86 Customhouse Quay
PO Box 165, Wellington 6140
New Zealand

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

Electric Vehicle Charging Safety Guidelines

Part 1: Safety Fundamentals

1 Application

1.1 These Guidelines apply to electric vehicle supply equipment.

1.2 Nothing in these Guidelines prevents the use of a socket-outlet for the supply of an Electric Vehicle where that socket-outlet has been installed for another purpose, e.g. a connectable installation, provided that the socket-outlet is protected by an RCD.

1.3 These Guidelines do not apply to supplies for electric vehicles where the supply to the vehicle is at extra low voltage.

1.4 It is intended that these Guidelines will be reviewed on or before 12 months from the date of publication.

1.5 These Guidelines do not recognise persons entitled to carry out work under an Employer Licence.

2 Introduction

2.1 These Electric Vehicle Charging Safety Guidelines provide guidance for the safe design, specification, supply, installation and operation of electric vehicle supply equipment (EVSE) for electric vehicles (EV) 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 these regulations.

2.2 These Guidelines are intended to be read in conjunction with the Electric Vehicle Charging Safety Guidelines Parts 2 and 3, and with the Electricity (Safety) Regulations 2010 (ERs).

2.3 Workplace health and safety legislation places additional duties on workers and persons conducting a business or undertaking (PCBU). Persons having duties under the Health and Safety at Work Act 2015 may find these Guidelines relevant and useful. However, these Guidelines are not a legal substitute for compliance with workplace health and safety legislation.

3 Interpretation – terms and definitions

3.1 In these Guidelines (including Parts 1, 2 and 3), unless the context

otherwise requires:

3.1.1 **A.C. Electric vehicle charging station** means all equipment for delivering a.c. to EVs, installed in an enclosure(s) and with special control and safety functions and communication.

3.1.2 **D.C. Electric vehicle charging station** means all equipment for delivering d.c. to EVs, installed in an enclosure(s), with special control and safety functions and communication and located off the vehicle.

NOTE: d.c. charging includes pulse mode charging.

3.1.3 **Connecting point** means the point where one electric vehicle is connected to the fixed facility of electricity supply, or is a part of dedicated EVSE.

NOTE 1: The connecting point may be a socket-outlet or a vehicle connector.

NOTE 2: The connecting point may be part of the fixed electric vehicle supply equipment in accordance with the IEC 61851 series.

3.1.4 **Domestic or similar installation** means the electrical installation of premises that are occupied, or intended to be occupied, by a person as a residence for any person on a temporary or permanent basis.

3.1.5 **Electric vehicle (EV)**, also known as **electric road vehicle**, means any vehicle propelled, partly or wholly, by an electric motor drawing current from a rechargeable storage battery, or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle such as a residential or public electricity service), which is manufactured primarily for use on public streets, roads or highways.

3.1.6 **Electric vehicle charging station** means an A.C. electric vehicle charging station or a D.C. electric vehicle charging station.

3.1.7 **Electric vehicle charging station operator** means a person who owns, operates or manages electrical fittings and or EVSE that provide public charging.

3.1.8 **Electric vehicle supply equipment (EVSE)** means conductors including the phase, neutral and protective earth conductors, the EV couplers, attachment plugs and all other accessories devices, power outlets, safety function equipment, or apparatus installed specifically for the purpose of delivering energy from the facility wiring to the EV and allowing communication between them if required. It includes a charging station, IC-CPD, supply lead and a socket-outlet that is specifically intended to supply electricity to an EV.

3.1.9 **In Cable Control and Protection Device (IC-CPD)** means assembly of linked parts or components including cables, plug and vehicle connector for supplying electric vehicles in charging mode 2, which performs control functions and safety functions.

3.1.10 **Location** has the meaning given to it in Regulation 74I of the Electricity (Safety) Regulations 2010.

3.1.11 **Manufacturer** means a person or company that makes goods.

3.1.12 **Manufacturer's agent** means an agent nominated by the manufacturer in question.

3.1.13 **Public Charging** means EVSE that is:

(a) publicly available; and
(b) intended for use by the public; and
(c) intended for charging an Electric Vehicle

3.1.14 **Mode 1 charging** means connection of the EV to the a.c. supply wiring utilising standardised socket-outlets not exceeding 8 A and not exceeding 250 V a.c. single-phase at the supply side, and utilising the power and protective earth conductors.

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 installations.

3.1.15 **Mode 2 charging** means connection of the EV to a.c. supply wiring utilising standardised single-phase or three-phase socket-outlets not exceeding 32 A and not exceeding 250 V a.c. single-phase and utilising the live and protective earth conductors, together with a control pilot function and system of personnel protection against electric shock (RCD) between the EV and the plug, or as a part of the in-cable control box.

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 intended for public charging.

3.1.16 **Mode 3 charging** means connection of the EV to a.c. supply wiring

utilising dedicated EVSE permanently connected to the a.c. supply wiring, where the control pilot function extends to control equipment in the EVSE.

NOTE: In New Zealand it is permitted, in accordance with these Guidelines, to install Mode 3 EVSE.

3.1.17 **Mode 4 charging** means connection of the EV to the a.c. supply wiring utilising an off-board charger permanently connected to the a.c. supply wiring, where the control pilot functions extends to equipment.

NOTE 1: This mode supplies the EV with a DC supply.

NOTE 2: In New Zealand it is permitted, in accordance with these Guidelines, to install Mode 4 EVSE.

3.1.18 **Supply lead** also known as **cable assembly**, means a piece of equipment used to establish the connection between the EV and either a socket-outlet or a charging station.

NOTE 1: It may be either fixed, be included in the vehicle or the charging station or other EVSE, or be detachable.

NOTE 2: It includes the flexible cable and the connector and/or plug that are required for proper connection.

NOTE 3: A detachable cable assembly is not considered as a part of the fixed charging facility.

3.1.19 **Socket-outlet** means an electrical device that –

(a) is for fixing at a point where fixed wiring terminates; and
(b) provides a detachable connection with the pins of a plug; and
(c) has two or more contacts; and also includes
(d) a cord extension socket attached to a flexible cord that is permanently connected to installation wiring; but
(e) does not include a supply lead

3.2 A term used in connection with the Electricity Act 1992 or the Electricity (Safety) Regulations 2010 has the meaning used in that legislation.

3.3 A term used in connection with a particular standard has the meaning used in that standard.

3.4 A term used in Part 1 of these Guidelines, and not defined in the Electricity Act 1992 or Electricity (Safety) Regulations 2010, has the meaning (if any) given:

(a) in this Part of the Guidelines or, if not defined in the Guidelines,
(b) in the following:
  (i) In the case of installations, AS/NZS 3000
  (ii) In the case of electric vehicle supply equipment, IEC 61851-1

(iii) In all other cases, IEC 60050.

3.5 Any other term used in these Guidelines has the meaning (if any) given:

(a) in the Guidelines, or

(i) In the case of installations, AS/NZS 3000
(ii) In the case of electric vehicle supply equipment, IEC 61851-1
(iii) In all other cases, IEC 60050.

3.6 These Guidelines use the terms 'must', 'must not', 'shall', 'it is not permitted' and 'no person may' to refer to practices that it is essential to follow, or to avoid as the case may be, in order to conform to the Guidelines.

3.7 Clauses prefixed by 'NOTE:' provide additional guidance or clarification. They do not form part of the controls and should not be relied on for the purposes of determining what is required for conformance to these Guidelines.

4 General requirements for electric vehicle charging stations

4.1 All EV charging stations must be designed, installed, tested, certified, inspected and connected in accordance with Part 5 of the Electricity (Safety) Regulations 2010.

4.2 All EV charging stations must, in addition to the Electricity (Safety) Regulations 2010, be designed, installed, tested, certified, inspected and connected in accordance with the following requirements:

(a) All EV charging stations must:

(i) be supplied from a dedicated final sub-circuit; and
(ii) be supplied from a sub-circuit protected by a voltage independent RCD providing personal protection that is compatible with a charging supply for an electric vehicle; and
(iii) provide an earth continuity monitoring system that disconnects the supply in the event that the earthing connection to the vehicle becomes ineffective. This monitoring system must fail to safety; and
(iv) provide protection against the overload of the charging supply fittings; and
(v) provide protection against the overload of the incoming supply fittings; and
(vi) be supplied from a TNC-S (MEN) system of supply; and
(vii) be installed so that any socket-outlet of a Mode 3 or Mode 4 supply is at least 800 mm above the finished ground level.

NOTE: The alternative use of a TT configured supply system will be considered for the next edition of these Guidelines.

(b) No EV charging station may provide an a.c. charging supply that:

(i) is not at standard low voltage; and

(ii) is not at a nominal frequency of 50 Hertz.

4.3 In addition to the requirements of section 4.2, all functions of an EV charging station must fail to safety.

4.4 Any person offering for sale or supplying an EV charging station must have, and must make available to a purchaser, potential purchaser, installer or WorkSafe on request:

(a) a Supplier Declaration of Conformity; and

(b) either:
(i) in respect of an EV charging station complying with IEC standards, the relevant test certificates; or
(ii) in the case of an EV charging station complying with UL standards, the relevant UL certification verification.

5 Verification

5.1 Any person installing an EV charging station must:

(a) Verify and keep records that the EV charging station has been designed, constructed and labelled to be compatible with a supply of standard low voltage at a nominal frequency of 50 Hertz; and

(b) Verify and keep records that a supplier declaration has been made for any EV charging station gazetted as a medium-risk declared article; and

(c) Sight and keep records of the relevant test certificate for that medium-risk declared article – in respect of charging stations complying with IEC standards; or

(d) Verify and keep records of the relevant UL certification for that medium-risk declared article – in the case of EV charging stations complying with UL standards; and

(e) Verify and keep records that the EV charging station installation has been carried out in accordance with AS/NZS 3000, these Guidelines, and the manufacturer's installation instructions.

NOTE: the test certificate referred to in Part 1 - 5.1 (b)(i) of these Guidelines is the test certificate or other document confirming the declaration of compliance with the relevant standard in accordance with Regulation 83(4)(b) of the Electricity (Safety) Regulations 2010.

(f) Records mentioned in Part 1 – 5 of these Guidelines must form part of an attachment to the Certificate of Compliance issued on installation of the EV charging station and be kept by the responsible person as detailed in Regulation 74E of the Electricity (Safety) Regulations 2010 for the time required of a Certificate of Compliance by Regulation 74E of the Electricity (Safety) Regulations 2010.

6 Competence

6.1 No person may design or build an EV charging station or EVSE unless they are competent to do so.

6.2 No person may design a facility of electricity supply involving an EV charging station or EVSE unless they are competent and licensed to do so.

6.3 No person may install, test, certify, inspect or connect an EV charging station or EVSE unless they are competent and licensed to do so.

NOTE: the installation of an EV charging station itself is not defined as high risk PEW by the Electricity (Safety) Regulations 2010.

6.4 No person may carry out a periodic assessment of an EV charging station or EVSE unless they are competent to do so.

7 Periodic assessment of electric vehicle charging stations

7.1 Every EV charging station owned, operated or managed by an electric vehicle charging station operator, must be subject to periodic assessment commencing on or before the first anniversary of connection of that charging station to a supply of electricity.

7.2 Subsequent periodic assessments must take place at intervals of no more than 12 months.

7.3 An electric vehicle 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, or within 12 months from the date of the last inspection for that EV charging station.

7.4 A electric vehicle charging station operator must:

(a) establish and implement a safety assessment programme for regularly assessing the electrical safety of EVSE, conductors and fittings; and

(b) keep records of:

(i) the results of every periodic assessment; and
(ii) details of any issues found during the assessment; and
(iii) any actions required to be taken in relation to those issues; and

(c) retain a copy of these records, whether in hard copy or electronically, for at least seven years; and

(d) on request by any of the following, provide a copy of the records to the requester within 10 working days after the request:

(i) WorkSafe;
(ii) the Electrical Workers Registration Board;
(iii) the Registrar of the Electrical Workers Registration Board;

(iv) the territorial authority of the place where the EVSE is located;
(v) the person who contracted for the work;
(vi) the owner or occupier of the place or thing in which the EVSE is located.

7.5 Any person that carries out a safety assessment of an electric vehicle charging station must:

(a) keep records of:
(i) the results of every periodic assessment; and
(ii) details of any issues found during the assessment; and
(iii) any actions required to be taken in relation to those issues; and

(b) record that assessment on the Electricity and Gas high risk database; and

(c) provide a copy of these records, within 20 working days after it is issued, to the electric vehicle charging station operator; and

(d) retain a copy of the records, whether in hard copy or electronically, for at least seven years; and

(e) on request by any of the following, provide a copy of the records to the requester within 10 working days after the request:
(i) WorkSafe;
(ii) the Electrical Workers Registration Board;
(iii) the Registrar of the Electrical Workers Registration Board;
(iv) the territorial authority of the place where the EVSE is located;
(v) the person who contracted for the work;
(vi) the owner or occupier of the place or thing in which the EVSE is located.

8 General requirements for In-Cord Control and Protection Device

8.1 All In-Cord Control and Protection Devices must:

(a) incorporate an RCD function to provide protection against electric shock; and

(b) provide an earth continuity monitoring system that disconnects the supply in the event that the earthing connection becomes ineffective, this monitoring system must fail to safety; and

(c) provide protection against the overload of the charging supply fittings; and

(d) provide protection against the overload of the incoming supply fittings; and

(e) be designed to operate at standard low voltage and be supplied from a nominal 50 Hertz supply.

8.2 In addition to the requirements of section 8.1, all functions of an IC-CPD must fail to safety.

8.3 Any person offering for sale or supplying an IC-CPD and must have, and must make available to a purchaser, potential purchaser or WorkSafe on request:

(a) a Supplier Declaration of Conformity; and

(b) either
  (i) in respect of IC-CPD complying with IEC standards, the relevant test certificates; or
  (ii) in the case of IC-CPD complying with UL standards, the relevant UL certification verification.

9 Unsafe practices

9.1 The following are considered unsafe for the purposes of Part 2 of the Electricity (Safety) Regulations 2010, and no person may charge an electric vehicle by any, or any combination, of the following means:

(a) use of any plug adaptor that is not designed and approved by the EVSE manufacturer; or

(b) cascading of two or more supply leads; or

(c) use of an extension lead; or

(d) use of portable socket-outlets (EPOD or PSOA); or

(e) use of a socket-outlet for the supply of more than one vehicle at a time.

9.2 No person may supply electricity for EV charging of an electric vehicle other than through a charging station.

EXCEPTION 1 TO 9.2: This does not preclude the supply of electricity to electric vehicles located or under the supervision of a repair facility approved or accredited by the manufacturer of the vehicle.

EXCEPTION 2 TO 9.2: This does not preclude the supply of electricity using Mode 2 charging (use of an IC-CPD) from other than a public supply.

EXCEPTION 3 to 9.2: This does not preclude the supply of electricity using Mode 1 charging from a domestic or similar installation.

10 References
(Normative)

10.1 These Guidelines refer to the following documents, in whole or in part. To the extent these Guidelines refer to them, they form part of these Guidelines and are indispensable for their application. For dated references, the edition cited applies.

10.2 Australian (AS) Standards

AS 60529:2014 Degrees of protection provided by enclosures (IP code)

10.3 Joint Australian – New Zealand (AS/NZS) Standards

AS/NZS 3000:2007 Electrical installations (known as the Australian/New Zealand Wiring Rules): including Amendments 1 and 2

AS/NZS 3112:2011 Approval and test specification—Plugs and socket-outlets: including Amendment 1

AS/NZS 3123:2005 Approval and test specification - Plugs, socket-outlets and couplers for general industrial application

AS/NZS 60898.1:2004 Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Circuit-breakers for a.c. operation

AS/NZS 60898.2:2004 Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Circuit-breakers for a.c. and d.c. operation

AS/NZS 60968:2001 Self ballasted lamps for general lighting services - Safety requirements

AS/NZS 61008-1:2011 Residual current operated circuit breakers without integral overcurrent protection for household and similar uses (RCCBs) - Part 1: General rules

AS/NZS 61009-1:2011, Residual current operated circuit-breakers with integral overvoltage protection for household and similar uses (RCBOs) – Part 1: General rules

10.4 International Electrotechnical Commission (IEC) Standards

IEC 60269-1 Ed 4.1 Low-voltage fuses – Part 1: General requirements

IEC 60309-1 Ed 4.2 Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements

IEC 60309-2 Ed 4.2 Plugs, socket-outlets and couplers for industrial purposes – Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories

IEC 60898-1 Ed. 1.2 Electrical accessories - Circuit-breakers for overcurrent protection for household and similar installations - Part 1: Circuit-breakers for a.c. operation

IEC 60898-2 Ed 1.1 Circuit-breakers for overcurrent protection for household and similar installations - Part 2: Circuit-breakers for a.c. and d.c. operation

IEC 60947-2:2016 Low-voltage switchgear and control gear - Part 2: Circuit-breakers

IEC 60947-6-2:2002 (incorporating amendment 1) Low-voltage switchgear and control gear - Part 6-2: Multiple function equipment - Control and protective switching devices (or equipment) (CPS)

IEC 61140:2001 Protection against electric shock – Common aspects for installation and equipment

IEC TS 61439-7:2014 Low-voltage switchgear and control gear assemblies - Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations

IEC 61557-8:2014 Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems

IEC 61557-9:2014 Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 9: Equipment insulation fault location in IT systems

IEC 61558-2-4 Ed 2.0 Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers

IEC 61851-1:2010 Electric vehicle conductive charging system – Part 1: General Requirements

IEC 61851-22:2001 Electric vehicle conductive charging system - Part 22: AC electric vehicle charging station

IEC 61851-23:2014 Electric vehicle conductive charging system - Part 23: DC electric vehicle charging station

IEC 62196-1:2014, Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements

IEC 62196-2:2016, Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility and interchangeability requirements for AC pin and contact-tube accessories

IEC 62262:2002 Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code) IEC 62423, Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses.

IEC 62423:2009 Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses

IEC 62752:2016 In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)

10.5 Underwriters Laboratory (UL) Standards

UL 2202 Ed 2 Standard for Electric Vehicle (EV) Charging System Equipment – edition 2009-10-02

UL 2251 Ed 3 Standard for Plugs, Receptacles, and Couplers for Electric Vehicles

UL 2231-1 Ed 2 Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: General Requirements

UL 2231-2 Ed 2 Standard for Safety for Personnel Protection Systems for Electric Vehicle (EV) Supply Circuits: Particular Requirements for Protection Devices for Use in Charging Systems

NOTE: UL 2594 Ed1 Standard for Electric Vehicle Supply Equipment –is not considered suitable for New Zealand as it only addresses the safety of EVSE at 60 Hz.

11 **Bibliography** (Informative)

11.1 The following documents provide information which may be useful for understanding these Guidelines but they are not indispensable for application of the Guidelines.

IEC 60050-691:1973, International Electrotechnical Vocabulary – Chapter 691: Tariffs for electricity

IEC 60309-4, Plugs, socket-outlets and couplers for industrial purposes – Part 4: Switched socket-outlets and connectors with or without interlock

IEC 60364-5-51:2005, Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules

AS/NZS 60884-1, Plugs and socket-outlets for household and similar purposes – Part 1: General requirements

IEC 61439-7, Low-voltage switchgear and control gear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations

IEC 61851 (all parts), Electric vehicle conductive charging system

IEC 61851-1:2010, Electric vehicle conductive charging system – Part 1: General requirements

IEC 62196 (all parts), Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles

IEC TR 62350, Guidance for the correct use of residual current-operated protective devices (RCDs) for household and similar use