

Guidance Note on Fault Protection for Direct Current Electric Vehicle Charging Facilities

1 Introduction

1.1 The purpose of this Guidance Note is:

- (a) to draw the attention of the Registered Electrical Contractor (REC) and Registered Electrical Worker (REW) to the requirements on the selection and corresponding fault protection measures of the direct current (DC) electric vehicle (EV) charging facilities as stipulated in Code 26S of the Code of Practice for the Electricity (Wiring) Regulations (CoP);
- (b) to give guidance on how to meet the requirements for fault protection of DC EV charging facilities .

2 Code of Practice for the Electricity (Wiring) Regulations

2.1 The Electricity (Wiring) Regulations (Cap. 406E), hereinafter referred as the "Wiring Regulations", is one of the subsidiary regulations of the Electricity Ordinance (Cap. 406), hereinafter referred as the "Ordinance". The CoP is published to provide general technical guidelines on how to meet the statutory requirements of the Wiring Regulations. Compliance with the CoP can be considered compliance with the relevant requirements of the Wiring Regulations.

2.2 The Code 26S of the CoP stipulates particular requirements for EV charging facilities. In some instances, the EV charging facilities which is designed, constructed and installed to an equivalent or higher national/ international standards may be deemed to have met the requirements of the CoP.

3 Interpretation

3.1 For the purpose of the Guidance Note, some of the definitions used in the CoP and relevant international standards have been extracted herein for ease of reference:

- (a) "Mode 4 charging" as defined in Code 26S of the CoP, means the mode of charging where connection of the EV to the AC supply network utilizes an off-board charger where the control pilot function extends to equipment permanently connected to the AC supply. In this charging mode, either single-phase or three-phase AC is converted to DC within the EV charging equipment. The resulting DC is supplied to the EV via a charging cable that is tethered to the EV charging equipment.
- (b) "isolated DC charger" as defined in IEC 61851-23:2014, means a DC EV charging station with DC circuit on output side which is electrically separated by at least basic insulation from AC circuit on power system side.
- (c) "non-isolated DC charger" as defined in IEC 61851-23:2014, means a DC EV charging station with DC circuit on output side which is not electrically separated by at least basic insulation from AC circuit on power system side

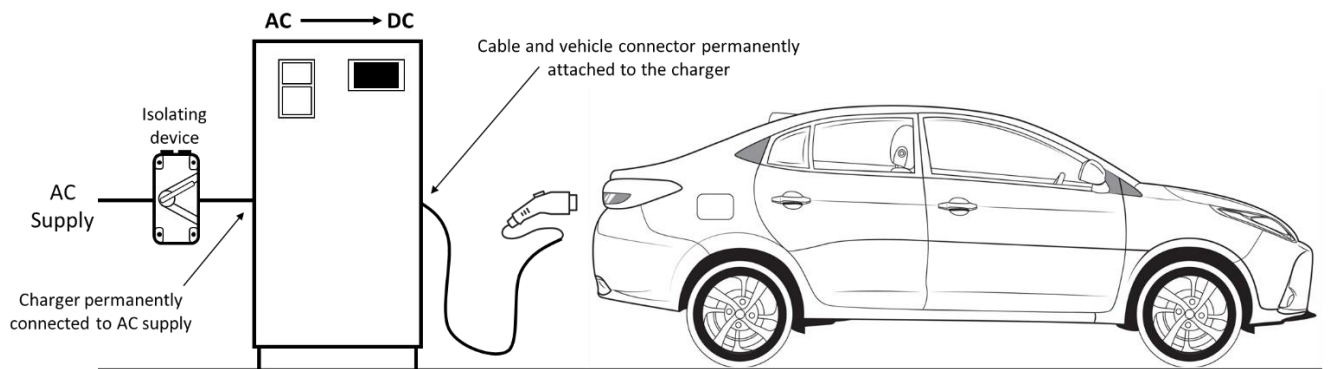
4 Selection and erection of DC EV charging facilities

- 4.1 According to Code 26S Clause (3)(a) of the CoP, EV charging installation should be selected and erected to ensure safe operation and ease of maintenance at all times. The EV charging installation should be designed and installed in accordance with IEC 61851 or equivalent.
- 4.2 DC EV charging installation for Mode 4 charging should comply with the requirements specific to DC EV charging stations given under Part 23 of the IEC 61851 (i.e. IEC61851-23).

5 Requirements for fault protection of DC EV charging facilities

- 5.1 For the purpose of the Guidance Note, DC EV charging facility refers to charging station for Mode 4 charging, where connection of the EV to the AC supply network utilizes an off-board charger permanently connected to the AC supply, with DC supplied to the EV via a charging cable that is tethered to the EV charging equipment and incorporated with a connector complying with the IEC 62196 series. Typical arrangement of a DC EV charging station for Mode 4 charging is illustrated in Annex A for reference.
- 5.2 According to Code 26S, Clause (4)(d)(i) of the CoP, **except for circuits using the protective measure of electrical separation**, each charging point shall be protected by its own RCD of at least Type A, having the characteristic specified in Code 11J. For different types of DC EV charger, the requirements for fault protection are as follows:
- (a) For an isolated DC EV charger complying with the IEC 61851-23:2014, the DC circuit on output side of the EV charger is electrically separated from AC circuit on power system side, which is acceptable as a means of protective measure by electrical separation. Protection by RCD is optional for such charging station.
 - (b) For any non-isolated DC EV charger where the DC circuit on output side of the EV charger is not electrically separated from AC circuit on power system side, RCD of at least Type A having the characteristic specified in Code 11J of the CoP shall be provided to protect such charging station.
 - (c) DC EV charging station in compliance with IEC 61851-23:2014 is required to be compatible with RCD Type A in the installation as specified in Clause 7.6 of the standard (i.e. RCD Type A, when installed on the AC supply circuit upstream to the charging station, shall be able to use together with the charging station and function safely as intended). Therefore, RCD Type B is not required for DC EV charging station in compliance with IEC 61851-23:2014.
- 5.3 The classification of a DC EV charging station and its conformity for protection against electric shock in compliance with IEC 61851-23:2014 should be checked against the type test report of the equipment. Relevant clauses of IEC 61851-23:2014 may include but not limited to the followings:
- (a) Clause 6.101 on classification of DC EV charging stations & systems;
 - (b) Clause 7 on protection against electric shock;
 - (c) Annexes AA.3.1, BB.2 or CC.4.1 on requirements for the isolated DC EV charging station for protection against electric shock for each system, etc.

Typical arrangement of a DC EV charging station (Mode 4)



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