1991-1997

National Electrical Safety Code Interpretations

1991—1997 inclusive

First Interim Collection of the National Electrical Safety Code Interpretations

1991–1993 inclusive

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1991–1993 NESC Interpretations

National Electrical Safety Code Committee, ANSI C2

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Abstract: This edition includes official interpretations of the National Electrical Safety Code as made by the Interpretations Subcommittee of the National Electrical Safety Code Committee, ANSI C2.

Keywords: electric supply stations, overhead electric supply and communication lines, underground electric supply and communication lines, clearances to electric supply and communication lines, strength requirements for electric supply and communication structures.

Foreword

In response to repeated public inquiries and requests from C2 Committee members, the IEEE C2 Secretariat arranged for publication of Interpretation Requests received and Interpretations made by the National Electrical Safety Code Subcommittee on Interpretations. The original requests have been lightly edited to remove extraneous matter and focus on the C2 problem presented. Some illustrations have been redrawn for publication. With these exceptions, requests are in the form received.

The first volume, INTERPRETATIONS 1961–1977, published in 1978, included the first interpretation request received for the 6th Edition of Part 2 (IR 92, May 1961) and ended with the last interpretation issued in 1977 (IR 212). The second volume, INTERPRETATIONS 1978–1980, continued with IR 213 issued in 1978 and ended with the last interpretation issued in 1980 (IR 283). It also includes all interpretations found in the archives and applying to the 5th and prior editions of the Code (IR 11 through IR 90). Where no copy of an interpretation request or an interpretation could be found in the archives, this fact is noted. The third volume, INTERPRETATIONS 1981–1984, continued with interpretation IR 284 issued in 1981 and ended with IR 361 issued in 1984. It also contained requests IR 362 to IR 366, but did not include their interpretations, as the Interpretations Subcommittee still had them under consideration at press time. INTERPRETATIONS 1984–1987 incorporated IR 362 to IR 366 with their interpretations, continued with IR 367, issued in 1984, and ended with IR 415, which was requested in 1987. The next volume, INTERPRETATIONS 1988–1990, incorporates interpretations for IR 407, IR 413, and IR 414, which were not included in the last volume, and includes interpretation requests through IR 443.

This new volume provides interpretations for IR 442 and IR 443, which were still under consideration at press time of the last volume. In addition, it incorporates interpretations for IR 444 through IR 447. It also contains requests IR 448 through IR 451, although interpretations have not yet been provided for them.

The Secretariat hopes that the publication of all interpretations will prove helpful to those concerned with the National Electrical Safety Code.

Procedure for Requesting an Interpretation

Requests for interpretation should be addressed to:

Secretary for Interpretations
National Electrical Safety Code Committee, ANSI C2
IEEE Standards Office
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331

Requests for interpretations should include:

1. The rule number in question.
2. The applicable conditions for the case in question.

Line drawings should be black ink or excellent black pencil originals. Photos should be black-and-white glossy prints. These illustrations must be reproduced for committee circulation and eventually will be used to supplement the text of our next edition. Clear diagrams and pictures will make the work of interpretation easier and more valuable to C2 users.

Requests, including all supplementary material, must be in a form that is easily reproduced. If suitable for Subcommittee consideration, requests will be sent to the Interpretations Subcommittee. After consideration by the Subcommittee, which may involve many exchanges of correspondence, the inquirer will be notified of the Subcommittee's decision. Decisions will be published from time to time in cumulative form and may be ordered from IEEE.

Interpretations are issued to explain and clarify the intent of specific rules and are not intended to supply consulting information on the application of the Code. The Interpretations Subcommittee does not make new rules to fit situations not yet covered.

Contents

Section 1. Introduction to the National Electrical Safety Code

013B **See 234F2** **IR 444**

Section 9. Grounding Methods for Electric Supply and Communication Facilities

92B1

Use of grounded conductor as a grounding conductor for bonding noncurrent-carrying metal parts

REQUEST (Feb. 8, 91) IR 448

I recently became involved with the inspection of the grounding of metal poles for highway lighting. The project consists of service equipment feeding 120 V fixtures mounted on metal poles. The fixtures are fed with underground branch circuits. A ground rod is driven at each pole.

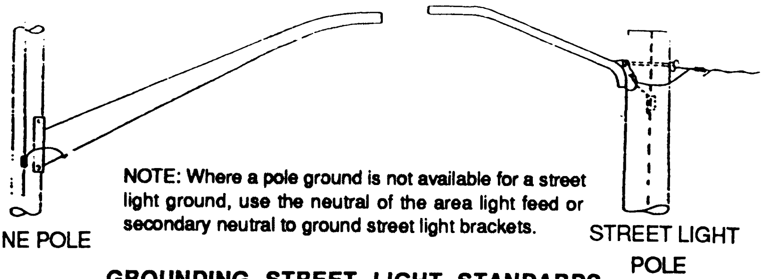
The standards used in designing the project were taken from a company that is bound by the National Electrical Safety Code. The State Statutes require us to use the ANSI/NFPA 70-1990, National Electrical Code.

This company's specifications require using the grounded (neutral) conductor not only as the multiwire branch circuit conductor, but also as the equipment grounding conductor for bonding the noncurrent-carrying metal parts. Their standards experts quoted NESC Section 9 (92B1) as the source for requiring the use of the grounded conductor as a grounding conductor. I am enclosing a drawing of the company's requirements.

Section 410-15 (b) of the NEC requires the metal poles be bonded with a grounding conductor recognized by Section 250-91 (b). Section 250-61 (b) is very specific in not allowing the use of the grounded conductor for grounding the noncurrent-carrying metal parts of equipment on the load side of the service disconnecting means.

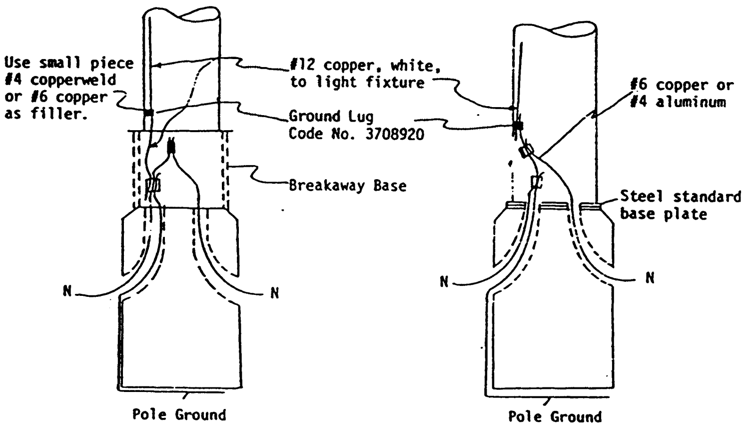
I feel that Section 92B(1) of the NESC agrees with the NEC by stating, "The grounding connections shall be made at the source, and at the line side of all service equipment." I would appreciate an interpretation of Section 9 of the NESC on using the grounded conductor as a grounding conductor for bonding the noncurrent-carrying metal parts in a situation similar to the one described.

Fig IR 448-1



GROUNDING STREET LIGHT STANDARDS

To ensure that the breakaway base functions in the proper manner, the #12 ground conductor shall run through the grounding lug and connect to the neutral conductor. The grounding lug is too large for the #12 conductor and a small piece of #4 copperweld or #6 copper shall be used to fill the lug. See Street Light Chapter for complete wiring installation detail.



INTERPRETATION
(In process)

97B

(a) Interconnected grounding conductors
(b) Definition of single-grounded system
(c) Definition of multi-grounded system

REQUEST (Oct. 10, 90) IR 445

I am under contract to revise two technical manuals and three electrical guide specifications. During the course of my work, a question regarding the separation of grounding conductors at pole-mounted transformer installations has been raised. Therefore, I am requesting an interpretation of Rule 97 as outlined below: Rule 97D1, which applies to ungrounded or single-grounded systems, states, in part, "Where the secondary neutral is not interconnected with the primary surge arrester grounding conductor as in Rule 97B, interconnection may be made through a spark gap. . ." This statement implies that Rule 97B (i.e., the interconnection of grounding conductors) may be applied to ungrounded or single-grounded systems. However, Rule 97B2 appears to limit the interconnection of grounding conductors to multi-grounded systems only, since Rule 97B2 refers to Rule 97C, which describes a multi-grounded system.

Question 1: Can ungrounded and single-grounded systems have "interconnected grounding conductors" as described in Rule 97B, even though there is no primary neutral, or must ungrounded and single-grounded systems have separate grounding conductors run to separate electrodes?

Question 2: What is the NESC definition of a single-grounded system?

Question 3: What is the NESC definition of a multi-grounded system?

INTERPRETATION (Feb. 26, 91)

1. The answer to the first part of Question 1 is "No." The answer to the second part of Question 1 is "Yes." Direct interconnection of primary equipment grounding conductors with secondary equipment grounding conductors is prohibited on delta-connected, high-impedance wye-connected (uni-grounded) and other ungrounded or single-grounded electric supply systems. Separate grounding conductors from each class are required to be run to separate electrodes.

2. The term "single-grounded system" is not defined in the NESC, but the term "grounded" is defined. Uni-grounded systems, which do not carry a neutral as such, and solidly grounded systems with neutrals that do not meet Rules 96A3 and 97C are examples of "single-grounded systems."

3. The terms "multigrounded system" and "multiple-grounded system" are not defined in the NESC. The requirements for a "multiple-grounded system" are included in Rules 96A3, 97C, and 97D2.

4. "Unigrounded" is a common industry term for a wye-connected system with its common point connected to earth at the source through a high-impedance, current-limiting connection; it is not defined in the NESC. Unigrounded systems are one form of "single-grounded" systems.

97C

Maximum spacing of grounding conductors

REQUEST (Jan. 16, 91) IR 447

Rule 97C in the 1990 Edition addresses separation of grounding conductors and stipulates that primary and secondary circuits using one conductor as a common neutral shall have four ground connections per mile. I am assuming that this figure is an average and one should attempt to space such connections equally or approximately one ground connection every 1760 ft.

In the event that this average spacing cannot be met, what would be the absolute maximum/minimum spacing one should attempt to maintain?

INTERPRETATION (May 29, 91)

Rule 97C requires that a common neutral have at least four ground connections on such conductor in each mile of line, exclusive of ground connections at customers' service equipment. The term "in each mile of line" could be stated as "within each mile of line." Neither minimum nor maximum distances are specified in this rule or elsewhere in the code. The intent of this rule is to spread the ground connections along the line rather than to group them together. Actual ground locations should be based on local conditions and engineering judgment such that the entire system will have sufficiently low resistance, due to the multiple parallel grounds, to minimize hazards to personnel and to permit prompt operation of circuit protective devices—see also Rule 96A3, including the note.

It should be noted that the 1760 ft mentioned in the request for interpretation would result in an average spacing of three grounds per mile rather than the four grounds required by Rule 97C.

97D2

Insulation requirements for secondary grounding conductor

REQUEST (Jul. 11, 90) IR 442

I would like to request an interpretation of the insulation requirements set forth in the last line of Rule 97D2. From discussions with other utilities, I have found that there is no universal interpretation of this provision in Rule 97D2.

The application in question is as follows. We have numerous farm service installations where primary and secondary neutral systems have been isolated to eliminate or reduce stray voltage. In accordance with the rule, the primary grounding conductor is bare copper, and 600 V insulated copper wire is used for the secondary ground conductor. However, most of the installations also have metallic conduit containing service cable as well as a meter base attached to transformer pole. Both of the items are bare uninsulated metallic objects and bonded directly or indirectly to the secondary neutral system.

It seems to me that the intent of requiring 600 V insulation for the secondary ground conductor, as specified in the last sentence in

Rule 97D2, is to ensure that the general public or line workers cannot come into contact with the potential difference which could exist between the two neutral systems. If that is a correct interpretation of this provision, it seems to me that other equipment mounted below the 18-ft level and electrically tied to the secondary neutral must either be constructed of material which is insulated for 600 V (such as PVC conduit), or alternately, as in the case of the meter socket, removed from the pole and relocated to a new site at least 6 ft away. Failure to insulate or remove these items of equipment would essentially defeat the purpose of utilizing 600 V insulation on the secondary ground conductor.

Some other utilities have told me that this interpretation is not correct, and that this is really not the intent of this provision. Rather, they interpret the requirement for 600 V insulation as applying only to the grounding conductor, in order to ensure the effective elimination of stray voltage, and not as a safety precaution to prevent inadvertent human contact.[1]

Since the cost to remove metering and service equipment from the pole is rather high considering the number of installations involved, we would appreciate receiving confirmation that our interpretation of Rule 97D2 is correct before proceeding with this work.

INTERPRETATION (Nov. 5, 90)

Rule 97D2 recognizes that unbonded primary and secondary neutrals, and their associated grounding conductors and equipment cases, may be at different voltage potentials. The intent of the rule is to limit the opportunity for line workers in the climbing space or members of the public to simultaneously contact items at the differing voltage potentials.

In situations such as you describe, Rule 012 allows the designer to meet the intent in a manner consistent with the good practice for the given local conditions. For example, a simple solution, such as insulating both grounding conductors to 600 V, is consistent with Rule 012.

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[1]Even with this interpretation, however, it is difficult to understand how these utilities can rationalize leaving the meter socket on the pole, since an accidental interconnection between the meter socket and the primary down ground could occur as easily as it could between the primary and secondary down grounds.

Part 2. Safety Rules for the Installation and Maintenance of Overhead Electric Supply and Communication Lines

220C2

Does Rule 220C2 cover the installation of separate utility primary and secondary circuits on the same structure?

REQUEST (Jan. 4, 91) IR 446

A situation exists wherein two separate utilities maintain separate distribution supply circuits along the same street where overlapping franchise areas exist. Both of the distribution supply circuits are located on the same side of the street. One utility supplies customers on both sides of the street. The other utility supplies selected customers only on one side of the street. Each supply circuit includes a primary circuit, distribution transformers, and secondary voltage circuits. This dual circuit arrangement is undesirable from a visual viewpoint and it is desired to replace the separate lines with a single line.

One possible solution to the problem is to install both supply circuits on joint-use structures in accordance with the requirements of Rule 220C2. Each utility would continue to supply its customers from its own distribution system consisting of a primary cable, secondary cable, and distribution transformers. We are uncertain, however, if Rule 220C2 was intended to be applied to this type of arrangement. Rule 220C2 refers to supply conductors of *different voltage classifications*. This tends to infer that the rule is intended to cover situations such as a mix of transmission lines and distribution circuits. Does Rule 220C2 cover the installation of separate utility primary and secondary circuits on the same structure? The primary voltages are different (5 kV and 15 kV); however, both circuits are identified as *distribution* circuits.

As a practical matter, location of two different distribution circuits, which are owned by separate companies, on the same structure will cause a number of problems:

- The circuits of each utility will likely be grouped together in accordance with the provisions of Rule 220C2b with one group of circuits placed above the other group. Thus, persons working on the conductors located in the upper level will be at increased risk due to the need to pass through the conductors located at the lower level.
- Placement of distribution transformers and service conductors for both circuits on the same structures will make it next to impossible to maintain clear climbing and working space, thus making installation and removal of transformers and services a more difficult undertaking.
- Lower voltage conductors placed at the upper level would be required to be constructed at a higher classification in accordance with Rule 220B2b.

INTERPRETATION (Apr. 4, 91)

Rule 220C covers the relative levels of supply lines of different voltage classifications, as classified by Table 235-5. Table 235-5 defines class by voltage range and conductor type, rather than by transmission, distribution, or secondary lines.

Rule 220C2b covers the installation of different supply circuits, owned by separate utilities, on the same structures. Under this rule, the circuits of each utility *may* be grouped together provided that the conditions of the rule are met.

Rule 220C2b is permissive; it covers the requirements when circuits on the same structures are grouped by ownership. An alternate would be to group circuits by voltage classification, placing the higher voltage (primary) circuits of both utilities above the lower voltage (secondary) circuits.

The requestor points out some practical matters which may cause problems when different utilities place supply circuits on the same structures. The following should also be considered: good practice for the given local conditions (Rule 012), identification of conductors (Rule 220D), cooperative consideration of all factors involved in joint-use construction (Rule 222), and clearances between line conductors (Rule 235). However, the requestor's reference to Rule 220B2b does not apply in this instance; this rule is limited to a special type of circuit.

224A

Construction of fiber optic cables in the clear space on joint-use poles

REQUEST (Jul. 30, 90) IR 443

A local power company has recently begun placing considerable amounts of all dielectric fiber optic cable for use as both (1) load control and (2) data circuits. It is our opinion that pole clearances are being violated because of misinterpretation of Rules 224A and 230F. In order to help us resolve this problem, please provide your interpretation of the following:

1. We interpret Rule 224A to apply to those circuits dedicated to operation of supply circuits and not for circuits transmitting data for other purposes. Is this correct?

2. We further interpret Rule 224A3 to mean that supply operating circuits that do qualify as "ordinary communications" must observe the rules established in the code for "ordinary communications." We consider the special case of "fiber optic communications" in Rule 230F2 as further reinforcement for our interpretation. Are these assumptions correct?

3. Fiber optic cable that does not qualify as "ordinary communications" cable is defined as fiber optic supply under Rule 230F1, and must be placed to meet the 30-in pole clearance from communications, and 12 in in the span, as are neutrals meeting Rule 230E1. Are we interpreting this rule correctly?

To help visualize the clearances we are referring to, we attach the following three photographs:

1. Photo 1 (Fig IR 443-1) shows a typical separation between the neutral (highest cable) and the fiber optic cable of about 10 in. Photo (1) also shows a clearance between CATV communications and the supply fiber optic cable of 24 in instead of the 30 in we feel is required.

2. Photo 2 (Fig IR 443-2) depicts a 6-in clearance between secondary triplex and the fiber cable. In our opinion, this categorizes the cable as fiber optic supply.

3. Photo 3 (Fig IR 443-3) shows a midspan clearance between CATV communications and the fiber optic supply cable between 1 and 2 in when, in our opinion, 12 in is required.

Fig IR 443-1

Fig IR 443-2

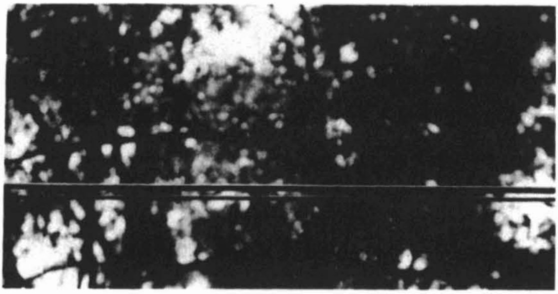

Fig IR 443-3

INTERPRETATION (Jan. 9, 91)

Rule 224 was originally contained in Section 28—Miscellaneous and was originally written before solid dielectric fiber optic cables began to be used in utility operations. Rule 224A1 is a permissive rule, not a requirement; it allows a choice of location for communication circuits when the circuit is used exclusively in the operation of supply lines, *IF* certain conditions are met.

The 1990 Edition revised the definition of fiber optic cable–supply and fiber optic cable–communications and added Rule 230F. The definitions are based on the historical practice and requirements that any cable will be located in either the supply space or the communications space. Rule 230F permits the fiber optic cable to be treated *EITHER* as supply or as communications and to be located, accordingly, in either the supply space or the communications space (depending upon its attributes), but *not in the safety zone* between the spaces.

Fiber optic supply cable that is supported in or on something other than an effectively grounded messenger is to have the same clearance to communications facilities as required for the messenger or conductors supporting the fiber optic cable (second sentence of Rule 230F1). The self-supporting all-dielectric cable, if located as fiber optic cable–supply is, from a safety standpoint, considered equivalent to an effectively grounded bare messenger or a neutral meeting Rule 230E1, and must meet the clearances applicable thereto.

230F See 224A **IR 443**

232B1, Table 232-1

Category of highway or bridge construction site

REQUEST (Mar. 12, 91) IR 450

I would appreciate an interpretation of Table 232-1 of Rule 232B1 as to which category a highway or bridge construction site would fall, if any. Cranes, forklifts, dump trucks, and other equipment of similar height are normally used.

I have knowledge of several incidents were workers have been killed or injured by contact of material or equipment with overhead lines, even though the height of the lines exceeded the minimums in the table.

INTERPRETATION

(In process)

234F2

(a) Definition of grain bin
(b) Extension of clearance envelope
(c) Construction of bin under existing line

REQUEST (Aug. 20, 90) IR 444

My requests for interpretations all concern Section 234F2, regarding the loading of grain bins by portable auger.

1. Would you provide a definition of grain bin? In our area, farmers use portable elevators to load straw and hay bales into the upper parts of a barn. Does the use of a portable auger or elevator for loading any structure thus place the clearances from that structure under Rule 234F2?

2. Referring to Figure 234-3, page 206, and the plan view of the diagram (assume for discussion purposes the top of the page is north) presumably the loading side clearance envelope is established for an auger loading from the west. If it is possible to

also load from the north, should the clearance envelope be extended clockwise for another 90° to enclose the northeast quadrant as well?

3. What are the requirements under 013B when a grain bin is constructed under or near an overhead line which was in compliance with a previous edition of the code until the bin was added, but is now in violation of the previous code? Assume that it is necessary to either reroute the line or install taller poles to bring the line into compliance with the previous edition. Would the 1990 Code allow such modification that would bring the line into compliance with a previous edition but not the 1990 Code, or would it be necessary to make additional modifications to bring the line into compliance with the 1990 requirements?

INTERPRETATION (Dec. 13, 1990)

Rule 234F2 was intentionally limited to grain bins. While Rule 234F2 may be of some value in meeting Rule 012 for an installation near a hay barn, it is not required. Rule 012 requires consideration of good practice for the given local conditions.

The clearances for the loading side apply in whatever areas are available for loading; that could be 360° around a single bin that had no constraints around it for using portable augers, or it could be only a narrow area, depending upon the constraints or agreements.

When a grain bin is added today near an existing line to which a pre-1990 Edition is applicable, the existing line is required by Rule 012 to meet good practice for the given local conditions. The 1990 Edition specified good practice for lines near grain bins. If lines and equipment on the existing structures meet, or can be altered to meet, good practice, then the pre-1990 Edition can remain applicable to the affected facilities. If new poles or line relocation is required, the 1990 Edition would apply to the new construction.

264B

Strength of guy and anchor assembly

REQUEST (Apr. 8, 91) IR 451

The strength required for the anchor and rod assembly is given in Rule 264G2 as "an ultimate strength not less than that required of the guy(s) by Rule 264B." Rule 264B says, "For guy wires conforming to ASTM Standards, the minimum breaking strength value therein defined shall be the rated breaking strength required in this code."

Do these two rules only require the guy and anchor assembly to "meet the requirements of Section 26 for the applicable grade of construction," or do they additionally require the strength of the anchor assembly in all cases to exceed the rated breaking strength of any guy wire that conforms to ASTM Standards? In other words, do Rules 264G2 and 264B prohibit the use of a 10 M guy in an 8000 lb anchor assembly?

INTERPRETATION

(In process)

264G2 **See 264B** **IR 451**

279A2b(2)

Installation of guy insulators

REQUEST (Mar. 12, 91) IR 449

We have reviewed the NESC Rule 279 pertaining to guy insulators, related rules, applicable interpretations, and the discussions of the 1944 NESC (H39) and the 1949 NESC (H43). However, it is apparent that Rule 279A2b(2) can be interpreted in several ways resulting in widely differing guying practices. This rule will be used as guidance in the design of a guying standard for those cases where guys should or must include guy insulators. Conditions under which this rule applies include the guying of transmission or distribution structures with and without distribution underbuild or other types of underbuilds. A succinct response to the following three questions should satisfy our request for interpretation.

1. Does Rule 279A2b(2) require guy insulators to be installed in a manner that protects line workers in the work space from the potential hazard of a grounded guy?

2. Does Rule 279A2b(2) require guy insulators to be installed in a guy wire in a manner that protects the public from exposure to a metallic portion of the guy wire that may become energized due to the failure of one or more system components?

3. Does Rule 279A2b(2) require guy insulators to be installed in a guy wire in a manner that protects the public from exposure to a metallic portion of the guy wire that may become energized due to a jerked or oscillated power conductor or guy?

INTERPRETATION

(In process)