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Issued by: Mark Wogan, Manager Energy Safety  
WorkSafe New Zealand

## Electric Vehicle Charging Safety Guidelines Part 2: Selection and Installation

### 1 Application

1.1 This Part 2 of the Electric Vehicle Charging Safety Guidelines applies to electric vehicle charging stations installed on or after 5 November 2016.

### 2 Introduction

2.1 The Electric Vehicle Charging Safety Guidelines provide guidance for the safe selection and installation of charging stations 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 a.c. 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 charging systems covered by these Guidelines, also apply. These Guidelines may therefore also supplement, parts of, modify or replace the requirements of those 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 EV charging stations. However different guidance may apply depending in whether an EV charging station is located at one or more of the following locations:

- (i) Domestic and similar premises;

- (ii) Locations providing a public EV charging facility;
  - (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 approved for the purpose by the manufacturer of the vehicle, or where the supply is used for experimental, testing, demonstration, teaching, or research purposes. Part 2 of the Guidelines does not apply to the use of 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.

NOTE: 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

An EV charging station may not be supplied from other than a TNC-S 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 from the MEN switch board of the supply installation.

##### 5.4 Protection for safety

###### 5.4.1 Protection against electric shock

5.4.1.1 All RCDs for the protection of supplies for electric vehicles must have a residual operating current of not greater than 30 mA.

5.4.1.2 All RCDs used for the protection of supplies to electric vehicles 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 charging stations must be individually protected by a Type B RCD.

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

5.4.1.3 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 Type A RCD identified by the manufacturer of the RCD as suitable for EV charging or Type B RCD.

5.4.2 Protective measure: electrical separation

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

5.4.3 Requirements for fault protection

An isolating transformer may not be used as the sole means of fault protection for the supply of electric vehicle 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 may not be used.

5.4.5 Non-conducting location

Protection from electric shock solely by means of a non-conducting location may 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 may 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 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 a.c.

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.

NOTE: Suitable additional standards, for example UL standards, may be added at a later date.

Note: Compliance with any cited Standard may be demonstrated through compliance with a Standard having 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 may 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, 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 EV 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 EV charging equipment 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 clause 6.3 must be achieved either by the selection and erection of the appropriate equipment in the fixed installation 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 electric vehicle charging station must include a lockable isolator that operates in all live conductors 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

6.4.1.1 Compliance with standards

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

6.4.1.2 All RCDs for the protection of supplies for electric vehicles must have a residual operating current of not greater than 30 mA.

6.4.1.3 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 Type Asi RCD in accordance with charging station manufacturer's instructions.

6.4.1.4 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 Type A RCD identified by the manufacturer of the RCD as suitable for EV charging or Type B RCD. 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.

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

6.4.1.6 RCDs must disconnect all live conductors.

6.5 Devices for protection against overcurrent

Each connecting point 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 AS 60269 series.

The overcurrent protective device must be part of the switchboard.

6.6 Co-ordination of various protective devices

6.6.1 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

6.7.1 Control signals on the protective earth conductor (PE) must not flow into the fixed electrical installation.

6.7.2 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

- 7.1.1.1 It is not permitted to install or use a socket outlet to provide Mode 1 charging for an electric vehicle.
- 7.1.2 Mode 2 charging
- 7.1.2.1 It is not permitted to install or use a socket outlet to provide Mode 2 charging for an electric vehicle in for public charging. The maximum current for Mode 2 charging is 32 A.
- 7.1.2.2 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; complying with AS/NZS 3123.
- 7.1.2.3 Each socket-outlet must have an earthing contact connected to the protective earth conductor (PE).
- 7.1.3 Mode 3 charging
- 7.1.3.1 It is permitted to install Mode 3 electric vehicle charging equipment in accordance with these guidelines.
- 7.1.4 Mode 4 charging
- 7.1.4.1 It is permitted to install Mode 4 electric vehicle charging equipment in accordance with these Guidelines.
- 7.2 Location of outlets
- 7.2.1 The minimum mounting height of socket outlets for mode 3 and 4 charging must be at least 1.2 m above the finished ground level.
- 7.2.2 Every socket-outlet or vehicle connector must be located as close as practicable to the EV parking place to be supplied.
- 7.2.3 Portable socket-outlets are not permitted.
- 7.3 limitation to single vehicle
- 7.3.1 Each socket-outlet or vehicle connector must supply only one electric vehicle.
- 7.4 Use of adaptors
- 7.4.1 The supply lead for the connection of the EV must be in one piece and adaptors or adaptor cords must not be used unless the plug adaptor complies with IEC 61851-1:2010 clause 6.3.3.
- 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 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) 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.

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

## **9 Periodic Assessment**

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

9.2 Periodic assessments must be undertaken by a competent person who is authorized (licensed) to inspect prescribed electrical work at EV charging stations.

9.2.1 The assessment must include the following:

- (a) Inspection of the EV supply lead(s);
- (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 charging station safety functions, including earth continuity monitoring using purpose built test equipment;
- (f) Inspection of the condition of the charging station.

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