Decision No. 73455 Application No, 47929 (Filed September 29, 1963)

F.T. Searls, John C. Morrissey, Ross Workman, for applicant.

John R. Bury, for Southern California Edison Company; Merton A. Walters, for Local Unions 18, 47 and 1245, International Brotherhood of Electrical Workers; Lee L. Burnside and Clifford Stoop, for Department of Water & Power, City of Los Angeles; Donald M. Height, for Sacramento Municipal Utility District; Robert M. Wilson, for Western Awning Association; Sherman Chickering, C. Hayden Ames, Donald J. Richardson, Jr. and Stanley Jewell, for San Diego Gas & Electric Company; Dick Riechel, for Haveg Industries, Inc., interested parties.

N.R. Johnson, for the Commission staff.

Pacific Gas and Electric Company (PG&E) seeks an order amending General Order No. 95 so as to establish standards for use of horizontal post-type insulators in vertical and triangular configuration for all voltages above 750 volts; to revise the rules for service drops to permit twelve-inch clearance for insulated service wires from metallic as well as nonmetallic roofs; to permit lateral runs of underarm moulding to end a reasonable distance from the outer pin hole; to permit the use of #6 AMG strong alloy aluminum tie wire; to permit the use of "U" shaped PVS moulding in vertical runs; to clearly define a "point-to –point" transposition; and to permit the use of glass fiber insulators in guys exposed to 20kV or higher voltages.

After due notice, public hearings in the matter was held before Examiner Gillanders on May 17, June 21, 22, 23, 1967 in San Francisco. Concurrent written statements were filed and the matter submitted on July 31, 1967.

PG&E presented evidence in support of its proposed amendments through three witnesses. The International Brotherhood of Electrical Workers presented evidence in opposition to certain of applicant's proposals through one witness. A representative of the manufacturer of the U shape moulding PG&E proposes to use testified in support of its use of such material. The staff presented evidence in support of most of PG&E's proposals and evidence in opposition to certain of PG&E's proposals.

PG&E's Position

After reviewing the exhibits and testimony, PG&E submits that with one exception, its proposed amendments to General Order No. 95, based on the experience of its engineers and operating personnel and the data it presented in this proceeding, are the most desirable of the proposals made.

The one exception wherein PG&E sees good reason to change the position contained in its exhibits relates to minimum vertical separation between conductors in crossarmless vertical configuration for distribution circuits in the 750 to 20,000 volt range. The proposed addition of Case 20 to Table 2 recommends vertical separations of 11-½ and 17-½ inches in Columns E (750 to 7500) and Columns F (7,500 to 20,000 volts), respectively. Inasmuch as PG&E has itself almost completely discontinued the use of an 18-inch vertical separation, it does not oppose the adoption of the 24-inch vertical separation proposed by the staff.

Position of Commission Staff

The Commission staff states that it has carefully reviewed the application, exhibits, and testimony. It believes that the evidence fully supports its recommended modification set forth in Part B, Chapter 5 of its Exhibit No. 9. It recommends that an order issued by the Commission adopting the recommended rules set forth in its exhibits as modified on the record.

Position of Southern California Edison

Edison states it has reviewed and fully considered the several proposals of PG&E, the staff and IBEW. In most cases, Edison recommends adoptions of the staff proposals set forth in Exhibit No. 9. In other cases, Edison recommends adoption of the proposals of PG&E. With respect to the issue of climbing space requirements for post insulator construction, Edison could not fully concur with the proposals of PG&E, the staff or IBEW, but submitted its own proposal for a new Rule 54.11 which it claims is both adequate and workable and represents a reasonable accommodation of the interests of all Parties.

Position of Local Unions 18, 47, and 1245, International Brotherhood of Electrical Workers

Local Unions 18, 47, and 1245, International Brotherhood of Electrical Workers (IBEW) represent a substantial majority of the workman engaged in work on overhead electric facilities. Included are employees of electric utilities, both privately and publicly owned, and employees of contractors engaged in construction and maintenance of such overhead electric transmission and distribution lines as are let to contract by the electric utilities.

No one in the State of California can have a greater interest in this application than these IBEW members since their safety and well-being will be directly involved in whatever decision the Commission makes. As the representative of its membership, IBEW fully shares this interest and it was for

that reason IBEW made its appearance and participated in the public hearing. In so doing its purpose was to call to the Commission's attention areas of concern involving safety, which had been expressed by the workmen involved, and to offer, wherever possible, the means to overcome the problems in connection therewith.

In its apllication, PG&E divided its proposal for revisions of the provisions of General Order N0. 95 into groupings as follows: POST-TYPE INSULATROS; LATERAL RUNS, UNDERARM MOULDINGS; TIE WIRE SIZE; VERTICAL RUNS; and GLASS FIBER INSULATORS FOR SECTIONALIZING. This same format will be utilized in the discussion of the evidence which follows.

Post-Type Insulators

Post-type insulators have made possible different line configurations such as post-type insulators at pole top in the ridge pin position or mounted horizontally and attached directly to the pole. These configurations were not contemplated at the inception of General Order No. 95; consequently the rules for treating such configurations are not included in the Order. In addition, the present rules are not readily adaptable to interpretation for the purpose of establishing clearances between conductors of the same circuit, or for clearances between conductors of the same circuit, or for clearances from pole centerline or pole surface conductors supported on post insulators mounted in vertical or horizontal positions directly to the pole.

PG&E first introduced post-type insulators in these different Configurations to the Commission in 1965through Application No. 47540 which requested modification of the rules applying to common neutral systems. In that application, these configuration were described by PG&E as crossarmless designs and were to be used primarily with common neutral systems. Revisions and amendments of General Order No. 95 as described in that application requested revision or modification of the rules to allow for conductors to be supported on post insulators mounted either in vertical position at pole top or in horizontal positions attached directly to the pole. The Commission's decisions (Decision No. 70489, dated March 29, 1966 and Decision No. 71094, dated August 9, 1966) relating to common neutral systems did not make any change in General Order No. 95 to accommodate overhead configuration utilizing post-type insulators.

PG&E, by the instant application dated September 29, 1965, requested an order amending General Order No. 95 so as to establish standards for the use of post-type insulators in vertical and triangular configuration on transmission circuits above 25 kV.

Amendments to the application were filed on February 9 and May 9, 1967, requesting changes in General Order No. 95 to allow the use of post-type insulators for all voltages above 750 volts; and in addition, requested certain other changes affecting other requirements of the General Order.

The primary objectives of General Order No. 95 are to provide the following:

1 An adequate climbing space that will permit linemen to have ready access to equipment and conductors.

2 Adequate working space for linemen to work above, below, and between conductor levels.

3 Freedom in the climbing space from hardware elements which may become energized through insulation failures,

4 Freedom in the climbing space grounds and grounded objects.

5 Limitation of physical obstructions within the climbing and working space to provide easy passage for the lineman and adequate room for his work.

6 A sufficient margin of safety so that normal wear and tear on overhead lines will not render these facilities unsafe or inadequate.

IBEW contends that crossarmless construction, particularly in connection with distribution circuits, as proposed by PG&E is inherently more hazardous than crossarm construction because of the facts that the crossarm itself has been a safety factor to the lineman; that the conductors are normally further from centerline of the pole than they will be under PG&E's proposal; and that it will be more difficult to work from below conductors. PG&E, although claiming that the elimination of crossarm members and their supporting hardware is a significant step in the aesthetic improvement of overhead lines, did not submit, in its direct case, any evidence relating to economics or aesthetics. The only testimony elicited re economics came about in cross-examination of one of PG&E's rebuttal witnesses, who testified that it cost about the same to build post-type construction as crossarm.

PG&E's rebuttal testimony re aesthetics of crossarmless construction consisted partly of hearsay concerning the favorable reception of such construction allegedly received in the State of Oregon. Although PG&E has installed approximately 37,000 12,000-volt post-type insulators in its 60 kV through 115 kV transmission system, it offered only hearsay evidence that such

transmission construction has be received with favor in California. Its engineer witness testified that some configurations used for transmission, in his opinion, had a higher aesthetic value than crossarm construction.

IBEW's witness testified that he and his fellow lineman do not believe that crossarmless construction is aesthetically more pleasing than crossarm construction. IBEW, however, is more concerned over the operability of overhead lines so constructed and the safety of the workmen involved.

The staff's testimony is that economic and aesthetic considerations for the construction of overhead lines are secondary tot eh safety of workmen and the general public and that overhead lines constructed in adherence with the basic safety objectives of General Order No. 95 should reduce operating and maintenance costs, increase plant life, and reduce or eliminate injuries with a corresponding decrease in associated costs.

The applicant suggest that the use of horizontal post-type insulators (as contrasted to crossarm construction) is a significant step in the aesthetic improvement of overhead lines. We feel, however, that the types are conceptually the same and consider that any difference in aesthetic values, if it could be determined, would be insignificant.

Furthermore, the selection of the superior type would appear to be a matter of personal preference. The Commission policy is to encourage and promote undergrounding of all facilities. It is hoped that the utilities would put more emphasis on this method of creating more aesthetic value where relative values would be as between a visible and an invisible facility.

While we will permit the use of crossarm less construction at this time, we must remind the utilities under our jurisdiction that we will not consider such construction a substitute for undergrounding of overhead electric facilities.

In approving, denying, or modifying the various proposals of the parties, we have placed emphasis on safety.

PG&E proposed the addition of new Rule 54.11 and related additions, deletions and amendments to General Order No. 95 so as to provide standards specifically applicable to the use of Post Insulators. PG&E's proposals are set forth in Exhibits No. 1, 2, and 3.

The staff's proposed specific recommendations for rule changes which adopt, deny or modify the several recommendations of PG&E insofar as they relate to post insulators, are found in Exhibit No. 9.

IBEW made certain recommendations relating to vertical construction which are found in Exhibit No. 11.

Edison did not present testimony or written evidence but did not make certain suggestions and recommendations in its written statement filed at the close of the proceeding.

For convenience, we shall discuss PG&E's proposed changes by reference to the staff proposals, Items Nos. 1 through 18, found at pages 21 to 25 of Exhibit No. 9.

Item No 1 – Rule 54.11 (Caption Only)

Staff recommended a modification to PG&E's proposal. IBEW and Edison urge adoption of staff's recommendation. PG&E's proposed caption, through longer, is more definitive than staff's and will be adopted.

Item No. 2 – Rule 54.11-A General

Staff recommended certain modification to PG&E's proposal and in addition recommended another paragraph be added to further define and clarify use of post insulators. IBEW and Edison concur with staff. The staff recommendation does clarify and define the use of post insulators and therefore will be adopted.

Item No. 3 – Rule 54.11-B (Caption only)

This item pertains to the caption only. All parties are in agreement. PG7e's caption will be adopted.

Item No. 4 – Rule 54.11-B(1) Conductor Clearance

IBEW and the staff, in the interest of providing safe operating conditions for workmen, proposed modifications which would: (1) assure that the metal clamps on post insulators be considered as part of the energized conductor, and (2) increase clearances by measuring clearances from the surface of the pole.

Edison recommends adoption of the proposal of PG&E. The proposal of the staff and of IBEW, Edison avouches, are ill-advised, unworkable and unnecessary. Edison strongly opposed these proposals.

Existing conductor clearance requirements in General Order No. 95 are measured by reference to the distance from the centerline of the pole to the conductor. Both the staff and the IBEW proposals would establish new points of

reference, i.e., from the surface of the pole to the "energized portions of post insulators." There is no technical difficulty in measuring clearances from the centerline of the pole because in crossarm construction the crossarm is bolted through the center of the pole and in vertical construction using horizontal post-type insulators the clearance from the pole is fixed by the length of the insulator and its bracket, if any. Designs are based on adding the fixed length of the insulator (and bracket, if any) to the diameter of the minimum size pole purchased so that climbing space is guaranteed. If increased clearances are justified, such change should be made directly and not in a manner which will tend to make General Order No. 95 more difficult to interpret and apply. A departure from conventional design criteria is bound to lead to confusion, error and inadvertent violation of the rule.

The term "energized portions of post insulators" as proposed by staff is ambiguous. It apparently is intended to refer to the hardware used to secure the conductor to the post insulator.

In view of the above discussion, we will adopt PG&E's proposal modified to state that hardware used to secure the conductor to the insulator shall be considered as part of the conductor for the purpose of determining clearances.

Item No. 5 – Rule 54.12-B(2). Conductor Arrangement

> 2. Conductor Arrangement: Not more than 1 circuit over 750 volts shall be attached to any pole on post insulators in triangular configuration. Not more than 4 conductors of any one circuit over 750 volts shall be attached to a pole on post insulators. The number of circuits attached to a pole by post insulators, except in triangular configuration, is not restricted. (A circuit is in triangular configuration only when it consists of one phase mounted vertically at the top of the pole and other phases mounted horizontally on opposite sides of the pole from each other.) The circuits shall be of one ownership.
>
> Conductors on post insulators over 750 volts shall not be attached to more than 3 sides (theres being 4 sides) of any pole at the level of any circuit group. Climbing space in conjunction with these attachments shall be maintained as specified by Rule 54.11-F.

IBEW and staff proposed that the rule be modified in the second paragraph to limit use to 2 instead of 3 sides of any pole, in order to provide adequate working space. In addition, the staff recommended the following paragraph be added to the rule in connection with its recommendation with respect to limiting use to 2 sided of a pole.

> In the event that circuit arrangement necessitates the utilization of 3 sides of pole conductor arrangement shall be such that all conductors of circuits less than 7,500 volts can be adequately covered and all conductors of circuits over 7,500volts can be moved out from the pole prior to workman entering the climbing space. Climbing space in conjunction with these attachments shall be maintained as specified by Rule 54.11-F.

The staff further recommended that the definition of triangular configuration should be clarified by the addition of the phrase "at the same level."

IBEW recommends that the proposed rule be approved if modified in accordance with recommendations made by it and staff.

PG&E does not agree that the two lower phases of a circuit in triangular configuration should not be required to be mounted at precisely the same level as one another. As testified to by its engineering witness, it is sometimes desirable to offset the lower two post-type conductors from one another in such a configuration so as to distribute the stress over a larger portion of the pole. Moreover, PG&E claims, since squarely back-to-back insulators would be attached with the same bolts, replacement of only one insulator would be considerably easier and safer if the insulators were offset slightly permitting the use of separate bolts. No reason was given why such circuit should be required to squarely back-to-back.

The suggestion of the IBEW that only two sides of the pole be use d for conductors attached to post insulators is impractical, according to PG&E, because the construction of an operable distribution line will necessarily involve the use of potheads, risers, lead wires, incidental pole wiring, etc., which will sometimes have to be mounted on the third side of the pole only if conductors over 7,5000 volts con be moved out from the pole, obviously does not provide a solution because risers and potheads, for example cannot be moved out from the pole. PG&E submits that unless the rule is written as it proposed, the use of post-type insulators will be needlessly hampered.

The staff interpretation that the vertical clearance between conductors mounted on horizontal post-type insulators be measured in the same fashion for conductors on opposite sides of the pole as for conductors on the same side of the pole is, PG&E submits, unreasonable. Referring to the configurations depicted on Exhibit No. , Figures 2 and 4, the staff interpretation would require the same clearance between the top conductor and the middle conductor. No good reason appears for this inasmuch as the radial clearance between the

conductors, under PG&E's proposal, will be greater in figure 4 than in Figure 2 and it is, after all, radial clearance which keeps conductors from contacting each other and burning down. Moreover, the conductors attached to insulators on the same level in Figures 1, 2, and 5 are considerably closer together than any two conductors in Figures 4, so safety is not enhanced by the staff's interpretation. The staff interpretation would either (1) eliminate the use of the configuration shown in Figure 4 for no good reason or (2) require utilities to use longer poles which are more conspicuous and more costly without enhancement of safety or continuity of service.

Edison generally concurs in the proposal with PG&E. Edison claims that both staff and the IBEW would restrict the definition of triangular configuration by requiring the lower phases to be mounted "at the same level". Edison opposes this additional restriction because good engineering practice may require the balancing of stress by off-setting the position of the lower phases.

Edison objects to the staff's suggestion that where circuit arrangement necessitates the use of three sides of the pole, lower voltage circuits be covered and higher voltage circuits be moved out from pole prior to entry by workmen. IBEW's proposal, according to Edison, would appear to provide attachments on more than two sides of the pole. Edison states that the staff attempts to incorporate into General Order No. 95 what is accepted good practice covered now by safety rules that it is also contrary to the purpose of General Order No. 95, which is to set construction standards and not to establish work practices. It will also be noted, however that the proposals that circuits be de-energized before workmen pass the lowest conductor level on the climbing side of the pole is in effect a working practice in the same broad sense as the staff proposal.

Edison proposed a rule identical to PG&E's except that it deletes the requirement that circuits be of one ownership. Edison maintains that no evidence supports such a restriction and that such a restriction would be an unwarranted limitation on essential, well-established joint pole practices.

We have reviewed the evidence re conductor arrangement and have considered the positions taken by each party. We believe the rule as proposed by PG&E, with the sentence "the circuits shall be of one ownership" deleted therefrom, as proposed by Edison merits adoption.

Item No. 6 – Rule 54.11-C. Conductor Material

No objections were raised in connection with PG&E's proposal. The proposed rule is reasonable and will be adopted.

Item No. 7 – Rule 54.11-D. Conductor Spacings

The staff and Edison recommended deletion of the phrase "in the same vertical plane" when establishing conductor spacing for horizontal post insulator construction. As previously stated, the exclusion of this phrase would either (1) eliminate the use of certain configuration or (2) require the utilities to use longer poles. Consequently. The proposed rule will be adopted.

Item No. 8 – Rule 54.11-E. Vertical Clearances Between Conductor Levels

No objections were raised in connection with PG&E's proposal. The rule, as proposed, is reasonable and will be adopted.

Item No. 9 Rule 54.11-F Climbing spaces

PG&E proposed the following rule:

F. Climbing Space for Direct Mounted Horizontal Post Insulators:

1. For a single circuit at the top of the pole, the climbing space shall be maintained to the lowest conductor level on the climbing side of the pole.

   Except: When the pole top circuit is de-energized the climbing space shall be maintained to the top conductor of the circuit. (See Appendix G, Fig 89, Drawings 1, 2, 3, and 4.)

2. Where two vertical circuits are installed at the top of the pole and commonly bonded, the climbing space shall be maintained to the lowest conductor level of those circuits on the climbing side of the pole.

   Except: (a) When both circuits are de-energized and commonly bonded and the bond and the circuits grounded as required in Rule 53.4-A3(b), the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 30 inches square.

   (b) When one circuit is de-energized and both circuits are commonly bonded and the bond and the de-energized circuit grounded as required in Rule 53.4-A3(b)

the climbing space shall be maintained on the climbing side between the center line of the pole and the de-enrgized conductors. The space shall not be less than 30 inches square. (See Appendix G, Fig 89, Drawing 5.)

3. For circuits below the pole top position climbing space shall be maintained through the levels of conductors supported on post insulators for a vertical distance of not less than four feet above the conductor and not les than four feet below the conductor.

The climbing space shall be a square of horizontal dimensions tabulated below and one side of the climbing space shall pass through the center line of the pole.

Voltage of Conductor	Dimensions of Square
750-7500 volts	30″
7500-46,000 volts	36″
More than 46,000 volts	36″ plus ½″ per kV in Excess of 46 kV

Staff, IBEW and Edison recommended various changes to PG&E's proposal. PG&E's proposal would adopt the same climbing space now applicable to other types of construction. The staff proposal, while based on the same clearance dimensions, indirectly increase the clearance requirement by changing the reference point from the centerline to the surface of the pole. The IBEW proposal would increase the clearance requirement by both increasing the clearance dimensions and by changing the reference point to the surface of the pole.

It is within this rule that the measures must be taken to provide the necessary climbing space and in turn the necessary working space to provide safe operating conditions for workmen. Also, steps can be taken in this rule to reduce the hazard of accidental contact with bond. Wires and bonded metallic materials.

In connection with proposed rule 54.11-F(1) and (2). PG&E's witness testified that it was it intention to treat that portion of the pole containing the energized pole top circuit or circuits in vertical construction as nonclimbable. For purpose of clarity and to spell this out, IBEW recommends that this be set forth in the rules by adding the phrase "and workmen shall not go above the lowest conductor level" at the end of the first paragraph of both rules. Looking at the exception in Rule 54.11-F(1), IBEW recommended that the word "grounded" be

inserted in first paragraph; this to assure the workman that the condition of the circuit is such that it is safe for him to climb through and work. IBEW also noted that nowhere in proposed Rule 54.11-F are provisions made to cover the situation where two unbonded circuits are located at the top of the pole. IBEW recommended that the proposed rule 54.11-F be reviewed to cover this situation.

IBEW is deeply concerned over hazards present to workmen in connection with bonded circuits regardless of the location of the circuit on the pole. This concern arises over the location of bond wires and bonded metallic materials in connection with crossarmless construction and the fact that while it is possible to cover the bond wires where it is attached vertically to the pole, it is next to impossible to cover the bonded brackets and other metallic materials. IBEW recommended that proposed Rule 54.11-F(2) be revised to cover bonded circuits regardless of their location on the pole.

Further steps can be taken to provide adequate climbing space and working space by increasing the Dimension of Square set forth in proposed Rule 54.11-F(3) and IBEW recommended that this be done. However, if IBEW recommendations with respect to Rules 54.11-F(1) and (2) are adopted, it does not believe that it would be necessary to increase the Dimension of Square to full extent it originally recommended.

Edison strongly opposes any change in the reference point for the clearance dimensions and recommends that such additional clearances as are found to be necessary to be referenced to the centerline of the pole.

According to Edison, the testimony supporting the IBEW recommendations for additional climbing space clearly indicates that their concern is limited to those cases where circuits on post insulators are below the top pole position as IBEW took no issue with proposals for pole top circuits.

In order to resolve the apparent conflict in the several proposals and to provide an adequate and workable rule, it is necessary, according to Edison, to distinguish between the lower circuits at the top pole position. In cases of one or more vertical circuits on post insulators below the top pole position, where conductors are installed on opposite sides of the pole at the same circuit level, additional climbing space appear justified. In other cases, Edison believes that existing climbing space requirements are adequate. The climbing space rule recommended by Edison is based on the clearance dimensions recommended by IBEW, but measure such dimensions from the centerline of the pole.

The proposals of the several parties would establish requirements for the following distances from the centerline of the pole (assuming an 8" diameter) to a 12kV conductor: PG&E-18", Edison-21", Staff-25", IBEW 25".

It is noted, however, that neither Edison's nor IBEW's proposals provide an option permitting the passage of workmen above the lower conductor level of a pole top circuit after the energized conductors have been moved out from the pole with "hot line" tools. Furthermore, IBEW's proposal would prohibit workmen from going above the lowest conductor level of energized bonded circuit on the climbing side of the pole irrespective position on the pole.

Furthermore, to meet the climbing space requirements recommended by PG&E, IBEW, and Edison for twin pole top circuits with one circuit de-energized (proposed Rule 54.11-F(2)(b)), it would be necessary for the utility to either maintain greater centerline conductor clearances than required by the order or move the de-energized conductor out from the pole before workmen can go above the lowest conductor level on the climbing side of the pole. The same is true of IBEW's proposal for bonded circuits irrespective of the relative position of the circuit on the pole.

It is believed that the provisions are unnecessarily restrictive and the authorized rule will permit workmen to climb above energized conductors that have been moved out from the pole sufficiently to provide workmen and their tools safe passage past energized conductors.

Item No. 10 – Rule 54.11-G

PG&E proposed the following rule:

> G. Allowable Climbing Space Obstructions: Post-type insulators and their attaching brackets which support line conductors of over 750 volts may extend not more than one-half of their dimension D into the climbing space. (See Appendix G, figure 89.)
>
> Suitable protected vertical conductors attached tot eh surface of poles and guys (except those guys contacting metal pins or dead-end hardware as specified in Rule 52.7-D are allowed in the climbing spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

The staffs recommended two revisions to PG&E's proposed rule. IBEW recommends they be adopted.

Edison recommends adoption of PG&E's proposal. The first proposal of the staff and of IBEW would prohibit post insulators in the climbing space unless

conductors "may be readily moved out from the pole or bracket by accepted hot line procedures." This proposal is objectionable, according to Edison, on at least two grounds. First it is unnecessary. If adequate climbing and working space are provided when conductors are attached, there is no reason to move conductors out. Second, these proposals are contrary to the basic concept of General Order No. 95 which is to prescribe construction standards and not to attempt to impose work practices. Even as a proposed work practice, this proposal is meaningless because it is obvious that any line conductor can be moved out from the pole. Secondly, the staff and IBEW suggest that through bolts, which may project into the climbing space, be covered with nonconducting material. Edison believes this proposal is objectionable because it would create a new greater hazard than the one they seek to eliminate. Bolt covers are rather bulky and obstruct the climbing space. Covering of relatively soft material can be penetrated by linemen's gaff and the use of relatively hard material would increase the chance of kickouts. According to Edison, experience clearly demonstrates that kickouts present a greater risk of serious injury to lineman than a possible contact with the bolt end.

According to PG&E this is an entirely useless requirement because one-half of the bracket or insulator itself is permitted in the climbing space. If it is permitted to have the bracket or insulator itself within the climbing space, there is no reason, PG&E claims to insulate the bolts which attaché the bracket or insulator to the pole, for those bolts cannot be energized to higher potential than the bracket or insulator.

Neither of the staff's proposals has merit. Neither adds to safety, but the second proposal, if adopted, could conceivably create a hazardous condition. We will adopt PG&E's proposal.

Items Nos. 12 and 13 – Rule 54.4-C(4)(b) and Rule 54.4-D(6)(b)

PG&E proposed the following changes in Rule 54.4-C(4)(b):

Delete: "Not more than two conductors of a circuit of 750-7500 volts shall be supported directly on a pole in vertical configuration without the use of crossarms."

Add for Reference: See Rule 54.11-F for climbing space requirements for conductors supported on post insulators.

PG&E also proposed the following changes in Rule 54.4-d(6)(b):

Delete: "Where conductors of more than one circuit are dead ended on a pole in vertical configuration, increased pole clearances are required as follows:

"All energized portions of conductors of a circuit dead ended in vertical configuration below any other circuit on a pole shall be maintained at a clearance of not less than 3 feet from the surface of the pole for conductors of more than 7500 volts; and

"Not more than two conductors of a circuit of 750-5000 volts shall be attached directly to a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported on a pole is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rule 54.7 is maintained."

General Order No. 95 now prohibits dead-ending more than two conductors of a circuit of 750 to 5,000 volts in certain cases. Unless these rules are changed, according to PG&E and Edison, vertical construction will be effectively prohibited for such circuits. Consistent with the development of new construction practices and the use of post insulators, PG&E and Edison recommend that this procedure no longer be prohibited.

The staff recommended that the present provisions of these rules be retained on the basis that the proposed change could result in increased hazards to linemen and that the proposal is unnecessary because alternate construction is available.

IBEW objected to these proposed deletions on the basis that increasing the number of conductors in such configuration would increase the hazards to workmen. IBEW therefore recommended that this portion of the application be denied.

IBEW also proposed the addition of a reference to Rule 54.11-F in Rule 54.4-C(4)(b). IBEW agrees in principle to this proposal but suggest that the reference to Rule 54.11-F apply to all types of vertical configuration.

The existing rules which limit attachments to only two conductors dead-ended in vertical configuration without the use of crossarms were established when such circuits were worked from below without covering the conductors. Under those conditions, the safe reach of a workman was prudently limited.

Today, according to PG&E and Edison, improved insulator and conductor coverings, gloves and other rubber goods are available so that such construction will not require any unsafe work practices and will result in improving the aesthetics of this type of construction.

We were not convinced by the testimony and arguments of the utilities that this work can now be done safely. We are concerned with safety, and in view of the evidence presented by the staff and IBEW we are concerned that PG&E's proposal should not be adopted at this time. The rules will be modified in accordance with the suggestions of IBEW.

Item No. 14 – Rule 54.7-A(1)

PG&E proposes to add a reference to Rule 54.11-F for climbing space where post insulators are utilized. IBEW agrees in principle to this proposal but suggest that this principle be applied to all types of vertical construction over 750 volts. The staff and Edison raised no objections. The proposal is reasonable and necessary, and will be adopted.

Item No. 15

PG&E proposed the following addition to Table 2.

Case No.	Nature of Clearance and class and voltage of wire cable or conductor concerned	A *	B *	C *	D *	E 750-7,500	F 7,500-20,000	G 20,000-35,000	H 35,000-68,000	I Over-68,000
**		*	*	*	*	*	*	*	*	*
20	Vertical clearance between conductors on horizontal Post Insulator	*	*	*	*	11 ½	17 ½	24	36	48(g)

"(g) 1.
2.
3. Conductors supported on Post type insulators 54.4-C(7)(c)"

Staff and IBEW concur that case 20 should be added but objected to the vertical clearance proposed by applicant and in doing, pointed out that applicant's proposed clearances would create potential hazards due to the type of live-line tools that are utilized. IBEW recommends that case 20 and footnote g(3) be added to Table 2 but that the vertical clearances be increased.

Edison agrees with these recommendations. It should be pointed out that the IBEW proposal properly recommends that the table heading referred to conductors "of the same circuit". In its written statement, PG&E changed its position and stated it did not oppose the 24-inch vertical separation proposed by staff.

The evidence regarding potential hazards is persuasive that the clearances should be increase. We will adopt IBEW's proposal.

Item No. 16- Rule 54.4-C(7)(c). Vertical Clearances Above 68 kV

Staff, PG&E, IBEW, and Edison each recommends the vertical clearances be applicable to post insulators.

The recommendations is desirable and will be adopted.

Items Nos. 17 and 18 – Rule 20.9 Definitions of Crossarms and Rule 20.9E. Definition of Post Insulator

PG&E Proposed the following changes:

Revise First sentence to read:

Crossarm or arm means a horizontal support attached to poles or structures generally at right angles to the conductor supported.

Add:

E. POST INSULATOR means a horizontal or vertical self-supporting insulator that provides suitable insulation for the voltage involved and is mounted with attaching hardware on the pole or structure to support a single conductor. (Refer to Rule 20.8 for definition of conductor)

PG&E's proposal deletes reference to specific materials.

Staff recommends retention of reference and that fiber glass be added to the types of material which can be used for crossarm as it believes that the company's proposed definition could be construed as being applicable to classifying a post insulator as a cross arm and thus permit it in the climbing space. To prevent such an interpretation staff recommended that the words "wood or metal" be retained in definition of crossarm together with fiber glass so that the first sentence of definition would read: "Crossarm or arms means a horizontal support of wood, fiber glass or metal attached to pole or structures generally at right angles to the conductors supported." The definition of post insulator proposed by company as Rule 20.9-E appears reasonable to the staff.

IBEW recommends approval of PG&E's proposal.

Edison concurs with PG&E. Edison states that any number of new materials or combination of new materials are being developed which may be suitable for crossarm construction including, but not limited to pre-stress concrete, PVC covered metal or fiver glass.

The definition of crossarms should be limited to the description of its function without any limitation on materials used. We will adopt PG&E's proposal, but set the definition of post insulators forth separately.

Service Drop

Applicant proposes that the provisions of this Rule 54.8-B(4)(a) and Rule 54.8-B(4)(b), including Table 10 be revised as set forth in Exhibit 4. These revisions permit 12-inch clearances for insulated service wires where service conductors pass over metallic as well as nonmetallic roofs for domestic buildings served and over specific portions of commercial buildings.

For residential purposes, clearances above other buildings on the premise served may be less than the distance specified in Table 10, but not less than 24 inches under certain conditions; and Rule 20.8-F defines "Insulated Conductors, suitable" as supply conductors surrounded by material which has a dielectric strength sufficient to withstand the maximum difference of potential under normal operating voltages of the circuit without breakdown or punctures.

The reasons for proposing the changes in Rule 54.8-B(4)(a) were set forth as being economic and aesthetic with the contention being made that the proposed change would not reduce safety to workmen or the general public. With respect to Rule 54.8-B(4)(b), the basic change was set forth as being an extension of proposed Rule 54.8-B(4)(a), which would also eliminate the need for a customer to rewire his service entrance if he added a non-walkable overhang.

IBEW and staff, while not opposing applicant's proposed revisions, as such, did in the interest of safety, propose modifications of or additions to applicant's proposed rules.

Staff recommended that "consist of abrasion-resistant cables having a grounded metal sheath and" be inserted in proposed Rules 54.8-B(4)(a) and 54.8-B(4)(b) for the purpose of providing safety for workmen for general contractors or private parties. With respect to the staff's recommendation it appears that applicant and the staff are in accord as to the type of service conductor that should be utilized – that being triplex service cable.

IBEW fount merit in staff's recommendation and, in addition, recommended that existing provisions of the next to last paragraph of present Rule 54.8-B(4)(a) be included in proposed Rule 54.8(4)(a) for the purpose of providing safety for workmen.

Edison recommends adoption of staff's proposal.

We will adopt the staff's recommendation re applicant's proposed changes to the existing requirements for service drops. "Abrasion resistant cable having a grounded metallic sheath" is to interpreted as referring to the same type of service wire now permitted for reduced clearing crossings over swimming pools. This wire is commonly called "Triplex" and is more particularly described in Commission Resolution No. E-1109 modifying Rule 54.8-B(5).

Lateral Runs, Underarm Moulding

PG&E claims that the requirement of Rule 54.6-C(3) (proposed Rule 54.6-C(4)) that protective covering over a lateral run extend to the outer position of any conductor in a run cannot be met when steel pins are utilized on crossarms.

In Rule 54.6-C(4) PG&E proposes that the protection of the underarm lateral run extend only to within 3 inches of the outer position of any conductor in the run rather than to the outer position of any conductor in the run as required by the existing order. PG&E contends that the proposed change will not create any hazard to workmen. The staff and IBEW, while not opposing PG&E's proposed change as such, pointed out conflicts with Table 1, Case 8 and recommended revisions to eliminate such conflict. Edison concurs with the staff recommendation. The suggestions of IBEW appear to be the most complete and will be adopted.

Tie Wire Size

Applicant proposes that Table 7, Rule 49.3—B(3) be revised to allow No. 6 AWG No. 6 AWG tie wires of strong alloy aluminum for all aluminum and ACSR line conductor sizes.

The reason for proposing the change is that it will provide strength equal to, or greater than the present #4 tire wire required by the General Order.

IBEW concurred that a #6 AWG strong aluminum tire wire is easier to handle than a #AWG soft aluminum tire wire and thus safer to handle.

IBEW, staff, and Edison recommend that the revision to Table 7, Rule 49.3-B(3) sought by applicant be approved. No reason appears why the proposed change should not be made.

Vertical Runs, Moulding

PG&E proposes to amend Rule 22.2 by adding paragraph D, so as to permit the use of rigid U-shaped plastic moulding as a "suitable protective covering" for vertical runs required by Rule 54.6-D. Such moulding would be composed of material meeting the same standards now required for plastic pipe use for vertical runs. AT the hearing, the staff disagreed with PG&E and recommended rejection of the proposed rule. The staff's recommendation that rigid U-shaped moulding not be authorized for vertical runs was based solely upon its lack of information upon which to base a recommendation that PG&E's proposal be adopted.

IBEW recommends only that the use of such plastic moulding be made subject to the attachment requirements of Rules 54.6-H and 84.6-F.

Edison believes that the use of rigid plastic moulding properly fastened tot eh pole is not unsafe and is, in many respects, superior to other materials now permitted. Edison concurs with IBEW there is a need for appropriate rules specifying the method in which such moulding should be fastened to the pole.

We have reviewed the evidence presented by all parties. NO good reason appears why plastic moulding should not be allowed.

In reviewing existing Rule s54.6-H and 84.6-F, it is apparent that there are unnecessary differences between these rules. The suggestions of IBEW that moulding be fastened at intervals of not less than three feet on each side appear to be equally applicable to hardwood moulding. TO eliminate these unnecessary differences and to adequately provide for suitable fastening, Rules 54.6-H and 84.6-F will be revised so that each reads as set forth in Appendix A.

Transpositions Not Vertical Runs

PG&E proposed that Rule 16 be clarified by amending it as follows:

Revise second paragraph to read:

Compliance with these rule is not intended to relieve a utility from other statutory requirements not specifically covered by these rules.

The staff, IBEW, and Edison did not oppose the proposed change. Adoption of the proposed rule will clarify the intent of Rule 16.

PG&E proposes to amend Rule 20.8, first paragraph, defining conductor so as to include cable.

Staff and IBEW both opposed applicant's proposed revision to Rule 20.8 on the basis that it could be interpreted to include multipath cable as a conductor. However, applicant witness testified this was not the intent. Edison recommends adoption of PG&E's proposal.

The staff recommended that Rule 20.8 as presently in the order be maintained as follows:

> CONDUCTOR means a wire, or combination of wires not included from one another, suitable for carrying electric current.

Adoption of the staff's proposal will remove any possibility of including multipath cable in the definition of conductor.

PG&E proposes to amend Rule 20.8-D to revise the definition of unprotected conductors so as to include those enclosed in plastic pipe. Staff recommends that the existing definition be retained.

IBEW suggests that plastic pipe not be included as suggested by PG&E because of doubt whether such plastic pipe would or would not have to meet the requirements of Rule 22.2

Edison believes that the existing definition and each of those proposed by PG&E, the staff and IBEW are ambiguous. This ambiguity results from the partial list of approved materials following the reference to Rule 22.2. Edison believes there is no need for such a listing of materials because a conductor should be considered protected when covered by any of the suitable protective coverings specified in Rule 22.2. To this end, Edison recommends a revision of Rule 20.8-D to read as follows:

> UNPROTECTED CONDUCTORS means supply conductors, including but not limited to lead wires, not covered by a "suitable protective covering" specified in Rule 22.2 and not enclosed in a grounded metal pole. Provisions for the use of such types of coverings are specified in certain of these rules.

Edison's proposal with the addition of certain portions of the present rule has merit and will be adopted.

PG&E proposes to add New Rule 20.8-E to define a vertical conductor. Staff, IBEW, and Edison concur. The proposed rule will be adopted.

PG&E proposes to add New Rule 20.8-F to define insulated conductors. Staff, IBEW, and Edison concur. The proposed rule will be adopted.

PG&E proposes to add New Rule 20.8-G to define terminal fittings. Staff, IBEW, and Edison concur. The proposed rule will be adopted.

PGE proposed that Rule 21.5 be revised to read as follows:

> LEAD WIRES mean those conductors which are sometimes termed "jumpers", "bridle wires", "transposition wires" or "tops", and which are used on an overhead line structure for connecting the line conductors to equipment and apparatus or other line conductors.

Staff proposed that the phrase " on the same overhead line structure" be inserted at the end of the proposed rule. IBEW and Edison concur, with staff's recommendation. Adoption of the staff proposal will clearly define what is meant by the term "lead wires".

PG&E proposes to add New Rule 21.7-D to define overhead line structures. Staff, IBEW, and Edison concur. The proposed change will be adopted.

PG&E proposes to revise Rule 54.6-A, 54.6-C(1-5), 54.6-C(4), 54.6-D(1-6) and 54.6-F to explicitly detail the rule for treating vertical and lateral conductors. Staff suggests minor changes; IBEW and Edison concur with staff. The staff proposed changes will be adopted as they further clarify PG&E's proposals.

Glass Fiber Insulators for Sectionalizing

Rule 56.6-D authorizes the use of wood strain insulators for sectionalizing guys exposed to 22,500 volts or more. Applicant proposes to also allow glass fiber noninterlocking sectionalizing insulators.

Applicant would also expand Table 4 " Minimum Safety Factors" to include noninterlocking glass fiber guy insulators with recommended minimum safety factors for the various grades of construction. Footnotes a and b would specify under what conditions the insulators are to be replaced. The required initial safety factor for noninterlocking glass fiber insulators has been set by applicant at 2 for Grades "B" and "C" construction. Footnotes a and b would require

replacement of the insulator before the safety factor for Grade "B" construction is reduced to 95 percent of 2 or 75 percent of 2 for Grade "C" construction.

The staff proposed minor changes. Edison and IBEW recommend the rule be modified as proposed by the staff.

The superiority of glass fiber insulators over wood with respect to natural deterioration or damage from electrical sources recommends its use as an approved guy sectionalizing insulator for construction where guys are exposed to voltages over 22,500.

Applicant's proposal as modified by the staff proposal will be adopted.

Additional Changes

The voltage requirements for post-type insulators are not presently covered by General Order No. 95 nor are they included in this application. Because of the similarity of physical and operating characteristics of post-type insulators and suspension and strain insulators the staff recommended for post-type insulators.

According to the staff, the strength requirements of post insulators could properly be construed as falling within the provisions of Rule 49.5-A which states, in part: "Insulators, supports, clamps and other miscellaneous attachments shall be designed to withstand with at least the safety factors specified in Rule 44; the mechanical stress to which they are subjected by conductors, wires or structures, under the loading conditions as specified in Rule 43." However, the mechanical loading to which such insulators are subjected are somewhat different than contemplated when the order was issued and it therefore recommended that the following, applicable specifically to post insulators, be included as Rule 49.5-D;

D POST

Post insulators units including supports, clamps and other miscellaneous attachments shall have a cantilever strength determined in accordance with paragraph 5.1.3 of the American Standard Insulator Tests, Publication No. C29.1-1961, or the latest revision thereof, equal to or greater than the product of the safety factors specified in Rule 44 and the mechanical stress to which they are subjected by conductors, wires, or structures under the loading conditions as specified in Rule 43.

The recommendations have merit and will be adopted.

In view of the evidence and in light of the foregoing discussion of its elements, the Commission finds:

1. The public interest, including safety to workmen and the public generally, will not be adversely affected by the use of crossarmless construction.

2. It is reasonable to modify the existing rules of General Order No. 95 and to add new rules to provide for the construction and operation of overhead lines in California, utilizing crossarmless construction.

3. It is reasonable to modify the existing rules and to add new rules as set forth in Appendix A, and as discussed in this opinion.

The Commission concludes that the application herein should be granted to the extent set forth in the following order and that in all other respects said application should denied.

ORDER

IT IS ORDERED that this Commission's General Order No. 95 "Rules for Overhead Electric Line Construction", be and it is hereby modified to the extent set forth in Appendix A attached to this order, said modifications to become effective on the effective date of this order.

IT IS FURTHER ORDERED that the Secretary shall cause a copy of this order and its Appendix to be served upon each electric and upon each telephone utility subject to jurisdiction of this Commission and, further, to cause a suitable number of copies to be made available for distribution to such of the general public as may request the same.

The effective date of this order shall be twenty-five days after the date hereof.

Dated at San Francisco, California, this 12th day of December, 1967.

Appendix A

The rules of General Order No. 95 are modified, amended or added to as set forth below:

Rule 16

The second paragraph of this rule is amended to read as follows:

Compliance with these rules is not intended to relieve a utility from other statutory requirements not specifically covered by these rules.

Rule 20.8-D

This rule is amended to read as follows:

> UNPROTECTED CONDUCTORS means supply conductors, including but not limited to lead wires, not covered by a "suitable protective covering" (See Rule 22.2), grounded metal conduit, grounded metal sheath or shield or impregnated fiber, and not enclosed in a grounded metal pole. Provisions for the use of such types of coverings are specified in certain of these rules.

Rule 20.8-E

Add new Rule 20.8-E as follows:

> VERTICAL CONDUCTOR means a conductor extending in a general vertical direction between conductor levels on an overhead line structure.

Rule 20.8-F

Add new Rule 20.8-F as follows:

> INSULATED CONDUCTORS, suitable, means supply conductors which are surrounded by an insulating material, the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture. A weather-resistant covering of a supply conductor does not meet the requirements of this rule as to a suitable insulation.

Rule 20.8-G

Add new Rule 20.8-G as follows:

> TERMINAL FITTINGS are the terminal equipment used in terminating the conductors of runs and risers and include cable potheads and conduit entrance fittings.

Rule 20.9

This rule is amended and added to as follows:

Revise first sentence to read as follows:

> CROSSARM OR ARM means a horizontal support attached to poles or structures generally at right angles to the conductor supported.

Add Rule 20.10

> POST INSULATORS means a horizontal or vertical self-supporting insulator that provide suitable insulation for the voltage involved and is mounted with attaching hardware on the pole or structure to support a single conductor (Refer to Rule 20.8 for definition of conductor).

Rule 21.5

This rule is amended to read as follows:

> LEAD WIRES means those conductors which are sometimes termed "jumpers", "bridle wires", "transposition wires", or "taps", and which are used on an overhead line structure for connecting the line conductors to equipment and apparatus or other line conductors on the same overhead line structure.

Rule 21.7-D

Add Rule 21.7-D as follows:

> OVERHEAD LINE STRUCTURES are the poles, towers, or structures located outside of buildings and which support circuits and their related conductors and equipment.

Rule 22.2

Add:

D RIGID U-SHAPED MOULDING made of unplasticized polyvinyl chloride having the properties and dimensions specified as Type II, High impact Normal Chemical Resistance in United States Department of Commerce Commercial Standards No. CS 207-60. The plastic moulding herein specified shall be installed only outside the climbing space on poles or structures within the light loading districts as defined in Rule 21.0-C and Rule 43.

Rule 49.5

Rule 49.5-D is added to as follows:

D. Post

Post insulator units including insulator supports, clamps and other miscellaneous attachments shall have a cantilever strength determined in accordance with a paragraph 5.1.3 of the American Standard Insulator Tests, Publication No. C29.1-1961, or the latest revision thereof, equal to or greater than the product of the safety factors specified in Rule 44 and the mechanical stress to which they are subjected by conductors, wires, or structures under the loading conditions as specified in Rule 43.

Rule 54.11

Add new Rule 54.11 as follows:

Post insulators in vertical and horizontal position without crossarms; more than 750 volts.

A. GENERAL

Post insulators supporting conductors of more than 750 volts may be attached to poles in vertical or horizontal position, and, where so attached, the following rules shall apply.

A post insulator mounted directly on the side of a pole shall be considered as in a horizontal position.

A post insulator mounted directly at the top of the pole in a vertical position shall be considered as in vertical position.

B. POLE ARRANGEMENT AND CLEARANCES

(1) Clearances: Conductors and the hardware used to secure the conductor to the insulator shall have clearances from the centerline of the pole (as specified in Rule 54.4-D2) when supported on post insulators that are mounted in horizontal position. Conductors and the hardware used to secure the conductor to the insulator shall have clearance from the surface of the pole (as specified by Table 1, Case 9, Columns E and F) when mounted in a vertical position.

(2) Conductor Arrangement: Not more than one circuit over 750 volts shall be attached to any pole on post insulators in tri- angular configuration. Not more than four conductors of anyone circuit over 750 volts shall be attached to a pole on post insulators. The number of circuits attached to a pole by post insulators, except in triangular configuration, is not restricted (a circuit is in triangular configuration only when it consists of one phase on insulators mounted vertically at the top of the pole and other phases on insulators mounted horizontally on opposite sides of the pole).

Conductors on post insulators over 750 volts shall not be attached to more than three sides (there being four sides) of any pole at the same level of any circuit group. Climbing space in con- junction with these attachments shall be maintained as specified by Rule 54.11F.

C. CONDUCTOR MATERIAL

All conductors of the same circuit on post insulators in the same vertical plane shall be of the same material.

D. CONDUCTOR SPACING

The vertical separation between conductors of the same circuit supported on post insulators in the same vertical plane shall be not less than spacing as indicated in Table 2, Case 20, Columns E, F, G, H and I.

E. VERTICAL CLEARANCES BETWEEN CONDUCTOR LEVELS

A vertical clearance of not less than that specified in Table 2, Case 8 through 13, shall be maintained between the lowest conductor supported on post insulator of a circuit group and the conductors supported on the same pole of the next lower circuit group.

F. CLIMBING SPACE

(1) One Vertical Circuit at Pole Top: For a single circuit at the top of the pole, the climbing space shall be maintained to the lowest conductor on the climbing side of the pole and workmen shall not go above the lowest conductor level,

EXCEPT:

(a) When Conductors Are Moved Out From Pole by accepted "hotline" techniques, or

(b) When the Pole Top Circuit Is De-energized and grounded, the climbing space shall be maintained to the top conductor of the circuit

and the climbing space shall not be less than 30 inches square.

(2) Two Vertical Circuits at Pole Top: When two vertical circuits are installed at the top of pole, the climbing space shall be maintained to the lowest conductor level of those circuits on the climbing side of the pole and workmen shall not go above such lowest conductor level,

EXCEPT:

(a) When Conductors Are Moved Out From Pole by accepted "hotline" techniques, or

(b) When Both Circuits Are De-energized and grounded the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 30 inches square.

(c) When One Circuit Is De-energized and grounded, the climbing space shall be maintained on the climbing side between the center line of the pole and the de-energized conductors. The space shall be not less than 36 inches square.

(3) Vertical Circuits Bonded Together: When vertical circuits are bonded together, regardless of location on the pole, the climbing space shall be maintained to the lowest conductor level of those circuits on the climbing side of the pole and workmen shall not go above such lowest conductor level, unless conductors are moved out from pole by accepted "hotline" techniques, or

EXCEPT:

(a) Where a Single Circuit is Involved and such circuit is de-energized and the bond and the de-energized circuit is grounded as required in Rule 53.4-A3b, the climbing space shall not be less than 36 inches and shall be maintained for

a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

(b) Where Two Circuits Are Involved:

1. When Both Circuits Are De-energized and commonly bonded and the bond and the circuits grounded as required in Rule 53.4-A3b, the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 36 inches square and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

2. When One Circuit Is De-energized and both circuits are commonly bonded and the bond and the de-energized circuit grounded as required in Rule 53.4-A3b, the climbing space shall be maintained on the climbing side between the center line of the pole and the de-energized conductors. The space shall not be less than 36 inches square, and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

(4) Unbonded Circuits Below Pole Top: For unbonded circuits below the pole top position climbing space shall be maintained through the levels of conductors supported on post insulators for a vertical distance of not less than four feet above the top conductor and not less than four feet below the lowest conductor.

The climbing space shall be a square of horizontal dimensions tabulated below and one side of the

climbing space shall pass through the center line of the pole.

Voltage of Conductor	Dimensions of Square
750-7,500 volts :	36"
7,500-46,000 volts	42"
More than 46,000 volts	42" plus ½ " per kV in excess of 46 kV

G. ALLOWABLE CLIMBING SPACE OBSTRUCTIONS

Post-type insulators and their attaching brackets which support line conductors of over 750 volts may extend not more than one-half of their dimension D into the climbing space.

Suitable protected vertical conductors attached to the surface of poles and guys (except those guys contacting metal pins or dead-end hardware (as specified in Rule 52.7D)) are allowed in the climbing spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

Rule 54.4-C(4)(b)

This rule is amended as follows:

(b) CONDUCTORS OF MORE THAN 750 VOLTS SUPPORTED ON CLIMBABLE POLES: Where conductors of more than 750 volts are supported in vertical configuration directly on a climbable pole without the use of crossarms at line terminations, angles or corners, the following requirements apply:

The vertical separation between conductors of the same circuit shall not be less than the clearances specified in Table 2, Case 15 and 20;

The vertical separation of different circuits shall be not less than the clearance specified in Table 2, Cases 8 to 13, inclusive;

Not more than two conductors of a circuit of 750-5000 volts shall be supported directly on a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5,000 volts so supported on a pole shall be limited such construction without the use of crossarms provided a climbing and working space as specified in Rule 54.7 and Rule 54.11 is maintained; and

The clearance of conductors from surface of pole shall be not less than as specified in Rule 54.4-D(6)(b).

See Rule 54.7-A(1) and Rule 54.11-F for climbing space requirements for conductors dead ended on poles in vertical configuration.

Rule 54.4-C(7)(c)

This rule is added to as follows:

Add:

(C) SUPPORTED ON POST INSULATORS

Supported on horizontal post insulators, the vertical clearances shall be increased by ½ inch for each kilovolt above 68 kV.

Rule 54.4-D(6)(b)

This rule is amended to read as follows:

(b) MORE THAN &%) VOLTS SUPPORTED ON CLIMABLE POES:

Where conductors are supported on a climbable pole in vertical configuration the energized portions less than 15 inches from the surface of the pole for between 750 and 7500 volts and 18 inches from surface of pole for voltages in excess of 7500 volts.

Not more than two conductors of a circuit of 750-5000 volts shall be attached directly to a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported on a pole is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rules 54.7 and 54.11 is maintained.

Rule 54.6-A

This rule is amended to read as follows:

Unprotected conductors may pass laterally on a pole or structure or vertically from one level on a pole or structure to another level, but shall not pass within the climbing space; shall not pass within the working space, except as permitted by Rule 54.7 -B2; shall not pass between the conductors of any other circuit, except between pole-pin conductor positions; and shall clear the conductors of other circuits by distances not less than the following:

Highest voltage classification of conductors concerned	Minimum radial distance between conductors
0-5000 volts	11 ½ inches
5000-7500 volts	17 ½ inches
7500-20,000 volts	24 inches
20,000 volts and above	36 inches

Where the distance between levels is in excess of 12 feet and unprotected conductors pass between the pole-pin conductor positions of any other circuit, additional supports shall be installed so that the maximum length of conductor between supports is not more than 12 feet.

The clearances in the above tabulation do not apply between taps in buckarm construction, the clearances specified in Table 2, Case 16, being directly applicable.

For clearances between street light drop wires and cables, other conductors and metal boxes, see Rules 58.2-B3 and 92.1-F5.

Unprotected conductors, installed as specified in this rule (54.6-A.) and in Rule 54.4-D9 are not vertical or lateral runs as defined in Rule 22.6.

In lieu of the foregoing, vertical and lateral conductors may be installed as specified in Rules 54.6-0 and 54.6-D.

Rule 54.6-C1 is amended to read as follows:

(1) LATERAL RUNS: Lateral conductors installed as specified in this Rule 54.6-C are known as Lateral Runs.

Rule 54.6-C2 is amended to read as follows:

(2) CONDUCTORS OF 0-750 VOLTS: Lateral conductors of 0-750 volts may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 an 17, and with less than the clearances from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductors are suitably insulated and placed along the bottom surface of crossarms and are protected by wood moulding or impregnated fiber conduit of thickness not less than as specified in Rule 22.2, or are protected by plastic pipe having the properties of the material designated as Type II in the standard specified in Rule 22.2-C. The plastic pipe shall have a minimum wall thickness of 0.10 inch.

Rule 54.6-C3 is amended to read as follows:

(3) CONDUCTORS OF MORE THAN VOLTS: Lateral conductors of more than 750 volts may be installed with less than the radial clearances between conductors specified in Table 2, Cases 16 and 17, and with less than the clearances from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductors are suitably insulated and are protected by the impregnated fiber conduit or plastic pipe specified in Rule 54.6-C2, such conduit or pipe being placed along and attached to the bottom surface of crossarm.

Rule 54.6-C4 is amended to read as follows:

(4) EXTENT OF RUN: The wood moulding, fiber conduit, or plastic pipe required for protection by this Rule 54.6-C shall extend on the bottom surface of the crossarm to within three inches of the outer position of any conductor in the run and in no case shall the covering be terminated at clearances from the center line of pole less then specified for conductors in Table 1, Case 8.

Rule 54.6-C5 is amended to read as follows:

(5) OPTION: In lieu of the foregoing lateral conductors may be installed as specified in Rules 54.6-A and 54.4-D9

Rule 54.6-D1 is amended to read as follows:

(1) VERTICAL RUNS: Vertical conductors installed as specified in this Rule 54.6-D are known as Vertical Runs.

Rule 54.6-D2 is amended to read as follows:

(2) RUNS LESS THAN 18 INCHES FROM POLE CENTERLINE: Vertical conductors may be installed with less than the radial clearances between conductors, specified in Table, Cases 16 and 17, and on the surface of poles or less than 18 inches from center line of pole provided such conductors are suitably insulated and covered throughout by a suitable protective covering. (See Rule 22.2 for the definition of suitable protective covering.) the plastic pipe or U-shaped moulding specified in Rule 22.2 shall have a minimum wall thickness of 0.15 inches. This protective covering is not required over suitably insulated vertical conductors in metal conduit attached to metal poles, towers, or other structures provided conduit and structures are metallically connected and effectively grounded.

Rule 54.6-D3 is amended to read as follows:

(3) RUNS 18 INCHES FROM POLE CENTERLINE: Vertical conductors may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and at a distance of more than 18 inches from the center line of any pole provided that such conductors are suitably insulated and covered by suitable protective covering or by securely supported impregnated fiber conduit without metal conduit. Such conductors shall be located outside of the climbing and working spaces and shall not pass between conductors of different ownership except between the pole pair and at a clearance therefrom of no less than 6 inches.

Rule 54.6-D4 is amended to read as follows:

(4) OPTION: In lieu of the foregoing vertical conductors may be installed as unprotected conductors, as specified in Rules 54.6-A and 54.4-D9.

Rule 54.6-D5 is amended to read as follows:

(5) RUNS WITHIN 8 FEET OF GROUND: Vertical conductors installed as specified in Rule 54.6-D(1) and 54.6-D(2) and which extend within 8 feet of the ground shall be treated as risers. Runs which terminate in the top of the runs may extend within 8 feet of the ground but not less than 6 feet of the ground without being treated as risers.

Rule 54.6-D6 is amended to read as follows:

(6) RUNS ENCASED IN GROUNDED METAL COVERING: Vertical conductors where encased shall be treated as risers.

RULE 54.6-H

This rule is amended to read as follows:

Protective covering shall be attached to poles, crossarms and structures by means of corrosion-resistant straps, lags or staples which are adequate to maintain such covering in a fixed position.

Where such covering consists of hardwood or rigid plastic moulding, the distance between straps, lags or staples shall not exceed three feet on each side and due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

When U-shaped moulding is utilized appropriate gaps between sections shall be provided to permit expansion due to temperature variations and such gaps shall be covered by corrosion resistant straps to prevent contact with conductors covered by moulding.

Rule 54.7-A(1)

This rule is added to as follows:

For climbing Space dimensions where post insulators are utilized see Rule 54.11-F.

Rule 54.8-B(4)(a)

This rule is amended to read as follows:

(a) INDUSTRIAL AND COMMERCIAL PREMISES: On premises used for industrial and commercial purposes service drops shall be maintained at a vertical clearance of not less than 8 feet over all or any portions of buildings and structures, except that service drops of 0-750 volts may be less than 8 feet, but not less than 12 inches above the metallic or nonmetallic cornice, decorative appendage, eave, roof, or parapet wall of the building served provided:

The current carrying service conductors are insulated for the voltage being supplied (see Rule 20.8-F), and the point of attachment of the service drops is not more than 18 inches back of the front face of the building wall facing the pole line from which the service drops originate.

Service drops are not required to clear buildings any specific horizontal distance but shall be so installed that they clear fire escapes, exits, windows, doors and other points at which human contact might be expected, a horizontal distance of not less than 3 feet.

Where service drop crosses over metallic or non-metallic nonwalkable overhang or patio cover vertical clearance may be less than 8 feet, but not less than 24 inches providing such service drops consist of abrasion-resistant cables having a grounded metallic sheath and are insulated for the voltage being supplied.

Rule s 54.8-B(4)(b) and Table 10

This rule is amended as follows:

In Table 10 add "(c)" after "8 ft." and "2 ft." in Column 1 (Building served). Footnote (c) to read:

(c) Where insulated abrasion-resistant conductors are may be reduced to 12 inches.

Preceding the last paragraph and following the table, add the following paragraphs:

On premises used for residential purposes only the clearance above building of service drops of 0-300 volts may be less than the distance specified in Table 10 but not less than 12 inches over the building served nor less than 24 inches above other buildings on the premises served, provided:

The current-carrying conductors consist of abrasion-resistant cable having a grounded metallic voltage being supplied and the roof is metallic or nonmetallic, nonwalkable over hang or patio cover.

Rule 55.3-B

This rule is modified as follows:

"B. SUSPENSION, POST, and STRAIN TYPES"

"Suspension, post, and strain type insulators…"

Rule 56.6-D

This rule is amended as follows:

Add at the end of the third paragraph:

> "or, glass fiber noninterlocking strair insulators which are designed to provide impulse insulation for lighting conditions."

Replace that portion of Table 4 relating to guy insulators to read as follows:

TABLE 4

Minimum Safety Factors

Element of Line	Grades of Construction			
	Grade "A"	Grade "B"	Grade "C"	Grade "D"
***	***	***	***	***
Guy insulators (Mechanical)				
Interlocking	2	2	2	2
Noninterlocking wood	3	3	3	-
Noninterlocking glass fiber	3	2(a)	2(b)	-

(a) Insulators are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement or other conditions subsequent to installation) to less than 95 percent of the safety factor specified in Rule 44.1.

(b) Insulator are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement, or other conditions subsequent to installation) to less than 75 percent of the safety factor specified in Rule 44.1.

Rule 84.6-F

This rule is amended to read as follows.

Protective covering shall be attached to poles crossarms and structures be means of corrosion resistant straps, lags or staples which are adequate to maintain such covering in a fixed position.

Where such covering consists of hardwood or rigid plastic moulding, the distance between straps, lags or staples shall not exceed three feet on each side due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

When U-shaped moulding is utilized appropriate gaps between sections shall be provided to permit expansion due to temperature variations and such gaps shall be covered by corrosion resistant straps to prevent contact with conductors covered by moulding.

Table 2

Table 2 is modified as follows:

		A	B	C	D	E	F	G	H	I
Case No.	Nature of clearance and class and voltage of wire cable or conductor concerned	*	*	*	*	750-7500	7,500-20,000	20,000-35,000	35,000-68,000	Over 68,000
***	***	*	*	*	*	*	*	*	*	*
20	Vertical clearance between conductors of the same circuit on horizontal post insulators	*	*	*	*	24	24	30	36	48(g)

(g) 1.
2.
3. Conductors supported on post insulators 54.4-C(7)(e)

Note Strikeout and Underline added on June 10, 2002 by Raymond G Fugere

Original Version

Rule 16

16 Saving Clause

The Commission reserves the right to change any of the provisions of these rules in specific cases when, in the Commission's opinion, public interest would be served by so doing.

Compliance with these rules is not intended to relieve a utility from any statutory requirement.

Strikeout and Underline Version

Rule 16

16 Saving Clause

The Commission reserves the right to change any of the provisions of these rules in specific cases when, in the Commission's opinion, public interest would be served by so doing.

Compliance with these rules is not intended to relieve a utility from ~~any~~ other statutory requirements not specifically covered by these rules.

Final Version

Rule 16

16 Saving Clause

The Commission reserves the right to change any of the provisions of these rules in specific cases when, in the Commission's opinion, public interest would be served by so doing.

Compliance with these rules is not intended to relieve a utility from other statutory requirements not specifically covered by these rules.

Original Version
Rule 20.8

20.8 Conductor means a wire, or combination of wires not insulated from one another, suitable for carrying electric current.

A **Lateral Conductor** means a conductor extending in a general horizontal direction and usually at an angle of approximately 90 degrees to the direction of the line conductors.

B **Line Conductor** means an overhead conductor which extends from the last point of support on one overhead line structure to the first point of support on another overhead line structure.

C **Open Wire Conductors** mean communication conductors separately supported.

D **Unprotected Conductors** mean supply conductors not covered by a "suitable protective covering" (see Rule 22.2), grounded metal conduit, grounded metal sheath or shield, or impregnated fiber and not enclosed in a grounded metal pole. The provisions for the use of these various types of coverings are specified in certain of these rules.

Strikeout and Underline Version
Rule 20.8

20.8 Conductor means a wire, or combination of wires not insulated from one another, suitable for carrying electric current.

A **Lateral Conductor** means a conductor extending in a general horizontal direction and usually at an angle of approximately 90 degrees to the direction of the line conductors.

B **Line Conductor** means an overhead conductor which extends from the last point of support on one overhead line structure to the first point of support on another overhead line structure.

C **Open Wire Conductors** mean communication conductors separately supported.

D **Unprotected Conductors** means supply conductors, including but not limited to lead wires, not covered by a "suitable protective covering" (see Rule 22.2), grounded metal conduit, grounded metal sheath or shield, or impregnated fiber and not enclosed in a grounded metal pole. The provisions for the use of these various types of coverings are specified in certain of these rules.

E **Vertical Conductor** means a conductor extending in a general vertical direction between conductor levels on an overhead line structure.

F **Insulated Conductors**, suitable, means supply conductors which are surrounded by an insulating material, the dielectric strength of which is sufficient to withstand the maximum difference of potential at normal operating voltages of the circuit without breakdown or puncture. A weather-resistant covering of a supply conductor does not meet the requirements of this rule as to a suitable insulation.

G **Terminal Fittings** are the terminal equipment used in terminating the conductors of runs and risers and include cable potheads and conduit entrance fittings.

Final Version
Rule 20.8

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G **Terminal Fittings** are the terminal equipment used in terminating the conductors of runs and risers and include cable potheads and conduit entrance fittings.

Original Version
Rule 20.9

20.9 **Crossarm or Arm** means a horizontal support of wood or metal attached to poles or structures generally at right angles to conductor supported.

A **Combination Arm** means a cross arm supporting supply conductors of 0-750 volts and supply conductors of 750-7500 volts.

B **Related Buck Arm** means a crossarm used to change the direction of all or a part of the conductors on the line arm immediately above or below. A buck arm is generally placed at right angles to the line arm.

C **Clearance Arm** means a crossarm supporting conductors installed on a pole of another line for the purpose of maintaining the prescribed clearances of this order which, if the other line did not exist, could be maintained without such clearance arm.

D **Guard Arm** means a wood crossarm installed on a pole directly above and parallel to the messenger, cable or conductors being guarded. Guard arms are required in certain cases of low voltage rack construction (see Rule 54.9-E) and certain cases of cable construction (see Rules 57.7, 87.7 and 92.1). Guard arms shall not be used to support conductors or other line facilities except as specifically provided in these rules (see Rules 84.8-B2c and 87.7-B).

Strikeout and Underline Version
Rule 20.9

20.9 **Crossarm or Arm** means a horizontal support ~~of wood or metal~~ attached to poles or structures generally at right angles to conductor supported.

A **Combination Arm** means a cross arm supporting supply conductors of 0-750 volts and supply conductors of 750-7500 volts.

B **Related Buck Arm** means a crossarm used to change the direction of all or a part of the conductors on the line arm immediately above or below. A buck arm is generally placed at right angles to the line arm.

C **Clearance Arm** means a crossarm supporting conductors installed on a pole of another line for the purpose of maintaining the prescribed clearances of this order which, if the other line did not exist, could be maintained without such clearance arm.

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Final Version
Rule 20.9

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Original Version
Rule 20.10

New Rule

Strikeout and Underline Version
Rule 20.10

20.10 **Post Insulators** means a horizontal or vertical self-supporting insulator that provide suitable insulation for the voltage involved and is mounted with attaching hardware on the pole or structure to support a single conductor (Refer to Rule 20.8 for definition of conductor).

Final Version
Rule 20.10

20.10 **Post Insulators** means a horizontal or vertical self-supporting insulator that provide suitable insulation for the voltage involved and is mounted with attaching hardware on the pole or structure to support a single conductor (Refer to Rule 20.8 for definition of conductor).

Original Version
Rule 21.5

21.5 **Lead Wires** mean those wires which are sometimes termed "jumpers", "Bridle wires" or "taps" and which are used for connecting the line conductors to equipment and apparatus.

Strikeout and Underline Version
Rule 21.5

21.5 **Lead Wires** mean those ~~wires~~ conductors which are sometimes termed "jumpers", "bridle wires", "transposition wires", or "taps" and which are used on an overhead line structure for connecting the line conductors on the same overhead line structure. ~~to equipment and apparatus.~~

Final Version
Rule 21.5

21.5 **Lead Wires** mean those conductors which are sometimes termed "jumpers", "bridle wires", "transposition wires", or "taps" and which are used on an overhead line structure for connecting the line conductors on the same overhead line structure.

Original Version
Rule 21.7

21.7 **Lines** means those conductors together with their supporting poles or structures and appurtenances which are located outside of buildings.

A **Conflicting Lines** (lines in conflict or conflicts) mean lines so situated with respect to each other (except at crossings) that the overturning of one line will result in contact of its poles or conductors with the poles or conductors of the second line, assuming no conductors are broken in either line; except that line on opposite sides of a thoroughfare are not considered as conflicting if separated by a distance not less than 60 per cent the height of the higher pole line above the ground line and in no case less than 20 feet (see App. G, Fig. 1).

B **Colinear Lines** mean:

Conflicting lines so situated that one line is wholly or partly over the other line, often called "overbuild'

Conflicting lines not "overbuilds" but not separated a horizontal distance of less than the required pin spacing of the highest voltage circuit involved

Conflicting lines not "overbuilds" but separated a horizontal distance of less than one foot, regardless of pine spacings. (See App. G, Figs. 2 and 3.)

Note-For the purpose of measurement, the horizontal distance between the conflicting lines shall be that distance measured horizontally between vertical planes passing through the adjacent extremities of the conflicting lines.

C **Tower Lines** (Class H, L and T) mean supply lines, the supporting structures of which are of steel or other metal and have a maximum outside dimension of more than 4 feet measured either along or across the line in a horizontal plane at the ground level. Metal supporting structures, "A" frames or "H" structures, having a dimension from outside of one support to outside of another support greater than 4 feet at the ground level will be classified as towers.

Note-Steel or metal structures having maximum outside dimensions of 4 feet or less, measured along and cross the line in a horizontal plane at the ground level, will be classified as poles under supply lines.

Strikeout and Underline Version
Rule 21.7

21.7 **Lines** means those conductors together with their supporting poles or structures and appurtenances which are located outside of buildings.

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B **Colinear Lines** mean:

Conflicting lines so situated that one line is wholly or partly over the other line, often called "overbuild'

Conflicting lines not "overbuilds" but not separated a horizontal distance of less than the required pin spacing of the highest voltage circuit involved

Conflicting lines not "overbuilds" but separated a horizontal distance of less than one foot, regardless of pine spacings. (See App. G, Figs. 2 and 3.)

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D **Overhead Line Structures** are the poles, towers, or structures located outside of buildings and which support circuits and their related conductors and equipment.

Final Version
Rule 21.7

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Original Version
Rule 22.2

22.2 PROTECTIVE COVERING, Suitable, means a covering of wood, or other material as authorized by the Public Utilities Commission, having the electrical insulating efficiency and mechanical strength of 1 ½ inches of redwood. Materials meeting the requirements of this definition, when installed in a workmanlike manner include:

A. IMPREGNATED FIBER CONDUIT, having a wall thickness of not less than one quarter of an inch, installed over rigid metal conduit as illustrated in Figure 82 of Appendix G.

B. HARDWOOD MOULDING (oak or rock elm) three eights of an inch in thickness, or having a cross-section as shown in Figure 81 of Appendix G, when used as a covering for ground wires and communication conductors.

Douglas Fir moulding ½-inch in thickness shall be considered as meeting the requirements of this rule for suitable protection of ground and bond wires.

C. PLASTIC PIPE made of rigid unplasticized polyvinyl chloride having the properties and dimensions specified as Type II, High Impact, Normal Chemical Resistance in United States Department of Commerce Commercial Standard No. CS 207-60. The plastic pipe herein specified shall be installed only outside the climbing space on poles or structures within the light loading district as defined in Rule 21.0-C and Rule 43.

Strikeout and Underline Version
Rule 22.2

22.2 PROTECTIVE COVERING, Suitable, means a covering of wood, or other material as authorized by the Public Utilities Commission, having the electrical insulating efficiency and mechanical strength of 1 ½ inches of redwood. Materials meeting the requirements of this definition, when installed in a workmanlike manner include:

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D. RIGID U-SHAPED MOULDING made of unplasticized polyvinyl chloride having the properties and dimensions specified as Type II, High impact Normal Chemical Resistance in United States Department of Commerce Commercial Standards No. CS 207-60. The plastic moulding herein specified shall be installed only outside the climbing space on poles or structures within the light loading districts as defined in Rule 21.0-C and Rule 43.

Final Version
Rule 22.2

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A. IMPREGNATED FIBER CONDUIT, having a wall thickness of not less than one quarter of an inch, installed over rigid metal conduit as illustrated in Figure 82 of Appendix G.

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D. RIGID U-SHAPED MOULDING made of unplasticized polyvinyl chloride having the properties and dimensions specified as Type II, High impact Normal Chemical Resistance in United States Department of Commerce Commercial Standards No. CS 207-60. The plastic moulding herein specified shall be installed only outside the climbing space on poles or structures within the light loading districts as defined in Rule 21.0-C and Rule 43.

Original Version
Rule 49.5

49.5 Insulators

A Line

Insulators, supports, clamps and other miscellaneous attachments shall be designed to withstand, with at least the safety factors specified in Rule 44, the mechanical stress to which they are subjected by conductors, wires or structures, under the loading conditions as specified in Rule 43. Pin insulators shall effectively engage the thread of the pin for at least two and one-half turns.

B Guy

Guy insulators, including insulators in messengers, shall have mechanical strength at least equal to that required of the guys in which they are installed.

C Replacements (see Rule 44.2)

Strikeout and Underline Version
Rule 49.5

49.5 Insulators

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Insulators, supports, clamps and other miscellaneous attachments shall be designed to withstand, with at least the safety factors specified in Rule 44, the mechanical stress to which they are subjected by conductors, wires or structures, under the loading conditions as specified in Rule 43. Pin insulators shall effectively engage the thread of the pin for at least two and one-half turns.

B Guy

Guy insulators, including insulators in messengers, shall have mechanical strength at least equal to that required of the guys in which they are installed.

C Replacements (see Rule 44.2)

D. Post

Post insulator units including insulator supports, clamps and other miscellaneous attachments shall have a cantilever strength determined in accordance with a paragraph 5.1.3 of the American Standard Insulator Tests, Publication No. C29.1-1961, or the latest revision thereof, equal to or greater than the product of the safety factors specified in Rule 44 and the mechanical stress to which they are subjected by conductors, wires, or structures under the loading conditions as specified in Rule 43.

Final Version
Rule 49.5

49.5 Insulators

A Line

Insulators, supports, clamps and other miscellaneous attachments shall be designed to withstand, with at least the safety factors specified in Rule 44, the mechanical stress to which they are subjected by conductors, wires or structures, under the loading conditions as specified in Rule 43. Pin insulators shall effectively engage the thread of the pin for at least two and one-half turns.

B Guy

Guy insulators, including insulators in messengers, shall have mechanical strength at least equal to that required of the guys in which they are installed.

C Replacements (see Rule 44.2)

D. Post

Post insulator units including insulator supports, clamps and other miscellaneous attachments shall have a cantilever strength determined in accordance with a paragraph 5.1.3 of the American Standard Insulator Tests, Publication No. C29.1-1961, or the latest revision thereof, equal to or greater than the product of the safety factors specified in Rule 44 and the mechanical stress to which they are subjected by conductors, wires, or structures under the loading conditions as specified in Rule 43.

Original Version
Rule 54.11

New Rule

Strikeout and Underline Version
Rule 54.11

54.11 Post insulators in vertical and horizontal position without crossarms; more than 750 volts.

A. GENERAL

Post insulators supporting conductors of more than 750 volts may be attached to poles in vertical or horizontal position, and, where so attached, the following rules shall apply.

A post insulator mounted directly on the side of a pole shall be considered as in a horizontal position.

A post insulator mounted directly at the top of the pole in a vertical position shall be considered as in vertical position.

B. POLE ARRANGEMENT AND CLEARANCES

(1) Clearances: Conductors and the hardware used to secure the conductor to the insulator shall have clearances from the centerline of the pole (as specified in Rule 54.4-D2) when supported on post insulators that are mounted in horizontal position. Conductors and the hardware used to secure the conductor to the insulator shall have clearance from the surface of the pole (as specified by Table 1, Case 9, Columns E and F) when mounted in a vertical position.

(2) Conductor Arrangement: Not more than one circuit over 750 volts shall be attached to any pole on post insulators in tri-angular configuration. Not more than four conductors of anyone circuit over 750 volts shall be attached to a pole on post insulators. The number of circuits attached to a pole by post insulators, except in triangular configuration, is not restricted (a circuit is in triangular configuration only when it consists of one phase on insulators mounted vertically at the top of the pole and other phases on insulators mounted horizontally on opposite sides of the pole).

Conductors on post insulators over 750 volts shall not be attached to more than three sides (there being four sides) of any pole at the same level of any circuit group. Climbing space in con- junction with these attachments shall be maintained as specified by Rule 54.11F.

C. CONDUCTOR MATERIAL

All conductors of the same circuit on post insulators in the same vertical plane shall be of the same material.

D. CONDUCTOR SPACING

The vertical separation between conductors of the same circuit supported on post insulators in the same vertical plane shall be not less than spacing as indicated in Table 2, Case 20, Columns E, F, G, H and I.

E. VERTICAL CLEARANCES BETWEEN CONDUCTOR LEVELS

A vertical clearance of not less than that specified in Table 2, Case 8 through 13, shall be maintained between the lowest conductor supported on post insulator of a circuit group and the conductors supported on the same pole of the next lower circuit group.

F. CLIMBING SPACE

(1) One Vertical Circuit at Pole Top: For a single circuit at the top of the pole, the climbing space shall be maintained to the lowest conductor on the climbing side of the pole and workmen shall not go above the lowest conductor level,

EXCEPT:

(a) When Conductors Are Moved Out From Pole by accepted "hotline" techniques, or

(b) When the Pole Top Circuit Is De-energized and grounded, the climbing space shall be maintained to the top conductor of the circuit and the climbing space shall not be less than 30 inches square.

(2) Two Vertical Circuits at Pole Top: When two vertical circuits are installed at the top of pole, the climbing space shall be maintained to the lowest conductor level of those circuits on the climbing side of the pole and workmen shall not go above such lowest conductor level,

EXCEPT:

(a) When Conductors Are Moved Out From Pole by accepted "hotline" techniques, or

(b) When Both Circuits Are De-energized and grounded the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 30 inches square.

(c) When One Circuit Is De-energized and grounded, the climbing space shall be maintained on the climbing side between the center line of the pole and the de-energized conductors. The space shall be not less than 36 inches square.

(3) Vertical Circuits Bonded Together: When vertical circuits are bonded together, regardless of location on the pole, the climbing space shall be maintained to the lowest conductor level of those circuits on the climbing side of the pole and workmen shall not go above such lowest conductor level, unless conductors are moved out from pole by accepted "hotline" techniques, or

EXCEPT:

(a) Where a Single Circuit is Involved and such circuit is de-energized and the bond and the de-energized circuit is grounded as required in Rule 53.4-A3b, the climbing space shall not be less than 36 inches and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

(b) Where Two Circuits Are Involved:

1. When Both Circuits Are De-energized and commonly bonded and the bond and the circuits grounded as required in Rule 53.4-A3b, the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 36 inches square and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

2. When One Circuit Is De-energized and both circuits are commonly bonded and the bond and the de-energized circuit grounded as required in Rule 53.4-A3b, the climbing space shall be maintained on the climbing side between the center line of the pole and the de-energized conductors. The space shall not be less than 36 inches square, and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

(4) Unbonded Circuits Below Pole Top: For unbonded circuits below the pole top position climbing space shall be maintained through the levels of conductors supported on post insulators for a vertical distance of not less than four feet above the top conductor and not less than four feet below the lowest conductor.

The climbing space shall be a square of horizontal dimensions tabulated below and one side of the climbing space shall pass through the center line of the pole.

Voltage of Conductor	Dimensions of Square
750-7,500 volts :	36"
7,500-46,000 volts	42"

More than 46,000 volts	42" plus ½ " per kV in excess of 46 kV

G. ALLOWABLE CLIMBING SPACE OBSTRUCTIONS

Post-type insulators and their attaching brackets which support line conductors of over 750 volts may extend not more than one-half of their dimension D into the climbing space.

Suitable protected vertical conductors attached to the surface of poles and guys (except those guys contacting metal pins or dead-end hardware (as specified in Rule 52.7D)) are allowed in the climbing spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

Final Version
Rule 54.11

54.11 Post insulators in vertical and horizontal position without crossarms; more than 750 volts.

A. GENERAL

Post insulators supporting conductors of more than 750 volts may be attached to poles in vertical or horizontal position, and, where so attached, the following rules shall apply.

A post insulator mounted directly on the side of a pole shall be considered as in a horizontal position.

A post insulator mounted directly at the top of the pole in a vertical position shall be considered as in vertical position.

B. POLE ARRANGEMENT AND CLEARANCES

(1) Clearances: Conductors and the hardware used to secure the conductor to the insulator shall have clearances from the centerline of the pole (as specified in Rule 54.4-D2) when supported on post insulators that are mounted in horizontal position. Conductors and the hardware used to secure the conductor to the insulator shall have clearance from the surface of the pole (as specified by Table 1, Case 9, Columns E and F) when mounted in a vertical position.

(2) Conductor Arrangement: Not more than one circuit over 750 volts shall be attached to any pole on post insulators in tri-angular configuration. Not more than four conductors of anyone circuit over 750 volts shall be attached to a pole on post insulators. The number of circuits attached to a pole by post insulators, except in triangular configuration, is not restricted (a circuit is in triangular configuration only when it consists of one phase on insulators mounted vertically at the top of the pole and other phases on insulators mounted horizontally on opposite sides of the pole).

Conductors on post insulators over 750 volts shall not be attached to more than three sides (there being four sides) of any pole at the same level of any circuit group. Climbing

space in con- junction with these attachments shall be maintained as specified by Rule 54.11F.

C. CONDUCTOR MATERIAL

All conductors of the same circuit on post insulators in the same vertical plane shall be of the same material.

D. CONDUCTOR SPACING

The vertical separation between conductors of the same circuit supported on post insulators in the same vertical plane shall be not less than spacing as indicated in Table 2, Case 20, Columns E, F, G, H and I.

E. VERTICAL CLEARANCES BETWEEN CONDUCTOR LEVELS

A vertical clearance of not less than that specified in Table 2, Case 8 through 13, shall be maintained between the lowest conductor supported on post insulator of a circuit group and the conductors supported on the same pole of the next lower circuit group.

F. CLIMBING SPACE

(1) One Vertical Circuit at Pole Top: For a single circuit at the top of the pole, the climbing space shall be maintained to the lowest conductor on the climbing side of the pole and workmen shall not go above the lowest conductor level,

EXCEPT:

(a) When Conductors Are Moved Out From Pole by accepted "hotline" techniques, or

(b) When the Pole Top Circuit Is De-energized and grounded, the climbing space shall be maintained to the top conductor of the circuit and the climbing space shall not be less than 30 inches square.

(2) Two Vertical Circuits at Pole Top: When two vertical circuits are installed at the top of pole, the climbing space shall be maintained to the lowest conductor level of those circuits on

the climbing side of the pole and workmen shall not go above such lowest conductor level,

EXCEPT:

(a) When Conductors Are Moved Out From Pole by accepted "hotline" techniques, or

(b) When Both Circuits Are De-energized and grounded the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 30 inches square.

(c) When One Circuit Is De-energized and grounded, the climbing space shall be maintained on the climbing side between the center line of the pole and the de-energized conductors. The space shall be not less than 36 inches square.

(3) Vertical Circuits Bonded Together: When vertical circuits are bonded together, regardless of location on the pole, the climbing space shall be maintained to the lowest conductor level of those circuits on the climbing side of the pole and workmen shall not go above such lowest conductor level, unless conductors are moved out from pole by accepted "hotline" techniques, or

EXCEPT:

(a) Where a Single Circuit is Involved and such circuit is de-energized and the bond and the de-energized circuit is grounded as required in Rule 53.4-A3b, the climbing space shall not be less than 36 inches and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

(b) Where Two Circuits Are Involved:

1. When Both Circuits Are De-energized and commonly bonded and the bond and the circuits grounded as required in Rule 53.4-A3b, the climbing space shall be maintained to the top conductors of the circuits. The space shall not be less than 36 inches square and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

2. When One Circuit Is De-energized and both circuits are commonly bonded and the bond and the de-energized circuit grounded as required in Rule 53.4-A3b, the climbing space shall be maintained on the climbing side between the center line of the pole and the de-energized conductors. The space shall not be less than 36 inches square, and shall be maintained for a vertical distance of not less than 4 feet below the lowest conductor and not less than 4 feet above the top conductor when not at the top of pole.

(4) Unbonded Circuits Below Pole Top: For unbonded circuits below the pole top position climbing space shall be maintained through the levels of conductors supported on post insulators for a vertical distance of not less than four feet above the top conductor and not less than four feet below the lowest conductor.

The climbing space shall be a square of horizontal dimensions tabulated below and one side of the climbing space shall pass through the center line of the pole.

Voltage of Conductor	Dimensions of Square
750-7,500 volts :	36"
7,500-46,000 volts	42"
More than 46,000 volts	42" plus ½ " per kV in excess of 46 kV

G. ALLOWABLE CLIMBING SPACE OBSTRUCTIONS

Post-type insulators and their attaching brackets which support line conductors of over 750 volts may extend not more than one-half of their dimension D into the climbing space.

Suitable protected vertical conductors attached to the surface of poles and guys (except those guys contacting metal pins or dead-end hardware (as specified in Rule 52.7D)) are allowed in the climbing spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

Original Version
Rule 54.4-C4b

54.4C-4 Dead Ended on Pole in Vertical Configuration:

b) Conductors of More than 750 Volts supported on climbable poles: Where conductors of more than 750 Volts are supported in vertical configuration directly on a climbable pole without the use of crossarms at the line terminations, angles or corners, the following requirements apply:

The vertical separation between conductors of the same circuit shall not be less than the pin spacings specified in Table 2, Case 15;

The vertical separation between conductors of different circuits shall not be less than the clearances specified in Table 2, cases 8 to 13, inclusive;

Not more than two conductors of a circuit of 750-5000 volts shall be supported directly on a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rule 54.7 is maintained; and

The clearance of conductors from surface of pole shall not be less than as specified in Rule 54.4-D6b.

See Rule 54.7-A1 for climbing space requirements for conductors dead ended on poles in vertical configuration

Strikeout and Underline Version
Rule 54.4-C4b

54.4C-4 Dead Ended on Pole in Vertical Configuration:

b) Conductors of More than 750 Volts supported on climbable poles: Where conductors of more than 750 Volts are supported in vertical configuration directly on a climbable pole without the use of crossarms at the line terminations, angles or corners, the following requirements apply:

The vertical separation between conductors of the same circuit shall not be less than the clearances ~~pin spacings~~ specified in Table 2, Cases 15 and 20;

The vertical separation between conductors of different circuits shall not be less than the clearances specified in Table 2, cases 8 to 13, inclusive;

Not more than two conductors of a circuit of 750-5000 volts shall be supported directly on a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rule 54.7 and Rule 54.11 is maintained; and

The clearance of conductors from surface of pole shall not be less than as specified in Rule 54.4-D6b.

See Rule 54.7-A1 and Rule 54.11-F for climbing space requirements for conductors dead ended on poles in vertical configuration.

Final Version
Rule 54.4-C4b

54.4C-4 Dead Ended on Pole in Vertical Configuration:

b) Conductors of More than 750 Volts supported on climbable poles: Where conductors of more than 750 Volts are supported in vertical configuration directly on a climbable pole without the use of crossarms at the line terminations, angles or corners, the following requirements apply:

The vertical separation between conductors of the same circuit shall not be less than the clearances specified in Table 2, Cases 15 and 20;

The vertical separation between conductors of different circuits shall not be less than the clearances specified in Table 2, cases 8 to 13, inclusive;

Not more than two conductors of a circuit of 750-5000 volts shall be supported directly on a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rule 54.7 and Rule 54.11 is maintained; and

The clearance of conductors from surface of pole shall not be less than as specified in Rule 54.4-D6b.

See Rule 54.7-A1 and Rule 54.11-F for climbing space requirements for conductors dead ended on poles in vertical configuration.

Original Version
Rule 54.4-C(7)(c)

54.4(C)7 Voltages of More Than 68,000 Volts:

c New Rule

Strikeout and Underline Version
Rule 54.4-C(7)(c)

54.4(C)7 Voltages of More Than 68,000 Volts:

(C) SUPPORTED ON POST INSULATORS

Supported on horizontal post insulators, the vertical clearances shall be increased by ½ inch for each kilovolt above 68 kV.

Final Version
Rule 54.4-C(7)(c)

54.4(C)7 Voltages of More Than 68,000 Volts:

(C) SUPPORTED ON POST INSULATORS

Supported on horizontal post insulators, the vertical clearances shall be increased by ½ inch for each kilovolt above 68 kV.

Strikeout and Underline Version
Rule 54.4-D6b

Rule 54.4-D6 Dead Ended on Poles

b) More Than 750 Volts supported on climbable poles:

Where conductors are supported ~~dead ended~~ on a climbable pole in vertical configuration, the energized portions of such conductors shall have clearances of not less than 15 inches from the surface of pole for voltages between 750 and 7500 volts and 18 inches from the surface of pole for voltages in excess of 7500 volts. ~~Where conductors of more than one circuit are dead ended on a pole in vertical configuration, increased pole clearances are required as follows:~~

~~All energized portions of conductors of a circuit dead ended in vertical configuration below any other circuit on a pole shall be maintained at a clearance of not less than 3 feet from the surface of the pole for conductors of more than 7500 volts; and~~

Not more than two conductors of a circuit of 750-5000 volts shall be attached directly to a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported on a pole is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rules 54.7 and 54.11 is maintained.

Final Version
Rule 54.4-D6b

Rule 54.4-D6 Dead Ended on Poles

b) More Than 750 Volts supported on climbable poles:

Where conductors are supported on a climbable pole in vertical configuration, the energized portions of such conductors shall have clearances of not less than 15 inches from the surface of pole for voltages between 750 and 7500 volts and 18 inches from the surface of pole for voltages in excess of 7500 volts.

Not more than two conductors of a circuit of 750-5000 volts shall be attached directly to a pole in vertical configuration without the use of crossarms. The number of conductors of a circuit of more than 5000 volts so supported on a pole is not limited. Branch circuits may be taken from such construction without the use of crossarms provided a climbing and working space as specified in Rules 54.7 and 54.11 is maintained.

Original Version
Rule 54.6A

54.6A Unprotected Conductors (see Rule 20.8-D for definition)

Unprotected conductors from one level on a pole or structure to another level shall not pass within the climbing space; shall not pass within the working space, except as permitted by Rule 54.7-B2; shall not pass between the conductors of any other circuit, except between pole pin conductor positions; and shall clear the conductors of other circuits by distances not less than the following:

Highest voltage Classification Of conductors concerned	Minimum radial distance before conductors
0-5000 volts	11 ½ inches
5000-7500 volts	17 ½ inches
7500-20,000 volts	24 inches
20,000 volts and above	36 inches

Where the distance between levels is in excess of 12 feet and unprotected conductors pass between the pole-pin conductor positions of any other circuit, additional supports shall be installed so that the maximum length of conductor between supports is not more than 12 feet.

The clearances in the above tabulations do not apply between taps in buckram construction, the clearances specified in Table 2, Case 16 being directly applicable.

For clearances between street light drop wires and cables, other conductors and metal boxes, See Rules 58.2-B3 and 92.1-F5

Strikeout and Underline Version
Rule 54.6A

54.6A Unprotected Conductors (see Rule 20.8-D for definition)

Unprotected conductors may pass laterally ~~from one level~~ on a pole or structure or vertically from one level on a pole or structure to another level shall not pass within the climbing space; shall not pass within the working space, except as permitted by Rule 54.7-B2; shall not pass between the conductors of any other circuit, except between pole pin conductor positions; and shall clear the conductors of other circuits by distances not less than the following:

Highest voltage Classification Of conductors concerned	Minimum radial distance before conductors
0-5000 volts	11 ½ inches
5000-7500 volts	17 ½ inches
7500-20,000 volts	24 inches
20,000 volts and above	36 inches

Where the distance between levels is in excess of 12 feet and unprotected conductors pass between the pole-pin conductor positions of any other circuit, additional supports shall be installed so that the maximum length of conductor between supports is not more than 12 feet.

The clearances in the above tabulations do not apply between taps in buckram construction, the clearances specified in Table 2, Case 16 being directly applicable.

For clearances between street light drop wires and cables, other conductors and metal boxes, See Rules 58.2-B3 and 92.1-F5

Unprotected conductors, installed as specified in this rule (54.6-A.) and in Rule 54.4-D9 are not vertical or lateral runs as defined in Rule 22.6.

In lieu of the foregoing, vertical and lateral conductors may be installed as specified in Rules 54.6-0 and 54.6-D.

Final Version
Rule 54.6A

54.6A Unprotected Conductors (see Rule 20.8-D for definition)

Unprotected conductors may pass laterally on a pole or structure or vertically from one level on a pole or structure to another level shall not pass within the climbing space; shall not pass within the working space, except as permitted by Rule 54.7-B2; shall not pass between the conductors of any other circuit, except between pole pin conductor positions; and shall clear the conductors of other circuits by distances not less than the following:

Highest voltage Classification Of conductors concerned	Minimum radial distance before conductors
0-5000 volts	11 ½ inches
5000-7500 volts	17 ½ inches
7500-20,000 volts	24 inches
20,000 volts and above	36 inches

Where the distance between levels is in excess of 12 feet and unprotected conductors pass between the pole-pin conductor positions of any other circuit, additional supports shall be installed so that the maximum length of conductor between supports is not more than 12 feet.

The clearances in the above tabulations do not apply between taps in buckram construction, the clearances specified in Table 2, Case 16 being directly applicable.

For clearances between street light drop wires and cables, other conductors and metal boxes, See Rules 58.2-B3 and 92.1-F5

Unprotected conductors, installed as specified in this rule (54.6-A.) and in Rule 54.4-D9 are not vertical or lateral runs as defined in Rule 22.6.

In lieu of the foregoing, vertical and lateral conductors may be installed as specified in Rules 54.6-0 and 54.6-D.

Original Version
Rule 54.6-C

54.6-C Lateral

(1) CONDUCTORS OF 0-750 VOLTS: Lateral runs of conductors of 0-750 volts may be less than the clearances from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductors are suitably insulated and placed along the bottom surface of crossarms and are protected by wood moulding or impregnated fiber conduit of thicknesses not less than as specified in Rule 22.2, or are protected by plastic pipe designated as Type II, in the standard specified in Rule 22.2-C. The plastic pipe shall have a minimum wall thickness of 0.10 inches.

(2) CONDUCTORS OF MORE THAN 750 VOLTS: Lateral runs of conductors of more than 750 volts may be less than the clearances from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductor s are suitably insulated and are protected by the impregnated fiber conduit or plastic pipe specified in Rule 54.6C(1), such conduit or pipe being placed along and attached to the bottom surface of crossarm.

(3) EXTENT OF RUN: The wood moulding, fiber conduit, or plastic pipe required for protection by this Rule 54.6C shall extend entirely under and along the arm to the outer position of any conductor in the run and in no case shall the covering be terminated within 15 inches from center line of pole.

(4) CONDUCTOR CLEARANCES: The radial clearances between conductors, specified in Table 2, Cases 16 and 17, are not required between the suitably insulated conductors in the same lateral run.

Strikeout and Underline Version
Rule 54.6-C

54.6-C Lateral

(1) LATERAL RUNS: Lateral conductors installed as specified in this Rule 54.6-C are known as Lateral Runs.

(~~1~~2) CONDUCTORS OF 0-750 VOLTS: Lateral ~~runs of~~ conductors of 0-750 volts may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and with less than the clearance from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductors are suitably insulated and placed along the bottom surface of crossarms and are protected by wood moulding or impregnated fiber conduit of thicknesses not less than as specified in Rule 22.2, or are protected by plastic pipe designated as Type II, in the standard specified in Rule 22.2-C. The plastic pipe shall have a minimum wall thickness of 0.10 inches.

(~~2~~3) CONDUCTORS OF MORE THAN 750 VOLTS: Lateral runs of conductors of more than 750 volts may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and with less than the clearance less than the clearances from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductor s are suitably insulated and are protected by the impregnated fiber conduit or plastic pipe specified in Rule 54.6C(~~1~~2), such conduit or pipe being placed along and attached to the bottom surface of crossarm.

(~~3~~4) EXTENT OF RUN: The wood moulding, fiber conduit, or plastic pipe required for protection by this Rule 54.6C shall extend on the bottom surface of crossarm to within three inches ~~of entirely under and along the arm to~~ the outer position of any conductor in the run and in no case shall the covering be terminated ~~within 15 inches~~ from center line of pole less than specified for conductors in Table 1, Case 8.

~~(4) CONDUCTOR CLEARANCES: The radial clearances between conductors, specified in Table 2, Cases 16 and 17, are not required between the suitably insulated conductors in the same lateral run.~~

(5) OPTION: In lieu of the foregoing lateral conductors may be installed as specified in Rules 54.6-A and 54.4-D9

Final Version
Rule 54.6-C

54.6-C Lateral

(1) LATERAL RUNS: Lateral conductors installed as specified in this Rule 54.6-C are known as Lateral Runs.

(2) CONDUCTORS OF 0-750 VOLTS: Lateral conductors of 0-750 volts may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and with less than the clearance from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductors are suitably insulated and placed along the bottom surface of crossarms and are protected by wood moulding or impregnated fiber conduit of thicknesses not less than as specified in Rule 22.2, or are protected by plastic pipe designated as Type II, in the standard specified in Rule 22.2-C. The plastic pipe shall have a minimum wall thickness of 0.10 inches.

(~~2~~3) CONDUCTORS OF MORE THAN 750 VOLTS: Lateral runs of conductors of more than 750 volts may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and with less than the clearance less than the clearances from center line and surface of pole, and from the surface of crossarm, as specified in Table 1, Cases 8 and 9, provided such conductor s are suitably insulated and are protected by the impregnated fiber conduit or plastic pipe specified in Rule 54.6C(2), such conduit or pipe being placed along and attached to the bottom surface of crossarm.

(4) EXTENT OF RUN: The wood moulding, fiber conduit, or plastic pipe required for protection by this Rule 54.6C shall extend on the bottom surface of crossarm to within three inches the outer position of any conductor in the run and in no case shall the covering be terminated from center line of pole less than specified for conductors in Table 1, Case 8.

(5) OPTION: In lieu of the foregoing lateral conductors may be installed as specified in Rules 54.6-A and 54.4-D9

Original Version
Rule 54.6-D

54.6 Vertical and Lateral Conductors

D Vertical Runs

Conductors installed in the form of vertical runs on the surface of poles or not more than 18 inches from the center line of a pole shall be suitably insulated and covered throughout by a suitable protective covering. (See Rule 22.2 for the definition of suitable protective covering) The plastic pipe specified in Rule 22.2-C shall have a minimum wall thickness of 0.15 inches. This protective covering is not required over vertical runs in metal conduit attached to metal poles, towers or other structures provided pipe and structure are metallically connected and effectively grounded.

Conductors in the form of vertical runs more than 18 inches from the center line of any pole shall be suitably insulated and covered by a suitable protective covering or by securely supported impregnated fiber conduit without metal pipe. The suitable protective covering specified in Rule 22.2-C shall have a minimum wall thickness of 0.15 inches. Such runs shall be located outside of the climbing and working spaces and shall not pass between conductors of different ownership except between the pole pair and at a clearance thereform of not less than 6 inches.

Vertical runs, where encased in grounded non-climbable metal poles, grounded metal conduit, sheath, or shield, shall be treated as risers.

Conductors installed in the form of vertical runs which extend within 8 feet of the ground shall be treated as risers. Runs which terminate in the top of enclosures which afford ample mechanical protection to the runs may extend within 8 feet of the ground but not less than 6 feet of the ground without being treated as risers.

The radial clearances between conductors, specified in Table 2, Cases 16 and 17, are not required between suitably insulated conductors in the same vertical run.

Strikeout and Underline Version
Rule 54.6-D

54.6 Vertical and Lateral Conductors

D Vertical Runs

~~Conductors installed in the form of vertical runs on the surface of poles or not more than 18 inches from the center line of a pole shall be suitably insulated and covered throughout by a suitable protective covering. (See Rule 22.2 for the definition of suitable protective covering) The plastic pipe specified in Rule 22.2-C shall have a minimum wall thickness of 0.15 inches. This protective covering is not required over vertical runs in metal conduit attached to metal poles, towers or other structures provided pipe and structure are metallically connected and effectively grounded.~~

~~Conductors in the form of vertical runs more than 18 inches from the center line of any pole shall be suitably insulated and covered by a suitable protective covering or by securely supported impregnated fiber conduit without metal pipe. The suitable protective covering specified in Rule 22.2-C shall have a minimum wall thickness of 0.15 inches. Such runs shall be located outside of the climbing and working spaces and shall not pass between conductors of different ownership except between the pole pair and at a clearance thereform of not less than 6 inches.~~

~~Vertical runs, where encased in grounded non-climbable metal poles, grounded metal conduit, sheath, or shield, shall be treated as risers.~~

~~Conductors installed in the form of vertical runs which extend within 8 feet of the ground shall be treated as risers. Runs which terminate in the top of enclosures which afford ample mechanical protection to the runs may extend within 8 feet of the ground but not less than 6 feet of the ground without being treated as risers.~~

~~The radial clearances between conductors, specified in Table 2, Cases 16 and 17, are not required between suitably insulated conductors in the same vertical run~~.

(1) VERTICAL RUNS: Vertical conductors installed as specified in this Rule 54.6-D are known as Vertical Runs.

(2) RUNS LESS THAN 18 INCHES FROM POLE CENTERLINE: Vertical conductors may be installed with less than the radial clearances between conductors, specified in Table, Cases 16 and 17, and on the surface of poles or less than 18 inches from center line of pole provided such conductors are suitably insulated and covered throughout by a suitable protective covering. (See Rule 22.2 for the definition of suitable protective covering.) the plastic pipe or U-shaped moulding specified in Rule 22.2 shall have a minimum wall thickness of 0.15 inches. This protective covering is not required over suitably insulated vertical conductors in metal conduit attached to metal poles, towers, or other structures provided conduit and structures are metallically connected and effectively grounded.

(3) RUNS 18 INCHES FROM POLE CENTERLINE: Vertical conductors may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and at a distance of more than 18 inches from the center line of any pole provided that such conductors are suitably insulated and covered by suitable protective covering or by securely supported impregnated fiber conduit without metal conduit. Such conductors shall be located outside of the climbing and working spaces and shall not pass between conductors of different ownership except between the pole pair and at a clearance therefrom of no less than 6 inches.

(4) OPTION: In lieu of the foregoing vertical conductors may be installed as unprotected conductors, as specified in Rules 54.6-A and 54.4-D9.

(5) RUNS WITHIN 8 FEET OF GROUND: Vertical conductors installed as specified in Rule 54.6-D(1) and 54.6-D(2) and which extend within 8 feet of the ground shall be treated as risers. Runs which terminate in the top of the runs may extend within 8 feet of the ground but not less than 6 feet of the ground without being treated as risers.

(6) RUNS ENCASED IN GROUNDED METAL COVERING: Vertical conductors where encased shall be treated as risers.

Final Version
Rule 54.6-D

54.6 Vertical and Lateral Conductors

D Vertical Runs

(1) VERTICAL RUNS: Vertical conductors installed as specified in this Rule 54.6-D are known as Vertical Runs.

(2) RUNS LESS THAN 18 INCHES FROM POLE CENTERLINE: Vertical conductors may be installed with less than the radial clearances between conductors, specified in Table, Cases 16 and 17, and on the surface of poles or less than 18 inches from center line of pole provided such conductors are suitably insulated and covered throughout by a suitable protective covering. (See Rule 22.2 for the definition of suitable protective covering.) the plastic pipe or U-shaped moulding specified in Rule 22.2 shall have a minimum wall thickness of 0.15 inches. This protective covering is not required over suitably insulated vertical conductors in metal conduit attached to metal poles, towers, or other structures provided conduit and structures are metallically connected and effectively grounded.

(3) RUNS 18 INCHES FROM POLE CENTERLINE: Vertical conductors may be installed with less than the radial clearances between conductors, specified in Table 2, Cases 16 and 17, and at a distance of more than 18 inches from the center line of any pole provided that such conductors are suitably insulated and covered by suitable protective covering or by securely supported impregnated fiber conduit without metal conduit. Such conductors shall be located outside of the climbing and working spaces and shall not pass between conductors of different ownership except between the pole pair and at a clearance therefrom of no less than 6 inches.

(4) OPTION: In lieu of the foregoing vertical conductors may be installed as unprotected conductors, as specified in Rules 54.6-A and 54.4-D9.

(5) RUNS WITHIN 8 FEET OF GROUND: Vertical conductors installed as specified in Rule 54.6-D(1) and 54.6-D(2) and which extend within 8 feet of the ground shall be treated as risers. Runs which terminate in the top of the runs may extend within 8 feet of the ground but not less than 6 feet of the ground without being treated as risers.

(6) RUNS ENCASED IN GROUNDED METAL COVERING: Vertical conductors where encased shall be treated as risers.

Original Version
Rule 54.6-H

54.6H Attachment of Protective Covering

Protective covering shall be attached to pole, crossarms, or structures by means of corrosion-resisting metal straps or staples which are adequate to maintain such covering in its proper position. The distance between straps or staples shall not exceed 3 feet where such covering is a hardwood moulding. Due care shall be exercised to avoid the possibility of nails protruding through any inner surface of any wood casing used as a protective covering.

Strikeout and Underline Version
Rule 54.6-H

54.6H Attachment of Protective Covering

Protective covering shall be attached to pole, crossarms, or structures by means of corrosion-resisting metal straps or staples which are adequate to maintain such covering in a fixed ~~its proper~~ position. ~~The distance between straps or staples shall not exceed 3 feet where such covering is a hardwood moulding. Due care shall be exercised to avoid the possibility of nails protruding through any inner surface of any wood casing used as a protective covering.~~

Where such covering consists of hardwood or rigid plastic moulding, the distance between straps, lags or staples shall not exceed three feet on each side and due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

When U-shaped moulding is utilized appropriate gaps between sections shall be provided to permit expansion due to temperature variations and such gaps shall be covered by corrosion resistant straps to prevent contact with conductors covered by moulding.

Final Version
Rule 54.6-H

54.6H Attachment of Protective Covering

Protective covering shall be attached to pole, crossarms, or structures by means of corrosion-resisting metal straps or staples which are adequate to maintain such covering in a fixed position.

Where such covering consists of hardwood or rigid plastic moulding, the distance between straps, lags or staples shall not exceed three feet on each side and due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

When U-shaped moulding is utilized appropriate gaps between sections shall be provided to permit expansion due to temperature variations and such gaps shall be covered by corrosion resistant straps to prevent contact with conductors covered by moulding.

Original Version
Rule 54.7-A

54.7-A Climbing Space

A Climbing Space

Climbing space, measured from centerline of pole, shall be provided on one side or in one quadrant of all poles or structures, with dimensions as specified in Rules 54.7-A1, 54.7-A2 and 54.7-A3.

The climbing space shall be maintained in the same position for a distance of not less than 4 feet vertically both above and below each conductor level through which it passes. Compliance with this requirement necessitates that the position of the climbing space shall not be changed through conductor levels which are less than 4 feet apart. Where the vertical distance between consecutive conductor levels is 4 feet or more, and less than 8 feet the position of the climbing space through such consecutive levels may be shifted not more than one-quarter of the distance around the pole. Where a conductor is installed at the top of a pole under the provisions of Rule 54.4-D8, the climbing space shall extend up to the level of such pole-top conductor but need not be provided through and above such level.

Allowable obstruction of these climbing spaces, where necessary, are specified in Rule 54.7-A4

1 Dimensions Where Crossarms are Not Involved:

Climbing space through the levels of conductors deadended on poles in vertical configuration shall be a square of the horizontal dimensions tabulated below; and one side of such climbing space shall be bounded by the vertical plane of the dead-ended conductors with the centerline of pole bisecting such side (see App. G, Fig, 15)

Voltage of Conductors	Dimensions of Square
750-7500 volts	30inches
7500-46,000 volts	36 inches
More than 46,000 volts	36 inches plus ½ inch Per kV in excess Of 46kV.

For climbing space dimensions for low voltage rack construction see Rule 54.9-F.

2 Dimensions Where Line Arms Only Are Involved:

The climbing space through levels where line arms without related buck arms are present on poles or structures shall be on one side or face of the pole, with the center line of pole approximately midway on one side of the climbing space (see App. G Fig. 16), and shall have the following dimensions:

For conductors of 0-7500 volts, the climbing space shall be not less than 30 inches square except that for combination arm construction the climbing space shall be not less than 36 inches square. (see Rule 54.8-E for additional requirements where service drops from combination line arms are involved.)

For conductors of 750-46,000 volts the climbing space shall not be less than 36 inches square.

For conductors of more than 46,000 volts the climbing space shall be a square the sides of which shall be not less than 36 inches plus ½ inch per kV in excess of 46 kV.

The above dimensions may be reduced not more than 2 percent because of line angles.

The climbing space required by this rule may be shifted laterally not more than 5 inches under the condition that (a) the mid-point of the side of the climbing space coinciding with the center line of, the pole shall be not more than 5 inches from the center line of the pole, and (b) that full climbing space dimensions shall be maintained, but without the use of the 2% reduction where the shift is more than 2 inches.

3 Dimensions Where Buck Arms Are Involved: The climbing space where line arms and related buck arms are involved on pole or structures shall be in a quadrant and shall have at least the dimensions, determined according to voltage classification as given below. These dimensions are based on the minimum clearance from center line of pole (Table 1, Case 8) and minimum pin spacings (Table 2, Case 15) for the voltages involved, with the pin position numbered outward from the pole on the climbing side.

Where metal back braces are used they shall be considered as one of the arms of double arm construction.

a) For Conductors of 0-750 Volts: Where single line arm and buck arm construction is involved and the climbing space is left open opposite the single arm, the No. 1 pin Position shall be left vacant in the single arm. (See App G, Fig 18.)

Where double line arm and double buck arm construction is involved, the No. 1 pin position shall be left vacant in each arm. (see App. G, Fig. 19)

b) For conductors of More than 750 Volts: Where single arm and single buck arm construction is involved and the climbing space is left open on the opposite side of the pole from the arms, the No. 1 pin position shall be left vacant in both line arm and buck arm (see App. G, Fig. 20). As an alternative, where the conductors are of 750-7500 volts, the No. 1 and No. 2 pin positions in one arm may be left vacant provided the arms involved are in top positions on the pole.

Where double line arm and single buck arm, or vice versa, construction is involved and the climbing space is left open on the side of the pole opposite the single arm, the No. 1 pin

position shall be left vacant in both line arm and buck arm (see App. G, Fig. 21). AS an alternative, where the conductors are of 750-7500 volts the No. 1 and No. 2 pin positions may be left vacant in the single arm provided the arm involved are in top positions on the pole.

Where double line arm and double buck arm construction is involved the No. 1 pin position shall be left vacant in one double arm and the No. 1 and No. 2 pin positions shall be left vacant in the other double arm. (See App. G, Fig 22.)

Where a single circuit of more than 7,500 volts is in horizontal configuration at the top of the pole, climbing space has to be provided only up to and not through the top level and the No. 1 pin position need not be left vacant.

c) For Combination Arm Construction with Line Arm and Line Buck Arm or Service Buck Arm: (See Rule 54.8-E for additional requirements where service drops are involved.)

Where the vertical separation between conductor levels on line and buck arms is not less than 4 feet and the climbing space is in a 0-750 volt quadrant, the climbing space dimensions shall be not less than those prescribed in Rule 54.7-A3a for 0-750 volt conductors provided that the required vacant pin conductors provided that the required vacant pin spaces shall be in addition to the 36-inch horizontal conductor separation required in Rue 54.4-C2b. (See App. G, Figs 23, 24 and 25.)

Where the vertical separation between conductor levels on line and buck arms is not less than 4 feet and the climbing space is in a 750-7500 volt conductors provided that the required vacant volt conductors provided that

the required vacant pin spaces shall be in addition to the 36-inch horizontal conductor separation required in Rule 54.4-C2b. (See App. G, Figs 26, 27 and 28.)

Where the vertical separation between conductor levels the vertical separation between conductor levels on line and buck arms is less than 4 feet such separation shall not be less than 2 feet and the climbing space dimensions, in any quadrant, shall be not less than those prescribed in Rule 54.7-A3b for 750-7500 volt conductors, provided that the required vacant pin spaces shall be in addition to the 42-inch horizontal conductor separation required in Rule 54.4-C2b. (See App. G Figs 29, 30 and 31.)

d) Alternatives: Where a single line arm or single buck arm is involved and it is impractical to locate the climbing space in the quadrant on the opposite side of the pole from the single arm, it may be located in another quadrant provided that any single arm or arms within the climbing space shall be treated as a double arm.

In applying the pin position spacings as prescribed in Rule 54.7 not less than the minimum spacings of Table 2, Case 15 shall be used. In the event the crossarms used are not bored for the minimum spacings, a spacing of conductors to give equivalent dimensions will be considered as meeting the requirements.

4 Allowable Climbing Space Obstructions: Crossarms and their supporting members are allowed in climbing spaces provided that, where buck arms are involved, any arms within climbing spaces are treated as double arms.

Suitably protected vertical conductors attached tot eh surfaces of poles, and guys, (except those guys contacting metal pins or dead-end hardware as specified in Rule 52.7-D) are allowed in climbing

spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

Pin-type insulators which support line conductors of 20,000 volts or less may extend not more than one-half of their diameter into the climbing space. Dead-end or strain type insulators which support line conductors of 0-750 volts may extend not more than one-half of their diameter into the climbing space.

Space bolts used for the attachment of dead-end hardware of a circuit of any voltage located below a circuit at the top of the pole may project into the climbing space provided they are protected with a suitable insulating cover, having an insulating value equal to the insulators on the associated circuit, and further that the area of the climbing space on a horizontal plane is not reduced by more than 10%.

Modifications of these requirements for rack construction are specified in Rule 54.9-F.

Strikeout and Underline Version
Rule 54.7-A

54.7-A Climbing Space

A Climbing Space

Climbing space, measured from centerline of pole, shall be provided on one side or in one quadrant of all poles or structures, with dimensions as specified in Rules 54.7-A1, 54.7-A2 and 54.7-A3. For climbing space dimensions where post insulators are utilized see Rule 54.11-F.

The climbing space shall be maintained in the same position for a distance of not less than 4 feet vertically both above and below each conductor level through which it passes. Compliance with this requirement necessitates that the position of the climbing space shall not be changed through conductor levels which are less than 4 feet apart. Where the vertical distance between consecutive conductor levels is 4 feet or more, and less than 8 feet the position of the climbing space through such consecutive levels may be shifted not more than one-quarter of the distance around the pole. Where a conductor is installed at the top of a pole under the provisions of Rule 54.4-D8, the climbing space shall extend up to the level of such pole-top conductor but need not be provided through and above such level.

Allowable obstruction of these climbing spaces, where necessary, are specified in Rule 54.7-A4

1 Dimensions Where Crossarms are Not Involved:

Climbing space through the levels of conductors deadended on poles in vertical configuration shall be a square of the horizontal dimensions tabulated below; and one side of such climbing space shall be bounded by the vertical plane of the dead-ended conductors with the centerline of pole bisecting such side (see App. G, Fig, 15)

Voltage of Conductors	Dimensions of Square
750-7500 volts	30inches
7500-46,000 volts	36 inches
More than 46,000 volts	36 inches plus ½ inch Per kV in excess

Of 46kV.

For climbing space dimensions for low voltage rack construction see Rule 54.9-F.

2 Dimensions Where Line Arms Only Are Involved:

The climbing space through levels where line arms without related buck arms are present on poles or structures shall be on one side or face of the pole, with the center line of pole approximately midway on one side of the climbing space (see App. G Fig. 16), and shall have the following dimensions:

For conductors of 0-7500 volts, the climbing space shall be not less than 30 inches square except that for combination arm construction the climbing space shall be not less than 36 inches square. (see Rule 54.8-E for additional requirements where service drops from combination line arms are involved.)

For conductors of 750-46,000 volts the climbing space shall not be less than 36 inches square.

For conductors of more than 46,000 volts the climbing space shall be a square the sides of which shall be not less than 36 inches plus ½ inch per kV in excess of 46 kV.

The above dimensions may be reduced not more than 2 percent because of line angles.

The climbing space required by this rule may be shifted laterally not more than 5 inches under the condition that (a) the mid-point of the side of the climbing space coinciding with the center line of, the pole shall be not more than 5 inches from the center line of the pole, and (b) that full climbing space dimensions shall be maintained, but without the use of the 2% reduction where the shift is more than 2 inches.

3 Dimensions Where Buck Arms Are Involved: The climbing space where line arms and related buck arms are involved on pole or structures shall be in a quadrant and shall have at least the dimensions, determined according to voltage classification as given below. These dimensions are based on the minimum clearance from center line of pole (Table 1, Case 8) and minimum pin spacings (Table 2, Case 15) for the voltages involved, with the pin position numbered outward from the pole on the climbing side.

Where metal back braces are used they shall be considered as one of the arms of double arm construction.

a) For Conductors of 0-750 Volts: Where single line arm and buck arm construction is involved and the climbing space is left open opposite the single arm, the No. 1 pin Position shall be left vacant in the single arm. (See App G, Fig 18.)

Where double line arm and double buck arm construction is involved, the No. 1 pin position shall be left vacant in each arm. (see App. G, Fig. 19)

b) For conductors of More than 750 Volts: Where single arm and single buck arm construction is involved and the climbing space is left open on the opposite side of the pole from the arms, the No. 1 pin position shall be left vacant in both line arm and buck arm (see App. G, Fig. 20). As an alternative, where the conductors are of 750-7500 volts, the No. 1 and No. 2 pin positions in one arm may be left vacant provided the arms involved are in top positions on the pole.

Where double line arm and single buck arm, or vice versa, construction is involved and the climbing space is left open on the side of the pole opposite the single arm, the No. 1 pin

position shall be left vacant in both line arm and buck arm (see App. G, Fig. 21). AS an alternative, where the conductors are of 750-7500 volts the No. 1 and No. 2 pin positions may be left vacant in the single arm provided the arm involved are in top positions on the pole.

Where double line arm and double buck arm construction is involved the No. 1 pin position shall be left vacant in one double arm and the No. 1 and No. 2 pin positions shall be left vacant in the other double arm. (See App. G, Fig 22.)

Where a single circuit of more than 7,500 volts is in horizontal configuration at the top of the pole, climbing space has to be provided only up to and not through the top level and the No. 1 pin position need not be left vacant.

c) For Combination Arm Construction with Line Arm and Line Buck Arm or Service Buck Arm: (See Rule 54.8-E for additional requirements where service drops are involved.)

Where the vertical separation between conductor levels on line and buck arms is not less than 4 feet and the climbing space is in a 0-750 volt quadrant, the climbing space dimensions shall be not less than those prescribed in Rule 54.7-A3a for 0-750 volt conductors provided that the required vacant pin conductors provided that the required vacant pin spaces shall be in addition to the 36-inch horizontal conductor separation required in Rue 54.4-C2b. (See App. G, Figs 23, 24 and 25.)

Where the vertical separation between conductor levels on line and buck arms is not less than 4 feet and the climbing space is in a 750-7500 volt conductors provided that the required vacant volt conductors provided that

the required vacant pin spaces shall be in addition to the 36-inch horizontal conductor separation required in Rule 54.4-C2b. (See App. G, Figs 26, 27 and 28.)

Where the vertical separation between conductor levels the vertical separation between conductor levels on line and buck arms is less than 4 feet such separation shall not be less than 2 feet and the climbing space dimensions, in any quadrant, shall be not less than those prescribed in Rule 54.7-A3b for 750-7500 volt conductors, provided that the required vacant pin spaces shall be in addition to the 42-inch horizontal conductor separation required in Rule 54.4-C2b. (See App. G Figs 29, 30 and 31.)

d) Alternatives: Where a single line arm or single buck arm is involved and it is impractical to locate the climbing space in the quadrant on the opposite side of the pole from the single arm, it may be located in another quadrant provided that any single arm or arms within the climbing space shall be treated as a double arm.

In applying the pin position spacings as prescribed in Rule 54.7 not less than the minimum spacings of Table 2, Case 15 shall be used. In the event the crossarms used are not bored for the minimum spacings, a spacing of conductors to give equivalent dimensions will be considered as meeting the requirements.

4 Allowable Climbing Space Obstructions: Crossarms and their supporting members are allowed in climbing spaces provided that, where buck arms are involved, any arms within climbing spaces are treated as double arms.

Suitably protected vertical conductors attached tot eh surfaces of poles, and guys, (except those guys contacting metal pins or dead-end hardware as specified in Rule 52.7-D) are allowed in climbing

spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

Pin-type insulators which support line conductors of 20,000 volts or less may extend not more than one-half of their diameter into the climbing space. Dead-end or strain type insulators which support line conductors of 0-750 volts may extend not more than one-half of their diameter into the climbing space.

Space bolts used for the attachment of dead-end hardware of a circuit of any voltage located below a circuit at the top of the pole may project into the climbing space provided they are protected with a suitable insulating cover, having an insulating value equal to the insulators on the associated circuit, and further that the area of the climbing space on a horizontal plane is not reduced by more than 10%.

Modifications of these requirements for rack construction are specified in Rule 54.9-F.

Final Version
Rule 54.7-A

54.7-A Climbing Space

A Climbing Space

Climbing space, measured from centerline of pole, shall be provided on one side or in one quadrant of all poles or structures, with dimensions as specified in Rules 54.7-A1, 54.7-A2 and 54.7-A3. For climbing space dimensions where post insulators are utilized see Rule 54.11-F.

The climbing space shall be maintained in the same position for a distance of not less than 4 feet vertically both above and below each conductor level through which it passes. Compliance with this requirement necessitates that the position of the climbing space shall not be changed through conductor levels which are less than 4 feet apart. Where the vertical distance between consecutive conductor levels is 4 feet or more, and less than 8 feet the position of the climbing space through such consecutive levels may be shifted not more than one-quarter of the distance around the pole. Where a conductor is installed at the top of a pole under the provisions of Rule 54.4-D8, the climbing space shall extend up to the level of such pole-top conductor but need not be provided through and above such level.

Allowable obstruction of these climbing spaces, where necessary, are specified in Rule 54.7-A4

1 Dimensions Where Crossarms are Not Involved:

Climbing space through the levels of conductors deadended on poles in vertical configuration shall be a square of the horizontal dimensions tabulated below; and one side of such climbing space shall be bounded by the vertical plane of the dead-ended conductors with the centerline of pole bisecting such side (see App. G, Fig, 15)

Voltage of Conductors	Dimensions of Square
750-7500 volts	30inches
7500-46,000 volts	36 inches
More than 46,000 volts	36 inches plus ½ inch Per kV in excess

Of 46kV.

For climbing space dimensions for low voltage rack construction see Rule 54.9-F.

2 Dimensions Where Line Arms Only Are Involved:

The climbing space through levels where line arms without related buck arms are present on poles or structures shall be on one side or face of the pole, with the center line of pole approximately midway on one side of the climbing space (see App. G Fig. 16), and shall have the following dimensions:

For conductors of 0-7500 volts, the climbing space shall be not less than 30 inches square except that for combination arm construction the climbing space shall be not less than 36 inches square. (see Rule 54.8-E for additional requirements where service drops from combination line arms are involved.)

For conductors of 750-46,000 volts the climbing space shall not be less than 36 inches square.

For conductors of more than 46,000 volts the climbing space shall be a square the sides of which shall be not less than 36 inches plus ½ inch per kV in excess of 46 kV.

The above dimensions may be reduced not more than 2 percent because of line angles.

The climbing space required by this rule may be shifted laterally not more than 5 inches under the condition that (a) the mid-point of the side of the climbing space coinciding with the center line of, the pole shall be not more than 5 inches from the center line of the pole, and (b) that full climbing space dimensions shall be maintained, but without the use of the 2% reduction where the shift is more than 2 inches.

3 Dimensions Where Buck Arms Are Involved: The climbing space where line arms and related buck arms are involved on pole or structures shall be in a quadrant and shall have at least the dimensions, determined according to voltage classification as given below. These dimensions are based on the minimum clearance from center line of pole (Table 1, Case 8) and minimum pin spacings (Table 2, Case 15) for the voltages involved, with the pin position numbered outward from the pole on the climbing side.

Where metal back braces are used they shall be considered as one of the arms of double arm construction.

a) For Conductors of 0-750 Volts: Where single line arm and buck arm construction is involved and the climbing space is left open opposite the single arm, the No. 1 pin Position shall be left vacant in the single arm. (See App G, Fig 18.)

Where double line arm and double buck arm construction is involved, the No. 1 pin position shall be left vacant in each arm. (see App. G, Fig. 19)

b) For conductors of More than 750 Volts: Where single arm and single buck arm construction is involved and the climbing space is left open on the opposite side of the pole from the arms, the No. 1 pin position shall be left vacant in both line arm and buck arm (see App. G, Fig. 20). As an alternative, where the conductors are of 750-7500 volts, the No. 1 and No. 2 pin positions in one arm may be left vacant provided the arms involved are in top positions on the pole.

Where double line arm and single buck arm, or vice versa, construction is involved and the climbing space is left open on the side of the pole opposite the single arm, the No. 1 pin

position shall be left vacant in both line arm and buck arm (see App. G, Fig. 21). AS an alternative, where the conductors are of 750-7500 volts the No. 1 and No. 2 pin positions may be left vacant in the single arm provided the arm involved are in top positions on the pole.

Where double line arm and double buck arm construction is involved the No. 1 pin position shall be left vacant in one double arm and the No. 1 and No. 2 pin positions shall be left vacant in the other double arm. (See App. G, Fig 22.)

Where a single circuit of more than 7,500 volts is in horizontal configuration at the top of the pole, climbing space has to be provided only up to and not through the top level and the No. 1 pin position need not be left vacant.

c) For Combination Arm Construction with Line Arm and Line Buck Arm or Service Buck Arm: (See Rule 54.8-E for additional requirements where service drops are involved.)

Where the vertical separation between conductor levels on line and buck arms is not less than 4 feet and the climbing space is in a 0-750 volt quadrant, the climbing space dimensions shall be not less than those prescribed in Rule 54.7-A3a for 0-750 volt conductors provided that the required vacant pin conductors provided that the required vacant pin spaces shall be in addition to the 36-inch horizontal conductor separation required in Rue 54.4-C2b. (See App. G, Figs 23, 24 and 25.)

Where the vertical separation between conductor levels on line and buck arms is not less than 4 feet and the climbing space is in a 750-7500 volt conductors provided that the required vacant volt conductors provided that

the required vacant pin spaces shall be in addition to the 36-inch horizontal conductor separation required in Rule 54.4-C2b. (See App. G, Figs 26, 27 and 28.)

Where the vertical separation between conductor levels the vertical separation between conductor levels on line and buck arms is less than 4 feet such separation shall not be less than 2 feet and the climbing space dimensions, in any quadrant, shall be not less than those prescribed in Rule 54.7-A3b for 750-7500 volt conductors, provided that the required vacant pin spaces shall be in addition to the 42-inch horizontal conductor separation required in Rule 54.4-C2b. (See App. G Figs 29, 30 and 31.)

d) Alternatives: Where a single line arm or single buck arm is involved and it is impractical to locate the climbing space in the quadrant on the opposite side of the pole from the single arm, it may be located in another quadrant provided that any single arm or arms within the climbing space shall be treated as a double arm.

In applying the pin position spacings as prescribed in Rule 54.7 not less than the minimum spacings of Table 2, Case 15 shall be used. In the event the crossarms used are not bored for the minimum spacings, a spacing of conductors to give equivalent dimensions will be considered as meeting the requirements.

4 Allowable Climbing Space Obstructions: Crossarms and their supporting members are allowed in climbing spaces provided that, where buck arms are involved, any arms within climbing spaces are treated as double arms.

Suitably protected vertical conductors attached tot eh surfaces of poles, and guys, (except those guys contacting metal pins or dead-end hardware as specified in Rule 52.7-D) are allowed in climbing

spaces provided that not more than one guy and one vertical riser, run, or ground wire are installed in any 4-foot vertical section of climbing space. The terminals or terminal fittings of risers or runs shall not be installed within climbing spaces.

Pin-type insulators which support line conductors of 20,000 volts or less may extend not more than one-half of their diameter into the climbing space. Dead-end or strain type insulators which support line conductors of 0-750 volts may extend not more than one-half of their diameter into the climbing space.

Space bolts used for the attachment of dead-end hardware of a circuit of any voltage located below a circuit at the top of the pole may project into the climbing space provided they are protected with a suitable insulating cover, having an insulating value equal to the insulators on the associated circuit, and further that the area of the climbing space on a horizontal plane is not reduced by more than 10%.

Modifications of these requirements for rack construction are specified in Rule 54.9-F.

Original Version
Rule 54.8-B(4)

Rule 54.8-B4 From Buildings and Structures

a) Industrial and Commercial premises: On premises used for industrial or commercial purposes service drops shall be maintained at a vertical clearance of not less than 8 feet over all or any portions of buildings and structures, except that service drops of 0-300 volts may be less than 8 feet, but not less than 12 inches, above the cornice, decorative appendage, eave, roof or parapet wall of the building served provided:

The cornice, decorative appendage, eave, roof or parapet wall less than 8 feet below such service drops is non-metallic,

The point or attachment of the service drops is not more than 18 inches back of the front face of the building wall facing the pole line from which the service drops originate, and

The cornice or decorative appendage which is less than 8 feet below such service drops does not extend more than 12 inches from said front face of building wall.

Service drops are not required to clear buildings any specified horizontal distance but shall be so installed that they clear fire escapes exits, windows, doors and other points at which human contact might be expected a horizontal distance of not less than 3 feet.

b) Residential Premises: On premises used for residential purpose only, service drops of 300-750 volts shall be maintained at a vertical clearance of not less than 8 feet over all buildings and structures.

The clearance above buildings of service drops of 0-300 volts shall be not less than the distance specified in Table 10.

Table 10
Minimum Allowable Clearances of Service Drops of 0-300 Volts Above Buildings.

Type of Roof	Minimum clearance above		
	Building Served	Other Buildings on Premises served	Buildings on other premises
Metal roof 3/8 pitch or less (a)	8 ft.	8 ft.	8 ft.
Metal roof, more than 3/8 pitch	2 ft.	2 ft.	8 ft.
Nonmetallic roof, 3/8 pitch or less	(b)	2 ft.	8 ft.
Nonmetallic roof, more than 3/8 pitch	(b)	2 ft.	2 ft.

a. 3/8 pitch is a approximately 37 degrees from the horizontal.
b. No limit specified but the greatest clearance should be obtained.

Service Drops are not required to clear buildings on residential premises any specified horizontal distance, but shall be so installed that they clear fire escapes, exits, windows, doors, and other points at which human contact might be expected, a horizontal distance of not less than 3 feet. Service drops above a horizontal plane through the top extremity of an opening should maintain the maximum practical radial clearance, which in no event shall be less than 1 foot.

Strikeout and Underline Version
Rule 54.8-B(4)

Rule 54.8-B4 From Buildings and Structures

a) Industrial and Commercial premises: On premises used for industrial or commercial purposes service drops shall be maintained at a vertical clearance of not less than 8 feet over all or any portions of buildings and structures, except that service drops of 0-300 volts may be less than 8 feet, but not less than 12 inches, above the cornice, decorative appendage, eave, roof or parapet wall of the building served provided:

<u>The current carrying service conductors are insulated for the voltage being supplied (see Rule 20.8-F), and the point of attachment of the service drops is not more than 18 inches back of the front face of the building wall facing the pole line from which the service drops originate.</u>

~~The cornice, decorative appendage, eave, roof or parapet wall less than 8 feet below such service drops is non-metallic,~~

~~The point or attachment of the service drops is not more than 18 inches back of the front face of the building wall facing the pole line from which the service drops originate, and~~

~~The cornice or decorative appendage which is less than 8 feet below such service drops does not extend more than 12 inches from said front face of building wall.~~

Service drops are not required to clear buildings any specified horizontal distance but shall be so installed that they clear fire escapes exits, windows, doors and other points at which human contact might be expected a horizontal distance of not less than 3 feet.

Where service drop crosses over metallic or non-metallic nonwalkable overhang or patio cover vertical clearance may be less than 8 feet, but not less than 24 inches providing such service drops consist of abrasion-resistant cables having a grounded metallic sheath and are insulated for the voltage being supplied.

b) Residential Premises: On premises used for residential purpose only, service drops of 300-750 volts shall be maintained at a vertical clearance of not less than 8 feet over all buildings and structures.

The clearance above buildings of service drops of 0-300 volts shall be not less than the distance specified in Table 10.

Table 10
Minimum Allowable Clearances of Service Drops of 0-300 Volts Above Buildings.

Type of Roof	Minimum clearance above		
	Building Served	Other Buildings on Premises served	Buildings on other premises
Metal roof 3/8 pitch or less (a)	8 ft.(c)	8 ft.	8 ft.
Metal roof, more than 3/8 pitch	2 ft.(c)	2 ft.	8 ft.
Nonmetallic roof, 3/8 pitch or less	(b)	2 ft.	8 ft.
Nonmetallic roof, more than 3/8 pitch	(b)	2 ft.	2 ft.

a. 3/8 pitch is a approximately 37 degrees from the horizontal.
b. No limit specified but the greatest clearance should be obtained.
c. Where insulated abrasion-resistant conductors are may be reduced to 12 inches.

On premises used for residential purposes only the clearance above building of service drops of 0-300 volts may be less than the distance specified in Table 10 but not less than 12 inches over the building served nor less than 24 inches above other buildings on the premises served, provided:

The current-carrying conductors consist of abrasion-resistant cable having a grounded metallic voltage being supplied and the roof is metallic or nonmetallic, nonwalkable over hang or patio cover.

Service Drops are not required to clear buildings on residential premises any specified horizontal distance, but shall be so installed that they clear fire escapes, exits, windows, doors, and other points at which human contact might be expected, a horizontal distance of not less than 3 feet. Service drops above a horizontal plane through the top extremity of an opening should maintain the maximum practical radial clearance, which in no event shall be less than 1 foot.

Final Version
Rule 54.8-B(4)

Rule 54.8-B4 From Buildings and Structures

a) Industrial and Commercial premises: On premises used for industrial or commercial purposes service drops shall be maintained at a vertical clearance of not less than 8 feet over all or any portions of buildings and structures, except that service drops of 0-300 volts may be less than 8 feet, but not less than 12 inches, above the cornice, decorative appendage, eave, roof or parapet wall of the building served provided:

The current carrying service conductors are insulated for the voltage being supplied (see Rule 20.8-F), and the point of attachment of the service drops is not more than 18 inches back of the front face of the building wall facing the pole line from which the service drops originate.

Service drops are not required to clear buildings any specified horizontal distance but shall be so installed that they clear fire escapes exits, windows, doors and other points at which human contact might be expected a horizontal distance of not less than 3 feet.

Where service drop crosses over metallic or non-metallic nonwalkable overhang or patio cover vertical clearance may be less than 8 feet, but not less than 24 inches providing such service drops consist of abrasion-resistant cables having a grounded metallic sheath and are insulated for the voltage being supplied.

b) Residential Premises: On premises used for residential purpose only, service drops of 300-750 volts shall be maintained at a vertical clearance of not less than 8 feet over all buildings and structures.

The clearance above buildings of service drops of 0-300 volts shall be not less than the distance specified in Table 10.

Table 10
Minimum Allowable Clearances of Service Drops of 0-300 Volts Above Buildings.

Type of Roof	Minimum clearance above		
	Building Served	Other Buildings on Premises served	Buildings on other premises
Metal roof 3/8 pitch or less (a)	8 ft.(c)	8 ft.	8 ft.
Metal roof, more than 3/8 pitch	2 ft.(c)	2 ft.	8 ft.
Nonmetallic roof, 3/8 pitch or less	(b)	2 ft.	8 ft.
Nonmetallic roof, more than 3/8 pitch	(b)	2 ft.	2 ft.

a. 3/8 pitch is a approximately 37 degrees from the horizontal.
b. No limit specified but the greatest clearance should be obtained.
c. Where insulated abrasion-resistant conductors are may be reduced to 12 inches.

On premises used for residential purposes only the clearance above building of service drops of 0-300 volts may be less than the distance specified in Table 10 but not less than 12 inches over the building served nor less than 24 inches above other buildings on the premises served, provided:

The current-carrying conductors consist of abrasion-resistant cable having a grounded metallic voltage being supplied and the roof is metallic or nonmetallic, nonwalkable over hang or patio cover.

Service Drops are not required to clear buildings on residential premises any specified horizontal distance, but shall be so installed that they clear fire escapes, exits, windows, doors, and other points at which human contact might be expected, a horizontal distance of not less than 3 feet. Service drops above a horizontal plane through the top extremity of an opening should maintain the

maximum practical radial clearance, which in no event shall be less than 1 foot.

Original Version
Rule 55.3-B

55.3B Suspension and Strain Types

Suspension and strain type insulators used on supply lines shall have a dry flashover voltage as specified in Rule 55.3-C for the nominal line voltage at which they are used when tested with their attaching fittings or harness and under the mechanical loading to which they are to be subjected.

Strikeout and Underline Version
Rule 55.3-B

55.3B Suspension<u>, Post,</u> and Strain Types

Suspension<u>, Post,</u> and strain type insulators used on supply lines shall have a dry flashover voltage as specified in Rule 55.3-C for the nominal line voltage at which they are used when tested with their attaching fittings or harness and under the mechanical loading to which they are to be subjected.

Final Version
Rule 55.3-B

55.3B Suspension, Post, and Strain Types

Suspension, Post, and strain type insulators used on supply lines shall have a dry flashover voltage as specified in Rule 55.3-C for the nominal line voltage at which they are used when tested with their attaching fittings or harness and under the mechanical loading to which they are to be subjected.

Original Version

Rule 56.6-D

56.6D Guys Exposed to 22,500 Volts or More

Guys exposed to conductors of 22,500 volts or more (see App. G, Fig. 52) shall not be sectionalized and shall have their lower ends securely grounded (by means of ground wires, anchor guys, or attachments to securely grounded metal poles or structures). Excepted from the above requirements are:

Guys which are required to be sectionalized in accordance with Rule 56.6-A because of proximity of wood poles and supply conductors of less than 22,500 volts or in accordance with Rule 56.6-B; and

Guys which are sectionalized by wood strain insulators equipped with arcing horns and designed to provide impulse insulation for lighting conditions.

Strikeout and Underline Version

Rule 56.6-D

56.6D Guys Exposed to 22,500 Volts or More

Guys exposed to conductors of 22,500 volts or more (see App. G, Fig. 52) shall not be sectionalized and shall have their lower ends securely grounded (by means of ground wires, anchor guys, or attachments to securely grounded metal poles or structures). Excepted from the above requirements are:

Guys which are required to be sectionalized in accordance with Rule 56.6-A because of proximity of wood poles and supply conductors of less than 22,500 volts or in accordance with Rule 56.6-B; and

Guys which are sectionalized by wood strain insulators equipped with arcing horns and designed to provide impulse insulation for lighting conditions or glass fiber noninterlocking strait insulators which are designed to provide impulse insulation for lighting conditions.

Final Version
Rule 56.6-D

56.6D Guys Exposed to 22,500 Volts or More

Guys exposed to conductors of 22,500 volts or more (see App. G, Fig. 52) shall not be sectionalized and shall have their lower ends securely grounded (by means of ground wires, anchor guys, or attachments to securely grounded metal poles or structures). Excepted from the above requirements are:

Guys which are required to be sectionalized in accordance with Rule 56.6-A because of proximity of wood poles and supply conductors of less than 22,500 volts or in accordance with Rule 56.6-B; and

Guys which are sectionalized by wood strain insulators equipped with arcing horns and designed to provide impulse insulation for lighting conditions or glass fiber noninterlocking strait insulators which are designed to provide impulse insulation for lighting conditions.

Original Version
Rule 44.1

44.1 Installation and Reconstruction,

Lines and elements of lines, upon installation or reconstruction, shall provide as a minimum the safety factors specified in Table 4 for vertical loads and loads transverse to lines and for loads longitudinal to lines except where longitudinal loads are balanced or where there are changes in grade construction (see Rules 47.3, 47.4 and 47.5)

Table 4
Minimum Safety Factors

Element of Line	Grade of Construction			
	Grade "A"	Grade "B"	Grade "C"	Grade "F"
Conductors, splices and conductor fastenings (other than tie wires)	2	2	2	1
Pins	2	2	2	1
Pole line hardware	2	2	2	2
Line insulators (mechanical)	3	2	2	2
Guy Insulators (mechanical)				
Interlocking	2	2	2	2
Noninterlocking	3	3	3	----------
Guys, except in light loading districts	2	2	2	1 ½
Guys, in light loading rural districts	2	1 ½	1 ½	1 ½
Messengers and span wires	2	2	2	2
Wood poles	4	3	2	1
Metallic Service and Meter Poles	-	2	2	-
Structural or tubular steel poles (other than service and meter poles), towers, crossarms and steel members of foundations	1 ½	1 ½	1 ½	----------
Foundations against uplift	1 ½	1 ½	1 ½	----------
Foundations against depression	3	2	2	----------
Reinforced concrete poles	4	3	3	----------
Crossarms (wood)	2	2	2	1

Strikeout and Underline Version
Rule 44.1

44.1 Installation and Reconstruction,

Lines and elements of lines, upon installation or reconstruction, shall provide as a minimum the safety factors specified in Table 4 for vertical loads and loads transverse to lines and for loads longitudinal to lines except where longitudinal loads are balanced or where there are changes in grade construction (see Rules 47.3, 47.4 and 47.5)

Table 4
Minimum Safety Factors

Element of Line	Grade of Construction			
	Grade "A"	Grade "B"	Grade "C"	Grade "F"
Conductors, splices and conductor fastenings (other than tie wires)	2	2	2	1
Pins	2	2	2	1
Pole line hardware	2	2	2	2
Line insulators (mechanical)	3	2	2	2
Guy Insulators (mechanical)				
Interlocking	2	2	2	2
Noninterlocking wood	3	3	3	----------
Noninterlocking glass fiber	3	2(a)	2(b)	----------
Guys, except in light loading districts	2	2	2	1 ½
Guys, in light loading rural districts	2	1 ½	1 ½	1 ½
Messengers and span wires	2	2	2	2
Wood poles	4	3	2	1
Metallic Service and Meter Poles	-	2	2	-
Structural or tubular steel poles (other than service and meter poles), towers, crossarms and steel members of foundations	1 ½	1 ½	1 ½	----------
Foundations against uplift	1 ½	1 ½	1 ½	----------
Foundations against depression	3	2	2	----------
Reinforced concrete poles	4	3	3	----------
Crossarms (wood)	2	2	2	1

(a) Insulators are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement or other conditions subsequent to installation) to less than 95 percent of the safety factor specified in Rule 44.1.

(b) Insulator are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement, or other conditions subsequent to installation) to less than 75 percent of the safety factor specified in Rule 44.1.

Final Version
Rule 44.1

44.1 Installation and Reconstruction,

Lines and elements of lines, upon installation or reconstruction, shall provide as a minimum the safety factors specified in Table 4 for vertical loads and loads transverse to lines and for loads longitudinal to lines except where longitudinal loads are balanced or where there are changes in grade construction (see Rules 47.3, 47.4 and 47.5)

Table 4
Minimum Safety Factors

Element of Line	Grade of Construction			
	Grade "A"	Grade "B"	Grade "C"	Grade "F"
Conductors, splices and conductor fastenings (other than tie wires)	2	2	2	1
Pins	2	2	2	1
Pole line hardware	2	2	2	2
Line insulators (mechanical)	3	2	2	2
Guy Insulators (mechanical)				
Interlocking	2	2	2	2
Noninterlocking wood	3	3	3	----------
Noninterlocking glass fiber	3	2(a)	2(b)	----------
Guys, except in light loading districts	2	2	2	1 ½
Guys, in light loading rural districts	2	1 ½	1 ½	1 ½
Messengers and span wires	2	2	2	2
Wood poles	4	3	2	1
Metallic Service and Meter Poles	-	2	2	-
Structural or tubular steel poles (other than service and meter poles), towers, crossarms and steel members of foundations	1 ½	1 ½	1 ½	----------
Foundations against uplift	1 ½	1 ½	1 ½	----------
Foundations against depression	3	2	2	----------
Reinforced concrete poles	4	3	3	----------
Crossarms (wood)	2	2	2	1

(a) Insulators are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement or other conditions subsequent to installation) to less than 95 percent of the safety factor specified in Rule 44.1.

(b) Insulator are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement, or other conditions subsequent to installation) to less than 75 percent of the safety factor specified in Rule 44.1.

Original Version
Rule 84.6-F

84.6F Protective Covering

Protective covering shall be attached to poles, crossarms, and structures by means of corrosion-resistant metal straps or staples which are adequate to maintain such covering in a fixed position.

Where such covering consists of hardwood moulding the, distance between straps or staples shall not exceed 3 feet.

Where such covering consists of a wood trough, due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

Strikeout and Underline Version
Rule 84.6-F

84.6F Protective Covering

Protective covering shall be attached to poles, crossarms, and structures by means of corrosion-resistant ~~metal~~, lags, straps or staples which are adequate to maintain such covering in a fixed position.

Where such covering consists of hardwood or rigid plastic moulding the, distance between straps, lags, or staples shall not exceed ~~3~~ three feet on each side due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

When U-shaped moulding is utilized appropriate gaps between sections shall be provided to permit expansion due to temperature variations and such gaps shall be covered by corrosion resistant straps to prevent contact with conductors covered by moulding.

~~Where such covering consists of a wood trough, due care shall be exercised to avoid the possibility of nails protruding through any inner surface.~~

Final Version
Rule 84.6-F

84.6F Protective Covering

Protective covering shall be attached to poles, crossarms, and structures by means of corrosion-resistant, lags, straps or staples which are adequate to maintain such covering in a fixed position.

Where such covering consists of hardwood or rigid plastic moulding the, distance between straps, lags, or staples shall not exceed three feet on each side due care shall be exercised to avoid the possibility of nails protruding through any inner surface.

When U-shaped moulding is utilized appropriate gaps between sections shall be provided to permit expansion due to temperature variations and such gaps shall be covered by corrosion resistant straps to prevent contact with conductors covered by moulding.

Original Version

Table 2

Basic Minimum Allowable Clearance of Wires from Other Wires at Crossings and at Supports

(Letter references Denote Modifications of Minimum Clearances Referred to in Notes Following this Table)

All Clearances Are in Inches

Case No.	Nature of Clearance and Class of Voltage of wire, cable or conductor concerned	Other Wire, cable or conductor concerned								
					Supply conductor (including supply cables)					
		A Span wires, guys and messengers	B Trolley contact conductors 0-750 volts	C Communication conductors (including open wire, cables and service drops)	D 0-750 volts (including service drops and trolley feeders (a))	E 750-7,500 Volts	F 7,500-20,000 volts	G 20,000-35,000 volts	H 35,000-68,000 volts	I Over 68,000 volts
	Clearance between wires, cables, and conductors not supported on the same poles, vertically at crossings in spans, and radially where collinear or approaching crossing									
1	Span wires, guys and messengers (b)	18 (c)	48 (d, e)	24 (e)	24 (e)	36 (f)	36	72	72	72(g)
2	Trolley contact conductors 0-750 volts	48 (d, e)	----------	48 (d)	48 (d, h)	48	72	96	96	96(g)
3	Communication conductors	24 (e)	48 (d)	24	48 (i)	48 (dd)	72	96	96	96(g)
4	Supply conductors, service drops and trolley feeders 0-750 volts	24 (e)	48 (d, h)	48 (i)	24	48	48	96	96	96(g)
5	Supply conductors, 750-7500 volts	36 (f)	48	48 (dd)	48	48 (h)	72	96	96	96(g)
6	Supply conductors 7500-20,000 volts	36	72	72	48	72	72	96	96	96(g)
7	Supply conductors, more than 20,000 volts	72	96	96	96	96	96	96	96	96(g)
	Vertical separation between conductors and / or cables on separate crossarms or other supports at different levels (excepting on related line and buck arms on the same pole)									
8	Communication conductors and service drops	----------	----------	12 (j)	48 (k, l, m, n)	48 (k)	72 (m, n)	72(m)	72	72
9	Supply Conductors, service drops and trolley feeders 0-750 volts	----------	----------	48 (k, l, m, n)	24 (h, k, m, o)	48 (k, m, p)	48 (k, m, q)	72(m)	72	72
10	Supply conductors, 750-7500 volts	----------	----------	48 (k)	48 (k, m, p)	48 (m, o, r, ee)	48 (m, q)	48(q)	48(q)	60(q)
11	Supply conductors 7500-20,000 volts	----------	----------	72 (m, n)	48 (k, m, q)	48 (m, q)	48 (m, o, q, r, ee)	48(q)	48(q)	60(q)
12	Supply conductors 20,000-68,000 volts	----------	----------	72 (m)	72 (m)	48 (m, q)	48 (m, q)	48(o, q)	48(o, q)	60(q)
13	Supply conductors, more than 68,000 volts	----------	----------	72	72	60 (q)	60 (q)	60(q)	60(q)	60(o, q)
	Vertical arms above or below conductors on related line arms and buck arms.									
14	Line arms above or below related buck arms (s, t)	----------	----------	6	12 (u)	18 (u)	18 (u)	24	36	48(g)
	Horizontal separation of conductors on same crossarm									

15	Pin spacings of longitudinal conductors, vertical conductors and service drops **Radial separation of conductors on same crossarm, pole or structure Incidental pole wiring**	----------	----------	3(x)	11 ½ (h, x)	11 ½ (x)	17 ½ (x)	24 (x)	36	48(g)
16	Conductors, tap or lead wires of different circuits (v, y, z)	----------	----------	3 (x)	11 ½ (h, x)	11 ½ (x)	17 ½ (x)	24 (x)	36	48(g)
17	Conductors, tap or lead wires of same circuits (v, y, z) Radial separation between guys and conductors	----------	---------- ----------	3	3	6	6	12	18	24
18	Guys passing conductors supported on other poles, and guys approximately parallel to conductors supported on the same poles	----------	----------	9 (bb)	12	18	18	30	36	36
19	Guys and spans wires passing conductors supported on the same poles	(ee)	3 (bb)	3	3	6	9	12	18	24

(a)	The clearances in Column D are also applicable to supply cables of any voltage under certain conditions	57.4
(b)	Clearances for guys and span wires apply vertically at crossings; see Case 18 for radial clearances from conductors.	
	1. Supply guys and span wires from conductors	56.4-C
	2. Supply guys and span wires from guys and span wires	56.4-D1
	3. Communication guys and span wires from conductors	86.4-C
	4. Communication guys and span wires from guys and span wires	86.4-D1
(c)	Not applicable between messengers or span wires of the same system.	
	1. Supply messengers	57.4-E
	2. Trolley span wires	77.4-D
	3. Communication messengers	87.4-G
(d)	Protection required on guys, span wires, messengers, and cables where within trolley throw	
	1. Supply Guys and Span wires	56.4-B2
	2. Supply Messengers and Cables	57.4-B2
	3. Communication guys and span wires	86.4-B2
	4. Communication messengers	87.4-B2
(e)	Not applicable to certain conductors supported on trolley span wires.	
	1. Trolley contact and feeder conductors	74.4-G
	2. Trolley feeder conductors	78.1
	3. Trolley system communication conductors	78.2
	4. Foreign conductors	78.3
(f)	Increased clearance required over trolley contact conductors of 750-7500 volts	74.4-G2
(g)	Shall be increased for conductors of more than 68,000 volts.	
	1. Conductors not supported on the same poles	54.4-C7a
	2. Conductors supported on the same crossarm, pole or structure.	54.4-C7b
(h)	May be reduced for certain conductors of Class T circuits of the same system	74.4-C
(i)	May be reduced for service drops under special conditions.	
	1. Supply service drops and communication line conductors	54.8-C1a
	2. Supply service drops and communication service drops	54.8-C4
	3. Communication service drops and supply line conductors	84.8-D1a
	4. Communication service drops and supply service drops	84.8-D4
(j)	May be reduced or shall be increased for certain communication conductors or cables.	
	1. Open wire conductors, attached to poles, within 3 feet of topmost conductor	84.4-C1a
	2. Line conductors of police or fire-alarm circuits and service drops from other communication circuits.	84.8-D1b
	3. Cables and messengers attached to poles	87.4-C3
(k)	Special clearances for 0-750 volt conductors in rack configuration and messengers and cables attached to poles.	
	1. Supply conductors of 0-750 volts in rack configuration	54.9
	2. Supply cables and messengers attached to poles	57.4-F
	3. Communication cables and messengers attached to poles	87.4-C3
	4. On Jointly used poles	92.1

(l)	May be reduced for service drops, and police or fire-alarm conductors, under special conditions.	
	1. Supply service drops and communication line conductors	54.8-C1b
	2. Supply service drops on clearance arms	54.8-C2
	3. Supply service drops on pole-top extensions	54.8-C3
	4. Supply service drops and communication service drops	54.8-C4
	5. Communication service drops and police, fire-alarm or supply line conductors	84.8-D1b
	6. Communication service drops on clearance arms	84.8-D2
	7. Communication service drops on pole-top extensions	84.8-D3
	8. Communication service drops and supply service drops	84.8-D4
	9. Police or fire-alarm conductors	92.2
(m)	May be reduced for lead wires	
	1. Supply lead wires above supply conductors	54.4-C6
	2. Supply drip loops above communication conductors	92.1-F3
(n)	May be reduced for supply conductors and private communication conductors of the same ownership	89.2-B
(o)	May be reduced or increased for triangular or vertical configuration or for pole-top construction.	
	1. Triangular or vertical configuration on crossarms	54.4-C1c
	2. Dead-ended on pole in vertical configuration	54.4-C4
	3. Conductors of 0-7500 volts in triangular configuration at top of pole	54.4-D8a
	4. Conductors of more than 7500 volts at top of pole	54.4-D8b
(p)	May be reduced for supply service drops of 0-750 volts	54.8-C6
(q)	Shall be increased between circuits where conductors of more than 7500 volts are at pole top.	54.4-D8b
(r)	May be reduced under special conditions	
	1. Supply conductors of 750-7500 volts	54.4-C1a
	2. Supply conductors of 7500-20,000 volts	54.4-C1b
(s)	Does not apply where conductors do not cross.	
	1. Supply conductors of different phase polarity	54.4-C2a
	2. Communication conductors	84.4-C1a
(t)	Shall not be applied consecutively both above and below the same supply conductors	54.4-2a
(u)	Shall be increased where conductors of different classifications are supported on the same crossarms.	
	1. Supply conductors of 0-750 volts and conductors of 7500-20,000 volts	32.4-A2
	2. Supply conductors of 0-750 volts and conductors of 750-7500 volts	32.4-A3
(v)	Not applicable to certain kinds of conductors.	
	1. Supply conductors of same phase or polarity	54.4-C3c
	2. Insulated supply conductors in multiple-conductor cables	57.4-C
	3. Communication insulated conductors or multiple-conductor cables	87.4-C1
(w)	Shall apply radially to conductors on brackets attached to crossarms.	
	1. Supply conductors	54.4-C3b
	2. Communication conductors	84.8-C1b

(x)	Shall be increased between conductors of different classifications supported on the same crossarm. 1. Supply conductors of different voltage classification 2. Supply circuits of 0-750 volts and communication circuits 3. Supply circuits and private communication circuits.	 32.4-A 32.4-B 89.2-A
(y)	Special clearances for unprotected supply conductors from one level to another level	 54.6-A 58.2-B3 92.1-F5
(z)	Not applicable to the following: 1. Clearances between conductors at different levels specified in Cases 8 to 13 inclusive. 2. Supply lateral conductors, suitably protected 3. Supply vertical runs, suitably protected 4. Supply risers, suitably protected 5. Communication Conductors	 54.6-C 54.6-D 54.6-E 87.4-C1
(aa)	Not applicable between cables and their supporting messengers. 1. Supply 2. Communication	 57.4-D 87.4-F
(bb)	May be reduced for communication guys and communication conductors supported on the same poles 1. Supply 2. Communication	 56.4-C 86.4-C
(cc)	Clearance required between guys. 1. Supply guys, crossing 2. Supply guys, approximately parallel 3. Communication guys, crossing 4. Communication guys, approximately parallel	 56.4-D2 56.4-D3 86.4-D2 86.4-D3
(dd)	Shall be increased where within 6 feet of a pole	103.5
(ee)	May be decreased in partial underground distribution	54.4-C4c

Strikeout and Underline Version

Table 2

Basic Minimum Allowable Clearance of Wires from Other Wires at Crossings and at Supports

(Letter references Denote Modifications of Minimum Clearances Referred to in Notes Following this Table)

All Clearances Are in Inches

Case No.	Nature of Clearance and Class of Voltage of wire, cable or conductor concerned	Other Wire, cable or conductor concerned								
					Supply conductor (including supply cables)					
		A Span wires, guys and messengers	B Trolley contact conductors 0-750 volts	C Communication conductors (including open wire, cables and service drops)	D 0-750 volts (including service drops and trolley feeders (a))	E 750-7,500 Volts	F 7,500-20,000 volts	G 20,000-35,000 volts	H 35,000-68,000 volts	I Over 68,000 volts
	Clearance between wires, cables, and conductors not supported on the same poles, vertically at crossings in spans, and radially where collinear or approaching crossing									
1	Span wires, guys and messengers (b)	18 (c)	48 (d, e)	24 (e)	24 (e)	36 (f)	36	72	72	72(g)
2	Trolley contact conductors 0-750 volts	48 (d, e)	----------	48 (d)	48 (d, h)	48	72	96	96	96(g)
3	Communication conductors	24 (e)	48 (d)	24	48 (i)	48 (dd)	72	96	96	96(g)
4	Supply conductors, service drops and trolley feeders 0-750 volts	24 (e)	48 (d, h)	48 (i)	24	48	48	96	96	96(g)
5	Supply conductors, 750-7500 volts	36 (f)	48	48 (dd)	48	48 (h)	72	96	96	96(g)
6	Supply conductors 7500-20,000 volts	36	72	72	48	72	72	96	96	96(g)
7	Supply conductors, more than 20,000 volts	72	96	96	96	96	96	96	96	96(g)
	Vertical separation between conductors and / or cables on separate crossarms or other supports at different levels (excepting on related line and buck arms on the same pole)									
8	Communication conductors and service drops	----------	----------	12 (j)	48 (k, l, m, n)	48 (k)	72 (m, n)	72(m)	72	72
9	Supply Conductors, service drops and trolley feeders 0-750 volts	----------	----------	48 (k, l, m, n)	24 (h, k, m, o)	48 (k, m, p)	48 (k, m, q)	72(m)	72	72
10	Supply conductors, 750-7500 volts	----------	----------	48 (k)	48 (k, m, p)	48 (m, o, r, ee)	48 (m, q)	48(q)	48(q)	60(q)
11	Supply conductors 7500-20,000 volts	----------	----------	72 (m, n)	48 (k, m, q)	48 (m, q)	48 (m, o, q, r, ee)	48(q)	48(q)	60(q)
12	Supply conductors 20,000-68,000 volts	----------	----------	72 (m)	72 (m)	48 (m, q)	48 (m, q)	48(o, q)	48(o, q)	60(q)
13	Supply conductors, more than 68,000 volts	----------	----------	72	72	60 (q)	60 (q)	60(q)	60(q)	60(o, q)
	Vertical arms above or below conductors on related line arms and buck arms.									
14	Line arms above or below related buck arms (s, t)	----------	----------	6	12 (u)	18 (u)	18 (u)	24	36	48(g)
	Horizontal separation of conductors on same crossarm									

15	Pin spacings of longitudinal conductors, vertical conductors and service drops **Radial separation of conductors on same crossarm, pole or structure Incidental pole wiring**	----------	----------	3(x)	11 ½ (h, x)	11 ½ (x)	17 ½ (x)	24 (x)	36	48(g)
16	Conductors, tap or lead wires of different circuits (v, y, z)	----------	----------	3 (x)	11 ½ (h, x)	11 ½ (x)	17 ½ (x)	24 (x)	36	48(g)
17	Conductors, tap or lead wires of same circuits (v, y, z)	----------	----------	3	3	6	6	12	18	24
	Radial separation between guys and conductors		----------							
18	Guys passing conductors supported on other poles, and guys approximately parallel to conductors supported on the same poles	----------	----------	9 (bb)	12	18	18	30	36	36
19	Guys and spans wires passing conductors supported on the same poles	(ee)	3 (bb)	3	3	6	9	12	18	24
20	Vertical clearance between conductors of the same circuit on horizontal post insulators					24	24	30	36	48 (g)

(a)	The clearances in Column D are also applicable to supply cables of any voltage under certain conditions	57.4
(b)	Clearances for guys and span wires apply vertically at crossings; see Case 18 for radial clearances from conductors.	
	1. Supply guys and span wires from conductors	56.4-C
	2. Supply guys and span wires from guys and span wires	56.4-D1
	3. Communication guys and span wires from conductors	86.4-C
	4. Communication guys and span wires from guys and span wires	86.4-D1
(c)	Not applicable between messengers or span wires of the same system.	
	1. Supply messengers	57.4-E
	2. Trolley span wires	77.4-D
	3. Communication messengers	87.4-G
(d)	Protection required on guys, span wires, messengers, and cables where within trolley throw	
	1. Supply Guys and Span wires	56.4-B2
	2. Supply Messengers and Cables	57.4-B2
	3. Communication guys and span wires	86.4-B2
	4. Communication messengers	87.4-B2
(e)	Not applicable to certain conductors supported on trolley span wires.	
	1. Trolley contact and feeder conductors	74.4-G
	2. Trolley feeder conductors	78.1
	3. Trolley system communication conductors	78.2
	4. Foreign conductors	78.3
(f)	Increased clearance required over trolley contact conductors of 750-7500 volts	74.4-G2
(g)	Shall be increased for conductors of more than 68,000 volts.	
	1. Conductors not supported on the same poles	54.4-C7a
	2. Conductors supported on the same crossarm, pole or structure.	54.4-C7b
	3. Conductors supported on Post insulators	54.4-C7c
(h)	May be reduced for certain conductors of Class T circuits of the same system	74.4-C
(i)	May be reduced for service drops under special conditions.	
	1. Supply service drops and communication line conductors	54.8-C1a
	2. Supply service drops and communication service drops	54.8-C4
	3. Communication service drops and supply line conductors	84.8-D1a
	4. Communication service drops and supply service drops	84.8-D4
(j)	May be reduced or shall be increased for certain communication conductors or cables.	
	1. Open wire conductors, attached to poles, within 3 feet of topmost conductor	84.4-C1a
	2. Line conductors of police or fire-alarm circuits and service drops from other communication circuits.	84.8-D1b
	3. Cables and messengers attached to poles	87.4-C3
(k)	Special clearances for 0-750 volt conductors in rack configuration and messengers and cables attached to poles.	
	1. Supply conductors of 0-750 volts in rack configuration	54.9
	2. Supply cables and messengers attached to poles	57.4-F
	3. Communication cables and messengers attached to poles	87.4-C3
	4. On Jointly used poles	92.1

(l)	May be reduced for service drops, and police or fire-alarm conductors, under special conditions.	
	1. Supply service drops and communication line conductors	54.8-C1b
	2. Supply service drops on clearance arms	54.8-C2
	3. Supply service drops on pole-top extensions	54.8-C3
	4. Supply service drops and communication service drops	54.8-C4
	5. Communication service drops and police, fire-alarm or supply line conductors	84.8-D1b
	6. Communication service drops on clearance arms	84.8-D2
	7. Communication service drops on pole-top extensions	84.8-D3
	8. Communication service drops and supply service drops	84.8-D4
	9. Police or fire-alarm conductors	92.2
(m)	May be reduced for lead wires	
	1. Supply lead wires above supply conductors	54.4-C6
	2. Supply drip loops above communication conductors	92.1-F3
(n)	May be reduced for supply conductors and private communication conductors of the same ownership	89.2-B
(o)	May be reduced or increased for triangular or vertical configuration or for pole-top construction.	
	1. Triangular or vertical configuration on crossarms	54.4-C1c
	2. Dead-ended on pole in vertical configuration	54.4-C4
	3. Conductors of 0-7500 volts in triangular configuration at top of pole	54.4-D8a
	4. Conductors of more than 7500 volts at top of pole	54.4-D8b
(p)	May be reduced for supply service drops of 0-750 volts	54.8-C6
(q)	Shall be increased between circuits where conductors of more than 7500 volts are at pole top.	54.4-D8b
(r)	May be reduced under special conditions	
	1. Supply conductors of 750-7500 volts	54.4-C1a
	2. Supply conductors of 7500-20,000 volts	54.4-C1b
(s)	Does not apply where conductors do not cross.	
	1. Supply conductors of different phase polarity	54.4-C2a
	2. Communication conductors	84.4-C1a
(t)	Shall not be applied consecutively both above and below the same supply conductors	54.4-2a
(u)	Shall be increased where conductors of different classifications are supported on the same crossarms.	
	1. Supply conductors of 0-750 volts and conductors of 7500-20,000 volts	32.4-A2
	2. Supply conductors of 0-750 volts and conductors of 750-7500 volts	32.4-A3
(v)	Not applicable to certain kinds of conductors.	
	1. Supply conductors of same phase or polarity	54.4-C3c
	2. Insulated supply conductors in multiple-conductor cables	57.4-C
	3. Communication insulated conductors or multiple-conductor cables	87.4-C1
(w)	Shall apply radially to conductors on brackets attached to crossarms.	
	1. Supply conductors	54.4-C3b
	2. Communication conductors	84.8-C1b

(x)	Shall be increased between conductors of different classifications supported on the same crossarm. 1. Supply conductors of different voltage classification 2. Supply circuits of 0-750 volts and communication circuits 3. Supply circuits and private communication circuits.	 32.4-A 32.4-B 89.2-A
(y)	Special clearances for unprotected supply conductors from one level to another level	 54.6-A 58.2-B3 92.1-F5
(z)	Not applicable to the following: 1. Clearances between conductors at different levels specified in Cases 8 to 13 inclusive. 2. Supply lateral conductors, suitably protected 3. Supply vertical runs, suitably protected 4. Supply risers, suitably protected 5. Communication Conductors	 54.6-C 54.6-D 54.6-E 87.4-C1
(aa)	Not applicable between cables and their supporting messengers. 1. Supply 2. Communication	 57.4-D 87.4-F
(bb)	May be reduced for communication guys and communication conductors supported on the same poles 1. Supply 2. Communication	 56.4-C 86.4-C
(cc)	Clearance required between guys. 1. Supply guys, crossing 2. Supply guys, approximately parallel 3. Communication guys, crossing 4. Communication guys, approximately parallel	 56.4-D2 56.4-D3 86.4-D2 86.4-D3
(dd)	Shall be increased where within 6 feet of a pole	103.5
(ee)	May be decreased in partial underground distribution	54.4-C4c

Final Version

Table 2

Basic Minimum Allowable Clearance of Wires from Other Wires at Crossings and at Supports

(Letter references Denote Modifications of Minimum Clearances Referred to in Notes Following this Table)

All Clearances Are in Inches

Case No.	Nature of Clearance and Class of Voltage of wire, cable or conductor concerned	Other Wire, cable or conductor concerned								
					Supply conductor (including supply cables)					
		A Span wires, guys and messengers	B Trolley contact conductors 0-750 volts	C Communication conductors (including open wire, cables and service drops)	D 0-750 volts (including service drops and trolley feeders (a))	E 750-7,500 Volts	F 7,500-20,000 volts	G 20,000-35,000 volts	H 35,000-68,000 volts	I Over 68,000 volts
	Clearance between wires, cables, and conductors not supported on the same poles, vertically at crossings in spans, and radially where collinear or approaching crossing									
1	Span wires, guys and messengers (b)	18 (c)	48 (d, e)	24 (e)	24 (e)	36 (f)	36	72	72	72(g)
2	Trolley contact conductors 0-750 volts	48 (d, e)	----------	48 (d)	48 (d, h)	48	72	96	96	96(g)
3	Communication conductors	24 (e)	48 (d)	24	48 (i)	48 (dd)	72	96	96	96(g)
4	Supply conductors, service drops and trolley feeders 0-750 volts	24 (e)	48 (d, h)	48 (i)	24	48	48	96	96	96(g)
5	Supply conductors, 750-7500 volts	36 (f)	48	48 (dd)	48	48 (h)	72	96	96	96(g)
6	Supply conductors 7500-20,000 volts	36	72	72	48	72	72	96	96	96(g)
7	Supply conductors, more than 20,000 volts	72	96	96	96	96	96	96	96	96(g)
	Vertical separation between conductors and / or cables on separate crossarms or other supports at different levels (excepting on related line and buck arms on the same pole)									
8	Communication conductors and service drops	----------	----------	12 (j)	48 (k, l, m, n)	48 (k)	72 (m, n)	72(m)	72	72
9	Supply Conductors, service drops and trolley feeders 0-750 volts	----------	----------	48 (k, l, m, n)	24 (h, k, m, o)	48 (k, m, p)	48 (k, m, q)	72(m)	72	72
10	Supply conductors, 750-7500 volts	----------	----------	48 (k)	48 (k, m, p)	48 (m, o, r, ee)	48 (m, q)	48(q)	48(q)	60(q)
11	Supply conductors 7500-20,000 volts	----------	----------	72 (m, n)	48 (k, m, q)	48 (m, q)	48 (m, o, q, r, ee)	48(q)	48(q)	60(q)
12	Supply conductors 20,000-68,000 volts	----------	----------	72 (m)	72 (m)	48 (m, q)	48 (m, q)	48(o, q)	48(o, q)	60(q)
13	Supply conductors, more than 68,000 volts	----------	----------	72	72	60 (q)	60 (q)	60(q)	60(q)	60(o, q)
	Vertical arms above or below conductors on related line arms and buck arms.									
14	Line arms above or below related buck arms (s, t)	----------	----------	6	12 (u)	18 (u)	18 (u)	24	36	48(g)
	Horizontal separation of conductors on same crossarm									

15	Pin spacings of longitudinal conductors, vertical conductors and service drops **Radial separation of conductors on same crossarm, pole or structure Incidental pole wiring**	----------	----------	3(x)	11 ½ (h, x)	11 ½ (x)	17 ½ (x)	24 (x)	36	48(g)
16	Conductors, tap or lead wires of different circuits (v, y, z)	----------	----------	3 (x)	11 ½ (h, x)	11 ½ (x)	17 ½ (x)	24 (x)	36	48(g)
17	Conductors, tap or lead wires of same circuits (v, y, z) Radial separation between guys and conductors	----------	---------- ----------	3	3	6	6	12	18	24
18	Guys passing conductors supported on other poles, and guys approximately parallel to conductors supported on the same poles	----------	----------	9 (bb)	12	18	18	30	36	36
19	Guys and spans wires passing conductors supported on the same poles	(ee)	3 (bb)	3	3	6	9	12	18	24
20	Vertical clearance between conductors of the same circuit on horizontal post insulators					24	24	30	36	48 (g)

(a)	The clearances in Column D are also applicable to supply cables of any voltage under certain conditions	57.4
(b)	Clearances for guys and span wires apply vertically at crossings; see Case 18 for radial clearances from conductors.	
	1. Supply guys and span wires from conductors	56.4-C
	2. Supply guys and span wires from guys and span wires	56.4-D1
	3. Communication guys and span wires from conductors	86.4-C
	4. Communication guys and span wires from guys and span wires	86.4-D1
(c)	Not applicable between messengers or span wires of the same system.	
	1. Supply messengers	57.4-E
	2. Trolley span wires	77.4-D
	3. Communication messengers	87.4-G
(d)	Protection required on guys, span wires, messengers, and cables where within trolley throw	
	1. Supply Guys and Span wires	56.4-B2
	2. Supply Messengers and Cables	57.4-B2
	3. Communication guys and span wires	86.4-B2
	4. Communication messengers	87.4-B2
(e)	Not applicable to certain conductors supported on trolley span wires.	
	1. Trolley contact and feeder conductors	74.4-G
	2. Trolley feeder conductors	78.1
	3. Trolley system communication conductors	78.2
	4. Foreign conductors	78.3
(f)	Increased clearance required over trolley contact conductors of 750-7500 volts	74.4-G2
(g)	Shall be increased for conductors of more than 68,000 volts.	
	1. Conductors not supported on the same poles	54.4-C7a
	2. Conductors supported on the same crossarm, pole or structure.	54.4-C7b
	3. Conductors supported on Post insulators	54.4-C7c
(h)	May be reduced for certain conductors of Class T circuits of the same system	74.4-C
(i)	May be reduced for service drops under special conditions.	
	1. Supply service drops and communication line conductors	54.8-C1a
	2. Supply service drops and communication service drops	54.8-C4
	3. Communication service drops and supply line conductors	84.8-D1a
	4. Communication service drops and supply service drops	84.8-D4
(j)	May be reduced or shall be increased for certain communication conductors or cables.	
	1. Open wire conductors, attached to poles, within 3 feet of topmost conductor	84.4-C1a
	2. Line conductors of police or fire-alarm circuits and service drops from other communication circuits.	84.8-D1b
	3. Cables and messengers attached to poles	87.4-C3
(k)	Special clearances for 0-750 volt conductors in rack configuration and messengers and cables attached to poles.	
	1. Supply conductors of 0-750 volts in rack configuration	54.9
	2. Supply cables and messengers attached to poles	57.4-F
	3. Communication cables and messengers attached to poles	87.4-C3
	4. On Jointly used poles	92.1

(l)	May be reduced for service drops, and police or fire-alarm conductors, under special conditions.	
	1. Supply service drops and communication line conductors	54.8-C1b
	2. Supply service drops on clearance arms	54.8-C2
	3. Supply service drops on pole-top extensions	54.8-C3
	4. Supply service drops and communication service drops	54.8-C4
	5. Communication service drops and police, fire-alarm or supply line conductors	84.8-D1b
	6. Communication service drops on clearance arms	84.8-D2
	7. Communication service drops on pole-top extensions	84.8-D3
	8. Communication service drops and supply service drops	84.8-D4
	9. Police or fire-alarm conductors	92.2
(m)	May be reduced for lead wires	
	1. Supply lead wires above supply conductors	54.4-C6
	2. Supply drip loops above communication conductors	92.1-F3
(n)	May be reduced for supply conductors and private communication conductors of the same ownership	89.2-B
(o)	May be reduced or increased for triangular or vertical configuration or for pole-top construction.	
	1. Triangular or vertical configuration on crossarms	54.4-C1c
	2. Dead-ended on pole in vertical configuration	54.4-C4
	3. Conductors of 0-7500 volts in triangular configuration at top of pole	54.4-D8a
	4. Conductors of more than 7500 volts at top of pole	54.4-D8b
(p)	May be reduced for supply service drops of 0-750 volts	54.8-C6
(q)	Shall be increased between circuits where conductors of more than 7500 volts are at pole top.	54.4-D8b
(r)	May be reduced under special conditions	
	1. Supply conductors of 750-7500 volts	54.4-C1a
	2. Supply conductors of 7500-20,000 volts	54.4-C1b
(s)	Does not apply where conductors do not cross.	
	1. Supply conductors of different phase polarity	54.4-C2a
	2. Communication conductors	84.4-C1a
(t)	Shall not be applied consecutively both above and below the same supply conductors	54.4-2a
(u)	Shall be increased where conductors of different classifications are supported on the same crossarms.	
	1. Supply conductors of 0-750 volts and conductors of 7500-20,000 volts	32.4-A2
	2. Supply conductors of 0-750 volts and conductors of 750-7500 volts	32.4-A3
(v)	Not applicable to certain kinds of conductors.	
	1. Supply conductors of same phase or polarity	54.4-C3c
	2. Insulated supply conductors in multiple-conductor cables	57.4-C
	3. Communication insulated conductors or multiple-conductor cables	87.4-C1
(w)	Shall apply radially to conductors on brackets attached to crossarms.	
	1. Supply conductors	54.4-C3b
	2. Communication conductors	84.8-C1b

(x)	Shall be increased between conductors of different classifications supported on the same crossarm. 1. Supply conductors of different voltage classification 2. Supply circuits of 0-750 volts and communication circuits 3. Supply circuits and private communication circuits.	 32.4-A 32.4-B 89.2-A
(y)	Special clearances for unprotected supply conductors from one level to another level	 54.6-A 58.2-B3 92.1-F5
(z)	Not applicable to the following: 1. Clearances between conductors at different levels specified in Cases 8 to 13 inclusive. 2. Supply lateral conductors, suitably protected 3. Supply vertical runs, suitably protected 4. Supply risers, suitably protected 5. Communication Conductors	 54.6-C 54.6-D 54.6-E 87.4-C1
(aa)	Not applicable between cables and their supporting messengers. 1. Supply 2. Communication	 57.4-D 87.4-F
(bb)	May be reduced for communication guys and communication conductors supported on the same poles 1. Supply 2. Communication	 56.4-C 86.4-C
(cc)	Clearance required between guys. 1. Supply guys, crossing 2. Supply guys, approximately parallel 3. Communication guys, crossing 4. Communication guys, approximately parallel	 56.4-D2 56.4-D3 86.4-D2 86.4-D3
(dd)	Shall be increased where within 6 feet of a pole	103.5
(ee)	May be decreased in partial underground distribution	54.4-C4c