



General Electrical Guidelines for Installation of EO Charging Stations

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1 Introduction

This document provides advice for the activities prior to installing an EO Charging station. This document represents the guidelines and best practice recommended by EO Charging. Ultimately it is the responsibility of the Installer to correctly install the charging stations as per the latest issue of relevant regulations. Therefore, this document should be viewed as a helping hand offered from EO to the installer. This document covers the following topics:

- A Review of the different earthing arrangements
- A review of the key requirements from the existing regulations and code of practice documents
- Some recommended installations for the different earthing arrangements
- A section to help prompt discussions during the site survey

2 A review of the different earth arrangements

This section summarises the different earthing arrangements available:

- TT
- TN-S
- TN-C-S or PME

2.1 TT System

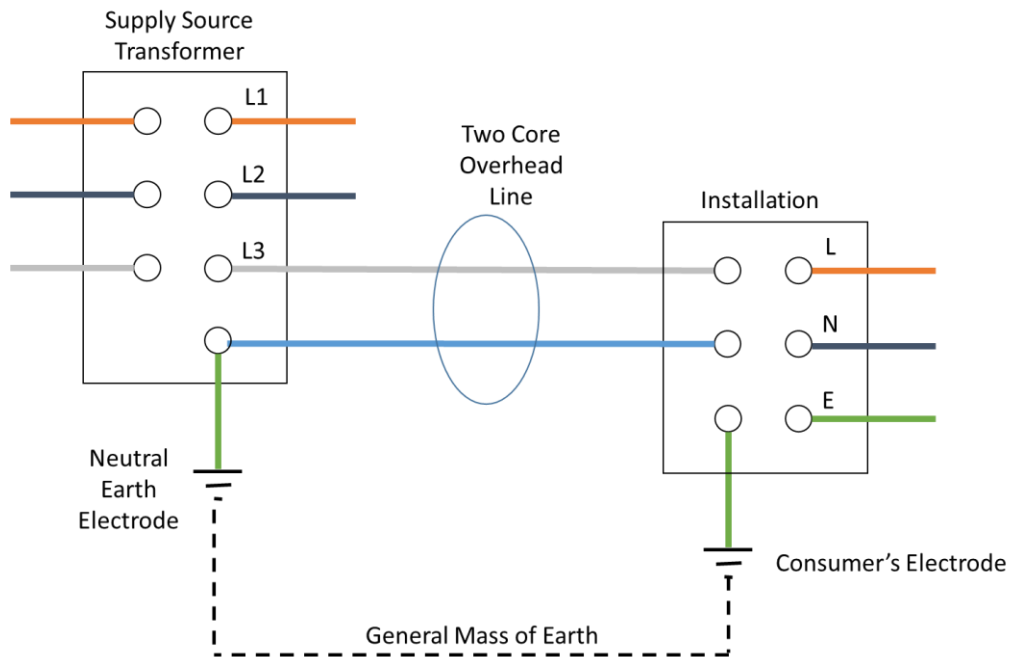


Figure 1 - TT System Connection

2.2 TN-S System

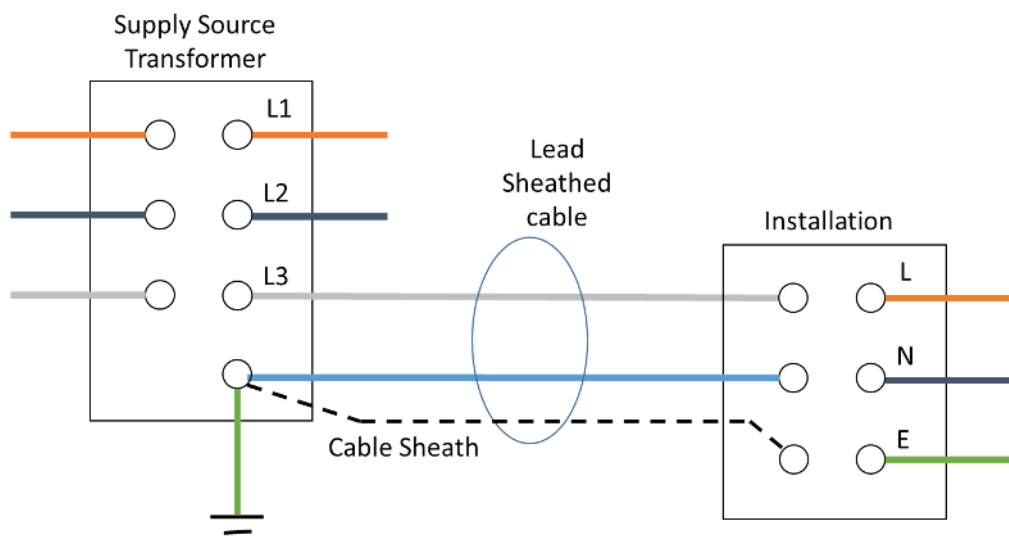


Figure 2 - TN-S System

2.3 TN-C-S System or PME

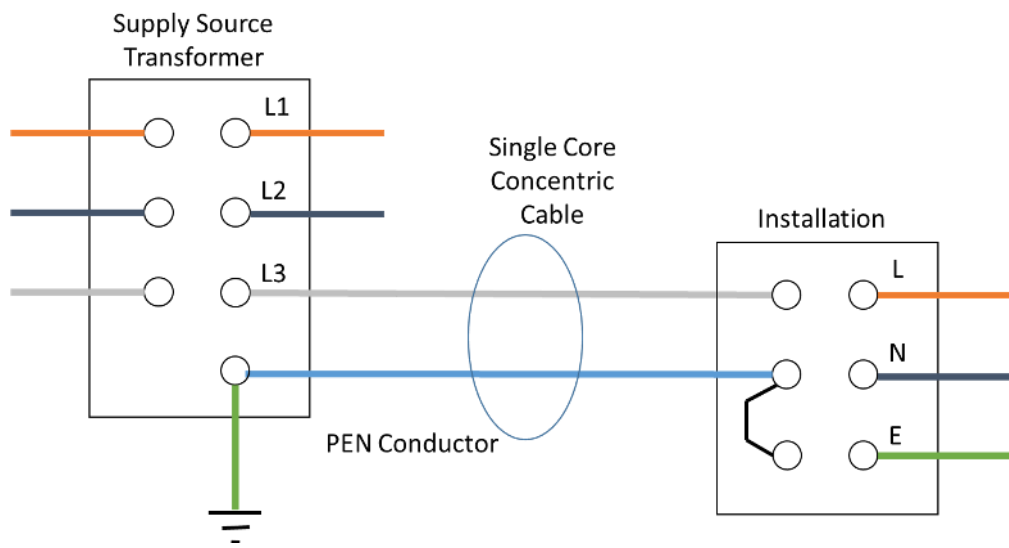


Figure 3 - TN-C-S or PME System

3 Review of the Regulations

This section details some of the key requirements that EO Charging feel should be highlighted. The full list of requirements can be found in the following:

- BS 7671:2008+A3:2015, IET Wiring Regulations Seventeenth Edition, Section 722
- IET Code of Practice For Electric Vehicle Charging Equipment Installation 2nd Edition

3.1 RCDs

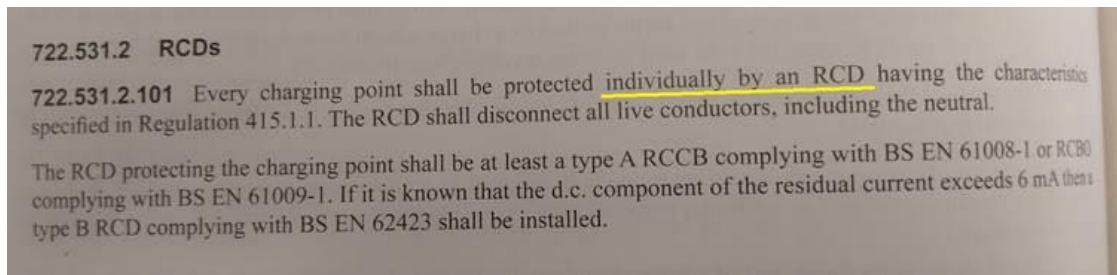


Figure 4 - BS7671 Wiring Regulations - RCDs

The above requirement clearly indicates that each charging outlet requires its own RCD. It is not possible to connect an EV Charging station to a group of circuits connected to an existing common RCD.

For the avoidance of doubt each EVSE requires a dedicated 30mA RCD which is at least of Type-A.

There are some manufacturers which have Type-A RCD protection, certified to the required standard, incorporated into the charge-station but many do not. For charge-stations which don't have it built into the housing (as in the case with EO products) it is the installers responsibility to ensure compliance by incorporating a **dedicated** RCD as part of the electrical installation; this meets the OLEV requirements since the RCD, typically in a separate housing within the dedicated final circuit, is part of the EVSE installation.

3.2 Discrimination of RCDs

Care must be taken when connecting any charging station to the RCD. The design of the installation must be such that it is possible to discriminate between any RCD on the system. This is shown in the IET Code of Practice in section 6.13.2, shown below:

6.13 Requirements for the provision of RCDs (Regulation 722.531.2)

6.13.1 RCD specification

Every charging point shall be protected by a 30 mA RCD, with an operating time not exceeding 40 ms at a residual current of $5 I_{\Delta n}$. Dedicated electric vehicle charging equipment should incorporate such an RCD, but the installer shall confirm this.

6.13.2 Discrimination

There should be discrimination between any RCD installed at the connecting point or incorporated in the charging equipment and the protection at the origin of the circuit (see Regulations 314.1 (i) and 531.2.9 of BS 7671:2008+A3:2015).

6.13.3 RCD protection (Regulation 722.531.2.101)

Every charging point shall be individually protected by an RCD having the characteristics specified in Regulation 415.1.1. The RCD shall disconnect all live conductors, including the neutral.

Figure 5 - IET Code of Practice details on Discrimination

3.3 Earthing

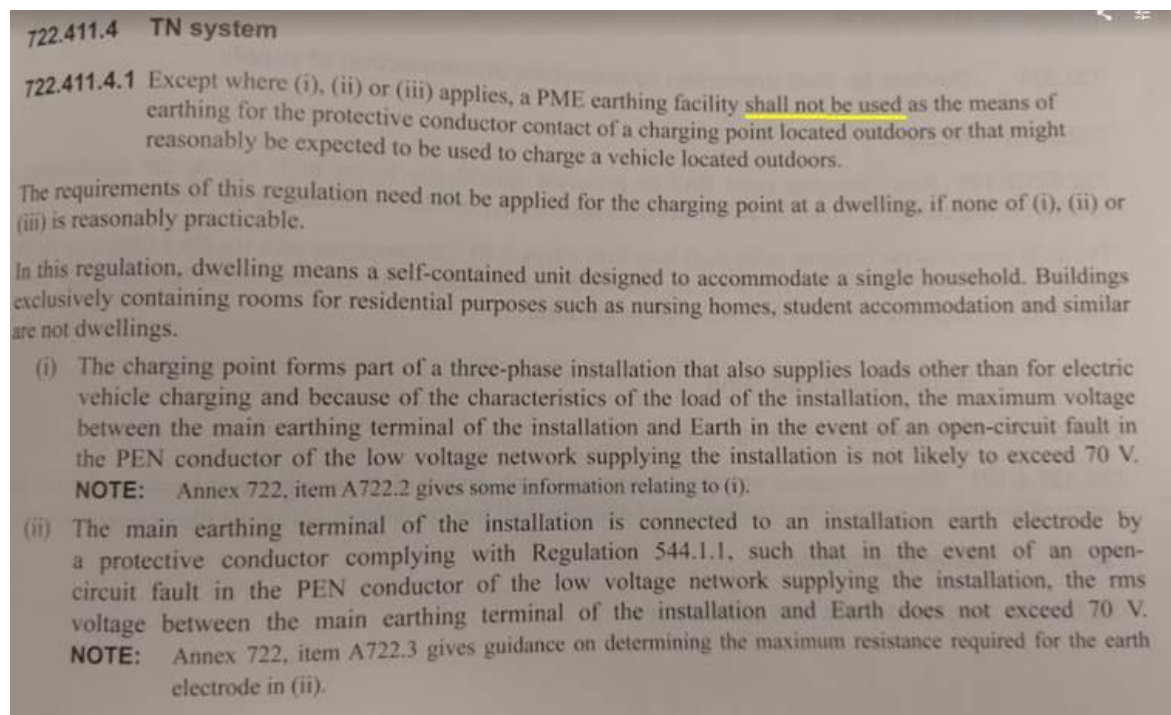


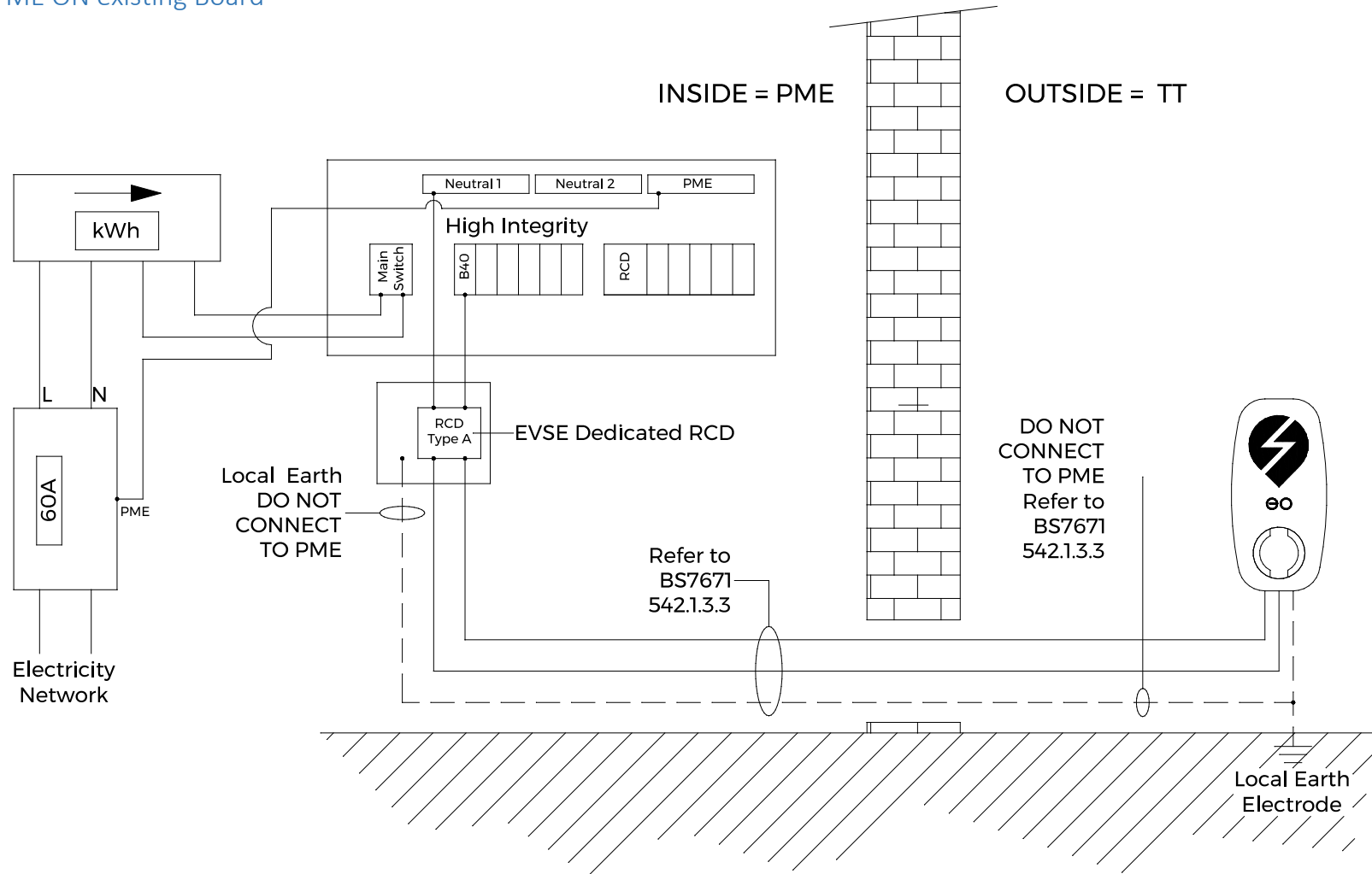
Figure 6 - Requirement excluding the use of PME for earthing

BS7671 Section 722.411.4.1, shown above states why the charge-stations should be installed using an earth electrode.

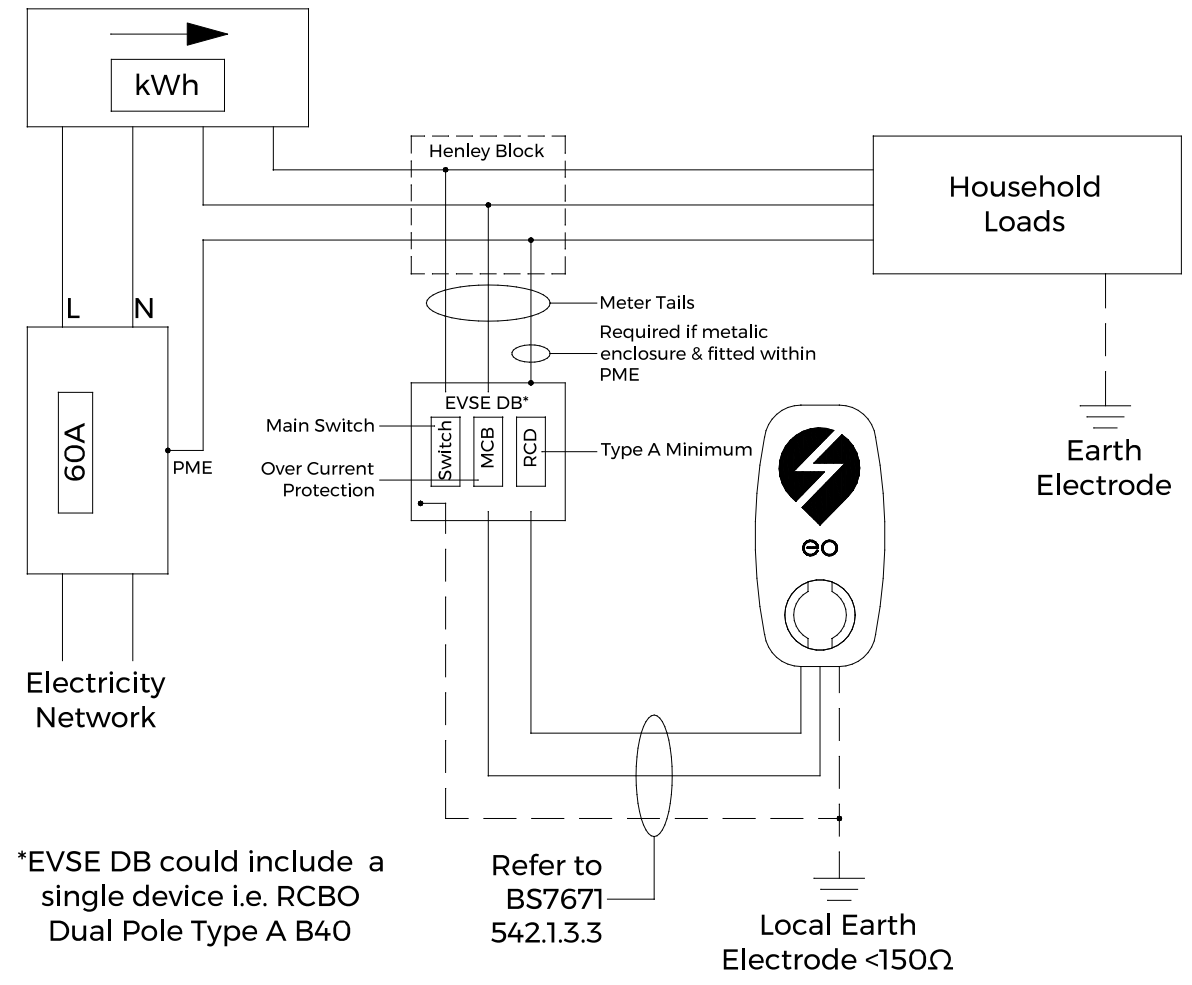
4 Proposed Installations

This section details the various best practices for installations of charging stations for different earthing types:

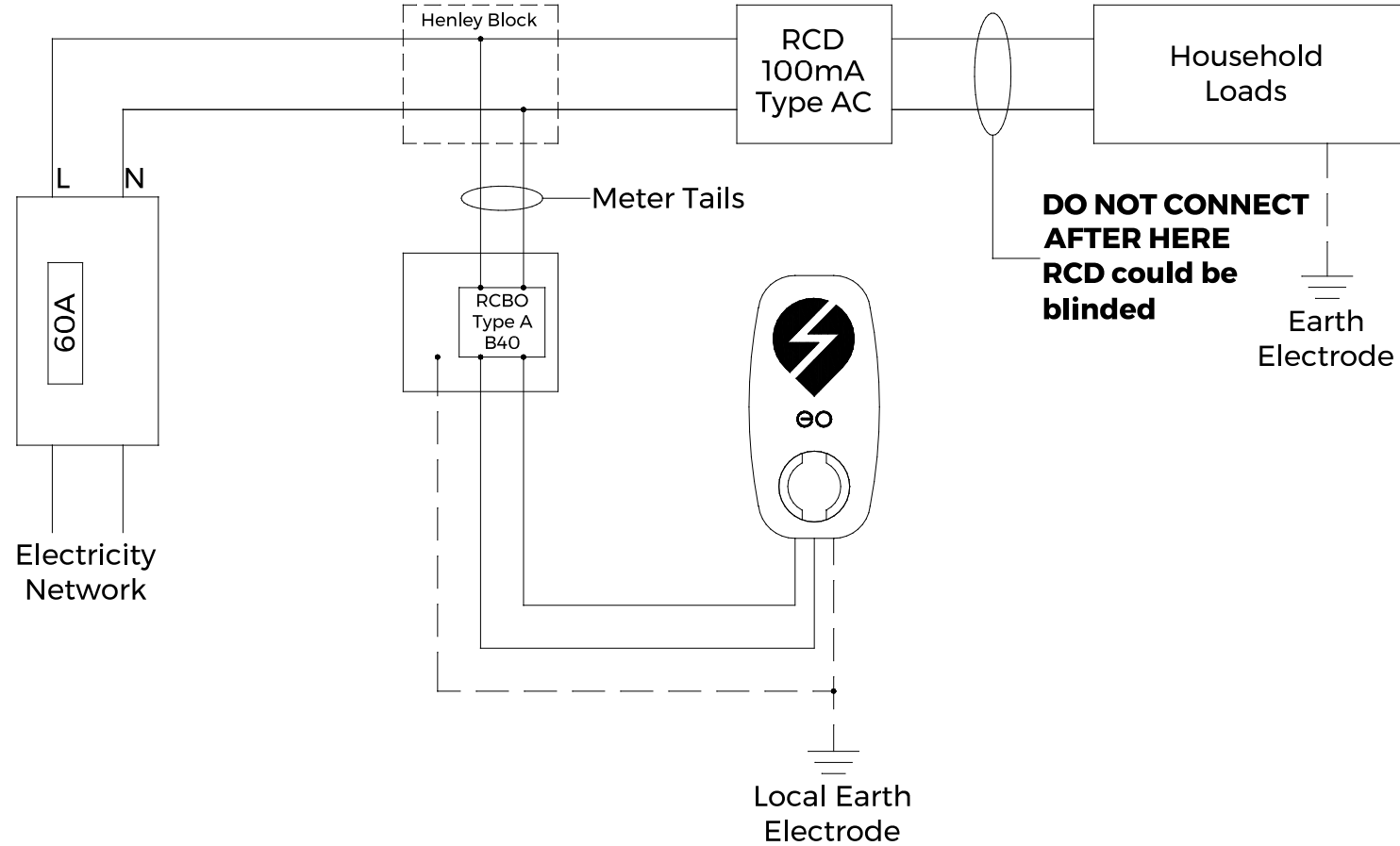
4.1 PME ON existing Board



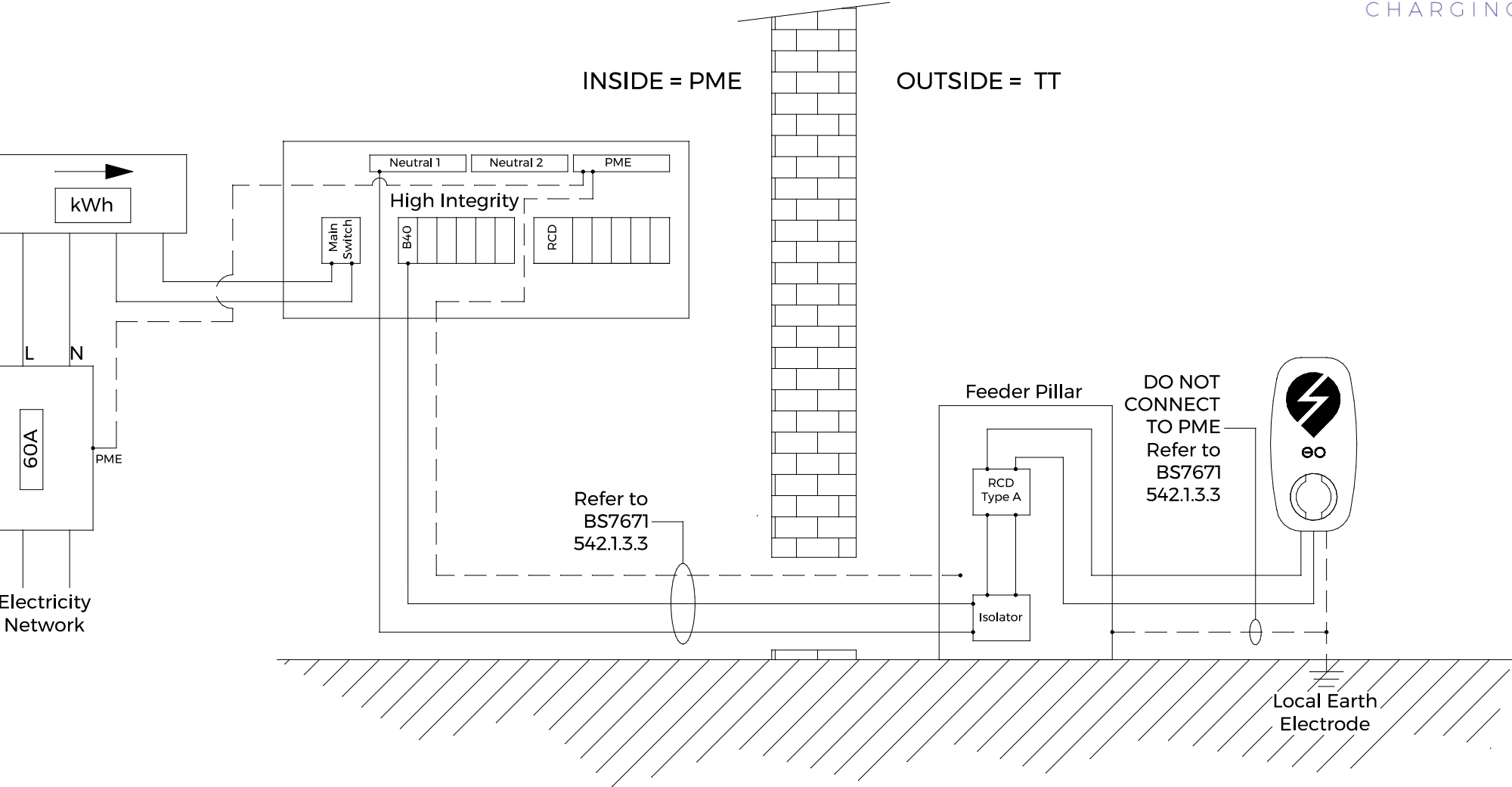
4.2 PME On Sub Board



4.3 TT Supply



4.4 PME To Feeder Pillar (Commercial)



4.5 Recommendations for a Domestic Installation

The following notes are a recommendation for a typical domestic installation in the UK. The premise should be equipped with the following:

1. 32A full load rated additional supply capacity – This equates to 100A cut-out fuse, 23kVA supply in most instances
 1. This assumes that Automatic Load Management has not been employed for use with an eoMini or an eoBasic.
2. Dedicated **high-integrity** connection point for the EVSE – No RCD upstream of the EVSE circuit
3. 40A MCB overcurrent protection
4. 40A rated dedicated radial final circuit (typically 6mm² cable depending on installation methodology)
5. Dedicated dual-pole Type-A RCD
6. Earthing connection of the EVSE circuit to be converted to TT-earthing, this must incorporate the CPC of the radial final circuit (assuming supply is PME).
7. In consideration of point-6, a suitable location to site an earth electrode (typically adjacent to the EVSE)
8. If including the earth electrode at point of installation the Ra must be <150Ω for reliable charging of all vehicle types (this exceeds the 200 Ω requirement of BS7671).

Some manufacturers offer a combined double-pole 40A RCBO in a single DIN (such as a Wylex [NHXS1B40](#)), but many do not. A single-pole RCBO does not meet the requirements of the wiring regulations since the RCD must disconnect both the line and neutral conductors.

5 Site Survey

This section is designed to help an installer with the site survey. A list of useful questions and topics is provided to guide and prompt discussions during the survey.

5.1 Pre-Site Survey Questions

Before the site survey, ask the client to consider the following

Question	Answer
Describe the site's power supply	
How many charging stations are expected to be installed?	
Where are the charging stations expected to be installed?	
Estimate how much work is expected to be required to install the stations (turn-key solution?)	
What is the desired functionality of the system? (eoBasic/eoGenius/Billing/Administration/Reporting/etc.)	
Are there any considerations for future expansion?	

5.2 Questions to consider during site survey

The following points should be considered as part of the actions that are carried out whilst performing a site survey

Question	Answer
What is the existing Supply overcurrent device?	
What is the Existing maximum demand on supply?	
An indication of load profile if possible	
What is the Earthing system of supply?	
Describe the Point of connection (ideally as close as possible to incoming supply, just after the meter is best)	
How many charging stations are required?	
Describe where the charge-stations are to be installed (inside equipotential zone or outside)	
Detail the Charge-station mounting methodology (wall/post/other)	
Identify the location for the EV supply distribution board (ideally dedicated if for more than three charge-stations)	
Size of sub-main required/existing	
Distance of sub-main to distribution board	
Distance of distribution board to charge-stations	
Confirmation of no upstream RCD requirements (depends on existing electrical installation design)	
How will cables be routed (underground/cable tray/cable basket/clipped direct/etc.) and method of containment	
Communications connection (Ethernet/GSM) if required and mobile signal strength if GSM	
Collision protection (bollards/wheel-stops)	
Have photos been taken of the site before work commences NB – this is essential to help with future support issues that may arise.	

5.3 Tools required for site survey

The following is a list of tools that are helpful for a site survey

- Camera phone
- Current clamp meter
- Tape measure/trundle-wheel
- GSM signal meter

5.4 Recommended skills for site survey engineer

The person who is performing the site survey should have the following skills:

- Qualified Electrical Engineer
- Experience of installing EV Charging stations
- Attended the EO training academy (www.eocharging.eventbrite.co.uk)
- Knowledge of local wiring regulations, electrical design, practical installations and [IET CoP for EV Charging](#)

6 Further Technical Support

All EO Charging technical documentation is published in the EO Resource Centre, this is found at:
<https://www.eocharging.com/service-support/>

The EO Support team can be reached at:

- Email: support@eocharging.com
- Phone: +44 (0) 333 77 20383