

Master Specification

Part RD-ITS-C2

Mains Power Supplies for Roadside Traffic Management Equipment

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RD-ITS-C2 Mains Power Supplies for Roadside Traffic Management Equipment

1 General

- a) This Master Specification Part sets out the requirements for the design, supply and installation of low voltage (LV) mains power for roadside traffic management equipment, including:
 - i) the documentation requirements, as set out in section 2;
 - ii) the scope requirements, as set out in section 3;
 - iii) the operational requirements, as set out in section 4;
 - iv) the installation requirements, as set out in section 5;
 - v) the acceptance test requirements, as set out in section 6;
 - vi) the Hold Point requirements, as set out in section 7; and
 - vii) the verification requirements and records, as set out in section 8.
- b) For the purposes of this Master Specification Part:
 - i) LV mains power supply for roadside traffic management equipment includes:
 - A. consumer mains;
 - B. submains;
 - C. switchboards;
 - D. switchboard enclosures;
 - E. associated pits and conduits; and
 - F. any other works necessary to meet the design, supply and installation requirements for LV mains power supplies for roadside traffic management equipment, as specified in the Contract Documents; and
 - ii) traffic management equipment includes:
 - A. ITS equipment; and
 - B. traffic signal control equipment.
- c) Where road lighting is powered from the same mains power system as traffic management equipment, then the road lighting mains power system must comply with all relevant parts of this Master Specification Part in addition to all aspects of the Master Specification relevant to road lighting.
- d) The design, supply and installation of LV mains power supplies for roadside traffic management equipment must comply with the Reference Documents, including:
 - i) AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules);
 - ii) SAPN Service & Installation Rules Manual No. 32; and
 - iii) all SAPN Drawings including:
 - A. SAPN Drawing E1921 - UD LV Service or Junction Pit, Looped, Footpath Use; and
 - B. SAPN Drawing E1922 - UD Low Voltage - Service Pillar - Looped.
- e) This Master Specification Part does not apply to:

- i) the design, supply and installation of switchboards that are internal to:
 - A. field cabinets; or
 - B. traffic signal controllers;
- ii) the provision of an UPS and generators;
- iii) switchboards feeding road lighting only; or
- iv) Tunnel LV electrical power systems.

2 Documentation

2.1 Design Documentation

In addition to the requirements of PC-EDM1 “Design Management”, the Design Documentation must include:

- a) the information required by section 3f) including:
 - i) evidence of designer qualifications as required by section 3e);
 - ii) proposed cable sizing calculations, fault levels and details of all proposed switchboards;
 - iii) details of any planned disruptions to supply to existing connected loads; and
 - iv) a copy of the system design calculations as required in section 3f)v); and
- b) details of all connection points as required by section 5.2b).

2.2 Construction Documentation

In addition to the requirements of PC-CN3 “Construction Management”, the Construction Documentation must include:

- a) evidence of electrical worker licencing as required by section 3h);
- b) copy of SAPN approval to use un-metered switchboards as a source of power for Temporary Works relating to LV mains power for roadside traffic management equipment as required by section 5.1f) (if applicable);
- c) the information and copies of documentation required by section 5.2e);
- d) SAPN’s notice to proceed, as required by section 5.2f);
- e) copies of all documentation that SAPN provides to the Contractor (including any test or inspection reports); and
- f) copies of all drawings and supplementary information obtained from BYDA.

2.3 Quality Management Records

In addition to the requirements of PC-QA1 “Quality Management Requirements” or PC-QA2 “Quality Management Requirements for Major Projects” (as applicable), the Quality Management Records must include the verification records required by Table RD-ITS-C2 8-1.

3 Scope

- a) The Contractor must provide LV mains power for roadside traffic management equipment forming part of the Works and Temporary Works.
- b) The Contractor must ensure that the design, supply and installation of the LV mains power for roadside traffic management equipment complies with the following requirements:
 - i) conduit design and installation must comply with:

- A. RD-EL-D3 “Conduit Design for Road Lighting, Traffic Signals and ITS”; and
- B. RD-EL-C3 “Supply and Installation of Conduits and Pits”; and
- ii) where the Contractor’s LV design determines that:
 - A. an existing LV mains power supply is unavailable or unsuitable for alteration, the Contractor must design and provide a new protected LV mains power supply; and
 - B. an existing LV mains power supply is available and suitable for alteration, the Contractor must design and perform alterations as necessary for the change in supply or connected load, as required by:
 - I. RD-ITS-S2 “Roadside Electrical Switchboards”;
 - II. RD-ITS-S3 “ITS Enclosures”; and
 - III. TUN-ME-DC4 “Tunnel Equipment Cabinets”.
- c) The Contractor must, where it is necessary to do so as a component of the design or construction:
 - i) disconnect, remove, relocate or reconnect existing switchboards in accordance with the requirements of RD-ITS-S2 “Roadside Electrical Switchboards”; or
 - ii) provide consumer mains or submains (as applicable) to existing, replacement and new switchboards, including those in equipment cabinets and traffic signal controllers, as required by RD-ITS-S2 “Roadside Electrical Switchboards”.
- d) Where required to complete the installation of LV mains power supply for roadside traffic management equipment, the Contractor must:
 - i) provide underground infrastructure including pits and conduits;
 - ii) provide poles or other mounting structures;
 - iii) provide footings, foundations and any retaining structures;
 - iv) provide protective traffic barriers;
 - v) provide maintenance access paths and or stairways;
 - vi) provide any other necessary materials, equipment and works as may be required by the Contract Documents;
 - vii) connect new or replacement switchboards to the SAPN connection point in accordance with the terms of the Contract Documents and as agreed with SAPN;
 - viii) act as the Principal’s agent concerning all aspects relating to the electricity supply; and
 - ix) carry out all testing and commissioning of the Works required by this section 3d) in accordance with the requirements of the Contract Documents.
- e) The Contractor must ensure that the electrical design relating to the LV mains power supplies for roadside traffic management equipment is only carried out by a designer who is qualified to perform such electrical design works.
- f) The Design Documentation must include:
 - i) evidence of the qualifications for the electrical designer required by section 3e);
 - ii) details of the proposed cable sizes and fault levels forming part of the electrical design associated with the LV mains power supplies for roadside traffic management equipment;
 - iii) details of any proposed switchboards associated with the LV mains power supplies for roadside traffic management equipment;
 - iv) details of any planned disruptions to supply to existing connected loads; and

- v) a copy of the Contractor's calculations showing:
 - A. current carrying capacity;
 - B. spare current capacity;
 - C. fault current calculation
 - D. maximum demand calculation;
 - E. voltage drop;
 - F. fault loop impedance; and
 - G. achievement of discrimination.
- g) The Contractor must ensure that all electrical installations relating to LV mains power for roadside traffic management equipment:
 - i) are carried out by an electrical worker who is:
 - A. licensed appropriately to perform the electrical works;
 - B. for any work on SAPN assets, also approved by SAPN to work on these assets; and
 - C. for any work on rail related assets (including any interfaces from Principal owned infrastructure to rail infrastructure), also approved by the relevant rail Authority; and
 - ii) comply with the requirements of:
 - A. AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules);
 - B. the *Electricity Act 1996 (SA)*;
 - C. the *Electricity (General) Regulations 2012 (SA)*; and
 - D. SAPN, including as specified in the SAPN Service & Installation Rules Manual No. 32.
- h) Evidence of the licence of the electrical workers required by section 3g)i) must be included as part of the Construction Documentation, prior to commencement of the electrical works.
- i) Where existing assets are rendered redundant by the Works, the Contractor must remove and dispose of those redundant assets in accordance with the Contract Documents.

4 Operational requirements

4.1 General

The Contractor must ensure that the LV mains power for roadside traffic management equipment satisfies the following operational requirements:

- a) field equipment and other electrical installations, except traffic signals and road lighting, must be powered by a metered power supply;
- b) all traffic signals and road lighting equipment (unless otherwise specified in the Contract Documents) must be:
 - i) powered from an unmetered supply; and
 - ii) included in the AEMO, National Electricity Market Load Tables (unmetered loads);
- c) mains power supply system capacity must meet the power consumption requirements of each individual installation, including any requirement for spare capacity as required by the Contract Documents;

- d) the switchboard must be designed to meet nominated fault levels and incorporate protective devices facilitating protection from:
 - i) transient voltages;
 - ii) harmonic content within the local the mains electricity supply; and
 - iii) overcurrent and earth leakage faults; and
- e) all points and surfaces at greater than ELV potential within each installation must be shielded to prevent direct contact to enable minor servicing and maintenance (excluding any requirement to work on “live” equipment) to be undertaken without a requirement to de-energise the switchboard.

4.2 Mains power

The Contractor must ensure that the LV mains power supply design for roadside traffic management equipment complies with the requirements of AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules).

4.3 Transient suppression

The Contractor must ensure the LV mains power supplies for roadside traffic management equipment satisfies the following transient suppression requirements:

- a) surge suppression must be provided on the load-side of the main switch; and
- b) the surge suppression device required by section 4.3a) must:
 - i) be designed to withstand a minimum of 100 surge events; and
 - ii) display suppression capacity (health) status locally via integral indicators.

4.4 Automatic change-over switch

- a) This section 4.4 only applies if the installation of a secondary power source and change-over facility has been specified in the Contract Documents.
- b) The Contractor must ensure that the change-over switch installation complies with the following:
 - i) an automatic change-over switch must be provided on the load side of the mains switch;
 - ii) upon detection of mains power failure, the change-over switch must automatically switch to the alternative power source. Upon detection of stable mains power restoration in excess of one continuous minute, the change-over switch must automatically switch back to mains power;
 - iii) the change-over switch must provide display status locally via integral indicators and provide volt-free contacts for remote indication; and
 - iv) the change-over switch must have the capacity to be manually switched between:
 - A. auto operation;
 - B. manual operation to connect to either mains supply or secondary supply power; and
 - C. bypass to disconnect and isolate the secondary power source.

5 Installation requirements

5.1 General

The Contractor must ensure that it complies with the following requirements with respect to installation of LV mains power for roadside traffic management equipment:

- a) the Contractor's construction schedule must ensure that wherever possible existing power supplies remain operational throughout the carrying out of the Contractor's Activities, and minimise the times of power supply disruptions;
- b) if disruption to an existing power supply is unavoidable, the Contractor must give the Principal 5 Business Days' written notice of the intention to disrupt an existing supply;
- c) the power supply disruption notice required by section 5.1b) must include an estimate of the duration of interruptions to the supply;
- d) provision of the power supply disruption notice under section 5.1b) constitutes a **Hold Point**. The disruption to the power supply must not commence unless this Hold Point is released;
- e) un-metered switchboards must not be used as a source of power for Temporary Works relating to LV mains power for roadside traffic management equipment unless SAPN has provided its prior written approval for such usage; and
- f) the Construction Documentation must include a copy of SAPN's written approval obtained pursuant to section 5.1e) (if applicable).

5.2 Contact with SAPN

- a) The Contractor must determine all existing and new connection point locations relevant to the LV mains power requirements for the proposed traffic management equipment.
- b) The Design Documentation must include details of all connection points determined pursuant to section 5.2a).
- c) The Contractor must undertake its own investigations and confirm the position and available load capacity of all existing and any new connection points with SAPN before commencing the installation of any conduit runs between the nominated connection points and the associated field equipment.
- d) The Contractor must consult with SAPN to:
 - i) obtain access to any required SAPN drawings;
 - ii) identify the specific requirements of SAPN in relation to the provision of LV mains power supplies for roadside traffic management equipment;
 - iii) make applications to SAPN for the supply of new or upgraded connection points, on behalf of, and in the name of, the Principal;
 - iv) advise SAPN of changes to connected loads; and
 - v) if the Contractor is to arrange new connection points, the Contractor must provide all applications, information and documentation to SAPN in relation to such connection points in the form and at the times required by SAPN.
- e) As part of the Construction Documentation, the Contractor must provide the Principal with a completed copy of any documents and supporting information the Contractor intends to provide to SAPN pursuant to this section 5.2.
- f) The Contractor must not proceed with the installation works the subject of this Master Specification Part until:
 - i) it has received written confirmation concerning the available load capacity at the proposed SAPN connection points; and
 - ii) all correspondence with SAPN, including written authorisation from SAPN, has been submitted to the Principal for approval as part of the Construction Documentation.

5.3 Inspection

- a) With respect to LV mains power for roadside traffic management equipment, the Contractor must:

- i) apply for and pay for all required SAPN connection tests as specified in SAPN Service & Installation Rules Manual No. 32 (the timing of which is to be confirmed with SAPN and incorporated into the Contract Program); and
- ii) arrange for electrical certificates of compliance as required by:
 - A. AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules); and
 - B. applicable Laws, including the *Electricity Act 1996 (SA)* and the *Electricity (General) Regulations 2012 (SA)*.
- b) The Quality Management Records must include:
 - i) the SAPN connection test results required by section 5.3a)i); and
 - ii) a copy of the electrical certificates of compliance required by section 5.3a)ii).

6 Acceptance test requirements

- a) In addition to the testing requirements set out in RD-ITS-C1 “Installation and Integration of ITS Equipment” and PC-CN1 “Testing and Commissioning”, the Contractor must undertake the following tests with respect to the LV mains power supplies for roadside traffic management equipment prior to or as a part of the commissioning process:
 - i) thermal (infrared) image scans of all cabinet interiors, cable connections to cabinets and any other equipment located external to cabinets such as fuses located in pits under maximum anticipated load conditions; and
 - ii) all testing required by AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules), including:
 - A. earth loop testing;
 - B. insulation resistance testing; and
 - C. polarity testing.
- b) The Contractor must rectify and retest all “hot” joints identified on the thermal image scan undertaken pursuant to section 6a)i) as part of the Site Acceptance Testing.
- c) The Contractor must provide a copy of all test results to the Principal as part of the Quality Management Records.

7 Hold Points

Table RD-ITS-C2 7-1 details the review period or notification period, and type (documentation or construction quality) for each Hold Point referred to in this Master Specification Part.

Table RD-ITS-C2 7-1 Hold Points

Section reference	Hold Point	Documentation or construction quality	Review period or notification period
5.1d)	Notice to disrupt supply	Documentation	5 Business Days review

8 Verification requirements and records

The Contractor must supply written verification as part of the Quality Management Records that the requirements listed in Table RD-ITS-C2 8-1 have been complied with.

Table RD-ITS-C2 8-1 Verification requirements

Document reference	Record
5.3b)	SAPN connection test results and electrical certificates of compliance
6c)	Acceptance test records