National Electrical Safety Code Interpretations

1943 - 1958 inclusive

IR 11 through IR 91

Interpretation No. 28 Insertion of choke coil in ground lead. Date of request is April 24, 1946.

Question - It will be appreciated if you can get an informal opinion for the Committee of Interpretation on whether the installation of choke coils in the grounds from neutral wire would be considered as interfering with the effectiveness of the ground. As you know, this proposal is being made for carrier communication on certain power systems.

Answer - It is the informal opinion of the Advisory Committee that the insertion of choke coils with an impedance of two to four ohms in each of the grounding leads on a power supply line would not appreciably increase the hazards to life provided that such coils are provided with gaps to bypass lightning or other steep-front transient surges, and the installation of experimental equipment should not be barred.

The code, when written, did not consider or anticipate such equipment, and if it is found to be practicable and is to be used extensively, it is recommended that the whole subject be carefully considered and appropriate rules prepared.

Interpretation No. 70 — Are galvanized steel group rods regarded as approved equivalent of rods of nonferrous materials? Date of request is March 2, 1954.

Question - Will you kindly give us the opinion of vour committee as to whether or not galvanized steel ground rods may be regarded as the approved equivalent of rods of nonferrous materials.

Answer - The question as to "Whether or not galvanized ground rods may be regarded as the approved equivalent of rods of non-ferrous materials" is one relating to possible modification of existing requirements rather than to their interpretation since Section 95-D specifically requires that "Electrodes of rods of steel or iron shall be at least 3/4 in. minimum cross-sectional dimension" while rods of non-ferrous material not less than 1/2 in. diameter are permitted. The 3/4 in. dimension quite evidently is intended to be the diameter of a round rod, and since the Interpretations Committee has no authority to change existing Code requirements any opinion as to the suitability of 5/8 in. diameter galvanized rods appears to be outside of this committee's jurisdiction.

Interpretation No. 55 — Ground resistance; a) limit, b) measurement requirement. Date of request is January 31, 1951.

Question - It is requested that an interpretation be made of the National Electrical Safety Code requirements concerning ground resistance and ground resistance testing. The questions on which clarification is desired pertain to Code Rules 96A and 96B. Statements of two specific questions are given below. Each question is preceded by a discussion of matters relating to the question.

1. Rule 96A "Ground Resistance - Limits"

Question. If more than one approved electrode is used in making a ground connection does the 25 ohm maximum resistance requirement for "resistance of grounding wire and connection with the ground" apply?

2. Rule 96B - "Ground Resistance - Checking"

Question. Is it the intent of Code Rule 96B to exclude ground connections on multi-grounded neutral lines from those which should be tested for resistance?

In this question multi-grounded neutral lines are distribution lines having in each mile at least four connections between the neutral conductor and the earth. The connection to earth at each location is made with one artificial ground electrode meeting code requirements of Rule 95D.

Rule 96A: The phrase "this requirement shall be waived" applies to the 25 ohm provision and, therefore, no specific ground resistance value need be met if two or more electrodes are used in cases where the measured resistance of a single electrode ground exceeds 25 ohms.

Rule 96B: In regard to the interpretation, the Code seems to be reasonably consistent in differentiating between multiple grounds or grounding and multiple electrodes, although the quoted portion of Code Rule 97A in the Discussion may be somewhat ambiguous. It appears evident that two or more electrodes whether connected to a given point in the circuit by a single conductor or by two or more conductors constitute only a single ground connection and that the term "multiple grounding" is intended to mean two or more separate ground connections, each attached to a different point in the circuit. On this basis, the last sentence of Rule 96B clearly requires no resistance measurement where multiple grounding is used.

Interpretation No. 88

Can grounding conductor of primary spark gap be solidly interconnected with the secondary neutral on an otherwise ungrounded system.

Date of request is July 1957

Question --

This is a request for an interpretation of Rule 97 of the National Electrical Safety Code regarding interconnection of lightning arrester grounds and secondary neutrals on ungrounded systems.

In the case of an ungrounded transformer installation, Rule 97 requires a separate grounding conductor from the lightning arrester and permits interconnection with the secondary neutral only through a spark gap. We consider this method of interconnection to be hazardous to the lineman because it results in two separate grounded conductors in close proximity which could under certain conditions have a substantial potential difference between them.

The requirement for a separate grounding conductor for primary lightning arresters on ungrounded systems apparently originated because of the tendency of certain lightning arresters to pass leakage current and develop dangerous voltages on the arrester grounding conductor. Recognizing that this possibility still exists, but not wishing to use the method of interconnection through a spark gap, it has been suggested that the lightning arresters be removed and replaced with primary spark gaps for lightning protection and then interconnect solidly the spark gap grounding conductor with the secondary neutral. REA borrowers have used primary spark gaps extensively for many years for protection of small transformers and have found them to be very rugged and free from any tendency to pass leakage currents. Therefore, we would consider it safe to make this solid interconnection under the conditions outlined above.

Under Section 1, Definitions of Special Terms, a lightning arrester is defined as "a device which has the property of reducing the voltage of a surge applied to its terminals, is capable of interrupting follow current of present, and restores itself to original operating conditions." Since a spark gap does not meet this definition, and since Rule 97A1 specifically mentions lightning arresters, on the basis of the Code wording it appears that the rules do not prohibit solidly interconnecting a primary spark gap grounding conductor and a secondary neutral.

However, in view of the importance of this question, we request an interpretation of the rules with respect to whether the grounding conductor of a primary spark gap can be solidly interconnected with the secondary neutral on an otherwise ungrounded system.

Answer --

It should be noted that Rule 97C is listed as an exception to Rule 97A. Rule 97C permits a solid interconnection between lightning arrester ground wires and secondary neutrals under any of the conditions prescribed in 97C1(a), (b), or (c), and requires the use of a spark gap only when these conditions are not met. The intent of the present rules would apply equally to primary spark gaps.

97A See 96A and B, IR 55
102
110
114 Table 2, C

Interpretation No. 86

a) Requirements for a fence to prevent unauthorized entry
b) What is practicable limit for reduction of hazards. Does rule apply to employee or public?
c) Is exterior of porcelain arrester a live part?
d) Clearance to ground in substation; measured from earth or concrete supporting base for arresters?
e) Clearance to live parts adjacent to fence separating station area from public.
f) Does locked fence constitute guarding by isolation.

Date of request is May 1, 1957

Question --

Several requests for interpretations of certain rules of the National Electrical Safety Code are contained in the following paragraphs. In compliance with the instructions in the Preface of the 5th Edition of this Code, these requests are submitted to the Bureau of Standards.

These points are at issue in a public liability suit against ••• Public Service Company which is to be tried on June 10, 1957. An interpretation prior to that date would be appreciated, if at all possible.

No. 1. Rule 102. General Requirements.

A. Enclosure of Rooms and Spaces.

Rooms and spaces shall be so arranged with fences, screens, partitions, or walls as to prevent entrance of unauthorized persons or interference by them with equipment inside, and entrances not under observation of an authorized attendant shall be kept locked. Signs prohibiting entrance to unauthorized persons shall be displayed at entrances.

Interpretation desired: What are the requirements of a fence that will prevent entrance by unauthorized persons into an unattended substation within the meaning of this paragraph.

No. 2. Section II. Protective Arrangements of Equipment.

Rule 110. General Requirements.

All electric supply equipment shall be of such construction and so installed and maintained as to reduce the life hazards as far as practicable.

Interpretation desired: What constitutes the practicable reduction of life hazards within the meaning of this rule? Does this rule apply only to employees or to the general public?

No. 3. Rule 114. Guarding Live Parts.

A. Where Required.

1. Guards shall be provided for all parts exceeding 300 volts to ground unless the boundary of the guard zone around the part has a vertical clearance of more than 7 feet 6 inches for voltages up to 7,500, and 8 feet 6 inches for voltages of more then 7,500, above any permanent supporting surface for workmen, or a horizontal clearance of more than 3 feet from the nearest edge of any such surface, or both. This includes parts exposed through windows, wall openings, etc.

Exceptions: Guards need not be provided where it is necessary to permit routine inspection of rotating equipment as required under operating conditions.

Note: The rule applies to the electric parts energized or considered available for service in temporary or partially completed installations, as well as to permanent installations.

Definitions: The guard zone means the space of minimum clearance from guards to electric parts where guards may be installed by workmen without definite engineering design. The radius of this zone varies with the voltage as specified in Column 4 of Table 2. See Rule 422 C of the Code, for working clearances about live parts.

"Permanent supporting surface for workmen" includes floors, platforms, or structures used regularly by workmen for inspection and maintenance near live adjacent parts; runways, ladders, stairways, etc.

Interpretation desired: 1. Is the entire porcelain portion of a lightning arrester considered a "live part" in the measurement of distance in the Rule and in Table 2.

2. In a substation with an unpaved surface, is the vertical distance in this rule measured from the earth surface or from the top of the concrete base on which lightning arrester supporting structures are mounted?

No. 4. Table 2. Minimum Clearances from Live Parts.

Voltages Between Phases	Minimum Vertical Clearance to Live Parts.		Minimum Horizontal Clearance to Live Parts.		Minimum Clearance From Guards to Live Parts.
	Feet	Inches	Feet	Inches	Inches
33,000	9	6	4	0	12

Interpretation desired: Are these clearances applicable within the fenced area of a substation? Can Column 3 of Table 2 be construed as the clearance between live parts and the top of a fence as far as the general public is concerned? (See attached Print.)

No. 5. Rule 114 C. Types of Guards.

1. Location or Isolation.

Parts having clearances equal to or greater than specified in A above are guarded by location. Parts are guarded by isolation when all entrances to enclosed spaces, runways, ladders, etc., are kept locked or warning signs posted at all entrances, in which case no other permanent guards need be supplied.

Interpretation desired: Does locked fence as indicated on attached print constitute guarding by isolation?

Answer --

Question 1 - Rule 102-A . The fence shown on sketch 41957, which accompanied the interpretation request, meets the requirements of rule 102-A , provided unattended entrances are locked and posted as specified in this rule. Any fence constitutes an inferred moral restraint in addition to being a definite physical obstacle. The fence in question presents a rather formidable physical obstacle; and one which obviously conveys the unwritten message that access gained by climbing it is against intent and desires of the owner.

Question 2 - Rule 110. A general answer to the first part of this general question is that there should be no life hazards when equipment performs as intended and when prescribed operating rules and procedures are being followed. The practicable reduction of life hazards to guard against abnormal equipment performance and violations of operating rules and procedures would have to be determined for each individual case. This rule applies to employees and to the general public.

Question 3 - Rule 114. The point of measurement of distance is from the actual "live part" rather than from some part of the porcelain body of the arrester. The vertical clearance should be measured from the top of the concrete base if it extends out from the structure to permit a person to stand upon it. Otherwise, the measurement should be made from the earth surface.

Question 4 - Rule 114 - Table 2. The answer to the first part of this question should be "yes." The answer to the second part of the question should be "The values in column 3 of Table 2 should not be construed as the clearance required between live parts and the top of a fence as far as the general public is concerned because the fence as shown on sketch 41957 is the guard for the public."

Question 5 - Rule 114. A locked fence as shown on sketch 41957 constitutes guarding by isolation, so far as the general public is concerned.

Interpretation No. 90

Systematic inspection - time interval between inspections
Date of request is October 24, 1958

Question --

Paragraph 213.A.2. of the National Electrical Safety Code states:

"Lines and equipment shall be systematically inspected from time to time by the person responsible for the installation."

Please give us an interpretation on what would be considered a reasonable time interval between such inspections.

Answer --

1. The inspection should be made by the person or company responsible for the operation and safety of the lines or equipment who should be in a better position than anyone else, to determine how thoroughly and how frequently the lines or equipment in question should be inspected.

2. Some lines and equipment in some locations might require dily inspections while other lines and equipment in other locations might need only annual or even less frequent inspections. This is why this rule could not be made specific. For example, if we are concerned only with decay and weakening of pole timber, experience shows that some treated poles have lasted 35 or 40 years. Some have shown signs of decay in less than 10 years. Also, there is definite evidence that decay is influenced by the amount of rainfall and hence moisture in the soil. This, of course, varies from one part of the country to another. Other factors such as woodpecker damage and lightning damage vary considerably from one area to another. Salt spray or industrial atmospheres may contaminate insulators or causeaccelerated corrosion of guys, hardware, etc. Again these factors vary from one area to another. In short, inspection procedures and intervals must be tailored to fit the local situation. What is reasonable and necessary in one area may be unsound or unduly burdensome in another area.

3. If there should be a question as to what is "systematically inspected from time to time", decision should rest with the administrative authority having jurisdiction.

Interpretation No. 18 - For special construction supply circuits is 550 the maximum allowable voltage or the nominal? Date of request is December 18, 1944.

Question - This refers to Rule 220-B-3 in National Bureau of Standards Handbook H-32, which states as follows: "Special Construction for Supply Circuits, the Voltage of which is 550 Volts or Less and Carrying Power not in Excess of 3200 Watts".

This rule applies for supply wires carried on the same pole line with communication conductors. The value of 550 volts given in the above rule does not appear to be in accordance with N.E.M.A. transformer standards, unless the value of 550 volts is considered as a nominal value. For example, N.E.M.A. generating station transformer standard are, nominal system voltage 550, generator rated voltage 600, rated voltage 575; and N.E.M.A. distribution transformer standards are, system voltage 550, rated high voltage 600 volts.

A typical power supply arrangement for a railway signaling system using standard transformers might be as follows:

Commercial power might be obtained at 115 or 120 volts which would be stepped up to line voltage using a 1 to 5 ratio transformer. This would give 575 or 600 volts at the power supply point. Under maximum load conditions a maximum line voltage drop of 20% would be allowed. With 600 volts at the power supply point and a drop of 20%, the voltage at the end of the line would be 480 volts. The average of 600 volts and 480 volts is 540 volts, or the nominal voltage of the line, which is less than the 550 volt value given in the Code. The distribution transformers usually used on such lines have no taps and the manufacturer's catalog usually rates each transformer primary 500, 575, 600 volts, secondary 110, 115, 120 volts, with the values of 575 and 115 set in heavy type, indicating that these are the normal values of voltage for the transformer.

It will be appreciated that in many sections of the country power can be obtained only at widely separated points so that it is desirable to make the signal power transmission lines as long as possible. When a maximum line voltage drop of 20% is allowed under maximum load conditions, it is desirable to use a voltage of 575 to 600 volts at the power supply point to insure that sufficient voltage is obtained at the end of the transmission line to provide satisfactory operation of the signaling equipment.

Is the value of 550 volts mentioned in the rule referred to above a nominal value with a permissible high voltage of 600 volts, and would it be possible to have the rule modified to call for a maximum of 600 volts between conductors with transmitted power not in excess of 3200 watts when involved in the joint use of poles with communication circuits?

Answer - The Committee on Interpretations reports that the value of 550 volts is the maximum and not a nominal value. The permission to use these voltages for signaling purposes on power lines and for applying power on signal poles permits considerably less protection than would normally be required for such circuits. The intent of the committee was to set 550 volts as the maximum.

This applies to supply wires carried on the same pole with communication conductors; specifically, it probably should apply to signal circuits carried in the lower position among communication conductors (See exception to Rule 239-G-2 and 3). Where a supply circuit is located at the required distance above communication conductors there is no code limitation as to the amount of power that may be transmitted.

Interpretation No. 11 Will use of Lamicoid marker on cross-arms of 550V power supply circuits comply with marking rule. Date of request is December 23, 1943.

Question - ... we asked

... whether or not the use of a Lamicoid high voltage marker bearing the letters "HV" in red on a white background applied to both sides of signal crossarms under the signal power supply circuits of not more than 550 volts and 3200 watts, permitted on communication pole lines, will comply with paragraph 220 B 3(b) on page 36 of the National Electrical Safety Code, Part 2 (Handbook H32).

Answer - The consensus seems to be that while the Lamicoid high-voltage marker would be satisfactory, three members have suggested that in place of the letters HV, such signs read 550 volts. I understand that the cost for any quantity would be the same regardless of lettering. Obviously this will last as long as some metal signs and they would be preferable to stenciling on the arms.

Interpretation No. 85

a) Classification of specific cable construction
b) Clearance requirements

Date of request is February 26, 1957

Question --

234 D1 - It states "Supply conductors not installed in grounded conduit or metal - sheath cable, etc." The cable that we are using is a 12 kv 3 single conductor twisted Kerite rubber insulated with an 8 mil zinc tape with 20% overlap covering each insulated conductor and a 6/64" neoprene jacket over each conductor. The three conductors are bound together with a copper strap to a 9/16" EHS Copperweld messenger wire. It is our belief that in paragraph 230 C, both in the Code and in the discussion of the Code, this type of cable is considered a metal sheath type. In such a case, it would not be necessary to maintain the clearances specified in paragraph 234D.

Answer --

In section 234D1 of the National Electrical Safety Code, the term metal-sheathed cable includes a cable carried on an effectively grounded messenger, where the individual conductors are covered with an overlapping metal tape and each tape effectively grounded.

Interpretation No. 31 Clearance over farm fields for voltages of 50kV. Date of request is March 28, 1947.

Question - Referring to the NESC Rule 232, Table 1, Item 3 shows a basic clearance of 22 ft. for crossings over public streets, alleys, or roads in urban or rural districts for voltages 15,000 to 50,000. Item 7 in the same Table shows a basic clearance of 20 ft. along roads in rural districts.

The interpretation requested therefore is whether in determining the required clearance over fields for voltages of 50,000, the basic clearance required in the NESC is 20 ft. or 22 ft.

Answer - When the code was revised no clearance from the ground over fields was set up because it did not seem practical to determine what vehicles could be expected to pass over such space. The 20-foot clearance specified in rural districts for wires along a right-of-way would seem logical but might be rather low for men on a load of hay or for certain farm machinery. Where there is no possibility of anything but a pedestrian traveling beneath the line, the reduced clearances given in sub-note 10 might apply. The 22-foot clearance is over established roads only.

Interpretation No. 76 Clearance requirements for telephone lines which pass over driveways into farmer's fields in strictly rural areas. Date of request is September 13, 1955.

Question - We should like to have clarified the clearance requirements for telephone lines which pass over driveways into farmer's fields in strictly rural areas. On page 44 of Handbook H32, in the table showing clearances, it lists 18 feet as the clearance for wires crossing over public streets, alleys or roads in urban or rural districts. On page 45, referring to footnote 13, there is a statement that where communication wires or cables cross over or run along alleys, this clearance may be reduced to 15 feet. Does this imply that 15 feet would be satisfactory clearance over the type of entrances mentioned above, namely, driveways into farmer's fields?

Answer - Where a telephone wire runs along a road in a rural district and crosses a driveway into a field, the required clearance above ground is 14 feet as indicated in the last line of the first column of table No. 1 and footnote No. 12 of the National Electrical Safety Code. This is based on the specific conditions set forth in Rule 232A and may be modified for longer spans, lower temperatures, or other conditions as set forth in Rule 232B.

The question concerning liability for failure to comply with the rules of the National Electrical Safety Code is not within the scope of the Interpretations Committee.

Interpretation No. 79

Clearance for cabled service drop,
150 V max to ground
Date of request is January 4, 1955

Question --

We desire a clarification and intrepertation of one vertical clearance in your National Bureau of Standards Handbook H-30, Part II, Sec. 23, Paragraph 232 A, Table 1.

The vertical clearance above ground in question is for service drops, 0 to 750 volts over spaces or ways accessible to pedestrians only and for voltages ~~requirements to~~ 150 volts or less to ground, covered by footnote 8 (2).

This shows a minimum clearance of 10 ft for open supply line wires and service drops. We have for years been under the impression this clearance for open supply wires and service drops referred to bare or weatherproof wire. We are now using for service drops triplex aluminum cable ~~for service drops,~~ which consists of one bare ACSR for neutral and messenger with two fully 600 volt insulated neoprene jacketed all aluminum cables wrapped around and supported by the ACSR neutral and messenger.

Since the two energized service wires are fully insulated for 600 volts we have assumed the vertical clearance from the ground in this case may be 8 feet and that open supply wires, that is, bare or weatherproof wires are required to have a clearance of 10 feet under the code.

It is our assumption that fully insulated wires for service drops are not open supply wires and are not required under the code to have the 10 ft vertical clearance.

If this triplex aluminum cable is required under the code to have a 10 ft vertical clearance above the ground because of the bare neutral wire then, suppose the neutral wire also is fully insulated for 600 volts, could this vertical clearance be reduced below 10 feet?

Answer -- The required minimum vertical clearance above ground for service drops at the building entrance for voltages not exceeding 150 volts to ground is 10 feet. This clearance is based primarily on mechanical considerations rather than on whether bare, covered or insulated conductors are involved.

Interpretation No. 43 - Clearances of transmission lines over navigable waters. Date of request is August 10, 1949.

Question - The question concerns interpretation of Table 1, Section 232, or more specifically, Table 1 of Page 108 of H30 concerning clearances of distribution conductors up to 15,000 volts over the surface of lakes, rivers, etc., on which fishermen can travel in small boats.

We interpret the requirements as being the same as space accessible to pedestrians only, that is, 15 feet. It may be possible for a fisherman in a boat to manipulate his line so that contact at such a clearance might be made. We are wondering if 15 feet has been interpreted as being the proper clearance for a distribution line over waters accessible for fishermen and will appreciate very much as early a reply from the Interpretation Committee as is practicable.

Answer - The members were unanimous in their opinion that nothing in the code covers, nor was intended to cover the case of clearances above power reservoirs, small creeks, etc.

Interpretation No. 13 - Clearance over farmland. Date of request is August 4, 1944.

Question - The subject under discussion involves Rule 232A, Table 1 entitled, "Minimum Vertical Clearances of Wires above Ground or Rails". We desire to know how to interpret Table 1 in determining the clearance over farmland.

Our problem deals with clearances of transmission lines over fields and farmland wherein there are no traveled roads or established driveways of any kind. The thought is that such fields or cultivated farmlands may be traversed by teams, wagons or mechanized farm machinery. In this connection, attention needs to be directed to the significance of that part of Table 1 referring to "Spaces or Ways Accessible to Pedestrians Only".

Answer - The specific situation • • • is, in our opinion, not covered by Table 1. Consequently no interpretation of Rule 232-A can be made which will serve as a guide to the proper clearance of supply wires above farm lands. It is our belief also that the clearance values for "Spaces and Ways Accessible to Pedestrians Only" do not apply inasmuch as fields may be traversed by various types of farm equipment.

However, it should not be difficult ••• to decide on clearances above tillable ground on the basis of the height of the farm equipment that normally is used in the region involved. To this can be added, if necessary, certain additional clearances for the safety of workmen on top of high loads, such as trucks or wagons loaded with hay or sheaves of wheat. Across farm lands that are not normally tilled or are only suitable for grazing, it would be reasonable to provide somewhat less clearance than over crop producing lands.

Rules 200, 210, and 211 which, while very general in their nature, govern locations which are not otherwise specifically covered.

Interpretation No. 58 — Do clearances have to be maintained under all weather conditions? Date of request is January 25, 1952.

Question - With reference to the temperature 60° F stated in Rule 232, A, 1, minimum vertical ground clearance values found in Table I, those which should exist only while stringing up say, a prestressed conductor at 60° F ambient temperature, no wind velocity or are those the minimum ground clearance values which should be maintained when the prestressed conductor is subjected to a climatic condition of 60°F ambient temperature, no wind, and is carrying a desired amount of current?

Answer - In dealing with clearances above ground or rails, neither the Code nor the Discussion of the Code makes any mention of the effect on clearances or sags caused by the heating of conductors as a result of electric currents passing through them.

It is our understanding that the heating effect of currents passing through the conductors was not considered of sufficient importance to warrent recognition in the portions of the Code dealing with above ground clearances.

If, however, due to over-heating of a line conductor, or for any other cause, the final unloaded sag at 60°F and no wind results in less clearance above ground or rails than specified in Table 1, then the conductors ought to be re-sagged so that the clearance in Table 1 obtain.

Interpretation No. 25 - Increased clearances for excess span length. Date of request is October 23, 1945.

Question - Please refer Bureau of Standards Handbook 32, National Electrical Safety Code Rule 232-B, is additional clearance required for excess of span length to be added to maximum sag increase to determine total additional clearance required, or is total additional clearance required the maximum sag increase as indicated by Paragraph 3, Rule 232-B? Answer night letter, Collect

Answer - The increased clearances called for in Rule 232-B are intended to be added to the basic clearances called for in Table I, Page 44 of Handbook H32. Rule 232-B-1 on Page 46 covers the increases necessary for excess span length. The amount of this increase, where the crossing occurs at the point of maximum sag, is given in Rule 232-B-1-(a)-(1) and (2) on Pages 46 and 47 and limitations to this amount of increase are given in Rule 232-B-1(a)-(3) on Pages 47 and 48. Further limitations of the amount of this increase, where the crossing occurs at other than the point of maximum sag, are given in Rule 232-B-1-(b) on Page 48.

Increases required for voltages exceeding 50,000 volts are given in Rule 232-B-2 on Page 48 and increases required for conductors supported by suspension-type insulators are given in Rule 232-B-3 on Pages 48 and 49. These latter two increases are in addition to the increases required for excess span length.

In considering the matter of increased clearances, you should find helpful the material given on Pages 22 to 30 of NBS Handbook H39 - Discussion of National Electrical Safety Code - Part 2 and Grounding. Values of maximum sag increase for commonly used conductors will be found in Table D-19 on Pages 122 to 124 of Handbook H39.

232B1 See 232B, IR 25
232B1a (1)(2)(3) See 232B, IR 25
232B2

Interpretation No. 83

a) Increase in clearance, V 50kV
b) Clearance for basic and longer spans
c) Clearance to building corner.

Date of request is November 1, 1956

Question:

Rules 232, B, 2, and 233, B, 2 provide for increase in clearance for voltages exceeding 50,000 volts between conductors at the rate of 0.5 inch for each 1,000 volts of the excess. It is my interpretation that this voltage adder should not be applied until the clearance has been determined for the particular span and conductor at its loading at 50 KV, and particularly that the voltage adder is not to be decreased by the application of the multipliers in Rules 232, B, 1, (b) and 232, B, 1, (b). Please advise whether this interpretation is correct and if not, give the correct interpretation.

In Rule 234, C, 4, CONDUCTORS PASSING BY OR OVER BUILDINGS, clearances are recited for various voltages and situations in spans of 0 to 150 feet. For increase in clearances, for spans in excess of 150 feet, reference is made back to Rule 232, B, 1, SPAN LENGTHS LONGER THAN SPECIFIED FOR RULE 232, A, where rates of increase, limits and reductions are set out. No span lengths are recited in Rule 232, B, 1, but reference is made in (a), (1), GENERAL and (2), RAILROAD CROSSINGS, to Rule 232, A, 2. Rule 232, A, 2 recites spans of 175 feet, 250 feet, and 350 feet, respectively, for the heavy, medium, and light loading districts with shorter spans for certain three strand conductors. It is my interpretation that under Rule 234, C that clearances shown in Table 4 apply for spans up to 250 feet in the medium loading zone and that the clearances increase at the rate of 0.1 feet for each 10 feet of the excess over 250 feet until a limit is reached for the particular conductor at its loading. Please advise whether this interpretation is correct and if not, give the correct interpretation. Please advise also whether, in the case of clearance to an upper corner of a building the clearance is to be measured both horizontally and vertically or whether it is to be measured diagonally along the shortest distance from the conductor to the building.

Answer:

With respect to the increased clearance from buildings for spans in excess of 150', we believe Rule 234C4 (a) (2) is fairly clear in stating that "where span lengths exceed 150' the increased clearance required by Rule 232B1 shall be required." The intent is that when using Rule 232B1 with 234C4 (a) (2) that spans longer than 150' are being considered and not spans longer than specified in Rule 232B2. There is no mention of voltage in [requester's] question and we assume that he must be concerned only with conductors carrying over 8700 volts since the exception points out that these increases are not required for conductors carrying from 300 to 8700 volts.

232A Table 1
232B1a(1)
232B3

Interpretation No. 60 - Clearance with suspension insulators. Date of request is March 27, 1952.

Question - I would appreciate your comments on the following questions relative to Section 232 of the 5th Edition of the National Electrical Safety Code:

(1) Rule 232 B, 1, a, 1 states that "For spans exceeding the limits specified in Rule 232 A,2 above the clearance specified in table 1 shall be increased by .1 foot for each 10 feet of the excess of span length over such limits. See (3) below".

Does this rule apply to conductors supported by suspension insulators as well as those supported by pin type insulators?

(2) Rule 232 B, 3, Covering Conductors Supported by Suspension-Type Insulators at Crossings Over Track Rails, states that "The clearance shall be increased by such an amount that the values specified in table 1 (rule 232 A) will be maintained in case of a broken conductor in either adjoining span, if the conductor is supported as follows": etc.

Does this mean that the increased clearance as specified in Rule 232 B,1,a,2 does not apply, when suspension insulators are used? In other words, if the requirements of Rule 232 B,4 are met, are the clearances given in table 1 the maximum required, irrespective of span length?

(3) Table 1, Rule 232 A lists a number of conditions under the caption "Nature of ground or rails underneath wires," and gives the required clearances.

What clearance is required for lines across cultivated fields for the following voltages of open supply lines, and service drops, 0-750 V, 750-15000 V, and 15000 to 50000 V?

Answer - It is our opinion that the only case in which the increased clearances required by Rule 232B1 do not apply is in the situation described in Rule 232B3. In such a situation, span length must be taken into account in calculating the increased clearance necessary to provide for a broken conductor in either adjoining span. This increase might be quite substantial.

The answer to the first two questions is that Rule 232B1 does apply to conductors supported by suspension insulators. Rule 232B4 merely covers means of avoiding the large increase in clearance required by Rule 232B3 and does not eliminate the requirements for increased clearances given by Rule 232B1.

With respect to the third question concerning clearances required for lines over cultivated fields, the Code does not specify such clearances. Were it not for the possibility that farm machinery and high loads may pass under the wires, the clearances specified in Table 1 for "Spaces or ways accessible to pedestrians only" could be applied. However, good engineering judgement should dictate clearances ample to provide protection in all cases. Some of the committee members recall that this subject was discussed during preparation of the fifth edition of the National Electrical Safety Code and that it was decided that a rule was neither necessary or desirable since the line would be on a private right-of-way and clearances and other considerations would be subject to contractual negotiations.

233 See 234B2, IR 69 and 234C4a(2), IR 89
233A Table 3

Interpretation No. 12 — Avoiding fatigue failure in conductors under tension. Date of request is January 18, 1944.

Question - With reference to the 5th Edition of the National Safety Code, I would like to ask a question concerning section 261 (f). At the end of this section there is a note which reads as follows: "The above limitations are based on the use of recognized methods for avoiding fatigue failures by minimizing chafing and stress concentration. If such practices are not followed, lower tension should be used."

Does this note mean that all conductors should be provided with armouring bars or wrappings at the points of support and also stock bridge dampers? According to the .... engineers, the use of armouring is not considered to be sufficient to prevent crystallization due to vibration where long spans are used, and some form of damper must also be used. Many supply lines are erected without any auxiliary devices at the pins. It would appear that the note is very vague in that it fails to state what the lower tensions should be.

Answer - This note was included primarily as a warning. In some cases wires strung to the permitted tensions will give no trouble when strung without pads and dampers; in other cases fatigue failure may occur.

It is not possible to set up any definite reduction in tension which will be satisfactory in all cases. Each case must be considered separately. In case of doubt, the advice of wire manufacturers might be sought; they have been studying fatigue failures for years and have considerable data covering such cases.

Interpretation No. 16 — Clearance of primary neutral conductor over communication conductor. Date of request is November 14, 1944.

Question - We have 12000/6900 volt, 4-wire, wye connected electric distribution circuits and branching from these are single phase circuits, consisting of one 6900 volt phase wire on insulator at top of pole and one primary neutral wire mounted 3 feet lower without insulator. The primary neutral wire is grounded at the source and is continuously grounded for at least 10 or more points per mile of line along its length.

What is the most liberal interpretation of minimum clearance of this primary neutral conductor over a communication conductor in a standard span?

Table 3, "Wire Crossing Clearances", on Page 51, of Standard Handbook H-32, appears to have possibly two clearances for such conditions. We interpret the table to allow as little as 4 feet clearance. However, there are a number of footnotes applying to this table; namely, footnotes 6, 10, 7, 9 and 3. Can a minimum of 2 feet clearance of such a neutral conductor above a communication conductor be interpretated from Handbook H-32?

Answer - For the conditions specified in ··· letter of November 14, we interpret N.E.S.C. Table 3 as requiring a minimum of 4 ft. basic clearance for a primary neutral crossing above communication lines. None of the footnotes which ... lists modify this value.

Interpretation No. 62 - Are clearance increases cumulative in 1, 2, and 3 as indicatd in the text on page 52? Date of request is November 27, 1952.

Question - A 115 KVA transmission line crosses a 7200 KVA distribution line at 25% of the 115 KVA span from its nearest support.

Span length -- 700 feet
Maximum sag increase - 8 feet
Heavy loading district

I have derived the required clearance as follows:

233A, Table 3 Basic clearance to 50000 volts - 4'
233B, Par. 2 Add for increased voltage:

115000 - 50000 = 65000 volts
Add 0.5" per 1000 = 32.5" or 2.7 feet
4' + 2.7' = 6.7 ft. Basic clearance

233B, Par. 1(a) Maximum additional clearance need not exceed 75% of the maximum sag increase, in this case, less than the total increments of 0.15 ft. per 10 ft. over 175 ft.

75% of 8 ft. = 6 ft. additional clearance

Clearance required at mid span 6.7 ft.+ 6 ft. = 12.7 ft.

233B, Par. 1(b) at 25% span
12.7 ft. X 0.82 = 10.4 ft. required clearance.

The contending argument states that the increment due to increased voltage would be added after the sequence of 4 feet basic clearance plus the 75% of maximum sag increase multiplied by the 0.82 factor or as follows:

233A, Table 3 Basic clearance 4 ft.

233B, Par. 1(a) 0.75 × 8 ft. (msi) 6 ft.

233B, Par. 2 Voltage increase
(as above) 2.7 ft.
Midspan clearance
(as above) 12.7 ft.

at 25% of span
0.82 × 10.0 ft. = 8.2 ft.
add voltage increase 2.7 ft.
Total clearance required 10.9 ft.

Also under 233A, Par. 1, I would measure this clearance from the lower conductor at initial sag whether or not it had reached final sag. I believe the same line of reasoning used in the first solution above would apply to Rule #232 as well as #233.

Interpretation No. 69 — Clearance between conductors and supporting structures of another line. Date of request is December 30, 1953.

Question - I am writing your organization to obtain an interpretation of Rule 234.B.2 on Page 56 of National Bureau of Standards Handbook H32 (National Electrical Safety Code).

In order to effect economies, it is proposed to use intermediate poles, as shown on the attached sketch. In attempting to determine the minimum distance "X" as shown on the attached sketch, no exact rule could be found. I am uncertain whether or not the provisions of Rule 234.B.2 apply. My interpretation is that the above rule should not apply, but rather that Rule 238.B.3(a) or Rule 233 (Wire Crossing Clearance) should apply. It is pointed out that the danger due to a broken conductor falling on the intermediate pole is no greater than if all poles were contacted by the 34.5 KV line. Further, Rule 238.B.3(a) and Rule 233 provide substantial clearance. The intermediate poles will probably employ a ridge pin, so that climbing space above the pole will not be necessary. A minimum vertical crossarm spacing of 10' between the 34.5 KV crossarm and the 12 KV crossarm has been proposed, assuming that the 12 KV crossarm at the intermediate pole was at the same height above level ground as the 12 KV crossarm on a line pole. Rule 234.B.2, if applicable, would require a 15' or higher spacing between the 34.5 KV crossarm and the 12KV crossarm.

The crux of the problem appears to be in a definition of this type of construction as it is both joint construction and overbuilding. Rule 234B mentions two lines, while the construction under construction might be considered as one line. The discussion of Rule 234B on Pages 30 and 31 of National Bureau of Standards Handbook H39 (Discussion of the NESC) hints that the primary purpose of the rule was to eliminate straddling the pole not contacted. This would limit the consideration to lateral clearances. However, the "Rule" does not distinguish between lateral and vertical clearance of the structure.

Answer - The requirements for clearance between conductors and structures to which they are not attached are covered in Rule 234B. We do not believe there would be much question as to whether Rule 234B2 applied if the 34.5 KV conductors mentioned in ... letter were crossing directly over a pole of a separate line. It seems to us that this situation is very similar to [case in question] and it makes little difference whether the conductors in question are supported on a separate pole line crossing the first line, or are supported on alternate poles of the same line. A pole straddled by supply conductors not attached to it is hazardous to the workman and it is this hazard against which Rule 234B seeks to guard. This rule does not indicate whether the clearances required are to be taken in the horizontal or vertical plane. We believe the intent of the rule, however, is to require these clearances in any direction.

234C3 and 4 See 238B1, IR 82
234C4 See also 232B2 IR 83

Interpretation No. 87

a) Clearance to building — 5th Ed
b) Is clearance (in a specific case) in accordance with the NESC?
Date of request is August 5, 1957

Question --

I. Section 234 C 4, Page 121 of the National Electrical Safety Code, Fifth Edition, states in paragraph (a) that conductors in excess of 300 volts "shall not come closer to any building * * * than listed below." Table 4 thereunder lists "horizontal clearances" in one column and "vertical clearances" in a second column. Does the required clearance have to comply with both columns above or is compliance with either column sufficient? In other words, if a conductor clears a building by 10 feet in a vertical direction must it also be 10 feet distant in a horizontal direction? This assumes a 150 foot span and conductors carrying between 33,000 and 34,000 volts between conductors?

II. Where a 3-phase circuit of between 33,000 and 34,000 volts passes a dwelling so that the nearest of the three uncovered wires is 10.01 feet distant from the dwelling measured perpendicularly from the wire to the nearest point on the building, and where the wire does not pass over the building and does not run parallel with the building but diagonally, and assuming a 150 foot span between poles, is the construction in conformity with the National Electrical Safety Code and with Section 234 C 4 thereof?

Answer --

"In answer to your first question, the clearance does not have to comply with both the horizontal and vertical values of Table 4. Compliance with either value is sufficient.

"In answer to your second question, the situation described and illustrated in the attached sketch is in conformity with the National Electrical Safety Code and with Section 234 C 4 thereof."

Interpretation No. 47 Clearances from building. Date of request is December 2, 1949.

Question - Referring to National Bureau of Standards Handbook H32 Safety Rules for Electrical Communication Lines, Section 234, Subsection C clearance from building, page 58, does the requirement of eight feet for horizontal clearance of 15,000 voltage wires apply to buildings not inclosed with solid walls but which have large openings in the walls on a level with the high voltage wire. In other words, is the eight foot requirement invariable or is the distance of the wire from the building to be determined by other surrounding circumstances such as openings.

Answer - Rule 234C4(a) requires an eight (8) foot minimum horizontal clearance between line conductors (8700-15000 volts) and buildings, where the span length does not exceed 150 feet, irrespective of any openings in a building wall, unless the conductors are guarded as specified by Rule 234C4(b). If the span length exceeds 150 feet, increased clearances as specified in Rule 234C4(a)(2) are required.

Interpretation No. 66 Clearances to building or similar structure. Date of request is May 14, 1953.

Question - Rule 34.3411, table 4, gives clearance requirements conductors in static position so I take it: span not exceeding 150' with correction of 0.5 inch per kv in excess of 50 kv, which produces, for a 138 kv conductor, 10 plus 3.67 or a horizontal clearance of 13.67 feet: to this figure would be added, side or lateral displacement with conductor loading per rule 51 maximum sag as per rule 33.21 for span lengths in excess of 150 feet. I am informed that usual conservative Power transmission line design of this type for a 700' span would consider insulator string length plus maximum sag 15', lateral displacement at 30° from vertical or 7.5', a total so far of 10 + 3.67 + 7.5 = 21.17 (have also observed 45° angle employed which results in greater side displacement). To figure so obtained would be added rule 51 constant 0.31 to bring out 21.48 feet.

I would, however, surmise that angle of departures from vertical would be actually somewhat different at insulator string attachment point than at maximum sag point at center of span.

Now assume that ladder space requirement of rule 34.32 is accumulative 21.48 plus 6.0 = Total 27.48 feet. If the 75% factor rule 33.211 is operative in these circumstances, then total would reduce to 25.61 feet.

In other words, a building, tower, water tank, etc., of such height as to reach into vertical clearance zone, should not occur or be erected closer to Power Conductor than as above.

Power line described as 138 kv, three phase, 60 cycle, conductors 900 MCM-ACSR, 54/7, static wire 1/2" 7 strand copperweld, 0°F 1/2" ice 4# wind. Clearances figures at 60°F, no wind.

What I want to do is to specify that no building, tank, tower or other like structure may be built above a defined vertical height, within a properly described and designed zone of horizontal clearance, related to the static (60°F. no wind or other lateral force) position of nearest conductor with known factors the relation between property lines; tower supports; static conductor position between tower attachments and; the varying span lengths.

Answer - A very similar question was raised ••• in [a] letter of March 10, 1952. It is our opinion that the interpretation given in the letter of June 19, 1952, is entirely applicable in this case, except that the arithmetical values would have to be changed. The basic clearance is 10 ft. and the voltage increment is 3.67 ft., as stated in the correspondence. The span length increment would be 0.10 ft. for each ten feet of the increase over 150 feet, but limited to 75 percent of the maximum sag increase. We do not have available the latter value for a 900 MCM-ACSR conductor.

In the letter. . .

reference is made to lateral displacement of the conductors. This is not specifically covered by the present rule. However, as pointed out in the last paragraph of the above previous interpretation, the Rule is not entirely clear as to the term "minimum clearance." This rule is one which will be considered during the current revision of the N.E.S. Code.

Interpretation No. 78 Clearance requirements for conductors passing by or over buildings. Date of request is November 16, 1955.

Question - Rule 234 C.4 sets out clearance requirements for conductors passing by or over buildings. Table 4 under this Rule states these requirements in terms of horizontal and vertical clearances of supply conductors from buildings. In case a conductor is passing by a building and is also higher than the building, does the Rule intend to describe a clearance "area" as pictured in Sketch "A" on the attached sketch or Sketch "B"?

In case an attachment such as a balcony is on the building as in Sketch "C", how is the clearance requirement of the Code determined?

In case an attachment such as a guy wire connects to the building as in Sketch "D", how is the clearance requirement of the Code determined?

Answer - With respect to rule 234C4-NESC, it is our understanding that the values given in Table 4 apply where the span length does not exceed 150 feet, unless the conductors are guarded as specified in rule 234C4(b). If the span length exceeds 150 feet, increased clearances as specified in rule 234C4(a) (2) are required. Rule 234C4 is specifically intended to cover conductors passing by or over buildings. In view of this, the horizontal or vertical clearances apply but not both, in any one case. Therefore, it is our understanding, that conductors passing by or over a building, which comply with the specified vertical clearance requirements (measured either vertically or diagonally from the building roof) meet the intent of rule 234C4.

With reference to the specific questions raised, the above paragraph would indicate that the clearances prescribed by sketches "A" and "B" meet the intent of rule 234C. With respect to sketch "C", it seems clear that as long as the conductor is over the balcony, it must meet the vertical clearance requirements of rule 234C, but in addition it must also meet the horizontal clearance requirements of that rule with respect to the side of the building. If the conductor is located adjacent to, but not directly over the balcony, then the previous interpretation seems to indicate that swinging a clearance arc about the corner as in sketch "B" would be considered as meeting the intent of the rule. With respect to sketch "D", rule 233-A, which provides clearance requirements at wire crossings would be applicable.

Answer - It is the Interpretation Committee's opinion that, in the example cited . . . the second solution is the correct one. The voltage increment of clearance applies regardless of span length and regardless of the point in the span at which the crossing occurs. It should, therefore, be added after the sum of the basic clearances of Table 3 and the span length increment of Rule 233E1(a) and (b) has been determined.

It is pointed out that the basis of the span length increments and the limitations thereof are quite thoroughly covered in the Discussion of Part 2 of the National Electrical Safety Code.

It is expected that careful consideration will be given to Rules 232 and 233 in connection with the current revision which is being undertaken of Part 2 of the National Electrical Safety Code.

Interpretation No. 57 - Horizontal or vertical clearances from buildings. Date of request is Aug. 21, 1951.

Question - We would appreciate an interpretation of section 234-C, Table 4, page 58 of Handbook H32 of the National Bureau of Standards.

We have been using this manual as a guide for constructing our overhead lines in both urban and rural areas. As we interpret the above section, the intent is that we are to maintain EITHER eight-foot horizontal clearances from buildings with conductors of circuits in excess of 8,700 volts between conductors, OR have eight-foot vertical clearance from buildings with conductors of circuits in this voltage class.

Answer - With respect to rule 234C4-NESC, it is our understanding that the values given in Table 4 apply where the span length does not exceed 150 feet, unless the conductors are guarded as specified in rule 234C4(b). If the span length exceeds 150 feet, increased clearances as specified in rule 234C4(a)(2) are required. Rule 234C4 is specifically intended to cover conductors passing by or over buildings. In view of this, the horizontal or vertical clearances apply but not both, in any one case. Therefore, it is our understanding that conductors passing by or over a building, which comply with the specified vertical clearance requirements (measured either vertically or diagonally from the building roof) meet the intent of rule 234C4.

Interpretation No. 67 Clearances from buildings. Date of request is August 5, 1953.

Question - Table 4 of Section 234C of the National Electric Safety Code deals with clearance from buildings. The case in which I am interested involved voltage of 7,200 volts, and as I look at Table 4 above-mentioned it is indicated that there must both be a horizontal clearance of eight feet and a vertical clearance of 8 feet.

The high tension line in question was one which ran over some metal grain bins, and although they are over eight feet high from the top of the bins, which would indicate that the vertical clearance is in compliance, they are not, however, eight feet away from the side of the bins since they run directly over the bins. Diagram No. 1 indicates the relative position of the wires over the bins looking down onto the top of the bins from above the wires. Diagram No. 2 indicates my interpretation of the above mentioned section.

Would you be so kind as to advise me whether or not in your interpretation of the above section both horizontal clearance and vertical clearance are necessary under the circumstances above outlined or whether or not it is true that if there is sufficient vertical clearance there need not be any compliance with the horizontal clearance provision.

Perhaps a more simple way of putting the question would be in any given case of a high tension line is it necessary that there be both horizontal and vertical clearance as indicated by Table 4.

Answer - Based on the information given, it is the opinion of the Interpretations Committee that the supply line in question complies with the clearance requirements of Table 4 of Rule 234C4 of the National Electrical Safety Code. The intent of Table 4 is to require a vertical clearance of 8 feet or a horizontal clearance of 3 feet for lines passing by or over a building and operating at 300 to 8700 volts between conductors.

Interpretation No. 81 — Horizontal clearance of supply conductors (300V to 8.7kV)from buildings
Dates of request are
April 18 and August 24, 1956

Question -- ... Specifically, our inquiry relates whether the horizontal distance between the nearest conductor and the metal gutter on the roof may be measured either horizontally or diagonally and if either distance is in excess of the three-foot minimum provided by the Code that such an installation would not be in violation of Rule 234C4.

Answer-- With respect to the construction shown on the sketch accompanying the letter from the ... Public Utilities Commission, in view of previous interpretations, we cannot help but question whether it meets the requirements of the rule as it now stands.

Previous interpretations have indicated that a clearance arc may be used at the edge of a building. However, when the horizontal clearance requirement is three feet and the vertical clearance is eight feet, as in this case, the clearance arc is of three feet radius, with the center five feet above the corner of the building. For the construction shown to meet the rule, it would have to be interpreted that a clearance arc with three foot radius be described about the metal gutter. In an extreme case this could locate a conductor almost directly below the gutter at a distance of three feet, and three feet horizontally from the building wall. The prescribed vertical clearance is, of course, eight feet. Rule 234C4 bears the heading "Conductors Passing by or Over Buildings" and it may be argued, therefore, that it was never intended that conductors be permitted below building projections such as eaves, balconies, cornices, etc. This appears somewhat restrictive, however, and Figure 5 in the Discussion shows a cornice that appears almost overhanging the conductor adjacent to the building, yet the conductor adjacent to the building is shown 3 feet from the wall, not a vertical line dropped from the cornice.

We think it is only reasonable to assume that the eight foot vertical clearance requirement for conductors is to safeguard men walking or working on roofs, and it must be admitted that workmen will not walk on the underside of balconies, cornices, etc. Certainly different considerations would apply in such a situation, and perhaps some vertical clearance other than eight feet is in order. However, for the Interpretations Committee to decide what this should be would be legislation rather than interpretation. We believe, therefore, that a reasonable answer to this problem would be to apply the same clearance considerations both for conductors above and below balconies, eaves, and other building projections.

Interpretation No. 77 Clearance requirements for conductors passing by or over buildings. Date of request is November 15, 1955.

Question - We would like very much to get an interpretation of Rule 234C4(a), "Conductors passing by or over buildings, minimum clearances." As you will notice on voltages exceeding 15,000, the horizontal and vertical clearances from buildings is the same; however, no mention is made of the clearances in the quadrant between horizontal and vertical, and we would like to know if this rule should be intrepreted to mean that a minimum clearance should be maintained on an arc extended from the minimum vertical to the minimum horizontal position.

Also, we would like an interpretation of the attachments to any building referred to in this rule; that is, whether it intends to refer to balconies, platforms, and other surfaces on which a person might be expected to climb or stand, or whether or not this means to any attachment to the building, such as a metal smoke stack with the attached guy wires thereto, or some other object on which a person would not be expected to stand or climb.

Answer - With respect to rule 234C4-NESC, it is our understanding that the values given in Table 4 apply where the span length does not exceed 150 feet, unless the conductors are guarded as specified in Rule 234C4(b). If the span length exceeds 150 feet, increased clearances as specified in rule 234C4(a) (2) are required. Rule 234C4 is specifically intended to cover conductors passing by or over buildings. In view of this, the horizontal or vertical clearances apply but not both, in any one case. Therefore, it is our understanding, that conductors passing by or over a building, which compny with the specified vertical clearance requirements (measured either vertically or diagonally from the building roof) meet the intent of rule 234C4.

With respect to whether the rule applies to all parts of the building and its attachments, we are of the opinion that the answer to this question depends on whether or not the parts of the building, its attachments, etc., may be such that persons can work or support themselves directly thereon. A smokestack for example, would most likely require maintenance, and men would either be working directly from the stack or from scaffolding adjacent to it. Guys used to sustain the smokestack would not, of course, be similarly used or maintained. We are, therefore, of the opinion that the smokestack should be considered as part of the building, as far as rule 234-C is concerned, although there may be some question as to the wisdom of permitting conductors of any kind to be located directly over a smokestack because of the corrosion likely to be caused by the hot gases, etc. As far as the guys are concerned, we believe that rule 233-A, which provides the clearance requirements at wire crossings, would be applicable.

Interpretation No. 74 Horizontal and vertical clearances from a steel windmill tower. Date of request is August 1, 1955.

Question - We will appreciate your advising us of the required horizontal and vertical clearance of a 12.5/7.2 Kv three-phase multigrounded power line from a steel windmill tower.

Answer - While windmill towers are not specifically mentioned in the present clearance requirements, it is the opinion of the committee that the clearances specified for conductors passing by or over buildings could be applied in such cases. Rule 234 C4 (a) (1) Table 4 would require either a horizontal or a vertical clearance of 8 feet from a 12.5/7.2 Kv three-phase multigrounded power line, having span lengths not exceeding 150 feet. For such a line having span lengths exceeding 150 feet, the increased clearance specified in Rule 234 C4 (a) (2) would be required.

Interpretation No. 59 Clearance from buildings. Date of request is March 10, 1952.

Question - We would like to have the National Electrical Safety Code clarified regarding clearances required 110 kv line with span of 700 feet with suspension insulator string five feet long. Sag 18.2' for 350 M.C.M. copper conductor.

Rule 234, C4 (a) (1) for conductors passing by or over buildings, Table 4, gives basic clearance of supply conductors from buildings as 10 ft., plus 0.5 inch per kv in excess of 50 kv., and for spans exceeding 150 feet (Rule 234C (a) (2) and 232B (1) (a) (1) increase of .1 ft. for each 10 ft. of the excess of span length over 150 ft. The required clearance between the conductor and the building is, therefore, 10.0 plus 2.5 plus 5.5, or 18 ft. for 110 kv and 700 ft. span.

We believe, that as the basic clearance of 18 ft., covered by Rule 234, took into account the increased clearance required by excess in voltage and span, it should only be increased to take into account the length of the string of line insulators which may swing transversely thru an angle of 45° from vertical position. This then would only be 3.54 ft. for insulator string 5 ft. long, giving the distance between planes of building and point of attachment of string of insulators to the tower of 21.54 ft.

Answer - It is our opinion that Rules 234C4 (a) (1) and (2) as now written and applied to the case in question, viz. 110 kv line, 700 ft. span, and 350 MCM copper conductors, requires the following:

From Rule 234C4 (a) (1) - Table 4 - The clearance for 110 kv and 150 ft. span is 10 ft. plus 0.5"× 60 kv = 12.5 ft.

From Rule 234C4 (a) (2) - For greater than 150 ft. spans, increase the clearance in accordance with Rule 232 B 1 (a) using Item (3), "maximum sag increase." For the 350 MCM copper conductor, depending on whether it has 12 or 19 strands, the maximum sag increase, as given in the NESC Discussion Handbook H39, is 2.9 ft. or 3.1 ft. respectively. Also, depending on whether the loading district considered is medium or light, 85% or 75% of the maximum sag increase is used. Using average values, we obtain a value of about 2.5 ft., which is the maximum additional clearance to be added to the 12.5 ft. given above. Therefore, according to the Code, the minimum clearance to the building is of the order of 15 foot for the case considered.

As to the matter of how far the insulator string attachment on the supporting structure should be from the face of the building, that, in our opinion, is not covered by the Code, but is a matter of engineering judgment and adequate design. Since Rule 234C4 is not entirely clear as to the meaning of minimum clearance, that is, whether it is the clearance which is to be maintained under the maximum line loading conditions or the maximum wind loading which would cause the maximum conductor swing-out, or only the clearance to be maintained from the conductor to the building under normal conditions, there is some latitude in any approach to the question dealing with the distance from the face of the building to the insulator string attachment on the supporting structure.

Interpretation No. 89

a) Should clearance of conductors passing by buildings include swing
b) Insulator swing considerations
c) Sag increase; span 150 ft or 350 ft?
Dates of request were April 14 and 17, 1958

We have two questions concerning the National Electrical Safety Code which we would like your committee to answer. Our questions concern the attached sketch showing two H-frame suspension lines.

Question 1.

According to Rule 234, Clearances of Conductors of One Line From Other Conductors and Structures, 234 C 4 (a) (2), Minimum Clearances, Conductors Passing by or Over Buildings; no mention is made of whether the conductors should be considered at rest or whether the insulators should be considered to swing 45° for steel supports and 30° for wood as required by N.E.S.C. 235 A 3 (b).

Question 2.

According to Rule 235 A 2 (a) (1), Minimum Horizontal Separation Between Line Conductors of the Same or Different Circuits, and Rule 235 A 2 (b), Suspension Insulators Not Restrained From Movement; it is not clear whether both insulator strings should be considered to swing in toward each other or whether one string should swing 45°, while the other remained vertical as specified in Rule 235 A 2 (b).

We have attached a copy of our letter to you of April 14 in which we asked two questions concerning H-frame suspension lines. We would like to ask an additional question which is pertinent to the previous two.

Question 3.

According to Rule 234 A, Clearance From Conductors of Another Line, reference is made to Rule 233 which requires a sag increase factor for spans greater than 350 feet for light loading conditions, while Rule 234 C4 (a) (1) requires a sag increase factor for spans greater than 150 feet. When calculating clearances for wire crossing, the sag increase factor should be used for spans in excess of 350 feet at light loading conditions, but for wire clearance from conductors to another line or to buildings, should the sag increase factor be used in excess of 150 foot spans or 350 foot spans for light loading conditions?

Answer --

Question 1. - A similar question was asked in Interpretation Request No. 59, dated March 10, 1952, and also in Interpretation Request No. 66, dated May 14, 1953. You will note that it was indicated in replies to those requests that rule 234C4 does not mention this subject and is not clear on the exact meaning of the term "Minimum Requirements". Please also note that according to the reply to Interpretation No. 66, this matter was to be considered during the current revision of the Code.

Question 2. - It is our understanding that the unrestrained suspension insulators referred to in rule 235A2(b) would apply to one string that could swing transversely toward the supporting structure or toward another string assumed to be in a vertical position, as both strings would not be expected to swing toward each other under wind loading. The fundamental idea being to maintain the clearance values given in the preceding paragraphs of rule 235A.

Question 3. - When calculating the required clearance from a building as covered in rule 234C4, the sag increase factor should be used for spans greater than 150 feet as indicated in rule 234C4(a)(2), when the voltage between conductors exceeds 6700 volts.

234C4a (2) and b See 234C, IR 47
234D See 230C, IR 85

235A Table 9

Interpretation No. 37 High voltage transmissions lines; excessive clearance requirements. Date of request is June 8, 1948.

Question - The major transmission system • • • is operating at 230 kv, with a considerable number of 115 and 69 kv lines also. It has been our past practice to adhere strictly to our interpretation of the National Bureau of Standards safety code. The experience • • • during recent years indicates that in some respects limitations imposed by the code may be somewhat more conservative than is necessary and, thereby, requires somewhat higher costs of construction than we believe is justifiable. We are, therefore, interested in obtaining your interpretation of some paragraphs of these standards with the view to their possible revision, as well as to more economical construction of high voltage transmission facilities.

Paragraph 235 A, Table 9, lists minimum clearances from line conductors to supports for the transmission of power at all voltages. In this table clearances for all higher voltages are given in terms of the excess above 8,700 volts, thus establishing a linear relation between voltage and clearances for all the higher transmission voltages. We are inclined to the opinion that this linear relation establishes somewhat greater clearances at the higher voltages than the minimum necessary for safety purposes. Specifically, we find a factor of .25 inches of additional clearance for each thousand volts in excess of 8,700 volts of clearance to surfaces of crossarms for all higher voltages. This factor together with the insulator swing on steel structures specified in Paragraph 235 A, 3 (b), requires us to use a length of insulator string somewhat in excess of the minimum we consider necessary for good engineering practice and for safety to personnel.

Answer - The question of changing the code requirements is not one of interpretation and the Bureau, which serves only as sponsor, has no authority to make code changes; that function rests solely with the sectional committee of 19 men representing the principal interests concerned.

235A2a(1)(2) See 235A3 Table 9, IR 15
235A2a(1), b See 234C4a(2), IR 89

Interpretation No. 15 Climbing space minimum clearance. Date of request is November 13, 1944.

Question - We have had discussions with respect to certain paragraphs of the NESC regarding minimum clearances required on electric lines which are to be worked when energized, or climbed through when energized.

Sketch 1 attached, shows two proposals for operating a 7620/13200 Y volt line. Normally, this type of line is built with the neutral and secondary wires below the 13200 volt arm as shown. At other times when ground clearance is at a premium and no secondary is involved, the neutral wire has been placed in the alternate position shown. At the point the crossarm is mounted, the pole has a diameter of 10" more or less. Generally the static ground wire is suspended clear of the pole to a point 5' below the lower high-voltage arm and then runs down the pole in the quadrant adjacent to the crossarm. Our question is: What is the recommended minimum distance "X" or the distance from the center of the crossarm to the conductor nearest the pole?

We might add that the reason for the 14' spacing between the 33 kv circuit and the 13.2 kv circuit is to provide space for a future 33 kv arm for a second circuit.

We would also like you to give us a basis for determining the vertical separation required between the phase wires and common neutral wire of 13.2 kv circuits. We notice in the REA Standards that when they use crossarms for this type of construction the neutral wire is spaced 2' 9" below the center of the crossarm while the NESC rules appear to call for a minimum separation of 40". Again on vertical angle construction, the vertical separation is reduced to 2' 6" between phases and between phase and neutral. Since this phase separation is a material item in determining pole heights and hence cost, we would appreciate your interpretation of the rules regarding minimum vertical separations in the cases mentioned, bearing in mind, that we work our circuits when energized.

Sketch 2 attached, shows a case which is coming more into prominence in our designs. The crossarm shown has been used extensively for 33 kv flat construction without a static wire. In this case dimension "Y" is 24" as it is not necessary that men go above the arm. Our question is: What is the minimum safe distance for "Y" when it is necessary for men to climb above the crossarm to work on the static wire or for other purposes? Pole diameter at the arm level may be assumed to be 8" more or less. Span lengths involved are about 300'. Generally the static ground wire runs down the pole in the quadrant adjacent to the crossarm except that on recent work it is suspended clear of the pole to a point several feet below the crossarm.

Answer - Under the conditions shown in Sketch No. 1, attached to ... letter of November 13 and assuming that an adequate climbing space is already provided on the side of the pole having the single insulator on the crossarm carrying the 13.2 kv circuit, dimension "x" should not be less than 4 1/8 in. + 1/2 the diameter of the pole, as required by N.E.S.C. Rule 235A3, Table 9.

The situation described in . . . second request involves a clearance between a conductor on a crossarm and the top conductor on a vertical rack (or on the pole) and is covered by paragraph 2, of Rule 238-C (page 77). This rule refers to Rule 235-A, 2, (a), (1) and (2), pages 60-63.

The required vertical separation at the pole then becomes a function of the conductor separation as determined by Rule 235-A 2, (a), (1) and (2). Rule 235-A, (2), (a) (2), applies only in the case of grades B or C construction. Without knowing the grade of construction and the conductor size and sags, no value for the separation can be given.

As regards dimension "Y" on Sketch No. 2, the N.E.S. Code requires a minimum separation of 9.1 inches from the surface of the pole (3 in. + 6.1 in. voltage increment - Table 9) for the 33,000 volt circuit. The distance from the center of the pole, therefore, would be 9.1 in. + 1/2 the diameter of the pole. In this case it is also assumed, of course, that adequate climbing space extending the required distance both above and below the crossarm is already provided on the other side of the pole.

Interpretation No. 49 Classification of Jumper, Wires at Poles. Date of Request is May 10, 1950

Question - Would the Table No. 9 of Clearance shown on page 64 of "Safety Rules for the Installation and Maintenance of Electric Supply and Communication Lines", National Bureau of Standards Handbook H32, apply to this jumper or primary tap? Also, would this jumper or primary tap be called a "line conductor"? If not, what provision, if any, contained in the National Electrical Safety Code would govern if Table No. 9 were not applicable?

Answer - The clearances given in Table 9 of rule 235A3 apply to the connecting conductor between the two dead-end insulators, as shown in the sketches. A 3 inch clearance is required between the conductor (0-8700 volt class) and the pole surface, except that an effectively grounded neutral conductor associated with a circuit operating at 0-15 kv between conductors may be attached directly to the pole surface. (See footnote 7.)

The connecting conductor mentioned above, would be considered a "line conductor" under the intent of that term as used in Table 9 of rule 235A3 - NESC.

Interpretation No. 80

Clearance between 8.7-15kV line and grounded neutral or secondary conductors
Date of request is August 14, 1956

Question --

This request for interpretation refers to Rule 237B-3. Our impression of this rule is that a grounded neutral or secondary conductor must be 48" below the crossarm attachment to the pole for 8700 to 15000 volt lines, according to Table 11. We understand that this practice is not universal. If the correct minimum is two feet, we would like to reduce this dimension to 30 inches in order to reduce pole height and also to make it the same as for voltages below 8700 volts.

In order to clarify this question, and perhaps furnish information which you may need to answer it correctly, I am enclosing several of our construction drawings. Also, it is our practice to maintain 12470 volt and 13800 volt lines using Hot-Line tools, and not rubber gloves. The 48" separation is now being provided only in new construction and pole rebuilding or replacement. Lines converted from lower voltages to 12470 volts are left at 30 inches until rebuilding takes place. We understand that this is permitted under Rule 238.

Answer --

The basic question seems to be: what separation is required between a grounded neutral or secondary and a crossarm carrying 8.7 to 15kV conductors? Rule 238A (Table 11) specifies the separation between crossarmsin this situation as 4 feet; Rule 238B permits 40 inch separation between conductors where 4 foot separation between crossarms is required. Rule 238D provides that the separation between conductors not on crossarms shall meet the separation requirements of conductors on crossarms. The configuration actually shown involves conductors on crossarms and conductors not on crossarms.

In the particular case of a 12.5 kv multigrounded neutral system, it should be noted that a single phase tap (7.2 kv to ground) from such a system would only require two feet between crossarmsor 16 inches between conductors, since definition 77 indicates the voltage of an effectively grounded circuit connected to a higher voltage circuit is not determined by the higher voltage circuit.

Also, it might be pointed out that for the particular configuration shown diagonal clearance from phase wire to neutral need be only 40 inches. The attached sketches may be of some assistance in clarify ing the foregoing points.

If the construction and operating practice in which you are interested makes compliance with the clearance required in Rule 237B-3 and Table 11 in Rule 238A unduly expensive, consideration should be given to Rule 201A which provides for a modification or waiver by the administrative authority having jurisdiction. This procedure has been resorted to in a few instances where the coderequirements resulted in construction costs that were not justified by the safety obtained. Your problem should be taken up with the regulatory authority in the State in which the construction is contemplated.

238 Definition 45

Interpretation No. 64 a) Definition: Communication Lines b) Classification of CATV cable as a communication circuit. Date of request is June 15, 1953.

Question - Our municipal electric distribution system and the . . . Telephone and Telegraph Co., now operating under a joint use of poles agreement, have been requested by local citizens to permit the attachment of a coaxial cable, supported by 3/16" messenger, and necessary T.V. signal boosters for the purpose of furnishing Television Antenna Service to various subscribers.

A question has been raised as to the classification of the coaxial cable and associated boosters etc.- whether or not it should be classed as a communication circuit or otherwise.

Answer - It is the Interpretation Committee's opinion that if the voltage and power of the coaxial cable circuit used for television antenna service do not exceed the limitations set forth in definition 45 for Communication Lines in the National Electrical Safety Code, then the circuit would be classed as a communication line and would be subject to the spacings indicated for such lines.

With respect to the second question as to allowing the coaxial cable to be installed at standard supply circuit secondary spacing under the supply circuit secondary position, Rule 238 requires a 40 inch separation between communication conductors and supply conductors with potentials of 8700 volts or less between conductors and we believe the separation between TV distribution facilities and supply conductors of 8700 volts or less between conductors should, in general, be a minimum of 40 inches.

Interpretation No. 63 Vertical separation at supports. Date of request is April 10, 1953.

Question - In considering the matter of such increased line voltage, a point of difference lies in the matter of required separation or clearance on pole lines between the phase conductors on the upper level and the multi-grounded neutral or secondary conductors at a lower level. A nominal 13,800 volt 3 phase 4 wire circuit employing a multi-grounded common neutral conductor will have 13,800 volts between its phase conductors and 7960 volts between each of these phase conductors and the neutral. The National Electric Safety Code (Fifth Revision) in Table 11, Section 238A, specifying "voltage between conductors," requires a vertical separation of 4 feet between crossarms carrying supply conductors in the 8700 to 15,000 volt class at the upper level and supply conductors of 0 to 750 volts at the lower level. The table also specifies a vertical separation of 2 feet between crossarms carrying supply conductors in the 750 to 8700 volt class at the upper level and supply conductors of 0 to 750 volts at the lower level. Section 238B of the Code permits reduction of the 4-foot and 2-foot crossarm separation to allow the conductors to have a minimum vertical separation of 40 inches and 16 inches, respectively, if the conductors on a crossarm are of the same voltage classification.

Since a 13,800 volt 3 phase 4 wire multi-grounded system will have 13,800 volts between phases and 7960 volts between any phase conductor and the grounded neutral at the lower level, while a single phase circuit on this system will have one phase conductor at the upper level and a grounded neutral at the lower level, with a voltage between these conductors of 7960 volts, it appears that the vertical separation requirements for the 3 phase and single phase construction are inconsistent as the voltage is exactly the same between conductors at the two levels on either single or 3 phase circuits. While there appears to be no specific advantage in the additional 2 feet of separation required for 3 phase circuits, there is a distinct disadvantage in that taller poles are necessary, resulting in a more expensive type of construction.

A second point involves the clearance between communication equipment and transformers with effectively grounded tanks. At the present time this Commission's rules specify that for such conditions clearance shall be a minimum of 40 inches. Since, however, the transformer tank and the telephone equipment would both be suitably connected to the common multi-grounded neutral, it appears to be unnecessary to require more than a working clearance, and, therefore, it is suggested that this clearance be reduced to 30 inches. It is the Commission's opinion that safety would not be sacrificed with reduced clearance which would allow lowering the transformers to maintain adequate separation between the transformer tank and the phase conductors without having to use taller and more expensive poles.

It is our understanding that the revisions suggested are consistent with suggestions made in Provisional Report #32 of the Joint Subcommittee on Development and Research of the Edison Electric Institute and the Bell Telephone System. It will be appreciated if you will give consideration to these matters and advise us if the reduced clearance for 13,800 volt multi-grounded distribution feeders may be permitted without sacrificing safety and, at the same time, not be in violation of the National Electric Safety Code.

Answer - With respect to the question of permitting the same clearance for 3 phase grounded wye system, conductors with 7960 volts phase to ground as for single phase system conductors with the same voltage to ground, Rules 238A and 238B seem clear on this matter and in their present wording make no provision for such a condition.

With respect to the second question as to whether the clearance between the lowest point of grounded transformer tanks and the highest communication conductor or attachment may be reduced from 40 inches to 30 inches, Rule 238E as it now stands clearly requires 40 inches separation for such installation.

Paragraph 201A points out that the rules are intended to be modified or waived by the proper administrative authority whenever they involve expense not justified by the protection secured or for other reasons are impracticable. If the Connecticut Commission feels this to be the case, they may wish to consider a field trial of the reduced clearances. The question of whether safety would be sacrificed by the suggested reductions in clearance can be best answered by experience, and a field trial of these reduced clearances would undoubtedly be helpful in judging the desirability of such a practice.

Interpretation No. 84

a) Clearance between power and signal H43 conductors on same crossarm
b) Clearance between signal conductors and multiple light system circuit
c) clearance of vertical supply conductors from communication crossarm
d) dead ending or guying of communication messenger without insulators.
e) spacing between crossarms

Date of request is November 7, 1956

Question --

Paragraph 3 of Section 238-E. It does state in Par. 3, "Span wires or brackets for lamps or trolley contact conductors shall have at least the vertical separations from communication equipment set forth below:

But the next statement reads "From open communication conductors on crossarms". It goes on to say "bracket above crossarm 20 inches" and "bracket below crossarm 2 feet". An exception is if the crossing takes place 40 inches or more from the pole surface. Now if my communication conductor, supported on a crossarm is less than 40 inches from the pole surface, running parallel with a street and on the same pole is a lamp bracket, attached at right angles to my conductor, should that bracket be attached at least 20 inches above my crossarm or 2 feet below my crossarm? Another point does it matter what the voltage of that lamp attached to the lamp bracket is?

Paragraph 2 of Section 239-F. I realize, under some conditions supply conductors can be directly attached to the pole and the point I didn't state very clearly was on construction allowing such conductors to be suspended from supply crossarm directly to a lamp bracket (sub-paragraph d of paragraph 2). It allows such leads to be dropped directly to the lamp bracket if at least 40 inches from the pole ~~space~~ surface where it passes thru the communication space. It also states such leads must be at least 12 inches beyond the end of any communication crossarm. The information I seek is, if I run my communication open wire on a crossarm 48 inches from the pole surface is there any regulation or exception to the rule quoted that will allow such lamp leads, attached in the manner described, to pass my conductor within twelve inches or to be dropped from the supply crossarm to the bracket less then 40 inches from the pole surface. Because of tree conditions there are places where I have to run my wire on a six pin crossarm and for the power company to drop their leads 12 inches beyond my wire they would be beyond the average length lamp bracket and so because of this I find some of their leads very close to my communication conductor, some leads being outside the communication conductor and some being dropped inside, between my conductor and the pole surface. As these are high voltage series lights for the most part there is real danger of such leads fouling up my circuit but before I order the power company to change this construction I must make sure I understand the regulation correctly.

Answer:

With respect to the first question regarding vertical separation between span wires or brackets for lamps and communication crossarms, it seems to us that the answer to this question is not directly spelled out in the code. The separations stated in Rule 238-E3 are for span wires or brackets for lamps and open communication conductors on crossarms. The separations stated in that rule apply under the conditions stated in requestor's letter but represent the physical distance between the communications conductors and the span wires or lamp brackets in question.

With respect to the second question regarding voltage of the street light circuit, we find no mention of lamp circuit voltage in the rules governing separations and in our opinion, it must be inferred that these separations apply regardless of the lamp circuit voltage.

With respect to the third question regarding vertical lamp conductors passing through communications space (Rule 239-F), when suspended from a crossarm and run directly to the street light fixture the vertical run must be at least 40 inches from the surface of the pole where it passes through the communications space. In addition it must be 12 inches beyond the end of the communications crossarm. It should not be inferred that meeting either requirement by itself necessarily satisfies the rule. For example, a 10 foot crossarm may be used and the end of such a crossarm will usually be about 4 feet 8 inches from the surface of the pole. In order for the vertical run to be 12 inches beyond the end of the crossarm, it would have to be 5 feet 8 inches from the surface of the pole at this point. If adequate separation cannot be obtained in the situation described by the requestor because the street light mast arm is too short, it seems to us that some other kind of construction should be employed. Some alternatives are indicated in Rule 289-F2 (a), (b) and (c).

238B and 238E See also 238A Table 11, IR 63

Interpretation No. 52 Clearance for communications conductors used exclusively in the operation of supply lines. Date of request is August 30, 1950.

Question - In Rule 238, B, a differentiation is made between general communications conductors and those used exclusively in the operation of supply lines. This rule permits a reduction in separation between supply lines and communication conductors used in the operation of supply lines. Rule 238, E, however, does not make this differentiation and requires the full forty inches separation between all communication conductors and certain noncurrent-carrying metals parts of supply equipment.

In the specific case involved a telephone circuit for use in the operation of the supply system is to be built below a multigrounded neutral. Rule 238, B, for conductors on crossarms or Rule 238, D, for conductors not on crossarms would require sixteen inches separation between the multigrounded neutral conductor and the telephone conductor. Rule 238, E, requires forty inches separation between the telephone conductor and the metal bracket supporting the multigrounded neutral conductor.

Answer - We believe that the confusion in this case results from the fact that the distinction between "Communication Conductors, General" and "Communication Conductors Used in the Operation of Supply Lines" as indicated in Table 11 and reflected in Rule 238B is not also reflected in Rule 238E.

It is our thought that the requirements of the Code would be met if the separations comply with the minimum values specified in Rule 238B. We would point out in this connection, however, that Rule 238B-3 requires that where conductors are strung to different sags, the separations at the pole shall be so adjusted that the minimum spacings in the span shall not be reduced more than 25 percent from that required at the supports. In long span construction where telephone conductors are strung to less sag than the supply conductors, this latter specification may require greater separation between supply and telephone conductors at the support than those specified in Rule 238B-1.

238B See also 238A Table 11, IR 63

We believe that a fair interpretation of the required separations between supply conductors and communication conductors used in the operation of supply lines would be as follows:

Voltage Classification of Supply Conductor	Minimum Separation Between Supply and Communication Conductors	
	At Support	In Span
0 - 8700 volts *	16 inches	12 inches
8700 - 15000 volts	40 inches	30 inches
Over 15000 volts	60 inches	45 inches

* These separations will generally apply for multi-grounded neutral conductors located below conductors having voltage classification 0-15000 volts (see Rule 230-D).

In rule 238-E3, there is an exception for lamp brackets which waives the separations specified in this rule, provided such brackets are effectively grounded. We can see no difference between a metal lamp bracket and a metal bracket supporting a multigrounded neutral conductor, if both brackets are effectively grounded.

Interpretation No. 82

a) Clearance between conductors on adjacent crossarms
b) Service brackets at end of crossarms
c) Clearance to buildings

Question --

Date of request is September 15, 1956

In order that a clear understanding of the rules as set forth in the N.E.S.C. will be available to committeemen working on revision of the State of Washington Electrical Construction Rules, I would appreciate interpretations from the National Committee on the following matters.

1. Wording of the title line of Rule 238.B.1.
"Where Conductors on the Crossarm are of the same Voltage Classification." (Underline of word "Crossarm ours.) Some of our committee read this as a typographical error and think it should read, "Crossarms .

It is the committee's intent to allow the reductions as set forth in this rule only when the conductors on adjacent crossarms are of the same voltage classification. As the rule reads, and as interpretated by some, there is possibility of conflict with the committees intent such as in case as; " Conductors of the same voltage classification of over 750 volts carried on one crossarm and conductors of less than 750 volts carried on an adjacent crossarm." The reduction in conductor spacing can be requested on the wording of the title line because the conductors on any one crossarm is the same voltage classification.

2. Your interpretation of the preceeding rule will affect the interpretation of Rule. 238. D and a word of clarification on this rule will be appreciated, particularly as it affects conductors attached to Service Brackets attached to the ends of crossarms, These brackets carry the top wire approximently six inches above the line conductors attached to the pins and insulators.

3. Rule 234.C. 3 & 4. Clearances from Buildings.
We would appreciate the reasoning behind the limitations of 300 volts in these rules as the generaly accepted practice is to treat service wires of 150 volts to ground as dangerous to the public and maintain at least three foot horizontal and eight foot vertical clearance from points of building accessable to the public.

Answer --

Rule 238B1

The title line correctly expresses the intent of the rule a printed "Where Conductors On The Crossarm Are Of The Same Voltage Classification". The intent in using the word crossarm (in singular form) was to fix the situation where each arm in any series of adjacent arms carried only conductors within a given voltage classification. The purpose of permitting the reductions, indicated in the three line table, was to provide for the possibility of one or more of the conductors dead ending on a strain insulator while other line conductors or tape might be supported on pin insulators. For over 30 years, this has been the rule, expressed in the same manner, in the Safety Code. For longer than this time it has been a universally accepted line practice to follow the procedure. This long experience with construction conforming to this rule has demonstrated that it is a safe practice to continue.

To limit the reductions to situations where the conductors on all crossarms involved are of the same voltage classification would be contrary to the public interest by requiring additional vertical pole space in situations where both pin type and strain type insulator attachments were required on a single crossarm. It would seem that such a modification of the intent of the present rule has proved unnecessary by our present long safe history of experience.

Rule 236D

The requirements for vertical separation between horizontal crossarms (238A) and vertical separation between line conductors on horizontal crossarms (238B) are fixed to provide vertical clearances on poles and between line conductors in spans. These vertical separation requirements are adequate in the normal situation with, for example, primary conductors on a top line arm and secondary conductors on the next lower arm. These pole and span clearances have satisfactorily withstood the test over long years of safe operating experiences.

The matter of service brackets attached to the ends of crossarms is a somewhat different situation. For the last 25 or 30 years the Utilities have demonstrated the desirability of a vertical arrangement for open wire service drops. Excepting the use of "Service Drop Cable," large numbers of utilities have adopted the vertical arrangement of open wire service drops. Mostly such vertical service drops have been attached to arms using the vertical brackets mentioned by Mr. .... The general practice has been to put such service brackets at the ends of the line arms normally spaced on the pole.

The vertical clearances in this instance becomes a different matter. Services radiate from a pole at generally approaching a right angle to the line conductors. Practically all service brackets on poles are considerably higher than the point of service attachment on the customers building. Services thus, slope down from their point of attachment on the pole. With this arrangement there is not the full span of vertical proximity such as exists between secondary conductors and primary conductors in the normal line span. In this situation it would appear to be a proper interpretation of the intent of Rule 238B1 to justify the use of service brackets as described ....

General experiences with this construction seems to bear out the validity of this interpretation of intent.

Rule 234C

The limitation of 300v. in these rules was fixed to defend Electric Utility customers from the expense and unsightlyness of large and unwieldy service attachments that would be necessary to maintain a clearance of 3 ft. between the customer's building and the house end of the live conductors of a service drop. No material change has been found necessary in these rules since before 1926. Again, safe operating experiences definitely justifies practices in accordance with the rules as they now stand.

Our answer to your Question No. 1 is:

This part of the Code does not specify the minimum "Clearance From Live Parts" for voltages above 70 KV other than the general requirements that make it obligatory to observe safe clearances under conditions that may exist, kind of equipment used, and working methods employed.

In answer to Questions 2 and 3. The Code is not specific on these points. Minimum Clearance from Live Parts for these conditions and climatic conditions, and type of equipment available for maintenance work.

These are not specific answers but you have asked questions that cannot be answered as specifically as for lower voltage conditions.

238B3a See 234B2, IR 69
238C See 235A3 Table 9, IR 15
238D&E See 238B IR 52
238E See 238A Table 11, IR 52
239F
239G2&3 See 220B3, IR 18
242 Table 14

Interpretation No. 65 — Interpretation of footnote "c" appearing in Table 14, allowing Grade C construction. Date of request is June 14, 1953.

Question - May we have your interpretation of a footnote appearing in Table 14 (facing page 156 or H-32-92) of the National Electrical Safety Code entitled "Grades of Construction for Supply Conductors alone at Crossings, at Conflicts or on same Poles with other Conductors." We have reference to footnote "c" as applied to grade B construction required for open conductors in urban districts at voltages exceeding 8700, elsewhere than on fence right-of-ways.

Footnote "c" reads: "If circumstances within a given area warrant it, supply conductors need only meet the requirements of grade C construction ..." We would like to know just exactly what is meant by the phrase "If circumstances within a given area warrant it".

We also wish to know whether footnote "c" permitting grade C construction also applies to the grade of construction for poles or towers as prescribed under Section 243-A, page 159.

Answer - The phrase "If circumstances within a given area warrant it" is intended to cover a situation or condition where a number of years of experience indicates that a locality may have weather conditions (ice or wind or a combination of both) that are less than those assumed for the loading district in which this locality or area is located. During the several years of study that was given to the analysis of weather data on which the present NESC loading requirements are based, it was demonstrated, that such areas do exist. Where overhead supply lines are built in such areas, generally relatively small in size, it was thought that the grade of construction for supply conductors might be reduced from Grade B to Grade C, provided the conditions mentioned in the latter part of Note c, with regard to construction, operation and maintenance are met.

The reasoning back of this is not different, from that on which Rule 201A is based. The latter rule is general and requires approval of the administrative authority having jurisdiction. Note c is specific in that it permits supply conductors to be reduced under certain conditions from Grade B to Grade C. One idea not expressed in Note c but which, in our opinion, is implied throughout the code, is that this change in the requirements of Table 14, should be agreeable to all parties concerned, including any regulatory authority that may have jurisdiction.

With respect to the second question as to whether the provisions of footnote c of Table 14 apply to poles and towers, Table 14 is a part of Rule 242 which expressly covers the grade of construction for supply conductors only. The grade of construction for supporting structures is specified in Rule 243. However, since Rule 243 provides, with some exceptions, that the grade of construction of the supporting structure shall be that of the highest grade of conductors carried, footnote c of Table 14 would also apply to supporting structures as indicated in Rule 243.

Interpretation No. 24 - Change of districting from heavy to medium loading. Date of request is May 26, 1945.

Question - In accordance with paragraph 250 of Section 23, Loading for Grades B, C, and D, of National Bureau of Standards Handbook H32, we wish to apply . . .

for a change of districting from heavy to medium loading for a part of the rural distribution system owned by the Cooperative. Detailed districting is not carried out by state administrative authorities in Texas, and we therefore address this application to you.

Answer - Change in the loading map would certainly be a change and not an interpretation.

Interpretation No. 14 - a) Transverse wind loading
b) Definition of "grades" of construction. Date of request is November 16, 1944.

Question - It seems to me that in Rule 251, the transverse wind pressure intensity was reduced to 4 instead of 8 lbs. per sq. ft. in the Heavy Loading District to allow lighter poles to be used. In applying this 4 lb. wind to the conductors however, it is realized that they can withstand a heavier loading and so a constant is added to the resultant of the 4 lb. per sq. ft. wind and the total weight, which brings the scalar value of the resultant approximately equal to what it would be if an 8 lb. per sq. ft. wind had been used. This is confusing because if an 8 lb. wind had been used, the angle that the plane of the resultant makes with the vertical is not the same as that with a 4 lb. wind, while, by adding the constant, the resultant force is made that of an 8 lb. wind, but the angle is that due to a 4 lb. wind. Would it not be more simple and less confusing to definitely use an 8 lb. wind intensity when considering conductors and static wires, and a 4 lb. wind when considering the forces acting on the pole, per se, . due to wind, leaving out all constants?

In Rule 252, B. 6, a reduction in transverse wind loading on conductors at angles is specified to account for the reduced wind pressure on the wires resulting from the angularity of the application of the wind to the wires. The reduction would be cosine of half the angle of departure. But in Rule 261, multipliers for various types of construction are used which offset this reduction; specifically the multiplier 1.78 in Rule 261, C.5,b.

Frequent mention is made of grade B and grade C construction but I do not find any definite, clear-cut specification of just what these grades are. There are rules which state what should be done in one grade or the other, but what are the "grades".

Answer - The answers to most of [the] questions are to be found in the discussion of Rules 250, 251, 252, and 261 in Handbook H39, as well as in the general discussion of Section 26, Strength Requirements.

From this discussion it can be seen that the reduction in transverse wind pressure from 8 pounds to 4 pounds per square foot of ice covered conductors was not made for the purpose of permitting lighter poles to be used. The purpose in changing the assumed climatic loadings was to express the loadings and the strength requirements on a more reasonable engineering basis. Except in the case of untreated poles at "isolated" grade B crossings for transverse strength, and untreated poles in grade C (transverse), pole strengths have not been reduced for the heavy and medium loading districts. In the light loading district no decreases in the transverse strength requirements for poles have been made, although substantial increases were made over those required for poles by the fourth edition of the Code. The required strength of poles in any particular situation is determined not only by the loading but by the allowable percentages of ultimate strength, as specified in the rules for strength requirements.

Rules 252B6 and 261C5(b) are discussed at considerable length in Handbook H-39 wherein a sample computation explains the derivation of the multiplying factors used in the calculation of Strength of Construction at angles in a line.

Replying to [requester's] final statement, the grade of construction to which a line shall be built depends upon the situation involved, as described in the column headings of Tables 14 and 15. A given grade of construction is determined by specifying the minimum requirements for that grade as is done in Section 26 of the Code. "Grades" are only a convenient means for indicating the requirements for the various situations covered by the Code.

Interpretation No. 42

Deflection data on tubular steel poles.
Date of request is June 30, 1949.

Question - Rule 260 of the National Electrical Safety Code states that the deflection of poles or towers shall not be taken into account in transmission line computations unless the method is approved by the public utility commission concerned.

Recently a manufacturer of steel poles, the Manufacturing Company of notified us that they had made extensive studies of the deflection of their tubular steel poles and had developed formulae which could be used in computing the effect of such deflections on transmission line sags, particularly at dead ends. They offered to show the test setup and explain their methods of calculation to a "proper committee."

Answer - Since the only active subcommittee at this time is the Subcommittee on Interpretations, the matter was put up to them. The consensus of this group was that the matter should be referred to a special subcommittee made up primarily from the membership of the Technical Committee on Part 2.

Interpretation No. 17 - Allowable stress in members of steel structure. Date of request is November 11, 1944.

Question - Table 16 of Handbook H32 specifies certain minimum overload capacity factors of completed structures based on the yield point of steel. Will you kindly advise what unit stresses should be used for steel having a yield point of 33,000 lb. in order to provide the strength specified in Table 16; that is, what I desire to obtain are the design unit stresses for tension, compression (including compression formula), shear values and bearing values for bolts and rivets. Such values were included under Table 16 in the Fourth Edition of the Code but are not included in the Fifth Edition.

Answer - The following interpretation is based on the considerations which led up to the adoption of the overload capacity factor method of specifying the strength of steel structures, during the revision of the National Electrical Safety Code.

In the absence of tests of a particular tower design the following values for the yield point of steel members may be used for purposes of design.

Tension--------------------33,000 lb per sq in.
Compression----------------33,000 minus 130 L/R lb per sq in.
Shear----------------------30,000 lb per sq in.
Bearing--------------------60,000 lb per sq in.

Towers should be designed so that, with an overload capacity factor of unity, the above values of stress will not be exceeded in any member. Where an overload capacity factor other than unity is specified either of two methods may be followed:

1. The assumed loads may be multiplied by the overload capacity factor and the above stresses used.

2. The assumed loads may be applied and the above stresses divided by the overload capacity factor.

Interpretation No. 46 - Thickness of metal used for metal poles. Date of request is October 31, 1949.

Question - We would like an interpretation regarding steel or metal poles for supporting constant current circuits for street lighting circuits:

The industry has adopted over many years for this service, 11 gauge (.119") thick and lighter for tangent pole construction. Does Rule 261 in Handbook H43 conflict with this use?

Answer - In the formulation of Rule 261-A-3(e) all of the considerations appear to have been based on fabricated steel structures such as towers, expanded steel poles, etc. It might well be said that this paragraph was not intended to apply to the tubular steel pole.

However, the requirements covering strength and protective covering do apply to the poles in question as they apply to all metal structures.

261A3e See 260, IR 46
261A4a See also 261C5a, IR 26b

Interpretation No. 26a a) Vertical and transverse loadings;
Date of request is December 15, 1953.

Question - 1. Rule 261.A.4.(a) Wood Poles:
This rule states that "Wood poles shall withstand the transverse and vertical loads assumed in rule 252.A and B, 1 to 4, inclusive.

Does this mean that the calculations of the class of poles required for a given tangent section of line must be based on:

a. Using the resultant of the transverse and the vertical conductor loads and assuming that this resultant load acts at right angles to the axis of the pole? or

b. Using only the transverse conductor loads acting at right angles to the axis of the pole?

Answer - As worded, Rule 261A4(a) requires that the allowable stress given in Table 20 applies as regards the resultant of the transverse and vertical stresses. The transverse load is almost always greatly in excess of the vertical load and the vector sum of the two stresses acting at right angles to each other will usually not be much in excess of the transverse stress. As a practical matter, therefore, the intent of the code requirements will usually be met if the vertical and transverse stresses are considered separately, the transverse load, of course, acting at right angles to the direction of the line and the vertical load acting in the direction of the axis of the pole. In most instances the vertical load can be neglected, but where the vertical load is very heavy, the resultant stress should, of course, be employed.

Interpretation No. 68 Does the word "spliced" also refer to pole top extensions? Date of request is October 1, 1953.

Question - The question concerns the title and the first Paragraph of 26.A.4(G) on Page 176 of Handbook H30. The question is does the word "spliced" also refer to pole top extensions added to a pole in order to provide for additional line circuit positions.

Answer - It is the Interpretation Committee's opinion that Rule 261A4(g) refers solely to poles that are "spliced" or "stubbed" and does not apply to the so-called "pole top extension or fixture." Any question involving the use of such pole top extensions or fixtures must be determined on the basis of the conductors attached to or supported by such extensions, the loading on these conductors, and the strength required to meet the assumed loadings with appropriate safety factors.

Interpretation No. 26b b) Strength requirements for dead-end and transverse guys.

2. Rule 261.C.5.(a) Strength of Guys:

Please explain why the maximum allowable percentage of the ultimate strength of guys (Grade B, for example) is 66.67% for deadend guys and only 37.50% for transverse guys.

Since transverse (wind) loads are of the transient nature and dead end loads are of a permanent nature (so far as the continuous stressing of the guys are concerned), why should the factor of safety be greater for transverse than it is for dead end guys?

The question you have raised regarding Rule 261C5(a) is not one of interpretation, as the intent of the code is entirely clear. The Interpretation Committee feels that questions concerning the reasons for establishing specific values in the code is not within their scope. The Interpretation Committee, therefore, offers no reply to this question.

Interpretation No. 51 - Double crossarm over railroad tracks in suspension insulator type of construction. Date of request is August 25, 1950.

Question - Is it the intent of Rule 261D5 to require a double crossarm on construction where suspension type insulators are used on a crossing over railroad tracks.

Answer - Double crossarms are not required at crossings where suspension insulators are used, provided the single crossarm meets all strength requirements.

Interpretation No. 61 — Grade B construction, conductor size; does Exception 2 apply to railroad crossings? Date of request is July 16, 1952.

Question - Would appreciate a decision by the Committee on Interpretations concerning certain rules of the National Electrical Safety Code, which apply to power line crossings over railroad tracks.

The crossing in question is located in Medium Loading District and the single-phase 120-volt span conductors are to be supported by a 45-foot pole on one side of track and a 35-foot pole on the other. Length of crossing span 143 feet.

Except for the size of conductors, construction meets the requirements of the National Electrical Safety Code.

A decision by the Committee on Interpretations, on above mentioned rules, particularly as to whether Exception 2 and Exception 3, Rule 261-F and Rule 263-E apply to railroad crossings, at earliest convenience will be appreciated.

Answer - It is the opinion of the Interpretations Committee that the conductor size specified in Table 22 for Grade B Construction applies where a supply service lead crosses the tracks of a railroad. Exception 2, which refers to Rule 263-D, is not applicable. The latter rule refers to Table 28 which specifies minimum sizes for such service leads in specific situations. Had it been intended that these sizes apply at crossings over railroads, this situation would have been included in Table 28.

Interpretation No. 20 — Do words "containing steel" describe composite conductor or merely any wire of such a stranded conductor? Date of request is February 15, 1945.

Question - Please refer to Rule 261, F, 2, Exception 1, on page 124 of Handbook H32. In Exception 1 covering stranded conductor at railroad crossings, do the words "containing steel" describe the composite conductor, or merely any individual wire of such a stranded conductor?

Answer - The wording of Rule 261-F-2, Exception 1, would appear to be quite clear. This wording says, "any individual wire of such a stranded conductor containing steel shall be not less than 0.1 inch in diameter if copper-covered and not less than 0.115 inch in diameter if otherwise protected or if bare."

This is intended to cover the individual wire and takes care of so-called "Copperweld" wire which may be 0.1 inch in diameter, or bare or galvanized wire which is required to have a minimum size of 0.115 inch.

Interpretation No. 72 Minimum size of conductors in a crossing span of 215 feet over a railroad track. Date of request is May 31, 1955.

Question - It is requested that we be furnished with your interpretation of Rule 262-I (2) N.E.S.C. as to minimum size of conductors in a crossing span of 215 feet over a railroad track.

The railroad interpretation is that No. 6 BWG (.203) should be used. This has a minimum breaking strength of 1770 pounds.

The telephone company interpretation is that No. 12 BWG (.109 HTL 190) can be used. This has a minimum breaking strength of 1800 pounds.

Also could No. 12 BWG (.109 HTL 135) with a minimum breaking strength of 1213 pounds be used under this rule?

Answer [Requestor's] letter indicates a proposed telephone wire crossing over railroad tracks will have a span length of 215 feet and questions the use of #6 BWG galvanized steel as the crossing span conductor. Rule 262-I-2(b), which deals with Grade D construction spans exceeding 150 feet in length, simply states that the (minimum) wire sizes of Table 24 are to be increased or the sag is to be correspondingly increased. According to Table 24, spans of 125 to 150 feet are required to use either #10 (.134) or #8 (.165) BWG if galvanized steel is used, depending upon whether the locality is or is not classified as a rural district in a arid region.

The size of steel wire specified for this kind of service reflects an allowance of extra metal because of the corrosive effects of locomotive stack gases and hot cinders. It seems clear that this must be the consideration because the strength of copper wire size specified, for example, is approximately one-half to two-thirds of that of steel wire size specified. (Hard drawn #9 copper has a rated breaking strength of 661 lbs; the best grade of #8 BWG galvanized steel has a rated breaking strength of 1170 lbs - the EBB grade has a rated breaking strength of 975 lbs.)

The word "size" as used in Rule 262-I-2 (b) was intended to also carry a connotation of strength since, when the wire sizes given in Table 24 were originally agreed to many years ago, only one general type of steel wire was available for communication service so any increased strength could only be obtained by an increase in size. With the advent of steel wires having higher breaking strengths the picture has changed and it would appear that the use of a No. 8 steel conductor having a breaking strength of 1700 to 1800 lbs. strung with normal rather than increased sag would comply with this rule.

Rule 262-I-2(b) does not attempt to spell out whether the wire size is to be increased or the sag of the wire sizes shown in Table 24 is to be increased; either method is acceptable. Presumably as long as the storm loaded tension does not exceed 50% of the breaking strength, #8 BWG galvanized steel could be used in a 215 foot crossing, provided proper clearance above the tracks is obtained. The extra sag necessary to use #8 rather than #6 BWG may, however, force the use of higher poles in order to obtain the required clearance. It should be noted that corrosion of a .109 wire would reduce its strength proportionately more than the same amount of corrosion of either a .168 (#8) or .203 (#6) conductor.

Because of the foregoing facts, .109 HTL 190, .109 HTL 135 or any steel wire smaller than No. 8, regardless of its ultimate strength, should not be construed as conforming to the requirements of Rule 262-I-2(b) as it now stands.

Since writing to you on August 15 (in reply to your inquiry of May 31) regarding Grade D construction for communications conductors crossing railroad tracks, I have received some additional information which may be of interest.

With respect to the matter of limitations on storm loaded tension, it appears that we have unwittingly made an error. Referring to my letter of August 15, you will note a statement to the effect that #8 BWG steel wire may be used in a 215 ft. crossing provided the storm loaded tension does not exceed 50%. The basis for the 50% figure was the footnote associated with Table 23 and the fact that EBB grade steel wire was in wide usage at the time the rules were being drawn up. Notice that #8 BWG EBB steel wire has a rated breaking strength of 975 lbs; #9 AWG copper has a rated breaking strength of 661 lbs. Then, 975 + 661 = 1636 lbs, for an average strength of 818 lbs, and 50% of 818 lbs is 409 lbs.

Compare this with the average pull of 408.75 lbs per wire mentioned in the footnote and it seems quite reasonable. However, this footnote merely presents an explanation of the basis for the guying requirements set forth in Table 23, and is not necessarily a good indicator of the maximum tension to be expected in the conductors.

A study of the wire sizes, sags and span lengths shows that storm loaded tension varies considerably and exceeds 50% of ultimate in some cases. The variation is so great, in fact, that it is apparent this could not have been a major factor in establishing wire sizes, and the associated limiting span lengths and sags.

As nearly as can be determined, it appears that the rules governing Grade D construction tried to reflect what was deemed (at that time) good practice. This in turn resulted in limiting the no load tension at 0°F. in the heavy and medium storm loading districts to values which approximate the fatigue endurance limit for copper and about 60% of fatigue endurance limit for steel. Curiously enough, however, the concept of fatigue endurance was apparently unknown at the time. The same limitation appears at 20°F. in the sag table for the light loading district.

Fatigue endurance limit of wire is generally defined as the unit stress which may be applied for an indefinitely large number of cycles without producing a break. For hard drawn copper wire this figure is generally taken as 16,000 lbs/in^2. In the case of steel wire, the exact figure depends on the particular kind of steel involved. For mild steel, this may run from about 40 to 60% of ultimate. High strength (carbon) steel wire on the other hand, has a fatigue endurance limit of around 30% of ultimate.

It is to be noted that even Grade "B" power conductors are required to meet a limitation of only 60% of ultimate under storm loading, and it seems reasonable that Grade D communications conductors should be permitted at least the same leeway. Actually, under the present rules, Grade D communications conductors under specified storm loading are stressed to 80% or more of their ultimate strength in some cases.

Some revision of these rules may be desirable and as you probably know, Part 2 of the Code is now in the process of limited revision. You may wish to suggest some changes in this field and in this connection since the United States Independent Telephone association is represented on the working committee, your suggestions would most likely be presented by their representative.

263D and E See 261F, IR61
282F See 283B4b, IR 50

283A1a

Interpretation No. 75 Guy installators; acceptability of fiberglass as insulating material. Date of request is August 29, 1955.

Question - Enclosed herewith, you will find a circular descriptive of our Glass-Strain insulator made of fiberglass.

We are writing to inquire if rule 283 A-1-a would encompass a strain insulator of our design.

Answer [Requestor] asks if rule 283A-1-a would encompass their strain insulator which employs fiberglass as the insulating material. The wording of the rule implies porcelain, either wet process or some other process which will provide a material of equal electrical and mechanical properties. Certainly the intent of this rule is to require a durable, dependable insulator. Wet process porcelain was, however, almost the only available insulating material with suitable electrical and mechanical properties for guy insulators at the time the Fifth Edition of the Code was prepared. We believe . . . insulator most likely meets the intent of the rule although it is open to question as far as the present wording of this particular rule is concerned. The data in the brocure is convincing as far as it goes, but there is no mention of wet flashover voltage, effects of aging, whether the surface may become porous and highly susceptible to collecting impurities, which when wet might seriously impair the electrical properties of the insulator. These, and other pertinent questions need to be answered before it can be established that a fiberglass insulator is the equivalent, better or worse than a wet process porcelain insulator. If it is true that the fiberglass insulator is equivalent or superior to wet process porcelain insulator, rule 201 A provides that the administrative authority may modify or waive the rules . . ."when equivalent or safer construction can be more readily provided in other ways."

Interpretation No. 73 Grounding of guys. Date of request is July 29, 1955.

Question - Is it necessary to meet all three conditions or just any one of the conditions for Rule 283-B-4 to apply? Will you please advise us on this.

Answer - In answer to the question as to whether any one of (the three conditions) or all three conditions stated under Rule 283B-4, must be fulfilled to omit insulators in guys, it is the opinion of the committee that the intent of this rule is met by complying with any one of the three conditions mentioned thereunder.

Interpretation No. 50 Guys attached to wood poles. Date of request is May 26, 1950.

Question - Many rural distribution lines are constructed without guy insulators and with all guys connected to the system neutral conductor, as permitted under Rule 283,B,4. The questions that now arise in regard to such lines are as follows:

1. If strain insulators are installed in certain guys for the purpose of isolating anchors from the system neutral, must strain insulators be installed in all guys throughout the system in order to avoid a violation of the National Electrical Safety Code? If so, what is the definition of the term "system" as used in Rule 283,B,4,(b)?

2. Where anchors or anchor rods would otherwise be subject to electrolysis due to external dc sources or to galvanic action as described below, does the National Electrical Safety Code permit the disconnection of guys from the system neutral where strain insulators are not used, on wood poles? Such a practice would seem consistent with Rule 282,F, "Insulating Guys from Metal Poles."

Answer - With respect to the paragraph numbered 1 in your letter, it is our opinion that the installation of strain insulators in certain guys does not require that such insulators be used in all guys of a line or system, provided the guys which do not have insulators meet the grounding requirements of 283B4.

With respect to the paragraph numbered 2, we do not consider that the Code permits disconnection of the guy from the system neutral, as outlined, unless it is otherwise adequately grounded or has a strain insulator installed in accordance with 283B1. This, of course, assumes a line voltage between 300 and 15000 volts. Rule 282F, in our opinion, refers only to situations where a strain insulator would not be required by 283B1.

Interpretation No. 89X

a) Should clearance of conductors passing by buildings include swing H43
b) Insulator swing considerations

c) Sag increase; span 150 ft or 350 ft?
Date of request is August 12, 1957

Question --

Under the above Rule 422, C, 1, CLEARANCES FROM LIVE PARTS the listing of specified operating voltages stops at 70.000 at which the distance named is 5 ft.

Question 1. Is it to be understood that above 70.000 volts this rule does not require more than 5 ft clearance from live parts?

Question 2. Would we be violating the code in specifiying that 5 ft is the minimum clearance requirements under Rule 422, C, 2 regarding hot line work on Transmission Lines of the 150 KV class supported on Steel Towers?

Question 3. Would we be violating the code in specifying that 5 ft is the minimum clearance requirements regarding climbing inspection of Transmission Lines of the 150 KV class supported on Steel Towers?

Your help in interpreting the above rules and your answers to the above three questions are requested in connection with the specific work indicated in questions 2 and 3. In the event that your reply to any or all of these questions are negative, will you please point out the appropriate rule or rules in the code that are applicable in each case.

Answer --

The Table in Rule 422, C, 1, Fifth Edition of the Code contains the same clearances as those specified in the Fourth Edition for corresponding situations. This goes back to about 1928 when we expect the upper voltage limit of line conductors supported on pin-type insulators was about 70,000 volts. Above this voltage, line conductors were likely to be supported on suspension-type insulators that were free to swing or move, making it more difficult to specify minimum clearance than it would be for conductors attached to rigid supports. Under such conditions, we think the minimum clearances should be decided upon by those in responsible charge as to working methods and clearances to be obtained. We might fall back on Rule 422, E, which states that when approaching live parts the voltages of which are in excess of those listed in 422, C, 1, the line should be killed. However, in modern practice live line maintenance is done on lines operating at voltages considerably in excess of 70 KV.

Our answer to your Question No. 1 is:

This part of the Code does not specify the minimum "Clearance From Live Parts" for voltages above 70 KV other than the general requirements that make it obligatory to observe safe clearances under conditions that may exist, kind of equipment used, and working methods employed.

In answer to Questions 2 and 3. The Code is not specific on these points. Minimum Clearance from Live Parts for these conditions and climatic conditions, and type of equipment available for maintenance work.

These are not specific answers but you have asked questions that cannot be answered as specifically as for lower voltage conditions.

National Electrical Safety Code
Interpretations
Interpretation Requests

1961 — 1980

LISTING BY RULE NUMBER
with citation of applicable NESC edition

For each rule in this list the applicable interpretations are arranged in IR serial number order. IR numbers 284 through 294 have not, yet been published.

Prepared by Alan L. Clapp
Member, Subcommittee on Interpretations.

NATIONAL ELECTRICAL SAFETY CODE INTERPRETATIONS
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Rule	Subject	IR Number	Request Date	NESC Edition
Def. Part II, Sect A.	Antenna conflicts	157	(Feb 25, 74)	6th
013	Interpretation of IR 177 and IR 201(b), Rule 13 vs. Rule 110A; extension of existing 6 ft. fence	291	(Feb 2, 81)	1977/81
013B2	Clearance required when cable is added	292	(Feb 2, 81)	1981
92B	Grounding point on 3-wire delta systems--corner or midpoint of one phase	104	(Dec 31, 63)	6th
92B	Number of grounds	118	(Sept 8, 65)	6th
92B1	Use of line conductor as grounding point in place of common point on wye connected secondary	234	(July 21, 78)	1977
92D	Objectionable voltage: neutral/ground	287	(Jan, 19, 80)	1981
92E	Grounding of Rolling Metal Gate	253	(July 11, 79)	1977
93A, B	Grounding of transformer tank with tank grounded arrester, via a spark gap, etc.	107	(Feb 24, 64)	6th
93C	Connection of fence grounding conductor to fence posts	291	(Feb 2, 81)	1977/81
93C1	(1) Method of grounding magnetic mechanical protection (2) Method of grounding nonmagnetic mechanical protection	118	(Sept 8, 65)	6th
94A3	Steel tower and footings; bonding requirements	259	(Nov 15, 79)	1977
94A3	Acceptability of steel wire wrapped around reinforcing bar cage, as grounding electrode	263	(Jan 4, 80)	1977
94B4a	Ground required at distribution transformer	267	(Mar 20, 80)	1977
94B4b	Grounding--pole butt plates	204	(Sept 13, 77)	1977

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94B6	Acceptability as a ground electrode of 20 ft of steel wire wrapped around rebar cage	259	(Nov 15, 79)	1977
95A3	Does 95A3 apply only to buildings or are steel-supporting structures included also?	259	(Nov 15, 79)	1977
96A3	Neutral grounding for buried concentric neutral cable with semiconducting sheath	196	(July 14, 77)	1977
96C	Neutral separation on distribution transformer poles to minimize dc flow	280	(Sept 9, 80)	1977
97A1	(1) Method of grounding magnetic mechanical protection (2) Method of grounding nonmagnetic mechanical protection	118	(Sept 8, 65)	6th
97C	Grounding of transformer tank with tank grounded arrester, via a spark gap, etc.	107	(Feb 24, 64)	6th
97C	(9) Allowable interconnection of grounds--primary arrester, primary neutral and secondary neutral	118	(Sept 8, 65)	6th
97C	Neutral grounding for buried concentric neutral cable with semiconducting sheath	196	(July 14, 77)	1977
97C1(b) and (c)	(1,2,3,4,7) Mechanical protection for interconnected (arrester and neutral) grounding lead; allowable omission of mechanical protection; required number of grounding connections	118	(Sept 8, 65)	6th
97C1(c)	Grounded neutral; definition of 4 grounds per mile	166	(Nov 1, 74)	6th
102B	(a) Implication of retro-fitting	201	(July 27, 77)	1977
110A	Height of fence	161	(May 15, 74)	6th
110A	Fence height	177	(Dec 18, 75)	6th

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110A	(b) Fence height	201	(July 27, 77)	1977
110A	Meaning to be attached to "prevent" in connection with equipment enclosures	276	(Aug 18, 80)	1977
110A	Interpretation of IR 177 and IR 201(b), Rule 13 vs. Rule 110A; extension of existing 6 ft. fence	291	(Feb 2, 81)	1977/81
114	Clearance of HV conductors around circuit breakers	114	(Aug 2, 65)	6th
114A	Outside substation-- (a) vertical clearance to live parts (b) definition of voltage	193	(Apr 18, 77)	5th
114A1	Substation conductor clearance to building	124	(Feb 22, 67)	6th
114C1	Outside substation-- (a) vertical clearance to live parts (b) definition of voltage	193	(Apr 18, 77)	5th
124	Clearance to energized parts in substation	192	(Mar 24, 77)	6th
124A, Table 2	Clearance at crossing between transmission line and rigid bus structure	283	(Dec 8, 80)	1981
141	Definition of unsealed jars and tanks	244	(Jan 17, 79)	1977
153A2	Definition of "large", meaning of "segregated"	241	(Nov 30, 79)	1977
153B1	Floor drains for transformer installations. Meaning of "outside the building"	240	(May 24, 79)	1977
162	Clearance at crossing between transmission line and rigid bus structure	283	(Dec 8, 80)	1981
165	44kV 3ø transformer bank fuse protection	106	(Jan 6, 64)	6th
170	(a) Requirements for disconnect switch (b) Energized switch blade	190	(May 23, 77)	1977

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Rule	Subject	IR Number	Request Date	Edition
171	(a) Requirements for disconnect switch (b) Energized switch blade	190	(May 23, 77)	1977
173B	Disconnecting Provision Acceptability	257	(Nov 2, 79)	1977
173C	(a) Requirements for disconnect switch (b) Energized switch blade	190	(May 23, 77)	1977
200C	Clearance to buildings and lines	158	(Dec 18, 72)	6th
201A	Clearance required for communications conductors over roads	195	(May 10, 77)	6th
202B	Reconstruction definition. Does line voltage change from 7.2/12.5 kV to 14.4/24.9 kV require compliance with 1977 edition.	219	(Dec 17, 77)	1977
202B	Reconstruction definition. Does line voltage change from 7.2/12.5 kV to 14.4/24.9 kV require compliance with 1977 Edition clearances.	220	(Jan 18, 78)	1977
202B	Definition of Reconstruction	230	(Apr 5, 78)	1977
202B	New Installations, Reconstruction, Extensions, Status of Existing Installation is Cable TV Line is Added	243	(Feb 7, 79)	1977
202B1	Meaning of "Reconstruction"	215	(Dec 12, 77)	1977
212	Intent of term "proximate facilities"	194	(May 9, 77)	1977
214A2	Frequency of Inspection for Service Drops	246	(Feb 5, 79)	6th/77
215C1	Grounding of supporting structures	212	(Nov 11, 77)	1977
215C1	(a) Magnitude limit of ground fault voltage (b) Intent of "effectively grounded" as applied to structure	227	(Feb 23, 78)	1977

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215C2	Insulator in down guy	236	(Aug 31, 78)	1977
216B	Load on foundation, application of overload capacity factors	216	(Dec 21, 77)	1977
220B2	Clearance Requirements for CATV Amplifier Power Feed	255	(Oct 15, 79)	1977
Section 23	(a) Clearance between supply conductors and signs (b) Clearance between pad-mounted transformers and gas metering equipment	117	(Sept 17, 65)	6th
230C	Meaning of "supply cables having an effectively grounded continuous metal sheath, or insulated conductors supported on and cabled together with an effectively grounded messenger." Spacer cable	92	(May 19, 61)	6th
230C	Supply cable requirements, OR vs AND	202	(Aug 23, 77)	1977
230C	Clearance for aerial secondary and service conductors with an insulated neutral	279	(Sept 4, 80)	1977
230D	(a) Grounded neutral clearance to ground (b) Grounded neutral clearance to building	126	(Feb 1, 68)	6th
231B	Location of pad-mounted equipment	258	(Nov 6, 79)	1977
231B1a	Example requested	231	(Apr 6, 78) (Apr 11, 78)	1977
232	Minimum clearance for spacer cable on messenger under heavy loading conditions	123	(Mar 7, 66)	6th
232	Clearance to ground at high conductor temperature	178	(Jan 22, 76)	6th
232A	(a) Sag--with or without creep (b) Clearance over cultivated field	121	(Dec 13, 65)	6th

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232A	Distinction between urban and rural	125	(Dec 23, 66)	6th
232A	Clearances applicable to building construction site	159	(Apr 11, 74)	6th
232A	Basic clearance--Wires above ground; "Accessible to pedestrians only"	165	(Aug 22, 74)	6th
232A	Clearance, CATV cable above vacant lot	169	(Dec 12, 74)	6th
232A	Clearance to building	186	(Oct 21, 76)	6th
232A	Clearance required for communication conductors over roads	195	(May 10, 77)	6th
232A	Clearance over snow covered	270	(June 25, 80)	1977
232A	Clearance for oversize haulage trucks	282	(Oct 17, 80)	1977
232A	Conductor clearance; applicability of catenary curve considerations	290	(Jan 30, 81)	1981
232A, Table 1	(a) Grounded neutral clearance to ground (b) Spaces and ways accessible to pedestrians	126	(Feb 1, 68)	6th
232A, Table 1	Clearance of power lines above sprinkler heads over farm orchard	168	(Dec 11, 74)	6th
232A, Table 1	Clearance above ground in orchard	187	(Mar 29, 77)	6th
232A, Table 1	CATV cable clearance	206	(Sept 15, 77)	6th
232A, Table 232-1	Service Drops, clearance to ground	223	(Feb 7, 78)	1977
232A, Table 232-1	Clearance over residential driveways	224	(Jan 26, 78)	1977
232A, Table 232-1	Service drop conductors (a) Minimum height in span (b) Minimum height of point of attachment	247	(Apr 3, 79)	1977

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232A, Table 232-1	Spaces or Ways Accessible to Pedestrians Only, Service drop clearance	249	(Mar 23, 79)	1977
232A, Table 232-1	Effect of trees on minimum clearances	256	(Nov 15, 79)	1977
232A, Table 232-1	Conductor Clearance for Line Near Recreational Water Area	261	(Oct 23, 79)	1977
232A, Table 232-1	Communication cable clearance to ground	269	(May 21, 80)	1977
232A, Table 232-1	Ground clearance for service	277	(Aug 25, 80)	1977
232A, Table 232-1	Reduced clearance to guys	292	(Feb 2, 81)	1981
232A, Table 232-1	Clearance for sailboating	284	(Jan 13, 81)	1981
232A3	Definition of fixed supports	99	(Mar 14, 63)	6th
232B	Grounded neutral clearance to ground	126	(Feb 1, 68)	6th
232B Exception 2	Communication cable additional clearance	292	(Feb 2, 81)	1981
232B2	Clearances--Wires on different supports, voltages 50 kV; also above ground or rails	160	(May 14, 74)	6th
232B2d	Transmission line clearances-Meaning of "maximum conductor temperature for which the line is designed to operate" with respect to designed for, but unplanned contingencies	207	(Oct 3, 77)	1977
232B2d(2)	Clearance to roads; high temperature transmission lines	197	(July 1, 77)	1977
233A, Figure 233-1	Clarification of clearance at crossing	289	(Jan 30, 81)	1981
233A1	Conductor clearance; applicability of catenary curve considerations	290	(Jan 30, 81)	1981
233A3	Clearance at crossing between transmission line and rigid bus structure	283	(Dec 8, 80)	1981
233B	Conductor clearance from guy of parallel line structure	218	(Jan 5, 78)	1977

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Rule	Subject	IR Number	Request Date	Edition
233B1	Horizontal clearance under wind loading. One or both conductors at maximum swing angle?	221	(Jan 25, 78)	1977
233B1	(a) Centerline spacing for adequate clearance between parallel lines on separate structures (b) Use of switching surge factor in above case	228	(Feb 28, 78)	1977
233B1b	Horizontal clearance under wind loading. One or both conductors at maximum swing angle?	221	(Jan 25, 78)	1977
233B2	Clearances--Wires on different supports, voltages 50 kV; also above ground or rails	160	(May 14, 74)	6th
234	Clearance for line	158	(Dec 18, 72)	6th
234	Horizontal and Vertical Clearances, Effect of high temperature	232	(Apr 6, 78)	1977
234	Clearance requirements for buildings in transit	251	(July 5, 79)	1977
234, Figure 234-1	Determination of Diagonal Clearance	260	(Nov 8, 79)	1977
234A	Conductor clearance; applicability of catenary curve considerations	290	(Jan 30, 81)	1981
234A1	Final condition of a conductor--to determine vertical clearance--storm loading and long term creep	112	(June 30, 64)	6th
234A3	Determination of Diagonal Clearance	260	(Nov 8, 79)	1977
234B	Clearance to parallel line	96	(Dec 7, 62)	6th
234B	Does the Exception apply to horizontal or vertical clearances or both?	233	(May 10, 78)	1977
234B1	Clearance, line to adjacent steel structure; Voltage definition	173	(May 29, 75)	6th

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Rule	Subject	IR Number	Request Date	Edition
234C	Clearance to conveyor structor	274	(July 25, 80)	1977
234C, Table 4	Clearances from buildings; Meaning of voltage	154	(Jan 29, 74)	6th
234C, Table 4	Clearances from buildings Meaning of voltage	156	(Oct 17, 73)	6th
234C, Table 4	Clearance, line to adjacent steel structure; Voltage definition	173	(May 29, 75)	6th
234C, Table 234-1	Grain Bin Clearance (Building vs. Tank); 115 kV line	248	(Mar 15, 79)	1977
234C1(a)	Clearance to building	186	(Oct 21, 76)	6th
234C4	Clearance--horizontal and vertical--from buildings	98/98a	(Feb 21, 63)	6th
234C4	Grounded neutral clearance to building	126	(Feb 1, 68)	6th
234C4	Clearances applicable to building construction site	159	(Apr 11, 74)	6th
234C4	Clearance to building	172	(May 21, 75)	6th
234C4	Clearance to building and guarding	174	(Sept 29, 75)	6th
234C4(a)	Clearance to building	113	(Nov 12, 64)	6th
234C4(a)	Substation conductor clearance to building	124	(Feb 22, 67)	6th
234C4(a)	Clearance to building	186	(Oct 21, 76)	6th
234C4(a)	Clearance to chiminey; meaning of attachments	198	(July 12, 77)	6th
234C4a	Governing clearance to building--horizontal or vertical	238	(Sept 25, 79)	6th
234C4a	Clearance to building	265	(Mar 3, 80)	6th/77
234C4(a)1, Table 4	Clearance of neutral to building	189	(Feb 18, 77)	6th
234C4b	Guarding Requirement Applicability	265	(Mar 3, 80)	6th/77
234D1, Table 234-2	Neutral clearance to bridge	208	(Oct 31, 77)	1977

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Rule	Subject	IR Number	Request Date	Edition
234E1, Table 234-3	Rationale involved in calculating basic clearances shown in Table 234-3	237	(Sept 19, 79)	1977
234E	Conductor Clearance to Swimming Pool Slide	262	(Nov 12, 79)	1977
234F1c	Electrostatic effects	205	(Sept 3, 77)	1977
234F2c and d	Increased clearances for long span or sag--applicability to horizontal clearances	203	(Aug 25, 77)	1977
235	Clearances to non-current carrying metal parts clearance for CATV	281	(Oct 14, 80)	1977/81
235, Table 235-3	Horizontal Clearance between wires in a triangular configuration	264	(Jan 21, 80)	1977
235A, Table 6	Compact transmission lines, status with respect to NESC 1973 edition, especially when jacking for hot line maintenance is taken into account	167	(Oct 15, 74)	6th
235A, Table 6	Clearance between conductors in substations	175	(Sept 30, 75)	6th
235A, Table 9	Clearance between line conductors and span or guy wires	101	(Sept 13, 63)	6th
235A3, Table 9	Clearance between line conductors and guy of EHV guyed tower	102	(Oct 11 and 22, 63)	6th
235B1	Horizontal clearance between line conductors. 2 circuits, 115kV & 230kV on same support	222	(Jan 25, 78)	1977
235B2	(a) Centerline spacing for adequate clearance between parallel lines on separate structures (b) Use of switching surge factor in above case	228	(Feb 28, 78)	1977

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Rule	Subject	IR Number	Request Date	Edition
235B3	(a) Centerline spacing for adequate clearance between parallel lines on separate structures (b) Use of switching surge factor in above case	228	(Feb 28, 78)	1977
235C, Table 235-5	Vertical separation of conductors of same circuit.	233	(May 10, 78)	1977
235C	Voltage between conductors	267	(Mar 20, 80)	1977
235C	Clearance from communication cable to tap and drip loop of supply cable	288	(Jan 23, 81)	1981
235C1, Table 235-5	Vertical clearance at supports	209	(Oct 31, 77)	1977
235C1, Table 235-5	Interpretation of Clearance Measurement; Communication to Power Conductors	242 242a	(Jan 2, 79) (Jan 11, 79)	1977 1977
235C1, Table 235-5	Spacing between communication cables of power and communication utilities, when located below supply lines	286	(Jan 19, 81)	1981
235C2b	Clearance in pole to building spans, between communication and electric supply service drops	226	(Feb 23, 78)	1977
235E	Conductor clearance from guy of parallel line structure	218	(Jan 5, 78)	1977
235E	Clearance to bridle guy	229	(Mar 6, 78)	1977
235E	Clearance Requirements for CATV Amplifier Power Feed	255	(Oct 15, 79)	1977
235E1, Table 235-6	Clearance from line conductors at supports (a) Meaning of minimum clearance (b) Clarification of "voltages are between conductors" (c) Reason for additional clearances on joint poles	210	(Oct 31, 77)	1977
235G	Clearance Requirements for CATV Amplifier Power Feed	255	(Oct 15, 79)	1977

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Rule	Subject	IR Number	Request Date	Edition
236	Climbing space	176	(Dec 15, 75)	6th
238	Clearance between supply conductors, communication and CATV cables	127	(Feb 28, 68)	6th
238	Clearances to non-current carrying metal parts clearance for CATV	281	(Oct 14, 80)	1977/81
238 Table 11	13.8 kV distribution clearance with horizontal post insulators without crossarms	115	(Aug 4, 65)	6th
238A,B; Table 283-1	(a) Is base of epoxy extension arm "non-current carrying" (b) Spacing required between non-current carrying parts of adjacent supply and communication circuits	268	(May 8, 80)	1977
238A, Table 11	Conductor vertical spacing with post insulators	110	(May 14, 64)	6th
238B, Table 238-1	Interpretation of Clearance Measurement; Communication to Power Conductors	242 242a	(Jan 2, 79) (Jan 11, 79)	1977 1977
238D	Clearance between multi-grounded neutral and communication service drop	93	(Apr 13, 62)	6th
238D	Clearance of Service Drop	252	(June 25, 79)	1977
238D	Clearance from communication cable to tap and drip loop of supply cable	288	(Jan 23, 81)	1981
238E4	Placement of communication cable above effectively grounded luminaires with drip loops	105	(June 15, 64)	6th
239C	Nonmetallic pipe protection for risers	153	(Dec 17, 73)	6th
239C	(1,3,4,5,6,7)Mechanical protection for interconnected (arrester and neutral) grounding lead; allowable omission of mechanical protection; method of grounding either magnetic or nonmagnetic mechanical protection	118	(Sept 8, 65)	6th

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Rule	Subject	IR Number	Request Date	Edition
239F	Clearance of primary riser termination from communication cable	225	(Feb 14, 78)	1977
242	Joint use 7.2kV/communications-cable joint use poles; insulated strand, self supporting communications cable	109	(Apr 24, 64)	6th
242	Grade of construction for Conductors	272	(July 14, 80)	1977
242, Table 15	Grade B crossing spans in a grade C supply line	111	(May 26, 64)	6th
242, Table 15	Definition of "constant potential" in grades of construction	162	(May 17, 64)	6th
242, Table 242-1 (Table 15)	4.8 kv ungrounded delta, change from grade C to B believed inadvertent when Footnote 7 changed	294	(Mar 25, 81)	1977 (6th)
242A, Table 15 note 3	(a) Definition of "promptly deenergized" (b) Deflection, unbalanced pull: should dissimilar ice loadings be considered? (c) Crossing of power and communications lines	122	(Feb 17, 66)	6th
243	Grade of construction for Conductors	272	(July 14, 80)	1977
243B	Clearance between highway lighting standards and transmission lines	120	(Dec 3, 65)	6th
250C	Application of extreme wind loading	200	(July 8, 77)	1977
251	Constant to be added to storm loading for messenger supported cable	103	(Nov 12, 63)	6th
251	Application of K-factors	181	(Mar 8, 76)	6th
251A	Ice loading computation on non-circular cross-section conductor	266	(Mar 7, 80)	1977
252	Application of K-factors	181	(Mar 8, 76)	6th

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Rule	Subject	IR Number	Request Date	Edition
252B3	Calculation of support load at angle in line	239	(Oct 13, 79)	1977
252C1	Grade B crossings in Grade C supply lines	111	(May 26, 64)	6th
260C	(b) Meaning of "other supported facilities"	211	(Nov 4, 77)	1977
260C	Load on structure or foundation; application of overload capacity factors	213	(Nov 26, 77)	1977
261	Overload Capacity Factors for Composite Components	245	(Feb 13, 79)	1977
261A1	Allowable pole loading	184	(June 10, 76)	6th
261A2b	Calculation of support load at angle in line	239	(Oct 13, 79)	1977
261A2b	Application of an overload capacity factor of 4.0 to the vertical load on an eccentric loaded column	250	(Mar 27, 79)	1977
261A2b, c	Omission of fiber stress calculation point formerly stated in 6th Edition, 261A4a, b	211	(Nov 4, 77)	6th
261A2d	Application of overload capacity factor, unguyed and guyed angle structures	214	(Nov 28, 77)	1977
261A3(b)	Longitudinal strength of towers--Grade B construction	108	(Apr 2, 64)	6th
261A4	Construction grade of line; Effect of additional loading	180	(Feb 3, 76)	6th
261A4a	Location of high longitudinal strength structures with respect to higher grade section in line of lower grade construction	285	(Dec 19, 80)	1981
261A4(g)	Spliced and stub pole definitions; extension at top of pole	95	(Nov 14, 62)	6th

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Rule	Subject	IR Number	Request Date	Edition
261A6b	(b) Deflection, unbalanced pull: should dissimilar ice loadings be considered	122	(Feb 17, 66)	6th
261B	Foundation strength for steel pole structure	191	(Mar 23, 77)	1977
261D	Crossarm; Definition and status of integrated conductor support assemblies	151	(Nov 15, 73)	6th
261D3(b)(d)	Grade B crossing in Grade C supply lines	111	(May 26, 64)	6th
261D5	(c) Crossing of power and	122	(Feb 17, 66)	6th
261E3	Grade B crossing in Grade C supply lines	111	(May 26,64)	6th
261F4	(a) Sag--with or without creep	121	(Dec 13, 65)	6th
261F4	Final condition of a conductor--storm loading and long term creep	112	(June 30, 64)	6th
272	Insulator electrical strength	119	(Sept 2, 65)	6th
280A1b	Meaning of "readily climbable"	199	(July 4, 77)	1977
280A1b	Warning signs on Tubular Steel Poles	271	(June 13, 80)	1977
280A2(b)	Meaning of "closely latticed poles or towers"	128	(Apr 15, 68)	6th
282B	Fiberglass rod; Acceptability in lieu of steel	183	(May 17, 76)	6th
282C	Guy connection and placement of insulators	217	(Dec 9, 78) (Jan 3, 78)	1977
282D	Fiberglass rod; Acceptability in lieu of steel	183	(May 17, 76)	6th
282E	Plastic guy guards	94	(Mar 5, 62) (Mar 27, 62) (Aug 6, 62) (Aug 8, 62)	6th
282E	Guy guard--on guys to ground anchors--in areas where stock runs	116	(Aug 31, 65)	6th

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Rule	Subject	IR Number	Request Date	Edition
282E	Guy guards; meaning of "traffic"	179	(Feb 5, 76)	6th
282E	Guy guard; Placement on guy in field	182	(June 1, 76)	6th
282E	Guy guards in relation to definition of "guarded"	188	(June 24, 77)	6th
282H	Guy grounding; upper end effectively grounded vs. anchor end ground	97	(Feb 14, 63)	6th
282H	Grounding of guys	163	(May 21, 74)	6th
283A	Insulator in down guy	236	(Aug 31, 78)	1977
283B	Guy connection and placement of insulators	217	(Dec 9, 78) (Jan 3, 78)	1977
283B1	Insulating vs. effectively grounding guy wires	254	(Aug 29, 79)	6th/77
283B2	Insulators in guys	100	(Apr 22, 63)	6th
283B2b	Use of double guy insulators in down guy; also, validity of Discussions of 4th and 5th Editions of NESC	235	(July 27, 78)	1977
286E	Clearance to ground for equipment on structures--not above a roadway	275	(Aug 6, 80)	1977
300	Location of pad-mounted equipment	258	(Nov 6, 79)	1977
310	Location of pad-mounted equipment	258	(Nov 6, 79)	1977
311	Location of pad-mounted equipment	258	(Nov 6, 79)	1977
314B	Neutral grounding for buried concentric neutral cable with semiconducting sheath	196	(July 14, 77)	1977
330	Installation of submarine cable on islands in connection with aids to navigation	278	(Aug 25, 80)	1977

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Rule	Subject	IR Number	Request Date	Edition
330D	"Immediate vicinity of a fault" as applied to damage withstanding capability of underground cable	164	(May 29, 74)	6th
332	Use of steel-clad copper wire as neutral conductor air direct buried, bare concentric neutral cable	273	(July 24, 80)	1977
350B	Neutral grounding for buried concentric neutral cable with semi-conducting sheath	196	(July 14, 77)	1977
351	Installation of submarine cable on islands in connection with aids to navigation	278	(Aug 25, 80)	1977
351C1	Direct buried cable near swimming pool	170	(Feb 25, 75)	6th
353	Installation of submarine cable on islands in connection with aids to navigation	278	(Aug 25, 80)	1977
353D	Cable burial dèpth	155	(Feb 5, 74)	6th
353D	Communication cable burial depth	171	(Mar 19, 75)	6th
Section 38	Location of pad-mounted equipment	258	(Nov 6, 79)	1977
381G	Unfenced, pad-mounted equipment; Meaning of two procedures	185	(June 29, 76)	6th
423C	Is tagging of remote close/trip control required if device is otherwise rendered inoperable	293	(Apr 7, 81)	1981

NOTE: Numbers 129 through 150 not assigned.