BEM

ORIGINAL

Decision No. 73813

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application of SOUTHERN CALIFORNIA EDISON COMPANY for an order amending General Order No. 95, "Rules for Overhead Electric Line Construction," with respect to tower lines and extra high voltage lines.	Application No. 49851 (Filed December 5, 1967)

O P I N I O N

Southern California Edison Company (Edison) requests an order amending and revising certain portions of General Order No. 95, "Rules for Overhead Electric Line Construction," relating to lines with operating voltages in excess of 68,000 volts.

Many lines at higher voltages are being planned and constructed to satisfy the rapidly increasing demands for electric service by the most feasible and economic means. The General Order contains no standards specifically applicable to the construction of extra high voltage lines.

There is a present need to amend and revise certain portions of General Order No. 95 with respect to tower lines and extra high voltage lines for the purpose of keeping the provisions, rules, standards and specifications of the General Order up to date.

Through the cooperative effort of the major electric utilities, the Commission staff and other interested parties, certain modifications have been developed to establish appropriate minimum clearances, wire sizes, strength requirements and other provisions in keeping with the purpose, scope and intent of the General Order.

Attached to the application marked Exhibit A is a proposed modification to Section VI of General Order No. 95. All of present Section VI covering additional construction requirements for tower

lines is deleted and replaced by detailed construction requirements for tower lines and extra high voltage lines.

Attached to the application marked Exhibit B is a compilation of related modifications in other sections of the General Order, including proposed changes or additions in the following rules: Rule 20.5-D; Rule 20.8; Rule 21.7-C; Rule 33.1; Rule 37 (Table 1); Rule 38 (Table 2); Rule 39 (Table 2-A); Rule 42 (Table 3); Rule 44; Rule 44.1 (Table 4); Rule 48.2; Rule 49.1-A; Rule 49.6-B (Table 9); Rule 50; Rule 51.6-A; Rule 54.4-A(1); Rule 54.4-C(2); Rule 54.4-C(7); Rule 100; Rule 103.2 and Rule 113.2. Edison, by letter of January 19, 1968, filed certain revisions to Exhibit B of the application pertaining to prior decisions. Said letter is received herein as Exhibit 1.

Edison states the proposed modifications set forth in Exhibit A and Exhibit B have been reviewed by Pacific Gas and Electric Company, Pacific Power & Light Company and San Diego Gas & Electric Company, each of which has advised Edison that it concurs in and endorses such modifications to General Order No. 95. In addition, said modifications were submitted to and reviewed by the Department of Water and Power of the City of Los Angeles, Sacramento Municipal Utility District, the Commission staff and representatives of the International Brotherhood of Electrical Workers.

The Commission finds that such modifications will not be detrimental to the safety of the general public and workmen; such modifications will assist in achieving greater statewide uniformity of practices relative to specifications and requirements for the construction, maintenance, operation or use of tower lines and extra high voltage lines and concludes that General Order No. 95 should be modified to the extent set forth in Appendices A and B attached hereto.

No protest to the adoption of the proposed modifications has been received. A public hearing is not necessary.

O R D E R

IT IS ORDERED that the Commission's General Order No. 95, "Rules for Overhead Electric Line Construction," is modified to the extent set forth in Appendices A and B attached hereto.

IT IS FURTHER ORDERED that the Secretary shall cause a copy of this order and its Appendices A and B to be served upon each electric and telephone utility subject to the jurisdiction of this Commission, the State Division of Industrial Safety, and further, to cause a suitable number of copies to be made available for distribution to such other agencies furnishing utility service and 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 5th day of March, 1968.

President

Commissioners

Commissioner Peter E. Mitchell, being necessarily absent, did not participate in the disposition of this proceeding.

APPENDIX A

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

Delete: All of Section VI.

Add:

SECTION VI

DETAILED CONSTRUCTION REQUIREMENTS
FOR TOWER LINES AND EXTRA HIGH VOLTAGE LINES
(Class E Circuits)

Rule

60. GENERAL

61. TOWERS AND STRUCTURES
- 61.1 Definition
- 61.2 Maintenance and Inspection
- 61.3 Material and Strength
  - A. Material
    - (1) Tower Members
    - (2) Overhead Ground Wires or Lightning Protection Wires
    - (3) Guys and Anchor Rods
      - a) Guys
      - b) Anchor Rods
  - B. Strength
- 61.4 Clearances
  - A. From Railroad Tracks
- 61.5 Dimensions and Settings
- 61.6 Marking and Guarding
  - A. Marking
  - B. Guarding
- 61.7 Stepping

63. DEAD ENDS, CONDUCTOR SUSPENSIONS AND FASTENINGS
- 63.1 Maintenance and Inspection
- 63.2 Material and Strength
- 63.3 Dead End and Suspension Spacing
- 63.4 Bonding

64. CONDUCTORS
- 64.1 Definition
- 64.2 Maintenance and Inspection
- 64.3 Material and Strength
- 64.4 Clearances
  - A. Above Ground
  - B. Above Railways and Trolley Lines
  - C. Between Conductors
    - (1) On different crossarms on the same structure
    - (2) On the same crossarms

65. CONDUCTOR INSULATORS
- 65.1 Material
- 65.2 Strength

66. GUYS
- 66.1 Definition
- 66.2 Use
- 66.3 Material and Strength
- 66.4 Clearance
- 66.5 Fastenings
- 66.6 Grounding of Anchor Guys
- 66.7 Protection

SECTION VI
DETAILED CONSTRUCTION REQUIREMENTS
FOR TOWER LINES AND EXTRA HIGH VOLTAGE LINES
(Class E Circuits)

60. GENERAL

The following rules cover certain special details for the construction of tower lines and extra high voltage lines.

These rules are supplemented, in certain cases, by rules in other sections. See Section X for special rules applicable to line crossings or conflicts; see Section XI for special rules applicable to lines crossing railways.

61. TOWERS AND STRUCTURES

61.1 Definition (see Rule 21.7C)
61.2 Maintenance and Inspection (see Rules 31.1 and 31.2)
61.3 Material and Strength (also see Section IV)

A. Material
(1) Tower members shall have a thickness of metal equivalent to the following:
Galvanized steel: Main corner members, 3/16 inch; other members, 1/8 inch.
Painted steel: Main corner members, 1/4 inch; other members, 3/16 inch. All iron or steel members of towers and all hardware subject to injurious corrosion under the prevailing conditions shall be protected by galvanizing, painting or other treatment which will effectively retard corrosion.
(2) Overhead ground wires or lightning protection wires shall be galvanized steel cable not less than 1/4 inch in diameter, or other corrosion resistant material of equal tensile strength. Where overhead ground wires are not used, effort shall be made to secure an effectively grounded structure.
(3) Guys and Anchor Rods
a) Guys shall be galvanized steel strand not less than 5/16 inch in diameter, or other corrosion resistant material of equal tensile strength, or they shall be rolled rods of galvanized steel or other corrosion resistant material with tensile strength not less than the tensile strength of 5/16 inch diameter galvanized steel strand.
b) Anchor rods shall be galvanized steel not less than 5/8 inch in diameter or shall be of equal strength and durability.

B. Strength
Where support structures or towers are used which are not capable of withstanding substantially as great a stress longitudinally as transversely, longitudinal guying shall be used. The line as a whole shall be designed so that a failure of an individual support structure shall not cause successive failures of more than ten additional support structures.

61.4 Clearances
A. From Railroad Tracks (see Rule 36; also, Appendix E)

61.5 Dimensions and Settings (see Section IV)

61.6 Marking and Guarding
A. Marking
All towers or structures which are of a design easily climbed and which are located in urban districts or in cultivated agricultural areas or near roads or trails which are frequently traveled, shall be equipped with signs so worded as to warn the public of the danger of climbing same. Such signs shall be placed and arranged so that they may be read from the four corners of the structure. Such signs shall be neither less than 8 feet nor more than 20 feet above the ground except where the lowest horizontal member of the tower or structure is more than 20 feet above the ground in which case the sign shall be not more than 30 feet above the ground.

B. Guarding
Where a tower of a design which can be easily climbed supports supply conductors and is located in urban districts, or in rural areas adjacent to schools, dwellings, permanent or seasonal camps, or in orchards, or near roads or trails which are frequently traveled, a barrier or other provision shall be made to prevent easy climbing.

The provisions of this rule shall not apply to towers or structures on which all conductors have 5 feet or more horizontal clearance from the supporting structure, nor to towers or structures within fenced substation yards.

Note: It is the intent of Rule 61.6B to require such guarding as will prevent easy climbing of these towers by young persons who do not realize the danger of contact with live conductors supported thereon. It is not intended that such guarding will be required in sparsely settled districts, mountainous and desert areas, and similar locations.

61.7 Stepping
All towers upon which it may be necessary for workmen to climb shall be provided with steps or ladders, which shall start at not less than 7 feet 6 inches from the ground line. The spacing between steps on the same side of the tower legs shall not exceed 36 inches.

Where the members of the tower are so arranged that the tower may be climbed with safety, no steps or ladders need be provided.

63. DEAD ENDS, CONDUCTOR SUSPENSIONS AND FASTENINGS

63.1 Maintenance and Inspection (see Rules 31.1 and 31.2)

63.2 Material and Strength (see Rule 49.5)

63.3 Dead End and Suspension Spacing (see Table 1 and Table 2)

63.4 Bonding

Bonding is not required by these rules. It is recognized that under certain conditions it may be deemed necessary. Where phase-to-phase bonding is used, the bond wire or strap shall have a conductivity of not less than No. 10 AWG copper wire.

64. CONDUCTORS

64.1 Definition (see Rule 20.8)

64.2 Maintenance and Inspection (see Rules 31.1 and 31.2)

64.3 Material and Strength (see Rule 49.4)

64.4 Clearances

Allowable variations in clearances due to side swing of suspension insulators, temperature, loading, etc., are given in Rules 37 and 38.

A. Above Ground

The clearances shall be those specified in Rule 37.

B. Above Railways and Trolley Lines

The clearances shall be those specified in Rule 37.

C. Between Conductors

The minimum allowable clearances between conductors are specified in Rule 38, Table 2, with the following modifications for supply conductors:

These modifications, like the tabular values, are also subject to the allowable variations specified in Rule 38.

(1) On Different Crossarms on the Same Structure Triangular and Vertical Configuration:

Crossarms used to support conductors of a circuit at different levels (as in triangular or vertical configuration) need not be spaced as in Table 2.

(2) On the Same Crossarms Same Phase or Polarity:

The clearance specified in Table 2, Cases 15 and 17, are not required between conductors of both the same potential and the same phase or polarity, such as bundle conductors.

65. CONDUCTOR INSULATORS

65.1 Material

Insulators used on high voltage supply lines shall be porcelain or other equally suitable material to withstand the applied voltage.

65.2 Strength (see Rule 49.5)

66. GUYS

66.1 Definition (see Rule 21.3)

66.2 Use

Where mechanical loads imposed on towers or structures are greater than can be supported with safety factors as specified in Rule 44 or the design of such towers and structures requires it, additional strength shall be provided by the use of guys or other suitable construction.

Where guys are used with structures capable of considerable deflection before failure, the guys shall be able to support the entire load, the structure below the point of guy attachment acting merely as a strut.

Guys shall be attached to structures, as nearly as practicable, at the center of load. They shall be maintained taut and of such strength as to meet safety factors of Rule 44.

66.3 Material and Strength (see Rules 49.6 and 61.3)

66.4 Clearance

The basic minimum clearances of overhead guys above the ground and from other wires or cables are specified in Tables 1 and 2. Modifications of these basic clearances are specified in Rules 37 and 38. The minimum clearance of 18 feet for overhead guys of high voltage supply lines shall not be decreased along public thoroughfares or railways.

For clearances of anchor guys from overhead guys, span wires and conductors supported on other poles or structures, see Rule 56.4.

66.5 Fastenings

Anchor guys shall be protected by the use of guy thimbles or their equivalent where attached to anchor rods or through bolts.

66.6 Grounding of Anchor Guys

Anchor guys exposed to high voltage supply lines shall be securely grounded but may be sectionalized. Anchor guys which are attached to grounded towers or structures need not be provided with a separate ground.

66.7 Protection (see Rule 56.9)

Related rules in other sections of General Order No. 95 are modified, amended or added to as set forth below.

Rule 20.5-D

Revised to read as follows:

D. SUPPLY CIRCUITS mean those circuits which are used for transmitting a supply of electrical energy.

(1) Class E circuits include constant potential alternating or direct current circuits of 300,000 volts or more between any two conductors.

(2) Class H circuits include the following:
Constant potential alternating current circuits of 5,000 volts or more but less than 300,000 volts between any two conductors.

Constant potential alternating current circuits of 2,900 volts or more but less than 174,000 volts between any conductor and ground.

Constant potential direct current circuits exceeding 750 volts but less than 150,000 volts between any conductor and ground.

Constant current circuits of 7.5 amperes or less supplied from transformers or devices having a normal full-load output voltage of 5,000 volts or more.

Constant current circuits of more than 7.5 amperes supplied from transformers or devices having an open-circuit voltage of 2,900 volts or more.

(3) Class L circuits include the following:
Constant potential alternating or direct current supply circuits of lower voltage than Class H.

Constant current circuits of 7.5 amperes or less supplied from transformers or devices having a normal full-load output voltage less than 5,000 volts.

Constant current circuits of more than 7.5 amperes supplied from transformers or devices having an open-circuit output voltage less than 2,900 volts.

Rule 20.8

Revised by renumbering as follows:

Present	Modified
20.8-A	20.8-B
20.8-B	20.8-C
20.8-C	20.8-D
20.8-D	20.8-E

Rule 20.8-A

New rule to read as follows:

A. BUNDLE CONDUCTOR means a group of conductors of the same phase and polarity.

Rule 21.7-C

Revised to read as follows:

C. TOWER LINES (Class E, H, L and T) mean supply lines, with supporting metal structures having an 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, such as "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.

Guyed V-type or Y-type metal structures will be classified as towers.

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

Rule 33.1

Add new paragraph to read as follows:

"This rule need not apply to overhead lightning protection wires installed on metal structures or grounded wood structures."

Rule 37

Table 1 is modified by revising the heading of Column F and adding Column G and by adding references (kk), (ll), (mm) and (nn).

Rule 38

Table 2 is modified by revising Columns H and I, reference (g) and the statement of Case 18 and by adding Columns J and K and references (ff), (gg), (hh), (ii), (jj), (kk), and adding Case 20.

Rule 39

Table 2-A is modified by revising the heading of Column D, adding Column E and adding references g and h.

TABLE 1

BASIC MINIMUM ALLOWABLE VERTICAL CLEARANCE OF WIRES ABOVE RAILROADS, THOROUGHFARES AND GROUND; ALSO CLEARANCES FROM POLES, BUILDINGS, STRUCTURES OR OTHER OBJECTS (nn)
(LETTER REFERENCES DENOTE MODIFICATIONS OF MINIMUM CLEARANCES AS REFERRED TO IN NOTES FOLLOWING THIS TABLE)

Case No.	Nature of Clearance	Wire or Conductor Concerned: A — Span wires (other than trolley span wires) overhead guys and messengers	B — Communication conductors (including open wire, cables and service drops), supply service drops of 0-750 volts	C — Trolley contact feeder and span wires 0-5000 volts	D — Supply conductors of 0-750 volts, and supply cables treated as in Rule 57.8	E — Supply conductors and supply cables 750-22,500 volts	F — Supply conductors and supply cables 22.5-300 KV	G (mm) — Supply conductors and supply cables 300-550 KV
1	Crossing above tracks of railroads which transport or propose to transport freight cars (max. height 15 ft. 6 in.) where not operated by overhead contact wires (a)(b)(c)(d)	25 ft.	25 ft.	22-1/2 ft.	25 ft.	28 ft.	34 ft.	34 ft. (kk)
2	Crossing or paralleling above tracks of railroads operated by overhead trolleys (b)(c)(d)	26 ft. (e)	26 ft. (e)(f)(g)	19 ft. (h)(i)	27 ft. (e)(g)	30 ft. (g)	34 ft. (g)	34 ft. (g)(kk)
3	Crossing or along thoroughfares in urban districts or crossing thoroughfares in rural districts (c)(d)	18 ft. (j)(k)(ii)	18 ft. (j)(l) (m)(ii)	19 ft. (hh)	20 ft. (ii)	25 ft. (n)(o)(ii)	30 ft. (o)(ii)	30 ft. (o)(ii)(kk)
4	Above ground along thoroughfares in rural districts or across other areas capable of being transversed by vehicles or agricultural equipment	15 ft. (k)	15 ft. (m)(n)(p)	19 ft.	16 ft.	25 ft. (n)(o)	30 ft. (o)(p)	30 ft. (o)(kk)
5	Above ground in areas accessible to pedestrians only	7 ft.	10 ft. (m)(q)	19 ft.	12 ft.	17 ft.	25 ft. (o)	25 ft. (o)(kk)

TABLE 1 (Continued)

No.	Nature of Clearances	A	B	C	D	E	F	G (mm)
6	Vertical clearance above buildings and bridges (or other structures which do not ordinarily support conductors and on which men can walk) except generating plants or substations whether attached or unattached	8 ft (r)	8 ft. (r)	8 ft.	8 ft.	12 ft.	12 ft.	20 ft. (ll)
7	Horizontal clearance of conductor from buildings (except generating and substations), bridges or other structures (upon which men may work) where such conductor is not attached thereto. (s)(t)	---	3 ft. (u)	3 ft.	3 ft. (u)(v)	6 ft. (v)	6 ft. (v)	15 ft. (v)
8	Distance of conductor from center line of pole, whether attached or unattached (w)(x)(y)	---	15 in. (s)(aa)	15 in. (aa)(bb)(cc)	15 in. (o)(aa)(dd)	15 or 18 in. (o)(dd)(ee)(jj)	18 in. (dd)(ee)	Not Applicable
9	Distance of conductor from surface of pole, crossarm or other overhead line structure upon which it is supported, providing it complies with Case 8 above (x)	---	3 in. (aa)(ff)	3 in. (aa)(cc)(gg)	3 in. (aa)(dd)(gg)	3 in. (dd)(gg)(jj)	1/4 pin spacing shown in Table 2 Case 15 (dd)	1/2 pin spacing shown in Table 2 Case 15 (dd)

* references (a) through (jj) omitted.

(kk) Shall be increased by 0.025 ft. per kv in excess of 300 kv.
(ll) Shall be increased by 0.04 ft. per kv in excess of 300 kv.
(mm) Proposed clearances to be submitted to the CPUC prior to construction for circuits in excess of 550 kv.
(nn) Voltage shown in the table shall mean line-to-ground voltage for direct current (DC) systems.

TABLE 2

BASIC MINIMUM ALLOWABLE CLEARANCE OF WIRES FROM OTHER WIRES AT CROSSINGS AND AT SUPPORTS

(LETTER REFERENCES DENOTE MODIFICATIONS OF MINIMUM CLEARANCES AS REFERRED TO IN NOTES FOLLOWING THIS TABLE) ALL CLEARANCES ARE IN INCHES

Case No.	Nature of clearance and class and voltage of wire, cable or conductor concerned	Other wire, cable or conductor concerned										
					Supply conductors (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 35,000-75,000 volts	I 75,000-150,000 volts	J 150,000-300,000 volts	K(kk) 300,000-550,000 volts
	Clearance between wires, cables and conductors not supported on the same poles, vertically at crossings in spans, and radially where colinear or approaching crossings											
1	Span wires, guys and messengers (b)	18(c)	43(d, e)	24(c)	24(e)	36(f)	36	72	72	78	78(gg)	138(hh)
2	Trolley contact conductors, 0-750 volts	43(d, e)	*	43(d)	43(d, h)	43	72	96	96	96	96(gg)	150(hh)
3	Communication conductors	24(c)	43(d)	24	43(i)	43(dd)	72	96	96	96	96(gg)	150(hh)
4	Supply conductors, service drops and trolley feeders, 0-750 volts	24(c)	43(d, h)	43(i)	24	43	48	96	96	96	96(gg)	150(hh)
5	Supply conductors, 750-7,500 volts	36(j)	48	43(dd)	48	43(h)	72	96	96	96	96(gg)	150(hh)
6	Supply conductors, 7,500-20,000 volts	36	72	72	48	72	72	96	96	96	96(gg)	150(hh)
7	Supply conductors, more than 20,000 volts	72(g)	96(g)	96(g)	96(g)	96(g)	96(g)	96(g)	96	96	96(gg)	150(hh)
	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	Communications conductors and service drops	*	*	12(l)	43(k, l, m, n)	43(k)	72(m, n)	72(m)	72	78	87(gg)	147(hh)
9	Supply conductors, service drops and trolley feeders, 0-750 volts	*	*	43(k, l, m, n)	24(k, l, m, o)	43(k, m, p)	43(k, m, q)	72(m)	72	78	87(gg)	147(hh)
10	Supply conductors, 750-7,500 volts	*	*	43(k)	43(k, m, p)	43(m, o, q, r)	43(m, q)	43(m, q)	43(q)	60(ff)	90(gg)	150(hh)
11	Supply conductors, 7,500-20,000 volts	*	*	72(m, n)	43(k, m, q)	43(m, q)	43(m, o, q, r, ee)	43(m, q)	43(q)	60(ff)	90(gg)	150(hh)
12	Supply conductors, 20,000-75,000 volts	*	*	72(m)	72(m)	48(m, q)	43(m, q)	43(o, q)	43(o, q)	60(ff)	90(gg)	150(hh)
13	Supply conductors, more than 75,000 volts	*	*	72	72	60(q)	60(q)	60(q)	60(q)	60(ff)	90(gg)	150(hh)
	VERTICAL CLEARANCE BETWEEN CONDUCTORS ON RELATED LINE ARMS AND BUCK ARMS											
14	Line arms above or below related buck arms(s, q)	*	*	6	12(s)	18(s)	18(s)	24	48	60(ff)	90(gg)	150(hh)
	HORIZONTAL SEPARATION OF CONDUCTORS ON SAME CROSSARM											
15	Pin spacing of longitudinal conductors, vertical conductors and service drops (v, w)	*	*	3(v)	11-1/2(k, v)	11-1/2(v)	11-1/2(v)	24(v)	48	60(ff)	90(gg)	150(hh)
	RADIAL SEPARATION OF CONDUCTORS ON SAME CROSSARM, POLE OR STRUCTURE-INCIDENTAL POLE WIRING											
16	Conductors, taps, or lead wires of different circuits (v, y, q)	*	*	3(v)	11-1/2(k, v)	11-1/2(v)	11-1/2(v)	24(v)	48	60(ff)	90(gg)	150(hh)
17	Conductors, taps, or lead wires of same circuit (v, z, aa)	*	*	3	3	6	6	12	24	60(ff)	90(gg)	150(hh)
	RADIAL SEPARATION BETWEEN GUYS AND CONDUCTORS											
18	Guys passing conductors supported on other poles, (excluding poles of same circuit), and guys approximately parallel to conductors supported on the same poles	*	*	3 (bb)	18	18	18	30	36	96(ff)	78(gg)	138(hh)
19	Guys and span wires passing conductors supported on the same poles	(cc)	*	3	3	6	9	12	18	24	48(ii)	84 (jj)
20	VERTICAL CLEARANCE BETWEEN CONDUCTORS OF THE SAME CIRCUIT ON HORIZONTAL POST INSULATORS	*	*	*	*	24	24	30	36 OR 48(ll)(mm)	48 (mm)	48 (mm)	48 (mm)

* references (a) through (f) omitted

(g) shall be increased for voltages above 35,000 as required by Table 2, Columns H, I and K

* references (h) through (cc) omitted

(ff) shall be increased by 0.40 inches per KV in excess of 75 KV

(gg) shall be increased by 0.40 inches per KV in excess of 150 KV

(hh) shall be increased by 0.40 inches per KV in excess of 300 KV

(ii) shall be increased by 0.25 inches per KV in excess of 150 KV

(jj) shall be increased by 0.25 inches per KV in excess of 300 KV

(kk) proposed clearances to be submitted to the CPUC prior to construction for circuits in excess of 550 kv

(ll) 36-INCH CLEARANCE APPLIES 35 KV TO 68 KV
48-INCH CLEARANCE APPLIES OVER 68 KV

(mm) VERTICAL CLEARANCES SHALL BE INCREASED BY 1/2 INCH FOR EACH KILOVOLT OVER 68 KV.

A-49852

TABLE 2-A

MINIMUM CLEARANCES OF WIRES FROM SIGNS MOUNTED ON BUILDINGS AND ISOLATED STRUCTURES[a]

Case No.	Nature of Clearance Type of Sign	A Span Wires (Other than trolley span wires), Overhead Guys and Messengers, Communication Cables and Communication Service Drops	B Communication Open Wire Conductors, Supply Cables Treated as in Rule 57.8 and Supply Service Drops of 0-750 Volts	C Supply Conductors, Supply Cables of 0-750 Volts and Trolley Span Wires	D Supply Conductors and Supply Cables 750-300,000 volts b)	E Supply Conductors and Supply Cables 300 - 550 KV
1	Vertical clearance above all signs upon which men can walk	8 ft.	8 ft.	8 ft.	12 ft.	20 ft. (g)
2	Vertical clearance above all signs upon which men cannot walk	2 ft.	2 ft.	3 ft.	8 ft.	20 ft. (g)
3	Vertical clearance under signs which are illuminated	2 ft.[c]	2 ft.[e]	3 ft.	Prohibited[f]	Prohibited
4	Vertical clearance under signs which are nonilluminated	6 inches[d]	1 ft.	3 ft.	Prohibited[f]	Prohibited
5	Horizontal clearance from signs which are illuminated	3 ft.[c]	3 ft.[e]	3 ft.	6 ft.	15 ft. (h)
6	Horizontal clearance from signs which are nonilluminated	6 inches[d]	1 ft.	3 ft.	6 ft.	15 ft. (h)

a. These clearances do not apply to service drop conductors which are attached to signs for the purpose of serving such signs.
b. Nothing herein contained shall be construed as authorization of noncompliance with standards of the Industrial Safety Board of the California Division of Industrial Safety, including Section 2603 of the Electrical Safety Orders, entitled "Provision for Preventing Accidents Due to Proximity of High Voltage Lines," approved by that Board.
c. May be reduced to 6 inches provided illuminated sign is grounded.
d. May be reduced if adequate separation is provided by means of a suitable nonconducting separator.
e. May be reduced to 1 foot for communication open wire conductors only, provided illuminated sign is grounded.
f. When conductors are at a level of 8 feet or more below the level of the lowest portion of the sign but not vertically under the sign, no horizontal clearance is required between the vertical planes through the conductor nearest the sign and the vertical projection of the extremities of the sign. Also note (b) above.
g. Shall be increased by 0.04 ft. per kv in excess of 300 kv.
h. Not applicable to certain kinds of conductors.
   1. Supply conductors of same phase and polarity, Rule 54.4-C3c, Page 98.
   2. Insulated supply conductors in multi-conductor cables, Rule 57.4-C, Page 139.
   3. Communication insulated conductors or multiple-conductor cables, Rule 87.4-C1, Page 227.

Rule 42

Modified by inserting references to Class E supply circuits to read as follows:

GRADES OF CONSTRUCTION

For all classes of lines, the relative order of grades is "A", "B", "C" and "F", grade "A" being the highest. Supply and communication lines, where not involved in crossings, conflicts or on poles jointly used, shall be constructed and maintained so as to conform with grades of construction not less than as follows:

Class E supply . . . . . Grade B
Class H supply . . . . . Grade B
Class L supply . . . . . Grade C
Class C communication . . . . . Grade F

Supply and communication lines, where involved in crossings, conflicts or on poles jointly used, shall be constructed and maintained so as to conform with grades of construction not less than as specified in Table 3.

Table 3
Grades of Construction

Class of circuit involved at upper level	Other facilities involved at lower level at crossings, conflicts or on poles jointly used	Grade of construction to be used at upper level
E or H	Major Class C circuits	"A"
E, H or L	Major railways (steam, electric or other motive power, at crossings only)	"A"
E, H or L	Minor railways (at crossings only)	"B"
E or H	Under all conditions not required to be Grade "A" (except supply cables treated as specified in Rule 57.8)	"B"
L	Under all conditions not required to be Grade "A" or "B"	"C"
Supply cables treated as specified in Rule 57.8	Under all conditions	"C"
Major Class C	Class E or H circuits	"A"
Minor Class C	Class E or H circuits	"B"
C	Major railways (at crossings only)	"B"
C	Class L circuits of more than 750 volts	"C"
C	Supply cables treated as specified in Rule 57.8	"F"
C	Under all conditions not required to be Grade "A", "B" or "C"	"F"

Note: Rule 57.8 specifies bonding and grounding of sheath and messenger of supply cables.

Rule 44

Modified by changing the reference in the second paragraph from "steel" to "materials other than wood" to read as follows:

SAFETY FACTORS

The safety factors specified in these rules are the minimum allowable ratios of ultimate strengths of materials to the maximum working stresses, except that:

The safety factors for structural materials other than wood (towers, poles and crossarms) shall be applied as specified in Rule 48.2, and

The safety factors for wood members in bending shall be applied to longitudinal tension and compression as ratios of the moduli of rupture to the maximum working stresses.

The maximum working stresses used with these safety factors shall be the maximum stresses which would be developed in the materials under the construction arrangement with temperature and loadings as specified in Rule 43.

Rule 44.1

Table 4 is modified by substituting "metallic" for "steels" and by adding reference (a) to read as follows:

Table 4
Minimum Safety Factors

Element of line	Grades 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 rural districts	2	2	2	1-1/4
Guys in light loading rural districts	2	1-1/2	1-1/2	1-1/4
Messengers and span wires	2	2	2	2
Wood poles	4	3	2	1
Metallic service and meter poles	-	2	2	-
Structural or tubular metallic poles, towers, structures, crossarms and metallic members of foundations	1-1/2[a]	1-1/4[a]	1-1/4[a]	---
Foundations against uplift	1-1/2	1-1/2	1-1/2	---
Foundations against depression	3	2	2	---
Reinforced concrete poles	4	3	3	---
Crossarms (wood)	2	2	2	1

(a) For aluminum members subject to tension caused by one or more estimated loads and where the critical load combination for the tension member would not endanger adjacent compression members, the factor of safety on ultimate tension shall be 2 for Grade "A" construction and 1.67 for Grades "B" and "C" construction.

Rule 48.2

Modified by changing the heading and first paragraph references from structural steels to structural materials other than wood and by adding provisions governing the applications of safety factors to such materials to read as follows:

STRUCTURAL MATERIAL (OTHER THAN WOOD)

Structural members and their connections shall be designed and constructed so that the structures and parts thereof will not fail or be seriously distorted at any load less than their maximum working loads (developed under the current construction arrangements with loadings as specified in Rule 43) multiplied by the safety factor specified in Rule 44.

The safety factors specified in Rule 44 shall be applied as follows to structural steel:

Tension and Bending: The yield point, 33,000 pounts per square inch, shall be divided by the safety factor to determine the maximum allowable working stress.

Compression: The maximum allowable working stress shall be calculated by the following formula:

$$S_{max} = \frac{1}{f_s}\left(YP - \frac{(YP - 12{,}000)}{(200)} \frac{l}{r} \right)$$

where S_{max} = maximum allowable working stress, lbs per sq. in.
f_s = safety factor specified in Rule 44
YP = yield point of the steel, 33,000 lbs per sq. in.
l = unsupported length of member, inches
r = radius of gyration of member, inches

Shear: The ultimate tensile strength, 60,000 pounds per square inch, shall be multiplied by 2/3 and divided by the safety factor specified in Rule 44 to determine the maximum allowable working stress.

Where the figures given are used, structural steel shall conform to Standard Specifications A7-39 of American Society for Testing Materials for carbon steel of structural quality. Other values may be used for steel of other strength provided the yield point and ultimate tensile strength are determined by test.

For other structural materials (other than concrete), the safety factor specified in Rule 44 shall be applied as follows:

Tension: The yield strength of the material used shall be divided by the safety factor specified in Rule 44 to determine the maximum allowable working stress.

Compression: The ultimate compressive strength of the material used shall be divided by the safety factor specified in Rule 44 to obtain the allowable working stress. The ultimate compressive strength shall be determined by suitable formulae for the material used, considering yield strength of the material, modulus of elasticity, slenderness ratio and eccentricity of connection. In no case shall the ultimate compressive stress be greater than the yield strength of the material.

Shear: The ultimate shear strength of the material used shall be divided by the safety factor specified in Rule 44 to determine the maximum allowable working stress.

Rule 49.1-A

Modified by changing the references in the first line of the second paragraph from "steels" to "metal" and to add "towers and structures" to read as follows:

POLES, TOWERS AND OTHER STRUCTURES

A. STRENGTH

Wood poles shall be of sound timber, free from defects which would materially reduce their strength or durability and they shall have sufficient strength to withstand, with safety factors not less than those specified in Rule 44, the maximum stresses to which they are subjected under the loading conditions specified in Rule 43. The modulus of rupture used in calculation of safety factors shall be not greater than the value given in Rule 48.1.

Metallic and reinforced concrete poles, towers and structures, together with their foundations, shall be of such material and dimensions as to withstand, with safety factors not less than those specified in Rule 44, the maximum stresses to which they are subjected under the loading conditions specified in Rule 43. The fiber stress values used in calculation of safety factors shall be as specified in Rules 48.2, 48.3 and 48.6.

Certain poles are subject to special stresses due to angles in the line, dead-ending of conductors or other attachments, which stresses must be included in computing the loading and safety factor. Poles subject to these special stresses sometimes require the use of guys, in which case the pole below the point of guy attachment shall be considered merely as a strut, the guy taking all lateral stresses. In such cases, the pole strength requirement shall apply at the point of guy attachment rather than at the ground line.

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Spliced or stub reinforced poles or pole top extensions, including the attachment (joint) of the different members involved, shall meet all of the vertical, transverse and longitudinal strength requirements of these rules as if a whole pole were used. Spliced or stub reinforced poles or pole top extensions shall not be used where Grade "A" construction is required in supports of crossings or conflicts, or where Grade "B" construction is required for Class C lines crossing the main lines of major railways.

Rule 49.6-B

Table 9 is modified by adding a reference to Class E circuits to read as follows:

Table 9
Minimum Size and Strength of Guys Crossing over Class E, H, L, T or C Circuits

Material of strand	Minimum size	
	Anchor guys	Overhead guys
Galvanized steel:		
Common or Siemens-Martin	5/16 in. diam.	1/4 in. diam.
High Strength or extra-high strength	1/4 in. diam.	3/16 in. diam.
Copper-covered steel	3 No. 9 AWG	3 No. 10 AWG
Aluminum-covered steel	3 No. 9 AWG	3 No. 10 AWG
Bronze	1/4 in. diam.	3 No. 10 AWG
Minimum allowable ultimate strength of guys	3,200 pounds	1,900 pounds

Rule 50

Modified by adding a new second sentence referring to the applicability of Section VI to read as follows:

GENERAL

The following rules cover certain specific details for the construction of supply lines. These rules do not apply to Class E circuits, except where provisions are made for in Section VI. The rules are supplemented, in certain cases, by rules in other sections. See Section VII for special rules applicable to Class T circuits; see Section IX for special rules applicable to supply lines on poles jointly used; see Section X for special rules applicable to line crossings or conflicts; see Section XI for special rules applicable to lines crossing railroad.

Rule 51.6-A

Modified by revising the last sentence to read:

"See Rule 61.6 for marking of towers."

Rule 54.4-A(1)

Modified by excluding Class E circuits to read as follows:

Across Arid or Mountainous Areas: Across arid or mountainous areas supply circuits carrying 22,500-30,000 volts, inclusive,

may have a clearance of less than 30 feet (Table 1, Case 4, Column F) but not less than 25 feet above ground subject to a reduction of not more than 10 per cent because of temperature and loading as specified in Rule 43. Upon special permission from this Commission, a minimum clearance of 25 feet above ground may be applied in similar areas to circuits in excess of 30,000 volts, however, not including Class E circuits. For circuits in excess of 30,000 volts, no reduction of the 25 feet will be permitted for conditions less than maximum loadings or temperature specified in Rules 43.1 and 43.2.

Rule 54.4-C(2)

Modified by adding a voltage classification to read as follows:

(a) One Voltage Classification*: The clearances of Table 2, Case 14 (and clearances less than as specified in Cases 9 to 13) shall not be applied consecutively both above and below the same conductor. The foregoing provisions of this rule do not apply to conductors in triangular or vertical configuration, the clearances of Table 2, Case 14 being directly applicable.

Where conductors of one voltage classification only are supported on the same crossarms, the vertical clearances specified in Table 2, Case 14, are not required between conductors on line arm and conductors on related buck arm provided no conductors on the line arm cross conductors of different phase or polarity on the buck arm.

* Voltage classifications for this purpose are:
0 - 750 volts
750 - 7,500 volts
7,500 - 20,000 volts
20,000 - 75,000 volts

Rule 54.4-C(7)

Delete

Rule 100

Modified by clarifying the obligation to establish required clearances to read as follows:

GENERAL

The following rules cover certain details for the construction of supply and communication lines in line crossing or conflicts and

apply in general to the line which is at the higher elevation; however, the owner or operator who last in point of time constructs or erects facilities shall establish the required clearances. These rules are supplemental to the rules for lines of these classifications in general and to the construction details for such lines where alone, which general rules shall be followed in all respects, except as modified herein.

Rule 103.2

Modified by revising the last sentence to refer to proposed new Rule 61.3-A(2) to read as follows:

OVERHEAD LIGHTNING PROTECTION WIRES

Overhead lightning protection wires or cables, if used, shall conform to the requirements of this Order as to grades of construction, material, size and strength for conductors of the voltage of the circuit protected. For overhead ground wires or lightning protection wires supported on towers or structures, see Rule 61.3-A(2).

Rule 113.2

Modified by revising the last sentence to refer to proposed new Rule 61.3-A(2) to read as follows:

OVERHEAD LIGHTNING PROTECTION WIRES

Overhead lightning protection wires or cables, if used, shall conform to the requirements of this Order as to grades of construction, material, size and strength, for conductors of the voltage of the circuit protected. For overhead ground wires or lightning protection wires or cables supported on towers or structures, see Rule 61.3-A(2).