



Interpretation

Section 9. Grounding methods for electric supply and communications facilities

Rule 99A **Electrode**
Rule 96D **Single-grounded (unigrounded or delta) systems**
(2012 Edition, page 33)
(6 December 2016) IR581

Questions:

1. Does Rule 099A3 *EXCEPTION* take precedence over Rule 94B2 where only communication cables are installed?
2. Is it the intent of Rule 096D “Single-grounded (uniground or delta) systems” to apply to electric supply and communication facilities or to electric systems only?

General Discussion:

This request is in the context of a new fiber-optic cable network installation that will service only communication cables. Optical fiber communication cables with a metallic armor sheath will be installed in underground, non-metallic conduits and manholes. A tracer wire system will be installed along each cable path and will be external to the conduits. In isolated cases where the tracer wire breaks during (Horizontal Directional Drilling) conduit installation due to rock or other abrasions, the tracer wire may be installed inside the conduit with the fiber-optic cable for the isolated section of conduit path (between manholes) only.

The fiber-optic cable is constructed with a dielectric strength member surrounding the buffer tubes containing the fibers, then an inner polyethylene insulation jacket, a corrugated steel armor, and an outer polyethylene insulation jacket. Cable splices will be made in a manhole using a splice enclosure designed for the purpose.

The fiber-optic cable metallic armor sheath will be bonded to a ground electrode to minimize personnel hazard. The sheath bond will be made only at cable splice locations where the sheath has been broken/removed for splice purposes. A driven rod will be placed inside an open bottom manhole for this purpose.

The tracer wire installed along the conduit route will be either a water-blocking cable designed for tracing underground conduits or a standard 19 gauge THWN wire. The water-blocking tracer wire is constructed with a 19 gauge tinned-coated solid copper wire, a strengthening member, and a high-density polyethylene jacket. The tracer wire will be connected to a ground at only one point (far end of conduit path) and terminated to a floating terminal block at the point of origin,



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which may be accessed by maintenance personnel for tracing the conduit path. The tracer wire will maintain continuity in all manhole locations.

There will be no electric cables or equipment installed in the manholes or conduit. The metallic sheath, tracer wire, driven rod, and the connecting grounding conductors will be the only conductive elements in the underground conduit, cable, manhole, and splice network.

Discussion 1:

Rule 099A3 is applicable for a new communication cable installation. Rule 099A3 requires the made ground electrode to be as described in Rule 094B. For a driven rod electrode, Rule 094B2 requires the rod to be 8 ft in length and driven to a depth of 8 ft below the ground level.

Rule 094B2c *EXCEPTION 1* permits a ground rod to be driven to a depth less than 8 ft when rock is encountered. Similarly, for communication apparatus, Rule 099A3 *EXCEPTION* permits a 5 ft rod driven to a depth of 5 ft subject to Rule 094B2c *EXCEPTION 1*. Because Rule 094B2c *EXCEPTION 1* permits a driven depth less than the 8 ft rod length, it is inferred that a communication apparatus 5 ft rod is permitted to be driven to a depth of less than 5 ft when rock is encountered. However, there is no statement to effect a lesser depth for other types of electrodes such as a strip or plate. It is understood that a strip may be less than 18 in and that a plate may be less than 5 ft.

An interpretation is requested regarding if a plate or strip ground electrode for communication apparatus may be less than 5 ft when rock is encountered.

Rule 094B2c *EXCEPTION 2* permits a ground rod depth to be 7.5 ft when placed within a manhole. It is understood that the reduction in driven depth allows a portion of the rod exposed for connection of equipment grounding wire(s). Where a driven rod is used for grounding communication apparatus, Rule 099A3 *EXCEPTION* permits the rod to be 5 ft in length and driven to a depth of 5 ft; the full length of the rod. However, there is no rule exception similar to Rule 094B2c *EXCEPTION 2* for a communication apparatus ground rod installed in a manhole.

One view is that a communication apparatus driven rod within a communication only manhole is required to have a minimum soil contact of 5 ft; the full length of the rod. Another view is that the driven rod is subject to the same reduction in driven depth as permitted by Rule 094B2c *EXCEPTION 2*, meaning the rod may be driven to a depth of 4.5 ft.

An interpretation is requested to clarify the minimum depth of a ground rod driven inside a communication cable manhole.

Discussion 2:

Rule 096 provides the requirements of electrode ground resistance. Rules 096B and 096C are specifically for electric supply stations and electric distribution and are not applicable to communication systems. There is uncertainty about the applicability of Rule 096D with respect to communication cable systems. One understanding is that a single-grounded (unground or delta) system is strictly applicable to electric supply distribution and is not applicable to communication apparatus. Another understanding is that the ground electrode installed in a communication



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manhole to bond the fiber-optic cable sheath constitutes a uniground and therefore Rule 096D is applicable.

An interpretation is requested on the definition of a uniground and its applicability of Rule 096D for communication cables that are un-associated with electric service.

Interpretation

The Interpretation Subcommittee reviewed the interpretation request and identified five subjects for consideration. Each subject is stated below, followed by the answer. Answers are based on the NESC 2012 Edition.

Subject #1:

Does Rule 099A3 *EXCEPTION* take precedence over Rule 094B2 where only communication cables are installed?

Answer:

No. Rule 099 applies to communication apparatus, not to the communication cables described in the interpretation request. Note that “apparatus” is a type of equipment; apparatus is not cable. See the NESC definitions of “cable” and “equipment.”

Subject #2:

Is it the intent of Rule 096D “Single-grounded (uniground or delta) systems” to apply to electric supply and communication facilities or to electric systems only?

Answer:

The definition for single-grounded systems applies to electric supply systems, not communication systems. See NESC definition of “single-grounded system/unigrounded system.” Therefore, Rule 096D applies to electric supply systems only and not to communication systems.

Subject #3:

An interpretation is requested regarding if a plate or strip ground electrode for communication apparatus may be less than 5 ft when rock is encountered.

Answer:

Rules 094B3b and 094B3c specify specific parameters for buried strips and plates used as grounding electrodes where rock is encountered. The burial depth for strips is not less than 18 in, while the burial depth for plates is not less than 5 ft. There are no exceptions that allow a lesser burial depth for these two types of electrodes, even for communication installations.



Subject #4:

An interpretation is requested to clarify the minimum depth of a ground rod driven inside a communication cable manhole.

Answer:

As you state in the interpretation request, Rule 094B2c *EXCEPTION 2* does allow a reduced depth of 7.5 ft for an 8 ft grounding electrode when installed in a vault, manhole, or similar enclosure. The request also stated that the exception in Rule 099A3 allows a 5 ft grounding electrode with a driven depth of 5 ft to be used for communication apparatus. Both statements are correct. However, the Rule 099A3 *EXCEPTION* does not allow the 5 ft grounding electrode to be driven 4.5 ft where it is installed in a vault, manhole, or similar enclosure; the full 5 ft driven depth is required. Note that Rule 099 applies to grounding of communication apparatus only; it does not apply to grounding of communication cable. See the Answer to Subject #1.

Note also that the Rule 099A3 *EXCEPTION* further allows a lesser driven depth if rock bottom is encountered by referral to *EXCEPTION 1* of Rule 094B2.

Subject #5:

An interpretation is requested on the definition of a uniground and its applicability of Rule 096D for communication cables that are un-associated with electric service.

Answer:

See the Answer to Subject #2. Rule 096D applies to supply circuits, not communication circuits. However, the tracer wire used in your communication system is not specifically covered by the NESC. Therefore, Rule 012C applies and industry practices should be followed.

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