



Interpretation

Section 9.

Grounding methods for electric supply and communications facilities

Rule 094B **Grounding electrodes—Made electrodes**
(2012 Edition, pages 28-30)
(17 December 2012) IR570

The intention is to classify our service pedestal post as a made electrode under Rule 094B. More specifically, the proposal is to construct the post out of a formed 1/8" stainless steel plate with a buried length sufficient to expose at least two square feet of the post's surface to the soil below five feet in depth to meet the requirements for a plate ground under Rule 094B3c.

Questions:

1. Is it the intent of Rule 094B3, "Buried wire, strips or plates," to restrict their use to only "in areas of high soil resistivity or shallow bedrock, or where lower resistance is required than attainable with driven rods"?
2. Does Rule 094B1 (for "Made electrodes, 1. General - Where made electrodes are used, they shall, as far as practical, penetrate permanent moisture level and below the frostline.") dictate that the requirements for driven rods per Rule 094B2 must be met unless it is impractical to meet these requirements?
3. Is the term "ferrous," as used in Rule 094B3c ("Ferrous metal electrodes shall not be less than 6 mm (0.25 in) in thickness....") intended to include non-corroding, iron-bearing metals such as stainless steel?

Discussion of Question 1:

One opinion is that the Code expresses a preference for driven rods over other made electrodes. The language at issue is the opening to Rule 094B3 which reads, "In areas of high soil resistivity or shallow bedrock, or where lower resistance is required than attainable with driven rods, one or more of the following electrodes may be more useful."



It is suggested that this language means the use of buried plates, strips, or wires as ground electrodes may only be considered when one of the listed conditions is present— where high soil resistivity is encountered, where shallow bedrock is present, or where driven rods provide more resistance than needed. It is further suggested that Rule 094 generally is organized in preference order; that each Rule may be applied only if the next preceding Rule cannot be.

A different opinion is that the quoted language is not mandatory; that is, it does not set any requirement or recommendation one way or the other, but instead is meant to call the engineer's attention to conditions in which the listed grounding methods might be more appropriate than a driven rod. Furthermore, there does not seem to be any technical reason why a ground rod should be preferred over a plate, strip or wire, provided that they are each designed and installed to provide equivalent ground resistance and current capacity.

Discussion of Question 2:

One opinion is that unless conditions exist where using a driven rod is impractical, a driven rod must be used for making a made electrode. Another opinion is that one can use any of the types of made electrodes listed in Rule 094B, even where a driven rod is practical.

Discussion of Question 3:

One opinion is that the proposed post, being manufactured from stainless steel, falls into the category of ferrous metals for Rule 094B3c, for which a minimum thickness of 6 mm is required. "Ferrous," it is argued, is defined to mean "iron bearing," and because stainless steel is an alloy of iron and other materials, it is therefore a ferrous material for Code purposes.

A different opinion is that the reference to "ferrous" metal in Rule 094B3c (and, for that matter, Rule 094B3b) is meant to encompass the types of corroding metals mentioned in Rule 094B2a for which an increased diameter is required: iron, zinc-coated steel, and steel. Stainless steel, on the other hand, is listed among the materials in Rule 094B2a for which a smaller diameter is permitted, along with copper-clad and stainless-steel-clad. By parallel, then, the required thickness for stainless steel plates should likewise be in line with that for non-ferrous metals. It is further suggested that stainless steel, being a relatively high-value material, would rarely be buried in the traditional plate or strip ground installation, for which either copper or iron would often be used: copper for ease of connection and longevity, or iron for economy. Or, in short, the use of a stainless steel plate wasn't thought of in developing Rule 094B3c. On the premise that the ferrous vs. non-ferrous distinction is based solely on corrosion concerns, it is argued that the distinction between ferrous and non-ferrous material was drawn on the assumption that



all ferrous material is subject to corrosion to which stainless steel is resistant; therefore, that rules for non-ferrous material should apply to stainless steel and similar corrosion-resistant alloys in this case, and therefore that the minimum required thickness for a stainless steel plate ground should be 1.5 mm.

Interpretation

The Interpretations Subcommittee has considered the subject Interpretation Request for Rule 094B and has developed a consensus report as follows:

Question 1:

Rule 094B3 is not intended to limit the use of buried wire, strips or plates to areas of high soil resistivity or shallow bedrock, or to areas where lower resistance is required than attainable with driven rods. The overall intent of this Rule is to provide criteria for essentially equivalent made electrode systems.

Question 2:

While Rule 094B1 states the desired performance level for all electrode types, it recognizes that penetrating the permanent moisture level and being below the frostline may not be achievable in all situations. This Rule does not state that a specific type of electrode, such as a driven rod, be used. The Rule does require, if practical, that the electrode system penetrate the permanent moisture level and be below the frostline.

Question 3:

In general, Rule 094B3c was not intended to treat stainless steel as a “ferrous” metal. Stainless steel was not being used for electrodes when the wording was first used in the Rule, and the Rule has not been updated. The intent of Rule 094B3c is to allow non-corrosive (nonferrous) metal electrodes to be thinner than corrosive (ferrous) electrodes. Consequently, the designer should specify an appropriate non-corrosive type of stainless steel if the thinner dimension is used. Note that for all types of grounding electrodes, use of metals with appropriate corrosion-resistance properties is necessary to ensure long service life.

National Electrical Safety Code and NESC are both registered trademarks and service marks of the Institute of Electrical and Electronics Engineers, Inc. The NESC is available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854, USA (<http://standards.ieee.org/>)