

PART E

TECHNICAL REQUIREMENTS

RFT No. 2006/1215

Design and Construct Canopies for Wiley Park, Canley Vale, Newcastle, Padstow, Hornsby, Springwood, Woy Woy and Oatley Stations

PART E

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E1 DESIGN & CONSTRUCTION REQUIREMENTS - GENERAL

E1.1 OBJECTIVE

It is intended to provide new / additional covered area to the Station Platforms in Wiley Park, Canley Vale, Newcastle, Padstow, Hornsby, Springwood, Woy Woy, Oatley. This shall provide CityRail customers with additional and improved facilities.

Since the Public uses the stations, work must therefore be designed, staged and carried out in such a sequence that will not affect the running of the station or the safe flow of commuters. New and current technologies for construction, which will achieve minimal impact on station operations, will be considered in preference to traditional methods.

E1.2 SCOPE OF WORKS

E1.2.1 Generally

The Works comprise the design and construction of:

Separable Part 1: Design & Construct Works at Springwood, Woy Woy, Canley Vale and Newcastle Stations.

- Springwood Railway Station Sydney Side Platform 1 & 2 New Canopy Installation
- Woy Woy Railway Station-Platform 1&2 Country End Side New Canopy Installation
- Canley Vale Railway Station Platform 1 Canopy Installation
- Newcastle Railway Station Country End Platforms 2 & 3 New Steel Canopy Installation and required refurbishment of Existing Timber Framed Canopy

Separable Part 2: Design & Construct Works at Padstow, Wiley Park, Hornsby and Oatley stations.

- Padstow Railway Station Platform 1&2 New Canopy Installation
- Wiley Park Railway Station Platform 1 & Platform 2 Ramps New Canopy Installation
- Hornsby Railway Station- Country End Platform 4 New Canopy Installation
- Oatley Railway Station Country End Side Platform 1&2 New Canopy Installation

During the different stages of the whole project period:

- ⇒ professional practices shall be employed by the Contractor to ensure that risks in design and construction both during the construction work and for operation and maintenance of the assets created or refurbished are addressed in the design; and
- ⇒ the Contractor shall be totally responsible for the design and construction Works complying with the requirements as stipulated in the “CityRail Station Design Guide”.

E1.2.2 Design

A concept design has been developed for above mentioned stations. The design based on this already developed concept design must be fully reviewed at various stages of development and completed by the Contractor to satisfy all stakeholders, operational, technical and statutory requirements.

The Contractor shall be fully responsible for completing the design using a firm of design consultants (the Design Service Provider), approved by RailCorp, engaged and supervised by the Contractor (refer to Appendices).

The design responsibilities of the Contractor will therefore include but not necessarily be limited to the following: -

- Ensure design documents are error free and comply with all relevant Standards and statutory requirements.

- Ensure that design is workable and constructible within the constraints of the operating station environment. Full details of the constraints and safety requirements related to construction on Stations shall be developed, verified and certified in the design drawings and documents. Some major constraints include:
 - Due to the limited time (two possession weekends- 4days) for major installation activity which requires
 - track course usage,
 - need of space other than safe platform area,
 - crantage,
 - approaching the overhead lines more than 2000mm

It is suggested to adopt a modular design approach minimizing the crane and track usage and dependency to possession weekends. It may allow working normal operation days with proper safety precautions.

 - Minimum disruptions to Station operations eg. Provide maximum usage space for use by passengers.
 - Restriction on peak hour work and staging of work to allow satisfactory passenger movements for preparatory works.
- Investigate, determine and report all existing and proposed “service” requirements for the upgraded Station. Seek approval from the appropriate authorities for any proposals of relocation/removal of services.
- Ensure the detailed design is in comply with Heritage Council Requirements in line with provided heritage impact statement for relevant stations.
- Investigate and resolve all geotechnical requirements.
- Investigate and provide lighting plan to meet RailCorp's recommended minimum lighting levels.
- Complete design to meet construction and Railcorp minimum dimension requirements like
 - minimum set back from the platform edge,
 - minimum vertical clearance of Canopy Height to comply with RailCorp Station Passenger Information (SPI) Systems requirements,
 - minimum gap must be left between any part of the canopy roof and any overhead wiring structure,
 - The minimum distance between overhead wiring structures and other earthed metallic structures

E1.2.3 Development Applications

Since all canopies are on the platforms in the boundary of RailCorp Land and RailCorp Assets and far from council assets, there has not foreseen any need to make a DA application to relevant councils for the provision of canopies at specified stations. Nevertheless, Inquiries will be completed and if needed It is anticipated that the process of obtaining approval consent to the DA will be completed prior to awarding of the contract. Conditions if any imposed by the Councils shall be informed to all the Tenderers prior to closing.

NOTE: Notwithstanding the above, the Design and Construction of the Canopy shall be the responsibility of the Contractor.

E1.2.4 Construction

The construction Works under this Contract to be provided by the Contractor shall comprise the provision of all labour, materials, plant and equipment for completing the upgrading Works and handing over of the total Contract Works to a standard accepted by RailCorp. Some major constraints include:

- No construction activities shall proceed during Special Events, Easter, Christmas and other Public Holidays and all sites shall be adequately fenced off and made secure and safe during these periods. The Station Entry shall be restored to its maximum capacity for operations and to the satisfaction of the Contract Administrator. The same conditions shall apply on festival days and days of Special Events with prior notice from the Contract Administrator.
- No construction activities which requires
 - track course usage,
 - need of space other than safe platform area,
 - crantage,
 - approaching the overhead lines more than 2000mm
 shall proceed during normal operation days but only during possession days
- All major construction works necessitated track/crane usage and cause safety risks to public & employees shall be carried out during possession days if needed. Works can be performed during night-time (from 2200 hrs to 0600hrs) and off-peak hours (peak hours are 06:00-09:30 & 15:00-18:30) with taking all safety precautions
- Reinstate all works/services disturbed prior to Practical Completion of Works.
- At the end of the project within maximum two weeks of practical completion all relevant As-build drawings should be submitted to the Contract Administrator for review and acceptance.
- All submitted design Drawings should be in its original editable format (e.g. AutoCAD) in addition to the easy view format (e.g. PDF) and other specified formats.

E1.2.5 Certification

The Contractor shall provide the following design certification to the Contract Administrator:

- (a) A certificate from the Design Service Provider that the design complies with all relevant Australian Standards and BCA requirements.
- (b) A certificate from the Design Service Provider that the installation of all work complies with the design documentation.
- (c) The Contractor by submitting his “Services” Search Report prior to commencing construction, must certify that all existing conditions on site have been fully investigated and all requirements for upgrade, relocation, removal, connection and repairing will be incorporated in his design and construction Works in accordance with the Terms and Conditions of this Contract.
- (d) Inspection and Test Plans (ITP)

Inspection and testing shall be carried out by the Contractor in accordance with the Inspection and Test Plans approved by the Contract Administrator and shall be part of the work.

E1.2.6 Works at Various Stations

The Works to be carried out by the Contractor is broadly described and shown in the Concept Design Drawing and defined as, but not necessarily limited to, the following:-

Station	Description of Work
Wiley Park	Country End Platform 1 & Platform 2 Ramps New Canopy Installation Provide detailed design and final Technical Specification which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. Provide new canopies to existing footbridge and ramps to join the Station concourse canopy, on both platform side allowing for future connection to future platform canopies Trim trees and shrubs as required to allow for construction of new canopies Remove light poles, provide new lighting to the underside of canopies to standard RailCorp Requirements Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp). Connect stormwater to existing platform stormwater drainage. Provide new canopy with electrical lighting as necessary. All work shall be in accordance with RailCorp technical specification EP 12 00 00 SP for earthing, bonding and electrolysis. Colour scheme and finishes to match existing. Making good to landscaped area and public footpath area after installing columns & foundation elements. Canopy Steel elements erection, roof works essentially to be undertaken during possession weekends, and night hours (2200 hrs to 0600hrs) if needed as approved by RailCorp. Provide all As-Built drawings
Canley Vale	Sydney End-Platform 1-New Canopy Installation Provide detailed design and final technical specification which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. Remove existing free standing platform canopy Remove all necessary electric light poles and fittings Trim or remove trees as necessary to clear the new platform canopy Provide new single pitched roof with a steel framed galvanised finish and a metal roof Connect stormwater to street drainage and make good to landscaped area and public footpath area Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all

Station	Description of Work
Newcastle	fixings (with Communication and Control System Division of RailCorp) Provide new canopy with electrical lighting as necessary *The steel column next to the existing station building must be framed and clad in a non conductible material All work shall be in accordance with RIC technical specification EP 12 00 00 SP for earthing, bonding and electrolysis. Provide all As-Built drawings Provide a new pitched roof with centre column canopy structure to match existing steel framed canopy linking the platforms Provide detailed design and final technical specifications which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. The steel framed structure is to be painted to match the existing color scheme The canopy is to have translucent sections to both ends of the new canopy Remove all necessary platform seats and bins as necessary Remove all necessary electric light poles and fittings Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp) Modify/Relocate the timber planter boxes as necessary Provide to the new canopy electrical lighting as necessary Install stormwater drainage and connect to existing stormwater drainage Existing timber framed canopy shoe and spigot should be cleaned and finished with an anti corrosive paint Secure Existing timber framed canopy downpipes with new bracket to timber post Remove any unnecessary conduit and repaint the whole structure in the existing colour scheme. Provide all As-Built Drawings.
Padstow	Sydney end Platform 1&2 new canopy installation Provide detailed design and final technical specifications which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. Provide new canopy roof to match the existing platform station building profile with a steel framed structure, roof sheeting to be metal, steel framed structure to be galvanised finish. The steel framed structure is to be painted to match the existing color scheme Install a small gantry with a folding ladder system access on top of the canopy and a ladder system that enables 24hr access to the existing train radio antennas (total height including antenna mount is 12m) to climb radio antenna pole for maintenance Remove all necessary platform seats and bins as necessary

Station	Description of Work
Hornsby	Remove all necessary electric light poles, CCTV cameras, P.A. equipment and fittings Make platform surface good to public footpath area Provide new canopy electrical lighting as necessary. Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp) Install stormwater drainage and connect to existing stormwater drainage Provide As-Built Drawings
	Country End Platform 4 New Canopy Installation Provide detailed design and final technical specifications which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. provide a new single pitch canopy to match the existing canopies and to link the existing platform canopies Remove the existing palm tree and garden bed to the country end and make good to the platform surface. Install stormwater drainage and connect to existing stormwater drainage the existing steel framed stairway canopy will require to the platform side, large scale mesh framed inserts from the balustrade height to the roof level Existing column hang lights and CCTV will need to be removed as necessary Provide new canopy electrical lighting as necessary Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp) Provide As-Built Drawings
Springwood	Sydney End Platform 1 & 2 New Canopy Installation around the Building Provide detailed design and final technical specifications which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, the RailCorp and relevant authorities. relocate the existing painting, remove existing garden bed and septic structure making good to the platform surface provide a new gable pitched canopy with a steel framed galvanised finish and a metal roof to match the existing canopies and to link the existing platform canopies Provide existing platform buildings a canopy with translucent sheeting to match the other glazed roofs. Connect stormwater to existing station drainage and make good to platform surface as necessary remove all necessary CCTV, P.A and electric light poles& fittings making good to surface they attached

Station	Description of Work
Woy Woy	Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp) Provide new canopy with electrical lighting, as necessary Provide As-Built Drawings Country End Platform 1&2 New Canopy Installation: Provide detailed design and final technical specifications which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. Remove the existing smaller centre column canopy remove all necessary CCTV, P.A and electric light poles& fittings making good to surface they attached Relocate brick & timber planter boxes and make good to the platform surface if unavoidable provide a new gable pitched canopy with a steel framed galvanised finish and a metal roof to match the existing canopies and to link the existing platform canopies The new canopy to have a translucent portion to the gable at the existing building end, the remaining roof to be clad in metal to match the existing Connect stormwater to the existing platform drainage system Provide to new canopy with electrical lighting, CCTV and P.A. Equipment as necessary Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp) Provide As-Built Drawings
Oatley	Country End Platform 1&2 New Canopy Installation Provide detailed design and final technical specifications which considers all architectural, civil, structural, electrical, hydraulic aspects of the project in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, RailCorp and relevant authorities. remove all necessary CCTV, P.A and electric light poles& fittings making good to surface they attached if unavoidable relocate vegetation on platform, planters, garden bed making good to the platform surface Relocate existing platform seats and bins as necessary Relocate brick & timber planter boxes and make good to the platform surface if unavoidable provide new gable pitched canopy roof to match the existing platform station building profile with a steel framed centre columned structure , roof sheeting to be metal, steel framed structure to be galvanised finish Connect stormwater to station drainage system making good to platform surface as necessary

Station	Description of Work
	Provide new canopy with electrical lighting as necessary Coordinate the design with the removal and relocation of CCTV cameras and all fixings (with ADT Security Australia), Public Addressing System Elements and all fixings (with Communication and Control System Division of RailCorp) Provide As-Built Drawings

E1.3 WORKING AREAS

E1.3.1 Occupied Premises

For the parts of the site designated as occupied premises in the “Occupied Premises Schedule”:

- inform and consolidate all feedback from all parties being affected;
- allow occupants to continue in secure possession and occupancy of the premises for the required period;
- make available safe access for occupants;
- arrange work to minimise nuisance to occupants and ensure their safety;
- protect occupants against weather, dust, dirt, water or other nuisance, by such means as temporary screens; and
- arrange notifications to surrounding neighbours (retail, commercial and/or residential occupants) regarding the working hours and noise propagation.

E1.3.2 Occupied premises schedule

Occupants	Occupied premises
Commercial operators	Generally located in the concourse area
Station staff	Platforms and Public Access Areas (booking office and staff amenities, stairs, concourse)
Public	Public Access Areas (eg., concourse, stairs, walkways and platforms)

E1.3.3 Station Operations

Apart from the normal people movements/marshalling, the other activities happening on the station (including platforms) include, but are not limited to:

- Rubbish removal, platform cleaning, servicing of vending machines and parcel dispatch.
- Delivery of supplies to and removal of rubbish from shop tenants.

The normal Station operating hours are from 0400 to 0030 seven days a week. Within these hours, the peak periods are 0600 to 0930 and 1500 to 1830. (Details to be confirmed by the Station Manager).

The execution of the Works under this Contract shall not cause adverse impact upon the Station operations, tenants or the public, and shall be subject to the approval of the Contract Administrator and the Station Manager. The Canopy Roof Works shall be carried out during the night hours, noted previously.

All staircases must be accessible for use by the general public at all times.

E1.3.4 Temporary Signage

During the course of demolition and construction, the Contractor shall be responsible to provide and erect temporary Station signage as directed by the Contract Administrator to maintain satisfactory operations of the Station.

E1.4 DESIGN SERVICES TO BE PROVIDED BY THE CONTRACTOR

E1.4.1 Generally

The Contractor and his approved Design Service Provider shall fully familiarise themselves with the Site and the requirements of the Works, undertake thorough investigation of existing services and satisfy themselves in relation to all existing conditions including the adequacy of power supply, drainage and existing structures where required to accommodate the proposed works.

E1.4.2 Detail designs and documentation

The responsibilities of the Design Service Provider shall include but not be limited to:

- (i) the design and documentation of the Works with proper skill, care and diligence in accordance with the requirements of the Contract, the Building Code of Australia, the Standards Australia, the RailCorp and relevant authorities.
- (ii) arranging for such site investigations as may be considered necessary for the design of the Works
- (iii) the dimensional, functional and structural adequacy of their documentation irrespective of whether the documents have been reviewed by the Contract Administrator or any other source appointed by RailCorp.
- (iv) carrying out the Works in accordance with the program accepted by RailCorp.

The Contractor by sub-contracting any part or parts of the design Works shall not be relieved from any of its liabilities or obligations under the Contract and shall be and remain responsible for all Design Service Providers and for all Works which are or may be sub-contracted.

The Contractor shall be responsible for co-ordinating the work of the Design Service Providers engaged by it and shall provide and direct all necessary personnel to administer, supervise, inspect, review, co-ordinate and control the Design Service Providers so as to ensure the completion of the work undertaken by the Design Service Providers in a proper and professional manner and at a rate of progress consistent with the project program to meet agreed milestones and in accordance with the contract documents.

E1.4.3 Documentation

The Contractor will be required to develop the Detail Design and prepare professional documentation sufficient for the construction/installation of the Works shown in the Detail Design.

The documentation submitted by the Contractor shall include fully detailed drawings as required for the supply and construction/installation of the Works.

E1.4.4 Services Report

The Contractor shall investigate and determine existing and proposed specialist design 'service' requirements for the canopy works. This shall be in report format covering items such as:

- A list of all services and their capacities (including locations of isolating valves or switches) on the Station.
- An investigation of whether the power supply is adequate.
- An investigation of the drainage and water systems (eg. by dye testing) on the Station - in accordance with the BCA.

NOTE - 'services' in the above Works means electricity, telephone, pay phones, facsimile, water, radio, data communication, CCTV, alarms, P/A systems, drainage, sewer, ventilation, earthing, light posts, stanchions, planters, rubbish bins, train indicators, signage, Station furniture, drink and confectionery vending machines, fire protection, lift, over head wiring, signal cables and galvanised cable troughs.

A "Contact List for Services Search" is enclosed in the Appendices for Contractor's reference.

E1.4.5 Design and Constructability Review and Hold Points

Constructability is a critical element that shall be examined during the design review process. The Contractor shall provide to the Contract Administrator supporting information that will facilitate the ease of construction and the quality of the completed project.

The Contractor must prior to commencement of construction obtain certification of design documentation for its compliance with BCA requirements.

E1.4.6 Final Construction Documents

- (i) The Contractor shall complete the design work in accordance with the Contract by preparing such drawings, specifications, and other documentation as may be required to enable the construction and completion of the works.
- (ii) The Contractor shall submit these documents to the Contract Administrator and shall obtain his agreement in writing to these documents.
- (iii) The Contractor shall be responsible for the preparation of the final documentation and securing of approval by all relevant Authorities, including RailCorp.
- (iv) Notwithstanding any approvals to the Final Construction Documents, the responsibilities of the Contractor to comply with the provisions of the Contract shall remain.
- (v) The Contractor shall provide the originals, CAD discs, and all other documentation to the "As-Built" conditions in soft and hard copy. Copies of "As-Built" drawings shall be forwarded to the Contract Administrator.

E1.4.7 Minimum Documentation Requirements

(a) Documentation Generally

The provision by the Contractor of the following listed drawings and documents, and required associated work for the satisfactory construction of the Works is the minimum acceptable to the Contract Administrator for the services specified or implied, and these requirements shall be allowed for by the Contractor.

The Contractor shall incorporate any alterations to the documents requested by the Contract Administrator in writing (which may take the form of mark ups to the documents submitted by the Contractor to the Contract Administrator during the course of the design and documentation period) and shall resubmit the document for further review.

Negatives of drawings issued for construction shall be on archival quality drawing film. Drawing prints shall be of good quality and legible and printed copies of the Specification for construction of the Works shall be printed with a laser printer with a minimum resolution of 300 dots per inch.

(b) Drawing Information Requirements

The documentation to be provided by the Contractor for this Contract shall include fully detailed drawings as are required for the construction of the works.

The Contractor shall ensure that all drawings produced are co-ordinated and have the same orientation, scale and legend.

(i) Electrical Drawings

All electrical drawings to be used for tendering or construction purposes shall be officially lodged in the Electrical Plan Room, Level 1, 477 Pitt Street Sydney Central, with a drawing number issued by the Electrical Plan Room. Such drawing numbers will only be issued on completion of an Electrical Branch Registration Card (5374-1) having been approved and signed by the appropriate controlling officer of RailCorp. All drawings submitted to the Electrical Plan Room shall be of archival quality plastic film with the appropriate title block in the bottom right hand corner and an amendment column extending to the left hand margin where possible. Note that only one drawing number will be issued for each project and that drawings shall be annotated “sheet 1 of.....” as required.

Only A1 metric size drawings to be used. Drawings shall be legible when reduced to A3 size.

E1.5 CONFORMITY WITH ACTS, REGULATIONS, ORDINANCES AND RAILCORP STANDARDS

E1.5.1 General

Except where the Specification requires a higher standard, the work shall be carried out in accordance with the provisions of all relevant Acts, Regulations, Codes and RailCorp standards.

E1.5.2 Design Guides

The Contractor shall fully comply with the requirements set out in “CityRail Station Design Guide” CSR006 Vol 1, March 1996, (see Appendices).

E1.5.3 Heritage Issues

The Contractor is to inform the “Consenting Authority” of any matters with a heritage impact if required. Previously placed NSW Heritage Council Section 60 applications and issued Heritage Impact Statements for NSW Heritage Council and SRA Section 170 will be considered for design.

E1.6 ENVIRONMENTAL PROCEDURES GUIDE

The design of the proposed Works shall follow as a minimum requirement the requirements of the “Protection of the Environmental Operations Act” and the “RailCorp Environmental Handbook” which can be made available upon request.

E1.7 INTERFACE WITH OTHER RAILCORP, RIC AND OTHER GROUPS

In the design and documentation of the works, the Contractor shall take into consideration the requirements of the following specialist groups within the RailCorp, StateRail Authority (SRA) and Rail Infrastructure Corporation (RIC) groups. Individual access to these groups will be arranged by the Contract Administrator.

Rail Infrastructure Corporation
Property Group (for leasing issues)
Heritage Manager
CityRail Commercial Advertising
Project Manager, Fire and Life Safety
Passenger Information

CityRail Operations
Major Projects Safety & Environment
Station & Buildings Design

E1.8 DILAPIDATION SURVEYS

The Contractor shall clearly describe in his documents the work to be carried out under the heading of “dilapidation survey”, to be carried out by the Contractor prior to any other Works being carried out on the site and a copy forwarded to the Contract Administrator.

E1.9 INSPECTION AT CONSTRUCTION PHASE

During the course of the construction phase of the project, the Contractor shall provide the inspection reports, as required under the ITP.

E1.10 MAINTAINING EXISTING SERVICES

Existing services to the Station, tenancies and public areas are to be maintained at all times.

Where, in order to carry out Works under the Contract it becomes necessary to modify or relocate an existing service, the Contractor shall:

- submit to the Contract Administrator his proposal for maintaining the existing service and
- Obtain the Contract Administrator’s approval prior to executing any of the works.

Existing services include, but are not limited to electricity, telephone, pay phones, facsimile, water, radio, data communication, CCTV, alarms, P/A systems, drainage, sewer, ventilation, earthing, light posts, stanchions, planters, rubbish bins, train indicators, signage, Station furniture, drink and confectionery vending machines, fire protection, lift, over head wiring, signal cables and galvanised cable troughs etc.

Costs for the relocation and modification of existing services shall be borne by the Contractor.

E2 ARCHITECTURAL REQUIREMENTS

E2.1 DEMOLITION

STANDARD

General

Demolition: To AS 2601.

Scope

As detailed in the Description of Works.

SUBMISSIONS

Authorities

Evidence of compliance: Before commencing demolition, submit evidence that:

- requirements of authorities relating to the work under the contract have been ascertained;
- a permit to demolish has been obtained from the appropriate authority;
- a scaffold permit has been obtained from the appropriate authority (if scaffolding is proposed to be used);
- precautions necessary for protection of persons and property have been taken and suitable protective and safety devices provided to the approval of the relevant authority;
- treatment for rodent infestation has been carried out and a certificate has been obtained from the appropriate authority; and
- Fees and other costs have been paid.

Demolition

Work plan: Submit the work plan before demolition or stripping work. Include the following information:

- SWMS
- The method of protection and support for adjacent property.
- Locations and details of necessary service deviations and terminations.
- If removal of asbestos or of material containing asbestos is required, the information specified in the NOHSC Code of Practice for the Safe Removal of Asbestos.

SUPPORT

Temporary support

Existing buildings: Until permanent support is provided, provide temporary support for sections of existing buildings which are to be altered and which normally rely for support on work to be demolished.

Ground support: Support excavations for demolition of underground structures.

Adjacent structures: Provide supports to adjacent structures where necessary, sufficient to prevent damage resulting from the works.

- Lateral supports: Provide lateral support at least that given by the structure to be demolished, using shoring.
- Vertical supports: Provide vertical support where necessary using piling or, underpinning or both.

Permanent supports

If permanent supports for adjacent structures are necessary and are not described, give notice and obtain instructions.

PROTECTION

Encroachment

Prevent the encroachment of demolished materials onto adjoining property, parts of the

existing building to be retained and over the railway track and platforms.

Weather protection

If walls or roofs are opened for alterations and additions or the surfaces of adjoining buildings are exposed, provide temporary covers to prevent water penetration. Provide covers to protect existing plant and equipment and materials intended for re-use.

Dust protection

Provide dust-proof screens, bulkheads and covers to protect existing finishes and the immediate environment from dust and debris.

Security

If a wall or roof is opened for alterations and additions, provide security against unauthorised entry to the building.

Temporary screens

General: Fill the whole of designated temporary openings or other spaces using dust and weatherproof temporary screens, fixed securely to the existing structure.

Type: Timber framed screens sheeted with fibre cement and painted. Seal the junctions between the screens and the openings.

Temporary access

Provide a substantial temporary door set fitted with a rim deadlock, and remove on completion of demolition.

Exposed surfaces

General: Where necessary, protect and weatherproof the surfaces of adjacent structures exposed by demolition.

Explosives

Must not use explosives.

HAZARDOUS MATERIALS

Notices

Give notice immediately hazardous materials or conditions are found, including the following:

- Asbestos or material containing asbestos.
- Flammable or explosive liquids or gases.
- Toxic, infective or contaminated materials.
- Radiation or radioactive materials.
- Noxious or explosive chemicals.
- Tanks or other containers which have been used for storage of explosive, toxic, infective or contaminated substances.

MAKING GOOD EXISTING ITEMS

Requirement

Make good or replace all existing items to be retained or re-used, as directed by the Contract Administrator and described in the Specification.

DEMOLISHED MATERIALS

Demolished materials

Ownership: Ownership of demolished materials is described in the Demolished materials classes table.

Re-use: If it is proposed to re-use demolished materials in the works, submit proposals.

Salvage: Recover without damage materials to be salvaged.

Removal: Remove from the site demolished materials, which are the property of the

Contractor. Do not burn or bury on site.

Transit: Prevent spillage of demolishing materials in transit.

Demolished materials classes table

Class	Ownership
Salvaged for re-use	Principal/Proprietor
Salvaged for disposal	Principal/Proprietor
Demolished for re-use	Principal/Proprietor
Demolished for removal	Contractor

CLEANING

Materials for removal

Remove all materials from site.

E2.2 ADHESIVES, SEALANTS AND FASTENERS

CROSS REFERENCES

General

Refer to the General requirements section.

ADHESIVES

Performance

Provide adhesives capable of transmitting imposed loads, sufficient to ensure the rigidity of the assembly, and which will not cause discolouration of finished surfaces.

Adhesive types

Mastic adhesive: To AS 2329

Polymer emulsion adhesive for timber: To AS 2754.2, not inferior to Type 3 if required to be water-resistant.

Non-structural adhesive for timber: To AS 2754.3

SEALANTS

Elastomeric sealants

Sealing compound (polyurethane, polysulphide, acrylic):

- Single component: To TT-S-00230C.

Sealing compound (silicone):

- Single component: To TT-S-001543A.

FASTENERS

Performance

Provide fasteners capable of transmitting the loads imposed, and sufficient to ensure the rigidity of the assembly.

Fasteners

Bolts and screws: To AS/NZS 1111

Precision hexagon bolts and screws: To AS/NZS 1110

Hexagon nuts: To AS/NZS 1112

Hexagon socket screws: To AS/NZS 1420 and AS/NZS 1421

Metal washers: To AS 1237

- General: Provide washers to the heads and nuts of bolts and coach screws.

Machine screws: To AS/NZS 1427

Self-drilling screws: To AS 3566

- Minimum corrosion resistance class: 2.

Tapping screws: To AS/NZS 4402 - AS/NZS 4410

Steel nails: To AS 2334

- Length: At least $2\frac{1}{2}$ x the thickness of the member being secured, and at least 4 x if the member is plywood or building board < 10 mm thick.

Coach bolts: To AS/NZS 1390

Coach screws: To AS/NZS 1393

Powder-actuated fasteners: To AS/NZS 1873.4

Masonry anchors: Purpose-made proprietary expansion or chemical types.

Plugs: Purpose-made plastic.

Finishes

Electroplating:

- Metric thread: To AS 1897
- Imperial thread: To AS 4397

Galvanising:

- Threaded fasteners: To AS 1214
- Other fasteners: To AS 1650

Mild steel fasteners: Galvanise where

- (i) exposed to weather;
- (ii) embedded in masonry;
- (iii) in external timbers such as weatherboards or decking; or
- (iv) in contact with chemically treated timber.

E2.3 METALS AND PREFINISHES

CROSS REFERENCES

General

Refer to the General requirements section.

MATERIALS AND COMPONENTS

Steel

Structural hollow section: To AS 1163

Structural bars and sections: To AS/NZS 3679.1

Sheet: To AS/NZS 1595

Steel for prefinishes

Electric resistance welded pipe: To AS 1450 "bright".

Cold rolled bar: To AS 1443 "bright".

Cold rolled sheet: To AS 1595.

- Designation: CA2S-E.

Coated steel

Galvanised structural hollow sections: To AS 1163

Zinc-coated sheet: To AS 1397

- Coating class for sheet: Comply with the recommendations of AS 1397 Appendix B.

Thickness: Metal thicknesses specified are base metal thicknesses.

Stainless steel

Plate, sheet and strip: To ASTM A 240/A 240M.

Bars: To ASTM A 276

Welded pipe (round): To AS 1769

Welded pipe (square): To ASTM A 554

Type (minimum): 304.

Aluminium and aluminium alloys

Drawn rod, bar and strip: To AS/NZS 1865

Extrusions: To AS/NZS 1866

Drawn pipe: To AS/NZS 1867

Plate and sheets: To AS/NZS 1734

Copper and copper alloys

Casting: To AS 1565.

Plate, sheet and strip: To AS 1566

Rods, bars and sections: To AS/NZS 1567

METAL FINISHING

Preparation

General: Before applying decorative or protective pre-finishes to metal components, complete welding, cutting, drilling and other fabrication, and prepare the surface using a suitable method.

Standard: To AS 1627

Priming steel surfaces: Where site painting is specified to otherwise uncoated mild steel or similar surfaces,

- prime after fabrication and before delivery to the works; and
- after installation, repair damaged priming and complete the coverage to unprimed surfaces.

Welding

Steel: To AS/NZS 1554.1

Aluminium: To AS 1665

Stainless steel: To AS/NZS 1554.6

Brazing

General: Ensure brazed joints have sufficient lap to provide a mechanically sound joint. For butt joints do not rely on the filler metal fillet only.

Filler metal: To AS 1167.1

Finishing

Visible joints: Finish visible joints made by welding, brazing or soldering using methods appropriate to the class of work (including grinding or buffing) before further treatment such as painting, galvanising or electroplating. Ensure self-finished metals are without surface colour variations after jointing.

Damage

If pre-finishes are damaged, including damage caused by unauthorised site cutting or drilling, remove and replace the damaged item.

SELF FINISHING

Mechanical finishes

Bright finished copper alloy surfaces: For indoor applications, apply a clear lacquer protecting coating.

ELECTROPLATING

Electroplated coatings

Zinc on iron or steel: To AS 1789

Chromium on metals: To AS 1192

Nickel on metals: To AS 1192

Service condition number: At least 2

GALVANIZING

Galvanising

General ferrous articles: To AS 1650

- Minimum coating class (sheet): Z200

Coatings on steel wire: To AS/NZS 4534

- Coating type for wire (minimum): Class W10Z.

Components in contact with concrete

Passivate Galvanised surfaces to be cast into or in contact with concrete by dipping in 0.2% sodium dichromate solution.

Coating quality

General: Free from lumps, blisters, gritty areas, uncoated spots, acids and black spots, dross, flux and other imperfections.

ANODISING

Anodising

Standard: To AS 1231

Class:

- Indoor applications: At least AA10
- Outdoor applications: At least AA25

METAL SPRAYING

Metal spray

Standard: To ISO 2063

Process: Electric arc.

Minimum thicknesses:

- Outdoor applications: 175 mm
- Indoor applications: 125 mm

Seal coat: Cover the metal spray finish with two coats of vinyl seal to a total dry film thickness of 80 mm.

POWDER COATING

Thermoset powder coating

Standards: To AS 3715 or AS/NZS 4506 as appropriate.

Internal use: GPC P-155/1 or 4

External use: GPC P-155/2 or 5

Finish: Full gloss.

Preparation

General: Use chemical pre-treatments. If recommended, provide conversion coatings.

Unprotected steel: Remove rust to AS 1627.4 Class 2¹/₂, clean by immersing in trichloroethylene or an alkaline solution, and apply a coat of iron phosphate.

Galvanised steel: Clean by immersing in a suitable alkaline or acidic solution, apply a zinc phosphate chemical conversion coating, rinse and degrease.

Aluminium: Pre-treat as recommended in AS 3715 Appendix B, including the application of a conversion coating.

PREPAINTING

Pre-painted metal products

Standard: To AS/NZS 2728

Product type: Not lower than the type, appropriate to the field of application.

High performance organic coatings

Type: Factory applied spray coatings on aluminium products, including poly vinylidene fluoride (PVF₂) coatings.

Standards: To AAMA 605.2 and AS 2728

Equipment paint system

General: Brush or spray application using paint as follows:

- Prime coat to metal surfaces generally: GPC P-32 or GPC P-162.
- Prime coat to zinc-coated steel: GPC P-13/4 or GPC P-13/5.
- Undercoat: GPC U-23
- Full gloss enamel finish coats, oil and petrol resistant: GPC E-24, two coats.

Two-pack liquid coating

Primer: Two pack epoxy primer to GPC C-29/7.

Topcoat:

- Internal use: Proprietary polyurethane or epoxy acrylic system.
- External use: Proprietary polyurethane system.

Application: Spray.

Finish: Full gloss.

Air-drying enamel

Internal use:

- Primer: Two-pack epoxy primer to GPC C-29/7
- Topcoats: 2 coats to GPC E-15/3

Application: Spray or brush.

Finish: Full gloss.

Stoving enamel

Internal use:

- Primer: To GPC P-65
- Topcoat: To GPC E-66/3

Application: Spray or dip.

E2.4 HEAVY DUTY GALVANISED COATINGS

INSPECTION

Witness points

Give sufficient notice so that inspection may be made of the following:
Coating integrity, at the galvanising plant.

TESTS

Testing venue

General: Galvanising plant.

Galvanising tests

Sampling plan: In accordance with the recommendations of AS 1650 Appendix B and AS 1214 Appendix B.

Coating mass tests: Required.

SUBMISSIONS

Galvanising tests

Coating mass and adhesion: Submit a test report.

Problematic design

Submit advice on design and fabrication features of the articles to be galvanised, which may lead to difficulties during galvanising.

Holes and lifting lugs

Submit advice on size and locations of holes and lifting lugs to facilitate handling, filling, venting

and draining during galvanising.

Removal of deleterious materials

Submit advice on suitability of marking paints, and removal of materials deleterious to galvanising such as grease, oil and paint.

FABRICATION

Hot-dip Galvanised coatings

Ferrous articles: To AS 1650

Threaded fasteners: To AS 1214

Care

Mechanical properties: Avoid mechanical damage. Ensure that mechanical properties of the base metal do not change.

Distortion and cracking: Avoid.

Embrittlement: Take due care in processing steel that is susceptible to embrittlement.

Surface preparation

Surface contaminants and coatings generally: Chemical clean, then acid pickle.

Surface contaminants and coatings, which cannot be removed using chemical cleaning: Abrasive blast clean.

Chemical cleaning: To AS 1627.1

Cleaning designation: AD

Acid pickling: To AS 1627.5

Acid: Hydrochloric.

Abrasive blast cleaning: To AS 1627.4

Class: 2

Abrasive: Select from the following:

- Steel grit: Angular, free from rust and other foreign matter. Grade to pass an 850 µm sieve and be retained on a 350 µm sieve, with 50% retained on a 500 µm sieve.
- Copper slag: Clean, dry, free from extraneous matter. Grade to pass a 600 µm sieve and be retained on a 355 µm sieve.
- Profile height (maximum): One-third galvanising thickness.

Surface finish

Coating quality: Continuous, adherent, smooth, evenly distributed, free from defects detrimental to the end use of the finished article, such as lumps, blisters, gritty areas, uncoated spots, acids and black spots, dross and flux.

Silicon killed steels: Dull grey is acceptable.

High strength friction grip bolting: Buff faying surfaces, after galvanising.

Surplus zinc on fastener threads: Remove.

Coating reinstatement

Method: Wire brush or mechanically buff the surface. Apply zinc-rich primer to 85 µm dry film thickness. Stipple edges of the primed area.

Surface preparation: To AS 1627.2, Class 2½.

Primer: To GPC-P-14/1, or GPC-C-29/16A.

Extent: Significant areas of uncoated surface and areas damaged by handling at the galvanising plant.

Size of area to be repaired: Relevant to the size of the article and the conditions of service.

Components in contact with concrete

General: Chromate passivate.

Chromate passivation process: Dip in 0.15 - 0.2% sodium dichromate solution.

Preparation for architectural finishes

Coarse preparation: Remove spikes, and ensure edges are free from lumps and runs.

Light sweep blasting:

- Blast pressure (maximum): 280 kPa
- Abrasive grade (range): 0.2 - 0.5 mm clean ilmenite or garnet.
- Angle of blasting to surface: 45
- Distance of nozzle from surface (range): 300 - 400 mm.
- Nozzle type: Venturi, diameter 10 - 13 mm.

Galvanising schedule

All fabricated structural steel items

Storage of Galvanised articles

General: Store in dry, well-ventilated conditions.

ERECTION GENERALLY

Delivery

Transport in dry, well-ventilated conditions.

Site welding

Grinding of edges: Permitted.

Weld areas: Reinstate coating.

Site coating reinstatement

Method: Wire brush or mechanically buff the surface. Apply zinc-rich primer to 85 µm dry film thickness. Stipple edges of the primed area.

Surface preparation: To AS 1627.2, Class 2½.

Paint standard: To GPC-P-14/1, or GPC-C-29/16A.

Extent: Areas damaged by transport, site welding, site flame cutting, site handling, or erection.

Size of area to be repaired: Relevant to the size of the article and the conditions of service.

COMPLETION

Certificate

Submit a certificate stating that the galvanising conforms to this specification.

E2.5 SERVICE TRENCHING

INSPECTION

Witness points

Give sufficient notice so that inspection may be made at the following stages:

Service trenches excavated before laying the service.

Services laid in trenches and ready for backfilling.

EXCAVATING

Existing surfaces

Before excavating trenches, saw-cut existing concrete and bituminous surfaces on each side of the trench to provide a straight even joint. Lift and store unit paving for later reinstatement.

Excavation

Excavate for underground services, to required lines, levels and grades. Generally make the trenches straight between personnel access ways, inspection points and junctions, with vertical sides and uniform grades.

Trench widths

Keep trench widths to the minimum consistent with the laying and bedding of the relevant service and construction of personnel access ways and pits.

Trench lengths

Excavate trenches in sections of suitable length.

Trench depths

General: As required by the relevant service and its bedding method.

Notice: If excavation is necessary below the level of adjacent footings, give notice, and provide necessary support for the footings.

Obstructions

Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm clear of services. Remove other obstructions including stumps and boulders, which may interfere with services or bedding.

De-watering

Keep trenches free of water. Place bedding material, services and backfilling on firm ground free of surface water.

Excess excavation

If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value using compacted bedding material or grade N20 concrete.

BACKFILLING

General

Backfill service trenches as soon as possible after the service has been laid and bedded, if possible on the same working day. Place the backfill in layers ≤ 150 mm thick and compact to the density which applies to the location of the trenches to minimise settlement, and so that pipes are buttressed by the trench walls.

Marking services

Underground marking tape: To AS/NZS 2648.1

Backfill material

General: General fill with no stones greater than 25 mm occurring within 150 mm of the service, or other materials as required for particular services or locations. Well graded, inorganic, non-perishable material, maximum size 75 mm, plasticity index $\leq 55\%$.

Under roads and paved areas and within 4 m of building: Coarse sand, controlled low strength material or fine crushed rock.

In topsoil areas: Complete the backfilling with topsoil for at least the top 50 mm.

REINSTATEMENT OF SURFACES**General**

Reinstate existing surfaces removed or disturbed by trench excavations to match existing and adjacent work.

Concrete surfaces

Reinstate concrete surfaces to the original level. If necessary, provide steel reinforcement keyed to the adjacent concrete and laid to prevent the reinstalled concrete from subsiding and cracking.

Bituminous surfaces

General: Provide crushed rock base and sub-base to match the existing pavement. Prime coat the edges of the existing surfacing with bitumen. Lay and compact hot-mix asphalt so that the edges are flush and the centre is cambered 10 mm above the existing pavement. If hot pre-mix is not available, cold pre-mix may be used.

Minimum asphalt thickness: 50 mm or the adjacent pavement thickness, whichever is thicker.

E2.6 CONCRETE CONSTRUCTION**STANDARDS**

Concrete structures generally: To AS 3600

Ground slabs and footings: To AS 2870

GROUND SLAB VAPOUR BARRIER**Material**

General: Provide a proprietary vapour barrier which consists of high impact resistant polyethylene film minimum 0.2 mm thick which has been pigmented and branded by the manufacturer;

has a current Australian Building Products and Systems Certification Scheme certificate; or

has a current technical opinion issued by the Australian Building Systems Appraisal Council stating that it is suitable for use as a vapour barrier, when not subject to liquid water pressure, for concrete slabs on ground.

Type: as approved – if required

Base preparation

Blind the surface with sufficient sand to cover any hard projections. Wet the sand just before placing the vapour barrier.

REINFORCEMENT

Minimum lap

Splice as follows:

Mesh generally: 225 mm

Trench mesh: 500 mm

Bars: Greater of either 500 mm or 25 x bar diameter.

Strip footing intersections and corners: For full width of intersecting reinforcement.

Minimum cover

Unprotected by membrane on ground or external surfaces: 40 mm.

Protected by membrane on ground: 30 mm

Internal surfaces: 20 mm

Aggressive soil or salty environment: 65 mm

CONCRETE**Ready mixed supply**

Standard: To AS 1379, by the batch production process.

Maximum slump: 100 mm

Concrete placing

Depth: If concrete is deeper than 350 mm, place it in layers so that each succeeding layer is blended into the preceding one by the compaction process.

Slabs and pavements: Place concrete uniformly over the width of the slab so that the face is generally vertical and normal to the direction of placing.

Compaction

Vibrate concrete to remove entrapped air, but avoid over-vibration that may cause segregation.

Curing

Protection: Protect concrete from premature drying and from excessive hot, cold and/or windy conditions.

Method: Cure concrete by using a proprietary curing compound; or

keeping it covered and moist for the following periods:

- In-ground footings: 2 days.
- Exposed footings, beams and slabs: 7 days.

Formwork removal

Remove timber formwork.

Stripping times

Leave formwork for suspended structures in place after pouring concrete for the following periods:

Vertical surfaces: 2 days.

Bottom surfaces: 7 days with shoring and back props left in position for 21 days.

JOINTS**Construction joints**

Joint preparation: Roughen and clean the hardened concrete joint surface, remove loose or soft material, free water and foreign matter. Dampen the surface before placing the concrete.

Slip joints

If concrete slabs are supported on masonry, provide proprietary pre-lubricated slip joints.

E2.7 STRUCTURAL STEEL

all structural steelwork to be Hot Dip Galvanised paint finished to 150um TCT.

STANDARD**General**

Materials, construction, fabrication and erection: To AS 4100

ADJOINING ELEMENTS**General**

Provide for the fixing of adjoining building elements to be fixed to or supported on the structural steel.

INSPECTION**Witness points - off site**

Give sufficient notice so that inspection may be made at the following stages:

- Materials including welding consumables before fabrication.
- Testing of welding procedures and welder qualification tests.
- Commencement of shop fabrication.
- Commencement of welding.
- Before placement of root runs of complete penetration butt welds.
- Completion of fabrication before surface preparation.
- Surface preparation before shop painting.
- Completion of protective coating before delivery to site.

Witness points - on site (if welding has been approved by Contract Administrator)

- Give sufficient notice so that inspection may be made at the following stages:
- Steelwork on site before erection.
- Tensioning of bolts in categories 8.8/TB and 8.8/TF.
- Steelwork and column bases erected on site, before grouting, encasing, site painting or cladding.
- Anchor bolts in position before casting in.

TESTS**Non destructive weld examination**

General: Have the examination performed by an independent testing authority.

Repairs: Repair faulty welds revealed by non-destructive examination and repeat the examination.

SAMPLES**Special finishes**

General: Submit samples of finished steel listed in the **Special finishes schedule**.

Minimum sample sizes:

Surface finish samples: 0.1 m²

Weld samples: 300 mm run of weld.

SUBMISSIONS

Subcontractors

Fabricator and Installer: Use subcontractors that have been submitted in the Tender and approved by the Contract Administrator.

Shop drawings

General: Submit shop drawings showing the following information:

- Relevant details of each assembly, component and connection.
- Information relative to fabrication, surface treatment, transport and erection.

Particular: Include the following information:

- Identification.
- Steel type and grade.
- Dimensions of items.
- Required camber, where applicable.
- Fabrication methods including, where applicable, hot or cold forming and post weld heat treatment.
- Location, type and size of welds or bolts.
- Weld categories and bolting categories.
- Orientation of members.
- Surface preparation methods and coating system.
- Procedures necessary for shop and site assembly, and erection.
- Temporary Works such as lifting lugs, support points, temporary cleats and bracing which are required for transport and erection of the structural steelwork.
- Required fixings for adjoining building elements.

Tests

Steel: Submit evidence that the steel used in the work complies with the cited material standards.

Acceptable evidence: Certified mill test reports, or test certificates issued by the mill.

Alternative: Have the steel tested by an independent testing authority for compliance with the chemical composition and mechanical test requirements of the cited material standard.

Materials and components

Masonry anchors: If masonry anchors are required or proposed for the support or fixing of structural steel, submit evidence of the anchor capacity to carry the load.

Splicing: If splicing of structural members is intended, submit proposals.

Welding procedures: Submit details of proposed welding procedures, using the form in Appendix C of AS/NZS 1554.1

Distortions: If a member is distorted during the galvanising process, submit proposals for straightening.

MATERIALS AND COMPONENTS

STEEL TYPE AND GRADE

Standards

Cold-formed sections: To AS/NZS 4600

Steel grade table

Type of steel	Grade
Universal beams and columns, parallel flange channels, large angles to AS/NZS 3679.1	300
Flat, small angles, taper flange beams and columns to AS/NZS 3679.1	250
Welded sections to AS/NZS 3679.2	300
Hot rolled plates, floor plates and slabs to AS/NZS 3678	250
Hollow sections to AS 1163:	
- Circular sections less than 265 mm outside diameter	250
- Sections other than the above	350
Cold formed purlins and girts to AS 1397	G450 Z275
Steel rails to AS 1085.1	(one grade only)

FABRICATION**Splicing**

General: Provide structural members in single lengths.

Beam camber

If beam members have a natural camber within the straightness tolerance, fabricate and erect them with the camber up.

Site work

Other than work shown on the shop drawings as site work, do not fabricate or weld structural steel on site.

BOLTING**Connection bolts**

For connection bolts not shown on the drawings, provide hot-dipped Galvanised high strength bolts, nuts and washers to AS/NZS 1252 and snug tight bolting category 8.8/S.

Foundation bolts

General: Provide each foundation bolt with 2 nuts and 2 oversize washers and provide sufficient thread to permit the levelling nut to be set below the base plate.

Hexagonal commercial bolts: To AS/NZS 1111

Hexagonal nuts: Class 5

Extra large flat washers: To AS 1237 Appendix A.

Lock nuts

General: Provide lock nuts for bolts in moving parts or parts subject to vibration and for vertical bolts in tension.

WELDING

All weldings are to SP special purpose. Site welding is not allowed. It is necessary to allow for ultrasonic testing of 10% of welds

Weld category

Category GP welds: For weld categories not shown on the drawings, provide category GP to AS/NZS 1554.1

Site welds

Wherever possible locate site welds in positions for down hand welding.

ERECTION**Temporary connections**

Do not attach cleats except as shown on shop drawings.

Hand flame cutting

Do not hand flame cut boltholes.

Movements

Provide for thermal movements during erection.

Anchor bolts

For each group of anchor bolts provide a template with setting out lines clearly marked for positioning the bolts when casting in.

Grouting at supports

Temperature: Do not grout if the temperature of the base plate or the footing surface exceeds 38°C.

IDENTIFICATION MARKS**General**

Provide marks or other means for identifying each member, and for the setting out, location, erection and connection of the steelwork. If the work includes more than one bolting category, mark bolted connections to show the bolting category.

SURFACE PREPARATION**General**

Methods: To AS 1627

Site connections: After completing the connection, prepare the surface of the connection, adjacent un-primed surfaces and surfaces damaged during erection.

Steel surfaces generally: Remove loose mill scale, loose rust, oil, grease, dirt, globules of weld metal, weld slag and other foreign matter.

Marking

On the contact surfaces of friction type joints, confine the use of marking ink to the minimum necessary for marking hole positions.

Abrasive blast cleaning

Do not use silica abrasive for dry blasting. Use phosphate inhibitors when wet blasting.

PROTECTIVE COATINGS**General**

Shop work: Apply the primer coat or protective system to the structural steel before delivery to the site.

Transport and handling: Protect paintwork from damage during transport and handling. Do not handle or transport steel members until the paintwork is dry.

Site work: After erection, repair damage to the shop coating and apply coating omitted at site connections.

Priming

Time delay: Prime the steel surface as soon as possible after surface preparation and before the surface deteriorates. If the surface is contaminated or rust bloomed, repeat surface preparation before priming.

Fast drying primers: Do not provide fast drying primers where surface preparation is less than class 1.5

Concrete encasing: Where members are part concrete encased extend the priming 25 mm into the surface to be encased.

Inaccessible surfaces

Where surfaces will be in contact or near contact after fabrication or erection, apply the finish and allow it to dry before assembly.

GALVANIZING

Structural sections

Cold worked items: Anneal to 650°C before galvanising.

Coating mass: Other than nut and bolt thread surfaces:

Average: 600 g/m²

Minimum: 550 g/m²

Friction-type bolted connections

General: Treat contact surfaces to achieve the required slip factor.

Method: Wire brushing or light grit blasting.

COMPLETION

Temporary connections

Remove temporary cleats on completion and restore the surface.

E2.8 ROOFING

PERFORMANCE CRITERIA

Minimum requirements

Provide a roofing system and associated work which remains intact and waterproof under the local or regional ambient climatic conditions;

provides adequate means of dealing with vapour pressure, condensation, corrosion and thermal movement;

supports the specified imposed loads and types of roof access without impairment of performance;

in the case of dwellings within the scope of AS 2627.1, provides the minimum added thermal resistance of that standard; and satisfies other specified performance requirements.

Roof access Not required

INSPECTION**Witness points**

Give sufficient notice so that inspection may be made of roof supports; and those parts of the roofing, sarking, vapour barrier, insulation and roof plumbing installation which will be covered up or concealed.

TESTS**Metal roofing**

General tests: Type test the roof sheeting and fastenings to AS 1562.1 for resistance to concentrated load and to wind pressure.

MATERIALS AND COMPONENTS**Fasteners**

Self-drilling screws: Corrosion resistance Class 3

Finish: Prefinish exposed fasteners with an oven baked polymer coating to match the roofing material, or provide matching purpose-made plastic caps.

INSTALLATION**Protection**

General: Keep the roofing and rainwater system free of debris and loose material during construction, and leave them clean and unobstructed on completion. Repair damage to the roofing and rainwater system.

Touch up: If it is necessary to touch up minor damage to pre-painted metal roofing, do not over spray onto undamaged surfaces.

Thermal movement

Provide for thermal movement in the roof installation and the structure, including movement in joints and fastenings.

SAFETY MESH**Standard**

General: To AS/NZS 4389

SHEET METAL ROOFING AND CLADDING

Zincalume colorbond finish roof sheeting with dp 101.6 dia CHS 3.6mm wall thickness HDG (hot dipped galv), set 100mm above platform level sw.gulley with CI grate.

General

Type: Provide a proprietary system of preformed sheet and purpose-made accessories.

Prepainted and organic film/metal laminate products: To AS/NZS 2728

Product type: Profiled steel roofing

Design and installation: To AS 1562.1

Material: Steel

Profile: as shown on the drawings

Thickness (base metal) (mm): 0.48

Grade: XRW

Finish: Colorbond

Colour: to match existing

Fixing: To manufacturer's specification

Accessories: Provide material with the same finish as roofing sheets.

Ridges and eaves

Treat ends of sheets as follows:

Project sheets 50 mm into gutters.

Close off ribs at bottom of sheets using mechanical means or with purpose-made fillers or end caps.

Turn pans of sheets up at tops and down into gutters by mechanical means.

Provide pre-cut notched eaves flashing and bird proofing where necessary.

Close off ridges with purpose-made ridge fillers of closed cell polyethylene.

Ridge and barge capping

Finish off along ridge and verge lines with purpose-made ridge capping or barge rolls.

End laps

General: Where end laps are unavoidable, and the sheet profile is not suitable for interlocking or contact end laps, construct a stepped type lap.

Curved corrugated sheet

General: Form by rolling from material recommended for curving or bull nosing. Minimise crimping or creasing across the face of the sheet. Trim off crimped or creased edges and ends.

Metal separation

Prevent direct contact between incompatible metals, and between green hardwood or chemically treated timber and aluminium or coated steel, by either applying an anti-corrosion, low moisture transmission coating to contact surfaces; or inserting a separation layer.

ROOF PLUMBING

General

Standard: To AS/NZS 3500.3.2

General: Provide the flashings, cappings, gutters, rainwater heads, outlets and downpipes necessary to complete the roof system.

Materials

Metal rainwater goods: To AS/NZS 2179.1

Jointing sheet metal rainwater goods

Butt joints: Make joints over a backing strip of the same material.

Soldered joints: Do not solder aluminium or aluminium/zinc coated steel.

Sealing: Seal fasteners and mechanically fastened joints. Fill the holes of blind rivets with silicone sealant.

Flashings and cappings

Flashing material: To AS/NZS 2904

Type: Matching Colorbond sheet steel

Installation: Flash roof junctions, upstands, abutments and projections through the roof. Preform to required shapes where possible. Notch, scribe, flute or dress down as necessary to follow the profile of adjacent surfaces. Mitre angles and lap joints 150 mm in running lengths. Provide matching expansion joints at 6 m maximum intervals.

Upstands: Flash projections above or through the roof with two part flashings, consisting of a base flashing and a cover flashing, with at least 100 mm vertical overlap. Provide for independent movement between the roof and the projection.

Wall abutments: Provide over flashings where roofs abut walls, stepped to the roof slope in masonry and planked cladding, otherwise raking.

In masonry: Build into the full width of the outer leaf. Turn up within cavity, sloping inward across the cavity and fixed to or built in to the inner leaf at least 75 mm above.

Fixing to masonry or concrete: Step in courses to the roof slope. Interleave with damp proof course, if any.

Fixing to pipes: Solder, or seal with neutral cured silicone rubber and either secure with a clamping ring; or

provide a proprietary flexible clamping shoe with attached metal surround flashing.

Gutters

General: Prefabricate gutters to the required shape where possible. Form stop ends, downpipe pops, bends and returns. Dress downpipe pops into outlets. Provide overflows to prevent back-flooding.

Matching gutter and fascia: Provide a proprietary metal eaves gutter and accessories formed and pre-coated to match the fascia system.

Gutter and sump support: Provide framing and lining to support valley gutters, box gutters and sumps. Line the whole area under the gutters and sumps.

Type: All gutters are to be box type gutters

Valley gutters: Profile to suit the valley boarding. Turn back both edges 180o x 6 mm radius. Nail or screw to the valley boarding at the top end to prevent the gutter creeping downwards.

Gratings and guards: Provide removable gratings over rainwater heads and sumps and leaf guards to gutters and gutter units.

Expansion joints: Provide expansion joints in guttering longer than 30 m.

Downpipes

General: Prefabricate downpipes to the required section and shape where possible. Connect heads to gutter outlets and, if applicable, connect feet to rainwater drains.

Access cover: Provide a removable watertight access cover at the foot of each downpipe stack.

Ground level finish: Avoid any protrusions above ground surfaces that will stumble passengers.

Downpipe support: Provide supports and fixings for downpipes.

Gutter and downpipe schedule

as shown on the drawings

Rainwater disposal

- Connect the new downpipes to the existing stormwater drainage system installed for the

platform areas and the nearby track. This will necessitate laying of new underground pipes and connect to the down pipes in new canopies.

- When no stormwater drainage system exists that can be connected to, extend the new downpipe manifold up to the platform kerb to allow for future connection by others. The proposal and arrangement must be approved by the Contract Administrator prior to any construction work.
- The platform surfaces are to be made good following completion of pipe laying.

COMPLETION

Warranties

Submit the roofing materials manufacturer's published product warranties.

Maintenance manual

On completion submit a manual of recommendations from the roof manufacturer or supplier for the maintenance of the roofing system including, frequency of inspection and recommended methods of access, inspection, cleaning, repair and replacement.

E2.9 PAINTING

STANDARDS

Painting: Comply with the recommendations of those parts of AS 2311 and AS/NZS 2312 which are referenced in this section.

INTERPRETATION

Definitions

Standard: To AS/NZS 2310

INSPECTION

Witness points

Give sufficient notice so that inspection of work may be made at the following stages:

Painting stages:

- . Completion of surface preparation.
- . After application of prime or seal coats.
- . After application of undercoat.
- . After application of each subsequent coat.

SUBMISSIONS

Materials

Manufacturer's data: Submit the paint manufacturer's published material safety data sheets (MSDS) showing the health and safety precautions to be taken during application.

Proprietary materials: If the brand of paint has not been specified, submit the proposed brand of paint and paint line, at least 3 weeks before the paint is required.

MATERIALS AND COMPONENTS

Paints

GPC specifications: Provide paints and other materials which are scheduled in the Australian Paint Approvals Scheme "List of Approved Products" as complying with cited GPC specifications.

Quality: Provide premium quality lines.

Combinations

General: Do not combine paints from different manufacturers in a paint system.

Delivery

Deliver paints to the site in the manufacturer's labelled and unopened containers. Ensure containers of materials specified by a GPC specification code are labelled accordingly.

Tinting

General: Provide only products which are colour tinted by the manufacturer or supplier.

Tinting by contractor: Add tinters or stainers only if this is without detriment to the durability or aesthetic performance of the product.

Putty

General: Oil-based or polymeric based.

Putty for timber finishes: Lacquer or water based. Do not provide oil based or glazing putty.

Toxic ingredients

Comply with the requirements of Appendix P "Uniform Paint Standard" to the Standard for the Uniform Scheduling of Drugs and Poisons.

COLOUR SELECTION

Methods

From manufacturer's chart: From the standard colour chart of the nominated manufacturer.

From AS 2700: From the Australian standard colour range specified in AS 2700

From samples:

For paint systems: By requiring the paint to be mixed or tinted to match samples provided. Consult the paint manufacturer to ensure that the colours selected are of satisfactory durability and opacity, and will comply with requirements in the specified number of coats.

PAINTING

Standards

General: To AS 2311 Sections 3, 6 and 7.

Protection of steelwork: To AS/NZS 2312 Sections 5, 8 and 10.

Order of work

Other trades: Before painting, complete the work of other trades as far as practicable within the area to be painted, except for installation of fittings, floor sanding and laying flooring materials.

Protection

Fixtures: Remove door furniture, switch plates, light fittings and other fixtures before starting to paint, and refix in position undamaged on completion of the installation.

Adjacent surfaces: Protect adjacent finished surfaces liable to damage from painting operations.

"Wet paint" warning

Place notices conspicuously and do not remove them until paint is dry.

Restoration

Clean off marks, paint spots and stains progressively and restore damaged surfaces to their original condition. Touch up damaged decorative paintwork or misses only with the paint batch used in the original application.

Substrate preparation

General: Prepare substrates to receive the painting systems.

Cleaning: Clean down the substrate surface. Do not cause undue damage to the substrate or damage to, or contamination of, the surroundings.

Filling: Fill cracks and holes with fillers, sealants, putties or grouting cements as appropriate for the finishing system and substrate, and sand smooth.

Drying

Use a moisture meter to demonstrate that the moisture content of the substrate is at or below the recommended maximum level for the type of paint and the substrate material.

Paint application

Apply the first coat immediately after substrate preparation and before contamination of the substrate can occur. Ensure each coat of paint or clear finish is uniform in colour, gloss, thickness and texture, and free of runs, sags, blisters, or other discontinuities.

Light levels

During preparation of surfaces, painting, and inspection, maintain light levels such that the luminance (photometric brightness) of the surface is equal to the specified permanent artificial illumination conditions or 400 lux, whichever is the greater.

Spraying

General: If the paint application is by spraying, use conventional or airless equipment which satisfactorily atomises the paint being applied; does not require the paint to be thinned beyond the maximum amount recommended by the manufacturer; and does not introduce oil, water or other contaminants into the applied paint.

Priming before fixing

Apply one coat of wood primer (2 coats to end grain) to the back of the following before fixing in position:

Timber doors.

Bottoms of external doors.

Associated trims and glazing beads.

Repair of galvanising

General: For Galvanised surfaces which have been subsequently welded, prime the affected area.

Primer: To GPC-C-29/16, two pack.

Services

If exposed to view, paint new services and equipment including in plant rooms, except chromium, anodised aluminium, GRP, UPVC, stainless steel, non-metallic flexible materials and normally lubricated-machined surfaces. Repaint proprietary items only if damaged.

PAINT SYSTEMS**Paint system description**

Final coat: If a paint or clear finish system is referred to only by its final coat (for example by the manufacturer's brand name, or the generic name) provide in addition to the final coat, the appropriate stains, primers, sealers and undercoats, suitable for the substrate and compatible with the finish coat and each other.

No system description given: If a surface is to be painted but no system is nominated select the system from AS 2311 Section 5, using System 1 where a choice is offered.

Number of coats

Unless specified as one coat or two coat systems, each paint system consists of at least 3 coats. Provide additional coats if necessary to prepare porous or reactive substrates with prime or seal coats consistent with the manufacturer's recommendations; achieve the total film thickness or texture; or achieve a satisfactory opacity.

Tinting

Tint each coat of an opaque coating system so that each has a noticeably different tint from the preceding coat, except for top coats in systems with more than one top coat.

Colour selection

Method: From manufacturer's published colour charts

Interior painting schedule

Surface identification	Paint system
Fibrous cement walls	Semi-gloss latex: interior
Fibrous cement ceiling	Flat latex: interior
Exposed metal work	Full gloss, solvent-borne: Interior

Paint systems schedules

General: These schedules specify, for each of the paint systems listed in the **Painting schedules**, and for each substrate to which those systems are applied in the project, the number and order of coats; and the paint type for each coat.

Codes: Codes are GPC Specification codes.

Flat latex: Interior

Substrate	1 st Coat	2 nd Coat	3 rd Coat
Fibre cement	S-17/2	L-26/6	L-26/6
Existing paintwork	L-164	L-164	

Semi-gloss latex: Interior

Substrate	1 st Coat	2 nd Coat	3 rd Coat
Fibre cement	S-17/2	L-27	L-27

Full gloss, solvent-borne: Interior

Substrate	1 st Coat	2 nd Coat	3 rd Coat
Iron & steel	P-32	E-15/4	E-15/4

Exterior painting schedule

Surface identification	Paint system
Fibrous cement	Gloss latex exterior
Structural steel (zinc coated steel)	Gloss latex exterior
Iron and steel	Gloss latex exterior
Profiled sheet steel	Not applicable - COLORBOND

Gloss latex: Exterior

Substrate	1 st Coat	2 nd Coat	3 rd Coat
Existing paintwork	L-28	L-28	
Fibre cement	L-28	L-28	

Compressed fibre cement	S-17/1	L-28	L-28
Iron & steel	P-32	L-28	L-28
Zinc-coated and zinc-alloy-coated steel	P-13/4	L-28	L-28

COMPLETION**Maintenance manual**

Submit the paint manufacturer's published recommendations for maintenance.

E2.10 METAL FIXTURES**INSPECTION****Witness points**

Give sufficient notice so that inspection may be made of the following:

- Shop fabricated or assembled items ready for delivery to the site.
- Commencement of shop or site welding.
- Site erected assemblies on completion of erection, before covering up by cladding and encasing.
- Steel surfaces prepared for, and immediately before, site applied finishes.

TESTS**Weld testing**

Have testing of welds, or test plates, performed by an independent testing authority. In the event of test failure, rectify the defect and repeat the test.

SAMPLES**General**

Submit samples of the following:

- Each type of joint.
- Each type of finish.
- Sections for use in fabricated work.

SUBMISSIONS**Design**

Calculations: Submit calculations and other data demonstrating detailed compliance with performance criteria.

Shop drawings

Submit shop drawings showing the following information:

- Details of fabrication and components.
- Information necessary for site assembly.

Tests

Stainless steel: Before fabrication commences, submit satisfactory evidence that relevant procedure test plates have passed the tests specified in AS/NZS 1554.6

Materials

Manufacturer's data: Submit manufacturer's published product data including standard drawings and details.

Stainless steel: For each batch of stainless steel supplied to the works, submit the certificate of compliance or test certificate specified in the applicable standard.

Execution

Welding procedures: Submit details of proposed welding procedures before fabrication.

Welding dissimilar metals: Submit the following details:

- Type and thickness of materials to be welded.
- Proposed joint preparation and welding procedures.
- Proposed filler metal.
- Expected dilution (proportion of fused parent metal in the weld metal).

Fastenings to aluminium (including aluminium alloys): If cadmium-plated steel fastenings are proposed, submit proposals.

MATERIALS AND COMPONENTS

Metals

Performance: Provide metals suited to their required function, finish and method of fabrication, in sections of strength and stiffness adequate for their purpose.

Copper alloys (brass, bronze, etc.)

Composition and designations: To AS 2738.2

Rivets

Blind rivets where available in the required metal.

Masonry anchors

Proprietary types comprising screws or bolts in self-expanding sockets.

Masonry plugs

Screws in purpose-made resilient plastic sockets.

CONSTRUCTION GENERALLY

Aluminium structures

Standard: To AS/NZS 1664.1 or AS/NZS 1664.2

Metals

Performance: Provide metals so that they transmit the loads imposed and ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces.

Incompatible metals: Separate using concealed layers of suitable materials in appropriate thicknesses.

Fasteners

Performance: Provide fasteners so that they do not cause galvanic corrosion.

Materials: Provide fasteners in materials of mechanical strength and corrosion resistance at least equal to that of the lowest resistant metal joined.

To copper and copper alloys: Provide copper or copper-alloy fixing devices only.

To aluminium and aluminium alloys: Provide aluminium alloy or non-magnetic stainless steel fixing devices only.

To stainless steel: Provide appropriate stainless steel materials only.

Fabrication

Workshop: Fabricate and pre-assemble items in the workshop wherever practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.

Tube bends: Form bends in tube without visibly deforming the cross section.

Colour finished work: Match colours of sheets, extrusions and heads of fasteners.

Thermal movement: Accommodate thermal movement in joints and fastenings.

Fabrication tolerances

Structural work generally: ± 2 mm.

Joints

General: Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by welding, brazing or soldering using grinding, buffing or other methods appropriate to the class of work, before further treatment.

Self-finished metals: Free of surface colour variations, after jointing.

Joints: Fit accurately to a fine hairline.

Marking

Provide suitable and sufficient marks or other means for identifying each member of site-erected assemblies, and for their correct setting out, location, erection and connection. Mark bolted connections to show the bolting category. Do not mark stainless steel by notching.

Splicing

Provide structural members in single lengths.

WELDING AND BRAZING

General

Quality: Provide finished welds which are free of surface and internal cracks, slag inclusion, and porosity.

Site welds: Do not weld on site.

Steel welding

Standard: To AS/NZS 1554.1

Aluminium welding

Standard: To AS 1665

Butt weld quality level: Not inferior to the appropriate level recommended in AS 1665 Appendix A.

Brazing

General: Ensure brazed joints have sufficient lap to provide a mechanically sound joint. Do not use butt joints relying on the filler metal fillet only.

STAINLESS STEEL FABRICATION

Surface finish

N4

Welding stainless steel

Standard: To AS/NZS 1554.6

Certification of welders: To AS 1796

Riveting

Riveting may be used only to join stainless steel sheet or strip less than 1 mm thick. Drill (not punch) the rivet hole, and drive the rivet cold. On completion, clean and passivate the riveted assembly.

Soldering

Do not solder stainless steel.

METAL SIGN FIXINGS**General**

Provide all components necessary to install station signs as shown on drawings.

COMPLETION**Maintenance manual**

Submit manufacturer's published recommendations for service use.

Cleaning

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

E2.11 ASPHALT ROAD SURFACING**STANDARD****General**

Hot-mixed asphalt: To AS 2150.

INTERPRETATION**Definitions**

Standard: To AS 1348.1

Absolute level tolerance: Maximum deviation from design levels.

Relative level tolerance: Maximum deviation from a 3 m straightedge laid on the surface.

Relative compaction: The ratio between the field bulk density and the bulk density of the job mix when compacted in the laboratory.

INSPECTION**Witness points**

Give sufficient notice so that inspection may be made at the following stages:

- Materials or areas of work ready for tests.
- Testing including proof rolling.
- Each pavement layer placed and compacted.
- Automatic level control devices in place.
- Surface prepared for priming, sealing or asphalt surfacing.
- Commencement of asphalt surfacing.

MIX TESTS**Records**

Process control: Show the results of process control tests on control charts or graphs displayed on site in a readily accessible location and updated daily.

Methods

Use wet preparation methods where applicable.

Sampling

Process control tests: Determine timing and location.

Compliance assessment tests:

- Timing: Obtain materials samples at the time of delivery to the site.
- Location: Sample from selected sample sites within designated uniform test lots, consisting of an area placed, or compacted or both in one day. Test lots must be uniform in terms of material properties and density.

Sample preparation: To AS 2891.2.1 and AS 2891.2.2, as applicable

Mix properties

Take samples from trucks at the mixing plant and test for mix properties using one of the following methods as applicable:

- Tar mixes: To AS 2891.4

Marshall stability of compacted mix

Compactive effort: 50 - blow.

Variations in mix properties

Ensure that the maximum variation between the mix property of each sample and the job mix value is in accordance with the **Mix property table**.

Mix property table

Mix property	Maximum variation from job mix value
Aggregate passing 4.75 mm sieve or larger	± 4% by mass
Aggregate passing 2.36 to 0.3 mm sieves	± 3% by mass
Aggregate passing 0.15 mm sieve	± 2% by mass
Aggregate passing 0.075 mm sieve	± 1% by mass
Bitumen content	± 0.3% by mass
Added filler content	± 0.5% by mass
Mixing temperature	± 10oC

COMPACTION TESTS

Density tests

General: Perform a field bulk density test for each test site either

- on a core sample taken from the asphalt surfacing layer; or
- if the nominal layer thickness is ³ 50 mm, measured in situ using a nuclear gauge.

Sample preparation: To AS 2891.2.1 and AS 2891.2.2, as applicable.

Characteristic value of relative compaction: Calculate the value of relative compaction using the formulae in the **Relative compaction table**, in which X and S are the mean and the standard deviation, respectively of the individual relative compaction test values for the lot.

Relative compaction table

Number of tests per lot	Characteristic value
6	X - 0.92S
10	X - 0.88S

Acceptance criteria

The relative compaction of each lot of pavement must meet the criteria of the **Asphalt compaction acceptance criteria table**.

Asphalt compaction acceptance criteria table

	Test criteria scale	
	A	B
Number of test sites per lot:		
- Core sample tests	6	3
- Nuclear gauge tests	10	5
Lot value for relative compaction	Characteristic value	Mean value
Minimum value:		
- Layer thickness up to 50 mm	96%	94%
- Layer thickness 50 mm or more	96%	96%

SAMPLES

General

Submit samples of the following at least one month before use in the works:

- Granular materials: One 50 kg sample of each proposed type and size of asphalt aggregate and cover aggregate.

Identification

Attach a tag to each sample showing relevant information including description, source and nominal size of material.

SUBMISSIONS

Tests

Compliance assessment: If compliance assessment tests are to be carried out by an independent testing authority, have the authority submit 3 copies of each test result.

Certificate of compliance: If a certificate of compliance is acceptable as an alternative to testing a manufactured material, submit the manufacturer's certificate together with the results of recent tests undertaken by the manufacturer, showing compliance with test criteria.

Materials

Proposed job-mix: Submit the following details before commencing production:

- Combined aggregate particle size distribution.
- Binder content expressed as a percentage of the total mix.
- The filler content expressed as a percentage by mass of the combined aggregates.
- The asphalt mix properties.
- The proposed mixing temperature.

Delivery dockets: Submit a delivery docket at the time and place of asphalt mix delivery showing

- empty and loaded mass of the vehicle;
- date and time of loading;
- supplier and location of mixing plant;
- registration number of the vehicle;
- size and type of asphalt mix;
- class of binder;
- temperature of load at mixing plant; and
- laboratory stamp or other mark certifying compliance with the specified properties.

Execution

General: Submit proposals for the methods and equipment to be used the roadworks, including the following:

- Staging of the work, access and traffic control methods.
- Disposal of surface water, control of erosion, contamination and sedimentation of the site, surrounding areas and drainage systems.
- Methods and equipment for each operation.
- Sources of materials.
- Material stockpiles.

Records of measurement

Submit certified records of all work performed.

ASPHALT MATERIALS

Asphalt materials

Primer: Medium cut back bitumen to AS 2157, containing no fluxing oil.

Tack coat mix: 3:2 bitumen emulsion: water.

Bitumen emulsion: To AS 1160

- Designation: ARS/170-60

Coarse aggregate

Standard: To AS 2758.5

Type: Clean, sound, hard, angular, of uniform quality, free from deleterious matter.

Crushed slag: Air-cooled blast furnace slag of uniform quality, generally free from vesicular, glassy or other brittle pieces.

Resistance to polishing (wearing course):

Fine aggregate

Type: Clean, sound, hard, durable particles of natural sand or particles derived from crushed stone, gravel or slag, free from injurious coating or particles of clay, silt, loam or other deleterious matter.

Aggregate properties table

Property	Test method	Value
Resistance to abrasion	AS 1141.23	
Particle shape	AS 1141.14	≤ 25 for wearing course ≤ 30 for binder course and corrective course
Wet strength	AS 1141.22	³ 50 kN
Wet/dry strength variation	-	≤ 35%

Binder

Type: Bitumen binder, class 170.

Combined aggregate grading

Provide a quantity of mineral filler at least 2% by mass of the combined aggregates.

ASPHALT MIX DESIGN

Requirements

General: Design the asphalt mix to AC5 in accordance with AS2150 - 1995

Asphalt thickness: 40mm.

Mix properties

Marshall stability: 4.5 kN minimum.

Marshall flow: 4.5 mm maximum.

Voids in total mix (maximum theoretical density based on apparent specific gravity of aggregates):

- Wearing courses: 3% - 5%.
- Binder courses and 7 mm mixes: 4% - 6%.

Voids in aggregate filled with bitumen:

- Wearing courses: 75% - 85%.
- Binder courses and 7 mm mixes: 70% - 80%.

Asphalt surfacing schedule

Provide documentation showing that the laid asphalt satisfies the particular situation, location and likely usage for the following:

- Nominal mix size
- Combined aggregate grading
- Binder content (%)
- Layer thickness (mm)

TOLERANCES

Surface level

General: Provide a finished surface which is free draining and evenly graded between level points.

Edges abutting gutters: Within ± 5 mm of the level of the actual gutter edge.

Tolerances: The tolerances in the **Asphalt surface level tolerances table** apply to the finished level of each layer, unless overridden by the requirements (including tolerances) for the finished level and thickness of the surface course.

Asphalt surface level tolerances table

Item	Level tolerance:	
	Absolute	Relative
Longitudinal direction	± 10 mm	5 mm
Transverse direction	± 10 mm	10 mm

Thickness

Asphalt surface course: The following tolerances apply to variations in the compacted layer thickness from the specified thickness:

- Any one sample: + 10 mm, - 5 mm.
- The mean thickness of the core samples in a lot: + unspecified, - 0.

PREPARATION

Cleaning

Immediately before priming or tack coating remove loose stones, dust and foreign material from the base surface using a power broom or blower. Keep traffic off the cleaned surface.

Protection

Protect adjacent surfaces during spraying. Protect freshly sprayed surfaces from contamination.

Priming

Timing: Prime the base surface as soon as possible after compaction and finishing.

Potholes

Trim to a regular shape and a uniform depth of at least 75 mm, tack coat the edges and patch with asphaltic concrete.

TACK COATING

Tack coating

Apply tack coat 30 - 120 minutes before asphalt surfacing is placed. Cover the surface uniformly at an application rate of 0.10 - 0.30 L/m² of residual bitumen.

SPREADING

Spreading

Preconditions: Place asphalt surfacing in dry weather on a dry pavement surface at a pavement temperature of at least 10°C.

Operations: Spread the mix in layers covering the full width of the pavement, or, in the case of carriageways and wide pavements, in lanes of minimum width 3 m. Place layers in adjoining lanes to the same compacted thickness.

Compaction

Before commencing compaction, correct any irregularities in line or level. Trim lane edges to a straight line. Compact asphalt surfacing uniformly as soon as it will support rollers without undue

displacement, and complete rolling while the mix temperature is above 80°C.

Surface finish

Provide a surface uniform in appearance and free from depressions in which water can lie.

JOINTS

Joints

General: Minimise the number of joints. Make joints that are well bonded and sealed and provide a smooth riding surface across the joint.

Transverse joints: Construct a transverse joint if the operation is stopped for more than 20 minutes or the pavement temperature falls below 90°C. Construct to a straight vertical face for the full depth of the layer, and offset in adjoining spreader runs and layer to layer by at least 2 m.

Longitudinal joints: Offset joints from layer to layer by at least 150 mm. Position longitudinal joints in the wearing course to coincide with the lane line.

Edges: Form exposed edges of each spreader run while hot to a straight line with a dense face inclined between vertical and 45°.

Cold joints: Tack coat the surface of cold longitudinal and transverse joint before placing the adjoining asphalt.

Abutting structures

Place asphalt surfacing to match the level of abutting surfaces such as kerbs, gutters, edge strips, manholes, or adjoining pavement in the same manner as for longitudinal and transverse joints. Fill spaces left unfilled between the spreader run and abutting edges with sufficient material to the proper height before compaction.

Matched junctions

General: If asphalt surfacing is to match an existing pavement, bridge deck, rail or other fixture, place the material to provide a smooth riding surface across the junction. Where necessary, remove sufficient of the existing pavement for this purpose. Where it is necessary to taper the thickness of a layer to provide a smooth riding junction, terminate the layer at a chase cut into the existing pavement about 20 mm deep and 400 mm wide. Where necessary, remove coarse particles from a layer of tapering thickness using hand raking.

Tack coat: Where the thickness of the layer tapers to less than twice the nominal size of the mix, tack coat the area upon which material of such thickness is to be placed uniformly at an application rate 0.50 - 0.75 L/m².

Surface finish

Provide a surface uniform in appearance and free from depressions.

DEFECTIVE SURFACING

Defective compaction

Minimum criteria for retention:

- Characteristic value of relative compaction of the lot: ³ 90%.
- Mean of the individual relative compaction test values of the lot: ³ 90%.

Defective layer thickness

Minimum criterion for retention:

- Mean thickness of the core sample in the lot: ≤ 10 mm below the required layer thickness.

Rejection

Extent: Remove areas of rejected asphalt surfacing, including defective joints and finish, to the

full depth of the layer, and replace with complying pavement.

Joints: Treat edges of remedial work as specified for cold joints.

COMPLETION

Traffic on pavement

Give notice before opening the pavement to traffic before the work is completed. Provide adequate means of protection.

E3 ELECTRICAL SERVICES

SCOPE OF WORK

General

The work covered by this section of the Specification comprises the supply of installation, testing, commissioning and 12 months defects liability of electrical services as detailed herein and shown on the accompanying drawing.

Briefly the work comprises but is not limited to the following:

- Provision for new conduits and wiring supplying the new luminaries via the platform existing lighting circuits. Alternate light fittings shall be on separate circuits.
- Provision for new 2 x 36 watt fluorescent perlite "VANDALUX" or equivalent luminaries with clear diffusers. Design and supply to meet CityRails's minimum lighting levels with automatic control by daylight sensors.
- Lighting circuits connections shall be via the existing canopies, and, or via existing platform lighting poles underground pits.
- Relocation of existing equipment (lighting sensor, P/A system, indicator and cable etc.) being disturbed by the new awnings.

ASSOCIATED WORK

The following associated activities will be carried out by the Contractor.

- Investigation of the supply and installed capacity ensuring that it is adequate to cater for the new lighting circuit.
- Provision of all penetrations and openings in the structure.
- Supply of sleeves support frames etc.
- As-built drawings.

UNIFORMITY

Uniformity of type and manufacture of each individual fitting and accessory shall be preserved throughout the whole installation.

NEW MATERIALS

All materials and equipment shall be new unless otherwise specified.

Materials, Workmanship and Samples

Supply and install all necessary fittings, materials and accessories to complete the work whether or not individually specified on the drawing or in this specification

Use only the brand and model of light fittings, light poles, etc. as specified on the drawings.

Written approval from the Contract Administrator shall be obtained to vary any of the above items and samples shall be required to obtain approval.

Install all items in accordance with manufacturers' instructions.

Use only materials, fittings, accessories and apparatus complying with the relevant Australian Standard(s) or in the absence of such specification, with the appropriate British Standard(s).

Failure to comply with these provisions may result in the rejection of such items after installation.

Any materials, accessories equipment or apparatus rejected on site shall be removed from the site within 24 hours of such rejection.

TESTS AND INSPECTIONS

GENERAL

Provide all labour, plant, and instruments necessary to carry out insulation resistance and continuity test and any other tests necessary to ensure the correct operation of the electrical services. Where required the tests shall be carried out in the presence of the Contract Administrator.

A "Test Report" shall be submitted (in duplicate) with the Ready for Test certificate to the Contract Administrator for acceptance. The test report is to include the printed name, signature and license number of the electrician actually carrying out the test and the printed name, signature and license number of the electrician's supervisor. The test must be carried out by a qualified and licensed Electrician.

An "acceptable" Test Report and duly completed "Ready for Test" certificate are to be submitted to and accepted by the Contract Administrator prior to the issue of the "Certificate of Practical Completion".

PROGRESSIVE INSPECTIONS

All underground conduits shall be inspected by the Contract Administrator prior to backfilling taking place and the cables drawn through. This particularly applies in the case where platform lighting columns have been removed to make way for new canopies. Failure to comply with this requirement will result in the Contractor having to remove the back filling and expose the conduits at their expense so that they can be inspected.

All concrete foundation bases (plinths) for lighting columns are to be inspected by the Contract Administrator with regard to depth, steel-reinforcing rods, correct location of hole, conduits etc. before the concrete for the plinth is poured. Failure to comply with this requirement will result in the Contractor being required to demolish the plinth and start again at their expense to allow inspection prior to the concrete pour.

DRAWINGS

The drawings included in this Specification are diagrammatic only and the exact positions of all equipment shall be determined on site. Refer to architectural drawings which will be available on site for information regarding set outs, penetrations, and other details.

EARTHING

The earthing arrangement shall be a modified direct earthing system and MEN connections will not be permitted. The system shall comply with SRA drawing No C87115, the conditions set out in Sections 4 and 8 of the Code of Practice - Protective Earthing, dated August 1986, issued by the Energy Authority of NSW and as detailed hereunder.

The earthing arrangements shall be to the Principal's standards and the Principal's special requirements. The Contractor has to include all necessary changes to the existing installation to

cope with the Principal's requirements.

A separate earthing conductor shall be run with every circuit.

All sub-main and final sub-circuit earthing conductors shall not be less than half the cross-sectional area of the associated active conductor with 7/0.67mm (2.5mm) being the minimum size used.

All final sub-circuit earthing conductors shall be enclosed within the same conduit or sheathing as the associated circuit conductors.

All sub-main and final sub-circuit earthing conductors shall be connected to the earth bar of the switchboard at which the circuit originates.

EXISTING SWITCHBOARDS

The existing Station main switchboard and distribution board (DB) shall be upgraded as necessary to accommodate the new lighting circuits to the platforms (such as to replace the existing circuit breakers and cabling by new circuit breakers of suitable current ratings and new cabling).

WIRING

General

Cables shall be installed so that they can be withdrawn and/or replaced at a later date.

Cables run underground shall comprise T.P.S. cables enclosed in heavy duty rigid PVC conduit of minimum size 32mm diameter (unless otherwise specified).

All wiring shall be installed using the "Loop in" principle with no intermediate connection between outlets, switches and switchboard.

Unless otherwise specified, wiring within concrete slabs shall be enclosed in minimum 25mm heavy duty rigid PVC conduit. The conduit shall be installed above lower reinforcement steel or directly below top reinforcement with long sweeping bends. The conduit or associated fittings shall not penetrate or come in contact with damp proofing or water proof membranes.

Through joints in cables will not be permitted without the specific approval of the Contract Administrator, in writing, and then only where such joints are unavoidable.

If joints are permitted locate them as directed by the Contract Administrator utilising pre-insulated crimp links of "Utilex" or approved equal manufacture.

Show location of any joints on the "as installed" drawings.

Underground joints are not permitted.

Wiring located less than 2.4 metres above the platform level is to be installed in steel conduit. Otherwise, wiring shall comprise TPI cabling enclosed in light duty rigid PVC conduit.

Cables

Unless specified otherwise all wiring shall comprise stranded copper conductors with 600/1000 volt V75 grade PVC insulation and conforming to AS3147

Minimum conductor sizes shall be 2.5 sq mm (7/0.67) for lighting and power circuits and 1.5 sq mm (7/0.59) for control circuits.

Cables shall be of Australian manufacture and delivered to site in unopened drums bearing the manufacturer's name.

For all fixed wiring, different and distinctive colours shall be used to each phase, switch wire and neutral wire. Active to be red or blue for single-phase circuits, neutral to be black, earth to be yellow/green and switch wire to be white. (This particularly applies to twin TPS).

Conduit**Rigid PVC Conduit**

Rigid PVC conduit shall be heavy or light duty as required, complying with A.S. 2053, and with associated fittings in the same material. Use cemented joints adopting the procedures recommended by the manufacturer.

Set the conduits as required using correctly sized springs to form large radius bends whilst maintaining the effective diameter and shape of the conduit. Conduit sets distorted by kinks, wrinkles, flats or heating will be rejected. Use preformed bends for all conduit laid in concrete slabs.

Conduits shall be run direct from point to point and the use of elbows, tees and inspection points between outlets shall be kept to a minimum with no more than two normal bends or their equivalent between outlets.

Inspection type fittings shall only be used in readily accessible locations.

Where expansion joints occur provide approved type expansion couplings to the approval of the Contract Administrator.

Provide moulded plastic pits equal to Viscount Plastic Type P1 where indicated on the drawings in accordance with standard electrical drawing No. K/88525.

LIGHTING

Supply, install, remove, relocate, replace, and/or modify luminaries and lighting columns.

Luminaries types shall be as nominated on the drawings. Alternative types will only be accepted subject to the prior written approval of the Contract Administrator. Samples may be required for approval. Failure to obtain written approval will result in the alternative being rejected.

Luminaries shall be complete in all respects and comply fully with AS 3137

Ballasts shall be designed for operation at 240 volts 50 Hz with a maximum operating temperature of 130°C and with quick - connect terminals or teflon insulated leads not less than 150mm in length.

Mercury vapour lamp ballasts shall be low loss type and comply with AS1468. Ballast losses for 80 watt and 50 watt lamps shall not exceed 9 watts.

Power factor of luminaries to be not less than 0.85 lagging after two hours of continuous operation. Capacitors to comply with AS2644

Fluorescent tubes shall be 26mm dia with colour temperature 4100°K and of Australian manufacture.

Mercury vapour lamps shall be Phillips HPL Comfort type, GEC Osram, or approved equal.

Luminaries shall have the cable entries and other openings sealed with "Silastic" or approved equal after installation of the wiring to prevent the ingress of moisture and insects.

All lighting columns shall be provided with stainless steel set screws for cast heads, etc. and existing mild steel screws replaced.

LABELLING

Label all items of electrical equipment including distribution boards, load centres, circuit breakers, contactors, daylight switches, by-pass switches, terminal blocks, light switches, etc. to reflect what have been modified to the approval of the Contract Administrator.

Labelling of circuits shall include the DB/Loadcentre number along with the lighting or power circuit number.

Labels shall comprise “traffolyte”, engrave with minimum 3mm lettering and shall be type white with black lettering. Labels shall be “glued-on” type (KWIK GRIP or equivalent type glue to be used) unless specifically stated otherwise.

DB/loadcentre schedules are to be completed in “biro” or other permanent marker (Pencil not acceptable).

ELECTRICAL DESIGN STANDARDS

All electrical Works undertaken by the Contractor within the Station fabric shall be in strict accordance with the following:

- AS3000 – SAA Wiring Rules
- Low Voltage Electrical Standards for Railway Stations
- Standard for Low Voltage Electrical Services for Underground Railway Stations
- Station Lighting Standard
- Installation of Low Voltage (LV) Electrical Power Cables – Underground Standard
- SRA Earthing and Bonding Code in the 1500 volt Electrical Area
- SRA Low Voltage Electrical Labelling Standards
- SRA Services & Installation Rules for the Supply of Electricity
- Excavation by Electrical Branch Staff or their Representatives - Protection of other Branches and Other Authorities Underground services (6/9/1988)
- Standard Specification for Installation of Local Supply Authority Emergency (Back-up) Power Supply for Signalling Locations
- All other Rules, Regulations and Requirements of the StateRail Authority for Low Voltage Electrical Services for Railway Stations
- Safety Rules for Persons other than SRA/RSA Employees working on SRA Property
- Service Rules, Regulations and requirements of Energy Australia
- The Rules of the Council of Fire and Accident Underwriters of Australia
- The Requirements of the Australian Communications Authority (ACA)
- AS1044 Limits and Methods of Measurement of Radio Interference Characteristics
- AS1680 Interior Lighting
- AS2052 Metallic Conduits and Fittings
- AS2293 Emergency Lighting to Buildings
- AS3008 Selection of Cables
- AS3013 Wiring Systems for Specific Applications
- AS3439.1 Low Voltage Switchgear
- All other relevant Standards as applicable

APPENDIX E1

CONCEPT DESIGN DRAWINGS

APPENDIX E1
CONCEPT DESIGN DRAWINGS

The following Drawing of the Concept Design form Part of this Specification and enclosed:-

Drawing No.	Rev.	Title
A02068.S1	00	WILEY PARK STATION CANOPY CONCEPT - PLAN,ELEVATION, SECTION
		WILEY PARK STATION DETAIL SURVEY
A02100.S1	00	CANLEY VALE STATION PLATFORM 1 CANOPY CONCEPT-PLAN,ELEVATION, SECTION
A02102.S1	00	NEWCASTLE STATION PLATFORM 2&3 CANOPY CONCEPT DESIGN – SITE PLAN
A02102.S2	00	NEWCASTLE STATION PLATFORM 2&3 CANOPY CONCEPT DESIGN – DETAIL PLANS
A02102.S3	00	NEWCASTLE STATION PLATFORM 2&3 CANOPY CONCEPT DESIGN – ELEVATIONS & SECTIONS
2716SK001	00	PADSTOW STATION PLATFORM CANOPY-CONCEPT DESIGN SITE PLAN
2716SK002	00	PADSTOW STATION PLATFORM CANOPY-CONCEPT DESIGN PLATFORM PLAN + ROOF PLAN,
2716SK003	00	PADSTOW STATION PLATFORM CANOPY-CONCEPT DESIGN ELEVATIONS & SECTIONS
A03024.S1	00	HORNSBY STATION PLATFORM 4 COUNTRY END CANOPY CONCEPT-PLAN,ELEVATION, SECTION
A03036.S1	00	SPRINGWOOD STATION PLATFORM1&2 SYDNEY END CANOPY CONCEPT-PLAN,ELEVATION, SECTION
A03023.S1	00	WOYWOY STATION COUNTRY END PLATFORM 1&2 CANOPY CONCEPT-PLAN,ELEVATION, SECTION
A03055.S1	00	OATLEY STATION COUNTRY END PLATFORM 1&2 CANOPY CONCEPT-PLAN,ELEVATION, SECTION

APPENDIX E2

CITYRAIL STATION DESIGN GUIDE,

(Note: Not included here, but can be made available upon request.)

APPENDIX E3

RAILCORP ENGINEERING DESIGN MANAGEMENT PROCEDURE CAD AND DRAFTING MANUAL

(Note: Not included here, but can be made available upon request.)

SRA -ELECTRICAL SERVICES DESIGN & DOCUMENTATION GUIDELINES

APPENDIX E3

ELECTRICAL SERVICES DESIGN AND DOCUMENTATION GUIDELINES

The enclosed document “Requirements for the Design of SRA Low Voltage Electrical Services for Railway Stations (Guide for Electrical Consultants)” forms part of this Specification.

Note: Not included here, but can be made available upon request

APPENDIX E4

RAILCORP APPROVED ARCHITECTS

LIST OF RAILCORP APPROVED ARCHITECTS

Company	Contact	Telephone	Facsimile
Stafford Moor & Farrington Pty Ltd	Richard Newton	(02) 9555 1114	(02) 9818 5323
Powell Dodds & Thorpe Pty Ltd T/A PDT Architects	Susan Playford	(02) 9922 6544	(02) 9929 6756
Suters Architects Snell Pty Ltd T/A Suters Architects	Stewart Corner	(02) 9635 3800	(02) 9893 8749
Caldis Cook Group Pty Ltd	Stephen Caldis	(02) 9557 5066	(02) 9557 4066
Baker Kavanagh Architects Pty Ltd	Joe Baker	(02) 9281 4460	(02) 9281 4468
DEM Gillespies Pty Ltd	Rudi Valla	(02) 8966 6000	(02) 8966 6222

APPENDIX E5

CITYRAIL RECOMMENDED MINIMUM LIGHTING LEVELS

CITYRAIL RECOMMENDED MINIMUM LIGHTING LEVELS

Location	Lighting Level (Lux)
Car Parks:	
Covered areas	50
Open Areas	20
Bus-Rail Interchanges:	
Covered Areas	50
Open Areas	20
Pathways	50
External approaches	85
Covered areas, entrance halls & verandahs	150 – 200
Awnings on platforms	100
Platforms	
- underground	150
- open	50
Waiting rooms	150 – 200
Overbridges	150
Stairs (covered)	150
Stairs (uncovered)	150
Subways	100

The above levels are minimum average service illuminance after lamp and dirt depreciation factors (maintenance factor of 0.75) are allowed for.

Design Parameters for Open Platforms

In addition to the illumination levels listed above, the following lighting design parameters shall be considered:

- The minimum illumination on open platforms shall not be less than 30 lux and the uniformity shall not be less than 0.5 (ratio of the minimum illumination level to the average illumination level).
- The maximum height of the new poles on open platforms shall not be more than 4.5m high.
- The use of metal halide lamps only as a light source for compatibility with the existing light sources on the covered areas at other stations and for good distinction between the Station lights and train signal lights. *(Please note, SRA has established a Supply Agreement No. C99019 with Moonlighting Pty Ltd for KIM SAR 2/3/4 light fittings for open platforms).*

Design Parameters for Covered Areas

The lighting design for the Station covered areas shall be based upon the installation of standard Vandalux luminaires (2xVC236) containing fluorescent lamps, similar to existing on other Stations, in order to achieve the new illumination levels.

Design Parameters for Car Parks and Bus-Rail Interchanges

The minimum illumination shall not be less than 20 lux in covered areas and 10 lux in open areas. The uniformity shall not be less than 0.5 (ratio of the minimum illumination level to the average illumination level).

APPENDIX E6

CONTACT LIST FOR SERVICES SEARCH

Station	Buildings Maintenance Manager	External Party Works Manager
WILEY PARK	JOHN CHIVERS 0 417 028 354	Metro South, STEPHEN BOYD 0 413 007 857
CANLEY VALE	JOHN CHIVERS 0 417 028 354	Metro South, STEPHEN BOYD 0 413 007 857
NEWCASTLE	John Kirsopp 0 427 906430	Metro North, Eddie Blackwell (02) 9847 8914 Mobile 0418 115 412
PADSTOW	JOHN CHIVERS 0 417 028 354	CBD, Bruce Leishman 0412 521 455
HORNSBY	Nick O'Brein 0417 065 997	Metro North, Eddie Blackwell (02) 9847 8914 Mobile 0418 115 412
SPRINGWOOD	Robert Mann 0419 422 074	Metro West, Ken Amegor 0422 005 865
WOY WOY	John Kirsopp 0 427 906430	Metro North, Eddie Blackwell (02) 9847 8914 Mobile 0418 115 412
OATLEY	Lou Tiziani 0419 893 203	CBD, Bruce Leishman 0412 521 455

APPENDIX E7

ESSENTIAL DIMENSIONS - PLATFORM



