

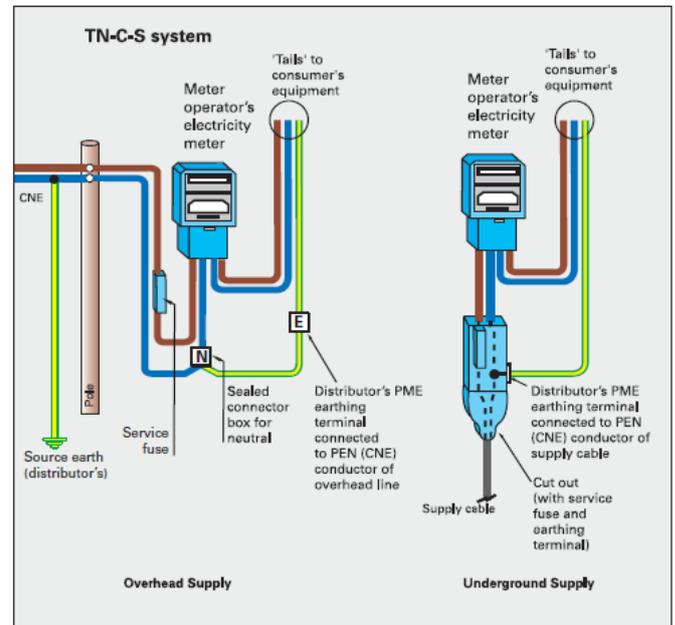
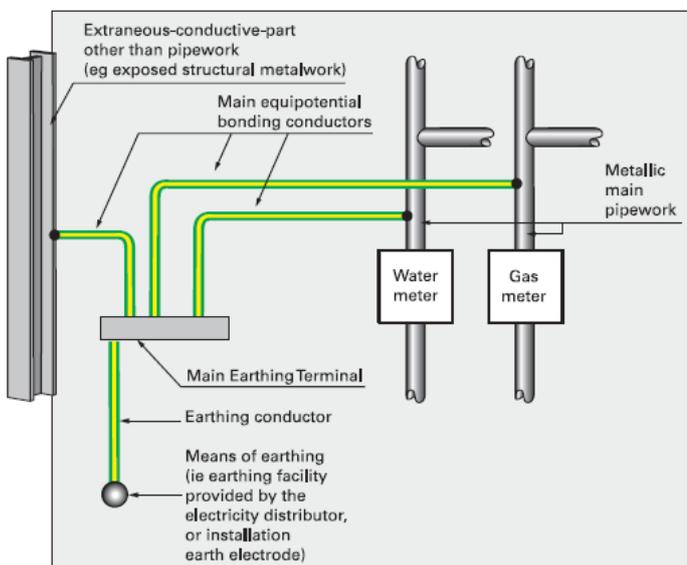
SIZING MAIN BONDING CONDUCTORS

NICEIC Approved Contractors and Domestic Installers should be aware that the requirements of BS 7671 for sizing the main equipotential bonding conductors of an installation where Protective Multiple Earthing (PME) conditions apply differ from those where such conditions do not apply. However, the NICEIC has found that some applicants wishing to register either as an Approved Contractor or as a Domestic Installer are not aware of this fact.

For the benefit of such applicants and as a reminder to contractors who are more familiar with the relevant requirements, this article provides guidance on sizing main bonding conductors where PME conditions apply.

Main bonding conductors

The main bonding conductors of an installation are the conductors connecting extraneous-conductive-parts, such as metallic water service pipes, gas installation pipes and exposed metallic structural parts of the building, to the main earthing terminal of the installation, as required by Regulation 413-02-02.



Typical arrangements of equipment on the distributor's side of the supply terminals at the origin of an installation where PME conditions apply

Most new low voltage electricity supplies provided during the last 35 years or so have included a PME earthing terminal. Where there is doubt as to whether an earthing terminal provided by a distributor is a PME earthing terminal, or whether an earthing facility is available for an installation at all, information should be obtained from the distributor.

Typical arrangement of main equipotential bonding conductors

Knowing whether or not PME conditions apply

In order to determine the minimum cross-sectional area (csa) required for the main bonding conductors of an installation, it is important to know whether or not PME conditions apply.

Protective Multiple Earthing is defined in Part 2 of BS 7671 as: "An earthing arrangement, found in TN-C-S systems, in which the supply neutral conductor is used to connect the earthing conductor of the installation with Earth in accordance with the Electricity Safety, Quality and Continuity Regulations 2002."

The connection between the earthing conductor of the installation and the supply neutral conductor is made at a PME earthing terminal provided by the electricity distributor. The terminal is located either on the distributor's fused cut-out or otherwise near the supply terminals and metering equipment for the installation. (Note: The supply neutral conductor is sometimes called a combined protective and neutral (PEN) conductor or a combined neutral and earth (CNE) conductor.)

It should be noted that PME conditions do not apply where a PME earthing terminal is provided but not used for the installation and not connected to any accessible metalwork at the premises. For example, this would be the case for:

- an installation in an outbuilding which has been arranged to form part of a TT system (as may have been required by the distributor in order to avoid extending PME to the outbuilding), or
- an installation where the use of the PME earthing facility is inappropriate for reasons of safety (as may be the case for an installation for a petrol filling station forecourt).

Minimum cross-sectional area required for main bonding conductors

Where PME conditions apply

Where PME conditions apply, Regulation 547-02-01 requires the csa of main bonding conductors to be in accordance with Table 54H of BS 7671, which is reproduced on the following page for ease of reference.

TABLE 54H

Minimum cross-sectional area of main equipotential bonding conductor in relation to the neutral conductor of the supply

Note: Local distributor's network conditions may require a larger conductor

| Copper equivalent cross-sectional area of the supply neutral conductor | Minimum copper equivalent* cross-sectional area of the main equipotential bonding conductor |
|--|---|
| 35 mm ² or less | 10 mm ² |
| over 35 mm ² up to 50 mm ² | 16 mm ² |
| over 50 mm ² up to 95 mm ² | 25 mm ² |
| over 95 mm ² up to 150 mm ² | 35 mm ² |
| over 150 mm ² | 50 mm ² |

* The minimum copper equivalent cross-sectional area is given by a copper bonding conductor of the tabulated cross-sectional area or a bonding conductor of another metal affording equivalent conductance.

Table 54H gives the required main bonding conductor csa in relation to the csa of the supply neutral conductor, based on copper conductors in both cases. (The supply neutral conductor is the neutral conductor of the low voltage network, and does not include any part of the neutral conductor on the consumer's side of the supply terminals.)

For example, where the csa of the supply neutral conductor is 35 mm² or less, as would normally be the case for the supply to a single family house, Table 54H requires that the csa of the main equipotential bonding conductors is not less than 10 mm² (based on copper conductors). A larger main bonding conductor size may be required by the distributor to meet local network conditions. Most distributors publish notes of guidance giving, amongst other things, any special requirements they may have for the csa of main bonding conductors in installations using PME earthing facilities.

It should be noted that the csa of the earthing conductor of an installation where PME conditions apply is required to be not less

than that required for a main equipotential bonding conductors of the installation (Regulation 542-03-01 refers). This is because, like the main equipotential bonding conductors, the earthing conductor may have to carry network circulating currents (diverted neutral currents) continuously or for long periods. In practice, however, the csa of the earthing conductor may have to be greater than that required for main equipotential bonding conductors, in order to meet the requirements of Regulation Group 543-01 (for protection against thermal effects and mechanical damage, etc), or to meet requirements stated in the distributor's notes of guidance.

Where PME conditions do not apply

Where PME conditions do not apply, Regulation 547-02-01 requires the csa of a main equipotential bonding conductor to be not less than half that required for the earthing conductor of the installation, and not less than 6 mm². The csa need not exceed 25 mm² if the main bonding conductor is of copper or a csa affording equivalent conductance in other metals.

From BS 7671:

Exposed-conductive part: Conductive part of equipment which can be touched and which is not normally live, but which can become live when basic insulation fails.

Extraneous-conductive part: A conductive part liable to introduce a potential, generally Earth potential, and **not forming part** of the electrical installation.

By BS7671 protective earthing is required for exposed conductive parts, and protective equipotential bonding is required for extraneous-conductive parts.

So, the metal trunking and metal enclosure **is part of the installation** so protective earthing is to be used.