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Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructure

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PREFACE

Revision History

January 7, 2020 First publication of this standard, titled ANSI/BICSI N3-20, *Planning and Installation Methods for the Bonding and Grounding of Telecommunication and ICT Systems and Infrastructures*

Translation Notice

This standard may have one or more translations available as a reference for the convenience of its readers. As that act of translation may contain inconsistencies with the original text, if differences between the translation and the published English version exist, the English text shall be used as the official and authoritative version.

Acknowledgments

BICSI gratefully acknowledges the contribution of figures by nVent Electric, Harger Lightning and Grounding, and Fluke Networks.

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1 Introduction

1.1 General

Personnel safety and protection of susceptible electronic equipment from ground faults, lightning, ground potential rise, and electrical surges is of the utmost importance at telecommunications facilities. Cloud to ground lightning discharges must find a path to ground; either discharging directly to the ground itself or to structures in contact with ground. Electrical transients must return to their source, many times following similar ground paths. In either event, proper bonding and grounding reduces the harmful effects associated with these electrical events.

Metallic components for power distribution systems are bonded together to provide an effective ground fault current path to allow proper operation of overcurrent devices. For telecommunications systems, metallic components are bonded to provide a low impedance path for electrical surges and transient voltages to return to their power source. The earth is also involved as a path for grounded (earthed) power systems and for lightning events. Lightning, fault currents, circuit switching (motors starting and stopping), and electrostatic discharge (ESD) are common causes of surges and transient voltages. An effective bonding and grounding system helps to minimize the damaging effects of electrical surges.

Proper bonding and grounding of electrical and information communication technology (ICT) systems infrastructure facilitates their intended operation. Improperly bonded and grounded electrical systems are a primary cause of power quality issues, which may affect information technology systems operation.

Other performance items related to bonding and grounding for telecommunications within a building involve power systems, surge protective devices, and electromagnetic compatibility (EMC). IEEE 1100 contains recommended practices on these and related subjects.

1.2 Purpose

The purpose of this standard is to allow the designer and installer to enhance their knowledge of effective telecommunications and ICT bonding and grounding systems and to strive for installations in a neat and workmanlike manner.

1.3 Categories of Criteria

Two categories of criteria are specified – mandatory and advisory.

- Mandatory criteria generally apply to protection, performance, administration, and compatibility; they specify the absolute minimum acceptable requirements.
- Advisory or desirable criteria are presented when their attainment will enhance the general performance of the component, system, or other element as indicated within all its contemplated applications.

Mandatory requirements are designated by the word *shall*; advisory recommendations are designated by the words *should*, *may*, or *desirable,* which are used interchangeably in this standard. While requirements and recommendations are typically separated to assist in usability, paragraphs or sections may exist where both appear together for context or readability.

Where equivalent local codes and standards exist, requirements from these local specifications shall apply. Where reference is made to a requirement that exceeds minimum code requirements, the specification requirement shall take precedence over any apparent conflict with applicable codes.

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2 Scope

This standard specifies aspects of planning and installation of bonding and grounding systems for telecommunications and information communication technology (ICT) systems and infrastructure within a customer premises (see Figure 2-1). This standard is intended to enhance the planning, specification and layout of an effective telecommunications bonding and grounding system. Additionally, this standard specifies installation requirements for components of the telecommunications bonding and grounding system, and when performed correctly, will produce neat and workmanlike results.

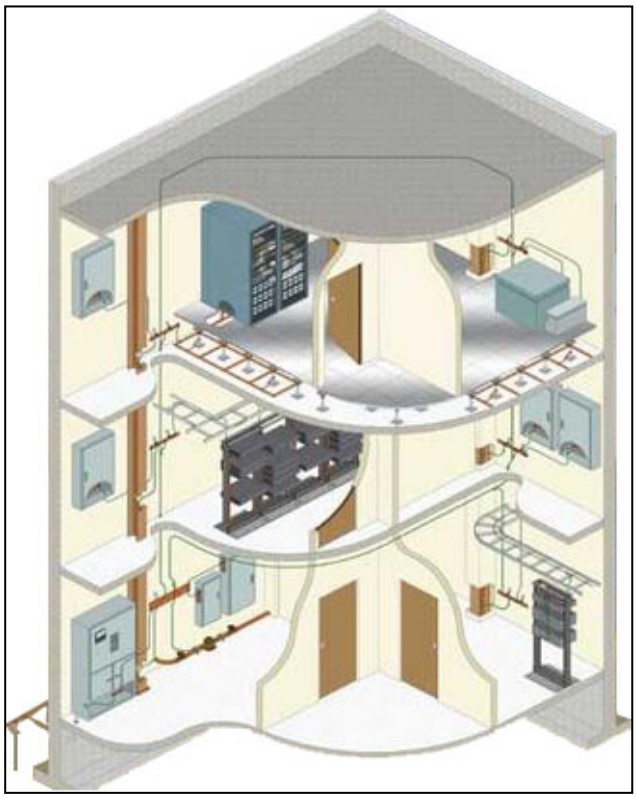

Figure 2-1
Example Illustration of a Telecommunications Bonding and Grounding System

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3 Required Standards and Documents

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Canadian Standards Association (CSA)

- C22.1, *Canadian Electrical Code, Part I, Safety Standard for Electrical Installations*
- Z462, *Workplace Electrical Safety*

European Committee for Electrotechnical Standardization (CENELEC)

- EN 50310, *Telecommunications bonding networks for buildings and other structures*

International Organization for Standardization (ISO)

- ISO/IEC 30129, *Information technology – Telecommunications bonding networks for buildings and other structures*

Institution of Engineering and Technology (IET)

- *Requirements for Electrical Installations (BS 7671)*

National Fire Protection Association (NFPA)

- NFPA 70®, *National Electrical Code®* (NEC®)
- NFPA 70E®, *Standard for Electrical Safety in the Workplace*

Standards Australia

- AS/NZS 3000, *Electrical installations "Wiring Rules"*

Telecommunication Industry Association (TIA)

- ANSI/TIA-607, *Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises*

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4 Definitions, Acronyms, Abbreviations, and Units of Measurement

4.1 Definitions

For the purposes of this standard, the following terms and definitions apply. Some terms and definitions may also be represented by an acronym as listed in Section 4.2.

NOTE: The terms below may be known by one or more regional equivalents. See Section 4.4.

backbone bonding conductor — A telecommunication bonding connection which interconnects telecommunications bonding backbones.

bonded (bonding) — The joining of metal parts together to form an electrically conductive path to *ground*.

coupled bonding conductor — A separate conductor in contact with, routed with, and secured to a communications cable. It may also be a metallic shield enclosing all of the conductors in a communications cable.

ground — The earth.

grounded (grounding) — Connected (connecting) to ground or to a conductive body that extends the ground connection.

Listed — Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction (AHJ), that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states either that the equipment, material or services meets appropriate standards or has been tested and found suitable for use in a specified manner.

point of entrance — Within a building, the point at which the wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode.

primary bonding busbar — A busbar placed in a convenient and accessible location and bonded, by means of the telecommunications bonding conductor, to the buildings service equipment (power) ground.

primary protector — The protector located at the building telecommunications entrance point.

rack bonding busbar — A busbar within a cabinet, frame or rack.

rack bonding conductor — Bonding conductor from the rack or rack bonding busbar to the telecommunications equipment bonding conductor.

secondary bonding busbar — A common point of connection for telecommunications system and equipment bonding to ground and located in the distributor room.

supplementary bonding structure — A set of conductors or conductive elements formed into a grid or provided as a conductive plate and becomes part of the bonding network to which it is intentionally attached.

telecommunications bonding backbone — A conductor that interconnects the primary bonding busbar to the secondary bonding busbar.

telecommunications bonding conductor — A conductor that interconnects the building's service or building's feeder equipment (power) ground to the telecommunications grounding system.

telecommunications equipment bonding conductor — A conductor that connects the primary bonding busbar, secondary bonding busbar or supplementary bonding network to equipment racks or cabinets, rack bonding busbars or rack bonding conductors.

unit bonding conductor A bonding conductor used to connect a rack/cabinet mounted equipment unit to the bonding busbar or conductor utilized in that rack or/cabinet.

4.2 Acronyms and Abbreviations

Abbreviations and acronyms, other than in common usage, are defined as follows:

ac	alternating current
AHJ	authority having jurisdiction
AWG	American wire gauge
BBC	backbone bonding conductor
CBC	coupled bonding conductor
CBN	common bonding network
EDP	electrical distribution panel
EMC	electromagnetic compatibility
ENT	electrical nonmetallic tubing
ESD	electrostatic discharge
ICT	information communication technology
Mesh-BN	mesh bonding network
PBB	primary bonding busbar
NRTL	nationally recognized testing laboratory
RBB	rack bonding busbar
RBC	rack bonding conductor
SBB	secondary bonding busbar
SRG	signal reference grid
SRPP	system reference potential plane
SRS	signal reference structure
TBB	telecommunications bonding backbone
TBC	telecommunications bonding conductor
TEBC	telecommunications equipment bonding conductor
UBC	unit bonding conductor

4.3 Units of Measurement

The units of measurement used in this standard are metric. Approximate conversions from metric to U.S. customary units are provided in parentheses. For example, 100 millimeters (4 inches).

Units of measurement used in this standard are defined below:

ft	foot
in	inch
m	meter
mm	millimeter

4.4 Standardized and Regional Terminology Equivalents

International efforts to standardized bonding terminology are ongoing and are documented within ISO/IEC 30129. While this standard utilizes the terminology in ISO/IEC 30129, Table 4-1 provides regional equivalent expressions per ISO/IEC terms and Table 4-2 provides regional terms with the ISO/IEC 30129 equivalent.

Table 4-1 Regional Terminology Equivalents – by Standardized Term

Term Used in this Standard	*Regional Equivalent Terms*
Backbone Bonding Conductor (BBC)	Grounding Equalizer (GE) Horizontal Equalizer
Primary Bonding Busbar (PBB)	Building Principal Ground (BPG) CO GRD Bus COG Facility Ground Main Earthing Terminal (MET) Master Ground Bar (MGB) OPGPB Principal Ground Point (PGP) Bus Reference Point 0 (RP0) Telecommunications Main Grounding Busbar (TMGB) Zero Potential Reference Point
Rack Bonding Busbar (RBB)	Rack Grounding Busbar
Secondary Bonding Busbar (SBB)	Approved Floor Ground Extended Reference Point 0 (Extended RP0) Floor Ground Bar (FGB) Telecommunications Grounding Busbar (TGB)
Telecommunications Bonding Backbone (TBB)	Equalizer Equalizing Conductor Vertical Equalizer Vertical Ground Riser
Telecommunications Bonding Conductor (TBC)	Bonding Conductor for Telecommunications (BCT)

Table 4-2 Regional Terminology Equivalents – by Regional Term

Regional Term	*Term Used in this Standard*
Approved Floor Ground	Secondary Bonding Busbar (SBB)
Bonding Conductor for Telecommunications (BCT)	Telecommunications Bonding Conductor (TBC)
Building Principal Ground (BPG)	Primary Bonding Busbar (PBB)
CO GRD Bus	Primary Bonding Busbar (PBB)
COG	Primary Bonding Busbar (PBB)
Equalizer	Telecommunications Bonding Backbone (TBB)
Equalizing Conductor	Telecommunications Bonding Backbone (TBB)
Extended Reference Point 0 (Extended RP0)	Secondary Bonding Busbar (SBB)
Facility Ground	Primary Bonding Busbar (PBB)
Floor Ground Bar (FGB)	Secondary Bonding Busbar (SBB)
Grounding Equalizer (GE)	Backbone Bonding Conductor (BBC)
Horizontal Equalizer	Backbone Bonding Conductor (BBC)
Main Earthing Terminal (MET)	Primary Bonding Busbar (PBB)
Master Ground Bar (MGB)	Primary Bonding Busbar (PBB)
OPGPB	Primary Bonding Busbar (PBB)
Principal Ground Point (PGP) Bus	Primary Bonding Busbar (PBB)
Rack Grounding Busbar	Rack Bonding Busbar (RBB)
Reference Point 0 (RP0)	Primary Bonding Busbar (PBB)
Telecommunications Grounding Busbar (TGB)	Secondary Bonding Busbar (SBB)
Telecommunications Main Grounding Busbar (TMGB)	Primary Bonding Busbar (PBB)
Vertical Equalizer	Telecommunications Bonding Backbone (TBB)
Vertical Ground Riser	Telecommunications Bonding Backbone (TBB)
Zero Potential Reference Point	Primary Bonding Busbar (PBB)

5 Regulatory and Safety

5.1 Requirements

Installers shall follow the applicable regulations, codes and AHJ requirements for the site.

NOTE: Examples of applicable site-specific codes include:

- NFPA 70®, *National Electrical Code®*
- C22.1, *Canadian Electrical Code, Part I, Safety Standard for Electrical Installations*
- BS 7671, *Requirements for Electrical Installations. IET Wiring Regulations*
- AS/NZS 3000, *Electrical installations (the Wiring Rules)*

While most of the code requirements for the job should be included in the scope of work documents, always review the local code requirements with the local authority having jurisdiction (AHJ) before proceeding with the installation. This includes reviewing what code and edition is adopted, and what, if any, exceptions to the code are adopted by the governing authority (i.e., AHJ).

If no code has been adopted locally, consult with fire or building AHJs to determine what agency is responsible for that geographic area and what codes are in effect. Do not depend on other installers, contractors, or even company personnel in making these determinations.

Installation practices shall comply with applicable safety regulations and requirements and regulations (e.g., Occupational Safety & Health Administration (OSHA), AS/NZS 3000).

5.2 Recommendations

Only qualified persons familiar with telecommunications cabling, electrical wiring, or both should perform the work described in this publication.

Some counties may have additional standards or guidelines (e.g., United States: NFPA 70E, Canada: CSA Z462) for the performance of electrical work. Where applicable standards or guidelines are not available or otherwise specified, it is recommended that all work be performed in accordance with NFPA 70E**.**

Installers should follow manufacturer's instructions, and contract documents when installing telecommunications cabling.