

# Railway

## Master Specification

### RW-COM-D1 Communications and Electronics

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# RW-COM-D1 Communications and Electronics

## 1 General

- 1.1 This Part defines the Requirements for the design of the Railway Communications and Electronics System specifically Passenger Information, CCTV and Security System.
- 1.2 Where this Part appears to conflict with the requirements of any other Departmental (Rail) documentation, or where the applying designer is concerned that the Part described herein do not satisfactorily address the primary and overriding requirement to design and implement solutions which support the safe operation of the railway, the matter shall be referred to the Unit Manager Communications & Electronic Systems or his designated Engineer or representative.

## References

- 1.3 The Contractor must comply with following DIT Standard:
- |                              |   |
|------------------------------|---|
| a) PTS-AR-10-CN-SPE-00200400 | Communications Network Principles and Practices.                  |
| b) PI4-DOC-000897            | Engineering Specification - Security Systems.                     |
| c) AR-PT-CE-SPE-00910001     | Technical Specification Optical Fibre and Copper Cabling.         |
| d) TC4-DOC-000357            | Non-Rail Service Installations within the Rail Corridor.          |
| e) D Part 074                | Design – Stations – Electrical Infrastructure                     |
| f) D Part 076                | Design - Stations - Passenger Information Systems.                |
| g) D Part 077                | Design - Stations - Equipment Room.                               |
| h) PTS-MS-1O-SG-STD-00000094 | Pit and Conduit Standard for Signalling and Communication Cables. |
| i) D Part 075                | Design - Stations - Security System.                              |
| j) S-4055 Sheet 62           | PTS PIT Requirement.  |
- 1.4 The Contractor must comply with the following external Standard:
- |                   |   |
|-------------------|---|
| a) AS 3000:2007   | Electrical Installations (Also known as the Australian/New Zealand wiring rules).                         |
| b) AS/CA S008     | Requirements for customer cabling products.   |
| c) AS/CA S009     | Installations requirements for customer cabling (wiring rules).   |
| d) AS 3080:2013   | Information Technology - Generic cabling for customer premises.   |
| e) AS 3085.1:2004 | Telecommunications Installations - Administration of Communications Cabling Systems - Basic Requirements. |
| f) AS 5000.1:2005 | Electric Cables - Polymeric Insulated - For working voltages up to and including 0.6/1 (1.2)kV.           |
| g) AS 1660.1:1998 | Test Methods for electric cables, cords and conductors and metallic components.                           |
| h) AS 1049:2000   | Telecommunications Cables - Insulation, Sheath and Jacket.  |
| i) AS 1049.1:2014 | Telecommunications Cables - Insulation, Sheath and Jacket – Materials.                                    |
| j) AS 1049.2:2008 | Telecommunications Cables - Insulation, Sheath and Jacket - Test Materials.                               |
| k) AS 1125:2001   | Conductors in insulated electric cables and flexible cords.   |
| l) AS 1660.1:1998 | Test Methods for electric cables, cords and conductors and metallic components.                           |

- m) AS 2857:1996 Timber drums for insulated electric cables and bare conductors.
  - n) AS 3808:2000 Insulating and sheathing materials for electric cables.
  - o) AS 1768:2007 Lightning Protection.
  - p) AS 4117:1999 Surge protective devices for telecommunication applications.
  - q) AS 60950.1:2015 Information Technology equipment - Safety - General Requirements.
  - r) AS 14763.3:2012 Information Technology - Implementation and Operation of Customer Premises Cabling - Testing of Optical fibre Cabling.
  - s) AS 2967:2014 Optical Fibre Communications Cabling Systems Safety.
  - t) AS 60825.2:2011 Safety of laser products - Safety of Optical Fibre Communication Systems.
  - u) AS 7660 Radio Communication in the Rail Corridor.
  - v) AS 7664 Railway Signalling Cable Routes.
  - w) AS 7666 Railway Train Control Systems - TPC Interoperability.
  - x) AS 7450 Railway Operations - Railway Systems Interoperability.
  - y) IEEE 802.3 Ethernet Standards (Wireline connected).
  - z) IEEE 802.11 Wireless Internetworking (Wi-Fi) Standards.
  - aa) IEEE 802.16m 4G Wireless Telecommunications Standards.
  - bb) Guideline - Rail Systems Interoperability.
  - cc) ITU Recommendations M.1457 3G wireless telecommunications standards.
- 1.5 Advice must be sought from the Principal's or Rail Communications and Electronic Systems Engineering's representative for any clarification or conflict regarding the standards listed in the above clause.

## 2 Design Reports

- 2.1 At a minimum, the Design Reports listed in this Part for the Communications and Electronics System must be provided at the following stages (15% design complete, 30% design complete, 70% design complete and 100% design complete) unless otherwise specified by the Principal.

## 3 Requirements Definition (Notionally 15% Design Complete) Stage

- 3.1 The following shall constitute **Hold Points** for this stage:
- a) Detailed Site Survey Drawings containing:
    - i) major monuments (e.g. Railway Stations, etc.);
    - ii) existing railway services;
    - iii) existing Utility Services;
    - iv) existing OHW infrastructure;
    - v) existing railway corridor access points;
    - vi) existing Communication Services; and
    - vii) existing pits and conduit layout.
  - b) Confirmation of existing System Design drawings and standards are correct and up-to-date;
  - c) Concept Design of Communications and Electronics System; which include:
    - i) hardware and software selection;

- ii) hardware layout and location;
- iii) proposed modifications and / or integration to existing design / system.
- d) Services Route and / or Combined Services Route (CSR); including station services route for the Communications and Electronics System applications. The schedule of drawings must include, but not limited to:
  - i) Stations layout with the proposed System location on the station/platform
  - ii) pits and conduit design and location;
  - iii) major monuments: Railway Stations, Side Roads, over bridges, etc.; and
  - iv) interface review for potential clashes with other services.
- e) Concept Design for Primary Cable Containment Route; which may include:
  - i) proposed location of the Primary Cable Containment (Up / Down track side) and Under Track Crossings;
  - ii) indicative make-up of the Primary Cable Containment (Conduit, Ground Level Trough, Galvanized Steel Trunking); and
  - iii) Layout and number of conduits with the correct conduit colour system where the Primary Cable Containment consists of a pit and conduit system.
- f) Identification of communication and electronic system assets requiring connection via a Secondary Cable Containment Route;
- g) Combined Services Plan:
  - i) chainage;
  - ii) major monuments (e.g. Railway Stations, Side Roads, over bridges, etc.);
  - iii) existing railway services;
  - iv) existing Utility Services and detailed design of Utility Services to be relocated;
  - v) track plan;
  - vi) OHW mast locations;
  - vii) existing railway corridor access points;
  - viii) the combined services plan may be overlaid on aerial photography; and
  - ix) cable route.
- h) Bill of Materials; and
- i) Design Basis Report.

## 4 Preliminary Design (Notionally 30% Design Complete) Stage

4.1 The following shall constitute **Hold Points** for this stage:

- a) Preliminary Design of Communications and Electronics System; which include:
  - i) Block Diagram Network
  - ii) System interconnection wiring schematic
  - iii) Wide area interconnection diagram
  - iv) Rack layout drawing including hardware and software selection;
  - v) hardware layout and location on the station/platform; and
  - vi) Proposed modifications and integration to existing design / system.
- b) Updated Services Route and / or Combined Services Route (CSR); including station services route for the Communications and Electronics System applications. The schedule of drawings must include, but not limited to:

- i) pits and conduit design and location;
  - ii) major monuments: Railway Stations, Side Roads, over bridges, etc.; and
  - iii) interface review for potential clashes with other services.
- c) Preliminary Primary Cable Containment Route, including:
  - i) proposed location of the Primary Cable Containment (Up/Down track side) and Under Track Crossing;
  - ii) containment Type: Conduit, Ground Level Trough, Galvanised Steel Trunking;
  - iii) number of conduits;
  - iv) location of pits; and
  - v) clash review identifying potential clashes of the Primary Cable Containment with other services including drainage infrastructure.
- d) Preliminary Secondary Cable Containment Route, including:
  - i) identification of communication and electronic system assets requiring connection via a Secondary Cable Containment Route; and
  - ii) location of pits.
- e) Updated Combined Services Plan:
  - i) chainage;
  - ii) major monuments (e.g. Railway Stations, Side Roads, over bridges, etc.);
  - iii) existing railway services;
  - iv) existing Utility Services and detailed design of Utility Services to be relocated;
  - v) track plan;
  - vi) OHW mast locations;
  - vii) existing railway corridor access points;
  - viii) the combined services plan may be overlaid on aerial photography; and
  - ix) cable route.
- f) New Equipment Enclosure :
  - i) preliminary identification of location case, Up / Down track, approximate chainage with labelling; and
  - ii) detailed position of location case (within 10m of the final position).
- g) Bill of Materials;
- h) Verify and confirm equipment and system specifications with the Rail Commissioner before any procurement. Any variations (to the standards specified in Clause 2; must be consulted and endorsed by the Rail Communications and Electronics System Engineering representative;
- i) Design Development Report including a list of Engineering Waivers to be sought;
- j) A list of construction specifications;
- k) A list of Inspection and Test Plans;
- l) SWMS and network access application to access the rail corridor if required;
- m) Integration consideration:
  - i) descriptions or the supply of Design packages against inter-discipline interfaces e.g. rail, stations, electrical works, etc.;
  - ii) constructability;
  - iii) sustainability in design;
  - iv) maintenance in design;

- v) risk analysis and assessment;
  - vi) Safety Management in design; and
  - vii) interim / temporary Work Packages.
- n) Verify and confirm equipment and system specifications with the Rail Commissioner before any procurement. Any variations (to the standards specified in Clause 2; must be consulted and endorsed by the Rail Communications and Electronics System Engineering representative;
- o) Bonding plans for Stations Services for PI System and CCTV systems;
- p) Typical details of cable pits; and
- q) Asset List skeleton.

## 5 Detailed Design (Notionally 70% Design Complete) Stage

5.1 The following shall constitute **Hold Points** for this stage:

- a) Detailed Design of Communications and Electronics System; which include:
- i) hardware and software selection;
  - ii) hardware layout and location;
  - iii) proposed modifications to existing design / system;
  - iv) The overall architecture of the PI System head end and its interface to the station distribution IP networks;
  - v) Interfaces to other systems and external devices;
  - vi) Block diagram network;
  - vii) System interconnection wiring schematic;
  - viii) Wide area network diagram ; and
  - ix) Rack layout drawing or design of interconnections within the site equipment cabinet and rooms.
- b) Detailed Services Route and / or Combined Services Route (CSR); including station services route for the Communications and Electronics System applications. The schedule of drawings must include, but is not limited to:
- i) pits and conduit design and location;
  - ii) major monuments: Railway Stations, Side Roads, over bridges, etc.; and
  - iii) interface review for potential clashes with other services.
- c) Detailed Primary Cable Containment Route including:
- i) location of the Primary Cable Containment (Up / Down track side), Under Track Crossings;
  - ii) Primary Cable Containment detailing sections of Conduit, Ground Level Trough, Galvanised Steel Trunking;
  - iii) typical trench, Ground Level Trough, Galvanised Steel Trunking cross sections;
  - iv) separation of High Voltage ELV and LV per communications conduit standard;
  - v) number of conduits where the Primary Cable Containment consists of a pit and conduit system;
  - vi) detailed construction methodology for conduits (open trench, directional bore, etc.);
  - vii) location of pits;
  - viii) closed out clash review of all previously identified clashes; and
  - ix) clash review updated to include all clashes of the Primary Cable Containment with other services including drainage infrastructure.
- d) Detailed Secondary Cable Containment Route including:



- i) location of Secondary Cable Containment Route Under Track Crossings;
  - ii) construction methodology of each Under Track and Under Road Crossings;
  - iii) Secondary Cable Route connections to communication and electronic system equipment and services;
  - iv) clash review identifying potential clashes of the Secondary Cable Containment with other services including drainage infrastructure;
  - v) details of cable pits;
  - vi) pits detailed on Drawings:
    - Primary cable / UTX pit;
    - Secondary cable / UTX pit;
    - location Case Pits;
    - Under Road Crossing pit;
    - Secondary cable break out pit;
    - fibre optic joint pits;
    - fibre optic make-off loop pit; and
    - labelling of the pits.
  - vii) Pit Schedule for all pits on Primary Cable Route;
  - viii) detailed design of all pits to be used. Where proprietary pits are to be used Product Technical File of pits; and
  - ix) proposed details of cable containment (pit and conduit, Ground Level Trough, Galvanised Steel Trunking) pit entry details.
- e) Detailed Combined Services Plan:
- i) chainage;
  - ii) major monuments (e.g. Railway Stations, Side Roads, over bridges, etc.);
  - iii) existing railway services;
  - iv) existing Utility Services and detailed design of Utility Services to be relocated;
  - v) track plan;
  - vi) OHW mast locations;
  - vii) existing railway corridor access points;
  - viii) the combined services plan may be overlaid on aerial photography; and
  - ix) cable route.
- f) New Equipment Enclosure:
- i) preliminary identification of location case, Up / Down track, approximate chainage with labelling; and
  - ii) detailed position of location case (within 10m of the final position).
- g) Bill of Materials;
- h) Detailed Design Report including:
- i) Creation of design drawings, design reports, wiring and networking tables, test plans, commissioning plans, transition plans, acceptance test plans and procedures, documentation (including updates to existing drawings and records) and hand-over documentation as specified. Where, the current drawing for the existing system is not available, the Contractor shall create one.
  - ii) Documentation or design of mains power supply to equipment enclosures and rooms, including UPS design and calculations;

- iii) completed Engineering Waivers of issues identified in the Preliminary Design stage; and
- iv) a summary of any additional Engineering Waivers sought due to development of the Detailed Design.
- i) 70% developed Construction Specifications;
- j) 70% developed Inspection and Test Plans;
- k) Updated SWMS and network access application to access the rail corridor, if required;
- l) Test certificates for the final commissioning and any stageworks;
- m) List of spare parts; Note: any spare part with length must be provided in meters;
- n) Operator and Maintenance manuals;
- o) Training manuals;
- p) Detailed Design Drawings; including pits schedule, CCTV camera schedule;
- q) Site Equipment Cabinets and room layouts;
- r) Updated Bonding plans for Station Services, PI and CCTV;
- s) Concept / Details of safe construction and maintenance access; and
- t) Preliminary Asset List in accordance with PTS-MS-05-AM-PRC-00000091.

## 6 Final Design (Notionally 100% Design Complete) Stage

6.1 The following shall constitute **Hold Points** for this stage:

- a) final site equipment cabinet and room layouts;
- b) final System Design drawings; including approval and manufacturer, of any proposed materials;
- c) final approved Bonding plans for Stations, PI and CCTV;
- d) final design and calculations for design of mains power supply to equipment enclosures and room, including UPS design and calculations.
- e) "as in service" alterations to circuit plans and application data as required to be completed after each level of stagework. Final "As in Service plans must be provided after the test copies have been returned and the commissioning is complete;
- f) test certificates for the final commissioning and any stageworks;
- g) combined Services Plan:
  - i) chainage;
  - ii) major monuments (e.g. Railway Stations, Side Roads, over bridges, etc.);
  - iii) existing railway corridor access points; and
  - iv) details of communications assets and / or infrastructure to be decommissioned and / or recovered.
- h) Primary Cable Containment Route:
  - i) location of the Primary Cable Containment Under Track Crossings and Under Road Crossings;
  - ii) Primary Cable Containment detailing Conduit, Ground Level Troughing, Galvanised Steel Trunking;
  - iii) trench cross sections for all arrangements including identification of conduits and compartments within Ground Level Troughing;
  - iv) separation of High Voltage ELV and LV per communications conduit standard;
  - v) construction methodology for conduits (open trench, directional bore, etc.);
  - vi) closed out clash review of all clashes; and

- vii) final design arrangement including station services including PI and CCTV Systems.
- i) Secondary Cable Containment Route:
  - i) Secondary Cable Route connections to communication and electronic system assets requiring connection via a Secondary Cable Containment Route;
  - ii) Location of pits; and
  - iii) closed out clash review of all clashes.
- j) Details of cable pits:
  - i) final Design of all pits;
  - ii) final location of all pits detailed on plans;
  - iii) pit schedule detailing the location, size and type of all pits;
  - iv) pit identification labels; and
  - v) final design of cable containment (pit and conduit, Ground Level Trough, Galvanised Steel Trunking) pit entry details.
- k) New Equipment Enclosure position including:
  - i) final position of location case; and
  - ii) safe construction and maintenance access.
- l) final Design Report including all Engineering Waivers completed;
- m) Drafts/Completed Asset List in accordance with PTS-MS-05-AM-PRC-00000091;
- n) final Construction Specifications;
- o) final Inspection and Test Plans;
- p) final Design Report; and
- q) final Bonding Plan for station services, PI and CCTV.

## 7 Construction and Installation

- 7.1 The following are **Hold Point** requirements for the construction and installation of communication system on the Adelaide Metropolitan Passenger Rail Network (AMPRN):
- a) Communication/ Station Design and issued for construction site plans must be reviewed and accepted by Rail Communication's Representative before the start of construction or installation work;
  - b) Detailed design to be submitted for approval which includes:
    - i) The overall architecture of the PI and CCTV System head end and its interface to the station distribution IP networks
    - ii) Design, dimensioning and configuration options made and the rationale for them
    - iii) Interfaces to other systems and external devices
    - iv) Functionality and performance to be provided by the final solution; and
    - v) Licenses to be provided (if applicable)
  - c) Installation for communication cablings and conduits shall be undertaken only by or under the direct supervision of a person or persons holding an ACMA Open Cabling License, with the appropriate endorsements for the type of cabling being performed. Evidence of cabling registration for installers and/or supervisors is to be submitted to the Principle prior to commencement of installation.
  - d) Software FAT, signed certificates, System/Equipment Configuration information and close out report or design issue register must be required for review at least 14 days prior to coming out on site and commissioning.

## 8 Inspection, Testing and Commissioning

- 8.1 Prior to testing, the Contractor shall demonstrate the correct functioning and current calibration of all test equipment. Copies of current calibration certificates shall be made available to the Principle prior to commencement of testing. Provision of the information shall constitute a Hold Point.
- 8.2 Provision of strategy and methodology for commissioning, Site Acceptance Test and Site Integration Test
- 8.3 Testing shall be carried out by appropriately trained and qualified personnel. Details of the qualifications and experience of the personnel performing the testing shall be provided to the Principal prior to commencement of testing. Provision of this information shall constitute a Hold Point.
- 8.4 The Contractor shall provide at least 48 hours' notice of the time and date that each stage of the testing will be undertaken. Provision of the notification shall constitute a Hold Point.
- 8.5 The Principal may choose to witness a representative sample of tests as they are conducted. The Principal shall liaise with the Contractor to make mutually suitable arrangements beforehand.
- 8.6 The results shall be submitted within 5 working days of tests being concluded.
- 8.7 Following completion of each package of installation for conduits & cablings and testing, the installation shall be certified as compliant with all relevant communications standards using a TCA1 Form (one for each separate package of work and system). Submission of completed TCA1 forms and Electrical Certificate of Compliance shall constitute a Hold Point.

## 9 Asset Handover

- 9.1 The Contractor must comply with AM4-DOC-000940 Asset Management Handover Requirements Standard and PTS-MS-05-AM-PRS-00000091 Asset Management Technical Data Requirements Specification.

## 10 Hold Points

- 10.1 The following is a summary of Hold Points referenced in this Part:

Document Ref.	Hold Point	Response Time
3.1	Provision of Requirements Definition Documents and Drawings	10 Working days prior 15% design complete stage
4.1	Provision of Preliminary Design Documents and Drawings	10 Working days prior 30% design complete stage
5.1	Provision of Detailed Design Documents and Drawings	10 Working days prior 70% complete stage
6.1	Provision of Final Design Documents and Drawings	10 Working days prior 100% complete stage
7.1	Construction and installation of communication system on the AMPRN	
8.1	Provision of Calibration Certificate(s)	10 Working days prior to Inspection, Testing and Commissioning stage
8.3	Provision of Trained and Qualified Personnel	10 Working days prior to Inspection, Testing and Commissioning stage
8.4	Notice of time and date for testing and commissioning	48 hours prior to Inspection, Testing and Commissioning stage
8.7	Provision of Certificates of Compliance	5 Working days prior to Inspection, Testing and Commissioning stage