



AUSTRALIAN RAIL TRACK CORPORATION LTD

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Installation Inspections

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The technical content of this document has been approved by the relevant ARTC engineering authority and has also been endorsed by the ARTC Safety Committee.

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About This Standard

This specification details the requirements for undertaking inspections of Customer installations connected, or proposed to be connected, to the ARTC distribution system. These inspections are to be carried out by authorised personnel engaged by ARTC's service providers.

Each Electricity Distributor has a responsibility to ensure that consumers' installations connected to its distribution system are safe and do not pose a risk to life, health or property. This is to protect the consumer and also to protect the Electricity Distributor so that its system reliability is not jeopardised by faulty consumers' installations.

The procedures contained in this specification are part of ARTC's Customer Installation Safety Plan which has been developed to meet the requirements of the Electricity Supply (Safety Plans) Regulation 1997 under the Electricity Supply Act 1995.

This specification is not a guide to owners of consumers' installations or installing contractors.

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1. References

The following documents are either referenced in this document or can provide further information.

1.1. Legislation

Electricity Safety Act 1945.

Electricity Supply Act 1995.

Electricity Safety (General) Regulation 1992.

Electricity Supply (Safety Plans) Regulation 1997.

1.2. Electricity Association of NSW

Code of Practice - Installation Safety Management.

Code of Practice - Service and Installation Rules.

Code of Practice - Distribution Risk Management.

Guide to the Inspection of Consumers' Electrical Installations (EC19 March 1993).

New South Wales Service and Installation Rules.

1.3. Australian Standards

AS 3000

AS/NZS 3017 - 1996 - Electrical Installations - Testing Guidelines.

1.4. Australian Rail Track Corporation

PDS 03 - "Low Voltage Distribution and Installations Earthing References and Definitions".

PDS 07 - "Low Voltage Distribution Earthing".

PDS 08 - "Low Voltage Installations Earthing".

PDS 15 – "Demarcation of ARTC Low Voltage Distribution System".

1.5. Miscellaneous

State Rail Authority of New South Wales Service and Installation Rules (July 1989)

2. Definitions

2.1. General Definitions

For the purpose of this specification the definitions given in the Electricity Safety (General) Regulation 1992 and the New South Wales Service and Installation Rules apply. In addition further definitions are contained in the following ARTC specifications:

EP 12 00 00 02 SP – "Low Voltage Distribution and Installations Earthing References and Definitions" (RailCorp publication)

PDS 15 – "Demarcation of ARTC Low Voltage Distribution System"

EP 95 00 00 02 SP - "General Requirements for a Contractor's Electrical Safety System" (RailCorp publication)

2.2. Specific Definitions

"Inspector":

Is the person who carries out the actual installation inspection and who is employed by an inspection contractor company.

"Inspection Contractor":

Is a company which is engaged by a Service Provider for the purpose of inspecting installations in accordance with this specification. (The inspection contractor may be the Service Provider itself).

"Service Provider":

Refer to the definition given in the RailCorp publication EP 95 00 30 01 SP - "Introduction to the Safety, Operating and Other Plans for the ARTC Electricity Distribution System".

3. Installations to be Inspected

3.1. Policy

Authorised staff must carry out inspections of consumers' installations where the installations (including sub-fed consumers) are supplied from the ARTC's high voltage or low voltage distribution system.

3.2. Consumer's Installation

A consumer's installation is defined in Part 1 of the Electricity Safety (General) Regulation 1992

A consumer's installation commences at the consumer's terminals. Generally, where supply is from the Australian Rail Track Corporation's low voltage distribution system the consumer's terminals should be taken to be at the line side of the installation main switch, unless otherwise specified. Refer to document PDS 15 - "Demarcation of ARTC Low Voltage Distribution System" for more details.

A consumer's installation may also commence at a point within another installation, eg. a shop at a station, a signal location back-up supply fed from a workshop sub-distribution board.

4. Standard of Installation Work

The minimum design, construction and maintenance standards required of customers' installations for connection to the ARTC distribution system is compliance with Electricity Safety (General) Regulation 1992, NSW Service & Installation Rules (including ARTC Local Service & Installation Rules), AS 3000 and other Australian Standards called up by AS 3000.

5. Testing Requirements

Before being permanently connected to supply, ARTC requires that all installation work carried out shall be tested, and a test report completed. This is to be done by the installing electrical contractor (or another electrical contractor that the installing electrical contractor has engaged to do the testing on his behalf). This is separate to the installation inspection carried out by the inspection contractor on ARTC's behalf.

The test is to check that the installation work complies with the appropriate Australian Standards, and operates safely.

For a list of the tests required to be carried out refer to the Electricity Association of NSW Code of Practice - "Installation Safety Management", Appendix 2.

6. Notification

ARTC or its representative is not required to be notified of any categories of work covered under Clause 13.(4) of the Electricity Safety (General) Regulation 1992.

For all other work ARTC requires that an installing contractor shall submit details of all work carried out on a consumer's electrical installation, including relevant test results, using the industry accepted pro-forma (Notification of Electrical Work Form), within 14 days of completion. The original shall be given to ARTC's Service Provider, and a copy to the owner of the customer's installation.

The Notification of Electrical Work (NOEW) form must be completed in full, with particular attention to the following details:

- The customer's address and contact number must be clearly identified;
- The load to be connected must be clearly identified;
- For Section C, actual test values must be shown for Tests 1 & 2;
- For Section D, legible signature and license details must be included for the "work completed by", "work tested by" and "work notified by electrical contractor" sub-sections.

If the NOEW form has not been clearly or correctly completed then the Inspection Contractor shall return the form to the person submitting it, advising them that a new or suitably corrected NOEW form must be resubmitted within 5 working days. Failure to comply with these requirements shall initiate corrective action in accordance with Section 11.

Inspection Contractors shall institute appropriate systems to ensure that they are aware of electrical work:

- Being carried out, in the geographical area for which they are responsible for carrying out Inspections, and
- For which the contractor has failed to provide the notification required.

In the case of work that is discovered other than by way of a NOEW form, the Inspection Contractor shall use its best endeavours to discover who was responsible for the work and require them to lodge the required NOEW. Corrective action in accordance with Section 11 should also be considered.

7. Inspections

7.1. Work to be Inspected

7.1.1. Mandatory Inspections

Clause 3.8 of the Electricity Association of New South Wales Code of Practice – "Installation Safety Management" states which installation work **MUST** be inspected.

All other installation work shall be inspected on a sample basis in accordance with Clause 7.1.2 of this specification.

7.1.2. Discretionary Inspections

Installation work, other than work in 7.1.1 above, is to be inspected in accordance with the following:

The percentage of work done by each individual electrician (working for an installing contractor) which is to be subject to an installation inspection is determined by the inspection contractor and is based on:

- The type of installation work involved, ie. major job/minor job &/or its location, eg. a public area/high risk area, etc. and
- The electrician's previous performance in that particular type of work; and
- With a minimum that each electrician's work must be subject to an installation inspection at least once every 3 months.

Note:

- 1) Irrespective of the above, all work that has been found to be defective must be re-inspected.
- 2) An installation inspection is separate to the "self test" which must be carried out after every job in accordance with Clause 11 of the Electricity Safety (General) Regulation 1992.
- 3) Inspection requirements, in terms of percentage of work to be inspected, will be periodically reviewed as the familiarity of installing contractors in the market changes, in particular with demonstrated knowledge of ARTC specifications.

7.2. Inspection Method

Installation inspections shall be carried out to determine whether the installation work complies with:

- AS 3000,
- The NSW Service & Installation Rules,(including ARTC's local Rules)

and that the installation work:

- Has been competently carried out, and
- Is safe and does not pose a risk to life, health or property.

Note:

Whereas local Electricity Distributors in NSW use a Multiple Earthed Neutral (MEN) system the ARTC distribution system uses a direct earthing system to reduce the risk of DC traction current flowing into the low voltage distribution system.

The Inspection shall include, but not be limited to, testing the work in accordance with the requirements of the Electricity Association of NSW Code of Practice - "Installation Safety Management", Appendix 2. Testing procedures must as a minimum be in accordance with AS/NZS 3017 - 1996 - Electrical Installations - Testing Guidelines.

It is essential that a thorough visual check is made of the work where reasonable access is available and that the earthing system is checked to ensure that it meets DC traction system special requirements as set out in ARTC specifications.

7.3. Progress Inspections

Where any part of the electrical installation, including wiring, will be concealed (such as installed underground or behind a wall which is lined) then progress inspections shall be carried out.

7.4. Defects

Work that does not comply with AS 3000 and the NSW Service & Installation Rules (including ARTC's local Rules) shall be considered to be defective.

A Standard Defect Report Form shall be used.

The procedure for completing the form is detailed in Appendix B with guidelines for completing the form in Appendix A.

Three copies of the report are required:

- Customer's copy,
- Installing Contractor's copy, and
- Distributor's Copy, which is held by ARTC's Service Provider. Each Defect Report form shall be uniquely numbered.

Refer to Clause 9 regarding the requirements for connecting (and disconnecting) of customers' installations to supply.

For minor defects a period of 21 days grace shall be allowed for the defects to be rectified. If it is not rectified within this period a Final Notice shall be forwarded to the owner of the installation. If it is still not rectified within 14 days of the date of the Final Notice then the matter should be discussed with the owner before disconnecting supply.

If any part of the electrical installation is disconnected it shall be suitably tagged with a

warning not to connect and the nature of the defect.

All work that has been defected shall be re-inspected.

7.5. Re-inspection

Work is not to be re-inspected until a new NOEW form (to notify that the work is ready for reinspection) has been received.

Costs associated with reinspection will be charged to the installing contractor.

7.6. Defects in Other Parts of the Installation

If during an Inspection of a consumers' installation other parts of the installation (other than installation work indicated on the NOEW form) is found to be dangerous, or is likely to become dangerous, then written notice (ie. a Standard Defect Report form) of the danger shall be given to the owner of the installation. This is in addition to the written notice given to the contractor for defective work associated with details of electrical work shown on the NOEW form.

If the supply to the installation is not disconnected then the notice shall include the period within which the installation is to be made safe or otherwise supply will be disconnected.

The installation shall be re-inspected after that period has expired to ensure that the installation has been made safe.

Note

Installations containing major safety breaches as listed in Appendix 3 of the Code of Practice – "Installation Safety Management" are not to be connected to supply or if found connected are to be disconnected.

7.7. Movable Electrical Equipment

If during an inspection of a consumers' installation movable electrical equipment is found to be dangerous then written notice of the respects in which it is dangerous shall be given to the owner or user of the equipment.

If the movable electrical equipment is immediately dangerous then a label (indicating that the equipment is dangerous and must not be used until it has been made safe) shall be placed in some conspicuous position on the equipment.

Note

A standard Defect Report form is not to be used in this case.

7.8. Records of Inspections

Records of inspections shall be maintained for a minimum of 2 years.

A follow up system shall be implemented to ensure NOEWs for reinspection are received. ARTC will periodically audit the inspection records.

8. Remedy of Work Containing Safety Breaches

All work that has been defected shall be re-inspected (refer to Clause 7.4 – Defects)

Note

The Electricity Association of NSW Code of Practice - Installation Safety Management lists, in Appendix 3, the types of safety breaches that are to be regarded as major safety breaches.

9. Connection to Supply

9.1. General

Installation work falling within any of the categories listed in clause 12 (2) of the Electricity Safety (General) Regulation 1992 must not, without appropriate permission, be connected to ARTC supply.

9.2. Disconnection of Defective Installations

Installation work containing major safety breaches as listed in the Electricity Association of NSW Code of Practice - Installation Safety Management Appendix 3, shall not be connected to supply, or if found connected shall be disconnected.

If the disconnection of a defective installation will result in subsequent hazards, eg. station lighting, then the defect must be rectified immediately.

10. Audit Inspections

ARTC shall have an audit inspection programme for the management of compliance with legislation, standards and service rules, of installations, installing contractors and inspectors and as a check on the operation of the installation safety management system. The audit frequency shall be at a level which contributes to maintaining or exceeding existing minimum safety outcomes.

11. Corrective Action

In the event of a failure of the system in the areas of installation safety, contractor performance or inspector performance, ARTC shall take corrective action. This corrective action will be determined in conjunction with the service provider and may include a range of disciplinary actions. This action may be through:

- Referral to the Department of Fair Trading.
- Referral to the Commercial Tribunal.
- Imposing additional inspection fees and penalties.

Note

It is imperative that inspectors maintain appropriate records in accordance with clause 7.8 so that corrective action will be defensible and consistently applied.

12. Qualifications of Inspectors

The qualifications of persons in employment as inspectors prior to specification of competencies and training are recognized. From the time competency standards and training courses have been produced, twelve months unemployment as an inspector is the limit before assessment of competence against the standard is required for future employment.

Installation inspections are only to be carried out by Authorised Persons, who meet the following minimum requirements.

a) For LV installations

- (i) The person must hold a qualified supervisor certificate (electrician) or a qualified contractor licence (electrical) issued by the NSW Department of Fair Trading) or approved equivalent which entitles them to work without supervision, and
- (ii) Have demonstrated the necessary knowledge of ARTC requirements and testing requirements, and
- (iii) Have a minimum of 5 years experience working as a qualified electrician.

b) For Consumers' Aerial Lines

- (i) The person must be qualified to have met the requirements of the Electricity (Workers' Safety) Regulation 1992 (now repealed) to inspect and test overhead lines, and
- (ii) Have the necessary knowledge and experience, in particular of ARTC requirements to undertake the inspection of the particular type of work to be inspected.

c) For HV installations

- (i) The person must hold the equivalent to an RSA ST2 qualification, and
- (ii) Have the necessary knowledge and extensive experience in particular of ARTC requirements, to undertake the inspection of the particular type of work to be inspected.

13. Requirements for Inspection Contractors

In addition Inspection Contractors shall:

- Use staff authorised in accordance with Section 12 to carry out the "inspection" and shall have appropriate Supervisory & Engineering back-up support, and
- Have a written procedure which details Standard forms and notices etc to use, in particular:
 - Standard Defect report form
 - "Notification of Electrical Installation Defects" standard covering letter (to give to customers with the Defect form)
 - "Final Notice : Outstanding Electrical Installation Defect" standard letter
 - "Warning - Equipment/Wiring Disconnected" standard warning tag
 - "Danger - Defective Equipment Do Not Use" standard danger tag
 - and procedures for dealing with unsatisfactory work by electrical contractors including corrective action in accordance with clause 11 for serious safety incidents.

Appendix A

GUIDELINES FOR COMPLETING DEFECT REPORT FORMS

(EXTRACT FROM “RECOMMENDED STANDARD INSPECTION PROCEDURES FOR EXISTING ELECTRICAL INSTALLATIONS” - ISSUED BY ENERGY AUTHORITY OF NSW, JUNE 1981)

“9.0 REPORTS TO CONSUMERS

9.1 Reports of defects or unsatisfactory conditions found in installations should be set out in such a manner that they will be clearly understood by the consumer or his contractor and so as to assist the contractor as much as possible in locating and identifying the faulty portion and in determining what action he must take to remedy the fault.

9.2 Each item of the report should consist of a clear statement describing the defective condition. **Attempts to set out the method of rectifying the fault should be avoided.** For example, if it is found that trees and vines have grown up and fouled aerial conductors, the report should read somewhat as follows:

“The aerial conductors to the garage were fouled by trees and vines”.

and NOT

“Trees and vines, fouling aerial conductors to the garage, to be cut back”.

(The consumer may prefer to rectify the defect by raising or re-routing the aerial conductor instead of by cutting his trees.)

9.3 It is, of course, important to identify the particular portion of the installation to which the report refers in order that the contractor will not be in doubt as to the portion requiring attention.

9.4 In setting out the results of their inspection, Inspectors should appreciate the importance of always using correct terms, and should remember that the use of “trade jargon” frequently leads to serious misunderstandings. Experience has shown that if the correct terms are consistently used by the inspection officers, they will always be understood by Electrical Contractors and will be rapidly adopted by them.

9.5 The words “not satisfactory” or “unsatisfactory” should not be used to avoid specifying defects. Such an expression, however, may be used to describe a condition provided it is qualified by stating the reason or reasons why it is not satisfactory. It may also be used in the case where the whole of an installation is found to be in such bad condition that there would be little point in specifying particular defects. Such a report would read:

“The whole of the installation was in such an unsatisfactory condition that it requires a complete overhaul”.

10. SAMPLE DEFECT STATEMENTS

10.1 The following sample statements indicate the proper method of reporting defects that will commonly be found by Inspectors. These sample statements need not, of course, be followed exactly if an alternative statement is either more concise or more definite and

conforms to the principles set out in these guidelines.

10.1.1 The rigid pendant in the kitchen was insecure.

10.1.2 The ceiling switch in the bathroom was insecure, thus placing strain on the conductors.

10.1.3 The conduits on the back verandah were not securely fixed in position where they passed along the back wall.

10.1.4 The conduits on the back verandah were not mechanically and electrically continuous as they had pulled apart at the fittings.

10.1.5 The flexible cord for the radiator was frayed and damaged.

10.1.6 The flexible cord, from the plug socket in the second bedroom to the standard lamp in the hall, was damaged where it passed through the doorway.

10.1.7 The insulation on the flexible pendant in the kitchen was perished, thus exposing live conductors (temporarily made safe by taping).

10.1.8 The use of lampholder and adaptor to join the flexible cord for the radio was not satisfactory.

10.1.9 The improvised hand-lamp consisting of a lampholder mounted on a wooden block and having an unguarded lamp was not satisfactory. (Situated in the garage.)

DISCONNECTED -LABELLED

10.1.10 The frame of the motor in the garage was not earthed.

10.1.11 The frame of the washing machine was earthed by means of a conductor not forming part of the flexible cord supplying the machine.

10.1.12 The earthing conductor above the bench in the garage was broken.

10.1.13 The earthing conductor adjacent to the laundry door was not securely fixed.

10.1.14 Some of the joints in the earthing conductor near the switchboard were not soldered or suitably clamped.

10.1.15 The metallic conduits in the garage were not earthed.

10.1.16 The connection of the earthing conductor to conduits at the main switchboard was not electrically effective.

10.1.17 The main earthing conductor on the southern side of the house was not connected to the water service (no earth clip fitted.)

10.1.18 The resistance between earth and metallic conduits at the switchboard was high (measured 200 ohms).

10.1.19 The metallic conduits in the following locations were not earthed:

(a) Kitchen,

- (b) Back verandah,
- (c) Main switchboard.

10.1.20 The metallic conduits in the garage were not earthed in a satisfactory manner. (Earthed to a separate electrode instead of to the main earth.)

10.1.21 The sheathing of an isolated length of lead covered cable in the garage was not earthed and was not protected against mechanical damage.

10.1.22 The switch for the plug socket in the dining room did not control the active conductor.

10.1.23 The main switch was broken and inoperative in the “ON” position and thereby the installation was not longer under the control of a main switch.

10.1.24 The metal cover of the switch in the bathroom was alive, (temporarily made safe by lining the switch cover with an insulating material.)

10.1.25 The plug socket in the dining room was not controlled by a switch.

10.1.26 The switch controlling the plug socket in the dining room was inoperative in the “ON” position.

10.1.27 The cover of the light switch in the bathroom was broken thus exposing live metal (temporarily made safe by taping).

10.1.28 The porcelain base of the power circuit fuse on the main switchboard was broken thus exposing live contacts (temporarily made safe by taping).

10.1.29 The heating element of the toaster was broken and likely to made contact with the frame., (toaster and the permanently attached flexible cord **DISCONNECTED - LABELLED**).

10.1.30 The electric jug was not provided with a lid and thus exposed live conductor. **DISCONNECTED - LABELLED**.

10.1.31 The aerial conductors to the garage were fouled by trees and vines.

10.1.32 The insulation resistance between earth and the neutral conductor of the power circuit was extremely low. (measured. __ ohms).

10.1.33 The insulation resistance between the frame and the elements of the radiator was very low. (measured . __ ohms).”

Appendix B

PROCEDURE FOR COMPLETING DEFECT REPORT FORMS

For guidelines to completing defect reports refer to appendix A which is an extract of section 9 & 10 of the Energy Authority of NSW publication -“Recommend Standard Inspection Procedure for Existing Electrical Installations” (June 1981).

Each defect should be separately listed together with what rule(s) or clause(s) that it contravenes (Use the standard abbreviations “SAA” for AS 3000, “NSW” for NSW Service and Installation Rules and “ARTC” for ARTC local Service and Installation Rules.

The Defect Report form and a standard covering letter should be filled out, on-site at the completion of the inspection and handed to the customer (with a copy of the Defect Report form for the customer to forward to their electrical contractor).