

PINE RIVERS SHIRE COUNCIL

DESIGN MANUAL

CIVIL INFRASTRUCTURE DESIGN



SPECIFICATIONS

AusSpec	Asset Owner Specifications (Roadworks & Drainage)
AusSpec	Development Construction Specifications (Roadworks & Drainage)
PRSC 100	Roadworks Specifications
PRSC 400	Water Supply Specifications
PRSC 500	Sewerage Specifications

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 502 – SEWER PRESSURE PIPELINE CONSTRUCTION



PRSC 502 SEWER PRESSURE PIPELINE CONSTRUCTION

1.0.0	PURPOSE	1
2.0.0	SCOPE	2
3.0.0	REFERENCES	3
4.0.0	DEFINITIONS	6
5.0.0	SPECIFICATION	7
5.1.0	Work on the Pine Rivers Shire Council Controlled Premises.....	7
5.2.0	Work on Other Premises	7
5.3.0	Working Hours.....	8
5.4.0	Information Supplied to the Contractor	8
5.5.0	Setting Out	8
5.6.0	Materials and Work Standards	9
5.7.0	Pipe	9
5.8.0	Pipe Materials.....	10
5.9.0	Sluice Valves.....	11
5.10.0	Knife Gate Valves.....	11
5.11.0	Reflux Valves	12
5.12.0	Coating of Valves and Pipework.....	12
5.13.0	Cartage.....	14
5.14.0	Pipe Bedding	14
5.15.0	Approved Filling.....	15
5.16.0	Backfilling	15
5.17.0	Sand Filling of Trenches Under Road Pavements.....	16
5.18.0	Imported Filling	16
5.19.0	Concrete.....	16
5.20.0	Cast Iron Covers and Frames	17
5.21.0	Water Required for Works	17
5.22.0	Timber	17
5.23.0	Nature of Ground.....	17
5.24.0	Excavation	18
5.25.0	Tunnelling.....	20
5.26.0	Rock	20

5.27.0	Underground Services.....	21
5.28.0	Excavation Under Railway Lines	22
5.29.0	Excavation Under State Controlled Roads	23
5.30.0	Excavation Under Other Roads.....	23
5.31.0	Laying and Jointing Pipes.....	23
5.32.0	Type 1 Construction	27
5.33.0	Type 2 Construction	27
5.34.0	Type 3 Construction	28
5.35.0	Type 4 Construction	28
5.36.0	Type 5 Construction	29
5.37.0	Type 6 Construction	29
5.38.0	Fittings, Valves, Air Releases, Scour Valves etc.....	30
5.39.0	Fasteners and Miscellaneous Items	30
5.40.0	Thrust Blocks.....	31
5.41.0	Testing of Pipelines	32
5.42.0	Backfilling of Excavation	33
5.43.0	Restoration of Surfaces	34
5.44.0	Cleaning Pipelines.....	37
5.45.0	Installation of Valve Boxes, Margin Setts and Markers.....	37
5.46.0	Payment Under a Schedule of Rates Contract.....	37



1.0.0 PURPOSE

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

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 by 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

3.1.0 The following shall apply:-

Sewerage and Water Supply Act 1949-1982 with Amendments

Workplace Health and Safety Act 1995 and Regulations with Amendments

AS 2124-1992 General Conditions of Contract

AS 3600-2001 Concrete Structures

AS 4373-1996 Pruning of Amenity Trees

ISO 9001-1994 Quality systems - Model for Quality Assurance in design, development, production, installation and servicing

3.2.0 The following shall apply when the respective materials have been specified or approved for use.

AS/NZS 1111 ISO Metric Commercial Hexagon Bolts and Screws

AS/NZS 1111.1-2000 Product Grade C - Bolts

AS/NZS 1111.2-2000 Product Grade C - Screws

AS 1112-2000 ISO Metric Hexagon Nuts (Set)

AS 1237-1973 Flat Metal Washers for General Engineering Purposes (Metric Series)

AS 1281-2001 Cement Mortar Lining of Steel Pipes and Fittings

AS 1289-2000 Methods of Testing Soils for Engineering Purposes (Set)

AS 1379-1997 The Specification and Manufacture of Concrete

AS/NZS 1477-1999 PVC Pipes and Fittings for Pressure Applications

AS/NZS 1516-1994 The Cement Mortar Lining of Pipelines in situ

AS 1579-2001 Arc Welded Steel Pipes and Fittings for Water and Wastewater

AS 1627-1997 Metal Finishing - Preparation and Pre-treatment of Surfaces

1627.1-2003 Cleaning Using Liquid Solvents and Alkaline Solutions

1627.4-2002 Abrasive Blast Cleaning

1627.9-2002 Pictorial Surface Preparation Standards for Painting Steel Surfaces

AS 1646.1-2000 Elastomeric Seals for Waterworks Purposes – General Requirements

AS 1726-1993 Geotechnical Site Investigations

AS 1742 Manual of Uniform Traffic Control Devices

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 2187 2187.1-1998 2187.2-1993	Explosive - Storage, Transport and Use Storage and Land Transport Use of Explosives
AS/NZS 2280-2004	Ductile Iron Pipes and Fittings
AS/NZS 2312-2002	Guide to the Protection of Iron and Steel against Exterior Atmospheric Corrosion
AS/NZS 2544-1995	Grey Iron Pressure Fittings
AS 2566 AS 2566.1-1998 AS 2566.2-2002	Buried Flexible Pipelines Structural Design Installation
AS 2638.2-2002	Gate Valves for Waterworks Purposes – Resilient Seated
AS 2837-1986	Wrought Alloy Steels - Stainless Steel Bars and Semi-Finished Products
AS 3571-1989	Glass Filament Reinforced Thermosetting Plastics (GRP) Pipes - Polyester Based - Water Supply, Sewerage and Drainage Applications
AS 3578-1993	Cast Iron Non-Return Valves for General Purposes
AS/NZS 3678-1996	Structural Hot-Rolled Steel Plates, Floor Plates and Slabs
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 3996-1992	Metal Access Covers, Road Grates and Frames
AS 4041-1998	Pressure Piping
AS 4087-2004	Metallic Flanges for Waterworks Purposes
AS/NZS 4130-1997	Polyethylene (PE) Pipes for Pressure Applications
AS/NZS 4158-1996	Thermal-Bonded Coatings Polymeric Coatings on Valves and Fittings for Water Industry Purposes
AS 6401-2003	Knifegate Valves for Waterworks Purposes

- 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:-

- ❖ **Construction** - any work necessary for the installation, testing and commissioning of a pressure pipeline. 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
- ❖ **Sewer** - any conduit used for carrying of sewerage from any premises which is not house drain, soil or waste pipe
- ❖ **Rigid pipe** - pipe manufactured from mild steel, ductile iron or cast iron
- ❖ **Flexible pipe** - pipe manufactured from the family of polyvinyl chloride (uPVC), polyethylene (PE) or glass filament reinforced thermosetting plastics (GRP)
- ❖ **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.
- ❖ **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 his/her 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 the 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 the contractor's 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 premise. 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.

5.5.0 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 sewer pressure mains, the principal shall supply the contractor with sufficient information to locate the centreline of each pipeline. The contractor will be supplied with drawings showing the alignment and level of the pipeline the distance between changes in vertical and horizontal alignment, and the diameter, level and grade of the pressure main.

- 5.5.3 In all 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.
- 5.5.4 It shall be fundamental to the contract that the positions of sewers in relation to the boundaries of premises and/or easements and to the improvements thereon, shall be maintained unless authorised otherwise by the superintendent and / or a Pine Rivers Shire Council engineer in writing.
- 5.5.5 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 tradespersons 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 tradespersons shall be employed on those works governed by statutory regulations.

5.7.0 PIPE

- 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 Standards 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 Where DICL pipes are specified, sufficient polyethylene sleeving in accordance with AS 3680 shall be supplied to sleeve all pipe and fittings supplied for the job. Polythene sleeving be applied in accordance with AS 3681.
- 5.7.4 The principal may carry out tests 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 the contractor.

5.8.0 PIPE MATERIALS

5.8.1 Grey iron pressure fittings shall be manufactured, tested and supplied in accordance with AS 2544.

5.8.2 Ductile iron pressure pipes and fittings shall be manufactured, tested and supplied in accordance with AS 2280. Ductile iron pipes shall be PN 20 or PN 35, except that flanged pipes shall be Class K12. All ductile iron pipes and fittings shall be cement lined with a Type SR or Calcium Aluminate sulphate resisting cement, and preferably have spigots and sockets coated with a thermal bonded polymeric coating in accordance with AS 4158.

Ductile Iron pipes Class K9 and K12 are also accepted.

5.8.3 Ductile iron pipes and fittings laid underground shall be given no additional external paint treatment, but shall be wrapped as specified in Clause 5.7.3 of this specification. Pipes and fittings installed above ground shall be treated externally by abrasive blast cleaning followed by painting with an approved system as detailed in AS 2312, reference LP1-A or LP2-A as appropriate to the installation location. The abrasive blast cleaning, location and painting shall comply with Sections 5.12.2 and 5.12.3 of this specification.

5.8.4 PVC pipes (u-, O- and M-) shall be Class 12 minimum or as noted on the drawings and they shall be Series 2 (DICL combatable) supplied in accordance with AS 1477. They shall have spigot and socket push-in type rubber ring joints unless noted otherwise in the job specification or on the drawings. PVC pipes shall be coloured "sewer grey" unless otherwise approved by a Pine Rivers Shire Council engineer.

5.8.5 PVC pipes shall be laid in accordance with AS 2032.

5.8.6 Ductile or cast iron fittings for use with PVC pipes shall have sockets which provide comparable penetration to the sockets of PVC pipes.

5.8.7 Glass filament reinforced thermosetting plastic pipe shall be manufactured, tested and supplied in accordance with AS 3571.

5.8.8 GRP pipes shall be centrifugally cast formed within an external rotating mould and finished with a smooth bore.

5.8.9 Unless otherwise shown on the drawings or specified GRP Pressure pipelines shall have a Pressure Class PN 12.5 and Stiffness Class SN5000.

5.8.10 All steel pipes and fittings shall be spiral welded pipe in accordance with AS 1579 unless otherwise approved by the superintendent and / or a Pine Rivers Shire Council engineer.

5.8.11 Unless noted otherwise on the drawings or in the job specification:-

- a. steel pipes and fittings shall have a fusion bonded external and internal protective coating of medium density polyethylene in accordance with AS 4321; or
- b. steel pipes and fittings shall have a fusion bonded external protective coating of medium density polyethylene in accordance with AS 4321, and be lined internally with a sulphate resisting cement mortar using Type SR cement in accordance with AS 3972, applied in accordance with AS 1281.

- c. The jointing system shall be spigot and socket rubber ring joint or bolted flange joints unless specified otherwise in the drawings or job specification.

5.8.12 All welding shall be carried out in accordance with AS 4041.

5.8.13 All pipes shall be installed to the lines, gradients and levels as are shown on the drawings.

5.8.14 In handling pipes during laying, transporting or during any other process, the greatest care shall be exercised to avoid damage to the pipe or coating. Under no circumstances shall a pipe be lifted by unprotected slings, levered or moved by implements without protecting pads. Slings shall not be less than 300 mm wide. Where pipes are lowered on to the ground they shall rest on padded bolsters, padded ramps or on padded cradles. Mounds of sand or soft earth as supports may be acceptable, subject to approval from the superintendent and / or a Pine Rivers Shire Council engineer. Any damage occurring to the pipe coating shall be made good by the contractor.

5.9.0 SLUICE VALVES

5.9.1 Sluice valves shall be resilient seated type suitable for a working pressure of 1600 KPa and conform to AS 2638.2.

5.9.2 The stem material shall be grade 431 Stainless Steel in accordance with AS 2837, with an integral thrust collar.

The stem seal shall be made by a minimum of two "O" rings, which are able to be replaced under full working pressure.

5.9.3 The direction of closing shall be anti-clockwise.

5.9.4 The wedge shall be cast in ductile iron and totally encapsulated in an approved synthetic rubber conforming to AS1646. Partially coated wedges are not acceptable.

The valve body, bonnet and top castings shall be manufactured from ductile iron and fully enveloped with a thermally bonded polymeric coating in accordance with AS 4158. Alternatively, components may be manufactured from an approved corrosion resistant material without protective coatings.

5.9.5 All fasteners shall be of high grade steel and completely isolated from the external environment or Grade 316 stainless steel.

5.9.6 Sluice valves shall be flanged and drilled to suit the mating flanges.

5.10.0 KNIFE GATE VALVES

5.10.1 Knife gate valves shall be flanged and drilled to suit the mating flanges. Wafer type valves shall not be installed unless specifically approved by a Pine Rivers Shire Council engineer. The body of each valve shall be made of cast iron or a non-corrosive material. Steel flanges shall not be accepted. The gate, seat and all bolts and studs shall be Grade 316 stainless steel. Nuts and washers shall be Grade 304 stainless steel. The valve stem shall be Grade 304 stainless steel or better. Washers shall be provided under all nuts and bolt heads where rotation can occur.

- 5.10.2 Knife gate valve seals shall be of synthetic rubber or Nylon 6. The seal shall not be located in the bottom of a recess in the valve body but shall be located in the side of the recess.
- 5.10.3 Each knife gate shall be tested open and to withstand 75 m head of water. The valve shall be able to operate against an unbalanced head of 10 m from the opposite direction. Drip tightness is not required for the unbalanced head test. The valves shall be fitted with handwheels unless otherwise shown on the drawings.
- 5.10.4 The direction of closing shall be anti-clockwise.
- 5.10.5 Knife gate valves for installation within concrete benching and other similar places where shown on drawings shall be bonneted valves. The valves shall comply with Clauses 5.10.1 to 5.10.3 of this specification with the appropriate actuator installed as shown on the drawings or as specified.
- 5.10.6 Knife gate valves, installed above ground or in sewerage wet wells, which are not of all stainless steel manufacture shall be coated in accordance with Section 5.12.0 of this specification.

5.11.0 REFLUX VALVES

- 5.11.1 Reflux valves utilising springs to effect closure shall not be accepted.
- 5.11.2 The reflux valves shall be cast iron, flanged, swing check non-return valves in accordance with AS 3578. Materials of construction shall be:-
- | | | | |
|------|-------------------------|---|---------------------------|
| i. | body | - | cast iron |
| ii. | body seat | - | bronze |
| iii. | clapper | - | bronze |
| iv. | arm and pin | - | Grade 304 stainless steel |
| v. | bolts, nuts and washers | - | Grade 316 stainless steel |
- 5.11.3 Unless otherwise specified, the exterior metal parts of all valves shall be abrasive blast cleaned and painted in accordance with Section 5.12.0 of this specification.

5.12.0 COATING OF VALVES AND PIPEWORK

- 5.12.1 All knife gate valves, reflux valves and pipework not of all stainless steel manufacture, which is located above ground or in sewerage wet wells shall be supplied with a thermally bonded polymeric coating in accordance with AS 4158, or alternately, they are to be coated in accordance with Clauses 5.12.2 and 5.12.3 of this specification.

5.12.2 ABRASIVE BLAST CLEANING

- i. The surfaces to be blast cleaned shall be dry abrasive blast cleaned to a metal finish in accordance with AS 1627-Part 4 and AS 1627-Part 9 using one of the following methods:-
- ✦ grit blasting using compressed air nozzles;
 - ✦ grit blasting using centrifugal wheels; or
 - ✦ sand blasting using compressed air nozzles.

- ii. Metallic abrasive, where used, shall comprise cast iron, cut wire or grit and shall be hard, sharp and free from dust. The maximum particle size shall be not larger than that passing through 1.18 mm Australian standard sieve.
- iii. Non-metallic, silica free and silica material shall not be re-used in the blasting operation.
- iv. All free oil and moisture shall be effectively removed from the air supply lines of all blasting equipment using adequate filters and driers.
- v. After blasting, the surface shall be brushed or blown down with clean dry air (using driers and oil mist filters in air lines), or vacuum cleaned to remove all blast products and abrasives from the entire surface including pockets and corners.
- vi. Blast cleaning operations shall not be performed on objects which have a surface temperature which is less than 3⁰C above the dew point of the ambient temperature, or when the humidity is calculated using a hygrometer, the wet bulb temperature differs from the dry bulb temperature by less than 7½% of the dry bulb temperature.
- vii. The cleaned surfaces shall be kept free of all contamination before painting and shall not be touched by bare hands or other bare parts of the body.
- viii. Any areas which become contaminated shall be immediately solvent cleaned in accordance with AS 1627 - Part 1.
- ix. Any surface which has been abrasive blast cleaned shall be coated within four hours or less of blasting depending on climatic conditions.
- x. All reference to the standard surface preparation shall be to AS 1627 - Part 4 Section 1.4 and AS 1627 - Part 9.

5.12.3

PAINTING

- i. Where fabricated articles are not specified or shown on the drawings to be galvanized or hot dip galvanized, they shall be painted.
- ii. Proposed paint systems shall be submitted to the superintendent and/or a Pine Rivers Shire Council engineer for approval before use. Full details of the paint manufacturers' specifications, which shall include details of methods of application, dry film thickness, pot life, drying time, re-coating time thinners and compatibility between primer and top coats shall be submitted.
- iii. The fabricated articles shall be cleaned by abrasive blast to a surface standard at least equal to Class 2½ as defined by AS 1627 - Part 4.
- iv. For wetted surfaces, the paint system shall be suitable for continuous immersion and, in the case of potable water, shall be approved by the Government Paint Committee for that purpose. The metalwork shall be painted with an approved system as detailed in AS 2312, reference LP1-A i.e. primed with an inorganic zinc silicate with a minimum dry film thickness of 65 microns and maximum of 75 microns, followed by two coats of high build catalysed epoxy paint, the two coats being different shades or colours. Total dry film thickness shall be not less than 325 microns. Micaceous iron oxide may be incorporated into the first of the two coats to assist bonding.

- v. For other surfaces, the steelwork shall be painted with an approved system as detailed in AS 2312, reference LP2-A i.e. primed with an inorganic zinc silicate with a minimum dry film thickness of 65 microns and maximum of 75 microns, followed by two coats of high build catalysed epoxy micaceous iron oxide paint, the two coats being different shades or colours. Total dry film thickness shall be not less than 325 microns.

5.13.0 CARTAGE

- 5.13.1 The contractor shall cart all materials to their appropriate position in the pipeline. This cartage shall include all necessary loading and unloading.
- 5.13.2 Every care shall be taken during loading, stacking, carting and handling of pipes, fittings or materials. On no account shall pipes or fittings be dropped off trucks or allowed to collide with one another when rolled down skids. The use of chain, wire rope slings or fastenings will not be permitted on pipes unless properly protected with rubber belting. Damage to any coatings shall be made good in a manner satisfactory to the superintendent and / or a Pine Rivers Shire Council engineer.
- 5.13.3 In the distribution of any pipes, fittings, valves or other material along streets, roadways or easements, care shall be taken not to cause any blockage or hindrance to drainage or traffic of any sort.

5.14.0 PIPE BEDDING

- 5.14.1 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.
- 5.14.2 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 in Table 5.0, unless otherwise directed.

Table 5.0

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

- 5.14.3 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.

5.14.4 Materials which occur naturally at the site of the works may be suitable subject to approval from 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.

5.14.5 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.

5.15.0 APPROVED FILLING

5.15.1 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.

5.15.2 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.

5.15.3 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.

5.15.4 A Pine Rivers Shire Council engineer may require that rigid pipes be laid in a pipe bedding surround where they are not satisfied with the quality of material proposed to be used as approved filling.

5.15.5 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 dry density of 95% - standard compaction or a minimum density index (DI) of 65.

5.16.0 BACKFILLING

5.16.1 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 a Pine Rivers Shire Council engineer.

5.16.2 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 Table 5.1.

Table 5.1

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

5.16.3 Unless otherwise approved by a Pine Rivers Shire Council engineer, the frequency of testing to confirm compliance with the requirements of Clause 5.16.2 of this specification shall be the greater of:-

- i. one test per 40 m of trench per two layers of compacted backfill (total compacted thickness not exceeding 600 mm) or
- ii. one set of tests per line.

5.17.0 SAND FILLING OF TRENCHES UNDER ROAD PAVEMENTS

5.17.1 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.

5.18.0 IMPORTED FILLING

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

5.19.0 CONCRETE

5.19.1 Concrete used for the construction of thrust blocks, structures and the restoration of concrete surfaces shall be Class N32 in accordance with AS 1379.

5.19.2 Concrete used for backfilling Types 2 and 3 construction and in other situations directed by the Pine Rivers Shire Council shall be Class N25 in accordance with AS 1379.

5.19.3 Lean mix concrete used for backfilling trenches under existing roads shall be a no slump (20:1 mix) in accordance with AS 1379.

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

5.20.0 CAST IRON COVERS AND FRAMES

5.20.1 Covers and frames for valves, air releases, chambers and other structures shall be grey iron or ductile iron to the details shown on project drawings or the Pine Rivers Shire Council standard drawings unless otherwise approved by a Pine Rivers Shire Council engineer. Multi-part cover systems with removable beams which provide a full opening are permitted.

5.20.2 Cast iron covers used in roadways or other areas subject to vehicular traffic shall be heavy duty covers complying with Class D of AS 3996.

5.20.3 Cast iron covers used in areas not subject to vehicular traffic shall comply with Class B of AS 3996.

5.20.4 Covers shall be set flush with the surface of the pit or chamber, free from any protrusions and shall provide a watertight installation. The lifting rebates shall be plugged with plastic inserts supplied by the manufacturer. Care shall be taken that concrete infill does not spill into lifting rebates, and any concrete which does shall be removed immediately.

5.21.0 WATER REQUIRED FOR WORKS

5.21.1 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.

5.21.2 The contractor shall abide by any restrictions imposed on the use of water by a Pine Rivers Shire Council engineer. The Pine Rivers Shire Council may impose a charge for water used if the contractor is deemed to be wasting water.

5.21.3 Reticulated water shall not be used for general earthworks.

5.22.0 TIMBER

5.22.1 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, waness, shakes, gum veins, cores and other defects.

5.22.2 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.

5.22.3 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.

5.23.0 NATURE OF GROUND

5.23.1 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.

5.23.2 In the case of sewerage pressure mains, the testing may be restricted to a limited number of 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.

5.23.3 The contractor shall be deemed to have satisfied themselves as to the nature of the ground at the time they made the offer to carry out the works.

5.24.0 EXCAVATION

5.24.1 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.

5.24.2 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.

5.24.3 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.

5.24.4 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.

5.24.5 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 and / or a Pine Rivers Shire Council engineer 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.

5.24.6 The contractor shall be responsible for claims for loss and damage resulting from the unapproved removal of or damage to trees and other flora.

5.24.7 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 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.

5.24.8 Where the contractor has excavated a trench deeper than required, the contractor 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.

5.24.9 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.

5.24.10 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 their 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.

5.24.11 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.

5.24.12 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 he/she consider that a dangerous situation exists. The trench shoring system shall be designed by a competent person.

5.24.13 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.

5.24.14 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 contractors own cost.

5.24.15 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.

5.24.16 Dewatering shall be carried out by methods which cause no damage to the works or to adjacent property. The contractor shall ensure that his/her 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.

5.25.0 TUNNELLING

5.25.1 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.

5.25.2 In all underground workings, the contractor shall take precautions prescribed in respect of mines and shall comply with all regulations applicable to such works.

5.25.3 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.

5.26.0 ROCK

5.26.1 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.

5.26.2 For this purpose only, rock shall be defined as a material which, in the opinion of the superintendent and / or a Pine Rivers Shire Council engineer 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 and / or a Pine Rivers Shire Council engineer are to be present with the contractor when measuring the quantity of rock excavated.

5.26.3 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.

5.26.4 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 their 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) Standards Association of Australia - Explosive Codes;
 - i. AS 2187, Part 1 Storage and Land Transport
 - ii. AS 2187, Part 2 Use of Explosive; and
 - iii. AS 2188, magazines for the Storage of Explosives
- (c) Generally, blasting within 50 m of electric power transmission lines shall be covered with approved mats.

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.

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.

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.

5.27.0 UNDERGROUND SERVICES

- 5.27.1 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.
- 5.27.2 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.
- 5.27.3 The contractor shall verify the position of each underground service with the relevant Authority before he/she commences 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.**
- 5.27.4 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.

- 5.27.5 Extra care shall be taken by the contractor to recompact excavations near existing underground pipework, so that foundations of that pipework are restored.
- 5.27.6 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.
- 5.27.7 Any alterations to existing services ordered by the superintendent and / or a Pine Rivers Shire Council engineer shall be carried out on behalf of the principal at no cost to the contractor.
- 5.27.8 No claims for payment or extension of time as a result in delays in alterations to services will be accepted.

5.28.0 EXCAVATION UNDER RAILWAY LINES

- 5.28.1 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.
- 5.28.2 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.
- 5.28.3 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.
- 5.28.4 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.
- 5.28.5 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.

5.29.0 EXCAVATION UNDER STATE CONTROLLED ROADS

- 5.29.1 The consulting engineer or designer shall obtain the written approval of the Department of Main Roads to construct works under or adjacent to any state controlled 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.
- 5.29.2 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.
- 5.29.3 The contractor shall be responsible for giving the Department of Main Roads the required notice prior to the commencement of construction.

5.30.0 EXCAVATION UNDER OTHER ROADS

- 5.30.1 Work under road surfaces carrying vehicular traffic shall be carried out in accordance with the details shown on the Pine Rivers Shire Council standard drawings and to the requirements of the a Pine Rivers Shire Council engineer.
- 5.30.2 The contractor shall be responsible for giving a Pine Rivers Shire Council engineer one weeks notice prior to the commencement of construction.
- 5.30.3 The pipe bedding, approved filling and backfilled material shall be compacted to prevent settlement of road surfaces in accordance with Clauses 5.14.5, 5.15.5, 5.16.2 of this specification and the details shown on the Pine Rivers Shire Council standard drawing.

5.31.0 LAYING AND JOINTING PIPES

- 5.31.1 All mains shall be laid to such lines, gradients and levels as are shown on the drawings or as may be otherwise directed by the superintendent and / or a Pine Rivers Shire Council engineer. It is the contractor's responsibility to preserve uniform gradients and correct alignment. Abrupt changes of grade, which may result from irregularities of the existing surface, shall be avoided.
- 5.31.2 Where shown on the drawings, special bends shall be provided for effecting horizontal or vertical changes of direction. Where such bends are not shown on the drawings or required by a Pine Rivers Shire Council engineer, changes of direction shall be effected by angling the pipe joints.
- 5.31.3 No joint shall be angled to such an extent as to impair its effectiveness and tightness.
- 5.31.4 When making a joint, pipes shall always be in line and if required, deflection made after making the joint. The deflection shall not be greater than the maximum value recommended by the pipe manufacturers.
- 5.31.5 Pipes shall be cut (by the methods specified herein) where and in such lengths as necessary to conform to the horizontal and vertical alignment shown on the drawings.
- 5.31.6 Before laying, all pipes and fittings shall be thoroughly cleaned of all dirt on the inside and the greatest care must be exercised to prevent dirt or foreign matter entering the pipes during the

operation of laying and jointing.

- 5.31.7 All open ends shall be protected against the ingress of dirt or foreign matter, by the use of plugs in a manner satisfactory to the superintendent and/or a Pine Rivers Shire Council engineer.
- 5.31.8 The pipe bedding and backfilling shall be carried out with the relevant construction type as indicated on the Pine Rivers Shire Council standard drawing and as described in Clauses 5.32.0 to 5.37.0 of this specification.
- 5.31.9 Unless otherwise indicated on the drawings or ordered by the superintendent and / or a Pine Rivers Shire Council engineer, sewer pressure line construction shall be Type 1 construction.
- 5.31.10 JOINTING DUCTILE IRON PIPES (TYTON JOINTS)

The contractor shall ensure that:-

- i. all pipe jointing is carried out in accordance with manufacturers recommended procedures
- ii. all ductile iron pipe shall be sleeved with polyethylene sleeving using the procedures given in AS 3681
- iii. before assembling the joint, the spigot and interior of the socket shall be thoroughly cleaned. The gasket shall be wiped clean, flexed in accordance with manufacturer's instructions, and then placed in the socket with bulb leading. When inserting 750 mm size gaskets, flexing in two places is necessary. The groove in the gasket shall be located on the retaining bead in the socket, and the retaining heel of the gasket firmly bedded in its seat so the heel of the gasket is not proud of the mouth of the pipe.
- iv. the gasket fits evenly around the whole circumference, removing any bulges which would prevent the proper entry of the spigot end
- v. a thin film of lubricant is applied to the inside surface of the gasket which will be in contact with the entering spigot. In addition a thin film of lubricant may be applied to the outside surface of the entering spigot for a distance of 50 mm from the spigot end.
- vi. only lubricant supplied by the pipe manufacturer is to be used
- vii. the spigot of the pipe being jointed shall be aligned and entered carefully into the adjacent socket until it makes contact with the gasket. Final assembly of the joint is completed from this position.
- viii. joint assembly is completed by forcing the spigot end of the entering pipe past the gasket, which is thus compressed, until the first painted strip on the end of the pipe disappears and the second is approximately flush with socket face
- ix. if the joint is difficult to assemble, then the spigot should be removed and rotated through 90° before attempting to assemble a second time. If the joint is still difficult to assemble, then the spigot should be removed and the position of the gasket examined.
- x. the actual method of assembly by either "crow-bar method", "fork & tool method", "come-along method" or "trench excavator method" shall be carried out in strict

accordance with the pipeline and / or fitting manufacturer's directions and installation manual.

- xi. all cuts in ductile iron pipes shall be made by either power driven abrasive wheel cutter or special wheel cutter made for ductile iron pipe. Pipes shall be cut right through the ductile iron and the lining in order to achieve a smooth unbroken end to the lining. To assist in this, the free end of the pipe shall be supported during cutting. Pipes cut more than 4 m from the spigot end may require grinding to remove the peening pattern on the pipes' outside surface to facilitate jointing, together with reinstatement of the pipe coating. Hydraulic snap cutters used for grey iron pipe shall not be used for cutting ductile iron pipe. All cut ends shall be chamfered similar to the original spigot.

5.31.11 JOINTING PVC PIPES

The contractor shall ensure that:-

- i. all pipe jointing is carried out in accordance with manufacturers recommended procedures
- ii. before assembling the joint, the spigot and interior of the socket should be thoroughly cleaned. Check that the ring code is correct. The ring should then be wiped clean.
- iii. a heart shaped fold is formed in the ring to reduce the ring diameter and then placed in the socket groove. The ring may be dipped in water to assist in locating the ring correctly.
- iv. the spigot and especially the chamfer of the mating pipe, as far as the black witness mark, is lubricated using the lubricant supplied with the pipes. With pipes in a straight line introduce the spigot into the socket and push home until the black witness mark remains just visible. In this position clearance is automatically provided to allow for expansion and contraction. Jointing may be assisted by the use of a crowbar and wooden block. The socket of the joint being made should be restrained to prevent backward movement which would close up joints already made.
- v. if the joint is difficult to assemble, the spigot should be removed and rotated through 90° before attempting to assemble a second time. If the joint is still difficult to assemble, then the spigot should be removed and the position of the gasket examined.
- vi. the actual method of assembly shall be carried out in strict accordance with the manufacturer's directions.
- vii. when laying in direct sunlight or hot weather, precautions shall be taken to minimise the distortion caused by uneven heat absorption where one side is exposed to the heat and the other is in the shade. The pipes should be shaded where possible, particularly during the jointing process so that an even heat is maintained around the circumference of the pipe. In these conditions the pipe should be free to expand and contract. This effect may be otherwise overcome by rotating alternate pipes 180° immediately prior to jointing. The system shall not be restrained by rigid connections until it reaches ground or service temperature.
- viii. all cuts in the PVC pipes will be made by using a fine toothed hand. All burrs shall be removed with a file. All cut ends shall be chamfered similar to the original spigot. A witness mark shall then be made using a soft pencil, at the required penetration depth.

5.31.12 JOINTING GRP PIPES

The contractor shall ensure that:-

- i. all pipe jointing is carried out in accordance with manufacturers recommended procedures
- ii. before assembling the joint, the pipe ends shall be cleaned and checked closely. Also all coupling components shall be cleaned and checked both inside and outside before assembly. The coupling grooves must be completely free of dirt. The lubricant supplied by the manufacturer shall be applied to the pipe ends and to the rubber seals of the coupling.
- iii. suitable auxiliary equipment, such as a wire rope puller, shall be used to provide mechanical assistance for coupling the pipes, as the joint is a high compression joint.
- iv. the approximate values of jointing forces required at normal temperatures are given in the Table 5.0.

Table 5.0

PIPE DIAMETER	FORCE (kN)
300	3.0
375	3.8
450	4.5
525	5.3
600	6.0
675	6.8
750	7.5

- v. as the couplings are usually already in place in one end of the pipe, it is more convenient to lay the coupling on to the spigot leaving the spigot end free for application of the jointing force. If a coupling is on the free end, a bolster shall be placed so that the jointing effort can be applied to the pipe without dislodging the coupling. Alternatively come-alongs may be useful in awkward locations and can be attached to the pipes using webbing slings or specially manufactured webbing bands.
- vi. the coupling end of the pipe being jointed shall be aligned and jointed carefully on to the spigot until the rubber seal makes contact with the spigot. Final assembly of the joint is completed from this position.
- vii. joint assembly is completed by forcing the coupling end of the pipe being jointed over the spigot thereby compressing the rubber seal, until the end of the coupling is approximately flush with the witness mark on the end of the pipe.

- viii. all cuts in the GRP pipes shall be made by wet-cutting with a water fed abrasive disc cutter. All cut ends shall be chamfered similar to the original spigot by using the same machine held at the required angle.
- ix. GRP pipes contain quartz (silica) sand. Therefore, suitable precautions against dust exposure should be taken when cutting, grinding or machining the material.

5.32.0 TYPE 1 CONSTRUCTION

- 5.32.1 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.
- 5.32.2 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 1289.5.1.1. Naturally occurring material shall be compacted to 95% maximum dry density using standard compaction as determined by AS 1289.5.1.1.
- 5.32.3 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.
- 5.32.4 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.
- 5.32.5 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.
- 5.32.6 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 5.32.2 of this specification.
- 5.32.7 The remainder of the trench shall be filled with approved filling and general backfill in accordance with Clauses 5.15.0 and 5.16.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.33.0 TYPE 2 CONSTRUCTION

- 5.33.1 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.
- 5.33.2 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.

- 5.33.3 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.
- 5.33.4 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.
- 5.33.5 The remainder of the trench shall be filled with approved filling and general backfill in accordance with Causes 5.15.0 and 5.16.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.34.0 TYPE 3 CONSTRUCTION

- 5.34.1 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

- 5.34.2 Type 3 construction consists of line stops constructed from Class N25 concrete and embedded in the undisturbed sides and bottom of the trench.
- 5.34.3 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.
- 5.34.4 The balance of pipeline construction shall be as for the type appropriate for a similar pipeline on normal grades.

5.35.0 TYPE 4 CONSTRUCTION

- 5.35.1 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.
- 5.35.2 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 5.32.0 of this specification.
- 5.35.3 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.

5.35.4 The gravel shall be compacted by a single pass of a heavy vibrating plate before the normal bedding is placed and compacted.

5.35.5 The pipe bedding, approved filling and backfill shall be constructed as per Type 1 construction.

5.36.0 TYPE 5 CONSTRUCTION

5.36.1 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.

5.36.2 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 5.35.3 of this specification.

Pipe bedding / surround consisting of gravel or crushed rock, not less than 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.

5.36.3 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 than 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.

5.36.4 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.

5.36.5 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 5.15.0 and 5.16.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.37.0 TYPE 6 CONSTRUCTION

5.37.1 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.

5.37.2 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.

5.37.3 The gabion shall be formed by preparing a cage of a 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 5.36.5 of this specification and the wire mesh shall be of adequate strength to permit the gabion to be handled in the intended manner.

5.37.4 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.

5.37.5 With the gabion in place on the aggregate base layer, the bedding shall be completed in a similar manner to Type 5 construction.

5.37.6 The remainder of the trench shall be filled with approved filling and general backfill in accordance with Clauses 5.15.0 and 5.16.0 of this specification and as indicated on the Pine Rivers Shire Council standard drawing.

5.38.0 FITTINGS, VALVES, AIR RELEASES, SCOUR VALVES ETC

5.38.1 The contractor shall fix in position all valves, bends, tees, angle branches, crosses, dead ends, reducers and other fittings which may be necessary for the completion of the mains into a continuous whole.

5.38.2 Unless otherwise specified, sluice valves, bends, tees, angle branches reducers, crosses and scour tees shall be supplied with two socket ends. Valves, bends, tees, wyes, reducers, crosses and scour tees shall be located in fixed positions, thereby necessitating the cutting to correct length of pipe, with the off-cut being used on the other side of the valve or fitting.

5.38.3 Sluice valves, air releases etc shall be carefully fixed in position so as to be plumb and at the correct distance from the surface.

5.38.4 The backfilling around the bodies of buried sluice valves shall be sand or gravel thoroughly compacted. Such sand/or gravel shall fill the full width of the trench and shall extend along the trench for a length of at least four times the valve diameter on both sides of the valve.

5.38.5 The contractor shall take such steps with valves and air releases to fully protect them during laying and backfilling and on completion shall see that all glands are well-screwed down and all valves operate freely.

5.39.0 FASTENERS AND MISCELLANEOUS ITEMS

5.39.1 All fasteners used in the work excluding shackles, shall be stainless steel in accordance with AS 1444. This includes bolts, nuts, washers, studs, screws, masonry anchors and threaded items joining flanges, mounting equipment or used in the assembly of valve bodies and switchboards. Shackles shall be fabricated from Grade 304 stainless steel in accordance with AS 1444.

5.39.2 Bolts shall be hexagon head bolts complying with AS 1111 EXCEPT that the material shall be Grade 316 stainless steel. The tensile and proof loads shall comply with Table 9 of AS 1111.

5.39.3 Nuts shall be hexagon nuts complying with AS 1112 manufactured from Grade 304 stainless steel. The nuts shall be normal type complying with the proof loads given in Table 10 of AS 1112 for property class 5.

- 5.39.4 Washers shall be normal series washers manufactured from Grade 316 stainless steel.
- 5.39.5 All saddles, clips and clamps used in the work shall be fabricated from Grade 316 stainless steel.
- 5.39.6 All Grade 316 stainless steel bolts, nuts, studs or washers shall be marked either with the ISO marking "A4" or the AISI marking "316" or "304" as appropriate.
- 5.39.7 The contractor shall provide washers under all nuts, studs or bolts where rotation can occur during tightening of the fastener. Loctite 222 or 567 shall be used on all threads and between stainless steel mating surfaces as an anti-galling lubricant.
- 5.39.8 Hole sizes shall be drilled only sufficiently large enough to accommodate the fastener and isolator chosen. Oversized holes shall not be accepted.
- 5.39.9 Unless otherwise shown on the drawings or specified in this specification, chemical anchors shall comply with Table 5.1.

Table 5.1

SIZE MIN	LENGTH MIN	EMBEDMENT	MIN. EDGE DISTANCE
M10	130	90	45
M12	160	110	55
M16	190	125	65

- 5.39.10 Unless otherwise shown on the drawing or specified in this specification, mechanical anchors shall comply with Table 5.2.

Table 5.2

SIZE MIN	LENGTH MIN	EMBEDMENT	MIN. EDGE DISTANCE
M10	90	60	60
M12	110	80	80
M16	145	100	100

5.40.0 THRUST BLOCKS

- 5.40.1 The contractor shall construct thrust blocks of Class N25 in accordance with AS 3600 concrete at all bends, horizontal and vertical, tees, angle branches, crosses, dead ends, reducers and other locations where there will be an unbalanced hydraulic load.
- 5.40.2 Every block shall be cast at least three days prior to the testing of any section of the main which may create hydraulic forces at the block. The contractor shall place the concrete against excavated ground which shall be undisturbed and free of loose or deleterious matter. Notwithstanding that details of thrust blocks have been shown on the drawings the contractor

shall be responsible for assessing the ground and should refer any instability to the superintendent and / or a Pine Rivers Shire Council engineer for advice.

5.40.3 The bearing of the thrust block shall be such that the ground will amply support the unbalanced hydraulic load. The hydraulic load shall be calculated from the test pressure detailed in Clause 5.40.1 of this specification.

5.40.4 Notwithstanding the above provisions, the contractor shall be solely responsible for the performance of the thrust blocks.

5.41.0 TESTING OF PIPELINES

5.41.1 The whole of the mains laid by the contractor shall be tested under hydraulic pressure to a pressure test at least 50% above the highest working pressure expected in the main or 0.8 MPa which ever is greater.

5.41.2 Where levels of different portions of the pipeline of the portions under test vary, the point at which the test pressure shall be held to be measured shall be the lowest point in the profile of that section.

5.41.3 The contractor shall provide all labour together with all pumps, engines, pipes, temporary valves, plugs and flanges as may be necessary. The equipment shall include a gauge capable of being read to 0.01 MPa and shall be accompanied by a recent calibration certificate. Such plant etc. shall be supplied and maintained by the contractor.

5.41.4 All tests shall be carried out under the supervision and in the presence of the superintendent and / or a Pine Rivers Shire Council engineer. The length of tests section should normally be between 500 m and 1000 m. Under no circumstances shall test lengths exceed 1600 m.

5.41.5 The contractor shall make their own arrangements to procure at their own expense the water necessary for carrying out these tests. Tests shall be carried out as soon as possible after the completion of any section of the main.

5.41.6 If water should be available from the Pine Rivers Shire Council water mains and the contractor desires to use it, seven days notice shall be given to a Pine Rivers Shire Council engineer. The Pine Rivers Shire Council shall make a charge for water supplied to the contractor, such charge to be the subject of agreement between the contractor and the Pine Rivers Shire Council.

5.41.7 The Pine Rivers Shire Council in making this water available shall not thereby absolve the contractor from any responsibility attaching to him/her under this contract.

5.41.8 During filling, the contractor shall release air from all air releases.

5.41.9 After filling with water, the test section shall stand for an initial period of approximately 24 hours under a static pressure of the intended working pressure in the section. Should a failure occur and some or all of the water lost, the procedure of filling and of raising the pressure shall be repeated after remedial work has been carried out. The standing period shall commence from the time at which the pressure has been last successfully reached. The test section shall be visibly inspected after the further standing period of about 24 hours.

5.41.10 If neither appreciable movement of the pipeline nor any leakage has been found during the aforementioned visual inspection, the section shall be subjected to the pressure test proper. While the pressure is being raised, care shall be taken to permit the release of further

quantities of air. The duration of the test at full pressure shall be not less than three hours for each test. Should pressure drop during the test, additional quantities of water shall be pumped into the test section to restore the required test pressure. Restoration of the test pressure shall be carried out at half-hourly intervals.

- 5.41.11 The quantity of water added each time referred to later as makeup water, shall be measured, recorded and totalled up at the end of the test.
- 5.41.12 During the three hour test, the amount of water added to maintain the specified test pressure shall not exceed the quantity given by the following formula:-

$$Q = 0.5 DLH \quad \text{where:-}$$

Q	=	permissible make up quantity over three hours (litres)
D	=	nominal diameter of pipe (m)
L	=	length of pipe under test (km)
H	=	average head over test section (m)

nor must any defects in the contractor's work become apparent.

5.42.0 BACKFILLING OF EXCAVATION

- 5.42.1 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.
- 5.42.2 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 5.15.0 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 5.16.0 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.
- 5.42.3 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.
- 5.42.4 Where excavation is in tunnel the refilling shall be with sand filling compacted by flooding with water, immersion vibration or other method approved by a Pine Rivers Shire Council engineer.
- 5.42.5 The backfilling of excavation under railway lines shall be carried out in accordance with Section 5.28.0 of this specification.
- 5.42.6 The backfilling of excavation under state controlled roads shall be carried out in accordance with Section 5.29.0 of this specification.
- 5.42.7 The backfilling under new roads and driveways shall be carried out in accordance with Section 5.30.0 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 98% maximum dry density using

modified compaction.

- 5.42.8 Under existing roads a 600 mm minimum depth of no slump (20:1 mix) lean mix concrete shall be placed on top of the compacted pipe bedding 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.

5.43.0 RESTORATION OF SURFACES

- 5.43.1 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.
- 5.43.2 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.
- 5.43.3 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.
- 5.43.4 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 re-erected in a temporary location until such time as permanent restoration can be carried out, unless agreed otherwise with the occupier.
- 5.43.5 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.
- 5.43.6 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.
- 5.43.7 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 coats.
- 5.43.8 Asphalt surfaces shall be restored using hot mixed asphalt in accordance with the Pine Rivers Shire Council current specifications. The thickness of asphalt shall be not less than 40 mm.
- 5.43.9 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 than 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.

- 5.43.10 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.
- 5.43.11 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.
- 5.43.12 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 m². 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.

- 5.43.13 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.
- 5.43.14 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 a 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. The contractor may submit alternative mixes to the superintendent and / or a Pine Rivers Shire Council engineer for approval.

Table 5.4

MATERIALS FOR HYDROMULCHING		
MATERIAL	RATE OF APPLICATION	
(A) Wood-fibre Defibrated pinus radiata dyed green	2.5 tonnes / hectare	
(B) Binder Anionic bitumen emulsion 50/50 bitumen/water	1000 - 2000 litres / hectare	
or Polymer binder	max. 250 litres / hectare	
(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.

- 5.43.15 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.

5.44.0 CLEANING PIPELINES

- 5.44.1 Before any pipelines are taken over by the Pine Rivers Shire Council, the contractor shall clear them by flushing with clear water or other method approved by a Pine Rivers Shire Council engineer to clean 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.

5.45.0 INSTALLATION OF VALVE BOXES, MARGIN SETTS AND MARKERS

- 5.45.1 The contractor shall fix over all sluice valves, (not including valves in concrete pit or chambers) cast iron cover boxes. At all sluice valves, gravel and sand shall be filled into the trench and compacted to form a support for bricks upon which the cover boxes are to be fixed.
- 5.45.2 Around the cover boxes, margin setts shall be carefully laid on selected filling and maintained so that their tops are 6 mm higher than the tops of the cover boxes.
- 5.45.3 The bricks shall be of good quality, well burnt and of uniform standard size; samples shall be submitted and no bricks may be used which have not been approved by the superintendent and/or a Pine Rivers Shire Council engineer.
- 5.45.4 Marker stakes shall be of hardwood, straight, sound and free from imperfections.
- 5.45.5 Marker plates shall be made from 1.6 mm galvanised steel sheet and attached to marker stake by four No. 2.6 x 25 Grade 304 stainless steel round head woodscrews.
- 5.45.6 Letters and distances shall be painted on plates as shown on the drawings. The lettering and numbering shall be done in a first class manner by an experienced sign-writer.
- 5.45.7 Installation details for valve boxes, margin setts and markers shall be in accordance with the Pine Rivers Shire Council standard drawing.

5.46.0 PAYMENT UNDER A SCHEDULE OF RATES CONTRACT

- 5.46.1 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.
- 5.46.2 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.

- 5.46.3 The contractor's obligations under Section 5.7.0 to 5.13.0 shall be allowed for in the rates for items relating to supply of pipes, fittings and valves.
- 5.46.4 The contractor's obligations under 5.1.0 to 5.6.0 and 5.15.0, 5.16.0, 5.22.0 (Clauses 5.22.1 and 5.22.2), 5.23.0, 5.24.0 (Clause 5.24.4), 5.27.0, 5.30.0, 5.42.0, 5.43.0 (Clauses 5.43.1 to 5.43.5 and 5.43.10) shall be allowed for in the rates for items relating to excavation and backfilling.
- 5.46.5 The contractor's obligations under Section 5.14.0, 5.32.0 to 5.37.0 and 5.40 shall be allowed for in the rates for items relating to the various construction type. The rates for Type 2 to 6 inclusive shall be in addition to the quoted rate for Type 1 construction.
- 5.46.6 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 measurement shall be taken from the length of trench.
- 5.46.7 The contractor's obligations under Clause 5.43.6 shall be allowed for in the rates for items relating to saw cutting.
- 5.46.8 The contractor's obligations under Clauses 5.43.7 and 5.43.8 shall be allowed for in the rates for items relating to resurfacing with bituminous surfaces.
- 5.46.9 The contractor's obligations under Clauses 5.43.9 shall be allowed for in the rates for items relating to reinstatement of concrete surfaces.
- 5.46.10 The contractor's obligations under Clauses 5.15.0 and 5.16.0 shall be allowed for in the rates for items specifically included for these works in the schedule.
- 5.46.11 The contractor's obligations under Clauses 5.21.0, 5.31.0 and 5.44.0 shall be allowed for in the rates for items relating to laying and jointing of pipes.
- 5.46.12 The contractor's obligations under Clauses 5.41.0 shall be allowed for in the rates for items relating to testing.
- 5.46.13 The contractor's obligations under Clauses 5.45.0 shall be allowed for in the rates for items relating to installation of valve boxes, margin sets and markers.
- 5.46.14 The payment for excavation and backfilling shall be based on the linear measurement of the trench.
- 5.46.15 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 pit or structure it shall be calculated from the outside dimension of the pit or structure multiplied by the depth over which it occurred.
- 5.46.16 The payment for supply, lay and joint shall be based on a linear measurement of the length actually laid.
- 5.46.17 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.

- 5.46.18 In general, payment will be made only in respect of lines which have been completed structure to structure, backfilled, tested and the surface restored.
- 5.46.19 Payment for restoration of surfaces shall be based on area calculated from the linear measurement along the pipeline multiplied by the standard trench width.