

**PART E**

---

**TECHNICAL  
REQUIREMENTS**

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# 1. General Requirements

## 1.1 Scope of Works

The scope of work for the upgrade of the interchange includes but is not limited to the following:

### North side of the Rail Corridor

- Design and construction of a new RailCorp maintenance shed. A proprietary unit is preferred if suitable.
- Demolition and removal of the existing RailCorp shed, including the ground slab and all services
- Excavation and regrading of the eastern end of the RailCorp maintenance area
- Construction of a new interchange entry point and road for buses and taxis, including access ramp to RailCorp Maintenance facility, three bus parking bays and three taxi spaces
- Reconstruction of the existing station entry from Dora Street, including traffic management devices and kiss & ride facility
- Extension of the existing car park opposite Short Street, to create Car Park 1 and Car Park 2, including retaining walls and new entry points
- Extension and modifications to the existing car park on Dora Street, designated Car Park 3
- Reconstruction of existing taxi/staff parking area as disabled/staff parking, designated as Car Park 4
- Pedestrian footpaths from all car parks to the station
- Design and construction of canopies from the station to the bus parking bays, profile and form as defined on the drawings
- Bus & taxi shelters
- Bicycle facilities
- New lighting
- CCTV conduits/cabling to all areas
- Line marking and signage.

### South side of the rail corridor

In the area shown on the drawings

- Reconstruct damaged kerb where directed by RailCorp
- Prepare and re-sheet existing car park
- Line mark new surface as per existing area

The Contractor must

- Prepare a detailed construction program defining the various stages for the Work, in the form required by Part D, Appendix D3.

- Construct the Works in stages with to minimise impact on commuters, bus drivers, taxi drivers, local community and RailCorp maintenance depot
- Provide all sampling and testing required by this RFT or necessary to verify compliance of the Work with this RFT. All such work is to be carried out by organisations accredited by NATA
- Communicate with station management, local businesses, authorities and the public
- Provide comprehensive traffic management plans for vehicles and pedestrians on the site and on surrounding streets. Detour details and traffic diversions must be prominently displayed. Obtain written approval of appropriate authorities before each stage of the Work.
- Project safety, as a minimum, must comply with RailCorp's Safety Management System (SMS); the SMS implementation plan must be utilised to determine the relevant procedures which are required to achieve safety onsite
- Use new and current technologies for construction that will deliver improvements and reduce impact on passengers and train services are preferred to traditional methods.

## **1.2 Not Used**

## **1.3 Standards**

Work specified in this Specification shall conform to the latest edition of the Standards referred to by this Specification.

## **1.4 Drawings**

- Morisset Bus Interchange & Car Park Drawing Series 21-17525;

All works associated with the construction of civil works shall be done in a sound, efficient and workmanship manner and in accordance with relevant Australian Standards, Codes of Practice and Construction Guidelines.

## **1.5 Inspection**

### **1.5.1 Hold Points**

Hold points are defined in Section 12

### **1.5.2 Records**

The contractor shall maintain all inspection records and Site Instructions.

## **1.6 Australian Standards**

The following Australian Standards shall apply to all Civil and Earthworks undertaken at the car parks and the bus interchange:

**Table 1 Australian Standards**

<b>Standards No.</b>	<b>Standard Title</b>
AS 2008	Residual Bitumen for Pavements
AS 2009	Glass beads for Pavement Marking Material
AS 1141	Methods of Sampling and Testing Aggregates
AS 1158	Lighting for Roads and Public Places
AS 1160	Bituminous Emulsions for the Construction and Maintenance of Pavements
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1379	Specification and Supply of Concrete
AS 1554	Structural Steel Welding Set
AS 1646	Elastomeric Seals for Waterworks Purposes
AS 1657	Fixed Platforms, Walkways, Stairways & Ladders – Design, Construction and Installation
AS 1742	Manual of Uniform Traffic Control Devices
AS 1743	Road Signs - Specifications
AS 2053	Conduits and Fittings for Electrical Installations
AS 2150	Hot Mix Asphalt – A Guide to Good Practice
AS 2439	Perforated Plastics Drainage and Effluent Pipe and Fittings
AS 2601	Demolition of Structures
AS 2758.1	Aggregate & Rock for Engineering purposes
AS 3600	Concrete Structures
AS 3610	Formwork for Concrete;
AS 3700	Masonry Structures
AS 3725	Loads on Buried Concrete Pipes
AS 3735	Concrete Structures for Retaining Liquids
AS 3798	Guidelines on Earthworks for Commercial and Residential Developments
AS 3996	Metal Access Covers, Road Grates and Frames
AS 3972	Portland and Blended Cement
AS 4049	Paints and Related Materials – Pavement Marking Materials
AS 4058	Precast Concrete Pipes (Pressure and Non-Pressure)



<b>Standards No.</b>	<b>Standard Title</b>
AS 4139	Fibre Reinforced Concrete Pipes and Fittings
AS 4671	Steel Reinforcing Materials
Building Code of Australia	Building works

### **1.7 Austroads Standards**

- ▶ AP-G78/04: Pavement Rehabilitation - A Guide to the Design of Rehabilitation Treatments for Road Pavements;
- ▶ AP-G66/02: Asphalt Guide;
- ▶ AP-G17/04: Pavement Design - A Guide to the Structural Design of Road Pavements; and
- ▶ AP-G69/02: Urban Road Design - Guide to the Geometric Design of Major Urban Roads.

### **1.8 Other Standards**

Other standards applicable for these works are:

- ▶ Lighting Specification,
- ▶ RTA 3051: Unbound and Modified Base and Subbase Materials for Surfaced Pavements
- ▶ RTA Test Method T1311; and
- ▶ RTA Specification R32 and R141.

### **1.9 Design**

The design of the new RailCorp shed and the steel frames for the canopies and the glass screen support frames is included in the contract, and form part of the Provisional Sums nominated for these items.

Design and construction of the slab of the RailCorp shed and the footings for the awning frames is included in the contract and is not part of the Provisional Sums.

The design & documentation services provided by the Contractor shall be to a professional standard and shall include but may not be limited to the following disciplines:

- (a) Architectural
- (b) Structural engineering
- (c) Electrical engineering

The design must:

- Provide safe and operationally efficient facilities
- Be easily accessible by authorised users and easily maintained
- Comply with requirements of all relevant authorities
- Coordinate all new services with existing
- Be fully checked before submission to the Contract Administrator.

- Include all necessary specifications for manufacture and construction. Technical details must comply with all equivalent points set out in this RFT.

The Contractor must:

- Meet with RailCorp representatives to confirm requirements for the RailCorp maintenance shed
- Submit to the Contract Administrator for approval a detailed design brief defining requirements for all items to be designed
- When directed by the Contract Administrator, proceed with design work
- Obtain all required authorities' approvals
- Submit completed designs to the Contract Administrator and receive his approval for designs before proceeding with manufacture and construction
- Provide to the Contract Administrator certificates from all designers confirming that the works have been completed in accordance with the approved designs and standards
- Submit as-built drawings to the Contract Administrator in autocad format. As-built drawings must be certified by the relevant designer

#### **1.10 CCTV**

Install all CCTV conduiting, cabling, pits and poles for cameras in accordance with the details contained in Appendix 1 to Part E of the RFT. All conduit and cabling is to extend from the individual camera locations to the existing CCTV rack in the station building. Allow three metres of cable tails at the rack. All cameras are to be mounted on dedicated poles, with cabling installed to the location of each camera plus 1.5 metre tail.

Installation of cameras and connections to cameras and rack will be by RailCorp contractor.

#### **1.11 Additional Information**

The Appendices to this RFT provide additional information on the Work and a number of RailCorp's requirements and installations. Unless otherwise specified elsewhere in the RFT, the Work of the RFT must comply with the standards, materials and methods defined in these Appendices.

#### **1.12 Information not provided in the RFT**

If the Contractor discovers that the documents provided by the Principal are not correct or are incomplete, the Contractor must submit a Request for Information (RFI) to the Contract Administrator, that:

- Gives full details of the error or omission, and
- States the date by which a direction from the Contract Administrator is required if the date for Practical Completion is not to be delayed, and
- For items that are within the expertise of the Contractor, proposes a resolution.

The Contract Administrator will either

- Provide the information requested, or
- Accept the resolution suggested by the Contractor, or

- Instruct the Contractor to carry out further investigation and report on options for resolution.

### **1.13 Dilapidation Survey**

The Contractor must provide to the Contract Administrator a complete dilapidation survey of all existing buildings, structures, and services before commencing work on site, including the immediate adjoining buildings that share a common boundary with the site.

The survey must clearly identify and record in writing and photographs the state of buildings, structures and services. Any existing damage must be recorded.

The dilapidation survey will form the basis of assessment of damages to existing buildings, structures or services during and at the completion of the works.

The Contractor must rectify, at their own cost, all damage that has occurred during the course of the works.

### **1.14 Worksite Protection**

The Contractor must:

- (a) Engage an approved worksite provider to prepare a worksite protection plan. A list of approved providers is included as an appendix to this Part E
- (b) Ensure that the worksite protection plan is updated by an approved provider whenever the works area or work methods are changed.

### **1.15 Separation of the Worksite**

The Contractor must provide suitable barrier fencing to separate the worksite from the rail tracks and other areas designated as a danger zone. This fencing is to clearly define areas into which workers are not permitted to enter unless under supervision from a worksite protection officer.

### **1.16 Project Hazard Log**

In addition to complying with all other safety related requirements, the Contractor shall have regard to the information provided in the Project Hazard Log (Appendix E12) and, in its capacity as principal contractor, shall complete Part B of that Log.

Note: The Project Hazard log relies on ratings for Initial Risks and Residual Risks. These are determined from the Risk Matrix, also in Appendix E12.

### **1.17 Provisional Sums**

The Contract includes Provisional Sum items for the following:

- (a) New RailCorp maintenance shed

- (b) Awning frames and glass screen support frames
- (c) Tactile indicators
- (d) Signage not otherwise required by this RFT
- (e) Upgrade to the existing CCTV system
- (f) Removal of contaminated or unsuitable material
- (g) Items required by the Traffic Impact Assessment report

Each Provisional Sum is limited to the specific scope described in clauses 1.18, 1.19, 1.20 and 1.21 included in this Part E.

All design work for Provisional Sum items is to be carried out by the Contractor as part of the Provisional Sum. In this regard Clause 8.8 of Part C of this RFT does not apply. The Contractor must provide the Contract Administrator with the names and a capability statement for each proposed designer. The Contract Administrator at his sole discretion may reject the proposed designer.

### **1.18 New RailCorp Maintenance Shed**

The Provisional Sum for the RailCorp maintenance shed is limited to the design, fabrication, delivery and installation of one shed as follows:

- (a) Approximate size 7.5 metres wide by 21 metres long with clear internal height of at least three metres
- (b) Galvanised steel frame and purlins
- (c) Cast-in fixings for the frame
- (d) Colorbond wall cladding
- (e) Roofing to be 80% colorbond with the balance translucent polycarbonate sheeting of similar profile
- (f) Two unpowered rotary roof ventilation units
- (g) Roof safety hook system
- (h) Two roller doors, approximately 2.7 metres wide by 2.5 metres clear opening height, secured by padlock from inside
- (i) One personnel access door, to be solid core and stainless steel faced both sides, lock to RailCorp specification
- (j) Four windows, each approximately 1.8 metres wide by 1.2 metres high
- (k) Colorbond gutters and four downpipes
- (l) Electrical and lighting installation within the shed.

The Provisional Sum does not include:

- (i) The concrete slab for the shed
- (ii) Stormwater drainage from downpipe outlets
- (iii) Power cabling to the distribution board inside the shed

### **1.19 Awning and Glass Screen Support Frames**

The Provisional Sum for the awning and Glass Screen support frames is limited to the design, fabrication, delivery and erection of the awning frames and glass screen support frames as shown on the drawings, as follows:

- (a) Awning frames fabricated from SHS sections, assumed weight of each frame (comprising two fabricated components to facilitate galvanising) approximately 0.5 tonne
- (b) Windbreak support frames fabricated from SHS sections, assumed 100x100x9
- (c) Galvanising mass/thickness to be in accordance with AS/NZS 4680, minimum 600g/square metre
- (d) Cast-in bolts

The Provisional Sum does not include:

- (i) Rolling margin on steel sections
- (ii) Roof purlins and cladding
- (iii) Gutters & downpipes
- (iv) Concrete footings

### **1.20 Tactile Indicators**

The Provisional Sum for the tactile indicators is limited to the layout design, fabrication, delivery and installation of the tactile indicators. RailCorp will nominate the type of tactile indicators that are acceptable.

### **1.21 Signage**

The Provisional Sum for the signage is limited to the layout design and detail design, fabrication, delivery and installation of signs that are not otherwise required by the RFT. It includes all footings, posts and fixings necessary for erection of the signs.

### **1.22 Upgrade to the Existing CCTV System**

The Provisional Sum for the upgrading of the existing CCTV system is for the supply and installation of all new or replacement cameras and other equipment necessary for the satisfactory operation of the completed CCTV installation. This work will be carried out by RailCorp's nominated contractor.

The supply and installation of all containment and cabling is included in the Contract.

### **1.23 Contaminated or Unsuitable Material**

The Provisional Sum for contaminated or unsuitable material is for removal of such material as directed by the Contract Administrator. It does not include removal of any such material that could be expected to be encountered after careful review of the Geotechnical Investigation Report, the Contamination

Assessment and Site Management Plan, or a careful inspection of the site before commencing the Works.

#### **1.24 Items required by the Traffic Impact Assessment report**

The Provisional Sum for items not shown on the drawings or detailed in this Part E but required by the Traffic Impact Assessment report. Examples include but are not limited to the following:

- (a) Alterations to the signals at the intersection of Dora Street and Short Street resulting from the addition of the fourth leg to provide access to the bus interchange
- (b) Traffic signage at the above intersection
- (c) Median islands at the entrance to Car Park 2.

## 2. Site Clearing

### 2.1 Scope

This section of the Specification provides for the demolition of structures, removal of nominated trees and plantings together with all other organic material; kerbing, guttering and pedestrian pavement, fencing and clearing and grubbing.

### 2.2 Demolition

#### 2.2.1 General

The standard of work shall comply with AS 2601.

Property, which is to remain on or adjacent to the site, is to be fully protected from interference or damage. Use appropriate means including protective screens, sheeting and the like. Make good any such damage to match existing.

All demolished material and redundant services are to be removed from site and disposed of. Materials shall be disposed of at an authorised site and documentary evidence of authorisation submitted to the satisfaction of the Contract Administrator.

### 2.3 Clearing and Grubbing

This work consists of the removal of all trees, shrubs, plants and other organic material affected by the works.

### 2.4 Damage

Make good damaged surfaces resulting from, demolition, clearing and grubbing. Reinstate such surfaces to match adjoining existing surfaces.

The making good shall match the new quality of the existing adjoining surfaces.

If damage to RTA's infrastructure along Dora Street occurs, reinstate shall be undertaken in discussion with the RTA.

### 2.5 Restoration of Site

All holes and depressions caused by the clearing and grubbing works shall be backfilled with approved material in accordance with Section 4 - Earthworks.

### 2.6 Security

The Contractor shall maintain site security and fencing for the duration of the works to the satisfaction of the Contract Administrator.

### 3. Erosion and Sediment Control

#### 3.1 Scope

This section of the Specification provides for erosion and sediment control measures to be undertaken during construction.

#### 3.2 General

Perimeter control measures shall be placed prior to or in conjunction with the first phase of excavation. Construction shall be staged so that land disturbance is confined to areas where erosion and sediment runoff can be controlled. Limit the duration for which disturbed areas are exposed to erosion. Stabilisation measures shall be applied on the disturbed section before the next section is opened up.

Topsoil stockpiles shall be located outside hazard areas such as drainage depressions and environmental control measures applied.

All areas not subject to construction works shall be retained free from disturbance or damage for the duration of the Contract. Should these areas become disturbed or damaged, the Contractor shall reinstate them.

#### 3.3 Sediment and Erosion Control Devices

Unless otherwise stated, sediment and erosion control devices shall be constructed and maintained. Erosion and sediment control measures will be implemented in accordance with the NSW Department of Land and Water Conservation "Urban Erosion and Sediment Control" guidelines and the NSW Department of Housing's "Managing Urban Stormwater – Soils and Construction" (2004).

All sediment and erosion control devices shall be maintained in a satisfactory working order throughout the Contract or until such time as the area above has been stabilised.

The Contractor shall inspect the devices after each major storm (>20mm) for structural damage or clogging by silt and other debris and make prompt repairs, replace or clean the devices as may be required.

Gravel or other filter materials shall be cleaned and re-stacked or replaced when directed by the Contract Administrator to maintain effective performance.



## 4. Earthworks

### 4.1 Scope

This section of the Specification covers detailed earthworks associated with the civil works for the bus interchange and the car parks.

### 4.2 Inspection

The Contractor shall give 2 days notice so the following may be inspected:

- ▶ Excavation completed to contract levels;
- ▶ Filling completed to contract levels;
- ▶ Service trenches excavated and ready for laying the services; and
- ▶ Services laid in trenches and ready for backfilling.

### 4.3 Removal of Topsoil

Where necessary, topsoil shall be stripped to a minimum depth of 150 mm and shall be disposed of off site in accordance with this specification.

### 4.4 Setting Out

The Contractor shall be responsible for the setting out of the Works in accordance with the dimensions shown on the Drawings. Where dimensions the Contractor believes are necessary to set out the work are not shown on the Drawings, he shall request the Contract Administrator provide these dimensions. The Contractor shall make adequate provision, in terms of time, for the Contract Administrator to determine such dimensions without causing delay to the works.

Prior to commencing earthworks over any section of the Site, the Contractor shall place marks as may be required for setting out and provide the Contract Administrator with a schedule and plan of these, showing their locations and levels.

The Contractor shall be responsible for the maintenance of all recovery pegs throughout the duration of the Contract or until directed by the Contract Administrator to remove them.

### 4.5 Existing Services

The Contractor shall take all reasonable and practicable steps to ascertain the exact location and depths of existing utility and service lines and to protect them from damage during construction operations to the satisfaction of the owner of the service. In the event that any line is damaged as a result of the Contractor's operations, then the Contractor shall make such damage good. The Contractor shall provide temporary services whilst repairs are being carried out.

The Contractor shall provide temporary services or retain existing services as necessary to ensure that occupied buildings, whether on the site of the Works or not, are not deprived of a continuous supply of existing services.

#### **4.6 Site Drainage**

The Contractor shall provide all materials and labour to effectively divert, contain and/or control surface and sub-surface water within the site so as to permit the works to proceed without undue interruption.

The Contractor shall provide for uninterrupted flow at all times of stormwater and drainage along existing gutters, drains and conduits by effecting such temporary works as may be required.

Where no adequate drainage by such means is possible, the Contractor shall provide and operate effective pumping plant to keep all excavations free of water whilst construction works are under way and at all other times as directed by the Contract Administrator.

#### **4.7 Excavation**

Excavation shall mean excavation in all classes of materials and shall include the removal of all unsuitable matter arising from or existing at the site of the works.

Excavation shall be carried out to the depths and dimensions shown on the Drawings. Excess material not required for backfill construction shall be disposed of off site.

All excavation work shall include all necessary excavation support and dewatering measures necessary to facilitate excavation to the specified levels.

Any over excavation shall be made good with granular or other approved filling placed in layers not exceeding 150mm loose thickness and compacted to 98% standard compaction at a moisture content within -1% and + 2% of O.M.C.

Excavation shall be carried out over a sufficient width to permit adequate construction of the pavement below and behind kerbs and edges.

#### **4.8 Unsuitable Material**

Unsuitable material is that occurring below the designed floor level of excavations and below the depth of stripped topsoil beneath embankments, which the Contract Administrator deems to be unsuitable for support of drainage pipes, pits, structures and pavements in its present position.

In addition to the inspections carried out by the Contract Administrator, the Contractor shall promptly notify the Contract Administrator of any areas of the earthworks, which rut excessively, yield or show signs of distress or instability.

Such material shall be excavated completely and disposed of as directed by the Contract Administrator. Material removed as unsuitable shall be disposed of as spoil.

The unsuitable material, which has been removed, shall be replaced with material of the quality specified in Section 4.9. Replacement material is deemed to form part of embankment construction. It shall be placed and compacted in accordance with this Section 4.

#### **4.9 Materials for Filling and Backfilling**

Fill is defined as the material placed at or above the existing surface. Backfill is the material placed in excavations. All fill and backfill material shall be approved by the Contract Administrator prior to placing in the works.

Approved filling may be used for construction of embankments or site regrading works.

Selected fill shall be used for areas under roads, car park pavements and for the replacement of unsuitable subgrade.

All imported fill is to be certified by an independent NATA registered laboratory to be free of contaminants.

#### **4.9.1 Approved Fill**

Approved fill shall be defined as sand, soil or broken rock obtained from excavations or approved off site areas. Such material shall:

- ▶ Be free of material greater than 150mm in size;
- ▶ Contain not more than 2% organic matter;
- ▶ Be capable of being brought to a moisture content suitable for compaction as specified elsewhere herein, under the weather conditions prevailing on site; and
- ▶ Shall have a minimum CBR of 10%.

#### **4.9.2 Selected Fill**

Selected fill shall be defined as material or materials, which are:

- ▶ Free of organic matter;
- ▶ Free from stone larger than 100mm maximum dimension, and shall contain:
  - at least 65% of material passing the 19.0mm AS sieve; and
  - at least 30% of material passing the 2.36mm AS sieve.
- ▶ Capable of being brought to a moisture content suitable for compaction as specified elsewhere herein, under the weather conditions prevailing on site; and
- ▶ Shall have a minimum CBR of 20%.

#### **4.10 Placing and Compacting Fill**

Fill material shall be placed and compacted in successive horizontal layers for the full width of the cross section. The loose depth of the material in each layer shall be such that, when compacted the layer thickness shall not be more than 150mm.

At the time of compaction of each layer the moisture content of the material shall be within - 1% and +2% of O.M.C. such that the specified compaction is achieved.

Equipment shall be properly weighted and sufficient passes shall be made to attain the compaction specified. A minimum of 4 passes of the equipment shall be carried out to achieve the compaction specified unless otherwise directed by the Contract Administrator. Inundation or flooding shall not be used as a method of compaction, or for any other reasons.

At the completion of each day's work and at any time during a shift when a delay to work appears imminent on account of rain, all fill deposited shall be spread, graded and lightly rolled to form a surface

sufficiently dense and shaped to shed the rain to drains. Upon resumption of work those areas, which have not been fully compacted shall be ripped for their full depth, bladed to shape and processed as newly deposited fill.

#### **4.11 Compaction**

Unless otherwise specified, all fill and all natural surfaces which have been scarified prior to placing fill shall be compacted to not less than 98% Standard Maximum Dry Density or a minimum Density Index of 70 for cohesion less material.

All layers in the full thickness of selected fill material placed under roads, footpaths, paved areas, car parks and hard standing areas shall be compacted to not less than 98% Standard Maximum Dry Density.

#### **4.12 Testing for Compaction**

Regular inspection, sampling and testing of the subgrade and pavement shall be undertaken while construction of the pavement is in progress. At least 24 hours notice shall be given to the Contract Administrator for inspection and testing of finished subgrade and other pavement courses.

A minimum of one test for every 250m<sup>2</sup> of finished earthworks shall be undertaken with a minimum of three tests per visit. The number of tests shall be whichever requires the most tests.

Tests shall be carried out in groups of at least three at locations to be determined on site and compaction of the layer concerned will be considered to be satisfactory, provided that no single result falls below 98% of the specified density except where specified otherwise.

Should the results not reach this standard the Contractor shall roll the area again, if necessary, after scarifying, adding water, blading to reduce the moisture content and/or removing and replacing excessively moist fill as may be required.

Should the depth of insufficiently compacted material be greater than can be effectively compacted from the surface, material shall be removed to a depth at which compaction can satisfactorily be achieved in layers not greater than those specified herein and placed to the correct levels.

The standard maximum dry density referred to herein for materials other than sand shall be the maximum standard dry density as determined in accordance with AS 1289.5.1.1.

The field density referred to herein for all materials shall be the dry density of the material in place as determined in accordance with AS 1289.5.3.1.

The percentage of the standard maximum dry density (Dry Density Ratio) referred to herein for materials other than sand shall be calculated in accordance with AS 1289.5.4.1.

The maximum and minimum densities for sands shall be determined in accordance with AS 1289.5.5.1.

The Density Index specified herein for sands shall be calculated in accordance with AS 1289.5.6.1.

A NATA registered laboratory shall carry out all testing.

#### **4.13 Finished Surface of Earthworks**

The required area shall be graded, within the limits specified, to the required elevation and cross section. The finished surfaces shall be smooth, compacted as specified, and free from irregular surface changes.

The finished surface shall be within 20mm of the established grade or cross section, except that the surface of the subgrade on which a pavement is to be constructed, shall not vary by more than minus 20mm/plus 0mm from the established grade or approved cross section and shall be free of depressions which pond water.

Grading shall include connections or entrances to drainage facilities or natural drainage and shall not create pockets in which water will stand.

Deviations in the finished surfaces in excess of these limits, when tested with a 3 metre straight-edge or profile template, as applicable, applied parallel with and/or at right angles to the centre line of the area, shall be corrected by loosening, to a minimum depth of 100mm, adding or removing material, reshaping, adjusting moisture content and re-compacting. This testing shall be repeated until the surface conforms to the limits specified. Costs of this work shall be borne by the Contractor.

#### **4.14 Proof Rolling**

Proof rolling of the finished subgrade shall be carried out as specified in AS 3798.

#### **4.15 Disposal of Surplus Excavated Material**

All surplus and unsuitable material shall be removed from the site, unless otherwise directed by the Contract Administrator. Burning of rubbish on site shall not be permitted. Disposal of surplus spoil shall comply with EPA, local Council and RailCorp Regulations.

## 5. Stormwater Drainage

### 5.1 Scope

This section of the Specification covers the supply of materials for laying, bedding and jointing of stormwater drainage pipes and excavation of drainage trenches.

### 5.2 Setting Out

Prior to commencing construction of any drainage lines, the Contractor shall set out the stormwater drainage systems as shown on the Drawings in sufficient detail to identify:

- (a) The location, lengths and levels at outlets and inlets of pipes;
- (b) The locations and levels of gully pits and inlet and outlet structures; and
- (b) The locations and levels of existing underground and other services.

The setout shall be presented for inspection and approval by the Contract Administrator prior to the commencement of construction.

The inlet or outlet locations or design levels or the drainage structure length may be amended by the Contract Administrator to suit actual site conditions.

### 5.3 Stormwater Drainage Pipes

Pipe used for car parks and bus interchange drainage shall be Reinforced Concrete (RC) (Class 4) complying with AS 4058 as indicated on the Drawings complying in all respects to the requirements of AS 4139. The Contractor shall be responsible for ensuring that each size and class of pipe is tested in accordance with the requirements of AS 4139 including ultimate load test. Cement used in the manufacture of pipes shall be Type GP in accordance with AS 3972.

Certified copies of the pipe test reports shall be submitted to the Contract Administrator before the pipes are installed. Any pipes tested to ultimate load shall not be used in the Works.

Rubber Ring or gaskets for flexible joints shall be of approved type and quality. Rubber rings shall comply with the requirements of AS 1646.

### 5.4 Excavation

Wherever appearing in the Specification excavation shall mean excavation in all classes of material.

The Contractor shall excavate drainage line trenches to the lines and levels shown on the Drawings, with allowance for bedding, 75mm in soil and 200mm in rock as listed below. Bottom of trenches shall be compacted to a minimum 98% standard compaction.

Should the Contractor excavate trenches to depths greater than that necessary, the excess excavation shall be backfilled to the correct level with approved material compacted as specified above.

Trenches shall be excavated to a sufficient width (in accordance with AS 3725) such that there is a minimum distance of 100mm between the side of the trench and the outside of the pipe collar. To allow

the proper handling, jointing and packing of all types of pipes specified, additional excavation shall be carried out, where necessary.

Unless otherwise specified or directed by the Contract Administrator, trench excavation for bedding on rock shall be a minimum of 200mm below the underside of the pipe collar. For bedding on earth foundation, the trench shall be excavated over its full width to a level at least 75mm below the underside of the pipe collar. All loose material shall be removed from the bottom of trenches prior to the placing of approved granular bedding material.

Subject to any Act of Parliament, Ordinance or Regulation, the Contractor shall satisfy himself as to the necessity of timbering/shoring any excavation and shall accept the sole responsibility as to its being required and to its use in the works to provide a safe working environment.

The execution of any additional excavation by benching or sloping of the trench walls to offset the necessity of timbering may be approved by the Contract Administrator at the written request of the Contractor, subject to the Contractor supplying, placing and compacting all additional specified backfill material required to make good the soil excavation in accordance with this Specification. A geotechnical report on the soil stability is required with the submission.

The Contractor shall take all precautions against accident, damage to the works or other works and properties and injury or loss arising from any cause whatsoever to persons employed by the Contractor, by the Principal or general public.

## **5.5 Pipe Bedding**

The material used for bedding of pipes shall be approved compacted granular material having high permeability and high stability when saturated and free of organic matter.

No bedding material shall be placed until the excavation has been inspected and approved by the Contract Administrator. After acceptance by the Contract Administrator, bedding material shall be placed and compacted to 98% standard compaction.

The bedding shall be Type HS3 minimum.

Where the trench is excavated in waterlogged ground, a layer of crushed rock, 20mm to 40mm size or other materials approved by the Contract Administrator, shall be laid 300mm thick below the pipe and shall extend the full width of the trench and half way up the sides of the pipe. The crushed rock shall be completely enclosed by a layer of geotextile Bidim A34 or approved equivalent with longitudinal and transverse laps of 1m and 0.5m respectively. Where in the opinion of the Contract Administrator the crushed rock would not form a suitable foundation for the pipe, a concrete cradle may be used instead. The concrete cradle shall be monolithic 20MPa mass concrete of minimum 0.25D below the pipe (min. thickness of 150mm) and surrounding the pipe up to 0.25D, where D is the pipe diameter. The concrete bedding shall be interrupted at each socket with a 12mm wide compressible joint filler.

## **5.6 Pipe Laying**

Before pipes are laid all debris and loose material that may have entered the pipe shall be removed and the outside of spigots and inside of sockets thoroughly cleaned of foreign matter.

Where indicated on the Drawings, pipe bends and fittings shall be laid to the details shown on the Drawings and in accordance with the provisions of this Specification. Anchor blocks shall be provided for pipes with grades higher than 15% as per the details shown on the drawings.

Pit walls and floors shall be constructed as pipe laying proceeds. Walls shall be brought at least to the level of the pipe invert during the laying of pipelines unless otherwise directed by the Contract Administrator.

Provision shall be made for temporary drainage in the event of rain. The Contractor shall ensure that this temporary drainage does not cause erosion or siltation of pipelines.

Pipes in proximity to existing services shall be laid with allowance for horizontal and vertical clearance as required by the relevant authorities. Contractor is responsible for obtaining the relevant authority design standards.

## **5.7 Method of Jointing**

### **5.7.1 Pipes**

Installation shall be in accordance with AS 3725 with Type HS3 support. Embankment and Trench Installation shall comply with Section 9 of AS 3725.

Pipes shall be laid with the socket end placed upstream.

Lifting holes in all pipes shall be sealed to prevent the ingress of materials in a manner approved by the Contract Administrator.

Upon completion of pipe laying, jointing and backfilling of the drainage line, the whole of the drainage line including junction pits, inlet pits, etc., shall be thoroughly cleaned to the satisfaction of the Contract Administrator and maintained in that state for the duration of the Contract.

### **5.7.2 Rubber Ring Type**

Rubber rings shall comply with the requirements of AS 1646.1 – 2000 “Elastomeric Seals for Waterworks Purposes.”

Socketed rubber ring type reinforced concrete pipes shall be jointed by placing the rubber ring evenly over the spigot end rolling it into the socket, care being taken to ensure that the joint is free from foreign matter and that the rubber ring is placed evenly in the joint.

### **5.7.3 All Types**

Where possible, the joint immediately adjacent to a pit and/or headwall shall not be made until after the pit or headwall is constructed.

In all cases care shall be taken that the interior of pipes are cleaned of any excess jointing material after jointing. Mortar joints shall be protected from the sun, and if necessary covered with earth or wet bags to prevent rapid drying of mortar for at least three (3) days after placing.



## 5.8 Concrete Encasing

Concrete encasement, if required, or where directed by the Contract Administrator, shall have a minimum thickness of 150mm around the pipe, and shall extend the full width of the trench. Concrete shall comply with Section 6 of this specification.

## 5.9 Direct Connections

Direct pipe connections, if required, or where directed by the Contract Administrator, shall require that both pipes be carefully cut or manufactured so that a neat junction is obtained. The inside joints shall be neatly and tightly finished off with cement mortar as specified hereunder so that the internal shapes of the pipes are maintained.

Bandage joints shall be placed on the outside of the connection so that all exposed external joints are lapped at least 100mm by the bandage.

## 5.10 Inspection Prior To Backfilling

All drainage lines shall be inspected and approved by the Contract Administrator after laying and jointing and prior to the placing of any backfilling. Any backfill required to avoid floatation may only be placed in the middle of a pipe section, ensuring all joints remain open for inspection.

CCTV camera inspection shall be carried out at the discretion of the Contract Administrator. Inspection reports identifying the results of the inspection along with a video/CD's shall be submitted to the Contract Administrator.

## 5.11 Backfilling

### 5.11.1 General

Unless otherwise specified or directed by the Contract Administrator, pipe trenches shall be backfilled and compacted to the satisfaction of the Contract Administrator with granular material to a point up to spring line of pipe. Selected backfilling above this height shall be placed in layers not exceeding 300mm compacted thickness. Compaction shall continue until a dry density ratio in accordance with AS 1289.5.4.1 has been achieved of not less than 98% standard compaction using the in-situ dry density determined in AS 1289.5.3.1, and the laboratory compaction method given in AS 1289.5.1.1.

Foundations and backfill material shall be compacted so that the minimum characteristic value of relative compaction when tested is as follows:

**Table 5.1 Backfill Compaction Requirements**

(a)	Backfill material within the selected material zone	98%
(b)	Foundations and trench bases to a depth of 150mm below the bottom of the plain concrete or of the bed zone	98%
(c)	All other fill material for drainage structures including select fill in the haunch, side and overlay zones, material replacing unsuitable material, backfill material and embankment material in diversion banks	98%.

The minimum Density Index shall be 70 for cohesion less material.

A minimum cover of 450mm above the collar of the pipe is to be achieved prior to subjecting the pipes to construction traffic.

Following compaction of the trench backfill, any further backfilling necessary to completely refill the trench shall be placed and compacted and the trench area shall be trimmed to restore the surface to final levels.

No lumps or layers of clay, silt or unsuitable material are to be left in place separating the pavement material from the granular trench backfill.

All pipes left open shall be capped temporarily to prevent silt wash-off entering the system during overnight rain.

Upon completion of pipe laying, jointing and backfilling of the drainage line, the whole of the drainage line including junction pits, inlet pits, etc., shall be thoroughly cleaned to the satisfaction of the Contract Administrator and maintained in that state for the duration of the Contract.

#### 5.11.2 Frequency of Testing

Compaction testing is to be undertaken in accordance with the requirements of Table 5.2.

**Table 5.2 Minimum Frequency of Testing**

Characteristic Analysed	Test Method	Minimum Frequency of Testing
Precast concrete pipes: - cover thickness - load test - cracking	In accordance with AS 4058	In accordance with AS 4058
Fibre reinforced concrete pipes: - load test	In accordance with AS 4139, Appendix C	1 pipe per 100 pipes or part thereof
Fibre reinforced concrete pipes: Dimensions and Tolerances tests	In accordance with AS 4139, Clause 9	1 pipe per 50 pipes or part thereof
Select fill in bed and haunch zones: - Particle size distribution	AS 1289.C6.1	One per 50m <sup>3</sup> or part thereof prior to placing
Select fill in bed and haunch zones: - Plasticity	AS 1289.3.3.1	One per 100m <sup>3</sup> or part thereof prior to placing
Select fill in side and overlay zones: particle size distribution	AS1289.C6.1	One per 50m <sup>3</sup> or part thereof prior to placing
Select fill in side and overlay zones: Plasticity	AS 1289.3.3.1	One per 50m <sup>3</sup> or part thereof prior to placing

Compaction	AS1289.5.3.1	In accordance with the requirements of RTA Q4 Clause A4.20
- foundations and trench bases		
- surface of excavated open drains		
- other fill material		

### 5.11.3 Capping Material

The forming capping material under roads referred to on the Drawing shall conform to the requirements of RTA QA Specification R3051 and shall be 150mm of DGB20.

## 5.12 Subsoil Pipes

### 5.12.1 General

Subsoil drainage pipelines shall be installed where shown on the drawings and also in the base of stormwater drainage line trenches for a distance 3m upstream of all stormwater inlet pits.

Subsoil pipes upstream of the pits shall be 100 mm diameter slotted pipes wrapped in geotextile filter sock and laid in the base of the trench on the trench bedding layer at the same grade as the stormwater pipeline.

Subsoil pipes in the gravel trench drain shall be as per the drawings. This trench shall be backfilled with 20mm nominal gravel. These pipes shall be placed at a minimum of 650 mm below finished surface levels.

### 5.12.2 Materials

The pipes used shall be 100mm diameter, Type 1, Class 1000, perforated plastic piping conforming to the requirements of AS 2439.1.

Joints, couplings, elbows, tees and end plugs shall conform to the manufacturer's specifications and AS 2439.1 using the manufacturer's appropriate accessory fittings, unless otherwise approved by the Contract Administrator.

Seamless tubular filter fabric shall conform to the requirements of RTA QA Specification 3553.

### 5.12.3 Installation

Trenches for subsoil drains, which are intended for the drainage of the pavement and subgrade shall be excavated to the required line to a depth of at least 650mm below the finished surface levels unless otherwise directed by the Contract Administrator.

Provided adequate clearance for the proper laying and jointing of pipes is available, plastic piping may be laid in trenches of minimum width of 300mm.

Subsurface drainage pipe shall be installed at the discharge end of pipes at gully pits and, junction boxes and at headwalls. Unless otherwise shown on the Drawings, the subsurface drainage pipe shall be a 3m length of 100 mm diameter subsoil pipe laid beside and 100 mm above the invert level of the drainage pipe discharging through the wall of the pit or headwall. The subsoil pipe shall be straight and discharge through the same wall as the drainage pipe. The subsoil pipe shall be sealed at the upstream end and shall be enclosed in a seamless tubular filter fabric.

#### 5.12.4 Filter Material

Depending on the materials through which the subsoil drain is constructed the Contract Administrator will instruct that one of the following types of filter material to be used.

Type A - Filter material shall conform to the following grading requirements:

**Table 5.3 Type A Grading Requirements**

Sieve Size	% Passing
6.7mm	100
4.75mm	85-100
2.36mm	10-40
1.18mm	0-5
425 µm	0-2

Type S - Filter material shall conform to the following grading requirements:

**Table 5.4 Type S Grading Requirements**

Sieve Size	% Passing
4.75mm	100
2.36mm	95-100
425µm	20-80
300µm	0-30
150µm	0-2
75µm	0-1

Type S filter material shall also have a co-efficient of saturated permeability of at least 8m/day, when tested in accordance with RTA Test Method T 1311 and compacted to 100% standard compaction.

Both types of filter material shall conform to the requirements of RTA QA Specification R32.

When a Type S subsoil drain is to be used the corrugated plastic subsoil pipe shall be enclosed in a seamless tubular filter fabric conforming to the requirements of RTA QA Specification 3553.

#### 5.12.5 Compaction

Filter material placed in subsoil drains shall be compacted for its full depth to a relative standard compaction of not less than 98%. Tamping around and over the pipe shall be done in such a manner as to avoid damaging or distorting the pipe or disturbing the joints and joint covering.

### 5.13 Construction Tolerances

**Table 5.5 Maximum Construction Tolerances\***

Component	Attribute	Tolerance
Concrete pipes, headwalls and wingwalls, channels	Location (plan)	Within 200mm of the plan position shown on the Drawings
Pits	Location (plan)	Within 200mm longitudinally and 20 mm laterally of the plan position
	Invert level	Within 10 mm of the invert level shown on the Drawings
Pipes, Open Drains, Other structures (box culverts, channels etc)	Maximum angular deviation from required Alignment	Horizontal – 1 in 300 Vertical – 1 in 1000
	Maximum displacement from required alignment	Horizontal – 15mm Vertical – 5mm

\*Note: Whilst maximum construction tolerances are specified above, the stormwater drainage system shall be built so that there are no areas where water ponds and that the design intent is achieved.

## 6. Concrete

### 6.1 Description

This section provides for the concrete works related to civil works such as in-situ and precast drainage pits, pit covers and miscellaneous minor special structures.

#### 6.1.1 Quality Assurance of Precast Concrete Manufacturers

The manufacturers of all precast units shall hold current accredited Quality Assurance certification to ISO 9002. A copy of the certificate shall be provided to the Contract Administrator five days prior to the delivery of the precast units to the site.

### 6.2 Preparation

#### 6.2.1 Excavation

Excavation shall mean excavation in all classes of materials and shall be carried out in accordance with the provisions of this Specification. In this specification excavation shall also include all clearing and grubbing necessary to clear the way for the proposed structure, compaction of the backfill after the structure is in place, disposal of surplus material and shall include all dewatering of the site. The Contractor shall divert or restrict the flow of water to ensure the ground is free of all surface or excess soakage water, until the completed structure is unaffected by water.

### 6.3 Formwork

All formwork shall produce a class 3 finish conforming with AS 3610.

Forms shall be designed and constructed so that they may be removed without damaging the concrete. The materials to be used in the forms shall be

- approved timber, free from loose knots and other defects, board or metal, in which all bolt or rivet heads are countersunk
- Proprietary form systems as may be approved by the Contract Administrator.

The forms shall be built true to line and in a substantial and unyielding manner to maintain position and shape. Provide V-joints on all construction joints and fillets on all external corners.

Forms shall be mortar tight and timber forms shall be thoroughly soaked with water. The interior surface of the forms shall be oiled or soaped to ensure the non-adhesion of the mortar. Oil, etc., used on forms against surfaces to be exposed shall be such that they will not stain or discolour the concrete surface. Forms shall be oiled in advance of placing reinforcement to ensure that oil will not coat the surfaces of the reinforcement.

The forms shall be inspected immediately before the placing of the concrete and any bulging or warping shall be remedied.

Forms shall remain firmly in place until the concrete has attained the necessary strength and to cure the concrete. Minimum forms stripping times should be in accordance with AS 3610 table 5.4.1. In addition, stripping time should not be less than:

- ▶ 2 days for vertical forms or external surfaces; and
- ▶ 1 day for vertical forms on hidden surfaces.

#### **6.4 Reinforcement**

Steel reinforcing bars shall conform to AS 4671 – 2001 as amended in 2003, hard drawn steel reinforcing wire shall conform to AS 4671 – 2001 as amended in 2003 and hard drawn steel wire reinforcing fabric shall conform to AS 1554.3 – 2002 as amended in 2003.

All steel shall be free from mill-scale, grease, tar, paint, oil, mud, mortar, or other foreign substance and shall be true to size. If the steel has more than a thin film of rust or pitted in the opinion of the Contract Administrator, it may be rejected.

All reinforcement shall be spaced accurately to the pitches and positions shown on the Drawings and bent and hooked cold at the points shown. Reinforcement shall be secured against displacement due to the flow and working of the concrete and shall be tied with suitable wire at all intersections of bars.

Reinforcement for slabs and similar flat surfaces shall be supported on chairs of appropriate height and made of plastic, or steel with plastic covered shields on lower ends.

Reinforcement shall be:

- ▶ of ductility grade 500;
- ▶ bent, coggled or formed as shown or required;
- ▶ lapped for:
  - 35 diameters for deformed bars;
  - 50 diameters for plain and hard drawn wire; and
  - 2 outermost wires overlap with next 2 wires.
- ▶ 50mm minimum cover if not stated on the drawings;
- ▶ wired at intersections with 18 gauge wire; and
- ▶ stored clear of the ground.

#### **6.5 Concrete**

The concrete shall comply with the requirements of AS 1379.

Unless otherwise specified, the cement shall be Type GP in accordance with the requirements of AS 3972. The nominal maximum size of aggregate shall be 20mm and the mix design shall be prepared on the basis of the concrete being placed direct from the truck mixer discharge chute.

The slump of the concrete at the time and place of delivery shall be 60mm plus or minus 15mm unless otherwise approved by the Contract Administrator or shown otherwise on the Drawings and shall be determined from samples obtained in accordance with the above Standard.

Concrete shall be obtained from an approved manufacturer unless permission is obtained by the Contract Administrator to use site mixed concrete in which case additional clauses of this specification will be given to the Contractor.

The following information shall be given to the concrete supplier:

- ▶ Slump:
  - Maximum 75mm; and
  - Minimum 45mm.
- ▶ Aggregate size: 20mm maximum;
- ▶ Cement: Normal Portland Cement shall be used throughout;

Non-agitating trucks will not be allowed. Do not add water at the site after starting discharge.

#### **6.5.1 Strength of Concrete**

Unless otherwise specified the concrete shall develop a minimum compressive strength after twenty-eight (28) days of

- ▶ 20 Mpa generally;
- ▶ 32 Mpa for drainage structures; and
- ▶ 40 Mpa for rigid pavement.

The concrete shall be sampled and tested in accordance with the requirements of this Specification. The concrete shall be assessed on the results of the 28-day tests.

#### **6.5.2 Sampling of Concrete**

Compressive strength samples shall be taken and distributed as evenly as possible over the number of truckloads being delivered. The frequency of sampling of concrete on any day shall be in accordance with the following requirements:

- |               |   |   |
|---------------|---|---|
| One truck     | - | one sample  |
| 2 to 5 trucks | - | three samples (with no samples less than 10% below the design strength) |

For each sample at least three cylinders (300mm x 150mm dia.) shall be cast for testing. Additional samples may be taken at the discretion of the Contract Administrator.

#### **6.5.3 Testing**

The moulded specimens shall be tested in accordance with AS 1012.

The test strength of the sample shall be the average of the strengths of the two, or more, specimens.



## **6.6 Concrete Works on Site**

### **6.6.1 Placing**

Before depositing concrete, all dirt, sawdust, shavings, debris and any temporary wooden blocks shall be removed from the space to be occupied by the concrete. Reinforcement shall be thoroughly cleaned and secured in position and approved by the Contract Administrator before placing any concrete.

Concrete shall be deposited without segregation of the aggregates. Care shall be taken to completely fill the forms and to sufficiently vibrate the concrete to ensure that the reinforcement is completely surrounded without displacement and the required finished surface is provided as specified.

Concrete shall not be placed while the air temperature is, or is likely to be (in the opinion of the Contract Administrator) within twenty-four (24) hours, below four (4) degrees Celsius, or while the shade temperature exceeds 38 degrees Celsius, without the approval of the Contract Administrator. No placement of concrete to be done during rain. If rain occurs during the pour, the poured concrete shall be covered and the pour terminated at a construction joint.

### **6.6.2 Construction Joints**

Where it is necessary to provide a construction joint, this shall be done with an approved rigid bulkhead, or on vertical sections, by finishing to a straight line with a roughened surface. When work is resumed, the concrete surface shall be roughened, care being taken not to disturb any reinforcement or damage adjoining concrete faces. The surface shall be cleaned of all laitance, loose and foreign matter and saturated with water.

The fresh concrete shall be carefully worked against the surface of the previous concrete and around reinforcement bars.

### **6.6.3 Finishing Concrete**

All concrete surfaces shall be true and even, free from honeycombs, depressions or projections beyond the surface. All arises shall be sharp and true, and moulding evenly mitred. Care shall be exercised in removing forms to ensure this and porous spots shall be repaired by removing defective work and filling with stiff cement mortar having the same proportions of cement and sand as used in the concrete and brought to an even surface with a wood or steel float as appropriate, unless otherwise directed by the Contract Administrator.

### **6.6.4 Curing**

After the completion of concreting of any structure or section thereof, the completed concrete shall be protected from extremes of temperature for a period of seven (7) days, during which time the concrete shall be kept continuously moist and covered with sand at least 50mm thick, straw, canvas, plastic or hessian sheets, chemical curing compound without visible breaks or pinholes, which remains unbroken at least seven days after application to AS 3799.

Retaining walls shall be cured by application of an approved chemical curing compound.

The new work shall be adequately protected from damage by weather conditions, traffic or other causes and any necessary barriers and signs for the control of traffic shall be erected and maintained for the required period.

During the curing period all vehicular traffic shall be kept off the completed concrete surface. No construction equipment or materials shall be stored on the completed concrete surface during the curing period.

#### **6.6.5 Cast in-situ Drainage Pits**

Provide a smooth, seamless finish, using a steel trowelled render or concrete cast in steel forms to the exposed surfaces of the pits.

Pit walls shall be formed on both the inside and outside faces.

Pits shall be constructed of sufficient internal dimension to avoid birds-mouthing of pipes.

Where drainage pits exceed 1.2m in depth, approved step irons shall be provided at 300 mm centres vertically and 220 mm horizontal spacing.

If the contractor nominates to use cast in-situ pit, the contractor shall provide a shop drawing of the pit showing the reinforcement details. Where the pit exceeds 1.2m deep and 900mm by 900mm square, the contractor shall obtain certification from a suitably qualified engineer that the pit is structurally adequate. The cost of providing shop drawings and structural certification shall be borne by the contractor.

Subsoil drainage pipes shall be connected through the upstream wall of the pit, and shall extend through any mass concrete benching so as to provide a free outlet. Pipes shall be protected from crushing. Where crushing has occurred the pipe shall be replaced.

#### **6.6.6 Pit Covers**

Steel gratings, frames and other fittings shall be in accordance with AS 3996.

Concrete lids and steel grated frames shall be securely fixed in place using high strength epoxy mortar. Gratings shall be secured with locking devices to prevent lifting.

#### **6.6.7 Precast Concrete Sections**

Where indicated on the Drawings or where authorised in writing by the Contract Administrator, precast concrete components shall be provided to the dimensions shown on the Drawings and shall be constructed in the positions specified in all cases.

The Contractor shall indicate the source of supply of the precast sections, and shall provide facilities for testing at the place of manufacture. The Contractor shall signify in advance when each consignment of precast sections will be ready to dispatch so that arrangements may be made for inspection and testing.

The Contractor shall provide a certification from a suitably qualified and experienced structural engineer that the pre-cast element has been designed for the expected loads and in accordance with the relevant Australian Standards. The cost of certification shall be borne by the contractor.

The surfaces of the precast components shall be smooth, in true planes with square ends.

Patching and plastering of sections will not be permitted except for lifting holes and pipe sealing. They shall be sound and free from cracks, chips, porous spots or other visible defects.

Where embedded into concrete bases the mating surfaces of the precast unit shall be scabbled and the unit shall extend a minimum of 75 mm into the concrete base.

The precast units shall be obtained from an approved source with the following information marked:

- ▶ Date and location of manufacture;
- ▶ Manufacturer's name or trademark;
- ▶ Inspection status; and
- ▶ Unit ID or number.

## 7. Line Marking

### 7.1 Scope

This section of the Specification covers the provision of line marking at locations shown on the Drawings.

### 7.2 Setting Out

The Contractor shall be responsible for the setting out of the works from details shown on the Drawings and the reference points provided therein. Additionally, kerbs and other pavement structures may be adopted for the purposes of alignment.

### 7.3 Tolerances

The location of all pavement markings shall not vary more than 10mm from that specified on the Drawings or as directed by the Contract Administrator.

The lengths of all longitudinal lines shall not vary more than 10mm from those specified.

The widths of all longitudinal lines shall not vary more than 5mm from those specified.

The dimensions of chevrons and arrows shall not vary more than 5mm from those specified.

Any arrows shall be placed square with the centreline of the traffic lane.

### 7.4 Surface Preparation

Pavement markings shall only be applied to clean, dry surfaces.

The Contractor shall clean the surface to ensure a satisfactory bond between the markings and wearing surface of the pavement.

Pavement markings shall not be carried out during wet weather or if in the opinion of the Contract Administrator rain is likely to fall during the process.

### 7.5 Materials

#### 7.5.1 General

The details of the various types of pavement markings and devices are generally in accordance with AS1742.2.

#### 7.5.2 Pavement Marking Paint

Pavement marking paint shall comply with the requirements of AS 4049.3 as directed by the Contract Administrator.

All paint shall be thoroughly mixed in its original container before use to produce a smooth uniform product consistent with the freshly manufactured product.

Colours shall be white as detailed on the Drawings and shall not be subject to discolouration by bitumen from the road surface.

### **7.5.3 Glass Beads**

Spherical glass beads shall comply with the requirements of AS 2009.

### **7.5.4 Pavement Markers**

Reflective and non-reflective pavement markers are to be in accordance with relevant RTA Standards. Pavement markers are to be held to the pavement by the use of CIBA-GEIGY Road Epoxy or an approved equivalent product.

## **7.6 Spraying Equipment**

Mechanical spraying equipment shall be capable of applying paint uniformly to the road surface at the application rate specified. It shall be equipped with a device for the application of glass beads located immediately behind the paint jets.

The paint tank shall be equipped with a suitable device such as a dip-stick for the determination of its contents.

## **7.7 Pavement Marking Details**

Unless otherwise specified, pavement marking shall comply with the details prescribed in AS 1742.2.

## **7.8 Application**

Unless otherwise approved by the Contract Administrator, all paint shall be applied by mechanical sprayer. The road surface shall be clean and dry at the time of painting. Paint shall be applied at a wet thickness in the range 0.35 to 0.40mm.

Pavement markings shall be straight or with smooth, even curves. Tolerances shall comply with those specified in Section 7.3.

## **7.9 Testing**

The thickness of the paint shall be tested by the Contractor in accordance with Clause 10.2 of RTA QA Specification R141.

## 8. Fencing

### 8.1 Scope of Work

The scope of work to be undertaken under this part of the Specification consists of the supply and installation of the following:

- ▶ Chain Wire Mesh Fencing;
- ▶ Pedestrian Fencing; and
- ▶ Security Steel Picket Fencing.

#### 8.1.1 Referenced Documents

Unless otherwise specified the applicable issue of a reference document shall be the issue current at the date one week before the closing date for tenders.

Standards, specifications and test methods are referred to in abbreviated form. For convenience the full title are given below.

#### Australian Standards

AS 1111	<i>ISO Metric Hexagon Bolts and Screws.</i>
AS 1112	<i>ISO Metric Hexagon Nuts.</i>
AS 1214	<i>Hot-dip Galvanised Coatings on threaded Fasteners.</i>
AS 1594	<i>Hot-Rolled Steel Flat Products.</i>
AS 1650	<i>Hot-dipped Galvanised Coatings on Ferrous Articles.</i>
AS 1725	<i>Chain-link Fabric Security Fencing and Gates.</i>
AS 2423	<i>Coated Steel Wire Fencing Products for Terrestrial, Aquatic and General Use.</i>
AS 3678	<i>Structural Steel-Hot-rolled Plates, Floorplates and Slabs.</i>
AS 3679	<i>Structural Steel.</i>
AS 3750	<i>Paints for Steel Structures.</i>
AS 3972	<i>Portland and Blended Cements.</i>
AS 4100	<i>Steel Structures.</i>
AS 4506	<i>Metal finishing – Thermoset Powder Coatings.</i>
AS 4680	<i>Hot-dip Galvanised coatings on Ferrous Hollow Sections, applied by a Continuous or a Specialised Process.</i>

## 8.2 Materials

### 8.2.1 Fittings and Baseplate – Chain Wire Fencing

All clamps, pipe fittings, hinges, fasteners and baseplates to be manufactured from plain carbon steel suitable for hot-dip galvanising in accordance with the requirements of AS/NZS 4680

All fittings and baseplates shall:

- ▶ Have fully welded joints (staggered welding not permitted). Fillet welds shall be not less than 6mm exposed surface width and shall be cleaned by chipping and brushing.
- ▶ Have two coats of approved zinc-rich paint and shall be applied in accordance with AS 4680 to any galvanised surface damaged by welding.
- ▶ Be manufactured from steel grade HA 250 in accordance with AS/NZS 3678.
- ▶ Be treated and hot-dip galvanised after fabrication in accordance with AS 1650. The minimum coating mass shall be 900g/m<sup>2</sup>, total both sides.

### 8.2.2 Chain Wire Mesh

All wire fencing material shall comply with AS 2423.

The coating for the chain link fabric shall comply with AS 2423. The PVC coated mesh shall comply with AS 2423 with a base metallic coating not less than a W02Z category.

The mesh coating is to be black N61 and be UV stable and comply with requirements of AS/NZS 4506.

### 8.2.3 Pedestrian Fencing

All pedestrian fencing to be loop top type fence and be constructed and erected in accordance with manufacturer's requirements and details shown on the Drawings. Fencing height to be 1.5m vertically above the immediate ground surface.

Steel posts for pedestrian fencing must be fabricated to the details shown on the Drawings from grade 250/300 structural steel plates complying with AS 3678 and must be powder coated in accordance with AS/NZS 4506. Where posts are required to be fabricated with a baseplate they must be erected using (4) chemical anchors, size as specified by the fencing manufacturer and embedded a minimum of 100mm in the existing concrete. A grout pad of 25 mm minimum thickness must be installed between the underside of the baseplate and the existing concrete surface. Where specified or shown on the drawings pedestrian fence posts must be fitted with a steel cap. The cap must be fabricated to the appropriate details shown on the drawings from sheet complying with AS 1397 and must be powder coated in accordance with AS/NZS 4506.

Welding must comply with AS 1554.1, Weld Category GP. All welds must be 6 mm continuous fillet unless noted otherwise on the drawings.

### 8.2.4 Security Steel Picket

All security steel pickets fencing must be constructed and erected in accordance with the manufacturer's requirements and details shown on the Drawings.

### **8.2.5 Footings**

All concrete for footings shall be prepared using cement complying with AS 3972 and shall be at least 32MPa in compressive strength.

### **8.2.6 Posts**

Tops of all posts shall be provided with tightly fitted steel caps.

Posts classification is to be Class 2 medium/light quality.

### **8.2.7 Barbwire and Tension Wire**

The Barbwire is to be manufactured in accordance with AS 2423.

The Horizontal Tension Wire is to be galvanised 4mm diameter wire helix spiralled.

### **8.2.8 Tie Wires and Clips**

Tie wires and clips to be black PVC coated and comprise of double strand 1.57mm diameter core wire.

All tie wires and clips shall be hot-dip galvanised after fabrication in accordance with AS1650.

### **8.2.9 Nuts and Bolts**

All threaded bolts shall be sized correctly for clamp-on fittings and securely tightened with nuts.

Nuts and bolts shall be hot-dip galvanised in accordance with AS 1214.

Bolts shall be of property Class 4.6 in accordance with AS/NZS 1111.

Nuts shall be property Class 5 in accordance with AS/NZS 1112.

### **8.2.10 Structural Strand**

Structural strands to be grade 1570. The structural strands shall be hot-dip galvanised after fabrication in accordance with AS 1650. The minimum coating mass shall be 900g/m<sup>2</sup>.

### **8.2.11 Steel**

All structural steel shall comply with AS/NZS 3678 or AS/NZS 3679.1, as appropriate.

Other metal materials, not specified herein, shall comply with the appropriate Australia Standard.

Universal Columns (UC's) and Equal Angles (EA's) shall be formed from steel grade HU300 in accordance with AS/NZS 1594.

UC's and EA's shall be hot-dip galvanised after fabrication in accordance with AS 1650. The minimum coating mass shall be 900g/m<sup>2</sup>.

Renovation of damaged or uncoated areas shall be in accordance with AS 1650.

Zinc-rich paints shall be in accordance AS/NZS 3750.0.



### **8.3 Information to be supplied by the Contractor**

Information to be supplied by the Contractor as part of the Quality Plan shall include but not be limited to the following:

1. Details of driving equipment and helmet proposed for driving steel fencing posts, plus procedure to prevent damage to posts if installing by driving; and
2. Procedure to prevent damage to underground facilities (utilities, services, structures, etc).

## 9. Safety Barrier Guard Systems

### 9.1 Scope

This section of the specification includes requirements for the construction of safety barrier guard systems.

Safety barrier guard systems are to consist of W-beam galvanized steel barriers with metal posts in accordance with RTA specification DCM R132, which includes safety barriers, terminals, transitions, and delineation. Safety barrier systems are to be constructed as set out in the Drawings.

### 9.2 Proprietary Safety Barrier Systems

Proprietary safety barrier systems and devices shall be supplied and constructed in accordance with this Specification and the manufacturer's recommendations.

### 9.3 Construction of Safety Barrier Systems

Construction of safety barrier systems includes supply, delivery, handling and assembly of components and devices, as well as setting out, and supply and installation of delineation.

Safety barrier systems supported by posts shall be constructed with the posts vertical.

The Contractor shall construct the safety barrier system to form a smooth line vertically and horizontally, when viewed along the line of the system, free from humps, sags, or other irregularities.

## 10. Awnings and Street Furniture

### 10.1 Scope for Awnings

The section of the specification includes requirements for the awnings. The extents and dimensions of the awnings shall be in accordance with the drawings. The contractor is responsible for the design, supply, and installation of the awnings including certification from a suitably qualified structural engineer that the structure meets all relevant Australian standards and codes with respect to design, fabrication, and installation.

The cost for design, fabrication, galvanising and erection of the awning frames is included in the Provisional Sum for this work. Refer clause 1.18 of this Part E.

All other costs for the awnings, including galvanised purlins and colorbond roofing, gutters and downpipes is included in the Contract Sum.

### 10.2 Design, Supply and Installation of Awnings

The objective of the proposed awning in terms of aesthetics is to match the existing awning at Morisset train station. The contractor is to submit shop drawings including structural certification to the Contract Administrator's approval prior to commencement of construction. The shop drawings shall include all necessary dimensions, welding and fastening details, grade and gauge of metal used, footing, and fixing details into the ground. Unless stated otherwise on the drawings, the structure is to be hot dipped galvanised.

The colour of all components of the awning is to be detailed on the shop drawings for the Contract Administrator's approval. The contractor is to take special note of the general sectional detail in the drawings and note the structural configuration, height, and offset from the kerb to ensure it does not conflict with high vehicles.

Purlins shall be Lysaght galvanised C15019 at 1.2 metre centres unless otherwise directed by the Contract Administrator.

### 10.3 Design, Supply and Installation of Glass Screens

The contractor is responsible for the design, supply, and installation of the glass screens where shown on the drawings including certification from a suitably qualified structural engineer that the structure meets all relevant Australian standards and codes with respect to design, fabrication, and installation.

Glass screens and frames shall generally conform to the detail shown in the Appendix to this Part E titled "Standard Windbreak". Screen height shall be 2.4 metres above paving, 5.0 metres long and with return panels 1.3 metres long on each end. One glass screen unit shall be provided at each of the three bus stops

The cost for design, fabrication, galvanising and erection of the glass screen support frames is included in the Provisional Sum for this work. Refer clause 1.18 of this Part E.

All other costs for the provision of glass screens is included in the Contract Sum.

#### **10.4 Taxi Waiting Shelter**

Provide adjacent to the taxi parking one Adsel colonial shelter structure including concrete slab.

#### **10.5 Downpipes**

Downpipes shall generally be colorbond except where within 2.4 metres of a publicly accessible surface. In such locations downpipes shall be galvanised steel of minimum 2mm wall thickness.

#### **10.6 Seats**

Provide one SSD/A Metro seat as manufactured by Adshel to each bus and taxi shelter. Seats to be 2.4 metres long, extruded aluminium planks, and with legfeet mounting to the concrete slab.

#### **10.7 Garbage Bins**

Provide one LB2 Urban Litterbin as manufactured by Adshel, clear anodised finish, surface mounted to concrete pad adjacent to the footpath at the bus stop.

#### **10.8 Bicycle Lockers**

Provide four double lockers (total for eight bicycles) within the car park area at a location to be nominated by the Contract Administrator.

Bicycle lockers are to be as manufactured by Leda-Vannaclip, or equal.

## 11. Septic Tank

### 11.1 Scope

This section of the specification includes requirements for septic tank. The contractor is to select and install a new septic tank with adequate capacity to match the existing septic tank that is currently on-site in the RailCorp compound immediately south of the eastern car park.

The entire septic system is to comply with the requirements of Lake Macquarie City Council and other relevant authorities.

### 11.2 Supply and Installation

The contractor is responsible for the selection, supply and installation of a septic tank to replace the current tank that serves the existing portable buildings in the RailCorp compound. The new tank is to be installed in-ground located in accordance with the drawings and include any necessary structural certification from a suitably qualified structural engineer that the structure meets all relevant Australian standards and codes with respect to design, fabrication, and installation. The contractor is to ensure the installed system is fit for purpose and satisfies its intended function. Consequently, the contractor shall ensure any necessary components including but not limited to the supply and installation of pumps, provision of a line to an outlet point as indicated on the drawings to be included in the tender price. The contractor shall also be aware that the tank is in-ground and needs a structurally adequate slab on top with 300mm cover to support semi trailer wheel loads.

## 12. Durability Issues

All materials and installation methods are required to meet the durability requirements as follows:

- All road pavement materials and installation methods are required to meet the durability requirements of the Deed for a 20-year design life.
- Miscellaneous concrete pits – 100 years
- Pipes above ground (accessible) – 25 years
- Pipes below ground (inaccessible) – 100 years

Suppliers shall be required to supply documentary evidence to demonstrate that all materials and proposed installation will conform to this objective. These shall be submitted for approval prior to procurement and installation. Allow 14 days for the assessment of such proposals.

## 13. Hold and Witness Points

### 13.1 Hold Points

The Contractor shall not proceed beyond a Hold Point until that Hold Point has been released by the person nominated in Table 12.1 below. The Contractor shall make suitable arrangements to notify the relevant person when a Hold Point will be reached so that they can review and/or witness any work process, record or test being undertaken by the Contractor and thus expedite the release of that Hold Point.

The Contractor shall define in the Project Quality Plan the method of release of Hold Points by the relevant parties.

**Table 12.1 Hold Points**

No	Hold Point Details	For Release by
1	All relevant Hold Points outlined in the Works Brief.	Contract Administrator
2	Hold Points as the Contractor deems necessary to meet its obligations under the Deed.	Contract Administrator
3	Erosion and sediment controls in place – Contractor report	Contract Administrator
4	Set-out of Stormwater Drainage – Contractor survey report	Contract Administrator
5	Materials test results for all fill materials – Contractor test Report	Contract Administrator
6	Earthworks compaction test results – Contractor test Report	Contract Administrator
7	Subgrade completed including levels and proof rolling – Contractor test Report	Contract Administrator
8	Materials test results for pipe bedding and filter materials – Contractor test Report	Contract Administrator
9	Service trenches excavated and ready for laying the services	Contract Administrator
10	Services laid in trenches and ready for backfilling	Contract Administrator
11	Trench compaction test results - Contractor test Report	Contract Administrator
12	Concrete Specification hold points	Contract Administrator
13	Materials test results for granular pavement courses - Contractor test Report	Contract Administrator
14	Granular pavement courses compaction test results - Contractor test Report	Contract Administrator
15	Asphalt mix design and materials test results -	Contract Administrator

No	Hold Point Details	For Release by
	Contractor test Report	
16	Asphalt compaction test results and grading, bitumen content etc as set out in section 8 - Contractor test Report	Contract Administrator
17	Materials Certificates	Contract Administrator
18	Excavate unsuitable materials	Contract Administrator
	Bearing capacity of foundation material – Contractor's Geotech engineer	Contract Administrator
19	Survey of holding down bolts before erection of steelwork – Contractor survey report	Contract Administrator
20	Inspection of steel reinforcement in place and prior to concreting – Contractor engineer's report	Contract Administrator
21	Inspection of structural steel prior to galvanising	Contract Administrator

### 13.2 Witness Points

The contractor shall provide the person nominated in the table below reasonable notice (minimum 24 hours or as agreed with relevant inspectors) of all witness points so that inspection may be made of the following:

**Table 12.2 Witness Points**

No	Witness Point Details	For Release by
1	All relevant witness points outlined described in the Works Brief.	Contract Administrator
2	Hold points as the contractor deems necessary to meet its obligations under the Deed.	Contract Administrator
3	Adjoining structures before commencement of demolition;	Contract Administrator
4	Existing services before level adjustment.	Contract Administrator
5	Trees and plantings specified to be retained, before commencement of demolition.	Contract Administrator
6	Services after level adjustment.	Contract Administrator
7	Adjoining structures after completion of demolition.	Contract Administrator
8	Concrete Specification witness points	Contract Administrator
9	Trimmed and compacted granular pavement courses	Contract Administrator
10	Kerb subgrade prior to placement	Contract Administrator
11	Tack coated base course	Contract Administrator



12	Asphalt paving and field compaction	Contract Administrator
13	Erected steelwork – Contractor's Design engineer	Contract Administrator
14	RailCorp maintenance shed complete - Contractor's designer	Contract Administrator
15	Electrical wiring prior to covering up – Checked by RailCorp representative	Contract Administrator
16	Testing electrical switchboard – Checked by RailCorp representative	Contract Administrator
17	Completed drainage invert levels – Contractor survey report	Contract Administrator

## **14. APPENDICES**

- 14.1 Appendix E1 - Drawing List**
- 14.2 Appendix E2 - Standard for on-site communications and customer relations procedures for station upgrading works**
- 14.3 Appendix E3 - RailCorp LV electrical standard drawings**
- 14.4 Appendix E4 - Approved electrical equipment**
- 14.5 Appendix E5 - CCTV conduit and cable requirements**
- 14.6 Appendix E6 - Traffic Impact Assessment**
- 14.7 Appendix E7 - Standard Windbreak**
- 14.8 Appendix E8 - Worksite Protection Providers**
- 14.9 Appendix E9 - Services Data**
- 14.10 Appendix E10 - Geotechnical Investigation Report**
- 14.11 Appendix E11 - Contamination Assessment and Site Management Plan**
- 14.12 Appendix E12 – Hazard Log & Risk matrix**