exceeding 150 mm compacted thickness and compacted by tamping rolling or vibration to achieve a minimum density index (DI) of 65.

5.9.0 APPROVED FILLING

- 5.9.1 Approved filling is the filling which is placed immediately on the pipe or pipe bedding to a depth of not less than 300 mm above the pipe. The purpose of the approved filling is to provide protection to the installed pipeline against damage from heavy objects which may fall into the trench or be contained in material being replaced in the trench.
- 5.9.2 Approved filling placed against a rigid pipe barrel shall be non-cohesive and free from any particles which may be retained on a 19.5 mm sieve.
- 5.9.3 Approved filling placed above a full surround of pipe bedding shall therefore be free from particles which may be retained on a 30 mm sieve. It is intended that approved filling shall be obtained from material occurring naturally at the site of the works.
- 5.9.4 A Pine Rivers Shire Council engineer may require that rigid pipes be laid in a pipe bedding surround where the engineer is not satisfied with the quality of material proposed to be used as approved filling.
- 5.9.5 Approved filling shall be placed over the full width of the trench in layers not exceeding 300 mm compacted thickness and compacted by tamping, rolling or vibration to a minimum relative density (RD) of 95% standard compaction or a minimum density index (DI) of 65.

5.10.0 BACKFILLING

- 5.10.1 Backfill of trenches between the top of the approved filling and the surface shall be generally obtained from material occurring naturally at the site of the works unless otherwise directed by the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.10.2 Backfill shall be placed over the full width of the trench in layers not exceeding 300 mm compacted thickness and compacted by tamping, rolling or vibration to the standards indicated in Table 5.2 below:-

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BACKFILL COMPACTION			
Allotments	95 % standard		
Footpaths	95 % standard		
Roads			
- Base course	98 % modified		
- Sub-base	95 % modified		
- Blanket course	95 % modified		
- Subgrade - Top 150 mm	100 % standard		
- Balance	95 % standard		

- 5.10.3 Unless otherwise approved by a Pine Rivers Shire Council engineer, the frequency of testing to confirm compliance with the requirements of Clause 5.10.2 of this specification shall be the greater of:
 - i. one test per 40 m of trench per 2 layers of compacted backfill (total compacted thickness not exceeding 600 mm) or
 - ii. one set of tests per line (manhole to manhole)

5.11.0 SAND FILLING OF TRENCHES UNDER ROAD PAVEMENTS

5.11.1 Sand filling shall be used to backfill trenches under existing road pavements or other specific locations as required by a Pine Rivers Shire Council engineer. Samples of the sand proposed to be used by the contractor shall be submitted to the superintendent and / or a Pine Rivers Shire Council engineer for approval. The required characteristic of the sand is that its particle size distribution will allow its consolidation to 65% of its density index by saturation and vibration.

5.12.0 IMPORTED FILLING

5.12.1 Imported filling shall be used where approved filling is specified and is not obtainable from excavation within the worksite. It shall possess characteristics similar to those specified for approved filling.

5.13.0 CONCRETE

- 5.13.1 Concrete used for the construction of manholes and the restoration of concrete surfaces shall be Class N32 in accordance with AS 1379.
- 5.13.2 Concrete used for backfilling Types 2 and 3 construction and in other situations directed by a Pine Rivers Shire Council engineer shall be Class N25 in accordance with AS 1379.
- 5.13.3 Lean mix concrete used for backfilling trenches under existing roads shall be a no slump (20:1 mix) in accordance with AS 1379.

5.13.4 Concrete shall be transported, placed, compacted and cured in accordance with AS 3600.

5.14.0 MANHOLE COVERS AND FRAMES

- 5.14.1 Manhole covers and frames shall be of grey iron or ductile iron to the details shown on the Pine Rivers Shire Council standard drawing.
- 5.14.2 The full cast iron cover shall be used in roads and on premises where the manhole may be subjected to vehicular traffic or where directed by a Pine Rivers Shire Council engineer.
- 5.14.3 The concrete filled cover shall be used on premises where the manhole is not subjected to vehicular traffic.
- 5.14.4 The bolt down cover shall be used where the manhole is located in a park, reserve or other area subject to flooding or where additional security is required as directed by a Pine Rivers Shire Council engineer.

5.15.0 WATER REQUIRED FOR WORKS

- 5.15.1 The contractor shall make the necessary arrangements with a Pine Rivers Shire Council engineer to obtain water. Any fees or charges imposed for the use of a standpipe or for the water used shall be paid by the contractor. The contractor shall not use a standpipe on a hydrant until such time that an application has been made to the Pine Rivers Shire Council and a permit issued for the use of a hydrant.
- 5.15.2 The contractor shall abide by any restrictions imposed on the use of water by a Pine Rivers Shire Council engineer. Council may impose a charge for water used if the contractor is deemed to be wasting water.
- 5.15.3 Reticulated water shall not be used for general earthworks.

5.16.0 TIMBER

- 5.16.1 All timber used for trench shoring and the restoration of timber structures shall be suitable for the use. The timber shall be thoroughly seasoned, sound, straight and free from sapwood, large loose knots, wanes, shakes, gum veins, cores and other defects.
- 5.16.2 Timber used for restoration shall be cut, matched and framed in a tradesman like manner. The timber shall be properly chamfered and shall hold to true dimensions when fixed in position.
- 5.16.3 A Pine Rivers Shire Council engineer may direct that timber used in trench shoring shall remain in place in the trench in order to protect adjoining improvements.

5.17.0 NATURE OF GROUND

5.17.1 Where the principal has undertaken a subsoil testing programme on the site of the works, this information shall be made available to the contractor. It shall be the contractor's responsibility to interpret the information supplied.

- 5.17.2 In the case of sewerage reticulation, the testing may be restricted to a limited number of manhole positions which were accessible to the drilling crew. Therefore, it should not be assumed that the available information represents all the subsoil conditions which may be encountered.
- 5.17.3 The contractor shall be deemed to have satisfied themself as to the nature of the ground at the time they made the offer to carry out the works.

5.18.0 EXCAVATION

- 5.18.1 Before commencing work on any pipeline, the contractor shall establish the centre of the pipeline, locate any underground services which may be present, make provision for the safe passage of foot and vehicular traffic during construction and offset any level pegs which may be located on the pipe centreline. The contractor shall install appropriate signs as required by the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.18.2 Before commencing excavation the contractor shall agree with the superintendent and / or a Pine Rivers Shire Council engineer on any measures to protect or to temporarily remove any improvements which may exist on or adjacent to the pipe centreline.
- 5.18.3 All trees, shrubs, stumps and roots which, in the opinion of the superintendent and / or a Pine Rivers Shire Council engineer, are likely to obstruct or damage the works, shall be removed and disposed of and the ground surface restored. All holes made by clearing shall be filled with sound material in an approved manner. A Pine Rivers Shire Council engineer may require the works to be constructed so that certain trees or other flora shall be preserved without damage and without interference to their limbs and roots. Trimming of trees and shrubs may be agreed to by a Pine Rivers Shire Council engineer and carried out by the contractor in a manner which will minimise the permanent damage to the trees or shrubs in accordance with AS 4373.
- 5.18.4 Prior to excavation, existing topsoil and turf shall be removed and stockpiled. The stockpiled topsoil shall be replaced over the completed works to the satisfaction of the superintendent and/or a Pine Rivers Shire Council engineer.
- 5.18.5 Areas to be cleared and grubbed shall be limited to the minimum necessary for the completion of the works. The contractor is to ensure that any clearing for the operation of machinery is minimized through the use of the smallest available equipment which will effectively carry out the works. The contractor shall exercise every care and where possible, shall preserve adjacent, amenity trees, fruit trees, ornamental trees and shrubs. Where pipelines pass through lawns and elsewhere when directed by the superintendent to do so, the contractor shall carefully cut and stack turfs which shall be replaced when the work is completed. The stacked turf shall be kept moist and replaced as quickly as possible.
- 5.18.6 The contractor shall be responsible for claims for loss and damage resulting from the unapproved removal of or damage to trees and other flora.
- 5.18.7 Excavation shall be performed in open cut unless otherwise ordered or approved by a Pine Rivers Shire Council engineer. All excavation shall be made to the lines, grades and levels shown on the approved drawings unless otherwise approved by a Pine Rivers Shire Council engineer. Care shall be taken to ensure that excavation is sufficiently deep at pipe sockets to allow a minimum clearance of 75 mm between collar and bottom of trench. All trenches, shafts, tunnels and drives shall have vertical sides, except that the superintendent and / or a Pine Rivers Shire Council engineer may approve of open cut trenches in which the sides Pine Rivers Shire Council

above a level of 300 mm above the top of the pipe are battered from the vertical, and if sheeted, the clear width between the trench sheeting shall correspond with the dimensions shown for trenches, shafts, tunnels and drives. Trenches shall not be excavated wider than the standard widths shown on the drawings, except with the written approval of the superintendent and / or a Pine Rivers Shire Council engineer, who will take into account the depth of trench, type of pipe bedding, class of pipe and type of backfilling material. If the contractor excavates the trench wider than the approved width (due to collapse of the trench walls or for any other reason), then the contractor shall provide stronger pipes and/or more effective bedding and consolidation as ordered by the superintendent and / or a Pine Rivers Shire Council engineer.

- 5.18.8 Where the contractor has excavated a trench deeper than required, they shall make good the over-excavation with compacted sand, concrete or such other materials as directed by the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.18.9 Where the depths shown on the drawings are to the pipe inverts, the contractor shall allow for the additional depth of excavation required for the bedding under pipes.
- 5.18.10 All surplus spoil shall be removed from the site and stacked or spread as directed, or as specified in the job specification and shall not be disposed of in any other manner. Any material which is removed or falls beyond the limits of the excavation shown, shall be removed by the contractor at his/her own expense.

Spoil shall not be placed on any property in Pine Rivers Shire that is external to the site of the works without prior written application and approval from the Pine Rivers Shire Council under the Pine Rivers Shire Council local laws and / or planning scheme requirements.

- 5.18.11 The contractor shall ensure that the work site is maintained as a safe working area and that the requirements of the Workplace Health and Safety Act and Regulations are complied with at all times. The contractor shall indemnify the principal and / or the Pine Rivers Shire Council against any costs arising out of any events occurring on the works.
- 5.18.12 The contractor shall supply all sheeting, waling, props and wedges which are necessary to secure all open trenches or tunnels. The superintendent and / or a Pine Rivers Shire Council engineer may order the contractor to cease excavation should they consider that a dangerous situation exists. The trench shoring system shall be designed by a competent person.
- 5.18.13 The contractor shall leave a clear space of not less than 600 mm between the edge of the excavation and the inner toe of the spoil bank. No materials shall be stacked within 1 m of the edge of any excavation. No excavated materials shall be placed against the walls of any building or fence without the written permission of the owner of such building or fence.
- 5.18.14 The contractor shall do all work necessary to divert any water interfering with the progress of the works, to keep the excavations free from water while the works are in progress and prevent any injury to the works by water due to floods or other causes. Any work or material damaged by water shall, if ordered, be taken up and replaced with fresh material by the contractor at the contractor's expense.
- 5.18.15 The contractor shall provide, where considered necessary in the opinion of a Pine Rivers Shire Council engineer, sediment traps on the discharge line of each dewatering pump, to prevent the deposit of sediment in channels and stormwater drains.
- 5.18.16 Dewatering shall be carried out by methods which cause no damage to the works or to
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adjacent property. The contractor shall ensure that their workmen do not, by walking on unprotected trench bottoms, cause puddling or other damage to the material of the trench bottom, or in any other way bring about a reduction in the bearing capacity of the material. In the event that such capacity is reduced in such manner, the contractor shall without any additional payment therefore, make good the trench bottom to the satisfaction of, and by such means as, the superintendent and / or a Pine Rivers Shire Council engineer may direct. Should the contractor place gravel under Type 1 bedding to satisfy the requirements of this clause, the cost of the gravel and its placement shall be the responsibility of the contractor.

5.19.0 TUNNELLING

- 5.19.1 Where tunnelling is approved, the maximum distance between adjacent shafts shall be determined to the satisfaction of a Pine Rivers Shire Council engineer. Pipes shall not be laid until the tunnel between adjacent shafts has been holed through and finished to the required line, level and grade.
- 5.19.2 In all underground workings, the contractor shall take precautions prescribed in respect of mines and shall comply with all regulations applicable to such works.
- 5.19.3 The dimensions of the tunnel and the installation of the tunnel support system shall be as agreed to the satisfaction of a Pine Rivers Shire Council engineer. Adequate working space to bed and lay pipes shall be provided.

5.20.0 ROCK

- 5.20.1 For a schedule of rates contract only, the principal may recognise that rock can be classified separately from other materials and may make an additional payment for its excavation in a trench if included in the schedule of rates.
- 5.20.2 For this purpose only, rock shall be defined as a material which, in the opinion of the superintendent can be removed only with the use of heavy pneumatic tools, explosives or excavators fitted with rock breaking attachments.

The classification of materials shall be based on the definitions and systems outlined in AS 1726 - Geotechnical Site Investigations.

The superintendent is to be present with the contractor when measuring the quantity of rock excavated.

- 5.20.3 Blasting may only be permitted subject to the approval of the superintendent and / or a Pine Rivers Shire Council engineer, who shall have the right to limit the sizes of the charges used and to fix the hours of the day or night within which blasting may be carried out.
- 5.20.4 Before using any explosives, the contractor shall obtain the necessary permits and instructions from the relevant authorities and issue all appropriate notices. The contractor shall be wholly responsible for any damage to life or property, and shall take at his/her sole risk, every precaution to carry out such operations. Approved means shall be employed to prevent all stones and other materials from being thrown out of the excavation. The contractor shall give sufficient warning to the general public and workmen when blasting operations are in progress.

When using explosives, the contractor's methods and operations shall conform with the:-

- a. Explosive Act 1952 1981, including delegated regulations; and
- b. AS 2187 Explosives Storage Transport and Use:
 - i. AS 2187.1 Storage
 - ii. AS 2187.2 Use of Explosives
- c. Generally, blasting within 50 m of electric power transmission lines shall be covered with approved mats.
- 5.20.5 The contractor shall indemnify the principal and / or the Pine Rivers Shire Council against any action claim or demand resulting from injuries to or death of persons, or damage to property caused by blasts or explosions.
- 5.20.6 The contractor shall employ a licensed and experienced shot-firer to handle, load, and set off charges. The contractor shall provide written advice to the superintendent and / or a Pine Rivers Shire Council engineer of the shot-firer's name and license number at least one day prior to blasting work commencing.
- 5.20.7 All blasting operations, including the depth and size of holes and the size and characteristics of charges shall be subject to review by the superintendent and/or a Pine Rivers Shire Council engineer.

5.21.0 UNDERGROUND SERVICES

- 5.21.1 The contractor shall note the presence of existing underground or overhead services in public and private premises on the works site. Special care shall be taken in the vicinity of underground electrical services.
- 5.21.2 The locations of some underground services are based on the information supplied by the respective authorities where such information is available. It is to be clearly understood that the information regarding these services are tentative only with respect to both details of services shown and the existence of other services not shown. The superintendent and / or a Pine Rivers Shire Council engineer does not warrant the completeness of any information given, and the contractor is required to make enquiries to all relevant authorities regarding the presence of underground services.
- 5.21.3 The contractor shall verify the position of each underground service with the relevant Authority before commencing excavation. The contractor shall pre-locate the services as to depth, alignment and extent or size, so as to ensure such services are not adversely affected. Hand excavation shall be used in close proximity to such services until the exact location is determined.
- 5.21.4 Trenches containing underground services shall be backfilled so that the subgrade is restored as nearly as possible to its original state of compaction. Where selected backfill has been placed by other utilities and has had to be removed, it shall be replaced by the same type of selected material. All backfill shall be carefully deposited in the trench and around the utility service in layers and adequately compacted by appropriate hand rammers and tampers, or by use of effective mechanical equipment.
- 5.21.5 Extra care shall be taken by the contractor to recompact excavations near existing underground pipework, so that foundations of that pipework are restored.

5.21.6 The contractor shall be responsible for any damage caused to existing underground services. In case of failure or damage, repairs shall normally be carried out immediately by the contractor. If there is any delay, the superintendent and / or a Pine Rivers Shire Council engineer will arrange for repairs to be carried out and the full cost of such repairs shall be borne by the contractor. If in the opinion of the superintendent and / or a Pine Rivers Shire Council engineer the failure or damage causes an emergency situation, then remedial action will be taken by the superintendent and / or a Pine Rivers Shire Council engineer and the full cost of such action shall be borne by the contractor.

5.22.0 EXCAVATION UNDER RAILWAY LINES

- 5.22.1 The consulting engineer shall obtain the written approval from Queensland Rail to construct works under or adjacent to any railway. The consulting engineer or designer shall submit drawings and specifications to Queensland Rail to support the application and shall comply with any conditions imposed upon the works.
- 5.22.2 Before constructing any work under or adjacent to any railway, the contractor shall give the required notice in writing to Queensland Rail of their intention to commence operations. The contractor shall not commence any such work until they have received the written permission of the Queensland Rail, and shall conduct the whole of the works under such conditions and supervision, and with such precautions against interruption or danger to traffic as Queensland Rail may direct.
- 5.22.3 The contractor shall be solely responsible for any stoppages, delays or accidents arising out of or in any way attributable to the contractor's operations. Should Queensland Rail consider it advisable, flagmen or other personnel shall be placed on any work to be executed under, over, or near any railway or any railway land for the purpose of seeing that no danger occurs to the traffic or railway property. Such action shall not relieve the contractor of any of the responsibilities.
- 5.22.4 The contractor shall obtain any necessary permits and pay all fees and charges in connection with the works carried out under this clause, including the cost of the flagmen or other personnel referred to above.
- 5.22.5 The attention of the contractor is drawn to the "Code for the Installation of Other Parties' Services and Pipelines within Railway Boundaries" or similar document issued by the Railways of Australia.
- 5.22.6 All works including excavation and backfilling shall be carried out in accordance with the requirements of Queensland Rail.

5.23.0 EXCAVATION UNDER STATE CONTROLLED ROADS

- 5.23.1 The consulting engineer or designer shall obtain the written approval of the Department of Main Roads to construct works under or adjacent to any declared road. The contractor shall submit drawings and specifications to the Department to support the application and shall comply with any conditions imposed on the works.
- 5.23.2 Work within the boundaries of state controlled roads shall be carried out in accordance with the current issue of the document "Installation of Services within the Boundaries of State Controlled Roads" or similar document prepared by the Queensland Department of Main Roads.

- 5.23.3 The contractor shall be responsible for giving the Department of Main Roads the required notice prior to the commencement of construction.
- 5.23.4 All works including excavation and backfilling shall be carried out in accordance with the requirements of the Department of Main Roads.

5.24.0 EXCAVATION UNDER OTHER ROADS

- 5.24.1 Work under road surfaces carrying vehicular traffic shall be carried out in accordance with the details shown on the Pine Rivers Shire Council standard drawing and the requirements of a Pine Rivers Shire Council engineer.
- 5.24.2 The contractor shall be responsible for giving a Pine Rivers Shire Council engineer one weeks notice prior to the commencement of construction.
- 5.24.3 The pipe bedding, approved filling and backfilled material shall be compacted to prevent settlement of road surfaces in accordance with Clauses 5.8.5, 5.9.5, 5.10.2 of this specification and the details shown on the Pine Rivers Shire Council standard drawing.

5.25.0 LAYING AND JOINTING PIPES

- 5.25.1 Pipelines shall be constructed with pipes of such diameter, class and material and laid to such lines, levels and grades as shown on the drawings or as directed in writing by the superintendent and/or a Pine Rivers Shire Council engineer. Construction shall be in accordance with the standard construction types shown on the drawings and described below and in accordance with the relevant Australian Standards and manufacturer's specifications.
- 5.25.2 The diameter levels and grades of all lines will be checked by the superintendent and / or a Pine Rivers Shire Council engineer and all pipes found incorrect shall be removed and re-laid by the contractor who shall replace, at their own cost, any pipes damaged during the course of such removal.
- 5.25.3 Pipelines shall be laid, jointed and checked, in complete lengths from manhole to manhole or structure to structure prior to commencement of backfilling. The superintendent and / or a Pine Rivers Shire Council engineer will, in exceptional circumstances such as crossing of important roads, works adjacent to buildings and extreme weather conditions, give consideration to any request from the contractor for approval to commence backfilling at an earlier stage, but will not approve any such request unless such action is, in the superintendent and/or a Pine Rivers Shire Council engineer's opinion, necessary in the circumstances. The contractor shall adopt measures to control the line and level of the pipeline to the satisfaction of the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.25.4 The contractor shall ensure that pipes to be embedded in the walls of structures are laid and retained in correct position and level. Where such pipes are at or near the invert level of a manhole, they shall be fixed by bedding the pipes on the concrete manhole bottom placed in conjunction with laying and jointing of pipes or by other approved methods.
- 5.25.5 Seals for future inspection and maintenance purposes and temporary seals shall be made with an approved factory-made sealing plug and flexible watertight joint. The plug shall be restrained from movement by an approved metal clip suitably protected against corrosion by hot dip galvanising and wrapping. Polythene sheeting of sufficient size shall be used to cover the plug so as to prevent entry of sand, soil etc. into the joint. All seals shall be watertight Pine Rivers Shire Council

under the specified test heads applied either internally or externally. Other approved seals may be used.

- 5.25.6 Joints in pipelines shall be of the flexible types using rubber jointing rings supplied with the pipes for that purpose. Lubricants shall be used where specified by the manufacturer. Spigot and socket joints shall be marked with gauge lines so that the pipe layer can judge the penetration achieved at the joint. The joints shall be cleaned before mating. To avoid damaging the end of the pipe during jointing, a suitable timber spacer shall be used between the pipe and the lever.
- 5.25.7 The contractor shall establish the correct line, level and grade for the pipeline using a laser beam, sight rails and traveller or by setting levels in the trench bottom.
- 5.25.8 The accuracy of level, line and grade will be checked by sighting through the pipeline, levelling on the tops of pipes or by string lines along the tops of pipes. A maximum deviation of 5 mm over an 8 m length will be permitted. All pipes found outside this tolerance shall be re-laid by the contractor. Any pipes laid with reverse fall or less than minimum fall, shall be taken out and correctly re-laid.

5.26.0 TYPE 1 CONSTRUCTION

- 5.26.1 Details for Type 1 construction are shown on the Pine Rivers Shire Council standard drawing. This type of construction applies to sand and approved naturally occurring bedding material.
- 5.26.2 The bedding shall be placed in the trench and compacted before any pipes are laid. Sand shall be compacted to a density index of not less than 65 measured in accordance with AS 1289.6.1. Naturally occurring material shall be compacted to 95% maximum dry density using standard compaction as determined by AS 1289.5.1.1.
- 5.26.3 Natural occurring material from trench excavation shall only be used for pipe bedding where specifically approved by a Pine Rivers Shire Council engineer in writing.
- 5.26.4 The bedding shall be placed to a level of not less than one quarter of the pipe diameter above invert, and then recessed to accommodate the pipe barrel. Holes shall be dug out for the pipe sockets to relieve the sockets of any load.
- 5.26.5 Having checked the pipe for soundness, it shall be bedded firmly along its barrel in the bedding material, while ensuring that the collar is not providing any support for the pipe. The pipe shall then be brought to line and grade with the minimum possible disturbance to the bedding material. On no account will the contractor be permitted to build up the bedding under the pipe after the pipe is in position.
- 5.26.6 When the line has been laid, the additional bedding material shall be added in layers not exceeding 150 mm compacted depth, to bring its level midway up the barrel of the pipe for rigid pipes. For flexible pipes, the bedding material shall be added in layers not exceeding 150 mm compacted depth, to bring its level to 75 mm over the crown of the pipe. This bedding shall also be compacted to the required standard set out in clause 5.26.2 of this specification.
- 5.26.7 The remainder of the trench shall be filled with approved filling and general backfill in accordance with Clauses 5.9.0 and 5.10.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.26.8 Where junctions are required in the line, the junction shall be protected with Class N25 concrete, as detailed on the Pine Rivers Shire Council standard drawing.

5.27.0 TYPE 2 CONSTRUCTION

- 5.27.1 Details for Type 2 construction are shown on the Pine Rivers Shire Council standard drawing. This construction replaces Type 1 construction and other construction types and is designed to provide added strength to the pipeline and to ensure a long working life in sensitive locations. Type 2 construction shall be used as detailed or as directed by the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.27.2 Type 2 construction consists of a full surround of Class N25 concrete. The thickness of the surround shall be not less than 100 mm. The concrete under the pipes shall be placed in the trench before any pipes are laid, and the pipes shall then be bedded firmly and brought to line and grade on the fresh concrete. The balance of the concrete surround shall then be placed without delay and without disturbing the pipes.
- 5.27.3 The contractor shall not be permitted to lay the line on bricks or other material and then place the concrete under the pipes. Flexible joints in the concrete surround shall be provided at intervals not exceeding 9 m, and coinciding with a flexible joint in the pipeline. The means of creating the flexible joint shall be approved by the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.27.4 Where this construction is used with flexible pipes, polyethylene sheet shall be used to separate the concrete from the pipe to allow longitudinal pipe movement to occur.
- 5.27.5 The remainder of the trench shall be filled with approved filling and general backfill in accordance with Causes 5.9.0 and 5.10.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.28.0 TYPE 3 CONSTRUCTION

- 5.28.1 Details for Type 3 construction are shown on the Pine Rivers Shire Council standard drawing. This construction shall be used in conjunction with other construction types and is designed to provide support to pipelines constructed at steeper grades than;
 - ✤ 1:6 for 150 mm dia sewers
 - 1:10 for 225 mm dia sewers
 - 1:15 for 300 mm dia and larger sewers
- 5.28.2 Type 3 construction consists of line stops constructed from Class N25 concrete and embedded in the undisturbed sides and bottom of the trench.
- 5.28.3 The stops shall be placed immediately behind the collars of the pipes, and the stops shall be spaced so that the maximum distance between them is 2 m for vitrified clay and concrete pipes and 6 m for all other pipes.
- 5.28.4 The balance of pipeline construction shall be as for the type appropriate for a similar pipeline on normal grades.

5.29.0 TYPE 4 CONSTRUCTION

- 5.29.1 Details for Type 4 construction are shown on the Pine Rivers Shire Council standard drawing. This construction replaces Type 1 construction and other construction types. It shall be used where the bottom of the excavated trench is unable when in a dry condition to provide support to allow the compaction of sand or naturally occurring bedding material to the required standard.
- 5.29.2 Type 4 construction consists of a 300 mm depth of gravel or crushed rock and a 75 mm depth of bedding material below the pipe and further bedding, approved filling and backfill material as for Type 1 construction in accordance with Clause 5.26.0 of this specification.
- 5.29.3 The gravel or crushed rock shall consist of particles generally between 19.0 mm and 37.5 mm in size 100 percent of the material shall pass the 37.5 mm sieve, with not more than 20 percent passing a 19.0 mm sieve and not more than 5 percent passing a 6.7 mm sieve.
- 5.29.4 The gravel shall be compacted by a single pass of a heavy vibrating plate before the normal bedding is placed and compacted.
- 5.29.5 The pipe bedding, approved filling and backfill shall be constructed as per Type 1 construction.

5.30.0 TYPE 5 CONSTRUCTION

- 5.30.1 Details for Type 5 construction are shown on the Pine Rivers Shire Council standard drawing. This construction replaces Type 1 construction and other construction types. This construction shall be used where the bottom and sides of the excavated trench are unable to provide support to allow the compaction of sand, naturally occurring material, gravel or crushed rock to the required standard.
- 5.30.2 Type 5 construction consists of a 100 mm layer of gravel or crushed rock placed and compacted by a single pass of heavy vibrating plate. The grading of the gravel or crushed rock shall be as described in Clause 5.29.3 of this specification.

Pipe bedding / surround consisting of gravel or crushed rock, not less that 200 mm deep below the underside of the pipe, shall then be placed within a layer of geotextile as indicated on the Pine Rivers Shire Council standard drawing.

The purpose of the geotextile fabric is to prevent the migration of the pipe bedding / surround into the adjacent natural material.

5.30.3 Pipe bedding / surround for Type 5 construction shall be non-cohesive granular material, free from particles which may be retained on a 19 mm sieve with not more that 10% passing a 2.36 mm sieve.

Angular material which, in the opinion of a Pine Rivers Shire Council engineer, may damage flexible pipes or the protective coating on rigid pipes shall not be used.

5.30.4 The pipe bedding shall be placed in layers not exceeding 150 mm and compacted by hand tamping or vibration to the satisfaction of a Pine Rivers Shire Council engineer. Well graded material shall achieve a minimum density index (DI) of 60.

5.30.5 The geotextile fabric shall be non-woven, thermally or mechanically bonded, with a mass not less than 150 g/m², a CBR tensile strength of 2700 N minimum and a puncture resistance measured by the drop cone test producing a hole not greater than 16 mm dia.

The remainder of the trench shall be filled with approved filling and general backfill in accordance with Clauses 5.9.0 and 5.10.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.31.0 TYPE 6 CONSTRUCTION

- 5.31.1 Details for Type 6 construction are shown on the Pine Rivers Shire Council standard drawing. This construction shall be used where all other construction types are unsuitable.
- 5.31.2 Type 6 construction consists of a 100 mm layer of gravel or crushed rock, compacted by a single pass of a heavy vibrating plate, upon which a 500 mm deep gabion lined with geotextile fabric and filled with gravel or crushed rock, is placed.
- 5.31.3 The gabion shall be formed by preparing a cage of PVC coated galvanised wire mesh supported by timber sheeting to limit bending when lifted into the trench. The cage shall be lined with geotextile fabric and filled with gravel or crushed rock of 20 mm to 75 mm nominal size. The geotextile fabric shall be folded and overlapped 500 mm at the top of the cage and the wire mesh joined to complete the cage. The cage shall not exceed 3000 mm in length. The geotextile fabric shall be as specified in clause 5.30.5 of this specification and the wire mesh shall be of adequate strength to permit the gabion to be lifted into place.
- 5.31.4 The gabion shall then be lifted into the trench by slings placed around the cage and timber or by wire ropes threaded through the gabion and passing through the timber base.
- 5.31.5 With the gabion in place on the aggregate base layer, the bedding shall be completed in a similar manner to Type 5 construction.
- 5.31.6 The remainder of the trench shall be filled with approved filling and general backfill in accordance with Clauses 5.9.0 and 5.10.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.32.0 TESTING OF PIPELINES

- 5.32.1 All pipelines shall be subjected to an internal vacuum test after completion of pipe laying. This test shall be carried out after backfilling takes place although the contractor may elect to carry out an additional test at their own expense at the completion of pipe laying.
- 5.32.2 The contractor shall supply all the equipment necessary to carry out the specified tests, which shall be carried out in the presence of the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.32.3 Vacuum testing of pipelines shall be carried out in accordance with Clauses 5.32.4 to 5.32.10 of this specification.
- 5.32.4 The full length of the pipeline (manhole to manhole) complete with all fittings including house connection branches shall be tested in one test (not separately). All equipment used for the testing shall be fit for the purpose to the satisfaction of a Pine Rivers Shire Council engineer.

- 5.32.5 All ends of the pipeline are to be plugged, one plug containing a suitable connection for the vacuum line. The plugs are to be firmly attached in place in order to avoid the plugs being "sucked" into the line during the vacuum test.
- 5.32.6 Connect the vacuum pump to the fittings and draw a vacuum of 30 KPa.
- 5.32.7 Hold the vacuum at 30 KPa for a minimum of three minutes to enable the system to stabilise.
- 5.32.8 Close off the vacuum line to the pipe and measure the time taken for pressure to drop 5 KPa. 5.32.9 If the time taken is less than the minimum times stated in Table 5.2, the test shall have failed.

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Main Sewer Diameter (mm)	150	225	300	375	450	525	600
Min. Time to Drop 5 KPa	5 r	nin		15 min		25	min

5.32.10 Should any line not pass a test, the contractor shall isolate the leak and undertake any remedial works required. On completion of the remedial works, the line shall again be tested, until the pipeline complies with the above standard to the satisfaction of the superintendent and / or a Pine Rivers Shire Council engineer

5.33.0 BACKFILLING OF EXCAVATION

- 5.33.1 Trenches shall not be backfilled until the lines have been visually inspected by the superintendent and / or a Pine Rivers Shire Council engineer, construction details recorded and permission given by him/her for filling to commence.
- 5.33.2 Approved filling shall be selected and placed to a level 300 mm above the crown of the pipe for rigid pipe or the bedding for flexible pipe in accordance with Section 5.9.0 of this specification. The remaining backfill shall be placed by methods which will ensure maximum compaction without damage to the pipes in accordance with Section 5.10.0 of this specification. Should the material excavated in a particular area be unsuitable for refilling, the contractor then shall backfill using suitable material excavated from other areas within the works site or imported to the site.
- 5.33.3 Where trench shoring has been used during excavation the contractor shall exercise particular care in its removal during the backfilling operation. The contractor shall not remove the shoring in such a way that the sides of the trench are permitted to fall or voids are left in the backfilled material.
- 5.33.4 Where excavation is in tunnel the refilling shall be with sand filling compacted by flooding with water or immersion vibration.
- 5.33.5 The backfilling of excavation under railway lines shall be carried out in accordance with Section 5.22.0 of this specification.
- 5.33.6 The backfilling of excavation under state controlled roads shall be carried out in accordance with Section 5.23.0 of this specification.

- 5.33.7 The backfilling under new roads and driveways shall be carried out in accordance with Section 5.24.0 of this specification. The backfill material shall be brought up to the underside of pavement. Pavement materials, similar to and of the same depth as the new road pavement material shall then be placed and compacted and brought up to the underside of the surfacing material. The pavement material shall be compacted to the relevant standard as set out in Section 5.10.2 of this specification.
- 5.33.8 Under existing roads a 600 mm depth of no slump (20:1 mix) lean mix concrete shall be placed on top of the compacted filling and brought up to the underside of the surfacing material. This shall be compacted in four layers with each receiving two passes of a heavy vibrating plate or similar compaction equipment.

5.34.0 RESTORATION OF SURFACES

- 5.34.1 All surfaces shall be restored in such a manner that they conform generally to the levels, grades and types of surface material existing before the work was commenced. Restored surfaces shall be maintained in such a way as to avoid any hazards or inconvenience. In private properties, routes of normal access shall be restored to a safe and trafficable condition by the close of work each day.
- 5.34.2 Garden soil to a maximum depth of 300 mm shall be replaced during backfilling with material approved by the superintendent and / or a Pine Rivers Shire Council engineer as equivalent to that removed.
- 5.34.3 In grassed areas, the top 150 mm of the backfilling shall be carried out with material approved by the superintendent and / or a Pine Rivers Shire Council engineer as equivalent to that removed. Where turfs have been removed, they shall be replaced on this material and top dressed.
- 5.34.4 All backfilling shall be completed as soon as practicable on each pipe length. Areas affected shall be cleared up, the surfaces made good and all surplus materials carted away.
- 5.34.5 All improvements on premises which have been damaged by the contractor shall be made good or replaced so as to be the equal of those existing before the contractor's operations. Where a clothes line on private premises cannot be restored within two days, it shall be reerected in a temporary location until such time as permanent restoration can be carried out, unless agreed otherwise with the occupier.
- 5.34.6 All restoration works shall be to the satisfaction of the superintendent and/or a Pine Rivers Shire Council engineer. Initial cleaning up shall be carried out as soon as backfilling is completed, and restoration in private premises shall be completed within seven days after backfilling.

Beyond this time the superintendent and / or a Pine Rivers Shire Council engineer may arrange to have the work carried out at the contractor's expense.

- 5.34.7 In bitumen, asphalt or concrete surfaces the edges of the excavation shall be saw-cut in straight lines before any surface restoration is attempted. Some preliminary cutting before excavation commences may assist in limiting the width of surface damaged.
- 5.34.8 Bitumen seal coats shall be restored using a prime coat and seal coat in accordance with the Pine Rivers Shire Council current specifications. If directed by the superintendent and / or a Pine Rivers Shire Council engineer, hot mixed asphalt shall be used in lieu of the bitumen seal Pine Rivers Shire Council Design Manual

coats.

- 5.34.9 Asphalt surfaces shall be restored using hot mixed asphalt in accordance with Pine Rivers Shire Council specifications. The thickness of asphalt shall be not less than 40 mm.
- 5.34.10 Concrete surfaces shall be restored with class N32 concrete with a surface texture matching the original surface as closely as possible. The depth of concrete shall be not less that of the existing concrete. In reinforced concrete surfaces, either dowel bars shall be used or the reinforcement in the original surface shall be exposed and bonded with reinforcement placed in the surface to be repaired. External edges of concrete surfaces shall be poured against secure formwork to restore the true edge shape of the original concrete.
- 5.34.11 The contractor shall, from time to time, as required, provide and place any pavement material, topsoil or other material that may be necessary to make good any subsidence and shall ensure that the restored surfaces are maintained throughout the duration of the contract in conformity with the level of the adjoining surfaces to allow the safe and convenient passage of traffic.
- 5.34.12 The superintendent and / or a Pine Rivers Shire Council engineer may require that designated areas receive special restoration using any one of a number of special techniques which are available. These may include re-seeding, turfing, hydraulic seeding and mulching and may include provision for the protection of newly restored surfaces using fibre matting.
- 5.34.13 For areas nominated by the superintendent and / or a Pine Rivers Shire Council engineer to be re-seeded, the contractor shall remove the top 100 to 150 mm of sand and / or soil including vegetable matter and stockpile for later re-use. On completion of backfilling the material removed in accordance with the preceding operation shall be spread uniformly over the disturbed area and covered with a light cover of topsoil to minimise wind erosion and leaching out. The whole of the disturbed area shall then be seeded with an approved mixture of grass seeds and fertilizer including trace elements.

One mixture which has been successfully used is provided in Table 5.3

Table 5.3

1 kg Husked Couch Seed (Cynodon Dactylon)
1 kg Japanese Millet (Summer application)
1 kg Green Pannikan
10 kg Q5/ with copper, zinc and molybdenum
10 kg Nitran

The approved mixture shall be spread at the rate of not less the 2.9 kg per 100 m^2 . The mixture shall be lightly raked in and the whole area immediately hand watered. Watering in compliance with the Pine Rivers Shire Council regulations shall than be carried out as necessary until the grass is well established.

- 5.34.14 For areas nominated by the superintendent and / or a Pine Rivers Shire Council engineer to be turfed, the surface of the backfilled trench and adjoining area shall be raked smooth at a depth of 75 mm below the required finished surface level. The turfs shall be of Cynodon Dactylon (green couch). The grass shall be of good quality free from paspalums, nut grass, oxalis and other weeds. Turfs shall be cut 300 mm wide x 3 m length approximately, and 50 mm 60 mm thick. Turfs shall be cut and delivered to the site so as to minimise time between delivery and laying. If necessary, the turfs shall be rolled with the grass facing inwards. A sample of two square metres of turf shall be submitted to the superintendent and / or a Pine Rivers Shire Council engineer at least one week prior to the commencement of laying of turfs. If approved, all turfs shall be of at least equal quality. If rejected, further samples from different sources shall be submitted, until an approved source is found.
- 5.34.15 For areas nominated by the superintendent and / or a Pine Rivers Shire Council engineer, the contractor shall use hydraulic seeding and mulching (referred to as hydromulching). Only qualified personnel with a proven ability to apply hydromulching treatment shall be employed by the contractor to perform this work. The contractor shall submit to the superintendent and / or Pine Rivers Shire Council engineer documentary evidence listing similar projects satisfactorily completed together with a statement of the qualifications and/or experience of the personnel to be employed on the works.

Seed, fertiliser, wood-fibre mulch, water and binder shall be thoroughly mixed together to provide a slurry and shall then be applied under pressure on to the area to be treated by means of hydromulching equipment specifically designed for this purpose. Prior to spraying the slurry, the contractor shall cover the area to be treated with topsoil to a depth of 75 mm. Spraying of the slurry shall be carried out as soon as possible after topsoiling, but not later than two weeks. The topsoiled area shall first be watered with a fine water spray to thoroughly moisten the soil to a depth of at least 25 mm without inducing any erosion. Spraying of the slurry shall then take place while the topsoil is still moist. After the slurry has been sprayed, further watering shall be applied, as ordered by the superintendent and/or a Pine Rivers Shire Council engineer. Application rates shall be as listed in Table 5.4 below. The contractor may submit alternative mixes to the superintendent and/or a Pine Rivers Shire Council engineer.

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MATERIALS FOR HYDROMULCHING				
MATERIAL		RATE OF APPLICATION		
(A)	Wood-fibre	2.5 tonnes / hectare		
	Defibrated pinus radiata dyed green			
(B)	Binder	1000 - 2000 litres / hectare		
	Anionic bitumen emulsion 50/50 bitumen/water			
or	Polymer binder	maximum 250 l/ha		
(C)	Certified seed			
	PRIMARY CEREAL COVER	SUMMER MIX	WINTER MIX	
Japanese Millet		25 kg / ha	-	
Perennial rye grass		-	40g / ha	
SECONDARY GRASS COVER		SUMMER MIX	WINTER MIX	
Green couch		15 kg / ha	25 kg / ha	
Rhodes grass		15 kg / ha	15 kg / ha	
(D)	Fertiliser Type to be approved by superintendent and/or a Pine Rivers Shire Council engineer	250 - 400 kg / hectare		

Summer shall be defined as from October to March inclusive. Winter shall be defined as from April to September inclusive.

5.34.16 Areas to be protected against erosion during the establishment of the grass cover shall be covered with a heavy duty fibremat. The heavy duty fibrematting (Enviromat or similar approved by the superintendent and/or a Pine Rivers Shire Council engineer) shall be supplied and laid to the manufacture's recommendations.

5.35.0 CLEANING PIPELINES

5.35.1 Before any pipelines are taken over by the Pine Rivers Shire Council, the contractor shall clear them by flushing with clear water and pulling an appropriate device through the pipeline to remove any material deposited there during construction. The contractor shall remove this flushing water from the pipe system and shall not allow it to flow into the Pine Rivers Shire Council sewer system. All lines will be inspected after cleaning and will not be taken over until they present a clear barrel free from any obstruction. The contractor shall dispose of the flushing water in a manner approved by the superintendent and/or a Pine Rivers Shire Council engineer.

5.36.0 MANHOLES

- 5.36.1 Cast *in situ* manholes shall be constructed in accordance with the Pine Rivers Shire Council Standard drawings. The manholes shall be constructed from Class N32 concrete.
- 5.36.2 Pre-cast manholes shall be constructed in accordance with the Pine Rivers Shire Council Standard drawings. The base of the manhole and that part of the wall extending up to 100 mm above the top of the highest pipe entry shall be constructed in accordance with the Pine Rivers Shire Council Standard drawings for *in situ* manholes. The pre-cast sections shall be constructed from Class N40 concrete to a design approved by the Pine rivers Shire Council. The contractor shall ensure that the pre-cast manholes are constructed to the details indicated on the Pine Rivers Shire Council standard drawings.
- 5.36.3 Joints between pre-cast sections and between a pre-cast section and an *in situ* base shall be able to sustain a hydrostatic pressure of 100 KPa.
- 5.36.4 Manhole cover frames shall be set in a concrete surround as shown on the Pine Rivers Shire Council Standard drawings for both types of manholes. The surround shall be mounted on the top slab in such a way as to resist horizontal shear forces. In the case of an *in situ* manhole this is achieved by ring ties or dowels. In the case of a pre-cast manhole this is achieved by recessed joints.
- 5.36.5 In both types of manholes the joint between the top slab and the wall shall be similarly constructed to resist horizontal shear forces.
- 5.36.6 The contractor shall ensure the proper placement of approved sealant, sealing rings or waterstop material in joints between the manhole top and wall and wall sections to ensure the chamber is watertight and will pass the vacuum test.
- 5.36.7 Manholes requiring the installation of bolt-down covers shall be constructed as cast *in situ* manholes.
- 5.36.8 Manhole covers and concrete rings shall be finished accurately to the levels shown on the drawings and shall wherever appropriate be sloped to conform to the required slope of road pavements or shoulders, footpaths or other areas. All covers shall sit evenly on the seatings without rocking and shall give as near as possible a watertight joint. Sealing shall be provided by use of an approved section of polyurethane foam impregnated with asphaltic bitumen or other method approved by a Pine Rivers Shire Council engineer. This shall be applied after the "on-maintenance" inspection.
- 5.36.9 All benches and channels shall be rendered with a 2:1 fine sand and Portland cement mortar and finished with a steel trowel true to the shape and dimensions shown.
- 5.36.10 Where required manholes shall be fitted with step irons or aluminium ladders complying with AS 1657 and with the Pine Rivers Shire Council requirements for the treatment of embedded aluminium or aluminium surfaces in contact with concrete.

5.37.0 TESTING OF MANHOLES

5.37.1 The Pine Rivers Shire Council standard test method for determining the acceptance of sewer manholes shall be vacuum testing. Hydrostatic and low pressure air tests are specifically not accepted.

- 5.37.2 Vacuum testing of sewer manholes shall be carried out in accordance with Clauses 5.37.3 to 5.37.15 of this specification.
- 5.37.3 The minimum number of sewer manholes tested in any project shall be in accordance with Table 5.4. The manholes to be tested shall be selected at random by a Pine Rivers Shire Council engineer who shall nominate the manholes to be tested.

Table 5.5Manhole Testing Frequency

Number of Manholes in Project	Minimum Percentage Tested Initially
<5	100%
6 to 10	50%
11 to 20	33%
>20	25%

Note:-

Where a project contains both precast concrete and cast *in situ* concrete manholes, each type shall be viewed as a separate population and the above criteria shall apply to each population separately within the project.

- 5.37.4 Cast *in situ* manholes shall not be tested within ten days of completion.
- 5.37.5 Precast manholes shall not be tested within three days of completion of benching.
- 5.37.6 Vacuum testing of manholes shall be carried out after completion of backfilling around the structure.
- 5.37.7 All pipe openings of the manhole to be tested shall be plugged before the test. The plugs shall be firmly attached in place in order to avoid the plugs being "sucked" into the manhole during the vacuum test.
- 5.37.8 The vacuum test head shall be placed in the top of the manhole and the seal inflated.
- 5.37.9 With all plugs and the vacuum test head in place, connect the vacuum pump and draw a vacuum of 30 kPa.
- 5.37.10 Hold the vacuum at 30 kPa for a minimum of three minutes to enable the system to stabilise.
- 5.37.11 Close off the vacuum line to the manhole and measure the time taken for the pressure to drop by 5 kPa. If the time taken is less than the minimum times stated in Table F, the test shall have failed.

Table	5.6
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Manhole Diameter	Minimum Time to Drop 5 KPa
1100	5 min
1500	15 min

- 5.37.12 Should any manhole fail the above test, it shall be repaired by the contractor in a manner approved by a Pine Rivers Shire Council engineer and retested.
- 5.37.13 Where the manhole test is witnessed by a superintendent other than a Pine Rivers Shire Council engineer, the superintendent shall provide a certificate detailing the result of the initial test (and any subsequent retesting) to the satisfaction of a Pine Rivers Shire Council engineer.
- 5.37.14 Not withstanding the provision for a superintendent other than a Pine Rivers Shire Council engineer to witness the manhole test, Council reserves the right to order additional testing to be witnessed by a Pine Rivers Shire Council engineer. Where such testing proves unsatisfactory in accordance with Clauses 5.37.7 to 5.37.11 of this specification, the manhole shall be repaired and retested in accordance with Clause 5.37.12 of this specification.

5.38.0 HOUSE CONNECTION BRANCHES

- 5.38.1 House connection branches shall be constructed in accordance with the Pine Rivers Shire Council standard drawing. House connection branches shall be constructed in sewers in the positions shown on the house connection plans or as directed by the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.38.2 Concrete used in the construction of house connection branches shall be Class N25.
- 5.38.3 The depth of the house connection branch shall be sufficient to permit the servicing of the whole of the area within building lines with a house drain gradient of 1:40.
- 5.38.4 The general maximum depth to invert of a house connection branch measured at the inspection opening shall be 1.0 m unless otherwise approved by a Pine Rivers Shire Council engineer.

5.39.0 HOUSE DRAINS

- 5.39.1 Where house drains are to be constructed under a Pine Rivers Shire Council sewerage scheme or to connect an existing dwelling adjacent to a development, construction of the house drains shall comply with the requirement of the standard sewerage by-laws.
- 5.39.2 Prints of approved house drain designs will be supplied by a Pine Rivers Shire Council engineer during the construction period.
- 5.39.3 Each house drain shall be constructed in accordance with these drawings, but construction shall be stopped at a point or points to be selected by the superintendent and / or a Pine Rivers Shire Council engineer. In general, this will be just prior to the first branch junction but in some cases the drain will be ordered to be laid beyond this point. An inspection opening pipe shall be provided at the end of each section of line to facilitate testing of both upstream

and downstream sections of the line. In no case will the contractor be required to install disconnecter traps or closet or vent bends.

5.40.0 PAYMENT UNDER A SCHEDULE OF RATES CONTRACT

- 5.40.1 This section of the specification is intended primarily for the Pine Rivers Shire Council projects. It may also be applied to other projects as described in the job specification and schedules.
- 5.40.2 This section of the specification identifies the obligations of the contractor and the items in the schedule of rates under which it is expected that a competent contractor would make a cost allowance to meet these obligations. The contractor shall not be entitled to any additional payment in meeting obligations set out in this specification or to be implied from the description of works to be carried out but not specifically referred to in this section. The clause numbers listed in the clauses below are as found in this specification.
- 5.40.3 The contractor's obligations under Section 5.1, 5.2, 5.3, 5.5, 5.6, 5.9, 5.10, 5.16 (Clauses 5.16.1 and 5.16.2), 5.17, 5.18 (Clause 5.18.4), 5.21, 5.24, 5.33 and 5.34 (Clauses 5.34.1 to 5.34.6 and 5.34.11), shall be allowed for in the rates for items relating to excavation and backfilling.
- 5.40.4 The contractor's obligations under Section 5.7 shall be allowed for in the rates for items relating to supply of pipes.
- 5.40.5 The contractor's obligations under Section 5.8, 5.26, 5.27, 5.28, 5.29, 5.30 and 5.31 shall be allowed for in the rates for items relating to the various construction types. The rates for types 2 to 6 inclusive shall be in addition to the quoted rate for Type 1 construction.
- 5.40.6 The payment for construction types shall be based on a linear measurement except for Type 3 construction which is based on actual number. The linear measurements shall be taken from outside to outside of structure including manholes.
- 5.40.7 The contractor's obligations under Sections 5.11, 5.12, 5.13, 5.14, 5.16 (Clause 5.16.3), 5.19, 5.20, 5.22, 5.34 (Clause 5.34.7 to 5.34.10 and 5.34.12 to 5.34.16 inclusive), 5.36, 5.38, 5.39 shall be allowed for in the rates for items specifically included for these works in the schedule.
- 5.40.8 The contractor's obligations under Sections 5.15, 5.25, 5.32, and 5.35 shall be allowed for in the rates for items relating to laying and jointing.
- 5.40.9 The payment for excavation and backfilling shall be based on the linear measurement from outside of structure or manhole.
- 5.40.10 The payment for excavation of rock shall be based on the volume of rock removed. This shall be calculated from the standard trench width, the length over which it occurred and the actual depth to a maximum of 75 mm below the barrel of the pipe. In the case of rock excavation at a manhole it shall be calculated from the outside diameter of the manhole multiplied by the depth over which it occurred.
- 5.40.11 The payment for supply, lay and joint shall be based on a linear measurement of the length actually laid. This payment shall include bedding to Type 1 standard with naturally occurring materials.

- 5.40.12 Payment for special backfilling materials for use under railways, state controlled roads, roads or other specified locations shall be by volume based on a standard trench width unless otherwise agreed with the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.40.13 In general, payment will be made only in respect of lines which have been completed structure to structure, backfilled, tested and the surface restored.
- 5.40.14 Payment for restoration of surfaces shall be based on area calculated from the linear measurement along the pipeline multiplied by the standard trench width.