PUBLIC TRANSPORT SERVICES

TECHNICAL STANDARD

PART 129002

STATIONS - EARTHING AND BONDING

AR-PW-PM-SPE-00129002

(D061)
### Document Control

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<td>Prepared By</td>
<td>Name: Kuldeep Zala</td>
<td></td>
<td>11/03/13</td>
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<td></td>
<td>Title: Rail Engineer</td>
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<tr>
<td>Reviewed By</td>
<td>Name: Keith Charlton</td>
<td></td>
<td>11/07/13</td>
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<td></td>
<td>Title: Rail Engineering Manager</td>
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<tr>
<td>Approved By</td>
<td>Name: Rob Taverner</td>
<td></td>
<td>11/07/13</td>
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<tr>
<td></td>
<td>Title: Director, Asset Management</td>
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1.0 INTRODUCTION

The Department of Planning, Transport and Infrastructure (DPTI) Public Transport Services Division (PTS) owns and operates the Adelaide Metropolitan Passenger Rail Network (AMPRN). There are approximately 85 stations serving the AMPRN. The significant number of stations means that the process of upgrading or renewal is continuous. In order to both economise on design and construction effort and costs and enhance the passengers’ experience a set of common design and construction technical standards for stations has been developed.

Because the set of station standards is primarily used within the contract administration process the technical standards documents must be aligned with both the DPTI wide Master Specification and the PTS engineering management system.

The document attached at Annex A, Technical Standard – Stations - Earthing and Bonding, is one of the set of station standards.

1.1 PURPOSE

The purpose of this Technical Standard is to outline the requirements for the design of Earthing and Bonding at the station precinct.

1.2 SCOPE

This Technical Standard applies to all PTS projects and contractor organisations designing, constructing or maintaining passenger stations on the AMPRN.
2.0 ANNEX A – TECHNICAL STANDARD – STATIONS - EARTHING AND BONDING

CONTENTS

1. General
2. Standards and Drawings
3. Reference Documents
4. Design Requirements
5. Verification of Earthing and Bonding Features
6. Inspection and Test Planning
7. Records

1. GENERAL

This Part specifies the requirements for the design of Earthing and Bonding on the Adelaide Metropolitan Passenger Rail Network (AMPRN).

“Bonding” means the effective connection between an earth electrode and any exposed electrically continuous metalwork of any equipment that may operate in an earthed situation.

“Earthing” means the effective connection to the general mass of the earth by means of a suitable earth electrode.

“Electrification” means the provision of an overhead wiring system above the railway track that is energised with a 25 kV AC current providing traction power for electric motor driven rail car sets through a roof mounted pantograph.

“Final Design Documents” means the Design Documents to be issued for construction of the Works that have been subject to all necessary approvals, verification, certification and release of applicable Hold Points required under the Contract.

“Final Design Review” means the design review meeting conducted at the completion of the final design and hosted by the Contractor for the purpose of presenting the final design to the Superintendent and Principal.

2. STANDARDS AND DRAWINGS

STANDARDS

| AS 3000 | Electrical Installations |

DRAWINGS

| 301-A2-86-2239 | STA Allowable Infringements Minimum Structures – 1 600 mm Gauge |
| AR-PW-EB-DRG-00110002 | Primary Earth Terminal (PET) Typical |

3. REFERENCE DOCUMENTS

Unless specified otherwise the following references shall be used in the conduct of the design:

(1) DPTI: D-2402 Traction Overhead System: Electrical and Mechanical Clearance; and

4. DESIGN REQUIREMENTS

All work within the Station Precinct shall be designed to safely permit the electrification of the Adelaide Metropolitan Rail Network (AMPRN) by means of an overhead traction power wiring system energised with 25 kV AC. The electrification may occur concurrently with the currently contracted Works or at a future time. Regardless of the expected timing of electrification the design shall meet these requirements.

The design shall comply with the following:

(1) Ensure all Works are undertaken in accordance with:
   • the DPTI Guidelines for the Protective Provisions Related to Electrical Earthing and Bonding for the Adelaide Metro Electrified Rail Network;
   • DPTI: D-2402 Traction Overhead System: Electrical and Mechanical Clearance; and
   • Drawing No. 301-A2-86-2239 STA Allowable Infringements Minimum Structures – 1 600 mm Gauge.

(2) Provide a Primary Earthing Terminal (PET) in accordance with Drawing No. AR-PW-EB-DRG-001 10002;

(3) Locate the Earth Collector Cabinet and PET off the platform within the rail corridor;

(4) Provide concealed (cad welding is preferred option) earthing and bonding connections which are vandal proof, theft proof and maintenance accessible for all items (e.g. furniture, light poles, fences, shelters); the method of concealment shall be approved by the Principal and shall be considered a HOLD POINT.

(5) Prepare necessary inspection and test plans for all stages of construction and installation, including for any necessary decommissioning, demolition, removal and/or disposal of any existing features rendered unusable by electrification, vide Clause 6 “Inspection and Testing” and Part 140 “Quality”, Clause 8 “Inspection and Testing; and

(6) Ensure that design and verification work is performed by competent persons equivalent to chartered professional engineers practicing in electrical engineering with electric rail and/or high voltage experience.

5. VERIFICATION OF EARTHING AND BONDING FEATURES

The Contractor shall arrange for independent verification and certification of the design and provide evidence to the Superintendent that the design of the works satisfies the requirements of the DPTI Guidelines for the Protective Provisions Related to Electrical Earthing and Bonding for the Adelaide Metro Electrified Rail Network and the STA Allowable Infringements Minimum Structures – 1 600 mm Gauge prior to submission of Final Design Drawings.

6. INSPECTION AND TESTING

The inspection and test plan shall consider, but not be limited to, the following points:

(1) Quantitative inspection criteria for earthing and bonding connections;

(2) Statistical validity of sampling where less than 100% of features are inspected;

(3) Inspection and test procedures to be used, especially the timing of inspections for conductors that are impossible to check after construction has been completed, such as welding of steel reinforcement;

(4) Collection and retention of the test data, including consolidation of the data to support test certificates;

(5) Reporting of the outcome of the inspection and test regime to the Superintendent; and
(6) Certification of earthing and bonding compliance for the total Works to the Superintendent.

The Contractor shall submit the Inspection and Test Plan, including inspection and test procedures which have been approved by the Independent Verifier, to the Superintendent at the Final Design Review.

7. RECORDS

Station Earthing and Bonding Detail Design documentation shall include, but not be limited to the following:

(1) Electrical installation layout plan drawings showing location of all switch boards, isolation transformers, earthing electrodes, conductor routes and the PET Primary Earth Terminal for connection of the Common Bonded Earth Network by the competent specialist skilled persons from the Electrification Constructor;

(2) Structure Bonding detail layouts including continuity bonding of reinforcement, provision of tails for connection of reinforcement and foundations steelwork by the Electrification Contractor's competent persons;

(3) Section and detail drawings where applicable;

(4) A single line schematic earthing and bonding diagram showing connectivity of the Main Earth Neutral links, PET primary earth terminal and earth electrode(s);

(5) Specification documents for size of conductors and prospective fault levels throughout the installation;

(6) Duct and Cable schedules for the earthing and bonding conductors;

(7) As built record of the earth electrodes and individual (statistical sample) resistance test results;

(8) A design report detailing acknowledgement of departures from AS 3000, Part 2 and other detail as required by AS 3000, Clause 1.9.4.3;

(9) Construction visual inspection check lists;

(10) Verification and Test measurement of the common bonded earth network and installation fault loop impedances;

(11) Installation Earthing and Bonding System Test Report; and

(12) Endorsed Certificate of Compliance.

The following records shall be provided to the Principal:

Inspection and Test Plan

(1) The Inspection and Test Plan in draft and final versions.

(2) Formats for inspection and test quantitative data and Contractor's and any subcontractor's certification thereof; and

(3) A Certificate of Compliance for the completed earthing and bonding design for the Works. If waivers have been granted, these shall be noted.