atis

PROTECTION
ENGINEERS
GROUP

HUNTSVILLE, AL - MARCH 13-15, 2018

Mesh Bonded vs Isolated Bonded Earthing Network for Indoor Grounding

Rohit Narayan
Global Telecom, ERICO PENTAIR
Melbourne, Australia
Rohit.narayan@pentair.com

Mesh Bonded vs Isolated Bonded Earthing Network for Indoor Grounding

Rohit Narayan
Global Telecom, ERICO PENTAIR
Melbourne, Australia
Rohit.narayan@pentair.com

Learning Objectives

At the end of this presentation you will be able to:

- Understand Star-IBN, Mesh-IBN and Mesh-BN methods of indoor grounding as per ITU K27 recommendations
- Understand indoor grounding arrangements as per TIA607 , IEC30129 and BICSI 607 Standards
- Understand indoor grounding arrangement in Telecom Carrier standards including Motorola R56, ATT&T Standards, Verizon Standards
- Understand advantages and disdvantages of MESH vs Star-IBN Systems

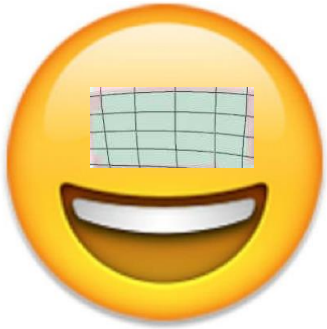
Parts of Grounding System at Telecom Facility

1. Indoor grounding arrangement
2. Outdoor grounding arrangement
3. AC surge protection for incoming power and DC surge protection for tower mounted radio units.
4. Surge protection & grounding of telephone lines, data lines and RF feeders.
5. Direct strike lightning protection

MESH AND STAR BONDING FORM PART OF THE INDOOR GROUNDING

ERICO

Outline

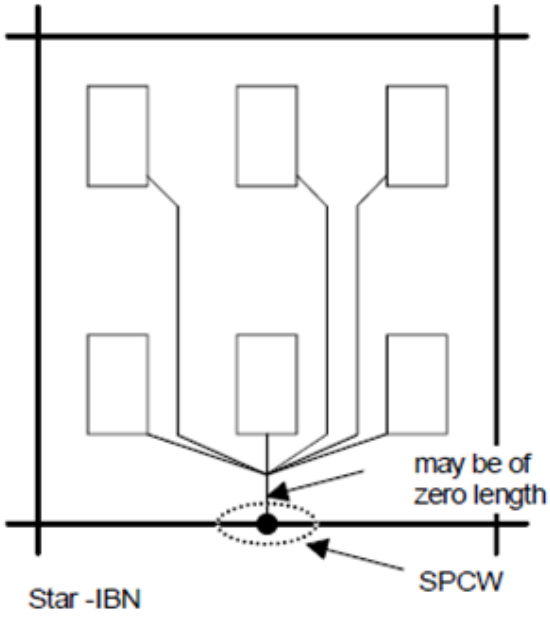


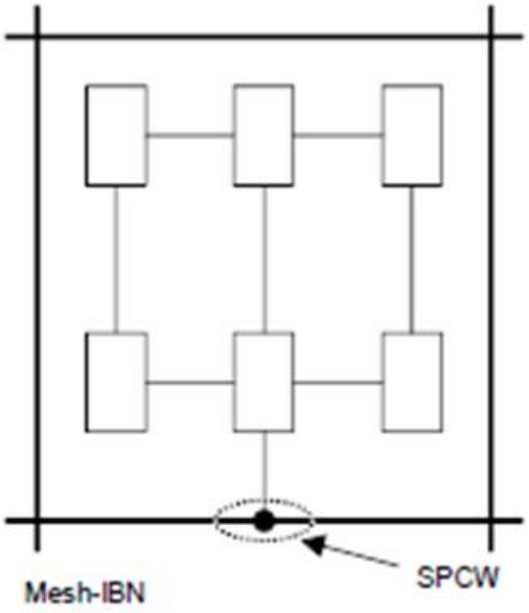
- Star-IBN, Mesh-IBN and Mesh-BN methods of indoor grounding as per ITU K27 recommendations
- Indoor grounding arrangements as per TIA606, BICSI 607, IEC30129 Standards
- Indoor grounding arrangement in Motorola R56, ATT&T Standards, Verizon Standards, Advantages & disadvantages if MESH & STAR IBN in telecommunications

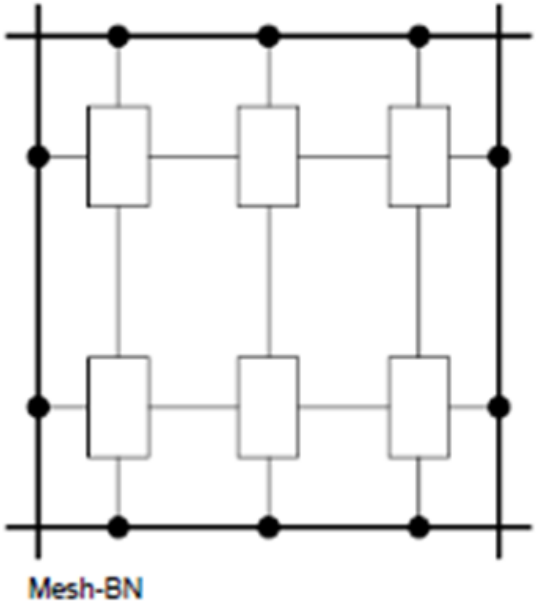
https://www.itu.int/ITU-T/recommendations/index.aspx?ser=K

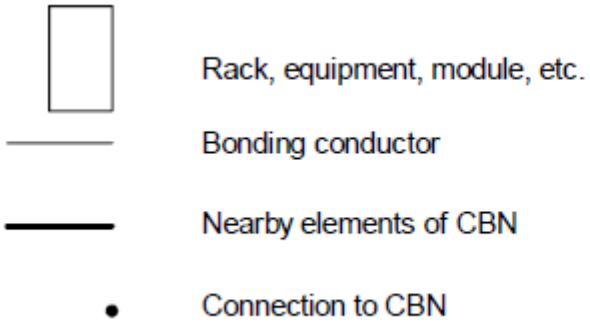
ITU was founded in Paris in 1865 as the International Telegraph Union. It took its present name in 1934, and in 1947 became a specialized agency of the United Nations.

Mesh and Star Methods As per ITU K27



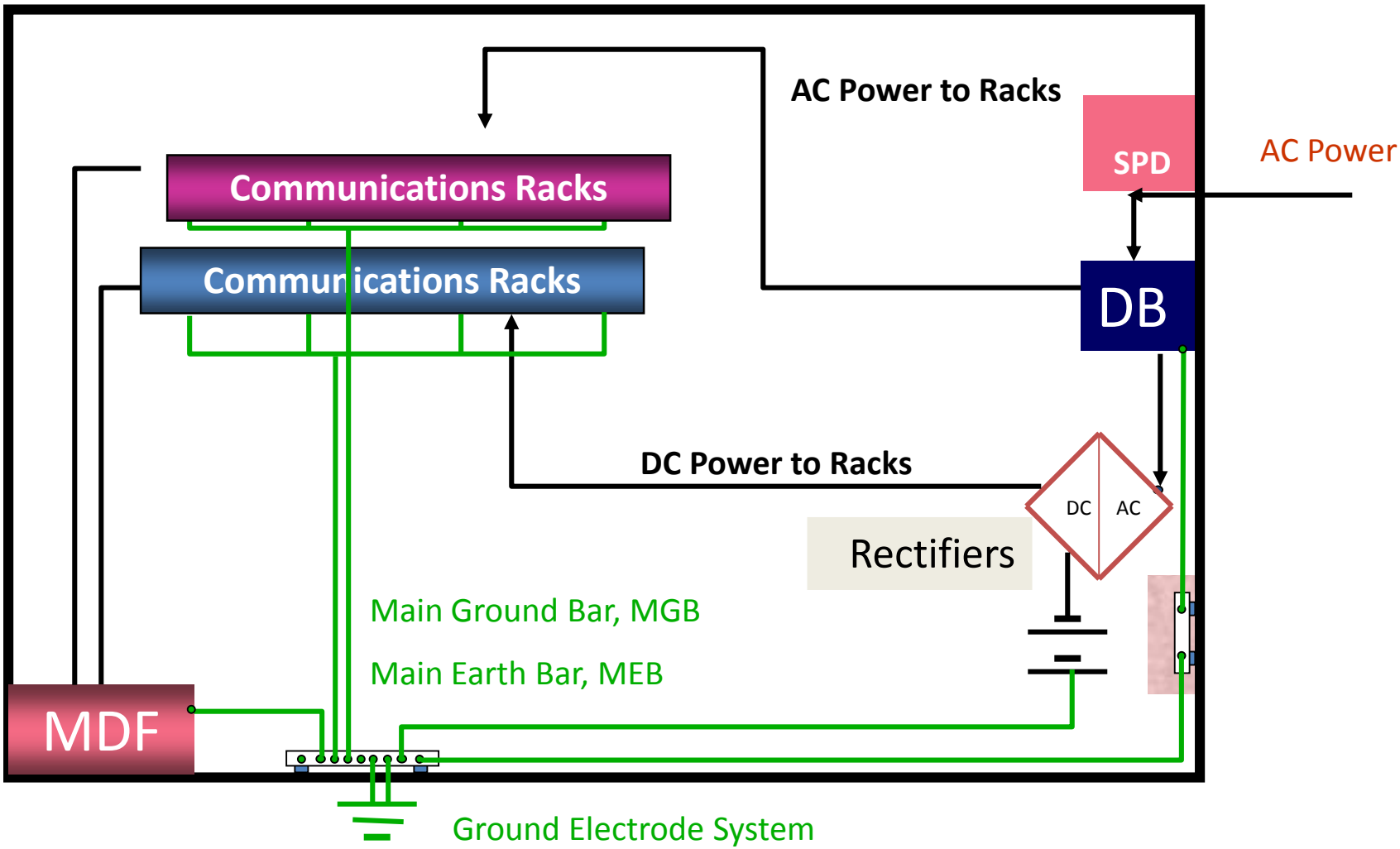




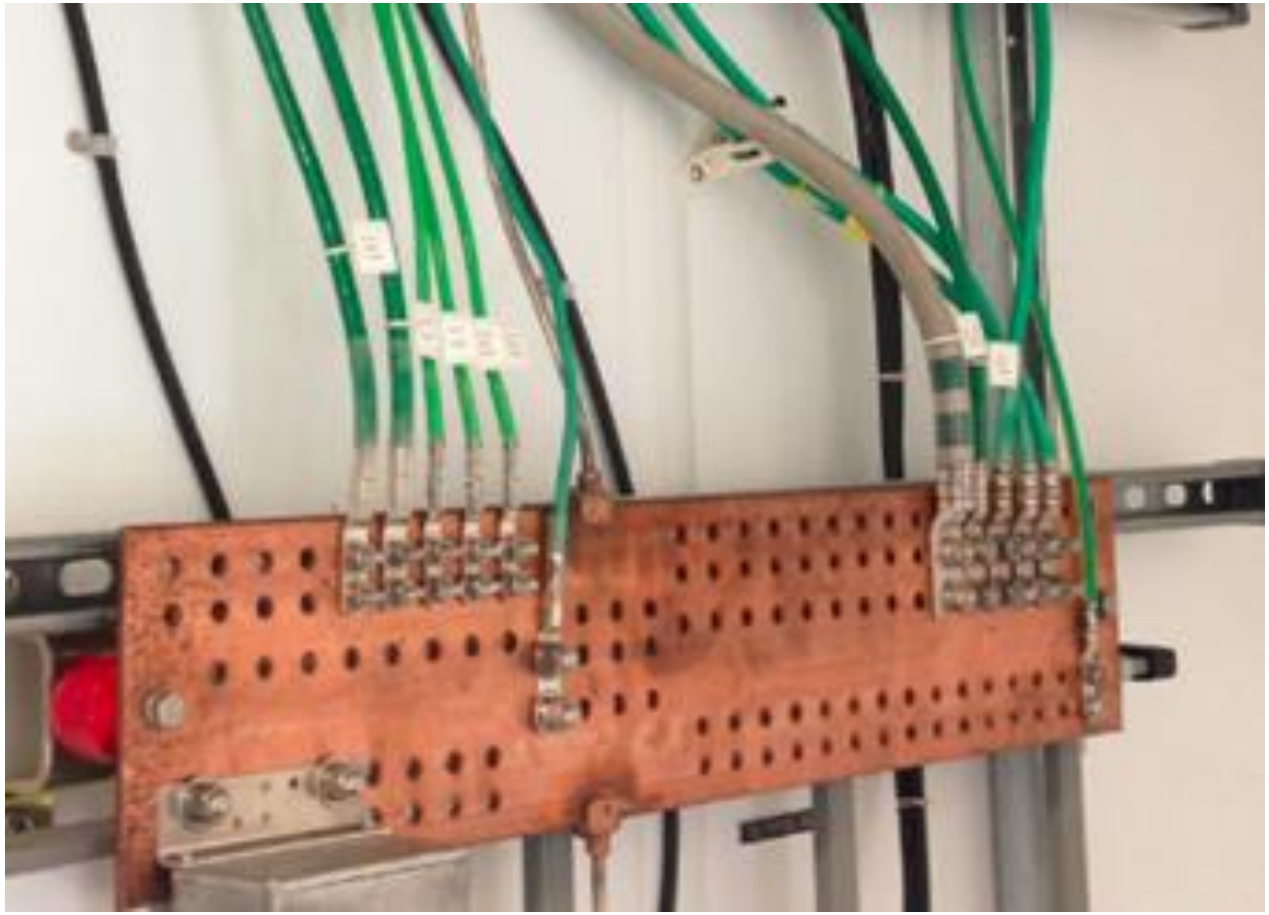


BN	Bonding Network
CBN	Common Bonding Network
IBN	Isolated Bonding Network
SPCW	Single Point Connection Window

Example Star IBN



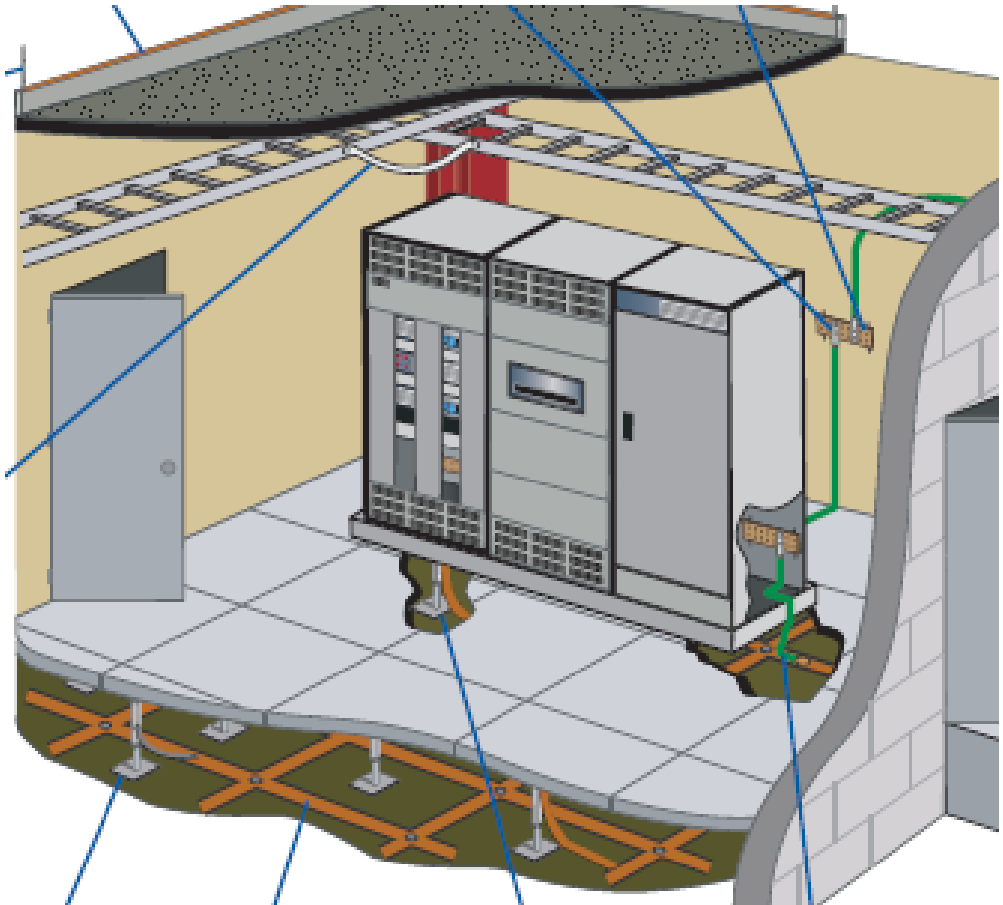
Example – Star IBN



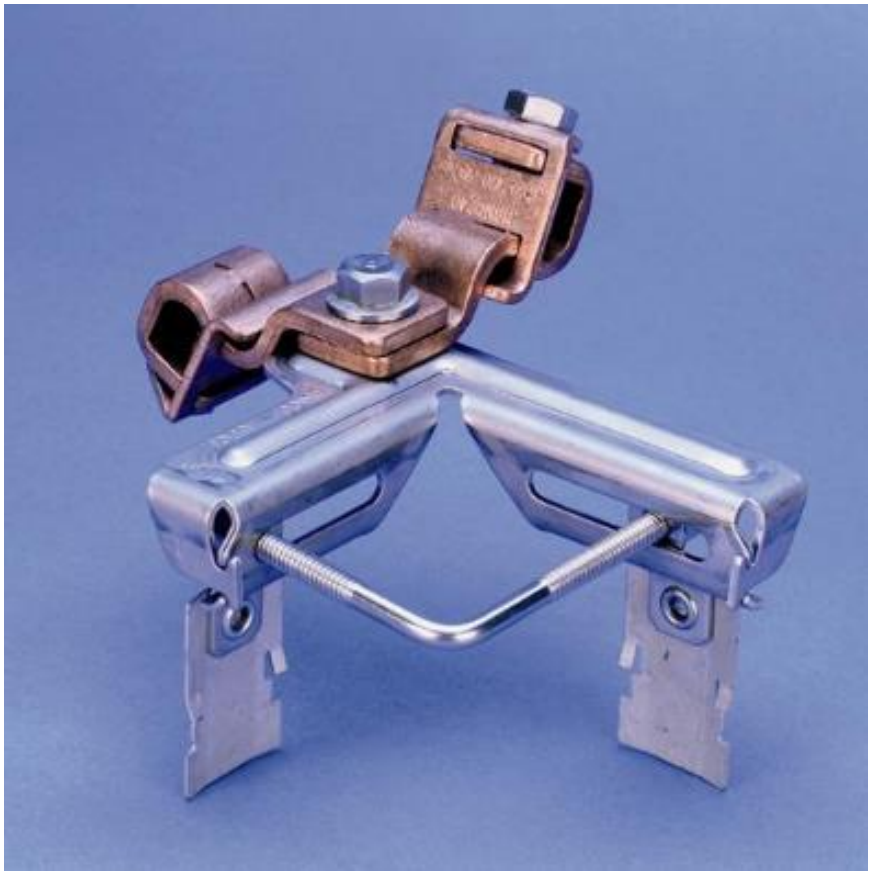
Typical Above Floor SPCW

ERICO

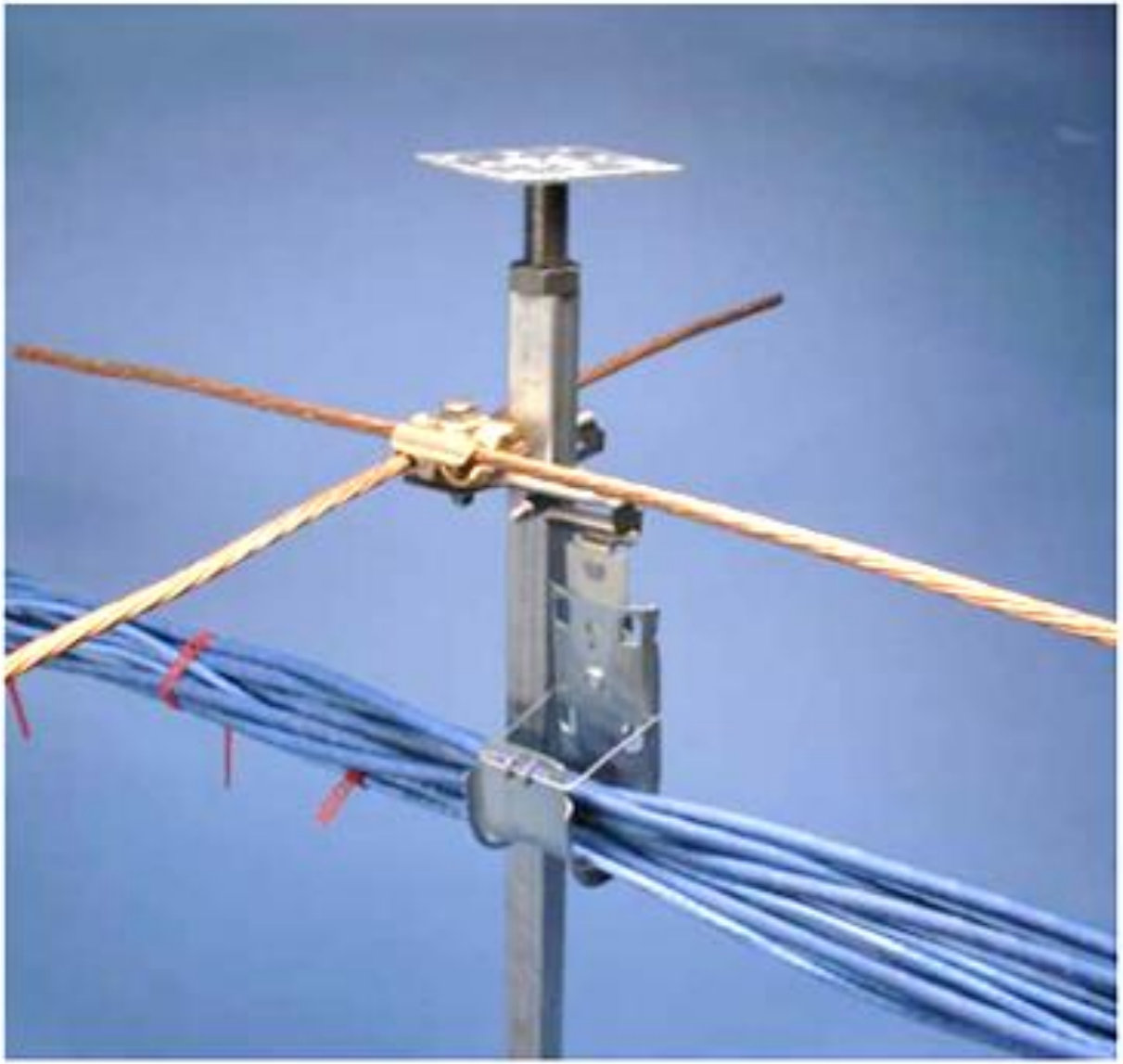
Example : Mesh Bonded Network



MESH BONDING METHOD MECHANICAL



MESH BONDING CLAMP



TIA 607C Generic Telecommunications Bonding & grounding for Customer Premises

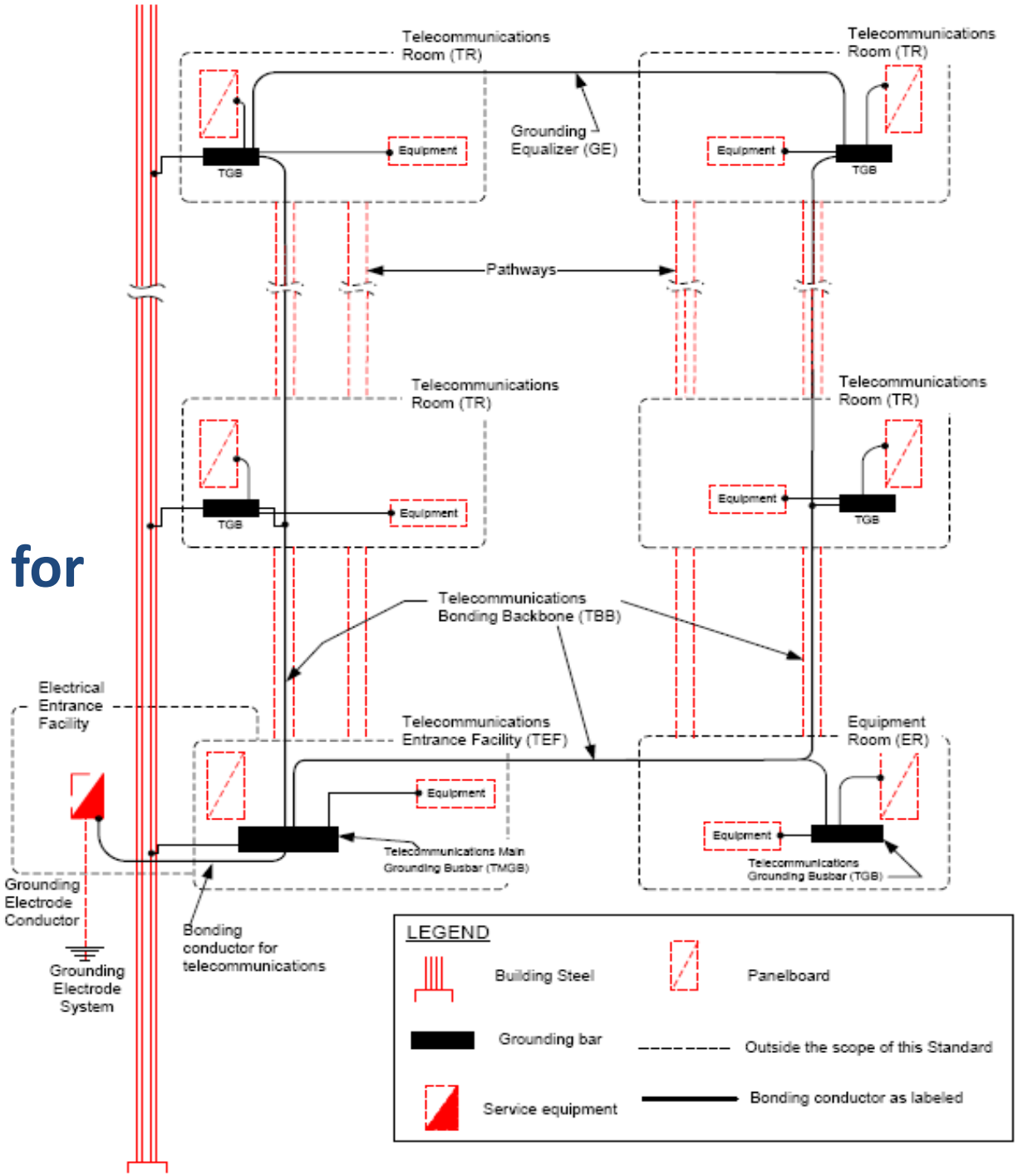
Purpose

The purpose of this Standard is to enable and encourage the planning, design, and installation of generic telecommunications bonding and grounding systems within premises with or without prior knowledge of the telecommunications systems that will subsequently be installed.

ERICO

TIA 607C Generic Telecommunications Bonding & grounding for Customer Premises

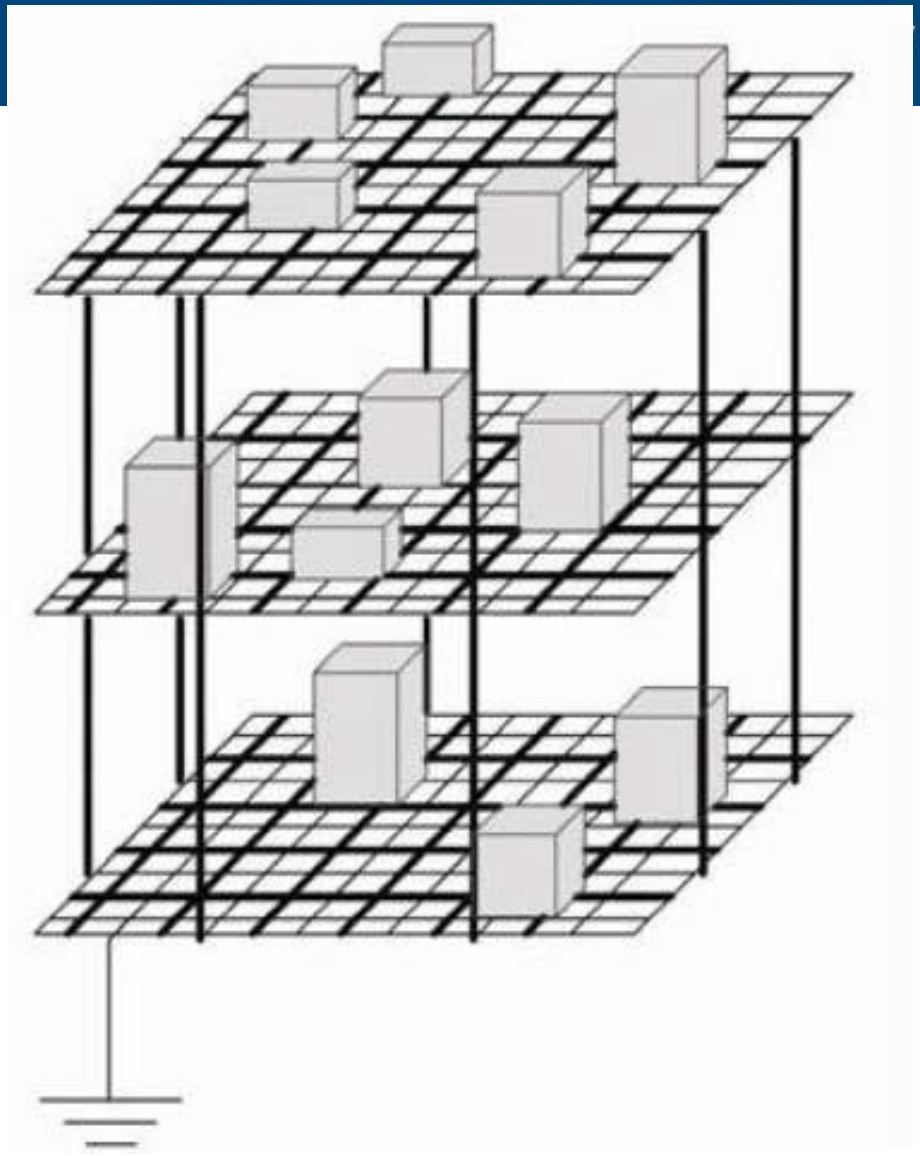
Star IBN Example



TIA 607C Generic Telecommunications Bonding & grounding for Customer Premises

7.1.3 COMPUTER ROOMS

Each computer room shall contain a TGB (or TMGB when specified in the design) and should also contain a supplementary bonding network (MESH BONDED NETWORK) that is bonded (and thus becomes grounded) to the TGB or TMGB.



American National Standard

ANSI/NECA/BICSI 607-2011

Standard for
Telecommunications Bonding and Grounding
Planning and Installation Methods
for Commercial Buildings

ERICO

ANSI/NECA/BICSI 607

Strong consistency with TIA 607 in methods and terminology used

Added clauses to signify that publication is intended to conform to the National Electrical Safety Code® and National Electrical Code®.

Local code requirements shall be followed. ……always review the local code requirements with the local authority having jurisdiction (AHJ) before proceeding with the installation

Limit on TBB size to 3/0 as opposed to 750KCMils for TIA

Quality Control – Best design can be undone by poor implementation, a majority of NECA/BICSI 607 details installation methods and practices to minimize potential grounding system failure.

IEC 30129 Standard

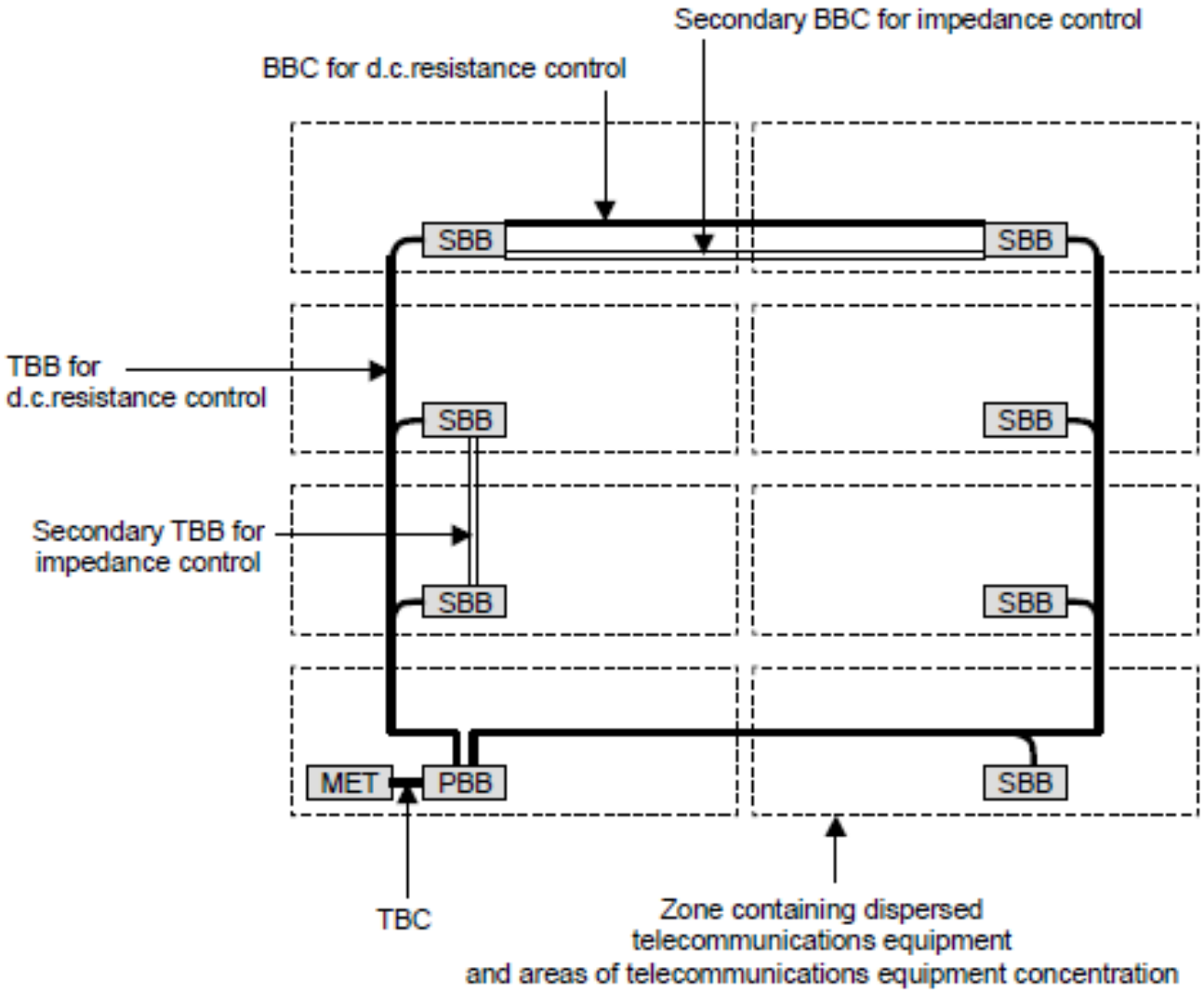
INTERNATIONAL STANDARD

ISO/IEC FDIS 30129

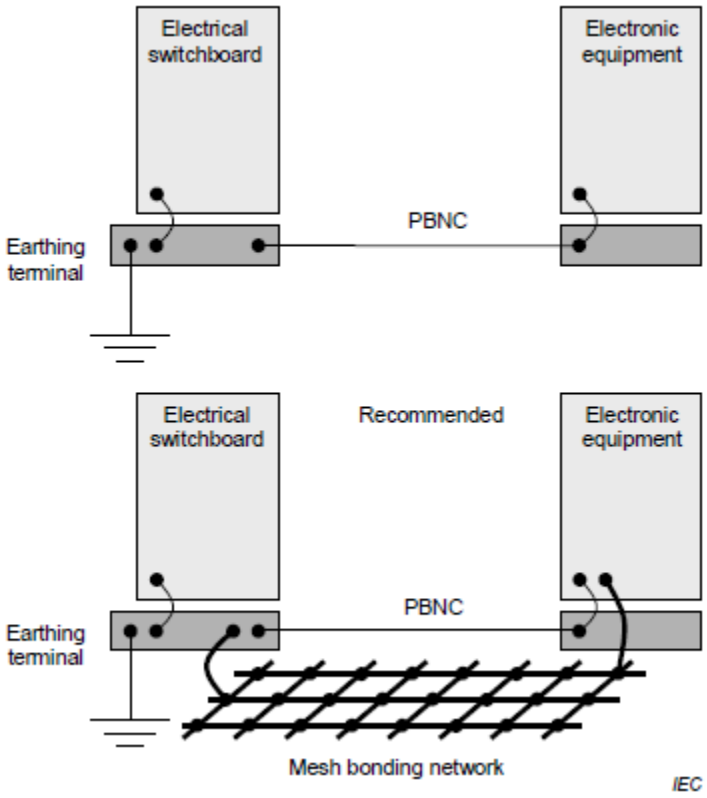
Information technology — Telecommunications bonding networks for buildings and other structures

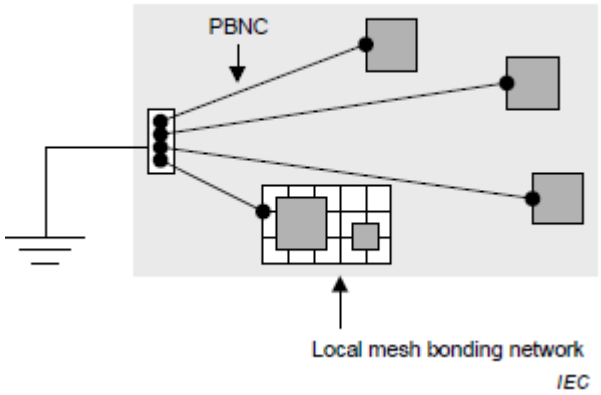
ERICO

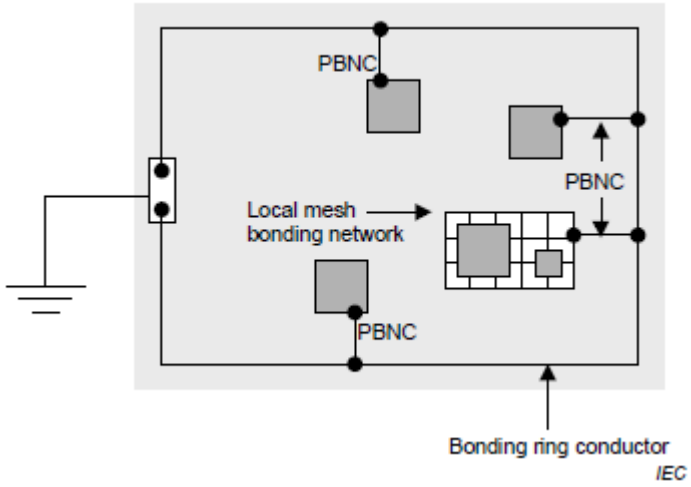
ISO/IEC3029 Star IBN Example



IEC30129 Mesh Bonded Superimposed on Star IBN





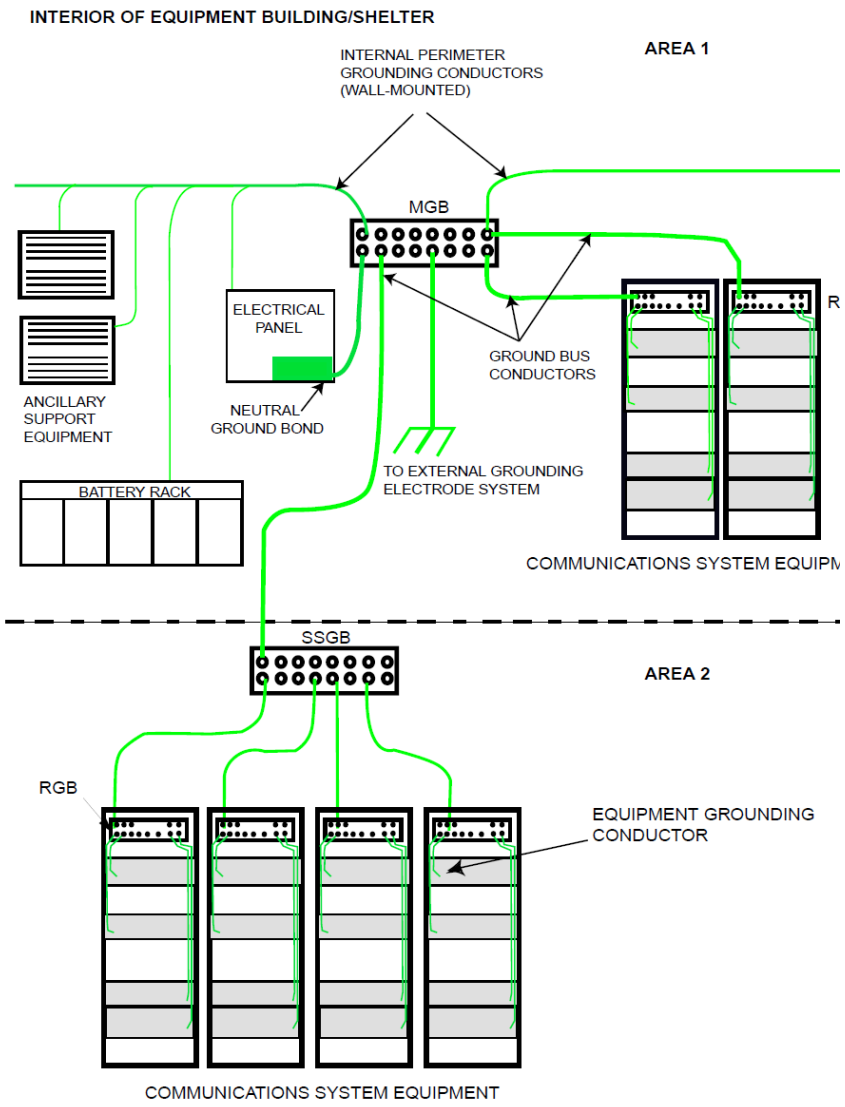


Star IBN Examples From Telecom Carriers

1) **Telcordia** GR295 Mesh and Isolated Bonding Networks: Definition and Application to Telephone Central Offices
2) **Motorola** R56- Standards & Guidelines for Communications Sites
3) **AT&T** : ATT-TP-76416 Grounding and Bonding Requirements for Network Facilities
4) **VERIZON**: VZ 330-100-100 CENTRAL OFFICE GROUNDING STANDARDS FOR NEW VERIZON FACILITIES

MOTOROLA R56

USES STAR ISOLATED BONDED NETWORK



ERICO

AT&T: ATT-TP-76416
GROUNDING AND BONDING REQUIREMENTS FOR NETWORK FACILITIES

- Uses Isolated Bonded Network
- Can be Star-IBN or MESH-IBN or a Combination of both
- Driven historically by equipment grounding need. ie. certain equipment needed mesh bonding network installed below raised floor
- Examples will show how the Star-IBN and MESH – IBN come together
- New Terminology
  - OPGP – Office Principal Ground Point
  - COGB – Central Office Ground Bar

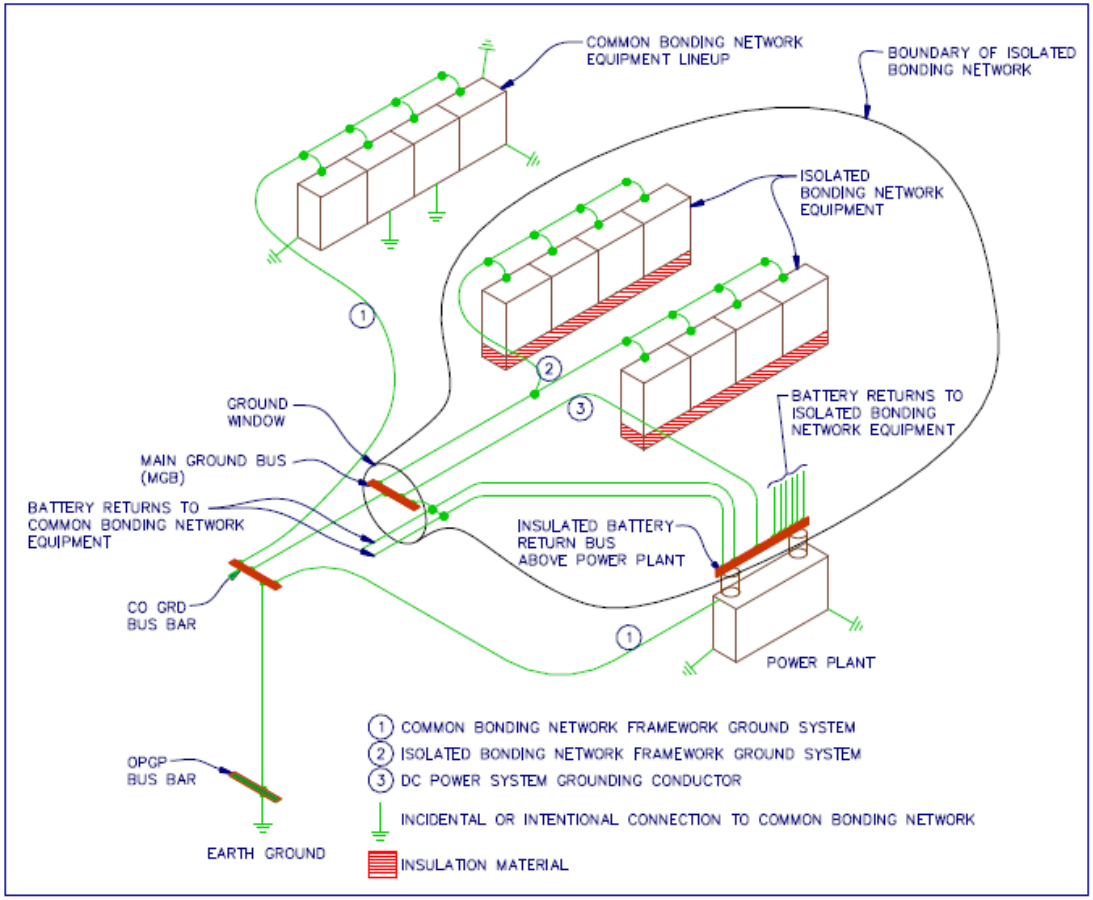


Figure 4-1 Relationship Between Common and Isolated Bonding Networks (MGB is located remote from equipment and power plant)

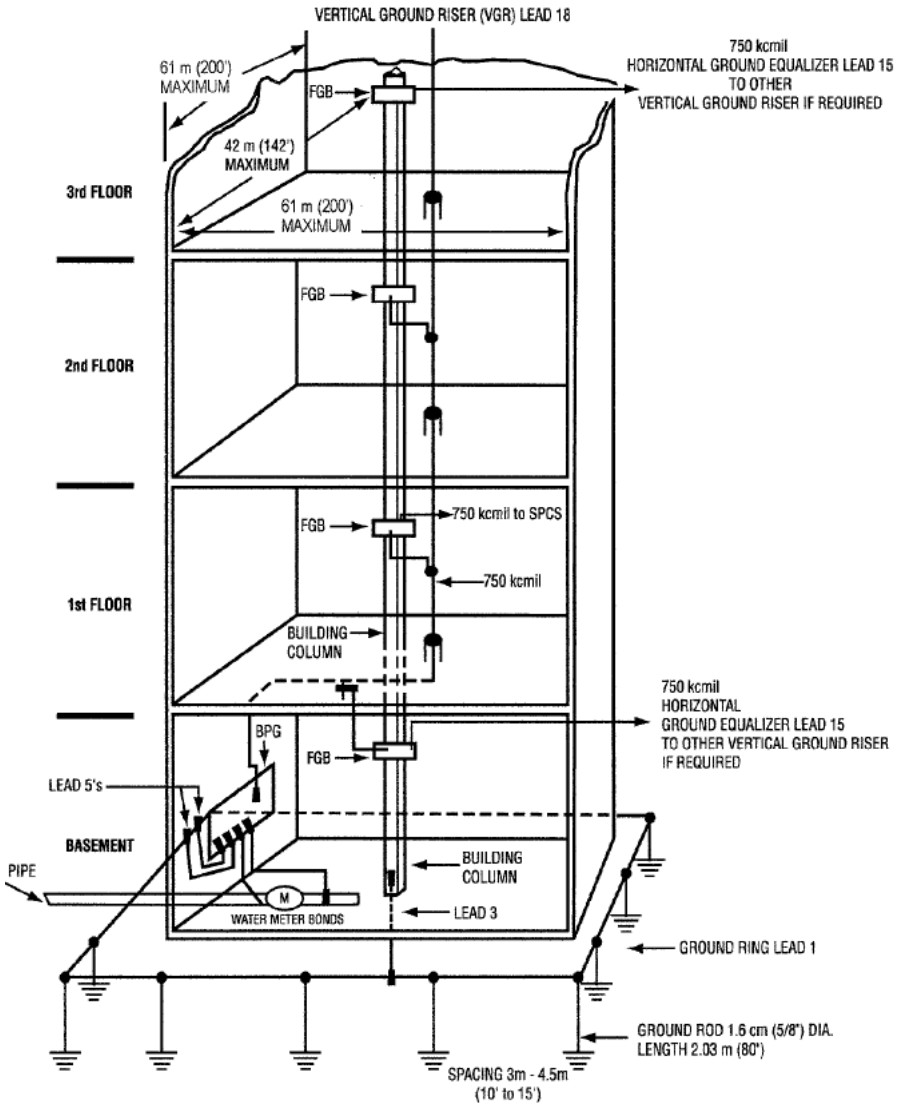
AT&T: ATT-TP-76416 GROUNDING AND BONDING REQUIREMENTS FOR NETWORK FACILITIES

ERICO

VERIZON VZW 330-100-11

CENTRAL OFFICE LAYOUT USES Star IBN

MAINLY Star IBN System
NEW TERMINOLOGY
- FGB – Floor Ground Bar
- BGB – Basement Ground Bar



The advantages of the MESH Bonding

- Excellent signal reference within the equipment room provided the mesh was of sufficient low impedance
- Excellent noise and EMF control within the equipment room.
- Short piece of ground connection between equipment and the mesh usually installed below raised floor.
- Reduced effect of large voltages across ground loops
- Excellent surge and transient control
- Multiple paths for disturbances to travel, hence less stress on one path

The disadvantages on MESH Bonding

- Ground loops always exist and can be problematic if the impedance of the MESH is high
- The strong signal reference offered may not be necessary for balanced pair communications protocols on phone wires or CAT6 wires.
- May not be allowed by the jurisdiction or carrier standards.
- Elements of the Mesh Network may not have the current carrying capacity to handle prospective short circuit currents that could arise from the large prospective battery faults in telecommunications facilities
- AC faults that transfer to the MESH network can get transferred to the low voltage DC power system posing electrocution risks.
- Difficult or impossible to retrofit and install in building without raised floor.

Advantages of the Star-IBN system

- Ground loops can be avoided if attention is paid to isolation and cable lengths and sizes
- Can be easily designed to carry prospective battery DC fault currents in telecommunication equipment rooms through correct selection of conductor size.
- Can be dedicated for use on DC powered equipment only, hence reducing the risk of AC faults transferring to the low voltage DC system
- Easy to install and retrofit
- Can be installed in building without raised floors
- Works well on systems where the communication is via balanced pairs on twisted copper.
- Easy for installers of equipment to adhere to when installing equipment down the track from the inception of the site.

Disadvantages of the Star-IBN

- Do not provide a good signal reference for communication protocols that need a good reference.
- High impedance at equipment level at high frequencies
- Inadvertent ground loops can cause serious problems if not detected
- If Star IBN is used for DC system exclusively, there is no clarity on how AC equipment should be grounded and isolation of AC equipment can be burdensome.

ERICO

CASE STUDY : BENEFITS OF STAR ISOLATED BONDED NETWORKS

- The following examples will demonstrate examples of star IBN Systems and how these help reduce ground loops and hence equipment damage

ERICO

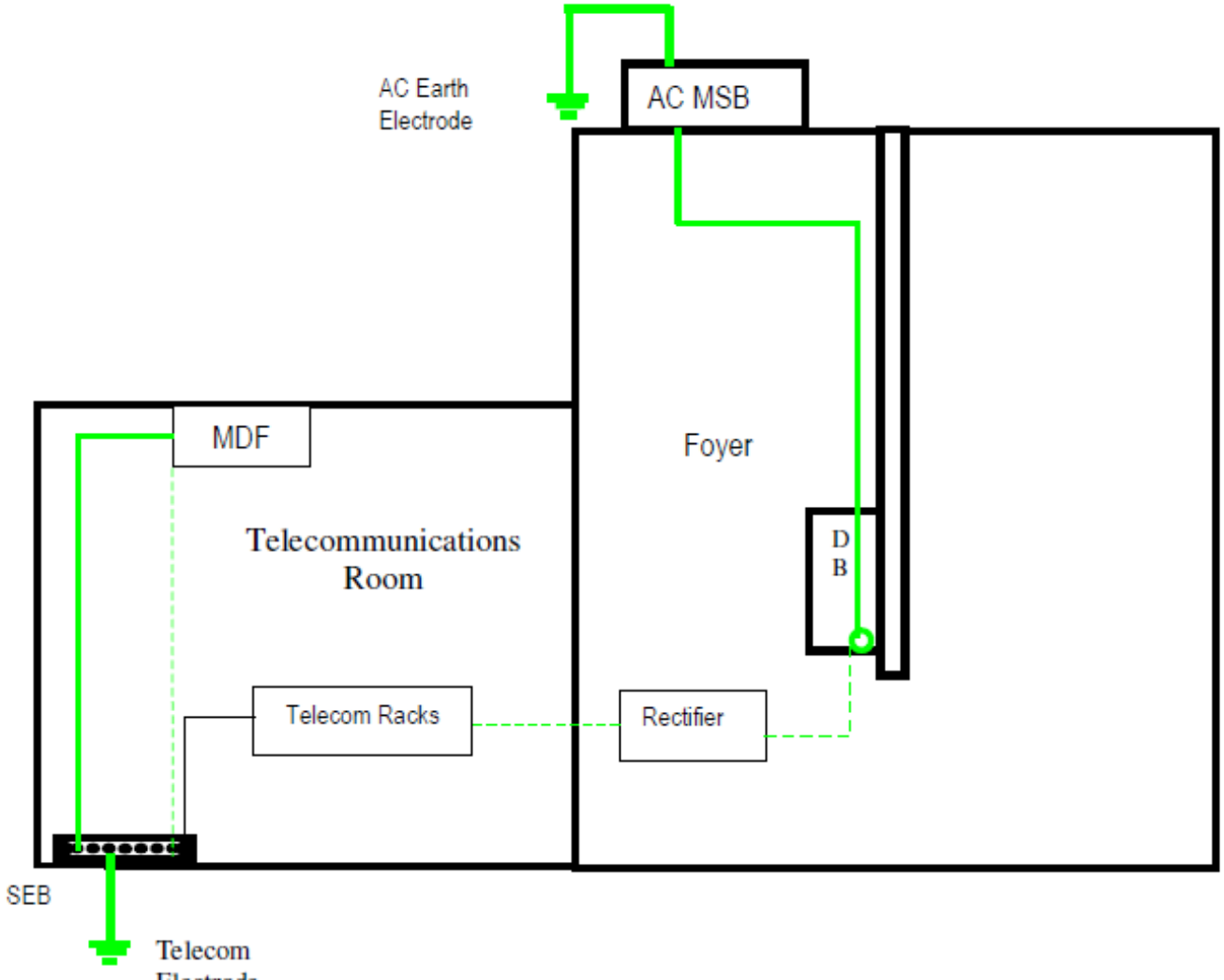
Star IBN Case Study

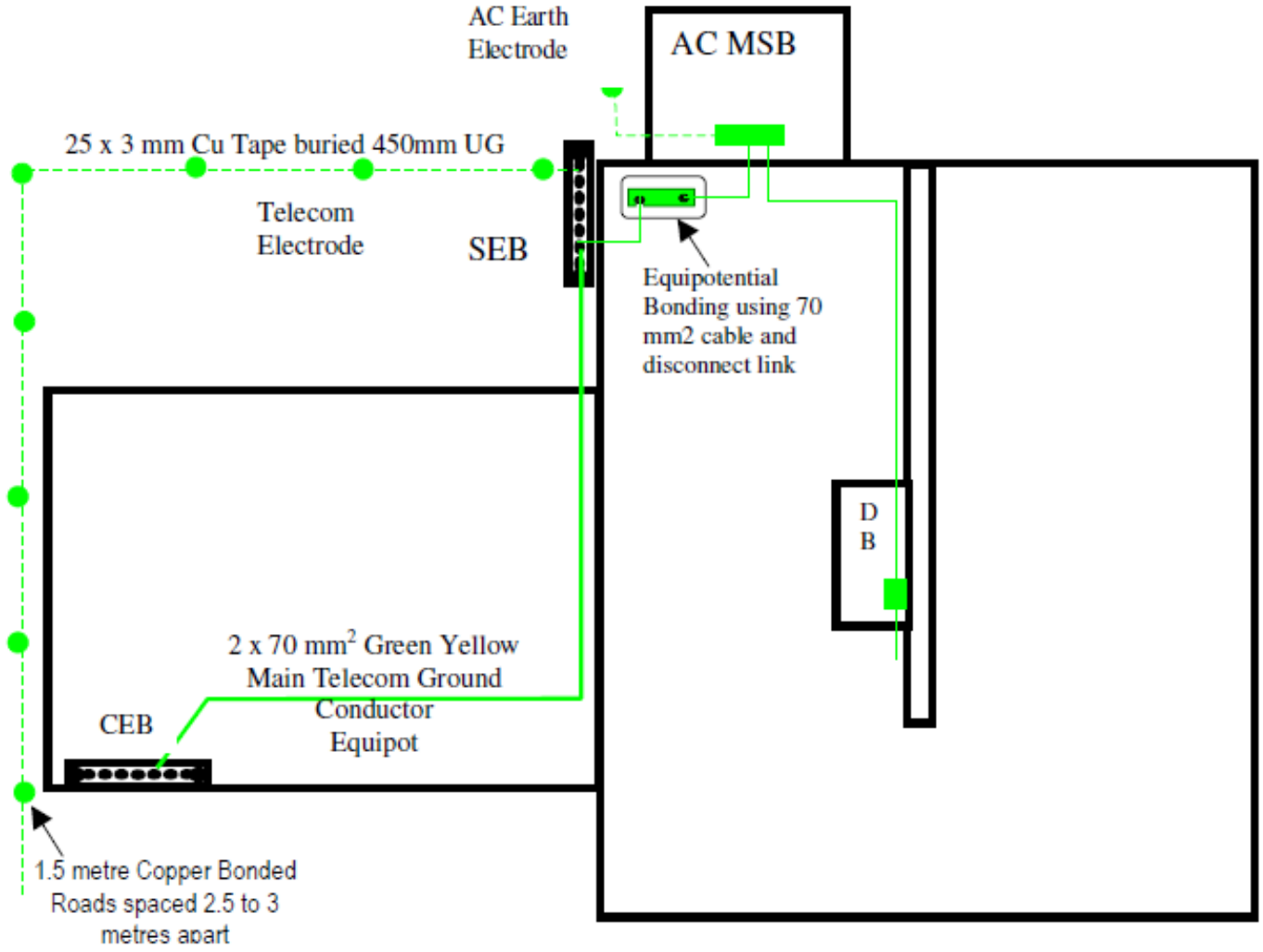
Star IBN Case Study

ERICO


Karasu
RESTAURANT

Star IBN Case Study





Star IBN Case Study

Summary

The indoor bonding is perhaps the most important part of the grounding system design:

1) Ensures equipotential bonding
2) Mesh Systems control risks by minimising potential differences
3) Star-Isolated Bonded Systems minimize ground loops
4) Star IBN more common in DC Power telecom equipment rooms
5) MESH IBN and MESH BN Common in AC Power Datacenters
6) Cabinet and equipment level bonding is identical regardless of Star-IBN or MESH-BN
7) TIA 607 , BICSI 607 & IEC30129 provide great practical descriptions on indoor grounding system and applicable to data-centers.
8) Carrier specific and Telcordia standards cover carrier premises grounding well