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Electric Vehicle Charging Safety Guidelines Part 2: Selection and Installation

1 Application

1.1 This Part 2 of the electric vehicle charging safety guidelines provides detailed guidance on achieving safety for the selection and installation of EVSE consistent with Part 1.

2 Introduction

2.1 The Electric Vehicle Charging Safety Guidelines provide guidance for the safe selection and installation of electric vehicle supply equipment (EVSE) for electric vehicles (EVs) consistent with New Zealand's electricity supply systems and infrastructure. They are intended to enable suppliers, installers and users to comply with fundamental safety requirements of the Electricity (Safety) Regulations 2010 and do not remove any obligation to comply with those regulations.

2.2 Part 2 of these Guidelines provides specific guidance for the ac power supply arrangements for electric vehicle charging systems, and is intended to be read in conjunction with the *Electric Vehicle Charging Safety Guidelines* Parts 1 and 3, and with the Electricity (Safety) Regulations 2010. Refer to Part 1 for interpretation, terms and definitions, references and bibliography.

2.3 The specific guidance contained in this Part of the Guidelines supplements, modifies or replaces the requirements of AS/NZS 3000:2007 (including Amendments 1 and 2).

2.4 The absence of a reference in these Guidelines to the exclusion of a particular part or a clause of AS/NZS 3000 means that part or clause of AS/NZS 3000 is (where relevant) applicable without modification.

2.5 The requirements of other IEC Standards detailed in these Guidelines, to the extent they are relevant for EVSE covered by these Guidelines, also apply. These Guidelines may therefore also supplement parts of, modify or replace the requirements of cited documents.

2.6 The clause references contained in these Guidelines to clauses of AS/NZS 3000 and to IEC Standards numbers are as indicated in the normative references in Part 1 of these Guidelines.

3 Scope

3.1 The specific guidance in these Guidelines applies to all EVSE. Part 2 gives specific additional guidance depending on whether an EVSE is located at one or more of the following locations:

(i) Domestic and similar premises;

(ii) Locations providing public charging;

(iii) EV charging in any other location.

3.2 Nothing in Part 2 of these Guidelines applies to the supply of electricity to electric vehicles while located in a repair facility (including the transporting of an EV to or from a repair facility) approved for the purpose by the manufacturer of the vehicle, or where the supply is used for experimental, testing, demonstration, teaching, or research purposes.

3.3 Part 2 of the Guidelines does not apply to inductive charging systems.

4 Interpretation – terms and definitions

4.1 The interpretation, terms and definitions stated in Part 1 of these Guidelines, apply to this Part.

4.2 See Part 1 of these Guidelines for references and bibliography.

5 Assessment of general safety

5.1 Purposes, supplies and structure

5.1.1 Maximum demand and diversity

In designing and constructing the facility it must be considered that, in normal use, each single connecting point will operate at its rated current.

For this application the demand factor of the final circuit supplying the connecting point (e.g. the socket-outlet) is equal to 1.

Since all the connecting points of the system can be used simultaneously, the diversity factor of the distribution circuit must be taken as equal to 1. However, this factor may be reduced where load control is available.

5.2 Conductor arrangement and system earthing

5.2.1 Systems of supply

EVSE may not be supplied from other than a TNC-S (MEN) supply.

5.3 Division of installation

A dedicated final sub-circuit must be provided for each EV charging station or socket-outlet intended for Mode 2 charging.

5.4 Protection for safety

5.4.1 Protection against electric shock

All RCDs for the protection of supplies for EVs must have a residual operating current of not greater than 30 mA and shall operate to interrupt all live conductors, including the neutral.

All RCDs used for the protection of supplies to EVs must be permanently marked to identify their function and the location of the charging station or socket outlet they protect.

All final sub circuits supplying EV charging stations must be individually protected by a Type B RCD.

EXCEPTION: Sub circuits supplying single phase ac EV charging stations may be protected by a voltage independent Type A RCD identified by the manufacturer of the RCD as suitable for EV charging, or a Type B RCD, in accordance with the RCD manufacturer's instructions.

5.4.1.1 All final sub circuits in domestic or similar premises intended for a mode 2 supply for an electric vehicle must be individually protected by a voltage independent Type A RCD identified by the manufacturer of the RCD as suitable for EV charging or Type B RCD, in accordance with the RCD manufacturer's instructions.

5.4.2 Protective measure: electrical separation

An isolating transformer must not be used as the sole means of protection against electric shock for the supply of EV charging.

5.4.3 Requirements for fault protection

An isolating transformer must not be used as the sole means of fault protection for the supply of EV charging.

5.4.4 Obstacles and placing out of reach

Protection from electric shock by placing out of reach or by the placement of obstacles must not be used.

5.4.5 Non-conducting location

Protection from electric shock solely by means of a non-conducting location must not be used.

5.4.6 Protection by earth-free local equipotential bonding

Protection from electric shock by the use of earth-free local equipotential bonding must not be used.

6 Selection and erection of electrical equipment

6.1 Charging Stations - Compliance with standards

6.1.1 All a.c. charging stations must:

(a) be Mode 3 in accordance with IEC 61851-1, and

(b) comply with IEC 61851-1 and IEC 61851-22; or

(c) be certified by UL in compliance with UL 2202 for operation when supplied at 230 V/400 V 50 Hertz ac

NOTE: Suitable additional standards may be added at a later date.

NOTE: Compliance with any cited Standard may be demonstrated through compliance with a national Standard having demonstrable equivalence with the cited Standard.

6.1.2 All d.c. charging stations must:

(a) be Mode 4 in accordance with 61851-1, and

(b) comply with IEC 61851-1 and IEC 61851-23; or

(c) be certified by UL in compliance with UL 2202 for operation when supplied at 230 V/400 V 50 Hertz ac

NOTE: Suitable additional standards may be added at a later date.

NOTE: Compliance with any cited Standard may be demonstrated through compliance with a national Standard having demonstrable equivalence with the cited Standard.

6.1.3 Nothing in these Guidelines prevents the use or installation of a single charging station that provides both a.c. and d.c. charging.

6.1.4 A charging station must not be connected to a supply of electricity using a plug and socket.

6.2 Operational conditions and external influences

6.2.1 Presence of water

Where the connection point is installed outdoors, or in a damp location, the equipment must have a degree of protection of at least IPX4 in accordance with AS 60529.

6.2.2 Presence of solid foreign bodies

Where the connecting point is installed outdoors or in an environment where dust may be present, the equipment must have or be provided with a degree of protection of at least IP4X in accordance with AS 60529.

6.2.3 Impact

Equipment installed for public charging, including in car parking sites, must be protected against reasonably foreseeable mechanical damage (impact of medium severity).

Protection of the equipment must be afforded by one or more of the following:

(a) position or location in order to avoid damage by any reasonably foreseeable impact in accordance with IEC TS 61439-7;

(b) provision of local or general mechanical protection; or

(c) use of EVSE that complies with a minimum degree of protection against external mechanical impact of IK07 (in accordance with the requirements of IEC 62262).

6.3 Selection and erection of electrical equipment – Isolation, switching and control

6.3.1 General and common requirements

The requirements of Part 2 - 6.3 of these Guidelines must be achieved either by the selection and erection of the appropriate equipment in the facility of supply of electricity to the EVSE or by the selection of an EV charging station which incorporates the appropriate equipment or a combination of both.

6.3.2 Method of isolation

All final sub circuits supplying an EV charging station must include a lockable isolator that operates in all live conductors including the neutral, for the purposes of isolating the supply in the event of damage to the charging station or its immediate supporting infrastructure.

6.4 Devices for protection against indirect contact by automatic disconnection of supply

6.4.1 Residual current protective devices (RCD)

RCDs must comply with one of the following standards: AS/NZS 61008-1, AS/NZS 61009-1, IEC 60947-2 or IEC 62423.

All RCDs for the protection of supplies for EVs must have a residual operating current of not greater than 30 mA and shall operate to interrupt all live conductors, including the neutral.

All final sub circuits supplying charging stations must be individually protected by a Type B RCD.

EXCEPTION: Sub-circuits supplying single phase a.c. charging stations may be protected by a voltage independent Type A RCD identified by the manufacturer of the RCD as suitable for EV charging.

All final sub-circuits in domestic or similar premises intended for a Mode 2 supply for an electric vehicle must be individually protected by a voltage independent Type A RCD identified by the manufacturer of the RCD as suitable for EV charging or a Type B RCD in accordance with charging station manufacturer's instructions.

NOTE: Where located at the origin of the final sub circuit, this RCD is deemed to provide the requirements for RCD protection contained in AS/NZS 3000 section 2.6.

All RCDs used for the protection of supplies to EVs must be permanently marked to identify their function and the location of the charging station or socket outlet they protect.

RCDs must disconnect all live conductors, including the neutral.

The RCD must be part of the switchboard.

The RCD may be combined with the overcurrent protection as detailed in Part 2 – 6.5 of these Guidelines (RCBO).

6.5 Devices for protection against overcurrent

Each EV charging station or Mode 2 socket-outlet must be supplied individually by a dedicated final sub-circuit protected by an overcurrent protective device complying with IEC 60947-2, IEC 60947-6-2 or AS/NZS 61009-1, or with the relevant parts of the AS/NZS 60898 series, or the IEC 60269 series.

The overcurrent protective device must be part of a switchboard.

6.6 Co-ordination of various protective devices

Discrimination (selectivity) between residual current protective devices

Where required for service reasons, discrimination (selectivity) must be maintained between the RCD protecting a connecting point and an RCD installed upstream.

6.7 Protective conductors

Control signals on the protective earth conductor (PE) must not flow into the fixed electrical wiring of the facility that supplies electricity to the EVSE.

Control signals and any related devices, must not impair the correct functioning of the protective devices installed to provide the automatic disconnection of supply (e.g. RCD).

NOTE: This requirement may be achieved by using a galvanic separation of the control electronics.

7 Other equipment

7.1 Socket-outlets and vehicle connectors

7.1.1 Mode 1 charging

In New Zealand, it is not permitted to install a socket-outlet to provide Mode 1 charging for an electric vehicle.

In New Zealand it is only permitted to use Mode 1 charging for an electric vehicle in a domestic or similar installation.

In New Zealand it is not permitted to install, use or allow the use of Mode 1 charging in locations that are not domestic or similar.

7.1.2 Mode 2 charging

The maximum current for Mode 2 charging is 32 A.

In New Zealand it is not permitted to use or allow the use of a Mode 2 supply for charging for an electric vehicle in public charging.

In New Zealand it is not permitted to install a socket-outlet to provide Mode 2 charging for an electric vehicle in public charging.

In New Zealand it is permitted in accordance with these guidelines, to install Mode 2 EVSE in locations that are not public charging.

Socket-outlets installed for Mode 2 charging in domestic or similar installations must be as follows:

(a) with a rated current not exceeding 20 A – complying with AS/NZS 3112; or

(b) with a rated current not exceeding 16 A – complying with IEC 60309; or

(c) with a rated current not exceeding 20 A per phase – complying with AS/NZS 3123.

Each socket-outlet must have an earthing contact connected to the protective earth conductor (PE)(also referred to as the earth continuity conductor).

7.1.3 Mode 3 charging

It is permitted to install Mode 3 electric vehicle charging equipment in

accordance with these guidelines.

7.1.4 Mode 4 charging

It is permitted to install Mode 4 electric vehicle charging equipment in accordance with these Guidelines.

7.2 Location of outlets

The minimum mounting height of a socket-outlet of a Mode 3 or Mode 4 charging station must be at least 800 mm above the finished ground level.

Every socket-outlet must be located as close as practicable to the EV parking place to be supplied.

Portable socket-outlets (EPOD or PSOA) are not permitted to be used for EV charging.

7.3 limitation to single vehicle

Each socket-outlet must supply only one EV at a time.

7.4 Use of adaptors

The supply lead for the connection of the EV must be in one piece and adaptors or adaptor cords must not be used.

EXEMPTION: An adaptor may be used with an EVSE if specifically designed and approved by the EVSE manufacturer.

8 Testing following installation

8.1 In addition to the testing required to comply with AS/NZS 3000 the following testing must be carried out for every charging station:

(a) Testing of all RCDs using a purpose built RCD tester to verify the performance of the RCD in accordance with the requirements for the type of RCD under test.

(b) Testing of the charging station safety functions, including earth continuity monitoring using purpose built test equipment.

(c) Any testing as specified in the manufacturer's instructions for the RCD and the EV charging station.

8.2 The results of this testing must be recorded with the relevant certification.

8.3 In addition to the testing required to comply with AS/NZS 3000 the following testing must be carried out for every socket-outlet for Mode 2 charging installed:

(a) Testing of all RCDs using a purpose built RCD tester to verify the performance of the RCD in accordance with the requirements for the type of RCD under test.

(b) Any testing as specified in the manufacturer's instructions for the RCD.

8.4 The results of this testing must be recorded with the relevant certification.

9 Periodic Assessment

9.1 Every electric vehicle charging station operator must ensure that the EVSE that they operate, are periodically assessed at a period not exceeding 12 months.

9.2 Periodic assessments must be undertaken by a person who is authorised (licensed) and competent to assess (inspect) prescribed electrical work at EV charging stations. Periodic assessments must not be carried out under supervision.

9.2.1 The assessment must include the following:

(a) Inspection of the EV supply leads;

(b) Testing of all RCDs using a purpose built RCD tester to verify the performance of the RCD in accordance with the requirements for the type of RCD under test;

(c) Verification of the correct Type and rating of all RCDs;

(d) Verification of the correct rating of all overcurrent protection devices;

(e) Testing of the EV charging station safety functions, including earth continuity monitoring using purpose built test equipment;

(f) Inspection of the condition of the EV charging station.

9.2.2 Failure of any of these items requires the EV charging station to be immediately removed from service by the electric vehicle charging station operator.

9.3 An EV charging station or EVSE must immediately be taken out of service by the electric vehicle charging station operator if the periodic assessment has not been carried out within 12 months from the date of first installation station or within 12 months from the date of the last inspection for that EV charging station.

9.4 Following an inspection where the EV charging station passes the tests indicated in 9.2.1, in addition to the requirements in Part 1 of these Guidelines, the person who carried out the inspection must affix a durable, non-reusable tag to the assessed EV charging station, in a position that will be seen by users of the EV charging station.

9.5 The tag must display the following:

(a) date of assessment; and
(b) date when next assessment due; and
(c) EWRB license number of the person that carried out the inspection; and
(d) a statement that the person who conducted the assessment is satisfied that the periodic testing has been satisfactorily completed and the charging station is safe to use; and
(e) phone number and email of the electric vehicle charging station operator; and
(f) the type of RCD that protects the EV charging station; and
(g) identify the serial number of the charging station; and
(h) if the assessment was carried out in accordance with a standard or a certified design:
    (i) state whether the assessment was carried out in accordance with a standard (and identify that standard); and
    (ii) state whether the assessment was carried out in accordance with a certified design (and identify that certified design).

9.6 An EV charging station must not be used without the tag referred to in Part 2 – 9.4 of these guidelines.

9.7 An EV charging station or EVSE must immediately be taken out of service by the electric vehicle charging station operator if the tag referred to in Part 2 – 9.4 of these guidelines is not 'in test', readable or affixed to the charging station.

9.8 Nothing prevents the first tag as detailed in Part 2 – 9 of these Guidelines from being issued by the installer of the EV charging station following the issuing of the Electrical Safety Certificate for the charging station.