

NAPIT

EV Charging Amendment 1

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BS 7671:2018 + A1:2020 *EV Charging Amendment 1*



BS 7671 Amendment 1:2020

Was published in February 2020, available free-to-view on the IET website.

It is a stand-alone update to Section 722 for electric vehicle charging installations.

Minor changes/corrections were introduced with Corrigendum May 2020

Amendment 1 will be incorporated into Amendment 2 when published.

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722.311 Maximum demand and diversity

~~A dedicated final circuit shall be provided for the connection to electric vehicles. It shall be considered that in normal use each single charging point is used at its rated current. Where the final circuit supplies more than one charging point no diversity shall be allowed.~~

~~Diversity may be allowed for a dedicated distribution circuit supplying multiple electric vehicle charging points if load control is available.~~

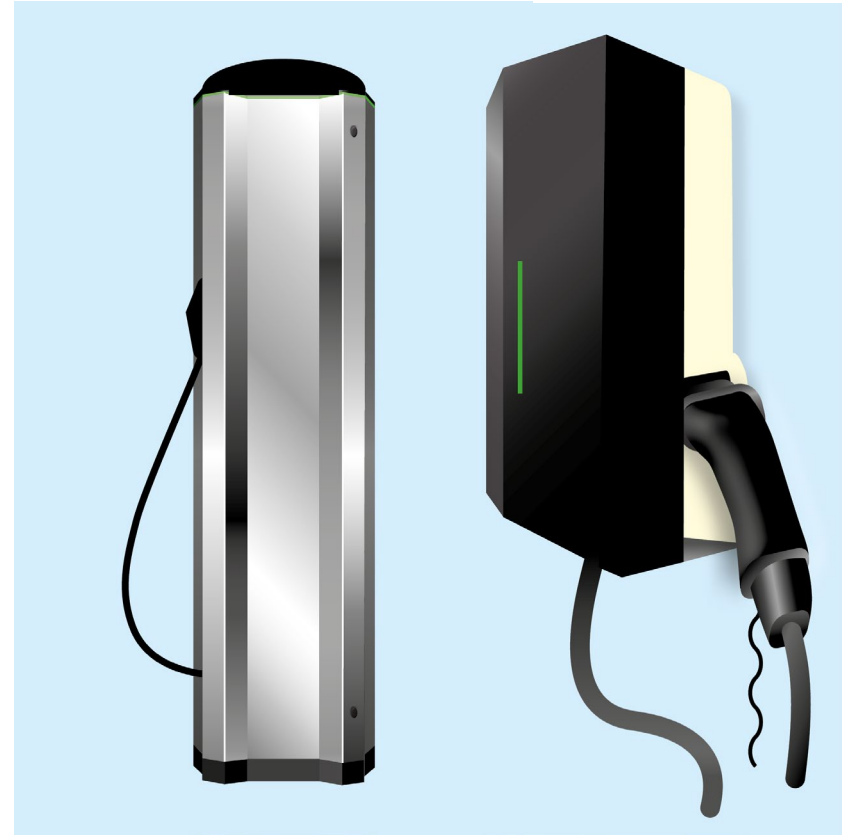
722.311.201

Load curtailment, including load reduction or disconnection, either automatically or manually, may be taken into account when determining maximum demand of the installation or part thereof.

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Maximum demand and diversity

The removal of the requirement to consider EV circuits at their maximum rated current when assessing maximum demand, removes installation barriers and takes advantage of manufacturers load management solutions



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Consumer unit loading considerations

Distribution boards and consumer units assemblies are rated by the manufacturer after applying an assumed loading diversity factor, known as the rated diversity factor (RDF)

RDF considers circuits that can be continually and simultaneously loaded and may need to be applied to EV charging circuits because they are continually loaded.

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Loading considerations- RDF

Table 9.1 -Values of rated diversity (RDF) / assumed loading			
BS EN 61439-2 (typically Switchboards. Panel boards and Motor Control Centres)		BS EN 61439-3 (typically Consumer units and Distribution boards)	
Number of circuits	RDF (assumed loading)	Number of circuits	RDF (assumed loading)
2 and 3	0.9	2 and 3	0.8
4 and 5	0.8	4 and 5	0.7
6 to 9 inclusive	0.7	6 to 9 inclusive	0.6
10 (and above)	0.6	10 (and above)	0.5

Table information courtesy of BEAMA Ltd

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722.411.4 TN Systems

Regulation 722.411.4.1 Introduces two new indents, (iv) and (v) which provides alternative solutions for charging installations using PME earthing systems outside.

The existing installation options (i), (ii) and (iii) are still available for use, although slightly modified

Many contractors found these conditions hard to meet, as summarised below.

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722.411.4 TN Systems

(i) The first option concerns charging points forming part of a three-phase installation also supplying non-vehicle charging loads. The maximum voltage between the MET and Earth in the event of an open-circuit fault in the PEN conductor of the low voltage network supplying the installation does not exceed 70 V rms.

This option relies on the system being balanced, which in theory would be hard to achieve.

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722.411.4 TN Systems

(ii) The second option requires the installation MET to be connected to an auxiliary earth electrode. The resistance of the earth electrode to Earth shall be such that the maximum voltage between the main earthing terminal of the installation and Earth in the event of an open-circuit fault in the PEN conductor of the low voltage network supplying the installation does not exceed 70 V rms.

$$R_{A\,ev} = \frac{70C_{\max}U_0}{I_{\text{inst}}(C_{\max}U_0 - 70)}$$

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722.411.4 TN Systems

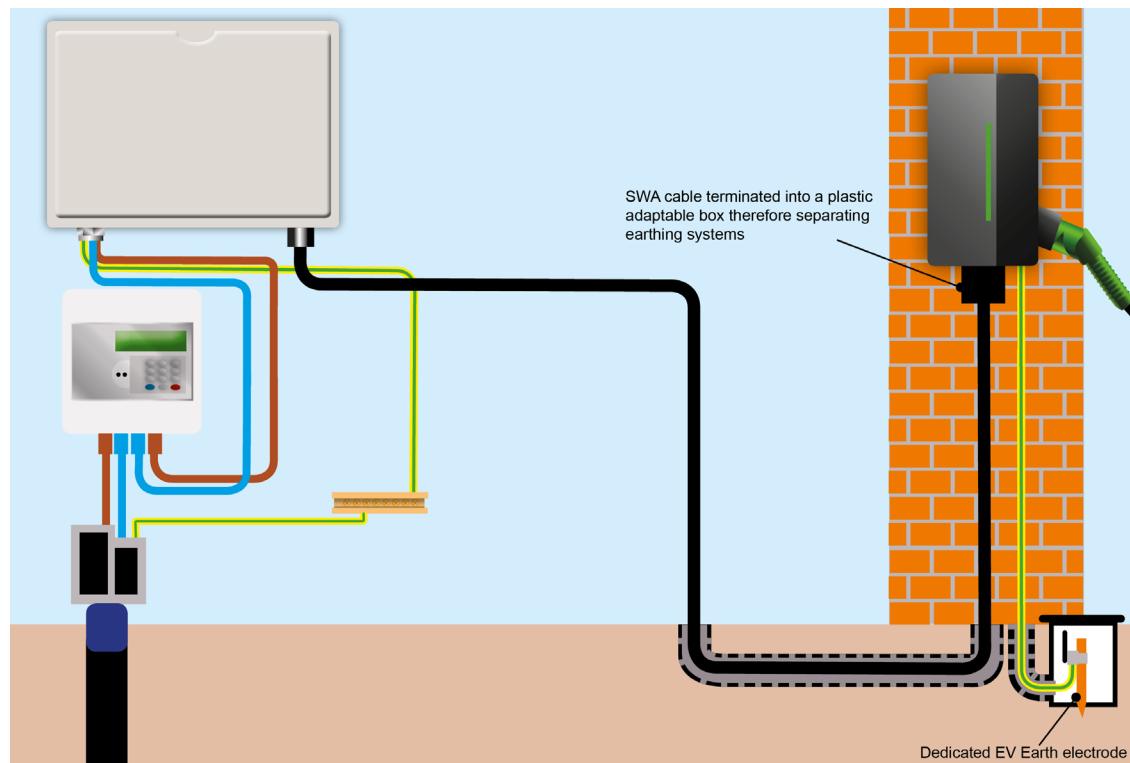
(iii) The third option concerns the use of a device which disconnects the charging point from the live conductors of the supply and from protective earth in accordance with Regulation 543.3.3.101(ii) within 5 s in the event of the voltage between the circuit protective conductor and Earth exceeding 70 V rms.

This method requires a suitable reference to Earth as measurement of the voltage will need to be between the circuit protective conductor and a suitable measurement earth electrode.

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TT arrangement used for EV charge point

Due to the onerous conditions required by installation methods (i), (ii) and (iii) most contractors opted for TT arrangement



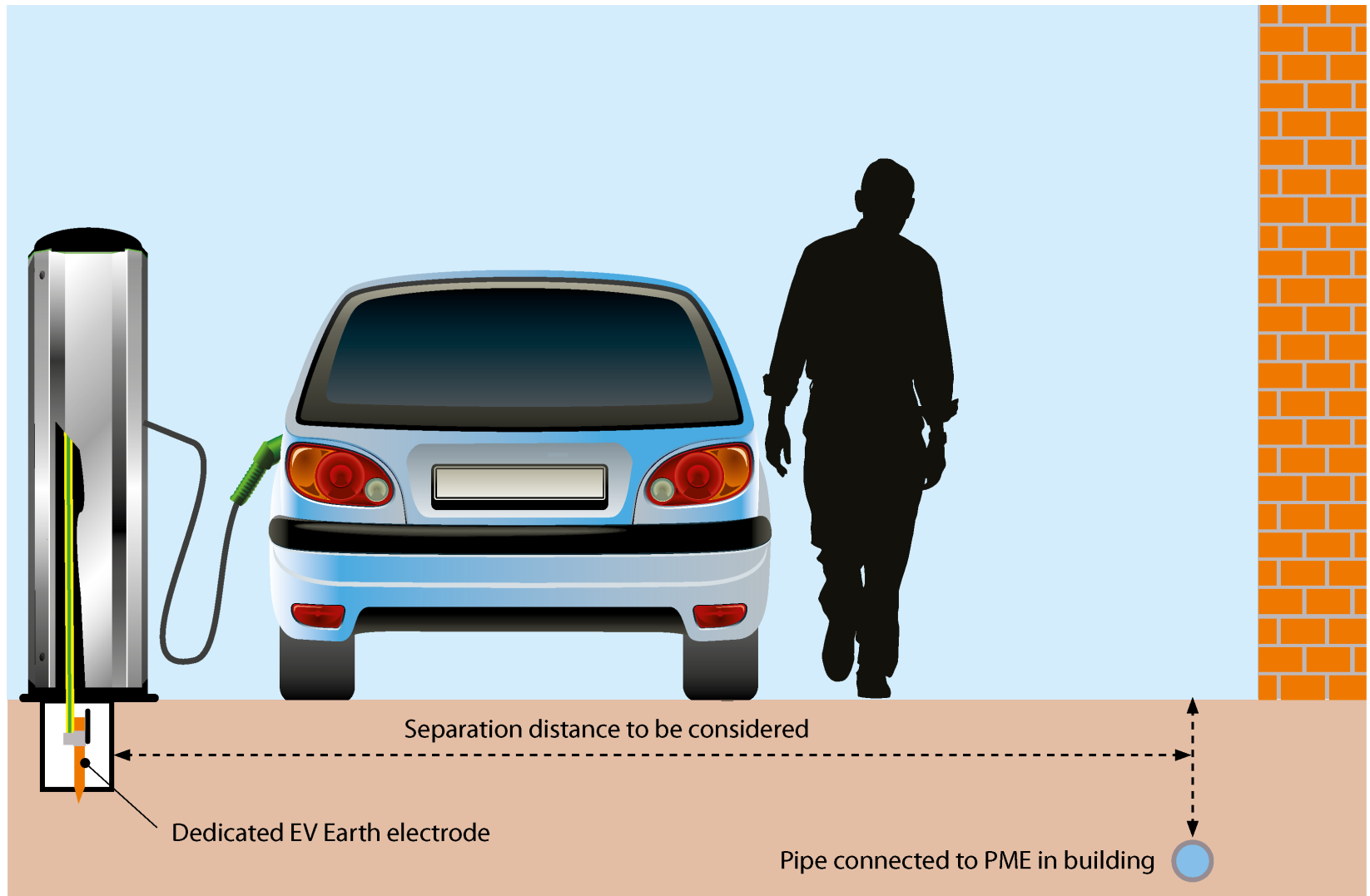
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TT arrangement used for EV charge point

Amendment 1 suggests caution with this approach in a new note

Note: 6, which states that creating a TT earthing system for charging equipment or the whole installation as an alternative to using a PME earthing facility may not be an appropriate solution due to the inability to provide sufficient separation from buried metalwork connected to the supply PEN conductor.

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722.411.4.1 *New Indent (iv)*

(iv) Protection against electric shock in a single-phase installation is provided by a device which electrically disconnects the vehicle from the live conductors of the supply and from protective earth in accordance with Regulation 543.3.3.101(ii) within 5 s in the event of the utilisation voltage at the charging point, between the line and neutral conductors, being greater than 253 V rms or less than 207 V rms.

It shall provide isolation and be selected in accordance with Table 537.4.

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722.411.4 TN Systems

722.411.4.1 *New Indent (v)*

(v) Protection against electric shock is provided by the use of an alternative device to those in (iii) or (iv) which does not result in a lesser degree of safety than using (iii) or (iv).

Equivalent means of functionality could be included within the charging equipment. The device (or means of functionality) shall operate by electrically disconnecting the vehicle from the live conductors of the supply and from protective earth in accordance with Regulation 543.3.3.101(ii).

It shall provide isolation and be selected in accordance with Table 537.4.

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722.411.4.1

NOTE 5: See Section 511. **BS 7671 does not deal with the safety requirements for the construction of electrical equipment.** Where equipment to be used is not covered by a British or Harmonized Standard or is to be used outside the scope of its standard, **it is the responsibility of the electrical installation designer or other person responsible** for specifying the installation to establish that the manufacturer of the equipment has ensured that the equipment satisfies the safety objectives of the relevant Directive(s), as it will not benefit from a presumption of conformity afforded by the appropriate product standard.

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722.531.3 Residual current devices (RCDs)

722.531.3.101

Unless using the protective measure of electrical separation, 30 mA RCDs are required for each charging socket

Except where provided by the EV charging equipment, protection against DC fault currents shall be provided by:

- (i) an RCD Type B; or
- (ii) an RCD Type A or Type F in conjunction with a residual direct current detecting device (RDC-DD)

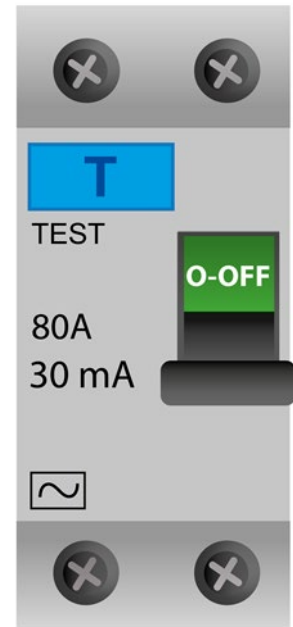
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Regulation 531.3.3 Types of RCD

General requirements





Different types of RCD exist, depending on their behaviour in the presence of DC components and frequencies. The appropriate RCD shall be selected from the following:

- Type AC - General purpose device that detect & respond to AC sinusoidal wave only
- Type A – Used for equipment incorporating electronic components, detect & respond to above PLUS pulsating DC components
- Type F – Equipment with frequency controlled speed drives detect & respond to above PLUS high frequency residual current
- Type B –Electric vehicle chargers, PV supplies, detect & respond to above PLUS smooth DC residual current



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RCD marking symbols

Table 9.2 Types of RCD and their operating restrictions and marking symbols					
RCD	Symbol	Examples of type of equipment / load	RCD	Symbol	Examples of type of equipment / load
Type AC		Resistive, Capacitive, Inductive loads generally without any electronic components, typically: <ul style="list-style-type: none"> • Immersion heater • Oven/Hob with resistive heating elements • Electric shower • Tungsten & halogen lighting 	Type F		Frequency controlled equipment / appliances, typically: <ul style="list-style-type: none"> • Some washing machines, dishwashers and driers e.g. containing synchronous motors* • Some Class I power tools • Some air conditioning controllers using variable frequency speed drives • Electric Vehicle charging in conjunction with RDC-DD
		Single-phase with electronic components, typically: <ul style="list-style-type: none"> • Single-phase invertors • Class I IT and Multimedia equipment • Power supplies for Class II equipment • Appliances such as a washing machine that is not frequency controlled e.g. DC or universal motor • Lighting controls such as a dimmer switch and home and building electronic systems LED drivers • Induction hobs • Electric Vehicle charging where any smooth DC fault current is less than 6 mA • Electric Vehicle charging in conjunction with RDC-DD 			Type F is also suitable for Type AC and Type A applications.
Type A		<ul style="list-style-type: none"> • Single-phase invertors • Class I IT and Multimedia equipment • Power supplies for Class II equipment • Appliances such as a washing machine that is not frequency controlled e.g. DC or universal motor • Lighting controls such as a dimmer switch and home and building electronic systems LED drivers • Induction hobs • Electric Vehicle charging where any smooth DC fault current is less than 6 mA • Electric Vehicle charging in conjunction with RDC-DD 	Type B		<p>Three-phase electronic equipment, typically:</p> <ul style="list-style-type: none"> • Inverters for speed control • UPS • Electric Vehicle charging where any smooth DC fault current is greater than 6 mA • Photovoltaic <p>Power Electronic Converter Systems (PECS), typically:</p> <ul style="list-style-type: none"> • Industrial machines • Cranes
Type A is also suitable for Type AC applications.			Type B is also suitable for Type AC, Type A and Type F applications.		

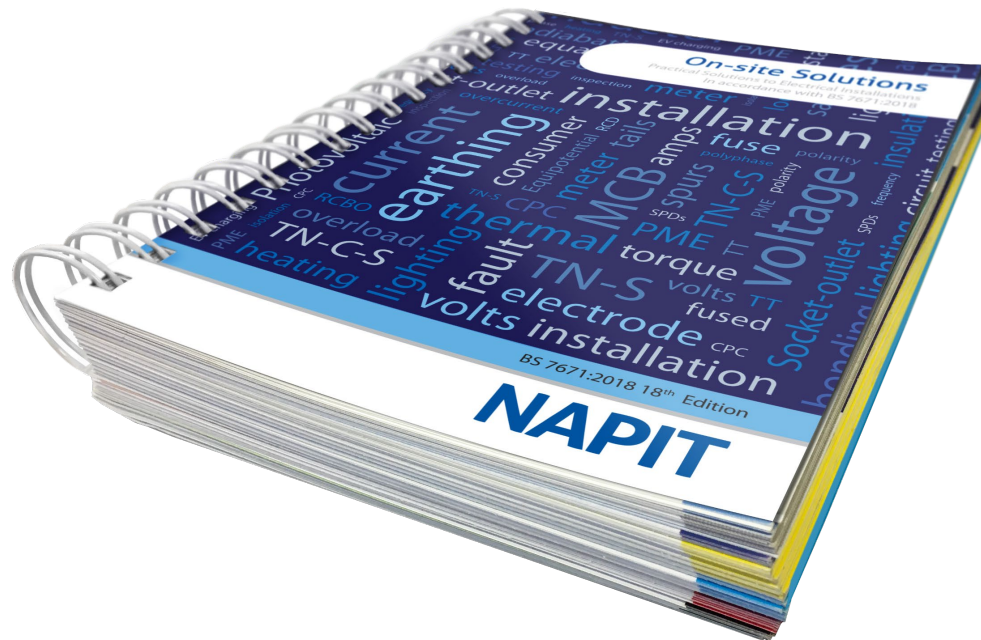
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Summary

Why are the new requirements so important?

- It allows the EV charging equipment manufacturers to include electrical safety devices, that will protect against electric shock
- EV charging installations will be subject to less restrictions, taking account of new techniques and the latest technology
- Government targets for EV sales by 2030 will be increasingly attractive with the removal of restrictions
- Reduce potential dangers associated with driving earth electrodes
- Reduce simultaneous contact and shock hazards
- Provides solutions for determining maximum demand

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Thank you for listening
Do you have any questions