RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD
ABN: 58 105 001 465

RISSB product for prioritisation

Primary information	
Type of product being suggested:	Standard
Title of product being suggested:	Signalling Power Supplies
Date of suggestion:	28 February 2018
Reason for suggestion:	Power supply systems for railway signalling frequently use 'floating'/earth-free supplies to minimise the risks of false operation of safety-critical systems that could lead to major safety incidents. While this is not precluded by AS3000, there is often uncertainty about best practice in designing installing and maintaining such systems. This Standard will provide guidance for design and performance criteria for a distributed power network for signalling requirements.
Railway discipline area:	Train Control Systems

Scope:

The following will be scoped in the Standard:

- Safety requirements and regulatory standards.
- Exemption from Electricity Act/Regulations (where applicable) and how safety issues are managed.
- Compliance with and departures from AS/NZS3000.
- Distributed network design.
- Distribution at higher voltages.
- Protection system design and discrimination.
- Loop impedance and tripping time coordination.
- Protection device selection for systems containing motors and transformers.
- Class II/double insulation requirements.
- Cable & equipment insulation, shrouding and isolation requirements.
- Criteria for determining acceptable cable volt drop and required cross sectional area.
- Power quality.
- Acceptable range of power factor, and power factor correction.
- Intake power from local utility (230V/240V).
- Power supplies derived from traction systems.
- Remote area power supplies.
- Alternate power supply systems e.g. solar, wind generator, motor generator.
- Transformer design criteria (240V to 110V; 240V to 600V; 600V to 110V) including nominal operating capacity and provision for future capacity.
- Transformer taps for ensuring transformers magnetic flux is in the correct design range.
- High reliability power supplies.
- Criteria for use of UPS systems to support periodic operation of electric motors such as typical point machines.
- Signalling dynamic power loads e.g. point motors, system start up, recovery from power outage.
- Power supplies for electronic/computer systems.
- Generic equipment requirements.
- Level crossing power supply reliability and back up.
- Signalling earth free supply and earth leakage detection/testing.
- Monitoring signals power supplies.
- Separation of supplies feeding equipment internal and external to equipment rooms/equipment cabinets using isolating transformers.

Objective:

This Standard will assist with design and delivery of signalling system power supply systems that match signalling equipment requirements, with improved maintainability, reliability and availability by addressing safety of persons and signal system safety.

Hazard identification:

1	Poor earthing of electrical installations	2	Proximity to underground/overhead power cables
3	Unprotected cables/leads (mechanical)	4	Exposure of persons to electric shock, arc flash
5	Ergonomic access (installation/maintenance)	6	Touch potential
7	Definition of work, testing, inspection	8	Fire detection, fire fighting
9	Emergency routes and access	10	Application of AS1851: penetrating fire rated walls
11	Containment requirements for batteries	12	Working alone

Benefits:

Safety

- Consistency of power supply design simplifies training and retention of equipment knowledge, leading to more reliable operations fewer errors and injuries
- Improvements to electrical safety due to more robust application of standards
- Risk of unforeseen outcomes reduced due to adoption of coherent standards

Interoperability[i] / harmonisation[ii]

- Common standards will lead to adoption of similar solutions, leading to reduction in the number of 'novel' power supply installations.
- Common standards will improve designer familiarity with matching solutions to design requirements, leading to lower design risks

Financial

- Common standards will lead to adoption of similar solutions, leading to lower pricing from suppliers due to increased volume and lower design risks
- Reduced training costs due to use of common products, and the ability to use vendor-supplied training

Environmental

- Potential improvements in efficiency by applying power factor correction in distributed power supply systems feeding reactive loads (many transformers and electric motors)

Impacts

The nominal mains voltage specified in As/NZS3000.2 is 230 volts, however power supply utilities in various Australian states and territories provide other nominal voltages such as is 240 volts or 254 volts. Equipment such as a transformer is usually designed for efficient operation when connected to a specific voltage. This requires the supply of equipment custom made for each jurisdiction, or the ability to adjust the equipment to suit a range of power supply characteristic, by, for instance, altering the taps on the mains transformer. Challenges will exist in harmonising between states and territories to achieve a common solution.

i Interoperability - the ability of a process, system or a product to work with other process, systems or products (aka compatible systems through managed interfaces).

ii Harmonisation - the act of bringing into agreement so as to work effectively together (aka uniformity of systems).