



**International Telecommunication Union**

# **ITU-T Study Group 05**

## **Earthing and bonding**

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**Switzerland**

**Technical Session, Protection  
Buenos Aires, 12/04/2010**

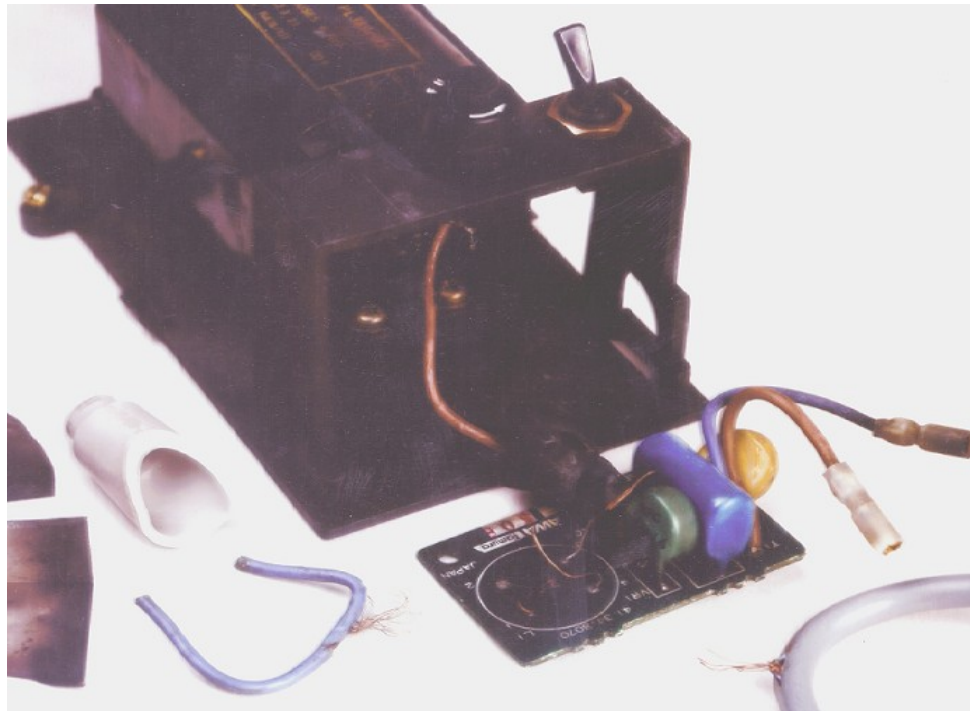


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## Introduction

Earthing and especially bonding are the prerequisite for the protection of equipments. It insures that no dangerous voltages (both for the equipment and for people) appear between ports.

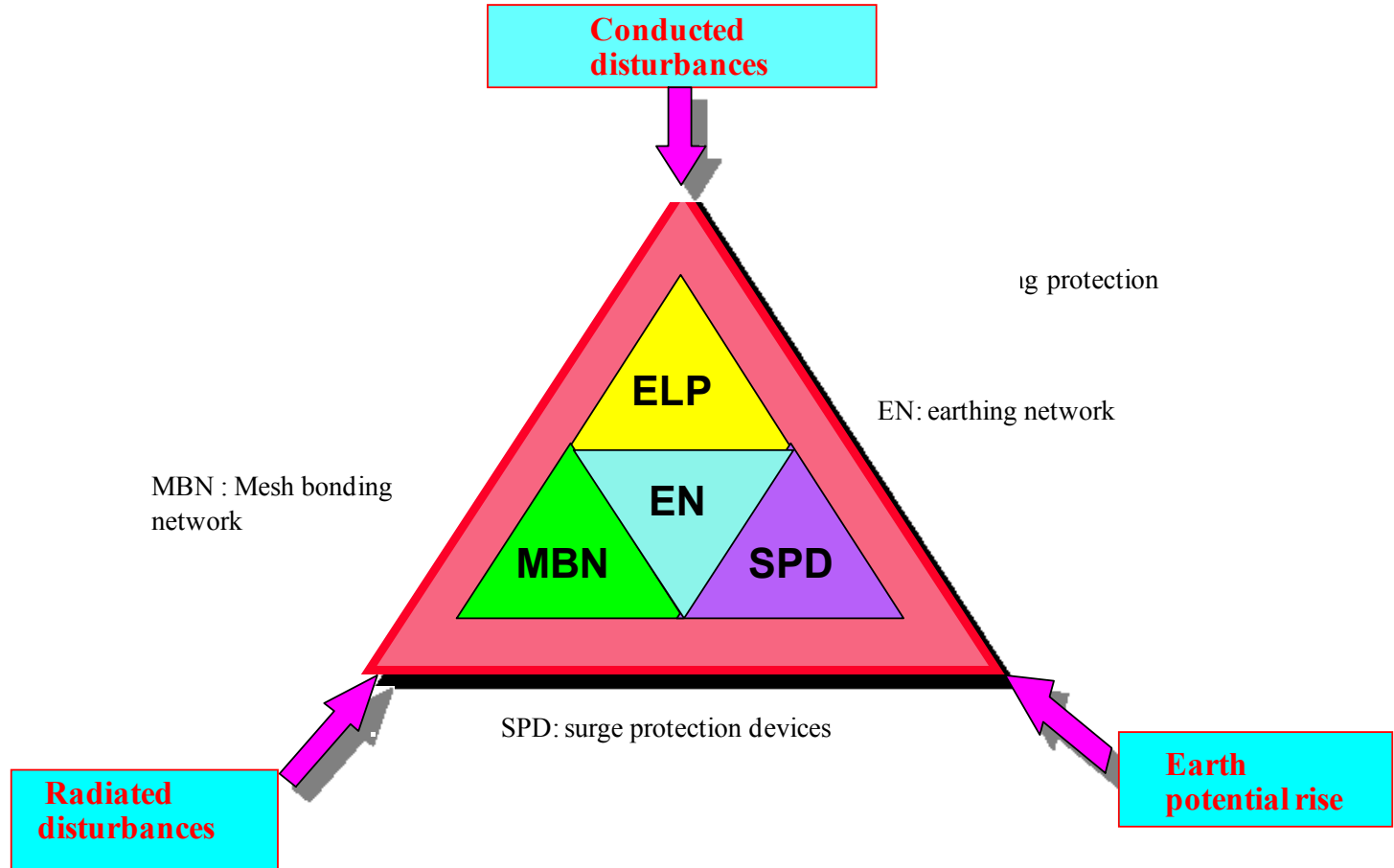




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# Relationship between earthing, bonding and surges





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# Relevant Recommendations

K.27: Bonding configurations and earthing inside a telecommunication building (1996)

K.35: Bonding configurations and earthing at remote electronic sites (1996)

K.56: Protection of radio base stations against lightning discharges (2010)

K.66: Protection of customer premises from overvoltages (2004)

Earthing and Bonding handbook (2003)

IEC 60364-4-44: Protection against voltage disturbances and electromagnetic disturbances (2007)



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# Differences between earthing and bonding

Though both terms are commonly used together, a clear distinction should be done

**Bonding:** Electrical connection putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential.

**Earthing:** Connecting the bonding network or bonding conductor to an earth electrode to provide a defined path for the current flow and reduce potential differences



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# Differences between earthing and bonding

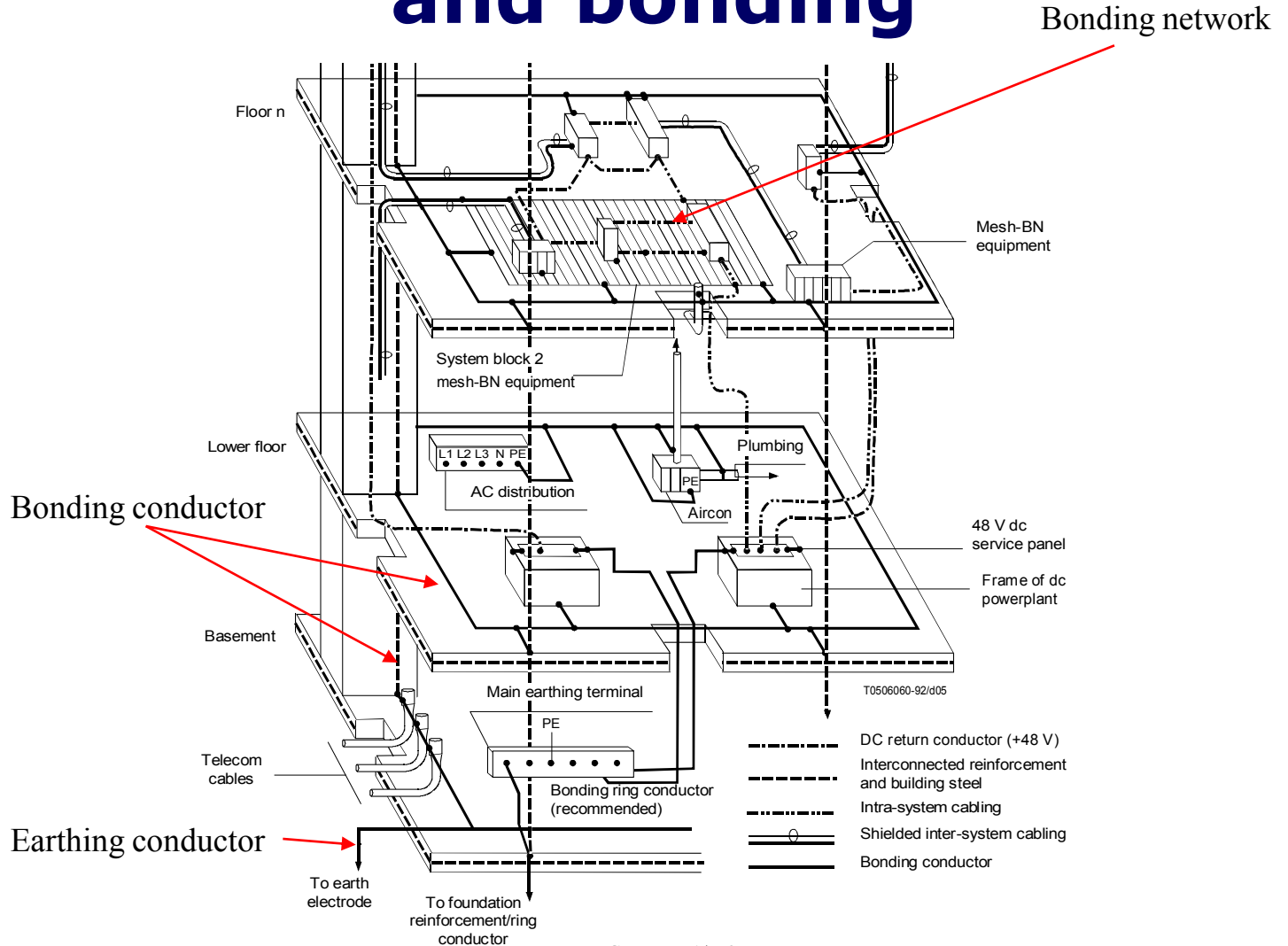


FIGURE B.1/K.27

Mesh-BN installation inside a telecommunication building

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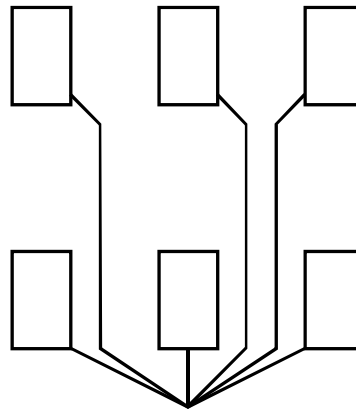
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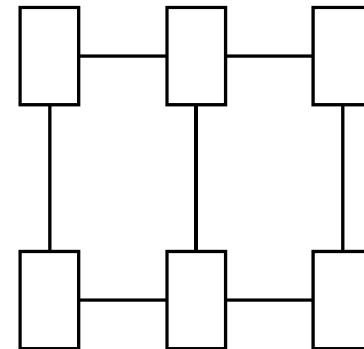
# Bonding networks

- Bonding is key to survive to overvoltages and overcurrents
- As shown in the film, earthing is secondary.

There are mainly 2 bonding networks' families



Star topology



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Mesh topology

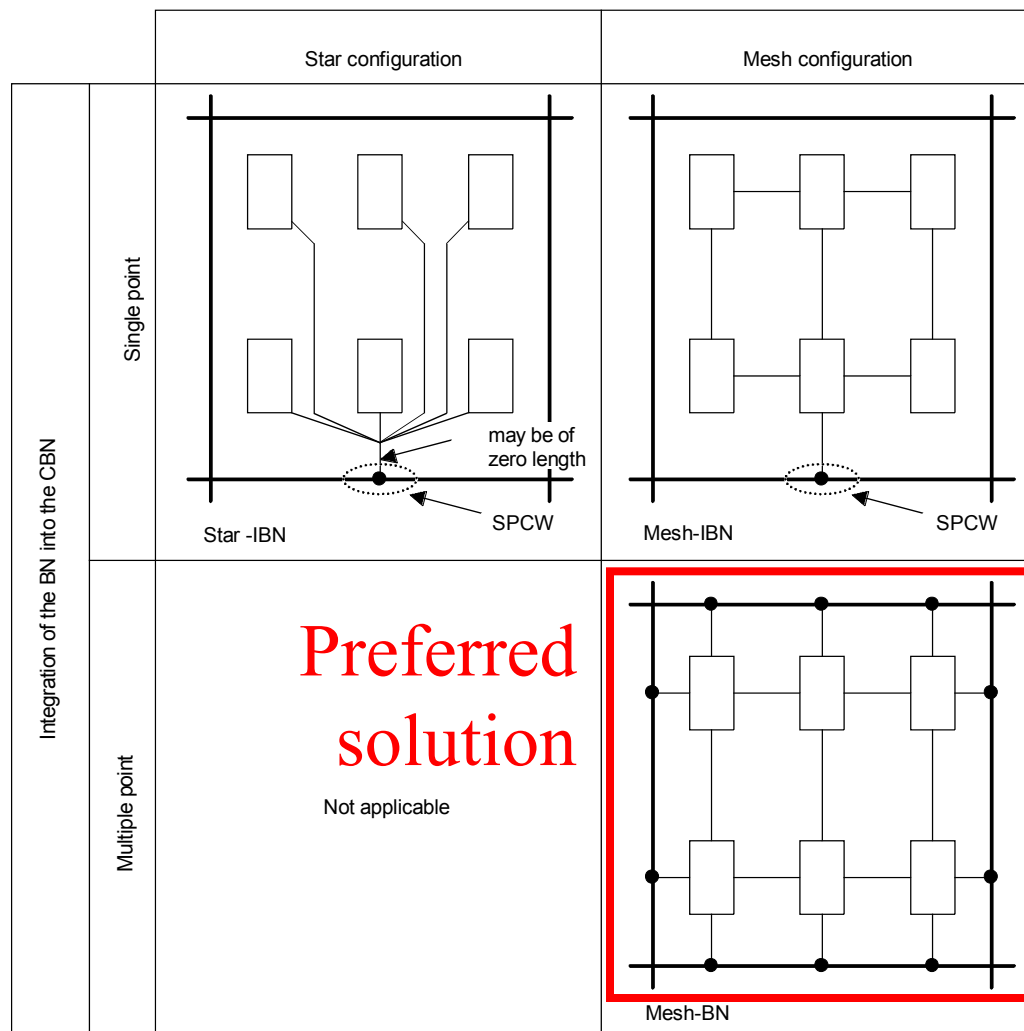
- o In addition, one can either link all connections together or isolate them from the structure



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# Bonding networks







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## Maintenance of bonding networks

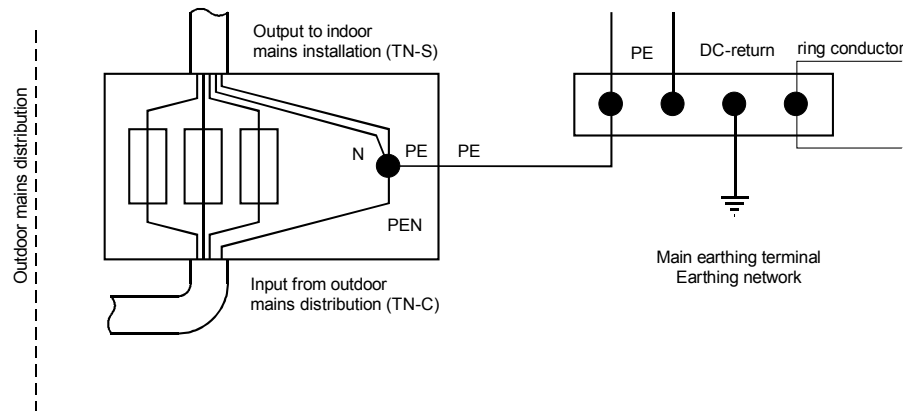
- Small changes that occur in the CBN generally have only a small effect on its shielding capability.
- Additional shielding may be obtained by introduction of additional conductors (e.g. bonding conductors, cable trays, and conduit). Such modifications are usually straightforward.
- IBN systems are more difficult to maintain, because craft-person activity is liable to result in inadvertent interconnections between IBN and CBN, violating the desired single point connection, and introducing surge currents into the IBN.
- It is recommended that systematic verification be performed on all bonding configurations and earthing connections inside a telecommunications building.



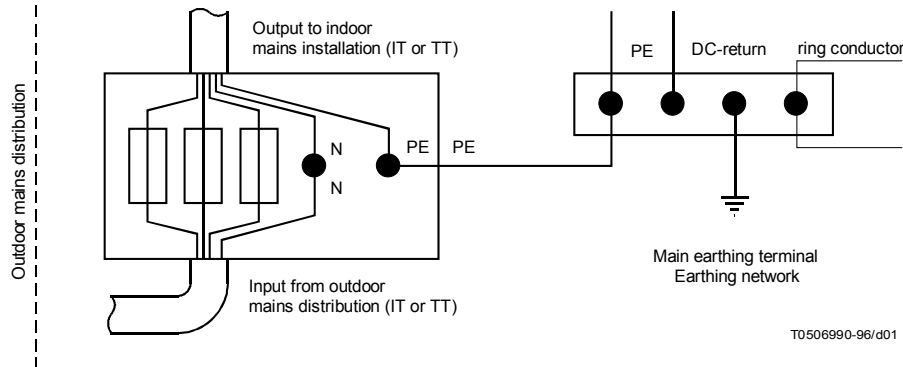
# AC power distribution

- From an EMC perspective, TN-S systems should be preferred

Mode 2: TN-C/TN-S



Mode 3: IT/IT or TT/TT



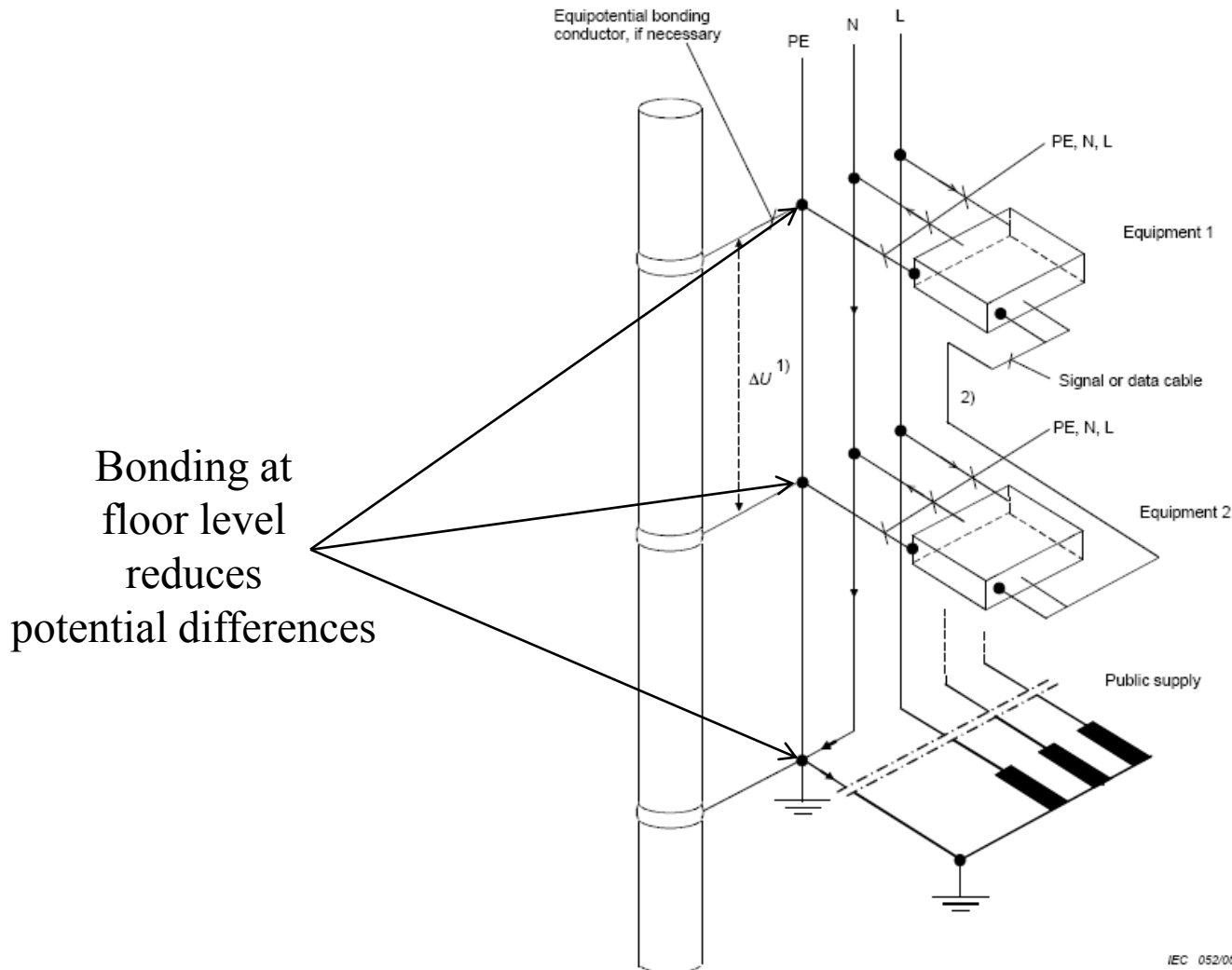
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# TN-S inside the building



IEC 052/00



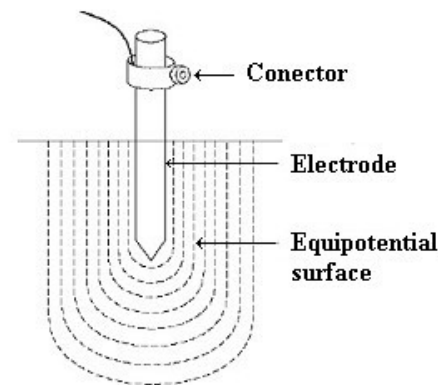
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## Earthing

The main functions of earthing are:

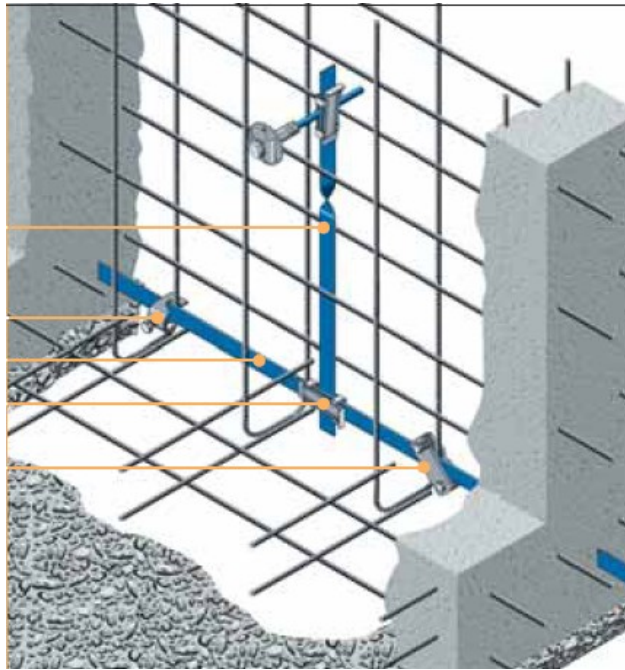
- Provide a safe path to the flow of surge current to earth (e.g., from lightning)
- Reduce the current and voltage propagating along a transmission line (e.g., a telecom cable)
- Reduce the voltage between the telecom line and local earth
- Provide sufficient current for the tripping of circuit breakers in case of a power to earth fault.



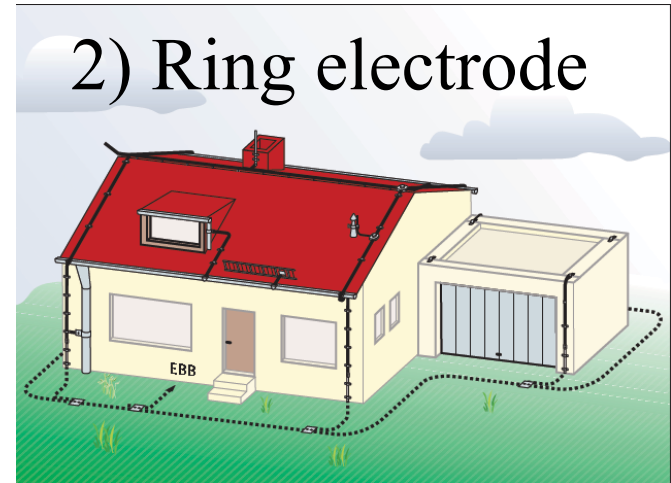
# Earthing

In the preference order

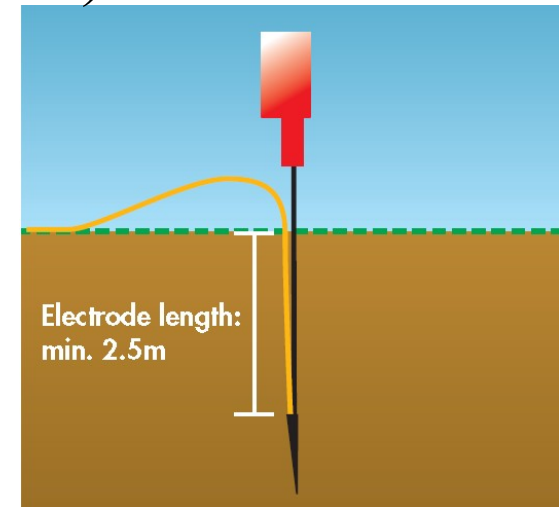
## 1) Armoured concrete



## 2) Ring electrode



## 3) Vertical rod

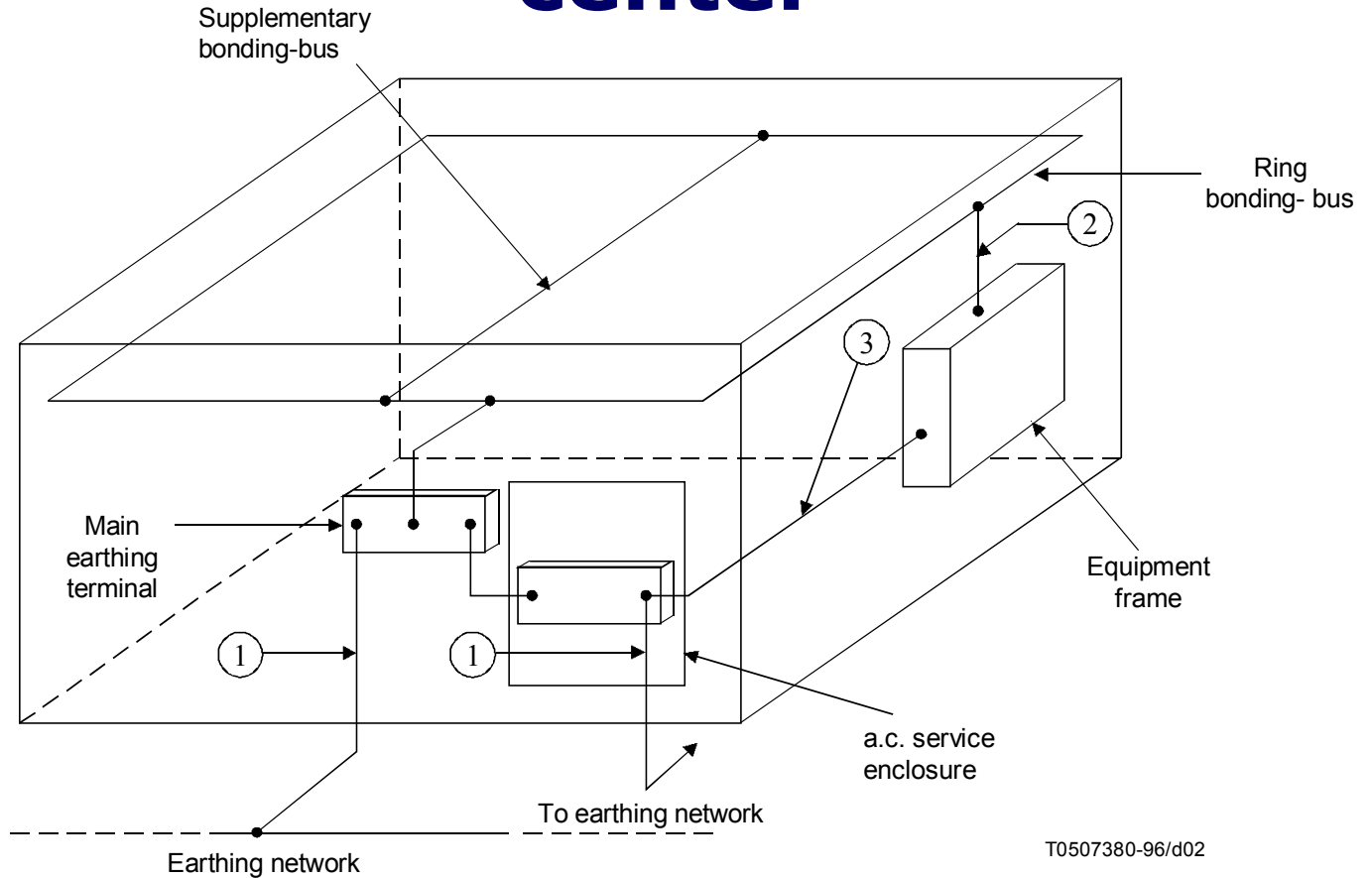




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# Example for a small telecom center



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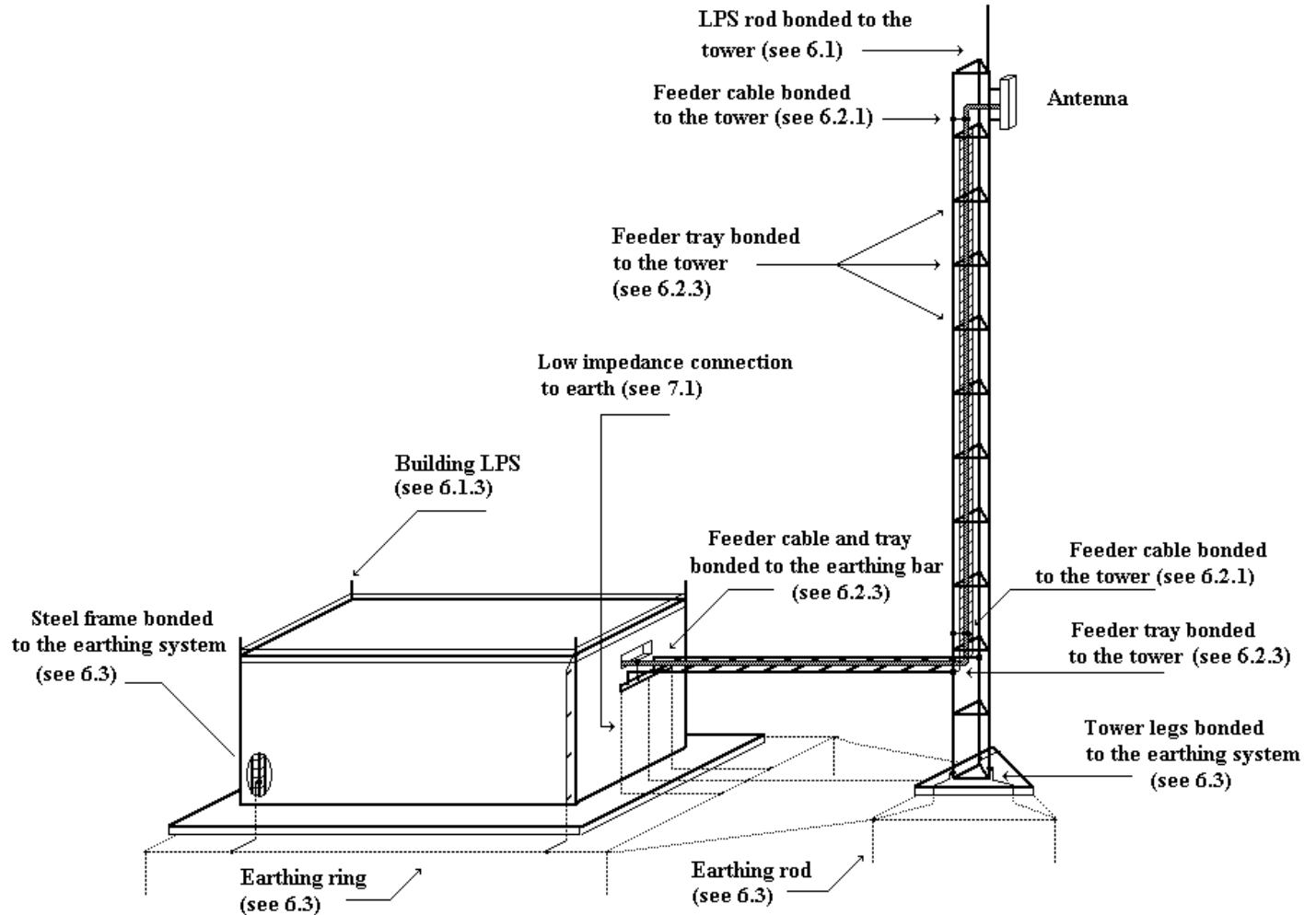
- ① Earthing conductor
- ② Equipment bonding conductor
- ③ Protective conductor



# Example for a base station

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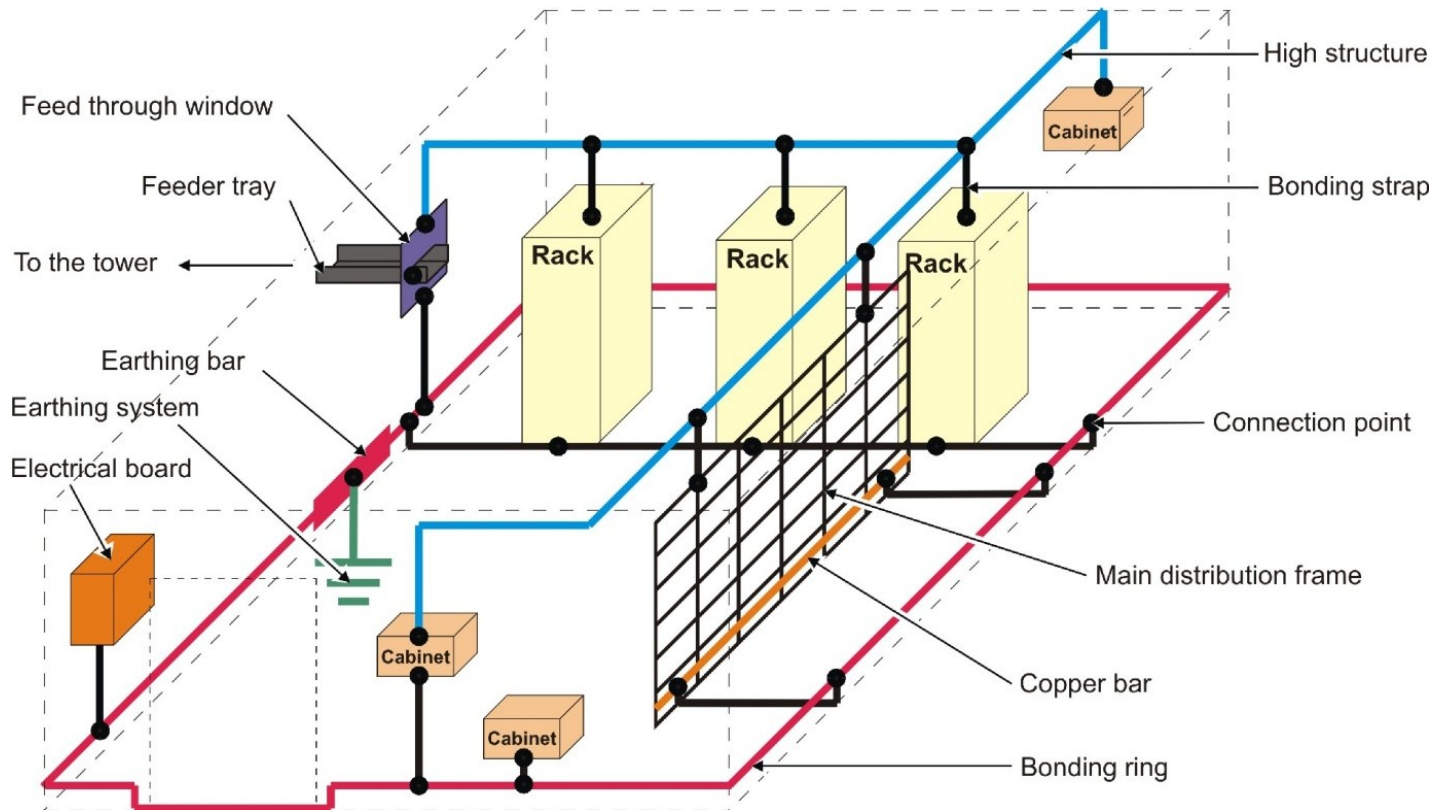




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# Example for a base station







# Example for a base station

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# Overvoltage protection

- It isn't possible to integrate live conductors into the bonding network
- In order to limit the overvoltage to a defined level, surge protection devices are required