

Decision No. 66707**ORIGINAL**

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application of
 PACIFIC GAS AND ELECTRIC COMPANY for
 an order amending and revising certain
 provisions of General Order No. 95
 "Rules for Overhead Electric Line
 Construction" to the extent necessary
 to permit the use of single- and three-
 phase partial underground electric
 distribution systems.
 (Electric)

Application No. 45653
 (Filed August 7, 1963)

F. T. Searls, John C. Morrissey and Ross Workman,
 for applicant.
Robert H. Wooden, for International Brotherhood
 of Electrical Workers; M. A. Walters, for Local
 Union 1245, I.B.E.W.; interested parties.
H. A. Dannenbrink, Jr., for the Commission staff.

O P I N I O N

This matter was heard before Examiner Emerson on
 November 20, 1963, at San Francisco.¹

Heretofore, by Decision No. 64588 issued December 4, 1962,
 in Application No. 44806, Pacific Gas and Electric Company has been
 authorized to deviate from certain of the provisions of General
 Order No. 95, on a system-wide basis, in order to permit construc-
 tion and operation of overhead high voltage conductors (nominally
 12 kv) in vertical configuration on metal poles, in a new design
 termed "partial underground distribution". Such authority to
 deviate was limited to the use of not more than two conductors of
 a single circuit of 7500-20,000 volts.

¹ Also heard, on a consolidated record, were Applications Nos. 45638,
 45755, 45778, 45807, 45845 and 45846, such other matters dealing
 with specific instances of the general issues here before the
 Commission.

The new design, an attempt partially to meet the public's desire for elimination of overhead lines within residential districts and at the same time to keep the costs of distribution within reasonable economic limits and substantially below the costs of full undergrounding, has found ready acceptance by civic groups, real estate developers and governmental bodies. Both trial and permanent installations, as authorized by the Commission, have been closely viewed by many interested persons and have engendered numerous requests for similar installations to be made in various sections of the State.

In view of the wide acceptance and, indeed, the number of demands for such construction, Pacific Gas and Electric Company has completed or is currently constructing 15 partial underground distribution systems and has 28 such systems in the planning stage. In compliance with the limited authority heretofore granted, such systems may accommodate only single-phase usage. Where customer demands call for three-phase service the new design may not, under present authority, be used. In order to meet this situation, two installations of three-phase systems were authorized by this Commission's Resolution No. E-1130, issued April 2, 1963, to be erected and operated in Alameda County. Construction of one of them was completed on June 21, 1963. Twelve others are contemplated and in the planning stage.

To date, the authorized construction has been confined to the so-called nonworkable voltages and to the Pacific Gas and Electric Company system through permitted deviations granted to that company alone. The Commission staff, in recognition of the widespread interest in the new design and visualizing its state-wide application, suggested that Pacific Gas and Electric Company in any contemplated future application for authority to deviate,

apply instead for modification of General Order No. 95 so that, if granted by the Commission, the new design might be utilized by any or all utilities in California. The instant application, therefore, seeks modification of General Order No. 95 itself and would apply state-wide.

The principal features of the new design are:

1. Uniformly tapered rigid steel poles, requiring no guying.
2. Transformers in specially-designed tanks mounted directly on the tops of poles.
3. Street lights, mounted on brackets attached to the poles, supplied by internal wiring and controlled by individual photocell units.
4. Primary lines supported in vertical configuration on the poles, just below the transformers.
5. Secondary conductors extending from the transformer down inside the pole to an underground secondary distribution system.
6. Poles are nonclimbable and energized primary conductors supported thereon are worked upon only from aerial lifts and by means of live-line tools.

Utility, labor union and Commission staff representatives have viewed and studied installations in the field. Their expert testimony is to the effect that such installations are satisfactory when viewed in the light of the principles embodied in the rules of General Order No. 95. In view of this expert testimony, the Commission finds that safety to workmen and to the public will not be lessened, that no undue hazard will result from the design and construction for which the proposed modification of the rules is intended, and that General Order No. 95 should be modified to the extent hereinafter ordered.

The following discussion constitutes an explanation of the rule changes hereinafter ordered:

Rule 20.6 - Since "partial underground construction" makes no provision for the poles being climbed by workmen and access to overhead equipment and conductors must be provided by means of aerial lifts, climbing space has no real meaning on such poles. The rule, therefore, will be clarified as being intended for climbable poles and structures.

Rule 20.8-D - The insulated conductors from the secondary terminals of the transformer to the splice box at the base of the pole are to be completely enclosed within the transformer case and the pole itself. Other risers and vertical runs (for example, secondary conductors to the street light) will be similarly encased. They will not be "unprotected conductors" and the rule will so provide.

New Rule 21.10 - A definition of "partial underground distribution" is needed to describe the salient features of the new design. The details are to be described in other rules.

New Rule 22.0-D - A definition of "nonclimbable" poles is needed and will be made as an addition to Rule 22.0.

Rule 31.5 and Rule 91.1 - Only supply conductors are to be supported by the poles in "partial underground distribution". These rules will emphasize such condition.

Rule 37, Table 1, Cases 8 and 9, Column E - The distance of 750-20,000 volt conductors from center line of pole and from surface of pole may be decreased to those distances which a post clamp-top or dead-end type insulator will provide, such conductors being not less than 6 inches from surface of pole when so supported. A new footnote (jj)

will be added to show a reference to Rule 54.4-D2 for the departure from the basic clearances set forth in Cases 8 and 9, Column E, Table 1.

Rule 38, Table 2, Case 10, Column E) - It is intended
Rule 38, Table 2, Case 11, Column F) that the spacing of high-voltage conductors in "partial underground distribution" systems be no greater than the normal crossarm pin spacing employed by a utility. For this reason, Cases 10 and 11, Columns E and F will be footnoted and reference will be made to New Rule 54.4-C4c wherein the minimum vertical separations will be specified.

Rule 54.4-C4b and New Rule 54.4-C4c - It is intended that the present rule remain in full force and effect where climbable poles are involved, whether in dead-end or tangent configuration. With respect to the new design using non-climbable metal poles, it is intended that the vertical extent of line conductors (which are less than "normal" clearances from center-line and surface of pole) be held within practical limits and that the possible exposure of workmen to energized high-voltage conductors be held to a practical minimum. This rule will therefore be modified to indicate its applicability to climbable poles and a NEW RULE 54.4-C4c will be applicable to the nonclimbable poles contemplated for partial underground distribution.

Rule 54.4-D2 - The present rule is primarily to amplify Table 1 clearances by showing clearances for 750-7500, for 7500-46,000 and for above 46,000 volts, and the rule applies generally to all poles, irrespective of pole material and whether or not the poles are climbable. In the new design, not only are the poles nonclimbable but, more importantly,

work is performed only from aerial lifts. Under these special circumstances, the clearances may appropriately be lessened for voltage of 750-20,000 volts and the rule will be so modified.

Rule 54.4-D6b and New Rule 54.4-D6c - The principles discussed under Rule 54.4-C4b, above, are applicable here also and similar treatment will be accorded these rules.

Rule 54.6-D and Rule 54.6-E - These rules did not contemplate runs and risers within a pole. They will be clarified so as to clearly provide for the encasement of conductors with the new type of metal pole construction.

Rule 54.6-F - In the vertical line conductor configuration of partial underground distribution, one or more riser terminals must be above the level of conductors of other phases. In addition, the terminals may appropriately be at no greater distance from surface of pole than are the line conductors to which they attach. Modification of the present rule will so provide.

Rule 54.7-A - The basic concept of General Order No. 95 is to provide a set of rules for the design and construction of overhead lines, the application of which will insure adequate service and secure safety to persons engaged in the construction, maintenance, operation and use of overhead electrical lines and to the public in general. The General Order does not, however, set forth rules pertaining to operating or working conditions or to the methods by which lines are worked upon except in extraordinary instances. Experience through the many years in which this General Order and its predecessors have been in use has, we believe, amply demonstrated the wisdom of adhering to the basic concept of

providing rules for design rather than rules for working conditions. In the instant proceeding one of these extraordinary instances arises, wherein operating rules must be specified, because the new design pertaining to partial underground distribution is predicated on all overhead line work being done only from aerial lifts and by means of live-line tools. An appropriate place in which to set forth the necessary working methods appears to be in the climbing space rule, Rule 54.7-A, and this rule will be modified accordingly.

Rule 55.3-D - In view of the special nature of the transformer tank construction and the line conductor placement on the pole, additional insulator requirements will be specified. Transformer bushings shall have ratings of not less than 95 kv BIL and 60 kv dry flash-over. Insulators for 750-20,000 kv line conductors shall have not less than an 80 kv dry flash-over rating.

Rule 58.3-C3 - The present rule, which recommends against hanging transformers on metal poles or structures, did not contemplate the exclusive use of aerial lifts for work on such poles or that the transformer tank would be an integral part of the pole structure. The rule will be modified to recognize these developments.

Rule 58.3-D - Since climbing space is not necessary in the new design, this rule may appropriately be modified.

Rule 58.5-D - This rule deals with both conductor clearances and climbing space requirements. While the rule may be modified respecting climbing space requirements, no convincing evidence was presented respecting a proposal to lessen conductor clearances. The rule governs line switches

and line disconnecting devices. No such equipment especially used or adaptable to the type of construction proposed in this proceeding is known by or has been brought to the attention of the Commission. Pending development of such equipment and experience with its use, modification of this rule will be deferred.

O R D E R

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 tenth day following the date of this order.

IT IS FURTHER ORDERED that the Secretary shall cause a copy of this order and its Appendix A to be served upon each electric and telephone utility subject to the 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 the date hereof.

Dated at San Francisco, California, this 28th day of January, 1964.

William La Bunde
President

John Mitchell

Robert W. Long

George H. Trover

Fredrick B. Holbrook
Commissioners

APPENDIX A

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

1. Rule 20.6

This rule is amended to read as follows:

"CLIMBING SPACE means the space reserved along the surface of a climbable pole or structure to permit ready access for linemen to equipment and conductors located on the pole or structure."

2. Rule 20.8-D

This rule is amended to read as follows:

"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."

3. Rule 21.10

This is a new rule which shall read as follows:

"21.10 PARTIAL UNDERGROUND DISTRIBUTION means a supply system of overhead primary conductors supported in vertical configuration, without crossarms, on non-climbable, non-joint-poles, and with underground secondary distribution facilities (see App. G, Fig. 87)."

4. Rule 22.0-D

This is a new rule, which shall read as follows:

"D. NON-CLIMBABLE POLE means a metal pole of smooth exterior surface (not latticed), that is not equipped with pole steps or other provisions for climbing, and upon which work is performed only from aerial lifts."

5. Rule 31.5

Add to the existing rule a paragraph which shall read as follows:

"Non-climbable poles in partial underground distribution systems (see Rules 22.0-D and 21.10) shall not be jointly used."

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6. Rule 37, Table 1

In Table 1, Case 8, Column E and in Case 9, Column E, add footnote (jj) and in the "references to rules modifying minimum clearances in Table 1" add the following:

"(jj) May be decreased in partial underground distribution.....54.4-D2 (page 101)."

7. Rule 38, Table 2

In Table 2, Case 10, Column E and in Case 11, Column F, add footnote (ee) and in "references to rules modifying minimum clearances in Table 2" add the following:

"(ee) May be decreased in partial underground distribution.....54.4-C4c (page 99)."

8. Rule 54.4-C4b

The first paragraph of this rule is revised to read 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:"

9. Rule 54.4-C4c

This is a new rule, which shall read as follows:

"c) Conductors of More than 750 Volts supported on non-climbable poles: Where conductors of more than 750 volts are supported in vertical configuration on non-climbable poles in partial underground distribution at line terminations, angles, or corners, the following requirements apply:
Not more than three conductors of a single circuit of 750-20,000 volts shall be supported directly on the pole in vertical configuration without the use of crossarms. Branch circuits may be taken from such construction without the use of crossarms provided that conductors are supported on not more than three sides of the pole, there being four sides (see App. G, Fig. 88); The vertical separation between conductors shall be not less than the pin spacings specified in Table 2, Case 15;
The clearance of conductors from surface of pole shall be not less than as specified in Rule 54.4-D2."

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10. Rule 54.4-D2

This rule is modified by adding thereto a new paragraph which shall read as follows:

"These clearances from center line of pole need not apply to conductors of 750-7500 volts and 7500-20,000 volts supported in vertical configuration in partial underground distribution provided: a) such conductors have clearances from surface of pole of not less than 6 inches, b) in tangent construction, conductors so supported are not attached to more than one side of pole, and c) in dead-end construction conductors so supported are not attached to more than three sides of a pole (there being four sides, see App. G, Fig. 88)."

11. Rule 54.4-D6b

The first sentence of this rule is revised to read as follows:

"b) More than 750 Volts supported on climbable poles: Where conductors are 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 surface of pole for voltages in excess of 7500 volts."

12. Rule 54.4-D6c

This is a new rule, which shall read as follows:

"c) More than 750 Volts supported on non-climbable poles: Where conductors are dead-ended on a non-climbable pole in partial underground distribution, the energized portions of such conductors shall be not less than 6 inches from surface of pole (see Rule 54.4-D2)."

13. Rule 54.6-D

The third paragraph of this rule is revised to read as follows:

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

14. Rule 54.6-E

The last paragraph of this rule (page 110) is revised to read as follows:

"Protective covering (suitable) is not required over risers encased in effectively grounded non-climbable metal poles or in iron or steel pipe attached to a steel pole, tower or other metal structure, provided the iron or steel pipe is effectively grounded and is metallicly connected to such metal structure."

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15. Rule 54.6-F

The first paragraph of this rule is modified to read as follows:

"Terminals of risers or runs shall not extend above the level of line conductors to which terminal leads are connected except as follows:

Where the line conductors are installed in vertical configuration in partial underground distribution, or where the line conductors are dead-ended on the opposite side of crossarms from the terminals and no line conductors supported on the same crossarm and the same side of pole extend past the terminals and no buckarm construction is involved, or Where conductors in excess of 7500 volts are installed in vertical configuration on crossarms, and the terminals are mounted on the same arms which support the conductors to which the terminals are connected."

The third paragraph of this rule is revised to read as follows:

"Cable or conduit bends and the terminals of risers or runs of conductors of more than 750 volts supported on climbable poles or structures shall be arranged with as little exposed surface as practicable but are not required to be covered by a protective covering provided that no portion of the terminal or associated unprotected conductors are within the climbing space or within the clearance from center line of pole specified in Table 1, Case 8 (15 or 18 inches). All exposed grounded surfaces of such terminal fittings and bends of risers and runs shall be not less than 18 inches vertically above the conductor level, and not less than 2 feet radially from any conductor at the next conductor level, of unprotected conductors of another circuit which is entirely below the level of the circuit to which the riser is connected."

Following the above paragraph, the following new paragraph shall be inserted:

"In partial underground distribution (750-20,000 volts in vertical configuration on non-climbable poles), energized portions of the terminals may be less than the clearances from center line of pole specified in Table 1, Case 8, Column E (15 or 18 inches) but shall be not less than 6 inches from the surface of the non-climbable metal pole and grounded metal surfaces associated therewith."

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16. Rule 54.7-A

The following new paragraph shall be added to this rule (page 113).

"This Rule 54.7-A need not apply to non-climbable metal poles in partial underground distribution, provided the regular written operating rules of the utility concerned specify that all work on conductors and equipment supported by such poles shall be performed only from aerial lifts and (1) in the case of primary conductors, shall be done with live-line tools after installing adequate insulating and protective devices or barriers in order to (a) prevent accidental contact by the workman with the energized conductors other than the conductor being worked on and (b) to minimize the possibility of simultaneous contact of the metal parts of live-line tools with the grounded pole and the energized conductor and (2) in the case of secondary conductors shall be done after suitably covering all energized primary conductors with adequate insulating and protective devices or barriers."

17. Rule 55.3-D

This rule is amended to read as follows:

"Insulators used in territories where fog or lightning conditions prevail should be given more liberal factors of safety than those indicated in Table 12. In partial underground distribution, the primary transformer bushings shall have ratings of not less than 95 kv BIL and a dry flashover of not less than 60 kv; line conductor insulators, either post clamp or dead-end type, shall have a dry flashover rating of not less than 80 kv.

Insulators used at crossings or conflicts shall conform to Rules 104 and 114."

18. Rule 53.3-C3

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

"Except in the case of partial underground distribution systems (see Rule 21.10), the hanging or placing of transformers on metal poles or structures is not recommended, particularly with respect to transformers connected to circuits of less than 14,000 volts."

19. Rule 53.3-D

The following paragraph is added to this rule:

"The provisions of this rule shall not apply to partial underground distribution systems."

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20. Rule 91.1

Add to the existing rule a paragraph which shall read as follows:

"Non-climbable metal poles in partial underground construction (see Rules 22.0-D and 21.10) shall not be jointly used."

21. Appendix G

Figures 87 and 88 are added to Appendix G in order to illustrate the type of construction and clearances involved in partial underground distribution.

APPENDIX G
PARTIAL UNDERGROUND
RULE 21.10

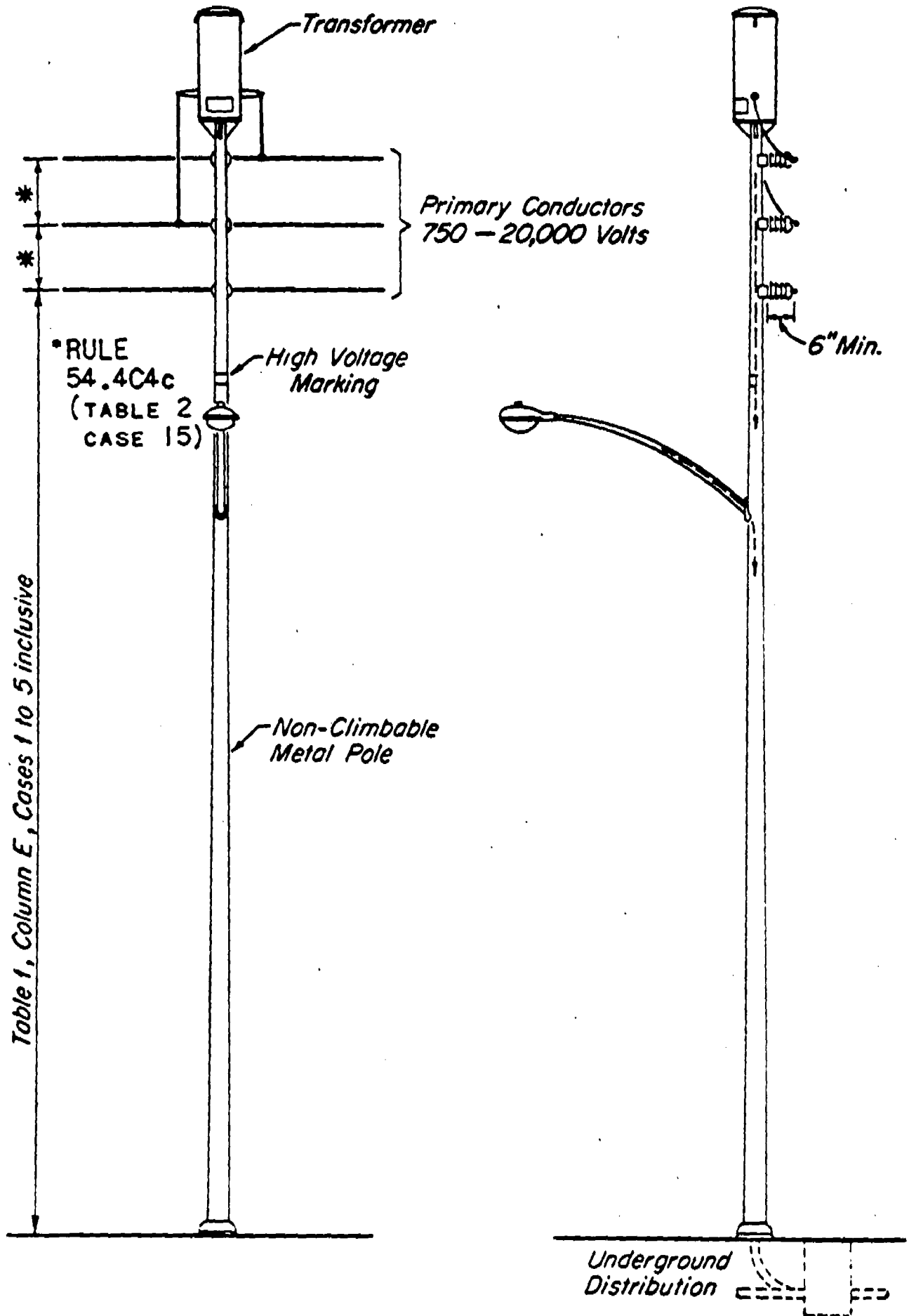
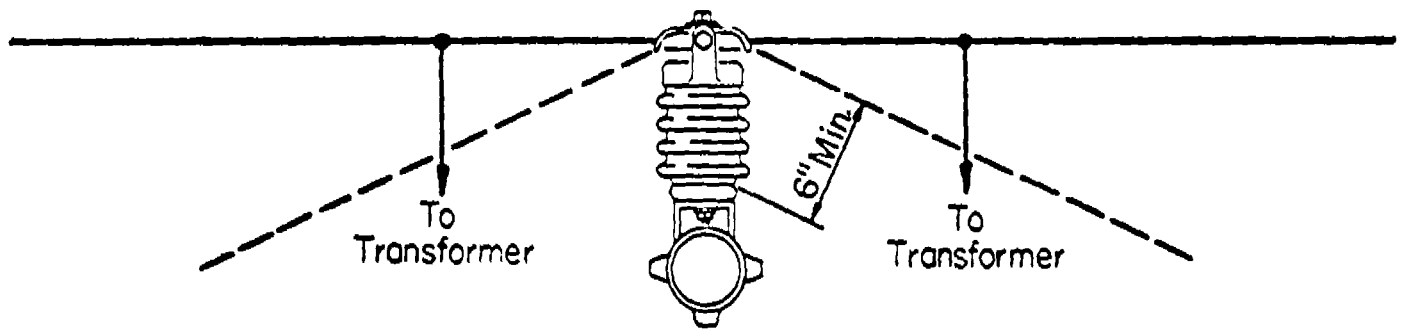
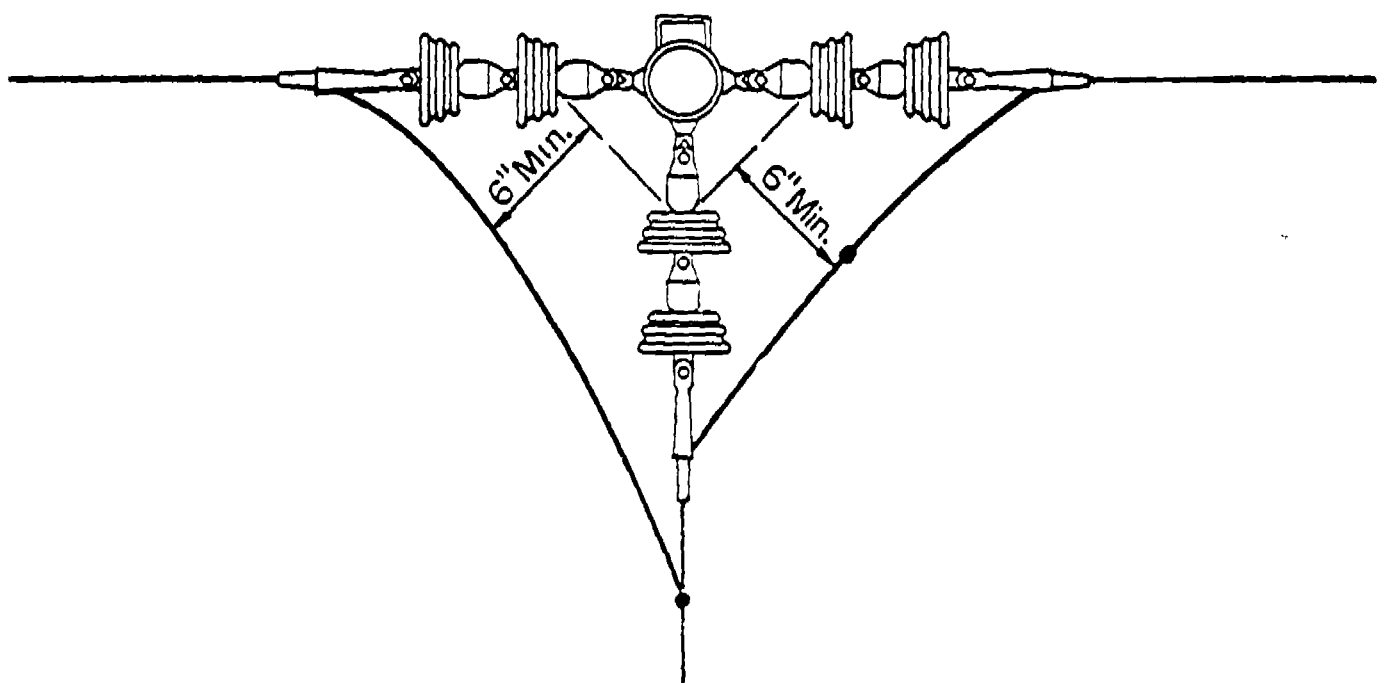


FIG. 87

CONDUCTOR CLEARANCE AND ARRANGEMENT
PARTIAL UNDERGROUND
RULE 54.4-02



TANGENT CONSTRUCTION



DEADEND CONSTRUCTION

FIG. 88