Eighth Interim Collection
1997–1999 NESC® Interpretations

National Electrical Safety Code Committee, ASC C2

Eighth Interim Collection of the National Electrical Safety Code® Interpretations 1997–1999

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, ASC C2.

Keywords: clearances to electric supply and communication lines, grounding conductors, overhead electric supply and communication lines, strength requirements for overhead electric supply lines, underground electric supply and communication lines

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Foreword

The IEEE C2 Secretariat regularly publishes Interpretation Requests received and Interpretations made by the National Electrical Safety Code® (NESC)® 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 Interim Collection 1991–1993 provided interpretations for IR 442 and IR 443, which were still under consideration at press time of the previous volume, and incorporated interpretations for IR 444 through IR 447.

The Second Interim Collection 1991–1993 provided interpretations for IR 448 through IR 453.

The Third Interim Collection 1991–1993 incorporated an interpretation for IR 454 and provided interpretations for IR 455 through IR 462. IR 463 through IR 467 were included, although the interpretations were under consideration.

The Fourth Interim Collection 1991–1993 provided interpretations for IR 463 through IR 467 and incorporated interpretations for IR 468 through IR 470. IR 471 through IR 474 were included, although interpretations had not yet been provided for them.

The Fifth Interim Collection 1993-1995 provided interpretations for IR 471 through IR 474 and incorporated IR 475 through IR 489.

The Sixth Interim Collection 1994–1996 provided interpretations for IR 490 through IR 499, inclusive.

The Seventh Interim Collection 1996–1997 provided interpretations for IR 500 through IR 508, inclusive.

This Eighth Interim Collection 1997–1999 provides interpretations for IR 509 through IR 518, inclusive.

The Secretariat hopes that the publication of all interpretations will prove helpful to those concerned with the NESC.

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:

a) The rule number in question.

b) 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 9.
Grounding Methods for Electric Supply and Communications Facilities

Rule 97
Separation of Grounding Conductors

Request (27 May 1999) IR 513

The opinion of engineers from several utilities is divided whether Rule 97 requires the installation of a separate grounding conductor for the transmission shield wires and another grounding conductor for distribution primary/secondary neutral. Some understand Rule 97B to permit a common grounding conductor and ground electrode.

a) Is the grounding conductor for a lightning shield wire addressed by this rule?

b) Is a lightning shield wire considered to be like a "surge arrester" and, thereby, to be considered under Rule 97A1?

c) Can a common grounding conductor be utilized between a transmission shield wire, multi-grounded distribution primary neutral, lightning surge arresters, pole mounted equipment grounds, secondary neutral, and the grounding electrode? (See Figure 1.) Is this practice permitted under Rule 97B?

I, along with my associates, opine that using a single interconnected grounding conductor is a safe practice. Conversely, providing separate grounding conductors between the shield wire and the system's neutral will not prevent a lightning surge from flashing over to the system neutral.

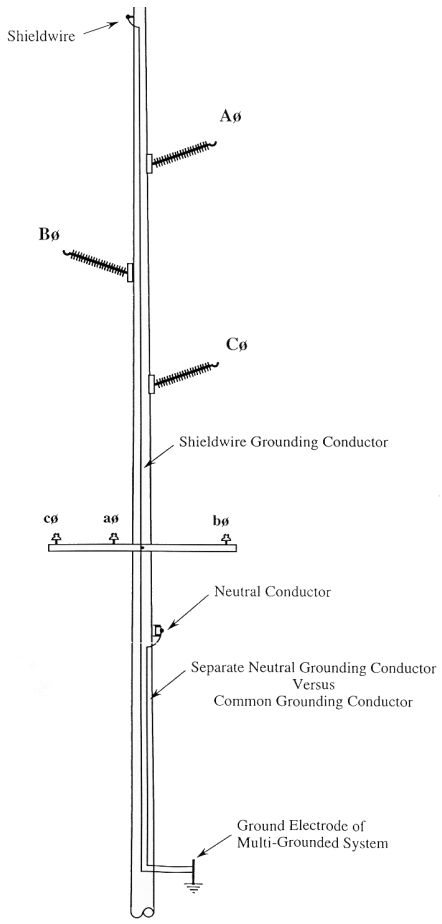

Figure 1—Typical wood transmission structure with distribution underbuild

Interpretation

The answer to question a) is: Rule 97 does not specifically cover grounding conductors for a transmission circuit shield wire.

The answer to question b) is: Such shield wires are not like surge arresters for Code purposes. Rule 91, which covers the scope of the grounding rules, states: "These rules do not cover the grounded return of...those lightning protection wires that are normally independent of supply or communication wires or equipment." However, see IR 476 for shield wires intentionally designed to serve both as a shield wire and as a neutral conductor.

The answer to question c) is: A common grounding conductor as described in your question is not prohibited, provided that all requirements for a common grounding conductor are met. See also Rule 012 regarding good practice for particulars not specified in the NESC rules.

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

Rule 217B
Unusual Conductor Supports

Request (6 March 1997) IR 509

This is a request for interpretation of Rule 217B, 1997 Edition. During the 1996 IEEE seminars a very practical question was raised regarding the above rule that could not be answered without interjecting personal opinion. Reference to the 1997 *NESC Handbook, Fourth Edition*, added further confusion.

a) Clearly Rule 217B does not indicate as to whether the conductors referenced are limited to services or include line conductors, as well.
b) The Code definition of "line conductor" does not preclude the attachment of a line conductor to a building.
c) The 1997 *NESC Handbook* discussion of Rule 217 does not address the issue, but the sentence, "Accordingly, designers must pay attention to the weight of the cable, length of span, and tension on messengers at installation." appears to me (and other Code users) more directed toward line conductors than service drops. In any case, the question is not resolved.
d) The 1997 *NESC Handbook* discussion of Rule 234C4, which pertains exclusively to communication conductors, informs one, with emphasis, that a supply conductor may not be attached to a building unless it is for the purpose of providing service. What is the source of this information? It certainly is not Rule 217.

Question: Is it the intent of Rule 217B to address only service drops, or are building-to-building or pole-to-building conductors that do not serve the immediate building included? If the latter is the case, are there special constraints such as a limitation to secondary voltages?

Interpretation

In answer to your basic question, Rule 217B is generic with regard to conductors. The rule covers all electric supply and communication conductors and cables; it does not limit the voltage of electric supply facilities.

Rule 217B applies to unusual conductor supports, i.e., supports other than a conventional pole or tower. The phrase "unusual conductor supports" is not limited to buildings (in fact, the word "buildings" is not used in the rule). Such support(s) could be an outcropping of rock in a

mountainous area or a wall around a substation at a conductor entrance or exit. Also, the conductors may be running between poles with intermediate attachments to unusual supports.

Note that Rule 217B states that additional precautions may be required to avoid damage to the structures or injuries to the persons using them, and that using roofs or trees as conductor supports should be avoided.

Rule 234C3 contains specific requirements for electric supply service drops necessary for an entrance to a building while Rule 234C4 permits communication conductors and cables of any type to be attached directly to buildings. Other than for a service entrance, attachments of electric supply conductors and cables to buildings are unusual; specific rules for such situations are not included in the NESC. Also, the NESC does not anticipate attachment of high-voltage electric supply conductors or cables to residential buildings (see IR 500).

In your comment d), you asked for the source of the *NESC Handbook, Fourth Edition*, comment on Rule 234C4. While not part of this official interpretation but for your information, the Handbook comment on Rule 234C (not Rule 234C4) was based on IR 500.

Rule 220D
Identification of Overhead Conductors

Rule 220E
Identification of Equipment on Supporting Structures

Request (20 November 1997) IR514

An investor-owned electric and gas utility company seeks an interpretation of the Code as it applies to identification of conductors

and equipment[1] attached to distribution pole lines. Electric utility owned pole lines are routinely found to be in joint use with multiple communication companies. The expanding use of the traditional "communications space" on a pole by multiple telecommunication companies has complicated ready identification of facility ownership. The variety of conductors (e.g., fiber, coax, copper), equipment (e.g., splice and terminal boxes), and means of attachment (e.g., direct, lashing, co-lashing, etc.), is the basis for the questions. System expansion, rebuilds, and the associated timing of construction often renders uniform construction or position invalid.

Refer to Rule 220D and Rule 220E "...so as to facilitate identification by employees *authorized to work thereon* (emphasis added)."

Question: Assuming arrangement of communication conductors cannot be uniformly positioned, is it correct to interpret that Rule 220D and 220E require tagging of communication conductors and equipment so as to facilitate identification by employees authorized to work on the pole?

Comment: There word "thereon" is the term requiring clarification. Certain communication companies maintain "thereon" applies to the conductor or equipment, and that the employees of "other" companies are not authorized to work on their facilities. Their position is that if they can readily identify their own facilities, that is all that is required by the Code (i.e., that other users of the pole have no right or need to know ownership of all facilities on the pole.) As a pole owner and user, our company maintains that all parties should have the ability to readily identify facility ownership at the pole.

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[1]Equipment and conductors are generically referred to as "facilities."

Interpretation

Rules 220D and 220E require personnel to be able to identify conductors and equipment (facilities) that each individual worker is authorized to work on. While workers must be trained to identify other facilities as to general type (e.g., electric supply, communication) in order to work safely on the structure, subject rules do not require workers to be able to identify foreign construction by company ownership.

For your information only and not as part of the interpretation, we offer the following comments:

a) Joint use agreements can specify additional requirements for identification of facilities on poles.
b) Working group 4.8 has been authorized to consider a new approach to space allocation on poles for the 2007 Edition. This group will include identification of facilities as part of its work.

Rule 232A
Vertical Clearances of Wires, Conductors, Cables, and Equipment Above Ground, Roadway, Rail, or Water Surfaces—Applications

Rule 261H
Open Supply Conductors and Overhead Shield Wires

Request (26 August 1998) IR 516

Cable television service is often provided through the utilization of aerial cable attached to utility poles, in accordance with the applicable requirements of the National Electrical Safety Code. The cable television association in our state has been made aware that a utility interprets Rule 232A to mean that, for an overhead installation, there is no Code violation on clearances until the loading condition of

Rule 232A1, 232A2, or 232A3 causes the clearance to come below the required value. In other words, this particular utility believes they are not in violation of the Code until the clearance violation actually exists.

On behalf of our association and its members, I respectfully request an interpretation of Rule 232A with respect to the requirements for ground clearance. In our opinion, the clearances of Rule 232B1 and Table 232-1 apply under the conditions of Rule 232A. At final sag, if the loading condition is less than that specified in Rule 232A1, 232A2, and 232A3, the clearance at that condition (translated to initial sag at installation) must be greater than required by Rule 232B1 and Table 232-1. The clearance will then not be below the required value when the specified condition does occur.

As an example, a communication utility should install an insulated communication cable over a road subject to truck traffic at an initial clearance of some amount over 15.5 ft in order to expect it to remain in Code compliance for any reasonable period of time. At 15.5 ft initial clearance, it is guaranteed that there will be a clearance violation on this installation, probably before the end of the day.

Within the context of this request, we are also asking for confirmation that the same philosophy applies to Rule 261H on sags and tensions. Although it is allowable to install a conductor at tension up to 35% of its rated breaking strength, this cannot be done if the tension will be above 25% at final unloaded tension, or above 60% under loading specified in Rule 261H2a, even if those conditions have not occurred.

Please advise on whether our interpretations of the above-mentioned rules are consistent with those of the NESC. The Committee's clarification on this issue is of significance to our association and its members in their construction of aerial cable, as well as other entities who install aerial cable on utility poles.

Interpretation

Two rules must be met in order to determine vertical clearance above ground for overhead electric supply or communication wires, conductors, and cables. First, the clearance must be not less than that shown in Table 232-1 (see Rule 232B1). Second, this clearance requirement applies with the wire, conductor, or cable at the largest final sag condition outlined in Rule 232A1, 232A2, or 232A3. In other words, lines must be constructed and maintained so that the required clearance will be obtained when the lines are at their largest final sag condition.

For example, consider clearance for a communication cable over a road subject to truck traffic. Table 232-1 requires not less than 15.5 ft clearance. Rule 232A requires consideration of three conditions. Assume that the installation is in a loading district where icing is a factor and that the Rule 232A3 icing condition produces a larger final sag than either of the Rule 232A1 or 232A2 conditions. Icing becomes the limiting condition and the cable must have at least 15.5 ft clearance at the Rule 232A3 icing condition. Obviously, it will have more clearance at other times without the ice load.

In the example, the communication cable may have 16 ft clearance under some operating conditions. However, the cable is not in compliance *at any time* if it will have less than 15.5 ft clearance under the Rule 232A limiting condition.

The same philosophy applies to sags and tensions. Wires, conductors, or cables are not in compliance with NESC requirements *at any time* if any one of the stated tension limits will be exceeded at the applicable condition.

See also Rules 014 and 230A for emergency and temporary installations.

Rule 234D2
Guarding Trolley—Contact Conductors Located Under Bridges

Request (10 May 1999) IR 518

a) Please clarify if Rule 234D2 applies only to a current collection system using trolley poles.

Another overhead current collection device, a pantograph (a typical pantograph commonly used in the U.S. has a head width of about 6.5 ft), which collects current from a catenary system consisting of messenger and contact wires, can only touch the bridge structure under two scenarios: a) When both the contact wire and the messenger wire break, resulting in the pantograph rising up and making contact with the bridge (assuming the bridge is within reach of the spring-up pantograph); b) The rail car is derailed to the degree that the pantograph comes off the contact wire and springs up to touch the bridge. In both scenarios, the pantograph can not make contact with the catenary wires and the bridge structure at the same time.

b) Footnote 5 of Table 234-2 states that "Where conductors passing under bridges are adequately guarded..." Please clarify if "adequately guarded" refers to the guard requirements set forth in Rule 234D2, or any other means used to prevent the touching of live wires by unauthorized persons.

Interpretation

Rule 234D2 applies to current-collection systems using trolley poles. Pantographs are not covered in this rule. In the absence of specific requirements, please see Rule 012C.

Guarding is defined (see Section 2, Definitions). Footnote 5 of Table 234-2 is general in nature. The footnote covers any type of a conductor passing under a bridge; it is not limited to trolley or train contact conductors or catenary. The objective of the footnote is to prevent contact by unauthorized persons when reduced clearances are used. The objective of the guarding requirement in Rule 234D2 is to prevent simultaneous contact of the trolley pole with both the trolley-contact conductor and the bridge structure. A properly designed guard can serve both purposes.

Rule 235
Clearances for Wires, Conductors, or Cables Carried on the Same Supporting Structure

Table 235-6
Clearance in Any Direction from Line Conductors to Supports and to Vertical or Lateral Conductors Span, or Guy Wires Attached to the Same Support

Request (2 April 1997) IR 510

The recent proliferation of mobile telephones has created a great demand for the utilization of existing tall structures on which to mount the antennas required to receive and transmit telecommunication signals. Obviously, when existing electric utility transmission structures are used for this purpose, appropriate clearance distances must be maintained.

I am unable to find a rule in the National Electrical Safety Code, 1993 or 1997 Edition, that specifically addresses clearance to communication antennas attached to supply company structures mounted (see Figure 2) in the supply space. Our present interpretation would be Rule 235 and Table 235-6. Any work would be performed by persons qualified to work in supply space while electric power line is de-energized. Since Rule 235 and Table 235-6 establish the minimum

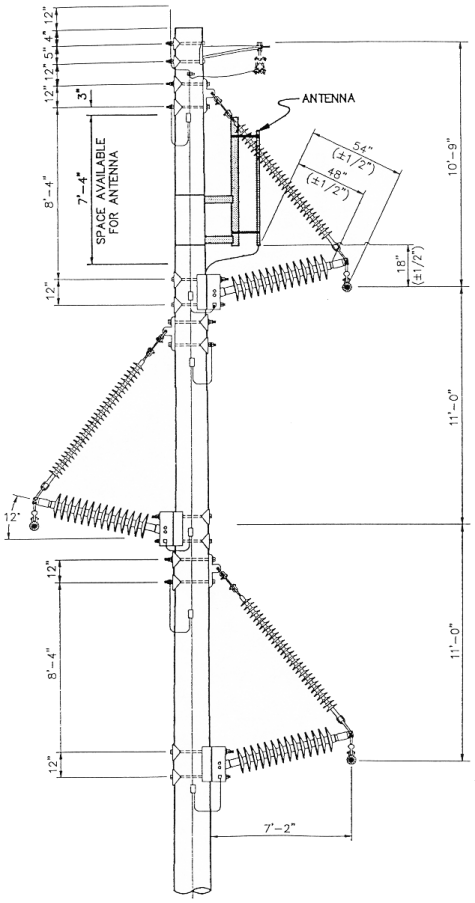

Figure 2—PCS antenna, pole top assembly

clearance between a conductor and the steel transmission pole to which it is attached, we find this clearance the only appropriate clearance to use. The line voltage is 230 kV, therefore; the calculation is [11 in + (230 – 50) × 0.2 in] = 47 in.

Rule 224A2c addresses clearance to open wire communication circuits in the supply space, but is incomplete in that it does not address clearance to pole mounted communication antennas in the supply space.

I would greatly appreciate an interpretation of either rule as one or the other would apply to these recently introduced pole mounted communication antennas.

Interpretation

You are correct; the NESC does not contain specific rules covering clearance for communication antennas installed in the supply space of supporting structures. Consequently, Rule 012 applies. Nevertheless, the Interpretations Subcommittee believes that some comments regarding your assumptions and calculations are in order.

As you surmised, Rule 235 and Table 235-6 provide the best guidance in this situation. Table 235-6 specifies clearance requirements from line conductors to vertical conductors. While the antenna is not a vertical conductor as the term is normally used in the NESC, the antenna functions as a rigid, vertical, open wire, communication conductor. Also, the lead to the antenna is a communication conductor. Rule 224A2c requires open wire communication circuits in the supply space to have the same clearances from supply circuits as would be required for open supply conductors of 0–750 V. However, the maximum voltage of the antenna should be obtained from the manufacturer or supplier of the broadcasting system because a higher voltage may be appropriate.

In applying Table 235-6, the clearance between two different circuits (supply and communication) must be determined. Consequently, item 1b is appropriate (the second line of the table), with the clearance as stated in the last column (supply lines over 50 kV), rather than item 4b as you used in your example (the antenna is not a surface of the supporting structure). All appropriate footnotes, including 4, 9, and 12, also must be considered.

Another concern is degradation of the flashover characteristics of the structure if an antenna is introduced between the structure and an energized high-voltage conductor as shown in your drawing. If flashover occurs due to over-voltage, the flashover should go to the structure, not to the antenna and/or its related circuit. Considering the good practice required by Rule 012, the air gap clearance between the antenna and the nearest energized conductor should exceed the equivalent dry arcing distance of the shorter (or lesser insulating) string of insulators by an appropriate amount to assure flashover to the structure.

Finally, you state that any work (on the antenna assembly) would be performed by persons qualified to work in the supply space while the electric power line is de-energized. We are not sure of what you mean by "de-energized": disconnected (from all sources of electric supply) or disconnected and grounded. Normally, the line would be de-energized and grounded, otherwise live line work practices with associated greater clearance distances would be required to work on the antenna. In either case, the workers must be fully qualified to work both in the supply space under the appropriate work practice and on the antenna itself.

Rule 235C1
Basic Clearance for Conductors of Same or Different Circuits

Table 235-5
Vertical Clearance Between Conductors at Supports

Rule 235E1
Fixed Supports

Table 235-6
Clearance in Any Direction from Line Conductors to Supports and to Vertical or Lateral Conductors, Spans, or Guy Wires Attached to the Same Support

Request (8 May 1998) IR 515

NESC Rule 235 contains Tables 235-5 and 235-6, both of which contain clearances from supply conductors to other supply conductors. The question is: What is the proper vertical clearance between two secondary Rule 230C3 cables (triplex), one of which is in the main lead and one of which is crossing on a joint-use support pole. Each of the two cables is from a separate power company and each is attached to a common support pole. Does Rule 235C1, Table 235-5 (indicating 16 in clearance) apply or does Rule 235El, Table 235-6 (indicating 3 in clearance) apply?

Interpretation

Your request for interpretation involves two secondary triplex cables (Rule 230C3 cables—less than 750 V) crossing on a common supporting pole. As we understand the situation, both cables are line conductors; see the definition for conductor, line conductor: "A wire or cable...extending along the route of the line, supported by poles..." Consequently, Rule 235C1 applies: "The clearances given in Table 235-5 shall apply to lines, wires, conductors, or cables of 0 to

50 kV attached to supports." and the appropriate clearance requirement is 16 in.

Rule 235E1 and Table 235-6 cover clearances between line conductors and vertical or lateral conductors attached to the same support. The rule and table do not apply in your situation because the cables are neither vertical nor lateral conductors. Note the definition for conductor, lateral conductor: "A wire or cable extending in a general horizontal direction at an angle to the general direction of the line conductors, and *entirely supported on one structure*." (emphasis added).

Table 235-5
Vertical Clearance Between Conductors at Supports

Request (13 May 1997) IR 512

Table 235-5 of the 1997 NESC address clearances between conductors at supports.

Footnote 11 states, "No clearance is specified between fiber-optic-supply cables meeting Rule 230F1b and supply cables and conductors." The footnote is applicable in situations when the cable is in the supply space on systems from 0 kV to 8 kV, 8.7 kV to 50 kV, or with supply cables meeting Rule 230C1, 230C2, or 230C3, neutral conductors meeting Rule 230E2, or communications cables meeting Rule 224A2a.

We have heard people argue that since the table only goes to 50 kV, the application of the footnote is limited to 50 kV, and that above 50 kV, All-Dielectric, Self-Supporting (ADSS) cables must follow the c1earance guidelines in 235C2al, which treats the cable as a separate circuit and imposes the clearance of 0.4 in per kV in excess of 50 kV.

We argue that no clearances are specified for the ADSS for situations from 0 kV to 50 kV. and argue that we don't see a safety-related reason

why a clearance needs to be imposed simply because the system voltage goes above 50 kV. The ADSS cable is classified as a cable that is entirely dielectric, per Rule 230F1b. We believe that footnote 11 can be extended to systems with voltages higher than 50 kV, as long as the ADSS cable manufacturer can ensure that the cable material can function at the pole attachment position and as long as workers observe the safe approach distances for their work classification. Is this a correct interpretation? If not, why?

Interpretation

As you note in your request for interpretation:

a) Table 235-5 specifies vertical clearance between conductors at supports for supply conductors to 50 kV, and
b) Footnote 11 states that no clearance is specified between fiber-optic-supply cables meeting Rule 230F1b and supply cables and conductors.

While additional clearances to those specified in Table 235-5 are normally required for open supply conductors operating at over 50 kV, there is no such requirement for fiber-optic cables covered by Footnote 11. Consequently, the Interpretations Subcommittee concurs with your basic conclusion. However, since clearances of Rule 230F1b fiber-optic cables to conductors operating at more than 50 kV are not covered in the rules, Rule 012C (good practice) should be observed. Again, as you note in your request for interpretation, the fiber-optic cable must be suitable for the intended service and workers must observe appropriate approach distances to energized conductors.

For your information, entirely dielectric fiber-optic cable meeting Rule 230F1b can be “wrapped around” or can be part of an energized supply conductor. While Footnote 11 states that no clearance is

specified between such fiber-optic cables and supply conductors, the intent of the rules is that they should be either:

a) Cabled together or otherwise constructed without separation, or
b) Separately supported far enough apart so as to not physically contact each other in the span during expected wind and sag conditions.

See also IR 497, dated 28 August 1995, for background information. Note that this was an interpretation of the 1993 Edition; Footnote 11 was added to the 1997 Edition.

Rule 239D
Mechanical Protection Near Ground

Request (10 April 1997) IR 511

Please clarify Rule 239D in the following situation: When installing a jacketed cable down a pole to convert from an overhead system to an underground system (primary or secondary), does the phrase "protected by a covering" mean encased or enclosed? In other words, is the pole an acceptable cover on one side and a U-guard an acceptable cover on the other side? Or is a backplate required with the U-guard to completely encase the jacketed cable to provide suitable mechanical protection?

Interpretation

The Interpretations Subcommittee assumes that you are requesting an interpretation of the 1993 Edition because the language "protected by a covering" appears in Rule 239D of that edition. In this context, either a conduit or a U-guard (with or without a backplate) may be used. However, two comments are appropriate, as follows:

a) Where mechanical protection is required and a U-guard is used without a backplate, the U-guard must have a tight fit to the pole surface, without gaps between the guard and the pole. Otherwise, the U-guard should have a backplate.
b) Only certain types of conductors, cables, and grounding wires can be attached directly to a pole, see Rule 239A1 and the exceptions in Rule 239D (1993 Edition). All other types of conductors and cables must be fully enclosed, either by a conduit or a U-guard with a backplate.

Rule 239D covers mechanical protection near ground, see other rules for protection requirements in different areas of supporting structures. The 1997 Edition contains similar requirements; see the appropriate rules.

Part 3.
Safety Rules for the Installation and Maintenance of Underground Electric Supply and Communication Lines

Rule 314A
Grounding of Circuits and Equipment—Methods

Rule 96C
Ground Resistance Requirements, Multi-grounded Systems

Rule 354D
Random Separation—Additional Requirements, Supply and Communication Cables or Conductors

Request (1 February 1999) IR 517

We request an interpretation of the NESC regarding the grounding of direct buried primary underground random separated jacketed cable on a multi-grounded system. We are working with three single-phase

cables in a three-phase 7.2/12.5 kV system. The jacket is full insulating consisting of a black-linear, low-density, high-molecular weight polyethylene, extruded over the concentric neutral. Each individual wire of the concentric neutral is annealed solid uncoated copper.

Rule 314A states “The methods to be used for grounding of circuits and equipment are given in Section 9.” Rule 96C states “The neutral, which shall be of sufficient size and capacity for the duty involved, shall be connected to a made or existing electrode at each transformer location and at a sufficient number of additional points with made or existing electrodes to total not less than four grounds in each 1.6 km (mile) of the entire line, not including grounds at individual services.” Rule 354D3c for random separation states that “Grounded in accordance with Rule 314 except that the grounding interval required by Rule 96C shall be not less than eight in each 1.6 km (mile) of the random buried section, not including grounds at individual services.”

Do these rules, therefore, dictate that for a direct-buried random separated, jacketed, 7.2/12.5kV three-phase underground cable installation, a minimum of 24 electrodes (8 per phase, per mile), plus grounds for individual services, shall be installed?

Interpretation

A multi-grounded three-phase wye system has, in effect, a single neutral conductor. When three single-phase concentric neutral cables are buried in the same trench, each concentric neutral becomes a neutral sub-conductor. To maintain equipotential, the sub-conductors must be bonded together (see definition for “bonding,” Section 2) at each grounding point to form a grounding conductor capable of meeting the requirements of Rule 93C. While more than one grounding electrode may be installed at a grounding point, a single electrode is all that is required by the rules.

As you state, Rule 314 requires primary neutrals to be effectively grounded, using the methods given in Section 9. Rule 96C requires the neutral to be connected to a grounding electrode at not less than four locations in each mile of line. While transformer grounds are included (and required) in the count, service grounds are excluded.

Because of your reference to Rule 354D, the Interpretations Subcommittee assumes that you are concerned about electric supply and communication cables buried together at the same depth in the same or common trench with no deliberate separation between the electric supply and communication cables. Note that Rule 354D applies *only* under such conditions. With this in mind, you are correct in stating that Rule 354D3c (for cables with overall insulating jackets) requires eight grounds, rather than four, in each mile of the random buried section. Again, the sub-conductors must be bonded together and grounded at each transformer location; these locations are included in the count, and service grounds are excluded. The requirements of Rules 354D3a and b must also be met.

Consequently, the answer to your specific question is “no.”