

**TITLE:** EMEA Guide to Functional and Protective Grounding & Bonding of Cabinets, Frames & Rack Systems where CENELEC Standards Apply

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This field bulletin has been developed to offer advice to ensure that all protective earthing and equipotential bonding shall comply with the safety requirements of the European Harmonisation Document HD 60364-5-54: 2007: *Low voltage electrical installation – Part 5-54: Selection and erection of electrical equipment: Earthing arrangement and protective bonding conductors* (IEC 60364-5-54: 2002, mod.) and furthermore the grounding and bonding requirements of EN 50310: 2010 *Application of equipotential bonding and earthing in buildings with information technology equipment*.

All metallic parts in a building shall be bonded to provide an electrically continuous earthing network for low impedance which includes all cabinets, frames, racks and all metallic components located or mounted within.

Multiple bonding or 'daisy chaining' of bonding conductors should not be attached to a single connection point (e.g. screw or bolt) due to the risk of interruption of all connections during maintenance or repair. In addition to these requirements for safety, all conductive items within a cabinet (e.g. doors, panels, shelves and cable organisers) shall be bonded to reduce the effects of electromagnetic interference radiating from the cabinet, frame or rack. Functional earthing (FE) that is provided by means of Protective Earth (PE) cabling and/or where telecommunications equipment has a PE connection that can be used as an FE connection then the following shall apply:

- The outer insulation of the PE conductor shall be green/yellow in colour
- The PE conductor shall be tagged or marked with the words 'SAFETY/TELECOMS EARTH DO NOT REMOVE' adjacent to all connection points

Metallic elements such as conduit, pipes, metallic frames, cable armouring and trunking shall not be used to provide an FE path.

Where the FE conductor is not provided by the PE conductor, the FE conductor shall be connected to earth at the Customer Main Earth Terminal (CMET) via a local distribution board and shall be tagged or labelled with the words 'TELECOMS EARTH – DO NOT REMOVE'.

In respect to cabinets, frames and racks that contain telecommunications metallic cabling or telecommunications equipment the following requirements shall apply (see Figure 1):

- Each cabinet, frame or rack shall be connected to the earthing network using a separate bonding conductor. The bonding conductor shall be neither coiled or doubled back on itself and shall have a cross-sectional area not less than:
  - 4mm<sup>2</sup> (11 AWG) for a cabinet, frame or rack less or equal to 21U<sup>1</sup> in height
  - 16mm<sup>2</sup> (5 AWG) for a cabinet, frame or rack greater than 21U<sup>1</sup> in height
- Multiple cabinets, frames or racks located in one area shall be bonded to the earthing network using a separate bonding conductor 4mm<sup>2</sup> or 16mm<sup>2</sup> for each cabinet, frame or rack dependant on physical size as stated above. This bonding conductor shall be connected to a telecommunications ground bar located in the same room or area where the cabinet, frames or racks are located. The overall length of this cable is dependant on the type of earth network employed in the building and it is therefore essential that the designer liaise with suitably qualified electrical engineers and the Standards stated within this Field Bulletin.
- The earthing bar in this area shall be of a length suitable for the immediate requirements and shall contain a 20% growth factor
- The cabinets, frames or racks shall be connected via the telecommunications ground bar to the customer main earthing network with a bonding conductor not less than 25mm<sup>2</sup> (3 AWG) which is neither, coiled or doubled back on itself<sup>2</sup>. The overall length of this cable is dependant on the type of earth network employed in the building. It is therefore essential that the designer liaise with suitably qualified electrical engineers and the Standards stated within this Field Bulletin as a larger conductor may be required.

<sup>1</sup> U represents a rack mount unit of 44.5mm in height

<sup>2</sup> The earthing bar should be fitted with a disconnection/test point

Where screened telecommunication cables are installed and terminated with a cabinet, frame or rack, the screen or connector shall be connected to the bonding connection point within the cabinet, frame or rack by at least one of the following:

- A bonding conductor of 4mm<sup>2</sup> (11 AWG)
- In accordance with the Siemon product installation guidelines that are specifically designed for this purpose

Bayed cabinets, frames and racks should be fitted with a FE cable 4mm<sup>2</sup> (11 AWG) or bonding bar in order to main equipotential bonding.

Each cabinet shall be fitted with their own PE cable 16mm<sup>2</sup> (5 AWG) to the telecommunications ground bar. The physical length of this cable will be dependant on the type of earthing network employed. It is therefore essential that the system designer liaise with a suitably qualified electrical engineer taking into account the requirement of the relevant local Country codes and Standards listed in this document

The earth cable from the telecommunications ground bar shall not be less than 25mm<sup>2</sup> (3AWG).  
  
It is essential that the system designer liaise with a suitably qualified electrical engineer as the physical diameter of the cable may increase dependant on the distance to the Customer Main Earth Terminal.

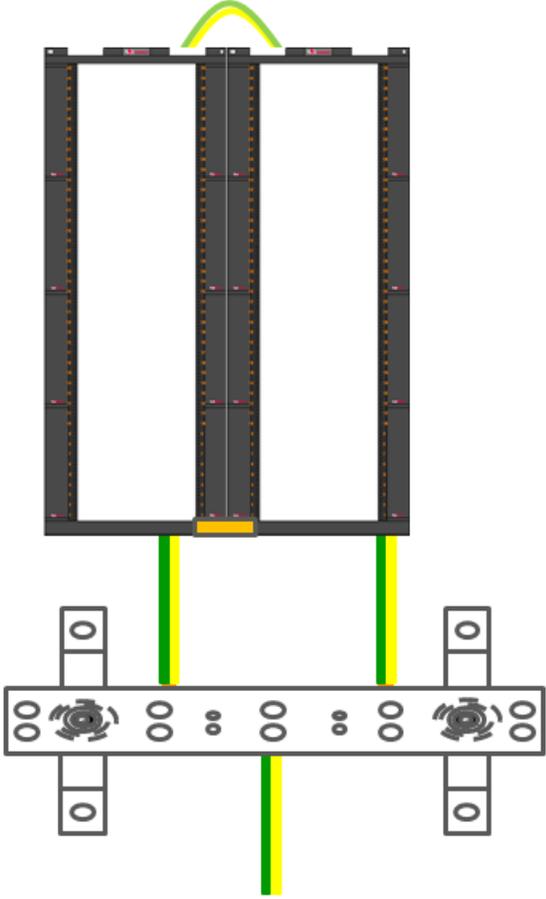


Figure 1: Example of cabinet bonding (bayed cabinets)

### Definitions:

Protective earth (PE) connections ensure that all exposed conductive surfaces are at the same electrical potential as the surface of the Earth, to avoid the risk of electrical shock if a person touches a device or containment system in which a fault has occurred

The functional earth (FE) connection serves a purpose other than providing just protection against electrical shock. The purpose of the functional earth connections in this field bulletin may be required by the cabinets, frames or racks as an electromagnetic interference filter (reducing the effects of electrical noise and harmonics). The FE may also be provided by the PE.

### Sub-Note:

The UK standards (BS 6701: 2010 Telecommunications equipment and telecommunications cabling – Specification for installation, management and maintenance), where the FE conductor is provided as a separate cable, the cable shall be:

- Cream in colour (sourced by the installation contractor)
- Continuously marked with the wording 'TELECOMMUNICATIONS FUNCTIONAL EARTH'

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If you have any questions pertaining to this bulletin or other related issues, please contact our Technical Services Staff at The Siemon Company at the EMEA Head Office at +44 (0)1932 571771 or the US Corporate Head Office in Watertown CT at +01-800-365-2285 or your regional international sales office.