Second Revision No. 7997-NFPA 70-2021 [Detail]

250.109: Add the new Informational Note shown below after the Metal Enclosures text:

Informational Note: See 250.97 for bonding requirements for over 250 volts to ground.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 21:01:20 EDT 2021

Committee Statement

Committee Statement: An informational note was added to clarify that the text in 250.109 does not supersede the requirements of 250.97.

Response Message: SR-7997-NFPA 70-2021

Second Revision No. 8013-NFPA 70-2021 [Definition: Bonding Conductor or Jumper (BJ).]

Bonding Conductor or Bonding Jumper ~~(BJ)~~ .

A conductor that ensures the required electrical conductivity between metal parts that are required to be electrically connected. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 13:11:44 EDT 2021

Committee Statement

Committee Statement: Bonding was added to be more descriptive of the term. The acronym is removed as it is not used.

Response Message: SR-8013-NFPA 70-2021

Public Comment No. 274-NFPA 70-2021 [Definition: Bonding Conductor or Jumper (BJ).]

Second Revision No. 8055-NFPA 70-2021 [Definition: Bonding Jumper, Equipment (EBJ).]

Bonding Jumper, Equipment. (~~EBJ~~ Equipment Bonding Jumper).

The connection between two or more portions of the equipment grounding conductor. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 11:17:09 EDT 2021

Committee Statement

Committee Statement: The searchable term was added in to comply with 2.2.2.3.1 of the NEC Style Manual and the acronym was removed as it is not needed.

Response Message: SR-8055-NFPA 70-2021

Public Comment No. 63-NFPA 70-2021 [Definition: Bonding Jumper, Equipment (EBJ).]

Second Revision No. 8056-NFPA 70-2021 [Definition: Bonding Jumper, Main (MBJ).]

Bonding Jumper, Main. (~~MBJ~~ **Main Bonding Jumper**).

The connection between the grounded circuit conductor and the equipment grounding conductor, or the supply-side bonding jumper, or both, at the service. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 11:22:48 EDT 2021

Committee Statement

Committee Statement: The panel removed the acronym, added the searchable term in accordance with 2.2.2.3 of the NEC Style Manual

Response Message: SR-8056-NFPA 70-2021

Public Comment No. 64-NFPA 70-2021 [Definition: Bonding Jumper, Main (MBJ).]

Second Revision No. 8057-NFPA 70-2021 [Definition: Bonding Jumper, Supply-Side (SSBJ).]

Bonding Jumper, Supply-Side. (~~**SSBJ**~~ **Supply-Side Bonding Jumper**).

A conductor installed on the supply side of a service or within a service equipment enclosure(s), or for a separately derived system, that ensures the required electrical conductivity between metal parts required to be electrically connected. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 11:31:17 EDT 2021

Committee Statement

Committee Statement: The panel removed the acronym, added the searchable term in accordance with 2.2.2.3 of the NEC Style of the NEC Manual.

Response Message: SR-8057-NFPA 70-2021

Public Comment No. 66-NFPA 70-2021 [Definition: Bonding Jumper, Supply-Side (SSBJ).]

Second Revision No. 8059-NFPA 70-2021 [Definition: Bonding Jumper, System (SBJ).]

Bonding Jumper, System. **(~~SBJ~~ System Bonding Jumper).**

The connection between the grounded circuit conductor and the supply-side bonding jumper, or the equipment grounding conductor, or both, at a separately derived system. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 11:37:16 EDT 2021

Committee Statement

Committee Statement: The panel removed the acronym and added the searchable term in accordance with the NEC Style Manual.

Response Message: SR-8059-NFPA 70-2021

Public Comment No. 67-NFPA 70-2021 [Definition: Bonding Jumper, System (SBJ).]

Second Revision No. 8026-NFPA 70-2021 [Definition: Ground-Fault Condition.]

Ground Fault ~~Condition~~ .

An unintentional, electrically conductive connection between an ungrounded conductor of an electrical circuit and the normally non-current-carrying conductors, ~~metallic~~ metal enclosures, ~~metallic~~ metal raceways, ~~metallic~~ metal equipment, or earth. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 15:20:12 EDT 2021

Committee Statement

Committee Statement: The panel removed the word "condition" to add clarity for users of this code, as a ground-fault is an event not necessarily a condition.

The word “metallic” is changed to “metal” to comply with the NEC Style Manual.

Response Message: SR-8026-NFPA 70-2021

Public Comment No. 69-NFPA 70-2021 [Definition: Ground-Fault Condition.]

Public Comment No. 287-NFPA 70-2021 [Definition: Ground-Fault Condition.]

Public Comment No. 764-NFPA 70-2021 [Definition: Ground-Fault Condition.]

Second Revision No. 8029-NFPA 70-2021 [Definition: Ground-Fault Current Path, Effective. (Effectiv...]

Ground-Fault Current Path, Effective. (Effective Ground-Fault Current Path)

An intentionally constructed, low-impedance electrically conductive path designed and intended to carry current ~~under~~ during ground-fault ~~conditions~~ events from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground-fault detectors. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 15:25:22 EDT 2021

Committee Statement

Committee Statement: The panel replaced the phrase "under ground-fault conditions" with the phrase "during ground-fault events" to add clarity.

Response Message: SR-8029-NFPA 70-2021

Public Comment No. 289-NFPA 70-2021 [Definition: Ground-Fault Current Path, Effective. (Effectiv...]

Second Revision No. 8025-NFPA 70-2021 [Definition: Grounded, Solidly.]

Grounded, Solidly. (Solidly Grounded)

Connected to ground without inserting any resistor or impedance device. (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 15:12:47 EDT 2021

Committee Statement

Committee Statement: The Committee added the searchable term to comply with 2.2.2.3.1 of the NEC Style Manual.

Response Message: SR-8025-NFPA 70-2021

Public Comment No. 290-NFPA 70-2021 [Definition: Grounded, Solidly.]

Second Revision No. 8030-NFPA 70-2021 [Definition: Grounding Conductor, Equipment (EGC).]

Grounding Conductor, Equipment. (Equipment Grounding Conductor) (EGC).

A conductive path(s) that is part of an effective ground-fault current path and connects normally non-current-carrying metal parts of equipment together and to the system grounded conductor or to the grounding electrode conductor, or both. (CMP-5)

Informational Note No. 1: It is recognized that the equipment grounding conductor also performs bonding.

Informational Note No. 2: See 250.118 for a list of acceptable equipment grounding conductors.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 15:28:20 EDT 2021

Committee Statement

Committee Statement: The panel added the searchable term to comply with the NEC Style Manual 2.2.2.3.1 to assist in electronic searching.

Response Message: SR-8030-NFPA 70-2021

Public Comment No. 23-NFPA 70-2021 [Definition: Grounding Conductor, Equipment (EGC).]

Public Comment No. 291-NFPA 70-2021 [Definition: Grounding Conductor, Equipment (EGC).]

Second Revision No. 8033-NFPA 70-2021 [Definition: Likely to Become Energized.]

Energized, Likely to Become. (Likely to Become Energized) .

Conductive material that could become energized because of the failure of electrical insulation or electrical spacing ~~failure~~ . (CMP-5)

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 15:32:39 EDT 2021

Committee Statement

Committee Statement: The panel re-ordered the term to locate it to follow the term “energized” and edited the definition for clarity.

Response Message: SR-8033-NFPA 70-2021

Public Comment No. 70-NFPA 70-2021 [Definition: Likely to Become Energized.]

Public Comment No. 295-NFPA 70-2021 [Definition: Likely to Become Energized.]

Public Comment No. 1269-NFPA 70-2021 [Definition: Likely to Become Energized.]

Second Revision No. 7910-NFPA 70-2021 [Section No. 200.4(A)]

(A) Installation.

Neutral conductors shall not be used for more than one branch circuit, for more than one multiwire branch circuit, or for more than one set of ungrounded feeder conductors unless specifically permitted elsewhere in this *Code*.

Informational Note: See 215.4 for information on common neutrals. ~~See 225.7(B) for information on common neutrals in lighting.~~

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 11:23:45 EDT 2021

Committee Statement

Committee Statement: The second sentence of the Informational Note of 200.4(A) is deleted as 225.7 is removed.

Response Message: SR-7910-NFPA 70-2021

Public Comment No. 910-NFPA 70-2021 [Section No. 200.4(A)]

Second Revision No. 7941-NFPA 70-2021 [Section No. 250.6(B)]

(B) Alterations to Stop Objectionable Current.

If the use of multiple grounding or bonding connections results in objectionable current and the requirements of 250.4(A)(5) or (B)(4) are met, one or more of the following alterations shall be permitted:

(1) Discontinue one or more but not all of such grounding or bonding connections.

(2) Change the locations of the grounding or bonding connections.

(3) Interrupt the continuity of the conductor or conductive path causing the objectionable current.

(4) Take other ~~suitable~~ remedial and approved action.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 12:48:09 EDT 2021

Committee Statement

Committee Statement: The word suitable is removed in accordance with Section 3.2.1 of the NEC Style manual

Response Message: SR-7941-NFPA 70-2021

Public Comment No. 740-NFPA 70-2021 [Sections 250.6(A), 250.6(B), 250.6(C)]

Second Revision No. 7938-NFPA 70-2021 [Section No. 250.6(C)]

(C) Currents Not Classified as Objectionable Currents.

Currents resulting from abnormal conditions~~,~~ such as ground faults, and from currents resulting from required grounding and bonding connections shall not be classified as objectionable current for the purposes specified in 250.6(A) and (B).

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 12:38:48 EDT 2021

Committee Statement

Committee Statement: The text is modified to make it clear that currents resulting from required grounding and bonding connections are not abnormal.

Response Message: SR-7938-NFPA 70-2021

Second Revision No. 7951-NFPA 70-2021 [Section No. 250.20]

250.20 Alternating-Current Systems to Be Grounded.

Alternating-current systems shall be grounded in accordance with 250.20(A), (B), (C), or (D), unless prohibited elsewhere in this *Code*. Other systems shall be permitted to be grounded. If such systems are grounded, they shall comply with the applicable provisions of this article.

Informational Note No. 1: An example of a system permitted to be grounded is a corner-grounded delta transformer connection. ~~See 250.26(4) for conductor to be grounded.~~

Informational Note No. 2: See 503.155, 517.61, 517.160, 668.10, and 680.23(A)(2) for examples of circuits prohibited to be grounded.

(A) Alternating-Current Systems of Less Than 50 Volts.

Alternating-current systems of less than 50 volts shall be grounded under any of the following conditions:

(1) If supplied by transformers, if the transformer supply system exceeds 150 volts to ground

(2) If supplied by transformers, if the transformer supply system is ungrounded

(3) If installed outside as overhead conductors

(B) Alternating-Current Systems of 50 Volts to 1000 Volts.

Alternating-current systems of 50 volts to 1000 volts that supply premises wiring and premises wiring systems shall be grounded under any of the following conditions:

(1) If the system can be grounded so that the maximum voltage to ground on the ungrounded conductors does not exceed 150 volts

(2) If the system is 3-phase, 4-wire, wye connected in which the neutral conductor is used as a circuit conductor

(3) If the system is 3-phase, 4-wire, delta connected in which the midpoint of one phase winding is used as a circuit conductor

Informational Note: According to Annex O of *NFPA 70E*-2021, *Standard for Electrical Safety in the Workplace*, high-impedance grounding is an effective tool to reduce arc-flash hazards.

(C) Alternating-Current Systems of over 1000 Volts.

Alternating-current systems supplying mobile or portable equipment shall be grounded in accordance with 250.188. If supplying other than mobile or portable equipment, such systems shall be permitted to be grounded.

(D) Impedance Grounded Systems.

Impedance grounded systems shall be grounded in accordance with 250.36 or 250.187, as applicable.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 13:17:01 EDT 2021

Committee Statement

Committee Statement:	The last sentence of Informational Note 1 is removed for compliance with the NEC Style Manual.
Response Message:	SR-7951-NFPA 70-2021

Public Comment No. 741-NFPA 70-2021 [Section No. 250.20]

Second Revision No. 7954-NFPA 70-2021 [Section No. 250.24]

250.24 Grounding of Service-Supplied Alternating-Current Systems.

(A) System Grounding Connections.

A premises wiring system supplied by a grounded ac service shall have a grounding electrode conductor connected to the grounded service conductor, at each service, in accordance with 250.24(A)(1) through (A)(4).

(1) General.

The grounding electrode conductor connection shall be made at any accessible point from the load end of the overhead service conductors, service drop, underground service conductors, or service lateral to the terminal or bus to which the grounded service conductor is connected at the service disconnecting means.

Informational Note: See Article 100 for definitions of *Service Conductors, Overhead; Service Conductors, Underground; Service Drop;* and *Service Lateral* ~~in Article 100~~ .

(2) Outdoor Transformer.

If the transformer supplying the service is located outside the building, at least one additional grounding connection shall be made from the grounded service conductor to a grounding electrode, either at the transformer or elsewhere outside the building.

Exception: The additional grounding electrode conductor connection shall not be made on impedance grounded systems. ~~*The system*~~ *Impedance grounded systems shall meet the requirements of 250.36 or 250.187, as applicable.*

(3) Dual-Fed Services.

For services that are dual fed (double ended) in a common enclosure or grouped together in separate enclosures and employing a secondary tie, a single grounding electrode conductor connection to the tie point of the grounded conductor(s) from each power source shall be permitted.

(4) Main Bonding Jumper as Wire or Busbar.

If the main bonding jumper specified in 250.28 is a wire or busbar and is installed from the grounded conductor terminal bar or bus to the equipment grounding terminal bar or bus in the service equipment, the grounding electrode conductor shall be permitted to be connected to the equipment grounding terminal, bar, or bus to which the main bonding jumper is connected.

(B) Load-Side Grounding Connections.

A grounded conductor shall not be connected to normally non-current-carrying metal parts of equipment, to equipment grounding conductor(s), or be reconnected to ground on the load side of the service disconnecting means except as otherwise permitted in this article.

Informational Note: See 250.30 for separately derived systems, 250.32 for connections at separate buildings or structures, and 250.142 for use of the grounded circuit conductor for grounding equipment.

(C) Main Bonding Jumper.

For a grounded system, an unspliced main bonding jumper shall be used to connect the equipment grounding conductor(s) and the service-disconnect enclosure to the grounded conductor within the enclosure for each service disconnect in accordance with 250.28.

Exception No. 1: If more than one service disconnecting means is located in an assembly listed for use as service equipment, an unspliced main bonding jumper shall bond the grounded conductor(s) to the assembly enclosure.

Exception No. 2: Impedance grounded systems shall be permitted to be connected in accordance with 250.36 and 250.187.

(D) Grounded Conductor Brought to Service Equipment.

If an ac system operating at 1000 volts or less is grounded at any point, the grounded conductor(s) shall be routed with the ungrounded conductors to each service disconnecting means and shall be connected to each disconnecting means grounded conductor(s) terminal or bus. A main bonding jumper shall connect the grounded conductor(s) to each service disconnecting means enclosure. The grounded conductor(s) shall be installed in accordance with 250.24(C)(1) and 250.24(D) (1) through (D)(4).

Exception: If two or more service disconnecting means are located in a single assembly listed for use as service equipment, it shall be permitted to connect the grounded conductor(s) to the assembly common grounded conductor(s) terminal or bus. The assembly shall include a main bonding jumper for connecting the grounded conductor(s) to the assembly enclosure.

(1) Sizing for a Single Raceway or Cable.

The grounded conductor shall not be smaller than specified in Table 250.102(C)(1).

(2) Conductors Connected in Parallel in Two or More Raceways or Cables ~~Connected in Parallel~~ .

If the ungrounded service-entrance conductors are connected in parallel in two or more raceways or cables, the grounded conductors shall also be installed in each raceway or cable and shall be connected in parallel. The size of ~~the~~ each grounded conductor(s) in each raceway or cable shall not be smaller than 1/0 AWG and shall be sized in accordance with 250.24(D)(2) (a) or (D)(2)(b) in accordance with 250.24(D)(1) . ~~be based on the largest ungrounded conductor in each raceway or cable, or the sum of the circular mil areas of the largest ungrounded conductors from each set connected in parallel in each raceway or cable in accordance with in 250.24(D)(1) , but not smaller than 1/0 AWG.~~

(a) Shall be based on the largest ungrounded conductor in each raceway or cable. ~~, or~~

(b) Shall be based on the sum of the circular mil areas of the largest ungrounded conductors from each set connected in parallel in each raceway or cable. ~~in accordance with in 250.24(D)(1) , but not smaller than 1/0 AWG~~

Informational Note: See 310.10(G) for grounded conductors connected in parallel.

(3) Delta-Connected Service.

The grounded conductor of a 3-phase, 3-wire delta service shall have an ampacity not less than that of the ungrounded conductors.

(4) Impedance Grounded Service.

The impedance grounding conductor on an impedance grounded system shall be connected in accordance with 250.36 or 250.187, as applicable.

(E) Grounding Electrode Conductor.

A grounding electrode conductor shall be used to connect the equipment grounding conductors, the service-equipment enclosures, and, if the system is grounded, the grounded service conductor to the grounding electrode(s) required by Part III of this article. This conductor shall be sized in accordance with 250.66.

Impedance grounded system connections shall be made in accordance with 250.36 or 250.187, as applicable.

(F) Ungrounded System Grounding Connections.

A premises wiring system that is supplied by an ac service that is ungrounded shall have, at each service, a grounding electrode conductor connected to the grounding electrode(s) required by Part III of this article. The grounding electrode conductor shall be connected to a metal enclosure of the service conductors at any accessible point from the load end of the overhead service conductors, service drop, underground service conductors, or service lateral to the service disconnecting means.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 13:24:25 EDT 2021

Committee Statement

Committee Statement: Section 250.24(A)(1) Informational Note is revised to comply with Section 4.1.3 of the NEC Style Manual. The words “The system” are replaced with “Impedance grounded systems” in 250.24(A)(2) Exception for clarity. The term “impedance grounded systems” correlates with the changes made in 250.36. Section 250.24(D)(2) is revised to a list format for clarity of how the ungrounded and grounded service conductors are installed and connected for parallel installations.

Response Message: SR-7954-NFPA 70-2021

Public Comment No. 742-NFPA 70-2021 [Section No. 250.24]

Second Revision No. 7957-NFPA 70-2021 [Section No. 250.25]

250.25 Grounding of Systems Permitted to Be Connected on the Supply Side of the Service Disconnect.

The grounding of systems connected on the supply side of the service disconnect, in accordance with 230.82, that are in enclosures separate from the service equipment enclosure shall comply with 250.25(A) or (B).

(A) Grounded System.

If the utility supply system is grounded, the grounding of systems permitted to be connected on the supply side of the service disconnect and are installed in one or more separate enclosures from the service equipment enclosure shall comply with the requirements of 250.24(A) through (D).

(B) Ungrounded Systems.

If the utility supply system is ungrounded, the grounding of systems permitted to be connected on the supply side of the service disconnect and are installed in one or more separate enclosures from the service equipment enclosure shall comply with the requirements of 250.24(F).

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 13:41:43 EDT 2021

Committee Statement

Committee Statement: The word “of” is added in the title of 250.25 to be consistent with 250.24.

Response Message: SR-7957-NFPA 70-2021

Public Comment No. 409-NFPA 70-2021 [Section No. 250.25]

Second Revision No. 7965-NFPA 70-2021 [Section No. 250.30]

250.30 Grounding Separately Derived Alternating-Current Systems.

In addition to complying with 250.30(A) for grounded systems, or as provided in 250.30(B) for ungrounded systems, separately derived systems shall comply with 250.20, 250.21, or 250.26, as applicable. Multiple power sources of the same type that are connected in parallel to form one system that supplies premises wiring shall be treated as a single separately derived system and shall be installed in accordance with 250.30.

Informational Note No. 1: An alternate ac power source, such as an on-site generator, is not a separately derived system if the grounded conductor is solidly interconnected to a service-supplied system grounded conductor. An example of such a situation is if the alternate source transfer equipment does not include a switching action in the grounded conductor and allows it to remain solidly connected to the service-supplied grounded conductor when the alternate source is operational and supplying the load served.

Informational Note No. 2: See 445.13 for the minimum size of conductors that carry fault current.

(A) Grounded Systems.

A separately derived ac system that is grounded shall comply with 250.30(A)(1) through (A)(8). Except as otherwise permitted in this article, a grounded conductor shall not be connected to normally non-current-carrying metal parts of equipment, be connected to equipment grounding conductors, or be reconnected to ground on the load side of the system bonding jumper.

Informational Note: See 250.32 for connections at separate buildings or structures and 250.142 for use of the grounded circuit conductor for grounding equipment.

Exception: Impedance grounded system grounding connections shall be made in accordance with 250.36 or 250.187, as applicable.

(1) System Bonding Jumper.

An unspliced system bonding jumper shall comply with 250.28(A) through (D). This connection shall be made at any single point on the separately derived system from the source to the first system disconnecting means or overcurrent device, or it shall be made at the source of a separately derived system that has no disconnecting means or overcurrent devices, in accordance with 250.30(A)(1)(a) or (A)(1)(b). The system bonding jumper shall remain within the enclosure where it originates. If the source is located outside the building or structure supplied, a system bonding jumper shall be installed at the grounding electrode connection in compliance with 250.30(C).

Exception No. 1: For systems installed in accordance with 450.6, a single system bonding jumper connection to the tie point of the grounded circuit conductors from each power source shall be permitted.

Exception No. 2: If a building or structure is supplied by a feeder from an outdoor separately derived system, a system bonding jumper at both the source and the first disconnecting means shall be permitted if doing so does not establish a parallel path for the grounded conductor. If a grounded conductor is used in this manner, it shall not be smaller than the size specified for the system bonding jumper but shall not be required to be larger than the ungrounded conductor(s). For the purposes of this exception, connection through the earth shall not be considered as providing a parallel path.

Exception No. 3: The size of the system bonding jumper for a system that supplies a Class 1, Class 2, or Class 3 circuit, and is derived from a transformer rated not more than 1000 volt-amperes, shall not be smaller than the derived ungrounded conductors and shall not be smaller than 14 AWG copper or 12 AWG aluminum.

(a) *Installed at the Source.* The system bonding jumper shall connect the grounded conductor to the supply-side bonding jumper and the normally non-current-carrying metal enclosure.

(b) *Installed at the First Disconnecting Means.* The system bonding jumper shall connect the grounded conductor to the supply-side bonding jumper, the disconnecting means enclosure, and the equipment grounding conductor(s).

Exception: Separately derived systems consisting of multiple sources of the same type that are connected in parallel shall be permitted to have the system bonding jumper installed at the paralleling switchgear, switchboard, or other paralleling connection point instead of at the disconnecting means located at each separate source.

(2) Supply-Side Bonding Jumper.

If the source of a separately derived system and the first disconnecting means are located in separate enclosures, a supply-side bonding jumper shall be installed with the circuit conductors from the source enclosure to the first disconnecting means enclosure. A supply-side bonding jumper shall not be required to be larger than the derived ungrounded conductors. The supply-side bonding jumper shall be permitted to be of nonflexible metal raceway type or of the wire or bus type as follows:

(1) A supply-side bonding jumper of the wire type shall comply with 250.102(C), based on the size of the derived ungrounded conductors.

(2) A supply-side bonding jumper of the bus type shall have a cross-sectional area not smaller than a supply-side bonding jumper of the wire type as determined in 250.102(C).

Exception: A supply-side bonding jumper shall not be required between enclosures for installations made in compliance with 250.30(A)(1), Exception No. 2.

(3) Grounded Conductor.

If a grounded conductor is installed and the system bonding jumper connection is not located at the source, 250.30(A)(3)(a) through (A)(3)(d) shall apply. The grounded conductor shall not be required to be larger than the derived ungrounded conductors.

(a) *Sizing for a Single Raceway.* The grounded conductor shall not be smaller than specified in Table 250.102(C)(1).

(b) *Conductors Connected in Parallel in Two or More Raceways or Cables.* If the ungrounded conductors are connected in parallel in two or more raceways or cables, the grounded conductors shall also be installed in each raceway or cable and shall be connected in parallel. The size of the grounded conductor(s) in each raceway or cable shall be based on the largest derived ungrounded conductor in each raceway or cable, or the sum of the circular mil areas of the largest derived ungrounded conductors from each set connected in parallel in each raceway or cable, in accordance with 250.30(A)(3)(a), but not smaller than 1/0 AWG.

Informational Note: See 310.10(G) for grounded conductors connected in parallel.

(c) *Delta-Connected System.* The grounded conductor of a 3-phase, 3-wire delta system shall have an ampacity not less than that of the ungrounded conductors.

(d) *Impedance Grounded System.* The impedance grounding conductor of an impedance grounded system shall be installed in accordance with 250.36 or 250.187, as applicable.

(4) Grounding Electrode.

The building or structure grounding electrode system shall be used as the grounding electrode for the separately derived system. If located outdoors, the grounding electrode shall be in accordance with 250.30(C).

Exception: If a separately derived system originates in equipment that is listed and identified as suitable for use as service equipment, the grounding electrode used for the service or feeder equipment shall be permitted to be used as the grounding electrode for the separately derived system.

Informational Note No. 1: See 250.104(D) for bonding requirements for interior metal water piping in the area served by separately derived systems.

Informational Note No. 2: See 250.50 and 250.58 for requirements for bonding all electrodes together if located at the same building or structure.

(5) Grounding Electrode Conductor, Single Separately Derived System.

A grounding electrode conductor for a single separately derived system shall be sized in accordance with 250.66 for the derived ungrounded conductors. It shall be used to connect the grounded conductor of the derived system to the grounding electrode in accordance with 250.30(A)(4), or as permitted in 250.68(C)(1) and (C)(2). This connection shall be made at the same point on the separately derived system where the system bonding jumper is connected.

Exception No. 1: If the system bonding jumper specified in 250.30(A)(1) is a wire or busbar, it shall be permitted to connect the grounding electrode conductor to the equipment grounding terminal, bar, or bus if the equipment grounding terminal, bar, or bus is of sufficient size for the separately derived system.

Exception No. 2: If the source of a separately derived system is located within equipment listed and identified as suitable for use as service equipment, the grounding electrode conductor from the service or feeder equipment to the grounding electrode shall be permitted as the grounding electrode conductor for the separately derived system, if the grounding electrode conductor is of sufficient size for the separately derived system. If the equipment grounding bus internal to the equipment is not smaller than the required grounding electrode conductor for the separately derived system, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

Exception No. 3: A grounding electrode conductor shall not be required for a system that supplies a Class 1, Class 2, or Class 3 circuit and is derived from a transformer rated not more than 1000 volt-amperes, provided the grounded conductor is bonded to the transformer frame or enclosure by a jumper sized in accordance with 250.30(A)(1), Exception No. 3, and the transformer frame or enclosure is grounded by one of the means specified in 250.134.

(6) Grounding Electrode Conductor, Multiple Separately Derived Systems.

A common grounding electrode conductor for multiple separately derived systems shall be permitted. If installed, the common grounding electrode conductor shall be used to connect the grounded conductor of each separately derived system to the grounding electrode as specified in 250.30(A)(4). A grounding electrode conductor tap shall then be installed from each separately derived system to the common grounding electrode conductor. Each tap conductor shall connect the grounded conductor of the separately derived system to the common grounding electrode conductor. This connection shall be made at the same point on the separately derived system where the system bonding jumper is connected.

Exception No. 1: If the system bonding jumper specified in 250.30(A)(1) is a wire or busbar, it shall be permitted to connect the grounding electrode conductor tap to the equipment grounding terminal, bar, or bus, provided the equipment grounding terminal, bar, or bus is of sufficient size for the separately derived system.

Exception No. 2: A grounding electrode conductor shall not be required for a system that supplies a Class 1, Class 2, or Class 3 circuit and is derived from a transformer rated not more than 1000 volt-amperes, provided the system grounded conductor is bonded to the transformer frame or enclosure by a jumper sized in accordance with 250.30(A)(1), Exception No. 3, and the transformer frame or enclosure is grounded by one of the means specified in 250.134.

Exception No. 3: If the source of a separately derived system is located within equipment listed and identified as suitable for use as service equipment, the grounding electrode conductor from the service or feeder equipment to the grounding electrode shall be permitted as the grounding electrode conductor for the separately derived system, if the grounding electrode conductor is of sufficient size for the separately derived system. If the equipment grounding bus internal to the equipment is not smaller than the required grounding electrode conductor for the separately derived system, the grounding electrode connection for the separately derived system shall be permitted to be made to the bus.

(a) *Common Grounding Electrode Conductor.* The common grounding electrode conductor shall be permitted to be one of the following:

(1) A conductor of the wire type not smaller than 3/0 AWG copper or 250 kcmil aluminum

(2) A metal water pipe in accordance with 250.68(C)(1)

(3) The metal structural frame of the building or structure in accordance with 250.68(C)(2) or is connected to the grounding electrode system by a conductor not smaller than 3/0 AWG copper or 250 kcmil aluminum

(b) *Tap Conductor Size.* Each tap conductor shall be sized in accordance with 250.66 based on the derived ungrounded conductors of the separately derived system it serves.

Exception to (a)(1) and (b): If the only electrodes that are present are of the types in 250.66(A), (B), or (C), the size of the common grounding electrode conductor shall not be required to be larger than the largest conductor required by 250.66(A), (B), or (C) for the type of electrode that is present.

(c) *Connections.* All tap connections to the common grounding electrode conductor shall be made at an accessible location by one of the following methods:

(1) A connector listed as grounding and bonding equipment.

(2) Listed connections to aluminum or copper busbars not smaller than 6 mm thick × 50 mm wide (¼ in. thick × 2 in. wide) and of a length to accommodate the number of terminations necessary for the installation. If aluminum busbars are used, the installation shall also be in accordance with 250.64(A).

(3) The exothermic welding process.

Tap conductors shall be connected to the common grounding electrode conductor in such a manner that the common grounding electrode conductor remains without a splice or joint.

(7) Installation.

The installation of all grounding electrode conductors shall comply with 250.64(A), (B), (C), and (E).

(8) Bonding.

Structural steel and metal piping shall be connected to the grounded conductor of a separately derived system in accordance with 250.104(D).

(B) Ungrounded Systems.

The equipment of an ungrounded separately derived system shall be grounded and bonded as specified in 250.30(B)(1) through (B)(3).

(1) Grounding Electrode Conductor.

A grounding electrode conductor, sized in accordance with 250.66 for the largest derived ungrounded conductor(s) or set of derived ungrounded conductors, shall be used to connect the metal enclosures of the derived system to the grounding electrode as specified in 250.30(A)(5) or (A)(6), as applicable. This connection shall be made at any point on the separately derived system from the source to the first system disconnecting means. If the source is located outside the building or structure supplied, a grounding electrode connection shall be made in compliance with 250.30(C).

(2) Grounding Electrode.

Except as permitted by 250.34 for portable and vehicle-mounted generators, the grounding electrode shall comply with 250.30(A)(4).

(3) Bonding Path and Conductor.

A supply-side bonding jumper shall be installed from the source of a separately derived system to the first disconnecting means in compliance with 250.30(A)(2).

(C) Outdoor Source.

If the source of the separately derived system is located outside the building or structure supplied, a grounding electrode connection shall be made at the source location to one or more grounding electrodes in accordance with 250.50. In addition, the installation shall be in accordance with 250.30(A) for grounded systems or with 250.30(B) for ungrounded systems.

Exception: The grounding electrode conductor connection for impedance grounded ~~neutral~~ systems shall be in accordance with 250.36 or 250.187, as applicable.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 14:47:40 EDT 2021

Committee Statement

Committee Statement: The word “neutral” was removed in 250.30(C) Exception for consistency.

Response Message: SR-7965-NFPA 70-2021

Public Comment No. 743-NFPA 70-2021 [Section No. 250.30]

Second Revision No. 8047-NFPA 70-2021 [Section No. 250.36]

250.36 Impedance Grounded Systems — 480 Volts to 1000 Volts.

Impedance grounded systems in which a grounding impedance device, typically a resistor, limits the ground-fault current ~~to a low value~~ shall be permitted for 3-phase ac systems of 480 volts to 1000 volts if all the following conditions are met:

(1) The conditions of maintenance and supervision ensure that only qualified persons service the installation.

(2) Ground detectors are installed on the system.

(3) Line-to-neutral loads are not served.

Impedance grounded systems shall comply with 250.36(A) through (G).

Informational Note: According to Annex O of NFPA *70E*-2021, *Standard for Electrical Safety in the Workplace*, impedance grounding is an effective tool to reduce arc-flash hazards.

(A) Location.

The grounding impedance device shall be installed between the grounding electrode conductor and the impedance grounding conductor connected to the system neutral point. If a neutral point is not available, the grounding impedance shall be installed between the grounding electrode conductor and the impedance grounding conductor connected to the neutral point derived from a grounding transformer.

(B) Impedance Grounding Conductor Insulation and Ampacity.

The impedance grounding conductor from the neutral point of the transformer or generator to its connection point to the grounding impedance shall be fully insulated.

The impedance grounding conductor shall have an ampacity of not less than the maximum current rating of the grounding impedance but in no case shall the impedance grounding conductor be smaller than 8 AWG copper or 6 AWG aluminum or copper-clad aluminum.

(C) System Grounding Connection.

The system shall not be connected to ground except through the grounding impedance device.

Informational Note: The impedance is normally selected to limit the ground-fault current to a value slightly greater than or equal to the capacitive charging current of the system. This value of impedance will also limit transient overvoltages to safe values. For guidance, refer to criteria for limiting transient overvoltages in IEEE 3003.1-2019, *Recommended Practice for System Grounding of Industrial and Commercial Power Systems*.

(D) Impedance Grounding Conductor Routing.

The impedance grounding conductor shall be permitted to be installed in a separate raceway from the ungrounded conductors. It shall not be required to run this conductor with the phase conductors to the first system disconnecting means or overcurrent device.

(E) ~~Equipment~~ Impedance Bonding Jumper.

The ~~equipment~~ impedance bonding jumper (the connection between the equipment grounding conductors and the grounding impedance device) shall be an unspliced conductor run from the first system disconnecting means or overcurrent device to the grounded side of the grounding impedance device.

(F) Grounding Electrode Conductor Connection Location.

For services or separately derived systems, the grounding electrode conductor shall be connected at any point from the grounded side of the grounding impedance device to the equipment grounding connection at the service equipment or the first system disconnecting means of a separately derived system.

(G) ~~Equipment~~ Impedance Bonding Jumper Size.

The ~~equipment~~ impedance bonding jumper shall be sized in accordance with either of the following:

(1) If the grounding electrode conductor connection is made at the grounding impedance device, the equipment bonding jumper shall be sized in accordance with 250.66, based on the size of the service entrance conductors for a service or the derived phase conductors for a separately derived system.

(2) If the grounding electrode conductor is connected at the first system disconnecting means or overcurrent device, the ~~equipment~~ impedance bonding jumper shall be sized the same as the impedance grounding conductor in 250.36(B).

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 17:32:06 EDT 2021

Committee Statement

Committee Statement: The phrase “to a low value” is removed because low is an ambiguous term that is not enforceable. Users of this section of the code understand the current in an impedance grounded system is limited to value below the rating of the applicable overcurrent circuit protective device.

The term “equipment bonding jumper” is replaced by “impedance bonding jumper” in multiple locations because in an impedance grounded system the subject conductor does not meet the definition of equipment bonding jumper in Article 100. The replacement term is consistent with changes made in the First Draft action and is explained in the text, making a new definition unnecessary.

Response Message: SR-8047-NFPA 70-2021

Public Comment No. 1989-NFPA 70-2021 [Section No. 250.36(E)]

Public Comment No. 1994-NFPA 70-2021 [Section No. 250.36(G)]

Public Comment No. 1313-NFPA 70-2021 [Section No. 250.36 [Excluding any Sub-Sections]]

Second Revision No. 7968-NFPA 70-2021 [Section No. 250.50]

250.50 Grounding Electrode System.

All grounding electrodes as described in 250.52(A)(1) through (A)(7) that are present at each building or structure served shall be bonded together to form the grounding electrode system. If none of these grounding electrodes exist, one or more of the grounding electrodes specified in 250.52(A)(4) through (A)(8) shall be installed and used.

Exception: Concrete-encased electrodes of existing buildings or structures shall not be required to be part of the grounding electrode system if the ~~steel reinforcing bars or rods are~~ rebar is not accessible for use without disturbing the concrete.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 15:07:10 EDT 2021

Committee Statement

Committee Statement: The term “steel reinforcing bars or rods” was replaced with the term “rebar” for consistency.

Response Message: SR-7968-NFPA 70-2021

Public Comment No. 269-NFPA 70-2021 [Section No. 250.50]

Second Revision No. 7969-NFPA 70-2021 [Section No. 250.52(A)(3)]

(3) Concrete-Encased Electrode.

A concrete-encased electrode shall consist of at least 6.0 m (20 ft) of either of the following:

(1) One or more bare or zinc galvanized or other electrically conductive coated ~~steel reinforcing bars or rods~~ rebar of not less than 13 mm (½ in.) in diameter, installed in one continuous 6.0 m (20 ft) length, or if in multiple pieces, the rebar shall be connected together by steel tie wires, exothermic welding, welding, or other effective means to create a 6.0 m (20 ft) or greater length

(2) Bare copper conductor not smaller than 4 AWG

Metal components shall be encased by at least 50 mm (2 in.) of concrete and shall be located horizontally within that portion of a concrete foundation or footing that is in direct contact with the earth or within vertical foundations or structural components or members that are in direct contact with the earth. If multiple concrete-encased electrodes are present at a building or structure, it shall be permissible to bond only one into the grounding electrode system.

Informational Note: Concrete installed with insulation, vapor barriers, films, or similar items separating the concrete from the earth is not considered to be in “direct contact” with the earth.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 15:10:17 EDT 2021

Committee Statement

Committee Statement: The term “steel reinforcing bars or rods” was replaced with the term “rebar” for consistency.

Response Message: SR-7969-NFPA 70-2021

Public Comment No. 270-NFPA 70-2021 [Section No. 250.52(A)(3)]

Second Revision No. 7972-NFPA 70-2021 [Section No. 250.52(B)]

(B) Not Permitted for Use as Grounding Electrodes.

The following systems and materials shall not be used as grounding electrodes:

(1) Metal underground gas piping systems

(2) Aluminum

(3) The structures and structural ~~reinforcing steel~~ rebar described in 680.26(B)(1) and (B)(2)

Informational Note: See 250.104(B) for bonding requirements of gas piping.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 15:45:58 EDT 2021

Committee Statement

Committee Statement: The term “reinforcing steel” was replaced with the term “rebar” for consistency.

Response Message: SR-7972-NFPA 70-2021

Public Comment No. 271-NFPA 70-2021 [Section No. 250.52(B)]

Second Revision No. 7974-NFPA 70-2021 [Section No. 250.53(A)]

(A) Rod, Pipe, and Plate Electrodes.

Rod, pipe, and plate electrodes shall be free from nonconductive coatings such as paint or enamel. Rod, pipe, and plate electrodes shall meet the requirements of 250.53(A)(1) through (A)(3). ~~Rod, pipe, and plate electrodes shall be free from nonconductive coatings such as paint or enamel.~~

(1) Below Permanent Moisture Level.

If practicable, rod, pipe, and plate electrodes shall be embedded below permanent moisture level.

(2) Supplemental Electrode Required.

A single rod, pipe, or plate electrode shall be supplemented by an additional electrode of a type specified in 250.52(A)(2) through (A)(8). The supplemental electrode shall be permitted to be bonded to one of the following:

(1) Rod, pipe, or plate electrode

(2) Grounding electrode conductor

(3) Grounded service-entrance conductor

(4) Nonflexible grounded service raceway

(5) Any grounded service enclosure

Exception: If a single rod, pipe, or plate grounding electrode has a resistance to earth of 25 ohms or less, the supplemental electrode shall not be required.

(3) Supplemental Electrode.

If multiple rod, pipe, or plate electrodes are installed to meet the requirements of this section, they shall not be less than 1.8 m (6 ft) apart.

Informational Note: The paralleling efficiency of rods is increased by spacing them twice the length of the longest rod.

(4) Rod and Pipe Electrodes.

The electrode shall be installed such that at least 2.44 m (8 ft) of length is in contact with the soil. It shall be driven to a depth of not less than 2.44 m (8 ft) except that, where rock bottom is encountered, the electrode shall be driven at an oblique angle not to exceed 45 degrees from the vertical or, where rock bottom is encountered at an angle up to 45 degrees, the electrode shall be permitted to be buried in a trench that is at least 750 mm (30 in.) deep. The upper end of the electrode shall be flush with or below ground level unless the aboveground end and the grounding electrode conductor attachment are protected against physical damage as specified in 250.10.

(5) Plate Electrode.

Plate electrodes shall be installed not less than 750 mm (30 in.) below the surface of the earth.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 15:47:48 EDT 2021

Committee Statement

Committee Statement: The order of the sentences was modified for clarity.

Response Message: SR-7974-NFPA 70-2021

Public Comment No. 744-NFPA 70-2021 [Section No. 250.53(A)]

Second Revision No. 8087-NFPA 70-2021 [Section No. 250.94(A)]

(A) The Intersystem Bonding Termination Device.

An intersystem bonding termination (IBT) for connecting intersystem bonding conductors shall be provided external to enclosures at the service equipment or metering equipment enclosure and at the disconnecting means for any buildings or structures that are supplied by a feeder or branch circuit. If an IBT is used, it shall comply with the following:

(1) Be accessible for connection and inspection

(2) Consist of a set of terminals with the capacity for connection of not less than three intersystem bonding conductors

(3) Not interfere with opening the enclosure for a service, building or structure disconnecting means, or metering equipment

(4) Be securely mounted as follows:

a. At the service equipment, ~~be~~ to a metal enclosure for the service equipment, to a metal meter enclosure, or to an exposed nonflexible metal service raceway, or be connected to the metal enclosure ~~or to~~ for the grounding electrode conductor with a minimum 6 AWG copper conductor

b. At the disconnecting means for a building or structure that is supplied by a feeder or branch circuit , be electrically connected to the metal enclosure for the building or structure disconnecting means, or be connected to the metal enclosure ~~or to~~ for the grounding electrode conductor with a minimum 6 AWG copper conductor

(5) Be listed as grounding and bonding equipment

Exception: In existing buildings or structures, if any of the intersystem bonding and grounding electrode conductors required by 770.100(B)(2), 800.100(B)(2), 810.21(F)(2), and 820.100 exist, installation of an IBT shall not be required. An accessible means external to enclosures for connecting intersystem bonding and grounding electrode conductors shall be permitted at the service equipment and at the disconnecting means for any buildings or structures that are supplied by a feeder or branch circuit by at least one of the following means:

(1) Exposed nonflexible metal raceways

(2) An exposed grounding electrode conductor

(3) Approved means for the external connection of a copper or other corrosion-resistant bonding or grounding electrode conductor to the grounded raceway or equipment

~~Informational Note No. 1: A 6 AWG copper conductor with one end bonded to the grounded nonflexible metallic raceway or equipment and with 150 mm (6 in.) or more of the other end made accessible on the outside wall is an example of the approved means covered in 250.94 , Exception item (3).~~

Informational Note: See 770.100, 800.100, 810.21, and 820.100 for intersystem bonding and grounding requirements for conductive optical fiber cables, communications circuits, radio and television equipment, CATV circuits, and network-powered broadband communications systems, respectively.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 15:38:48 EDT 2021

Committee Statement

Committee Statement: Editorial revisions are made to add clarity. Item (4)(a) was changed to clarify that an IBT must be securely mounted and not only to a grounding electrode conductor. Informational Note 1 is deleted to comply with the NEC Style Manual 4.1.3.

Response Message: SR-8087-NFPA 70-2021

Public Comment No. 272-NFPA 70-2021 [Section No. 250.94(A)]

Public Comment No. 760-NFPA 70-2021 [Section No. 250.94(A)]

Second Revision No. 7986-NFPA 70-2021 [Section No. 250.94(B)]

(B) Other Means.

Connections to an aluminum or copper busbar not less than 6 mm thick × 50 mm wide (¼ in. thick × 2 in. wide) and of a length to accommodate at least three terminations for communication systems in addition to other connections. The busbar shall be securely fastened and shall be installed in an accessible location. Connections shall be made by a listed connector. If aluminum busbars are used, the installation shall also comply with 250.64(A). The busbar shall be connected to the grounding electrode system by a conductor that is the larger of the following:

(1) ~~Not smaller than the~~ The largest grounding electrode conductor that is connected to the busbar

(2) As required or permitted in 250.94(A)

Exception to (A) and (B): Means for connecting intersystem bonding conductors are not required if communications systems are not likely to be used in or on the building or structure .

Informational Note: The use of an IBT can reduce electrical noise on communication systems.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 16:49:49 EDT 2021

Committee Statement

Committee Statement: The editorial changes add clarity.

Response Message: SR-7986-NFPA 70-2021

Public Comment No. 301-NFPA 70-2021 [Section No. 250.94(B)]

Second Revision No. 7989-NFPA 70-2021 [Section No. 250.106]

250.106 Lightning Protection Systems.

The lightning protection system ground terminals shall be bonded to the building or structure grounding electrode system.

Informational Note No. 1: See 250.60 for use of strike termination devices. ~~For further information, see~~ ~~NFPA 780~~ ~~-2020,~~ ~~*Standard for the Installation of Lightning Protection Systems*~~ ~~, which contains detailed information on grounding, bonding, and sideflash distance from lightning protection systems.~~

Informational Note No. 2: ~~For further information, see~~ See NFPA 780~~-2020~~ , *Standard for the Installation of Lightning Protection Systems*, which contains detailed information on grounding, bonding, and sideflash distance from lightning protection systems.

~~Informational Note No. 2: Metal raceways, enclosures, frames, and other non-current-carrying metal parts of electrical equipment installed on a building equipped with a lightning protection system may require bonding or spacing from the lightning protection conductors in accordance with NFPA 780 -2020, *Standard for the Installation of Lightning Protection Systems* .~~

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 17:08:09 EDT 2021

Committee Statement

Committee Statement: The informational Notes are written to comply with the NEC Style Manual 4.1.3. The date of the NFPA 780 edition is deleted as permitted by the new 90.5(C).

Response Message: SR-7989-NFPA 70-2021

Public Comment No. 761-NFPA 70-2021 [Section No. 250.106]

Second Revision No. 7998-NFPA 70-2021 [Section No. 250.109]

Detail SR-7997

250.109 Metal Enclosures.

Metal enclosures shall be permitted to be used to connect bonding jumpers or equipment grounding conductors, or both, together to become a part of an effective ground-fault current path. If installed, metal covers, ~~mud~~plaster rings, extension rings, and metal fittings shall be attached to these metal enclosures to ensure an effective ground-fault current path or shall be connected with bonding jumpers or equipment grounding conductors, or both.

Informational Note: See 250.97 for bonding requirements for over 250 volts to ground.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Mon Oct 18 21:06:37 EDT 2021

Committee Statement

Committee Statement: The change correlates terminology with other sections of the NEC.

Response Message: SR-7998-NFPA 70-2021

Public Comment No. 1314-NFPA 70-2021 [Section No. 250.109]

Second Revision No. 8022-NFPA 70-2021 [Section No. 250.118(A)]

(A) Permitted.

Each equipment grounding conductor run with or enclosing the circuit conductors shall be one or more or a combination of the following:

(1) A copper, aluminum, or copper-clad aluminum conductor. This conductor shall be solid or stranded; insulated, covered, or bare; and in the form of a wire or a busbar of any shape.

(2) Rigid metal conduit.

(3) Intermediate metal conduit.

(4) Electrical metallic tubing.

(5) Listed flexible metal conduit meeting all the following conditions:

a. The conduit is terminated in listed fittings.

b. The circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.

c. The size of the conduit does not exceed metric designator 35 (trade size 1¼).

d. The combined length of flexible metal conduit, flexible metallic tubing, and liquidtight flexible metal conduit in the same effective ground-fault current path does not exceed 1.8 m (6 ft).

e. If flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation, a wire-type equipment grounding conductor or a bonding jumper in accordance with 250.102(E)(2) shall be installed.

f. If flexible metal conduit is constructed of stainless steel, a wire-type equipment grounding conductor or bonding jumper in accordance with 250.102(E)(2) shall be installed.

(6) Listed liquidtight flexible metal conduit meeting all the following conditions:

a. The conduit is terminated in listed fittings.

b. For metric designators 12 through 16 (trade sizes ⅜ through ½), the circuit conductors contained in the conduit are protected by overcurrent devices rated at 20 amperes or less.

c. For metric designators 21 through 35 (trade sizes ¾ through 1¼), the circuit conductors contained in the conduit are protected by overcurrent devices rated not more than 60 amperes and there is no flexible metal conduit, flexible metallic tubing, or liquidtight flexible metal conduit in metric designators 12 through 16 (trade sizes ⅜ through ½) in the effective ground-fault current path.

d. The combined length of flexible metal conduit, flexible metallic tubing, and liquidtight flexible metal conduit in the same effective ground-fault current path does not exceed 1.8 m (6 ft).

e. If flexibility is necessary to minimize the transmission of vibration from equipment or to provide flexibility for equipment that requires movement after installation, a wire-type equipment grounding conductor or a bonding jumper in accordance with 250.102(E)(2) shall be installed.

f. If liquidtight flexible metal conduit contains a stainless steel core, a wire-type equipment grounding conductor or a bonding jumper in accordance with 250.102(E)(2) shall be installed.

(7) Flexible metallic tubing if the tubing is terminated in listed fittings and meeting the following conditions:

a. The circuit conductors contained in the tubing are protected by overcurrent devices rated at 20 amperes or less.

b. The combined length of flexible metal conduit, flexible metallic tubing, and liquidtight flexible metal conduit in the same effective ground-fault current path does not exceed

1.8 m (6 ft).

(8) Armor of Type AC cable as provided in 320.108.

(9) The copper sheath of mineral-insulated, metal-sheathed cable Type MI.

(10) Type MC cable that provides an effective ground-fault current path in accordance with one or more of the following:

a. It contains an insulated or uninsulated equipment grounding conductor in compliance with 250.118(1).

b. The combined metallic sheath and uninsulated equipment grounding/bonding conductor of interlocked metal tape–type MC cable that is listed and identified as an equipment grounding conductor

c. The metallic sheath or the combined metallic sheath and equipment grounding conductors of the smooth or corrugated tube-type MC cable that is listed and identified as an equipment grounding conductor

(11) Cable trays as permitted in 392.10 and 392.60.

(12) Cablebus framework as permitted in 370.60(1).

(13) Other listed electrically continuous metal raceways and listed auxiliary gutters.

(14) Surface metal raceways listed for grounding.

Informational Note: See Article 100 for a definition of *effective ground-fault current path*.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Tue Oct 19 14:50:37 EDT 2021

Committee Statement

Committee Statement: The change to flexible metal conduit constructed of stainless steel was made to match what was done with stainless steel liquidtight flexible metal conduit in the first revision in 250.118(A)(6)(f) because the electrical characteristics of the stainless steel used in both products are similar.

Response Message: SR-8022-NFPA 70-2021

Public Comment No. 1327-NFPA 70-2021 [Section No. 250.118(A)]

Second Revision No. 8071-NFPA 70-2021 [Section No. 250.122(B)]

(B) Increased in Size.

If ungrounded conductors are increased in size for any reason other than as required in 310.15(B) or ~~310.15(C)~~ (C) , wire-type equipment grounding conductors, if installed, shall be increased in size proportionately to the increase in circular mil area of the ungrounded conductors.

Exception: Equipment grounding conductors shall be permitted to be sized under engineering supervision or by a qualified person using industry practices to meet the performance objectives of 250.4(A)(5) or (B)(4). Documentation of the method used and the equipment grounding conductor size shall be made available to the authority having jurisdiction upon request.

Informational Note: See GEMI Analysis Software for an industry practice method for determining acceptable equipment grounding conductor sizes.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 13:01:04 EDT 2021

Committee Statement

Committee Statement: An informational note is added to provide guidance on a method for calculating equipment grounding conductor sizes.

Response Message: SR-8071-NFPA 70-2021

Public Comment No. 1332-NFPA 70-2021 [Section No. 250.122(B)]

Second Revision No. 8073-NFPA 70-2021 [Section No. 250.130(C)]

(C) Replacement of Nongrounding Receptacle or Snap Switch and Branch Circuit Extensions.

The equipment grounding conductor ~~of~~ that is connected to a grounding-type receptacle, a snap switch with an equipment grounding terminal, or a branch-circuit extension shall be permitted to be connected to any of the following:

(1) Any accessible point on the grounding electrode system as described in 250.50

(2) Any accessible point on the grounding electrode conductor

(3) The equipment grounding terminal bar within the enclosure where the branch circuit for the receptacle or branch circuit originates

(4) An equipment grounding conductor that is part of another branch circuit that originates from the enclosure where the branch circuit for the receptacle, snap switch, or branch circuit originates

(5) For grounded systems, the grounded service conductor within the service equipment enclosure

(6) For ungrounded systems, the grounding terminal bar within the service equipment enclosure

Informational Note No. 1: See 406.4(D) for the use of a ground-fault circuit-interrupting type of receptacle.

Informational Note No. 2: See 404.9(B) for requirements regarding grounding of snap switches.

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 13:07:21 EDT 2021

Committee Statement

Committee Statement: The revised language improves clarity and readability without changing the intent of the rule.

Response Message: SR-8073-NFPA 70-2021

Public Comment No. 305-NFPA 70-2021 [Section No. 250.130(C)]

Second Revision No. 8053-NFPA 70-2021 [Section No. 250.140]

250.140 Frames of Ranges and Clothes Dryers.

Frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and outlet or junction boxes that are part of the circuit ~~for these appliances~~ shall be connected to the equipment grounding conductor in ~~the manner specified by~~ 250.134 ~~or 250.138~~ accordance with 250.140(A) or the grounded conductor in accordance with 250.140(B) .

~~*Exception: For existing branch-circuit installations only if an equipment grounding conductor is not present in the outlet or junction box, the frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and outlet or junction boxes that are part of the circuit for these appliances shall be permitted to be connected to the grounded circuit conductor if all the following conditions are met.*~~

(A) Equipment Grounding Conductor Connections.

The circuit supplying the appliance shall include an equipment grounding conductor. The frame of the appliance shall be connected to the equipment grounding conductor in the manner specified by 250.134 or 250.138 .

(B) Grounded Conductor Connections.

For existing branch-circuit installations only, if an equipment grounding conductor is not present in the outlet or junction box the frame of the appliance shall be permitted to be connected to the grounded conductor if all the conditions in the following list items (1), (2), and (3) are met and the grounded conductor complies with either list item (4) or (5):

(1) The supply circuit is 120/240-volt, single-phase, 3-wire; or 208Y/120-volt derived from a 3-phase, 4-wire, wye-connected system.

(2) The grounded conductor is not smaller than 10 AWG copper or 8 AWG aluminum or copper-clad aluminum.

(3) Grounding contacts of receptacles furnished as part of the equipment are bonded to the equipment.

(4) The grounded conductor is insulated, or the grounded conductor is uninsulated and part of a Type SE service-entrance cable and the branch circuit originates at the service equipment.

(5) The grounded conductor is part of a Type SE service-entrance cable that originates in equipment other than a service. The grounded conductor shall be insulated or field covered within the supply enclosure with listed insulating material, such as tape or sleeving to prevent contact of the uninsulated conductor with any normally non-current-carrying metal parts.

Supplemental Information

File Name	Description	Approved
NEC_CMP5_SR8053_250.140.docx	For staff use	

Submitter Information Verification

Committee: NEC-P05

Submittal Date: Wed Oct 20 11:06:09 EDT 2021

Committee Statement

Committee Statement: The section was revised by changing the main requirement and the former exception into two titled subdivisions. Section 250.140(A) address new installations and, other than the titled subdivision and mandatory text requiring the supply circuit to include an equipment grounding conductor, it remains unchanged from the 2020 NEC.

Section 250.140(B) incorporates the former exception for existing branch circuits that originated at the service equipment and it was expanded to recognize existing branch circuits originating at other than service equipment. The expansion was necessary to provide relief for situations where existing 3-wire branch circuits to electric ranges or dryers are connected to equipment that was formally service equipment but is now feeder supplied.

The hazard addressed by 250.142(B) and 250.140(A), having neutral current on the metal normally non-current-carrying parts (objectionable current), is addressed by the requirement in 250.140(B)(5) to insulate or cover an uninsulated grounded conductor within the supply enclosure so it does not contact metal parts that are normally non-current-carrying. Because the neutral bus will be isolated from the enclosure, the uninsulated conductor must be insulated or covered, so there will be no contact with the metal enclosure and, therefore, no parallel path for objectionable neutral current.

Response Message: SR-8053-NFPA 70-2021

Public Comment No. 2090-NFPA 70-2021 [Section No. 250.140]

Second Revision No. 8075-NFPA 70-2021 [Section No. 250.191]

250.191 Grounding System at Alternating-Current Substations.

For ac substations, the grounding system shall be in accordance with Part III of ~~Article~~ this article ~~00250~~ .

Informational Note: ~~For further information on outdoor ac substation grounding, see~~ See IEEE 80-~~2013~~ , *IEEE Guide for Safety in AC Substation Grounding*, for further information on outdoor ac substation grounding .

Submitter Information Verification

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Committee Statement

Committee Statement: Revisions to text are made to comply with NEC Style Manual Section.

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Public Comment No. 906-NFPA 70-2021 [Section No. 250.191]

Second Revision No. 8076-NFPA 70-2021 [Section No. 250.194]

250.194 Grounding and Bonding of Fences and Other Metal Structures.

~~Metallic~~ Metal fences enclosing, and other metal structures in or surrounding, a substation with exposed electrical conductors and equipment shall be grounded and bonded to limit step, touch, and transfer voltages.

(A) Metal Fences.

If metal fences are located within 5 m (16 ft) of the exposed electrical conductors or equipment, the fence shall be bonded to the grounding electrode system with wire-type bonding jumpers as follows:

(1) Bonding jumpers shall be installed at each fence corner and at maximum 50 m (160 ft) intervals along the fence.

(2) If bare overhead conductors cross the fence, bonding jumpers shall be installed on each side of the crossing.

(3) Gates shall be bonded to the gate support post, and each gate support post shall be bonded to the grounding electrode system.

(4) Any gate or other opening in the fence shall be bonded across the opening by a buried bonding jumper.

(5) The grounding grid or grounding electrode systems shall be extended to cover the swing of all gates.

(6) The barbed wire strands above the fence shall be bonded to the grounding electrode system.

Alternate designs performed under engineering supervision shall be permitted for grounding or bonding of metal fences.

Informational Note No. 1: A nonconducting fence or section may provide isolation for transfer of voltage to other areas.

Informational Note No. 2: See IEEE 80-~~2013~~ , *IEEE Guide for Safety In AC Substation Grounding,* for design and installation of fence grounding.

(B) Metal Structures.

All exposed conductive metal structures, including guy wires within 2.5 m (8 ft) vertically or 5 m (16 ft) horizontally of exposed conductors or equipment and subject to contact by persons, shall be bonded to the grounding electrode systems in the area.

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Committee Statement

Committee Statement: Revisions to text are made to comply with NEC Style Manual and the use of “Standard Terms” in Annex A of the NEC Style Manual.

Response Message: SR-8076-NFPA 70-2021

Public Comment No. 762-NFPA 70-2021 [Section No. 250.194]