Specification No. IT-CISD-GC-322-02

Consolidated Edison Company of New York
4 Irving Place, New York, New York 10003

Information Technology
Communications Infrastructure & Site Design

DESCRIPTION

General Contractor Requirements
R900 - Spring Valley Operations Center
Building Expansion

LOCATION

390 Route 59 West
Spring Valley, NY 10977

Prepared By: Ronald Devito — Date: 03/28/2025
Systems Specialist

Reviewed By: Paul Nardelli — Date: 03/31/2025
Systems Specialist

Approved By: Michael J. Ribarich — Date: 05/22/2025
Systems Manager

1.0 Project Overview

1.1 Orange and Rockland Utilities (ORU) is adding a three-story 48,000-square foot addition to Spring Valley Operations Center. This document details the construction requirements that the General Contractor must supply and perform to support the IT Telecom and AV installations.

2.0 Construction Requirements

2.1 IT Rooms

2.1.1 Architectural

- 2.1.1.1 There shall be no windows.
- 2.1.1.2 There shall be no false or suspended ceiling.
- 2.1.1.3 Ceilings shall be painted to reduce dust.
- 2.1.1.4 Walls and ceiling finishes shall be light in color to optimize lighting.
- 2.1.1.5 Location of lighting fixtures shall be coordinated with rack, cabinet, and cable runway locations shown in Attachment 03 IT Specification IT-CISD-LAN-322-00.
- 2.1.1.6 The flooring shall be antistatic tile.

2.1.2 Environmental

- 2.1.2.1 IT Rooms require 24/7/365 HVAC operation. Dual split unit required.
- 2.1.2.2 Location of HVAC units, piping and ducting shall be coordinated with proposed racks, cabinets, and cable runway locations shown in Attachment 03 IT Specification IT-CISD-LAN-322-00.

2.1.3 Power Requirements

- 2.1.3.1 One (1) dedicated 200-Amp panel is required in the Communications Room. Panel shall be fed from a generator backed up, non-building-UPS source.
- 2.1.3.2 Racks in the Communications Room require the following from the dedicated panel:
  - 2.1.3.2.1 Two (2) 5-20R 20-Amp outlets above the LAN Equipment Rack.
  - 2.1.3.2.2 Two (2) 5-20R 20-Amp outlets above the LAN Cabling Rack.
  - 2.1.3.2.3 Two (2) L5-30R 30-Amp outlets above the Security Cabinet.
  - 2.1.3.2.4 Four (4) 208V 20A Single-Phase Hard-Wired, No Outlets Two 120V Hots 1 Ground left in nine (9)-foot coils above the CCTN Rectifier Rack.
- 2.1.3.3 Outlets above the Communications Room racks shall be distributed in a Hubbell-Wiegmann wireway 2.5”x2.5” screw cover with knockouts (PN S22120) or equivalent.
- 2.1.3.4 Two (2) dedicated 5-20R 20-Amp outlets are required in each LAN Room from the 1st floor Communications Room dedicated panel, centered behind each rack/cabinet at the height of 6’-6” AFF as shown in Attachment 03 IT Specification IT-CISD-LAN-322-00.
- 2.1.3.5 At least One (1) dedicated 5-20R 20-Amp convenience outlet circuit is required within each IT Room from a source other than the 1st floor Communication Room dedicated panel.
- 2.1.3.6 One (1) 5-20R 20-Amp outlet for each LAN room and Comm room from the dedicated panel for a wall-mounted Femtocell at a height to be specified by the IT project manager.

2.1.4 Grounding and Bonding

- 2.1.4.1 A grounding conductor (GrC) bonded to building steel via cadweld is required in each IT Room.

2.1.4.2 The GrC shall be coordinated with the location of the Single Point Ground Bar as shown in Attachment 03 IT Specification IT-CISD-LAN-322-00.

2.1.4.3 The GrC shall be installed per reference standard IT-CISD-TGB-STD-11.

2.2 Work Area

2.2.1 Power Requirements

2.2.1.1 Reference the Audiovisual design package for all conference room and board room power requirements.

2.3 Cabling Pathways

2.3.1 CAT-6 cabling pathways are required into desk areas from the dropped ceiling space above including vertically down adjacent columns and horizontally to furniture raceways.

2.3.2 CAT-6A cabling pathways are required to WiFi access points in the dropped ceiling space.

2.3.3 Reference the IVCI Audiovisual design package for all conference room and board conduit, floor and wall box requirements.

2.3.4 As depicted on Attachment 05 – CCTN Routes, all CCTN fiber tube cables shall exit the new building 1st Floor Comm Room using the four CCTN EZ-Path sleeves and transit the hallways of the new building into the existing building. Thence, the tube cables shall transit the hallways of the existing building to the Spring Valley Old Data Center, Spring Valley Production Data Center, and Electric Control Center IDFs A and B.

2.3.5 CCTN Tube cables shall be supported by SnakeTray™ affixed to threaded rods. A single EZ-Path-44 sleeve shall be installed at the Point of Entry (POE) to the Spring Valley Old Data Center, Spring Valley Production Data Center, and Electric Control Center IDFs A and B.

2.3.6 CCTN fiber bundles shall be terminated in a rack/enclosure, tray/position to be determined by site surveys conducted in the Spring Valley Old Data Center, Spring Valley Production Data Center, and Electric Control Center IDFs A and B.

2.3.7 All Pathway routes and sizes shall be coordinated with the latest Power and Data Plan Drawing and IT Specification IT-CISD-LAN-322-00.

2.3.8 All conduits shall be installed per reference standard CISD Conduit Installation Standard Requirements.

3.0 Reference Standards

3.1 IT-CISD-TGB-STD – LAN Telecommunications Grounding and Bonding Standard

3.2 CISD Conduit Installation Standard Requirements

SPECIFICATION NO. IT-CISD-TGB-STD-11

Consolidated Edison Company of New York
4 Irving Place, New York, New York 10003

Information Technology
Communications Infrastructure & Site Design
(CISD)

DESCRIPTION

Standard Specification for Installation of LAN Telecommunications Grounding & Bonding (TGB)

Prepared By: Ron Devito
Systems Specialist
Date: April 4, 2022

Reviewed By: Michael J. Ribarich
Systems Manager
Date: June 10, 2022

Approved By: Michael J. Ribarich
Systems Manager
Date: August 8 10, 2022

Printed on 9/9/2022

Table of Contents

1.0 PURPOSE

1.1 This specification provides the technical requirements for the design and installation of telecommunication grounding and bonding systems withing IT rooms and spaces.

2.0 APPLICABILITY

2.1 This specification applies to corporate sites, control, centers, data centers and field sites.

3.0 USERS, REVIEWERS AND APPROVERS

3.1 The users of this specification are members of IT Communications Infrastructure & Site Design (CISD) group responsible for the design and build of LAN physical infrastructure including telecommunication grounding and bonding systems. Other users are contractors who design and build telecommunication grounding and bonding systems.

3.2 The approver of the document is the CISD Systems Manager. CISD SMEs will propose changes to the CISD Systems Manager. Revised documents will be placed in group's SharePoint public folder.

3.3 The review process is ongoing as new parts and technologies develop and are utilized. A formal review will take place annually in January by the CISD group to capture any changes that may not yet been incorporated.

3.4 Training requirements will be met by formal technical training by outside by internal on the job training, and group collaboration.

4.0 EXCEPTIONS / DEVIATION PROCESS

4.1 CISD will follow a review and approval process for interim changes required during emergent situations.

4.2 Interim changes will be handled by email or verbal notification by the CISD Systems Manager and/or CISD SMEs.

4.3 The process and forum for communicating Interim changes will be periodic staff meetings or by teleconference scheduled by the CISD Systems Manager.

5.0 TECHNICAL REQUIREMENTS

5.1 Technical Scope

5.1.1 Unless otherwise stated in the bid specification or MiniPO, the work to be done by the Contractor as described in the Scope of Work section of the project specification (bid spec or MiniPO) shall be done in accordance with the requirements set forth in this document

5.1.2 Any deviation from the CISD materials and installation requirements listed below, must receive prior approval from the CISD project manager. Deviations not receiving prior written approval will be subject to replacement and/or correction at the Contractors expense.

5.2 Ground Cable Pathways

5.2.1 The CISD project manager is responsible for identifying preliminary ground cable pathways.

5.2.2 Since the pathways provided by the CISD project manager are preliminary, it is the Contractors responsibility to develop a defined cable pathway.

5.2.3 The pathways provided by the CISD Project manager are preliminary. It is the Contractors responsibility to ensure that NEC Code permits the pathways.

5.3 Telecommunications Grounding and Bonding

5.3.1 Approved Materials and Substitutions

5.3.1.1 All materials specified in the document shall be provided and installed by the installation contractor as indicated, using the listed parts. Equivalent parts may be supplied by providing the part specification sheet for review and obtaining written approval from the CISD project manager.

5.3.2 Grounding Conductor (GrC)

5.3.2.1 A Grounding Conductor shall be installed for all newly constructed and upgraded LAN Rooms. The term LAN Room applies to IT spaces housing LAN racks, cabinets, cable runway and equipment and can range in size to single wall-mount cabinets to multi-cabinet data centers.

5.3.2.2 Con Edison personnel or a designated Contractor shall be responsible for installing the grounding conductor as directed below.

5.3.2.3 Where a dedicated 4/0 AWG Communications Ground Riser exists:

5.3.2.3.1 A Grounding Conductor (GrC) consisting of a 4/0 AWG green insulated stranded copper wire shall be fused to the dedicated riser using a CADWELD process.

5.3.2.3.2 The weld between the GrC and the riser must remain visible for future inspection.

5.3.2.3.3 The GrC shall be routed to the LAN Room via the most direct route.

5.3.2.3.4 While routing the GrC to the LAN Room, it is imperative that there shall be no sharp bends in the cable.

5.3.2.3.5 The cable shall be electrically isolated from all structural metal. This includes concrete walls that may contain metal rebar.

5.3.2.3.6 The end of the GrC, minimally 5’ in length, shall be brought into the LAN Room.

5.3.2.3.7 A durable tag shall be affixed to the GrC that clearly notes the location of the weld to the Ground Riser.

5.3.2.4 Where there is no dedicated 4/0 AWG Communications Ground Riser:

5.3.2.4.1 Con Edison or their designated Contractor shall identify a main steel column or a steel beam that has electrical continuity with a main steel column.

5.3.2.4.2 Identify a clearly visible 3” by 3” section of building steel within the LAN Room and clear it of any insulating material (e.g. concrete, rust, paint, etc).

5.3.2.4.3 A 5’ length of GrC shall be fused to the previously cleared Building steel using a CADWELD process.

5.3.2.4.4 The weld between the GrC and the steel must remain visible for future inspection.

5.3.2.5 For either new construction or retrofit situations, where it is neither possible nor practical to use a CADWELD process due to potential fire or sparking damage, Contractor shall consult with and receive written approval from IT to use the following alternative method:

5.3.2.5.1 Con Edison personnel or a designated Contractor shall identify a main steel column or a steel beam that has electrical continuity with a main steel column.

5.3.2.5.2 Identify a 3” by 3” section of building steel that can be made easily accessible and clearly visible, within or as close to the LAN Room as possible.

5.3.2.5.3 Clear the section of any insulating material (e.g. concrete, rust, paint, etc.).

5.3.2.5.4 A 5’ length of 4/0 AWG Green insulated wire shall be high pressure crimped to a Thomas & Betts (Part# IBG20-40) I-Beam Ground Clamp’s lug. The Contractor shall attach the clamp and lug to building steel, ensuring that it is firmly attached and cannot be moved - see Figure 5.3.1.

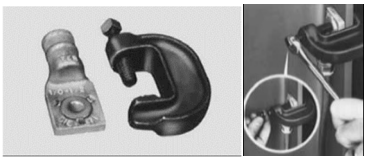


Figure 5.3.1

5.3.2.6 All deviations from the previously specified methodologies must be approved by the CISD PM, in writing, prior to proceeding. Failure to do so may require that the Contractor redo the work at the Contractors cost.

5.3.2.7 A bond resistance test shall be performed on the GrC using an AEMC Model 3731 Ground Resistance Tester or equivalent. Ground resistance shall not exceed 0.2 Ohms.

5.3.3 Single Point Ground Bar (SPGB)

5.3.3.1 An Un-sequenced Exterior Building Single Point Ground Bar (SPGB) (Harger Part# GBITP14412CE) Ground bar with wall mounting brackets, insulators and a 15’ exothermically bonded 2/0 AWG Stranded tail - see Figure 5.3.2 shall be installed in proximity (within 15 feet) to the GrC.

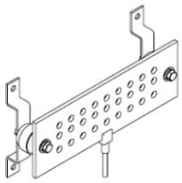


Figure 5.3.2

5.3.3.2 The Single Point Ground Bar shall be equipped with a Plexiglas cover with “SPGB” or “Single Point Ground Bar” stenciled on it - see Figure 5.3.3. The cover shall be stood-off the SPGB using insulated standoffs.

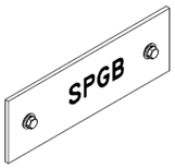


Figure 5.3.3

5.3.3.3 The 2/0 Stranded Copper CadWelded Tail shall be no longer than 15 feet.

5.3.3.4 The un-insulated stranded tail shall be electrically isolated from all structural metal. This includes concrete walls that may contain metal rebar.

5.3.4 Master Ground Bar (MGB)

5.3.4.1 A wall-mounted Master Ground Bar (MGB) with insulators (Harger Part# GPIB14420MMGB) - Universal 4" x 20" x 1/4" solid copper ground bar with 44 pairs of 7/16" pre-drilled universal lug holes, includes insulated mounting hardware - see Figure 5.3.4, shall be installed in the LAN Room, in a location specified in the Work Scope section of the job specific specification. The MGB shall contain pre-drilled double holes to accommodate two-hole lugs.

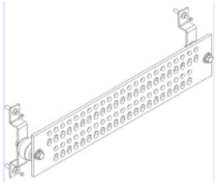


Figure 5.3.4

5.3.4.2 The MGB shall be equipped with a Plexiglas cover with “MGB” or “Master Ground Bar” stenciled on it - see Figure 5.3.5. The cover shall be stood-off the MGB using insulated standoffs.

Figure 5.3.5

5.3.4.3 The MGB shall be installed below the SPGB if the GrC comes from above. The MGB shall be installed above the SPGB if the GrC comes from below.

5.3.4.4 The MGB hole patterns are organized in a “PANI” layout as shown in Figure 5.3.6

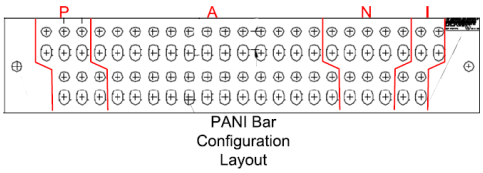


Figure 5.3.6

5.3.4.5 Each section on the PANI Bar may be expanded or contracted as needed, however the order cannot change. Lines shall be durably marked on the MGB in Red, delineating each PANI section (as show in the figure above).

5.3.4.6 The following ruleset shall be applied in determining the proper location on the PANI bar to which equipment or systems shall be connected - see Figure 5.3.13.

5.3.4.6.1 If the equipment or system can produce surge currents, carry surge currents, or carry lightning into a communications room, but is not designed to absorb and dissipate current, it shall be connected to the ‘P’ (**P**roducer) section of the MGB.

5.3.4.6.2 If the equipment is designed to absorb and dissipate fault current and lightning, or is inherently an alternate path to such system, it shall be connected to the ‘A’ (**A**bsorber) section of the MGB. The distinction here is that a ground to the MGB for AC-powered equipment, in which the AC Equipment Ground (ACEG) and ground to MGB are bonded together at the equipment through the chassis, is inherently an alternate path to the AC panel-board’s ground conductor. As such, it is classified as an absorber.

5.3.4.6.3 If the equipment is AC powered and the ACEG is isolated from the chassis and ground wire to the MGB, it shall be connected to the ‘N’ (**N**eutral) section of the MGB.

5.3.4.6.4 If the equipment is passive and is not connected to a piece of equipment or system that is connected to the AC panel-board ground, the equipment shall be connected to the ‘N’ section of the MGB.

5.3.4.6.5 If the equipment is passive and is connected to a piece of equipment or system that is connected to the AC panel-board ground and, the equipment shall be connected to the ‘A’ section of the MGB.

5.3.4.6.6 If the device is a ground bar for an intentional and properly designed Isolated Ground Zone (IGZ), it shall be connected to the ‘I’ (**I**solated) section of the MGB.

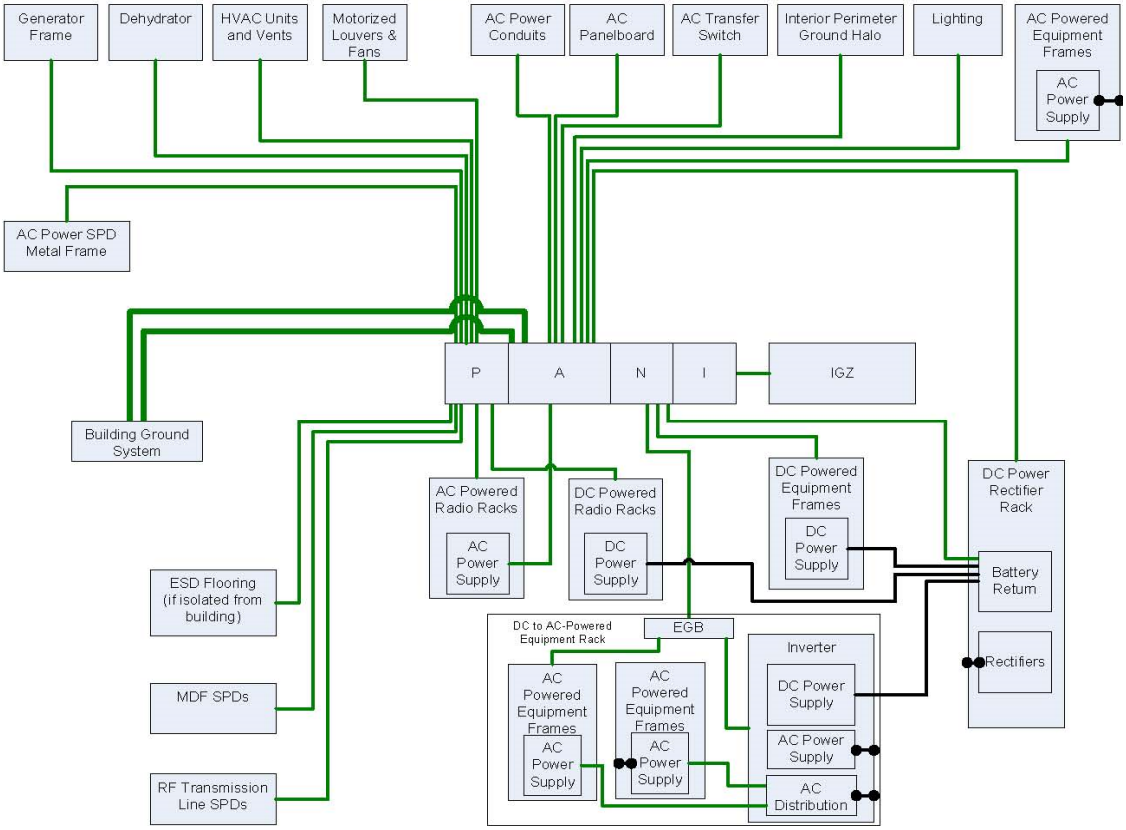


Figure 5.3.13

5.3.5 Equipment Ground Bar (EGB)

5.3.5.1 In large facilities it may be necessary to install supplemental Equipment Ground Bars (EGB) to minimize the length and number of individual ground wires connecting to the MGB. These bars (identical to the MGB, but without the PANI Markings) shall be used to bond racks, cabinets, cable runway and NetShelter ground bus cables.

5.3.5.2 The EGB shall be equipped with a Plexiglas cover with “EGB” or “Equipment Ground Bar” stenciled on it. The cover shall be stood-off the EGB using insulated standoffs.

5.3.6 Floor Ground Bar (FGB)

5.3.6.1 Where an anti-static floor is installed that uses Copper foil as its conducting medium, a Floor Grounding Bar (FGB) (Harger Part# GBIP1836CEFGB) shall be used.

5.3.6.2 The FGB consists of two 3" x 6" x 1/8" solid copper ground bars with a single pair of 7/16" pre-drilled universal lug holes. It includes insulated mounting hardware - see Figure 5.3.7.

Figure 5.3.7

5.3.6.3 The Floor Ground Bar shall be equipped with a Plexiglas cover with “FGB” or “Floor Ground Bar” stenciled on it. The cover shall be stood-off the FGB using insulated standoffs - see Figure 5.3.8.

Figure 5.3.8

5.3.6.4 The FGB shall be installed no more than 3” above the point that floor grounding foil protrudes from the floor.

5.3.7 Horizontal Rack-mount Ground Bar (HRGB)

5.3.7.1 A Horizontal rack-mounted Ground Bar (HRGB) - see Figure 5.3.9, (B-Line Part# SBHB119K), shall be installed in each Cabinet and/or Rack. For 23” racks, use B-Line Part# SBHB123K. These parts comes as a kit with the following material:

- 1 - Horizontal rack ground bar
- 2 - White insulators
- 4 - #12-24 x 5/8” (15.9mm) zinc plated screws & flat washers
- 20 - #12-24 x 1/2” (12.7mm) zinc plated screws
- 2 - Ground labels

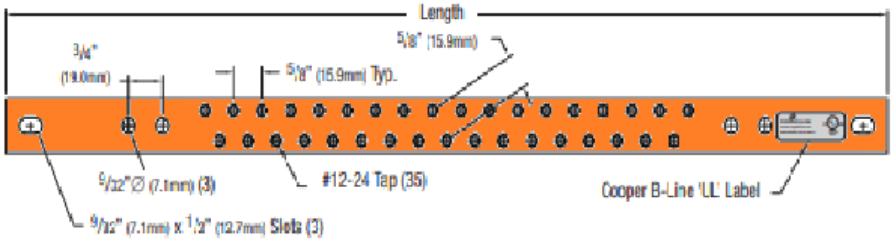


Figure 5.3.9

5.3.7.2 The HRGB shall be isolated from the cabinet and/or rack using (2) Rack Busbar Insulator Blocks supplied as part of the HRGB kit - see Figure 5.3.10 or equivalent. Unless otherwise directed by the CISD Project manager, the HRGB shall be installed at the topmost available RU mounting space.

Figure 5.3.10

5.3.7.3 In configurations where a 4-post rack or 4-rail cabinet is installed, the HRGB shall be installed on the rear set of posts or rails.

5.3.7.4 Rack and cabinet rail connections shall be installed in a manner that will minimize the rendering of RU spaces that become unusable. Where possible, bonding shall be done to built-in grounding studs.

5.3.7.5 All connections to the HRGB shall be installed in a manner that ensures that bends do not violate bend radius and bend angle limitations - see Figure 5.3.11. Two-hole lug connections to the Busbar shall face the direction from which the wire is routed to the Busbar.

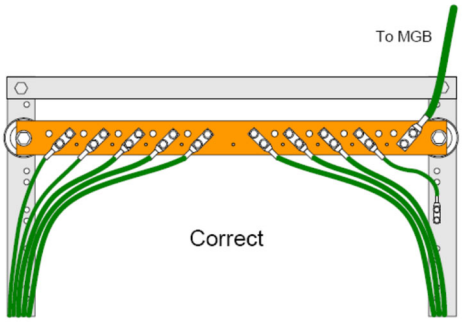


Figure 5.3.11

5.3.8 Bonding to Bus Bars

5.3.8.1 The SPGB shall be bonded to the LAN Room's 4/0 AWG ground wire GrC.

5.3.8.2 The stranded tail of the SPGB shall be attached to the attached to the GrC using a high pressure 4/0-2/0 "C" clamp - see Figure 5.3.12.

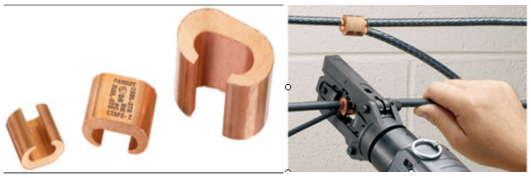


Figure 5.3.12

5.3.8.3 An MGB shall be bonded to the SPGB using a pair of 2/0 AWG green insulated stranded copper wire with double-hole lugs high pressure crimped on at each end. One lug of each cable shall be bolted to the first set of adjacent pairs of holes in the "A" section of the "PANI" layout closest to the "P" section. The other end shall be connected to an available pair of holes closest to the center of the SPGB.

5.3.8.4 Bonding cables are connected to the MGB using a specific set of rules (as described in the MGB section). When it is unknown where to ground a piece of equipment or system, the installer shall contact the CISD Project manager for the proper placement.

5.3.8.5 Unless otherwise noted, all CISD installed equipment and infrastructure shall be considered absorber type equipment and shall be bonded to the "A" section.

5.3.8.6 An EGB shall be bonded to the MGB using a #2 AWG green insulated stranded copper wire with high pressure crimped on double-hole lugs at each end. One lug of the cable shall be bolted to a pair of holes in the "A"

section of the “PANI” layout on the MGB and the other end shall be connected to a pair of holes closest to the left side of the EGB.

5.3.8.7 An HRGB shall be bonded to the “A” section of the MGB using a #6 AWG green insulated stranded cable a two-hole (5/8” OC Spacing), long barrel lug (Harger Part# GECLB62A) - see Figure 5.3.13 high pressure crimped to each end.

Figure 5.3.13

5.3.8.8 A #6 AWG Ground Strap kit (Chatsworth Part# 40164-001) - see Figure 5.3.14 or equivalent, shall be used to create a bonding connection between racks and/or cabinets and the rack mounted Bus bar.

Figure 5.3.14

5.3.8.9 The bonding strap shall be connected to the rail at the highest RU spacing below the Busbar that does not cause a sharp bend in the strap. The other end shall be bolted to the holes on the HRGB closest to the ground bonding cable.

5.3.8.10 Cable Runway Segments connected with butt splices shall be bonded using a #6 AWG Bonding Strap kit.

5.3.8.11 The bonding cable running between the various Bus bars shall be electrically isolated from all runways and conductive structures.

5.3.8.12 The bonding cable shall be routed along runways using non-conductive hangers such as the Panduit J-Pro hangers. Use of nylon ties or hook and loop straps to lash the cable to runways are not acceptable.

5.3.8.13 An anti-static tile floor that uses copper foil as the bonding medium shall be bonded to the floor’s copper foil by folding the foil three times which shall then be sandwiched between the two Copper plates - see Figure 5.3.15.

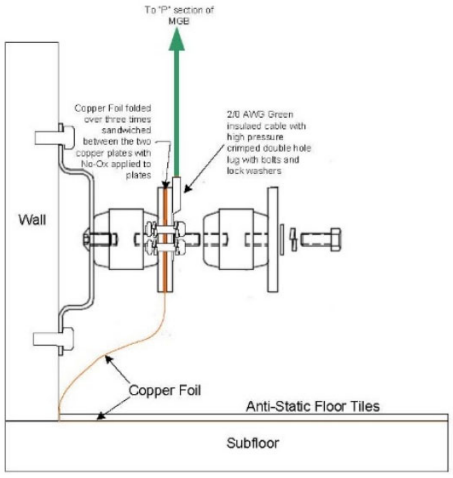


Figure 5.3.15

5.3.8.14 The FGB shall be bonded to the MGB using a 2/0 AWG green insulated stranded copper wire with double-hole lugs high pressure crimped to each end. One lug shall be bolted to the “P” section of the MGB. The other lug shall be bolted with lock washers, through the FGB’s Copper plates and foil.

5.3.8.15 A conductive anti-static rubberized tile floor shall be bonded to the MGB using a 2/0 AWG green insulated stranded copper wire with double-hole lugs high pressure crimped to each end. One lug shall be bolted to the “P” section of the MGB. The other lug shall be bolted to the tile using 1/4-20 T Nuts - see Figure 5.3.16 which shall be attached to the back of the tile.

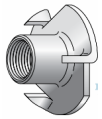


Figure 5.3.16

5.3.8.16 The cable connection to the floor shall be parallel and alongside the wall such that it does not cause a tripping hazard.

5.3.8.17 Raised floors shall be bonded and grounded as follows:

Install GPQC Access Floor Grounding clamps sized for the installed pedestal (Panduit Part # GPQCXX-1/0 - where XX represents type and size of pedestal), 2”-4” below top of pedestal and at 4’-6’ intervals - See Figure 5.3.16A

Figure 5.3.16A

5.3.8.17.1 Install bare #6AWG Copper Stranded cable in a continuous loop between as many GPQC’s as possible. - See Figure 5.3.16B – Floor Grounding Example

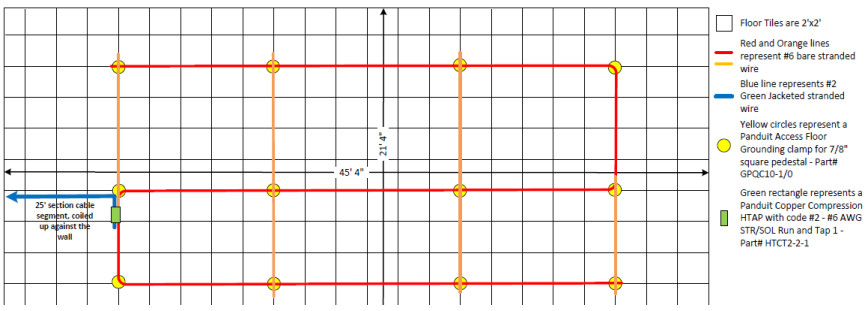


Figure 5.3.16B

5.3.8.17.2 Install segments of bare #6AWG Copper Stranded cable between any adjacent GPQC’s that were missed by the main loop.

5.3.8.17.3 Using a CTAP clamp, crimp a segment of #2AWG Green Jacketed Stranded copper cable long enough to reach the rooms' MGB, to the bare #6AWG Copper Stranded cable.

5.3.8.17.4 Attach the loose end of the #2AWG cable to the "P" section of the MGB.

5.3.9 Bonding Cables and Lugs

5.3.9.1 Bonding cables with high pressure crimped two-hole lugs shall be used with stainless steel bolts, lock washers & nuts when attaching Bus bars and other bonding points, to each other - see Figure 5.3.18.

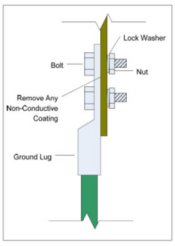


Figure 5.3.18

5.3.9.2 The table below - see Table 5.3.1, lists the wire gauge to be used for the bonding cable between the MGB and other Bus bars. Cable length shall not exceed the maximum length for a given wire gauge.

Conductor Size	Maximum Cable Length
#6 AWG	20 ft.
#2 AWG	33 ft.
2/0 AWG	66 ft.
4/0 AWG	>66 ft.

Table 5.3.1

5.3.9.3 Bonding cable exceeding the maximum length permitted for a particular wire gauge shall be sized to the appropriate gauge size.

5.3.9.4 The bonding cable shall be either green or green-coded black insulated stranded cable.

5.3.9.5 The bonding cable shall have each end terminated with a double hole, Irreversible high pressure crimped lug.

5.3.9.6 The following table - see Table 5.3.2, lists the lug to be used with a specific wire gauge when terminating the cable.

Conductor Size	Harger Part# (or equivalent)
#6 AWG	GECLB62C
#2 AWG	GECLB22C
2/0 AWG	GECLB2/02C
4/0 AWG	GECLB4/02C

Table 5.3.2

5.3.9.7 The metal surface that a bonding conductor will be bonded to shall be cleared of any foreign material and/or oxidation and shall be burnished to allow for good conductivity.

5.3.9.8 An approved antioxidant joint compound (Harger Part# HAAJC8) shall be applied between any bonding conductor and the burnished metal surface.

5.3.9.9 All bonding lugs shall be attached with Stainless Steel hardware and shall include a lock washer appropriate for the application.

5.3.9.10 All bonding cables (other than bonding straps) shall have identification tags (Panduit BM1M or equivalent) - see Figure 5.3.19, applied within 3”-5” of the lug.

5.3.9.11 At each end of the cable, the tag shall clearly identify, with permanent marker or printed label, the far endpoint of the cable. Each tag should contain a unique numeric identifier as well as the location of the other end.

Ex: at the MGB Bus bar end -- **#6 – Cab 4**
at the Cabinet end -- **#6 – MGB**

Figure 5.3.19

5.3.9.12 Bonding cables shall be routed in such a manner that results in the shortest cable length.

5.3.9.13 Bonding cables should always curve smoothly and never make sharp bends that exceed a 90 degree bend or exceed a minimum bend radius of 8 inches - see Figure 5.3.20.

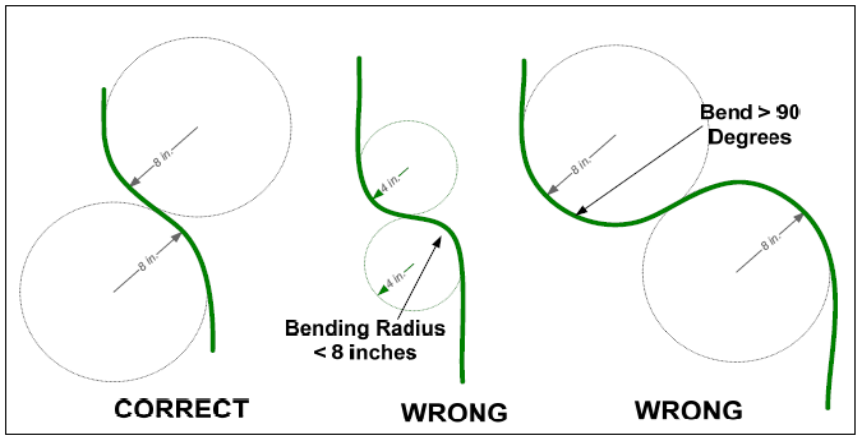


Figure 5.3.20

5.3.10 Equipment Cabinet Bonding Methodology

5.3.10.1 A #12 AWG green insulated stranded cable high pressure crimped to single-hole lugs at each end shall be used to bond all ground studs within a cabinet.

5.3.10.2 An HRGB shall be installed in the rear set of rails at the top RU position

5.3.10.3 The cabinet frame, power troughs & data partitions on NetShelter cabinets, shall be bonded as follows:

5.3.10.3.1 Two #2 AWG green insulated stranded copper ground buses (Cabinet and Data) shall be installed above the cabinet. These two Ground

Buss's shall be joined with a High-pressure C-Clamp just past the row of cabinets & before reaching the MGB or EGB.

5.3.10.3.2 The #2 AWG bonding cable shall be connected to an EGB or the "A" section of an MGB.

5.3.10.3.3 The cabinet and power trough (if installed) shall be bonded to the Cabinet Buss. The HRGB and data partition (if installed) shall be bonded to the Data Buss.

5.3.10.3.4 Bonds to the Ground Buss's shall use a short #6 AWG green insulated stranded copper bonding wire.

5.3.10.3.5 At one end of the bonding wire a one- or two-hole high pressure crimped lug (depending on the connection point) shall be mechanically connected to the threaded copper post or threaded bolt hole of the cabinet, trough, partition and HRGB - see Figure 5.3.21.

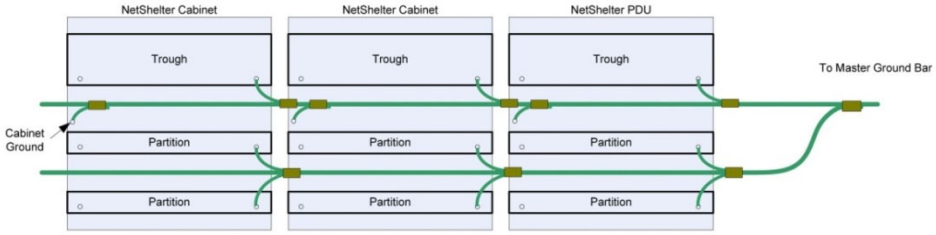


Figure 5.3.21

5.3.10.3.6 At the other end of the bonding cable an irreversible crimp connection shall be made to the Ground Buss using a Harger (Part# CT2248LD) or equivalent Light-duty C-Type Compression Tap - see Figure 5.3.22.

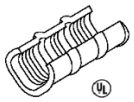


Figure 5.3.22

5.3.11 Equipment Isolation Methodology

5.3.11.1 Racks that will be bolted to the floor shall utilize a Rack isolation kit (CPI Part# 10605-019 for 19" Rack or 10605-023 for 23" Rack), that is placed under the rack - see Figure 5.3.23.

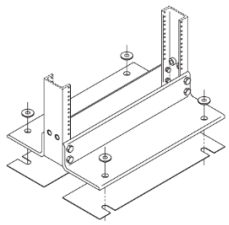


Figure 5.3.23

5.3.11.2 Cable Runway (ladder) shall be electrically isolated from racks or cabinets by using Runway Insulator bar kit (Chatsworth Part# 10842-001) - see Figure 5.3.24.

Figure 5.3.24

5.3.11.3 Cable Runway (ladder) shall be electrically isolated from walls, ceilings and any supporting structure using Runway Insulator bar kit (Chatsworth Part# 10842-001) or Stand-off Insulators (Chatsworth Part# 13622-000 or equivalent) - see Figure 5.3.25.

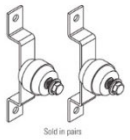
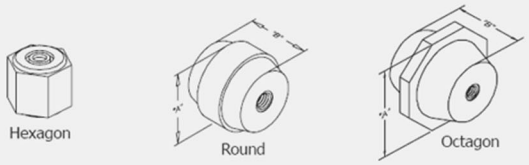


Figure 5.3.25

5.3.11.4 The following Harger Parts or equivalent - see Table 5.3.3, shall be used as applicable, when isolators are required:

Standoff Insulators - Red



Manufactured from glass reinforced thermoset polyester.

	Part No.	"A"	"B"	Shape	Thread Size	Voltage Rating	Tensile Strength (lbs.)	Box Qty.	Approx. Box Wt. (lbs.)
Add to BOM •	1100A1	1"	1"	Hex	1/4 - 20 x 1/4 AL	600	1200	25	1-1/2
Add to BOM •	4150S2	2"	1-1/2"	Oct	1/4 - 20 x 1/2 STL	1500	3000 - 4500	20	4-1/2
Add to BOM •	R4150S3	1-3/4"	1-1/2"	Round	5/16 - 18 x 1/2 STL	1500	2500 - 2700	20	5-1/2
Add to BOM •	R4150A4	1-3/4"	1-7/8"	Round	3/8 - 16 x 3/8 AL	2000	2500 - 2700	20	5-1/2
Add to BOM •	R4200S5	1-3/4"	2"	Round	3/8 - 16 x 5/8 STL	2500	2500 - 2700	20	6-3/4
Add to BOM •	4200S6	2"	2"	Oct	1/2 - 13 x 5/8 STL	2500	3000 - 4500	20	8
Add to BOM •	5250A5	2-1/2"	2-1/2"	Oct	3/8 - 16 x 5/8 AL	3200	5000 - 5700	10	4-1/2
Add to BOM •	5263A8	2-1/2"	2-5/8"	Oct	5/8 - 11 x 3/4 AL	3400	5000 - 5700	10	4-3/4

• BOM = Bill of Materials

Table 5.3.3

5.3.12 Single Small Cabinet Installations

5.3.12.1 Where an Installation consists of a single small cabinet, the Grounding and Bonding methodology changes as follows:

5.3.12.1.1 Con Edison or their designated Contractor shall identify a main steel column or a steel beam that has electrical continuity with a main steel column.

5.3.12.1.2 Identify a 3” by 3” section of building steel that can be made easily accessible and clearly visible, as close to the cabinet as possible.

5.3.12.1.3 Clear the section of any insulating material (e.g. concrete, rust, paint, etc).

5.3.12.1.4 A 5’ length of 4/0 AWG Green insulated wire shall be high pressure crimped to a Thomas & Betts (Part# IBG20-40) I-Beam Ground Clamp lug. The Contractor shall attach the clamp and lug to building steel, ensuring that it is firmly attached and cannot be moved. This cable will serve as the GrC for this cabinet.

5.3.12.1.5 A bond resistance test shall be performed on the GrC using an AEMC Model 3731 Ground Resistance Tester or equivalent. Ground resistance shall not exceed 0.2 Ohms.

5.3.12.1.6 A Horizontal Rack-mounted Ground Bar (HRGB) supplied by Con Edison, shall be installed in the cabinet.

5.3.12.1.7 The HRGB shall be installed at the topmost available RU mounting space.

5.3.12.1.8 The HRGB shall be isolated from the cabinet using (2) Rack Bus bar Insulator Blocks (Chatsworth Part# 40157-001) or equivalent.

5.3.12.1.9 The HRGB shall be bonded to the GrC using a #6 AWG Green insulated wire with high pressure crimped lug on one end. The other end shall remain bare and shall be bonded to the GrC using a high pressure crimped 4/0-#6 “C” clamp (Panduit Part# CTAP4/0-2-X).

5.3.12.1.10 All connections to the HRGB Bus bar shall be installed in a manner that ensures that there are no sharp bends. Two-hole lug connections to the Bus bar shall face the direction from which the wire is routed to the Bus bar.

5.3.12.1.11 A #6 AWG Ground Strap kit (Chatsworth Part# 40164-001) or equivalent shall be used to create a bonding connection between racks and/or cabinets and the rack mounted Bus bar.

5.3.12.2 Should a second cabinet be added in the future, then the following modifications shall be installed:

5.3.12.2.1 A SPGB shall be installed in close proximity to the GrC.

5.3.12.2.2 The bare 2/0 AWG Cad welded tail of the SPGB shall be bonded to the GrC using a high pressure crimped 4/0-2/0 “C” clamp (Panduit Part# CTAP4/0-2/0-X).

5.3.12.2.3 The #6 bonding cable from the HRGB shall be cut free from the GrC and a lug shall be high pressure crimped to the cable.

5.3.12.2.4 The lug shall be bolted to an available pair of holes closest to the center of the SPGB.

5.3.12.3 The second and/or any subsequent cabinet shall be grounded and bonded in the same manner as the first cabinet.

5.3.13 Outdoor Rated CatX Grounding at a POE

5.3.13.1 When an outdoor rated Cat/5e cable enters a facility, it needs to be grounded to isolate it and eliminate any induced current that may be present in the copper conductors. The follow methodology shall be used to affect this isolation and grounding.

5.3.13.2 For cable enclosed in above ground conduit or exposed to the environment:

5.3.13.2.1 An Altelicon Lightning Protector (Part# AL-CAT5EHPW) shall be installed at each end of the cable as close to the point of entry (POE) as practical - see Figure 5.3.26.

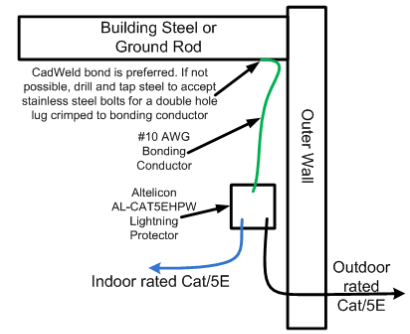


Figure 5.3.26

5.3.13.2.2 The Altelicon unit should be mounted in a location that permits simple access, should the unit need to be serviced.

5.3.13.2.3 The Outdoor rated cable, indoor rated cable and a #10 AWG Green insulated solid Copper cable shall be connected to the Altelicon as depicted in Figure 5.3.27.

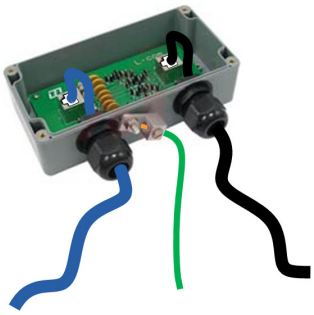


Figure 5.3.27

5.3.13.2.4 One end of the #10 AWG bonding conductor should be attached to the Altelicon's grounding lug and screwed down tightly so that it doesn't come loose.

5.3.13.2.5 The second end of the #10 AWG bonding conductor should be bonded to building steel or a properly installed ground rod.

5.3.13.2.6 The preferred method to bond to building steel or ground rod is by using a CadWeld process.

5.3.13.2.7 If it is not possible or practical to do the CadWeld, a two-hole lug should be attached to the bonding conductor using a high-pressure irreversible crimp.

5.3.13.2.8 A small section of steel beam flange should be cleared of concrete and/or rust and burnished to provide good conductivity.

5.3.13.2.9 When both sides of a beam flange are accessible, two holes should be drilled through the flange. An approved antioxidant joint compound shall be applied between the steel and lug. Two stainless steel bolts with lock washers and nuts shall be used to bond the lug to the steel.

5.3.13.2.10 When only one side of a beam flange is accessible, two holes should be drilled through the flange and tapped. An approved antioxidant joint compound shall be applied between the steel and lug. Three eights inch stainless steel bolts with lock washers screwed into the tapped holes shall be used to bond the lug to the steel. To prevent the screws from loosening over time, LOCTITE® 242™ medium strength thread lock shall be applied to the threads.

5.3.13.2.11 When the grounding will utilize a ground rod, a light duty ground rod clamp (Harger Part# 300LD) - see Figure 5.3.28, shall be used to bond the conductor to a properly installed ½" ground rod.

Figure 5.3.28

5.3.13.3 For cable enclosed in buried conduit:

5.3.13.3.1 Where a single device is being protected, an APC ProtectNet standalone surge protector (Part# PNET1GB) - see Figure 5.3.29, shall be installed at each end of the cable as close to the equipment that is being protected as practical.

Figure 5.3.29

5.3.13.3.2 The Green ground wire exiting the surge protector shall be attached to a properly installed ground point.

5.3.13.3.3 When multiple cables will be run between two locations, an APC 4 position chassis (Part# PRM4) or a 24-position chassis (Part# PRM24), shall be installed at the point of cable termination, typically on a rack or within a cabinet - see Figure 5.3.30.

Figure 5.3.30

5.3.13.3.4 A #10 AWG stranded Green insulated cable with a crimped on single-hole lug shall be attached to the chassis ground stud on the rear left of the chassis - see Figure 5.3.31.

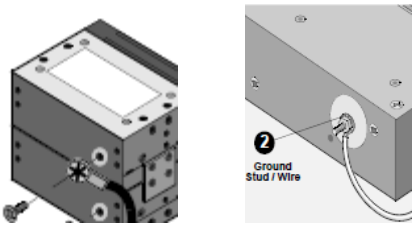


Figure 5.3.31

5.3.13.3.5 The other end of the cable shall be connected to the HRGB supporting the rack.

5.3.13.3.6 An APC Surge Module for Cat5e or CAT6 (Part# PNETR6) - see Figure 5.3.32, shall be installed in the chassis for each outdoor Cat5e cable that is to be protected.

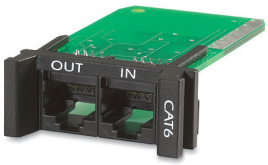


Figure 5.3.32

5.3.13.3.7 The outdoor cable shall be plugged into the “IN” port and the equipment being protected shall be plugged into the “OUT” port of the surge protection module.

6.0 Change Log

Date	Author	Rev #	Comments
6/10/22	Michael Ribarich	11	Changed references from LIS to CISD. Also changed references from IR to IT. Format changes.

Conduit Installation

1. Conduit shall be installed to run in the most direct route possible, preferably with no more than two 90-degree bends between pull points or pull boxes.
2. 90-degree condulets shall not be utilized in conduit runs.
3. Conduit runs shall contain no continuous sections longer than 100 ft.
4. All bends must be long sweeping bends.
5. For conduit with an internal diameter of 2 inches or less, the bend radius must be at least six times the internal conduit diameter.
6. For conduit with an internal diameter greater than 2 inches, the bend radius must be at least ten times the internal conduit diameter.
7. Conduit bends shall be smooth and even and shall not contain kinks or other discontinuities that may have detrimental effects on pulling tension or cable integrity during or after installation.
8. If a conduit run requires more than two 90-degree bends, a pull box shall be provided between sections with two bends.
9. If a conduit run requires a reverse bend (between 100-degrees and 180-degrees), a pull box must be inserted at each end having an angle from 100-degrees to 180-degrees.
10. All conduit ends shall be reamed and fit with an insulated bushing to eliminate sharp edges that can damage cables during installation and service.
11. Conduits that protrude through the structural floor shall be terminated as close to the wall as possible to allow for proper vertical cable routing.
12. Conduits that protrude through the structural floor shall be terminated 1 to 3 inches above the surface.
13. All conduits shall be equipped with a plastic or nylon drag line with a minimal test rating of 200lb.
14. Pull boxes shall be installed in easily accessible locations.
15. Length of pull box shall be a minimum of eight times the diameter of the largest conduit