

**GENERAL ORDER No. 52**  
(Supersedes General Order No. 39)

**Railroad Commission of the State of California**  
**IN THE MATTER OF THE CONSTRUCTION AND OPERATION OF POWER**  
**AND COMMUNICATION LINES FOR THE PREVENTION OR MITI-**  
**GATION OF INDUCTIVE INTERFERENCE.**

(Approved July 3, 1918. Effective August 1, 1918)

Rule II(b) amended May 13, 1947, Resolution No. U-283. Decision No. 67643 dated Aug. 4, 1964 in Application No. 46332 added Rule I(a) (3).

*It is hereby ordered*, that the following rules to govern the construction and operation of power and communication lines, subject to the jurisdiction of this Commission, in so far as that construction or operation applies to the prevention or mitigation of inductive interference, as hereinafter stated, be adopted and effective August 1, 1918.

**CONTENTS**

**DEFINITIONS**

1. Class H Power Circuit
2. Electrically Connected
3. Signal Circuit
4. Communication Circuit
5. Line
6. Parallel
7. Configuration
8. Transposition
9. Discontinuity
10. Barrel
11. Co-ordination
12. Balanced and Residual Voltages
13. Balanced and Residual Currents

**RULES**

- I. General Provisions
  - (a) Applicability of Rules
  - (b) Co-operation
  - (c) Principle of Least Cost
  - (d) Existing Parallels
  - (e) Saving Clause
  - (f) Information for Commission
- II. Location of Lines
  - (a) Avoidance of Parallels
  - (b) Notice of Intention
  - (c) Distance Between Lines
  - (d) Length of Parallels
  - (e) Discontinuities
- III. Design and Construction of Lines
  - (a) General Requirements
  - (b) Arrangement and Spacing of Power Conductors
  - (c) Transpositions—General
  - (d) Transpositions—Inside Limits of Parallels

- IV. Design, Construction and Arrangement of Apparatus
  - (a) Quality and Suitability
  - (b) Rotating Machinery
  - (c) Transformers and Their Connections
  - (d) Rectifiers
  - (e) Switches
  - (f) Fuses
  - (g) Electrolytic Lightning Arresters
  - (h) Special Instruments
  - (i) Communication Apparatus
- V. Operation and Maintenance
  - (a) General Requirements
  - (b) Balance
  - (c) Record of Neutral Current
  - (d) Transformers
  - (e) Switching
  - (f) Charging Electrolytic Lightning Arresters
  - (g) Abnormal Conditions
- VI. Other Cases of Interference
- VII. Rules Subject to Laws and Orders of Commission

### DEFINITIONS

Certain technical terms are employed herein in the senses set forth in the following definitions:

#### 1. Class H Power Circuit

The term "Class H Power Circuit" means any overhead open-wire constant-potential-alternating-current power transmission or distribution circuit or electrically connected network which has 5000 volts or more between any two conductors or 2900 volts or more between any conductor and ground; except railway trolley circuits and feeders electrically connected therewith.

#### 2. Electrically Connected

The term "Electrically Connected" means connected by a conducting path or through a condenser, as distinguished from connection merely through magnetic induction.

#### 3. Signal Circuit

The term "Signal Circuit" means any telephone, telegraph, messenger call, clock, fire, police alarm or other circuit of similar nature used exclusively for the transmission of signals or intelligence, which operates at less than 400 volts to ground, or 750 volts between any two points of the circuit, provided that if the voltage exceeds 150, the power transmitted shall not exceed 150 watts.

#### 4. Communication Circuit

The term "Communication Circuit" means any overhead open-wide signal circuit, except that, if such circuit be a telephone circuit, it is limited to inter-exchange metallic telephone circuits and to metallic telephone circuits operated by a railroad or other company for dispatching purposes, or for public use between separate communities.

#### 5. Line

The term "Line" means any circuit or aggregation of circuits carried on poles or towers, and includes the supporting elements.

#### 6. Parallel

The term "Parallel" means a condition where a Class H power circuit and a communication circuit follow substantially the same course or are otherwise in proximity for a sufficient distance so that the power circuit is liable to create inductive interference in the communication circuit.

With some parallels interference occurs only at times of abnormal conditions on the power circuit in which case such of these rules as affect induction only under normal operating conditions do not apply. When the application of any rule is thus restricted, the condition under which the rule applies is referred to as a "normal" parallel.

#### 7. Configuration

The term "Configuration" means the geometrical arrangement of a circuit or circuits, including the size of the wires, and their relative positions with respect to one another and earth.

#### 8. Transposition

The term "Transposition" denotes an interchange of position of the conductors of a circuit between successive lengths thereof.

#### 9. Discontinuity

The term "Discontinuity" means any abrupt change in the relative positions of a power and a communication circuit, or any abrupt change in configuration, line impedance or load along either such circuit (including such changes due to connected circuits, transformers, cables, loading coils or other apparatus) which materially affects the magnitude or phase of the induced voltages or currents per unit length or the capacitances of either circuit. Transpositions, however, are not considered to be discontinuities.

#### 10. Barrel

The term "Barrel" means an arrangement of a section of power circuit within which each conductor occupies each of the conductor positions for such distances as will result in a maximum degree of balance.

#### 11. Co-ordination

The term "Co-ordination" as applied to transposition systems means that the transpositions in power and communication circuits involved in a parallel are efficiently located, with respect to each other and to the discontinuities, for reducing the inductive effects on the communication circuits.

#### 12. Balanced and Residual Voltages

The voltages *to ground* of the several wires of a power circuit are divided for convenience into two classes of components, "balanced" and "residual."

The "balanced voltages" are those components which are equal in magnitude and have such phase relations that their algebraic sum is zero at every instant.

The remaining components of the voltages to ground, which exist under conditions other than perfect balance, are termed "residual." They are equivalent to a single-phase voltage impressed between the power wires in multiple and ground. The sum of the residual components is termed the "residual voltage" of the circuit. In case of a three-phase circuit it is three times the equivalent single-phase voltage mentioned above.

Mathematically expressed, the residual voltage is the vector sum of the voltages to ground of the several wires of a power circuit, while the balanced voltages are those components whose vector sum is zero.

#### 13. Balanced and Residual Currents

The currents in the several wires of a power circuit are divided for convenience into two classes of components, "balanced" and "residual."

The "balanced currents" are those wholly confined to the wires of the circuit. Hence, their algebraic sum is zero at every instant.

The remaining components of the currents in the several wires, which exist under conditions other than perfect balance, are termed "residual." The sum of the residual components is the "residual current" of the circuit. It is equivalent to a single-phase current in a circuit having the power wires in multiple as one side, and ground as the other.

Mathematically expressed, the residual current is the vector sum of the currents in the several power wires, while the balanced currents are those components whose vector sum is zero.

## **RULES**

### **I. General Provisions**

#### **(a) Applicability of Rules**

These rules, except as otherwise provided in I (e), shall apply and be effective as follows:

(1) Rules limited to lines involved in a parallel, or to apparatus connected to such lines, shall apply only in case of conditions of inductive interference created hereafter; except that rules relating to the operation or maintenance shall apply to all such lines and apparatus, both existing and new.

(2) Rules not limited to lines involved in a parallel, or to apparatus connected to such lines, shall apply to new construction only, including, however, existing lines and apparatus when such are generally reconstructed or renewed.

(3) The transpositions of Class H power circuits required as hereinafter set forth in Rule III(c) and Rule III(d) may be omitted in cases where mutual agreement for such omission is made between all of the parties involved in a parallel. Nothing contained in this Rule I (a) (3) shall be construed as permitting the construction of a Class H power circuit without transpositions unless all parties owning or operating overhead lines involved in a parallel shall have consented to such construction. The parties to such an agreement shall include those who may become involved in such parallel within the reasonably foreseeable future as well as those presently involved therein. Upon agreement to omit transpositions in any 60 kv or higher voltage transmission line, the pole or tower setting party, prior to construction, shall file with the Commission a description of the route and configuration of the lines involved together with copies of letters showing mutual consent for such omission by all above-described parties.

#### **(b) Co-operation**

Any party contemplating new construction which may create a parallel shall confer with the other party or parties concerned and they shall co-operate with a view of avoiding the parallel, or, if this be impracticable, of minimizing the resulting interference. Failure to comply with this requirement will receive consideration by this Commission in any subsequent issue involving such construction.

#### **(c) Principle of Least Cost**

When there are two or more different practicable methods of avoiding or mitigating interference, the method which involves the least total cost shall in general be adopted irrespective of whether the necessary changes are made in the plant of the party creating the parallel or in the plant of the other party; provided, however, that preference shall be given to methods of avoiding a parallel over methods of mitigating interference; and provided, further, that as between different methods of mitigation having different degrees of effectiveness, the most effective

method, the cost of which can be justified, shall be adopted. In estimating such costs, all factors of expense to both parties shall be taken into account.

**(d) Existing Parallels**

Parties operating power or communication lines shall exercise due diligence in applying measures, in general accordance with the principles of these rules, for mitigating inductive interference due to existing parallels. Any such parallels which now or hereafter cause excessive interference shall be attended to promptly.

When lines involved in existing parallels are added to, extended or generally reconstructed, or when additional apparatus is connected to such lines, or when apparatus now connected to such lines is renewed or rearranged, the new or changed plant shall thereafter conform to the provisions of these rules.

**(e) Saving Clause**

Any party desiring to make a departure from these rules regarding the operation or reconstruction of lines now existing or believing that these rules work an injustice or an undue hardship, may file a written petition with the Railroad Commission, whereupon the Commission will take such action as may seem to it proper.

The Commission reserves the right to modify any of the provisions of these rules in any specific case or otherwise, when, in the Commission's opinion, public interest would be the better served by so doing.

**(f) Information for Commission**

Parties operating or constructing power or communication lines, subject to the jurisdiction of this Commission, involved in or which may become involved in a parallel, shall file with the Railroad Commission, as the Commission may require, information appertaining to measures for the prevention or mitigation of inductive interference agreed upon between said parties.

**II. Location of Lines**

**(a) Avoidance of Parallels**

Every reasonable effort shall be made to avoid creating parallels. If the parties concerned can agree upon a plan for providing an adequate separation of the two classes of lines so as to avoid interference, such plan shall be put into effect. In no case shall a parallel be created unless the cost of avoidance by separation is greater than the cost of the remedial measures required by these rules.

**(b) Notice of Intention**

The party proposing to build a new Class H power or a communication line which may create a parallel, or generally to reconstruct or change the operating conditions of an existing line involved in a parallel shall give due written notice (at least sixty days where practicable but in any event not less than twenty days in advance of construction except for minor extensions, for which written notice shall be given immediately after the work is authorized of such intention to the other party, including full information as to the proposed location within the parallel and such features of the proposed line as would affect induction. In the event of disagreement between the parties concerned, full information relative to the parallel shall be furnished to the Commission.

**(c) Distance Between Lines**

Class H power lines and communication lines shall be kept as far apart as practicable. Their separation should be at least equal to the height above ground of the power wires, except when closer proximity is unavoidable.

If, in any case of inductive interference, it should be found impracticable to obtain a proper degree of relief by means of the remedial measures set forth in these rules or by other measures of a remedial nature, the parties concerned shall agree upon and put into effect a plan for increasing the separation of the lines within the parallel.

To promote the effective application of transpositions, both parties shall endeavor to maintain a uniform separation of the two lines throughout each normal parallel. However, in general, when it is feasible to secure more than a 20 per cent increase in separation, for a distance in excess of one mile, this shall be done.

**(d) Length of Parallels**

Parallels shall be made as short as practicable.

**(e) Discontinuities**

In the location, construction and general reconstruction of lines within normal parallels every reasonable effort shall be made to avoid discontinuities (except those due to increases in separation as provided for in (c) above) which would interfere with the application of effective and economical co-ordinated transposition systems in the power and communication lines.

In the location and construction of the first line along a public highway, special effort shall be made to avoid crossing the highway and also to avoid other features which would result in unnecessary discontinuities in the event of the construction of another line along the same highway.

### III. Design and Construction of Lines

#### (a) General Requirements

The quality of material, workmanship, methods and grade of construction shall be in accordance with approved modern practice with special regard to the prevention of failures and the avoidance of features, such, for example, as inferior insulation, which would tend to cause or promote inductive interference.

#### (b) Arrangement and Spacing of Power Conductors

In the design for construction or general reconstruction of Class H power lines, consideration shall be given to the configuration of the lines with a view to minimizing (1) throughout the entire length of the line inequalities among the capacitances to earth of the conductors; and (2) within normal parallels the intensity of the inductive effects. When two or more circuits are carried on one line the phase relations among the conductors of the different circuits should be chosen with the same purposes in view.

Excessive spacing of conductors should be avoided.

Two-wire branches electrically connected to a three-phase Class H power circuit should be avoided except those so short that they do not materially unbalance the three-phase circuit. Where such branches are employed they should be so distributed as to cause minimum unbalance.

No single-wire grounded Class H power circuits or branches of multi-wire Class H power circuits shall be employed.

#### (c) Transpositions—General

All Class H power circuits and metallic communication circuits, or extensions of such circuits, hereafter constructed or generally reconstructed, shall be transposed throughout their entire lengths in such manner as to balance, as nearly as practicable, the capacitances to earth of their conductors. For single-circuit three-phase lines the maximum length of barrel for this purpose shall be twelve miles for circuits of triangular \* configuration and six miles for other configurations. For twin-circuit three-phase lines, the maximum length of barrel shall be six miles; except that for circuits of the vertical type (including cases with the middle conductors displaced slightly outward) and the equilateral triangular type with vertices upward, nine-mile barrels may be used when the circuits are interconnected for minimum unbalances.

*Exceptions:* Power lines, located principally on private rights of way and not electrically connected to the other lines, are exempt from this rule if separated from existing communication lines, and from highways required for the future construction of communication lines, by distances not less than those given below, except for crossings at angles over 30 degrees and other sections of unavoidable closer proximity not exceeding one mile in total length in each ten consecutive miles of line; provided, however, that such sections of closer proximity to any one such communication line or highway shall not exceed one mile in each thirty consecutive miles of line.

\* A triangular configuration as here used means one in which the altitude of the triangle exceeds one half the length of the longest side as base.

<i>Voltage between power conductors</i>	<i>Minimum separation from highways and communication lines</i>
Below 50,000 -----	600 feet
50,000-75,000 -----	750 feet
75,000-100,000 -----	850 feet
100,000-150,000 -----	1,000 feet
150,000-200,000 -----	1,200 feet

For power lines meeting all these conditions for exemption except that they are electrically connected to other lines through autotransformers, the maximum lengths of barrel may be twice those specified above.

The question of whether highways that may be involved will be required for future communication lines shall be settled by agreement between the power company contemplating construction, the communication companies operating within the territory to be traversed and the Railroad Commission. In the event of disagreement, or if there is no such communication company, the matter shall be referred to this Commission. In cases where the proposed use of a particular highway by a communication company would be the determining factor in deciding whether a given power line must be transposed, such communication company shall make an effort to locate its proposed line elsewhere and the decision shall be made in accordance with the principle of least cost laid down in I (c).

Existing Class H power circuits and those exempted under the preceding paragraph, which hereafter become involved in normal parallels, shall be transposed so as to balance their capacitances to earth, when necessary for limiting residual voltages and currents to amounts which can be tolerated. The location and number of transpositions for this purpose shall be determined by agreement of the parties concerned.

In the location and spacing of the transpositions, due regard shall be paid to discontinuities which affect the capacitances of the circuit. Sections of circuit between such points of discontinuity should be treated independently.

In general, transpositions should be omitted at the junction points of successive barrels.

Metallic communication circuits, and single-phase and two-phase Class H power circuits, shall be transposed at intervals not exceeding four miles.

Power circuits less than three miles in length are not required to be transposed outside of parallels, except when the absence of transpositions would materially impair the balance of other circuits to which they are electrically connected.

Power circuits with grounded neutrals having a voltage of less than 12,500 volts between conductors are not required to be transposed outside of parallels, except where the lack of such transpositions in any specific case is the cause of interference.

Within normal parallels the transpositions in the two classes of circuits shall be as provided in (d) below. When the transpositions required in a parallel impair the general transposition system of either line outside the limits of the parallel, the necessary readjustment of transpositions shall be made in the sections of line adjacent to the parallel, as a part of the remedial measures therefor.



**(d) Transpositions—Inside Limits of Parallels**

Within each normal parallel an adequate scheme of transpositions, to neutralize so far as practicable the inductive effects, shall be installed in the power circuits, and also in the communication circuits, provided the latter are metallic. The transposition systems in the two classes of circuits shall be properly coordinated. The parties concerned shall co-operate to determine upon the transposition scheme to be employed. The transpositions required in the line last constructed shall be installed before it is placed in service.

In applying the foregoing, the following rules shall, in general, be observed:

(1) For each normal parallel at least one barrel shall be installed in the power circuit. This applies also to a section of parallel where it is not practicable to obtain a balance by combining it with another section. In applying this rule it is not intended ordinarily to change the span lengths required for other purposes.

(2) In long uniform parallels or sections of parallel, involving a telephone line at highway separation from the power line, the barrels shall be three miles in length, subject to such variation as may be necessary for co-ordination with the transpositions required in the telephone circuits. Transpositions should, in general, be omitted at the junction points of successive barrels.

(3) Except as modified by (1) above, the number of transpositions required in power circuits paralleling telephone circuits shall be subject to the following limitations expressed in terms of the average distance between successive transpositions.

(a) For power circuits of 50,000 volts or more between conductors, not less than one mile.

(b) For power circuits of less than 50,000 volts between conductors, not less than one-sixth mile.\*

(4) In case of a parallel between a power line and a telegraph line or other grounded communication line, the transpositions in the power circuit shall be located with due regard to the limits of the parallels and to discontinuities, in order to form as nearly as practicable a balanced system, subject to the condition that the transpositions in the power circuit are not required to be less than one mile apart, except as modified by (1) above. In long uniform sections of parallel, barrels six miles in length should be sufficient. Transpositions should be omitted at the junction points of successive barrels.

(5) The question of the most economical scheme to accomplish the purpose shall always be considered. Effort shall be made to utilize as many as practicable of the existing transpositions.

It is suggested that in case of a short section of a new line, not sufficient of itself to require transpositions, but which is likely to be extended later so that transpositions would then be necessary, consideration be given to the advisability of installing one or more suitably located transpositions in the new section of line while it is being constructed in order to avoid interrupting the service by adding transpositions afterwards.

*Exceptions:* Cases of parallelism may occur where the interference is due almost wholly to residual voltages and currents, in which event transpositions in the power circuit are not required, except as provided in III (c).

\* While barrels of approximately three miles, as provided in (2) above, are generally to be employed, the shorter barrels specified in (3) are sometimes necessary in short parallels and in short sections of parallels, in order to co-ordinate with the discontinuities and obtain a proper degree of balance.

#### IV. Design, Construction and Arrangement of Apparatus

##### (a) Quality and Suitability

In designing, specifying, or otherwise determining the quality or suitability of apparatus to be connected to Class H power or communication circuits, and in arranging such apparatus for use, effort shall be made to avoid, so far as is reasonably practicable, all features which would tend to create or promote inductive interference under either normal or abnormal conditions. As instances in applying the foregoing, the following rules shall be observed:

##### (b) Rotating Machinery

In order to improve conditions, generally, companies operating Class H power circuits shall make every effort to minimize the high frequency components of voltages and currents caused by rotating machinery. All new rotating machinery shall have as nearly as practicable a pure sine wave of voltage and shall not, in any case, deviate therefrom to exceed the limit set forth in the present standardization rules of the American Institute of Electrical Engineers.

No ground connection shall be used on the armature winding of an alternating-current generator or motor electrically connected to a power circuit involved in a normal parallel unless means are employed to avoid unbalancing the circuit and to reduce triple-harmonic residuals as far as may be necessary and practicable.

##### (c) Transformers and Their Connections

In order that the wave-shape of voltage and current may be distorted as little as practicable by transformers, all new transformers on Class H power circuits should have an exciting current as low as is consistent with good practice, and which shall not, at rated voltage, exceed 10 percent of the full load current; except that for transformers without neutral ground connections on the line side, the exciting current at rated voltage need not be less than 0.2 amperes.

Where three-phase transformers are employed with grounded neutrals the core type is preferable to the shell type.

Transformers or transformer banks shall not be grounded at such points of their windings as to unbalance a connected circuit involved in a normal parallel. As important cases under this rule, no grounded single-phase, grounded three-wire two-phase, or grounded open-star three-phase connection shall be so employed.

No star-connected transformers or auto-transformers shall be employed with a grounded neutral on the side connected to a three-phase power circuit involved in a normal parallel, unless low-impedance delta-connected secondary or tertiary windings or other equivalent means are used for suppressing the triple harmonic components of the residual voltages and currents introduced by the transformers.

Care shall be taken that the individual units in each grounded-neutral bank of transformers, connected to a circuit involved in a normal parallel, are alike as to type and rating, including all electrical characteristics, and that they are similarly connected, so as not to unbalance the circuit.

Closed-delta connections shall be used wherever practicable in preference to open-delta connections on three-phase power circuits involved in normal parallels. When open-delta connections are employed, an effort shall be made to distribute such connections equally among the three phases.

Where triple-harmonic residual voltages and currents due to star-connected transformer banks exist in amounts which can not be tolerated, and it is inexpedient to isolate the transformer neutrals, such residuals shall be limited by operating the transformers at reduced magnetic density or by other available means.

**(d) Rectifiers**

Rectifiers and other apparatus tending to distort the alternating-current wave when installed on power lines involved in normal parallels, shall, if necessary, be equipped with suitable auxiliary apparatus to prevent harmful distortion of the wave-form of power-circuit voltage or current.

**(e) Switches**

Each oil-break switch in a power-circuit involved in a parallel, located between the source or sources of energy and the parallel, and used for energizing or de-energizing the circuit, shall have all poles mechanically interconnected for simultaneous action. There shall be at least one such switch so located as to control the supply of energy to each power circuit involved in a parallel, and, except at stations where an operator is constantly on duty, such switch shall be made automatic for short circuits, grounds, and in case of grounded neutral circuits, for abnormal neutral circuits.

Careful consideration shall be given to means of minimizing transient disturbances caused by switching operations on Class H power circuits, which would cause inductive interference. Whenever practicable, provision shall be made for switching on the station-side rather than on the line-side of transformer banks.

Oil-break switches, having their poles mechanically interconnected for simultaneous action, shall be provided wherever the use of air switches or non-interconnected single-pole oil switches would cause harmful transient disturbances in parallel communication circuits.

**(f) Fuses**

Switches shall be used instead of main-line fuses wherever practicable in a power circuit involved in a parallel.

---

**(g) Electrolytic Lightning Arresters**

When electrolytic lightning arresters are employed on a power circuit involved in a parallel they shall be equipped with auxiliary charging resistances and contacts so arranged that the horn gaps are short-circuited at the time of charging, to avoid as far as possible the production of arcs.

**(h) Special Instruments**

Reliable indicating devices shall be installed at the source of supply of power circuits involved in parallels, to inform the operators immediately of abnormal conditions, such as grounds, and, wherever possible, open circuits, which have not operated automatic switches.

Whenever a neutral ground connection is employed on a circuit involved in a parallel, an ammeter, suitable for measuring the current in the neutral under normal operating conditions, shall be installed in each neutral connection to ground at the main generating and main attended substations on the power system electrically connected to the circuit involved in the parallel.

**(i) Communication Apparatus**

All apparatus electrically connected to metallic communication circuits involved in parallels shall be designed and constructed so as to secure as nearly as practicable an accurate balance of the series impedances and the admittances to earth of the two sides of the circuits in order to minimize the detrimental effects of induction from parallel power circuits.

**V. Operation and Maintenance**

**(a) General Requirements**

Power and communication companies shall use all reasonable means to operate and maintain circuits involved in parallels in such a manner as to minimize interference under conditions of normal operation, and to avoid transient disturbances.

**(b) Balance**

In the maintenance of both power and communication circuits involved in parallels special care shall be given to the prevention of mechanical and electrical failures which would cause or promote transient disturbances or unbalances such as those due to tree grounds, defective or dirty insulators or other faults.

The voltages and currents of power circuits involved in parallels shall be kept balanced as closely as practicable and accidental unbalances shall be promptly corrected.

**(c) Record of Neutral Current**

At all points on grounded neutral systems equipped as required in IV (h), the power company shall observe and record the approximate daily maximum neutral current.

**(d) Transformers**

No transformers connected to power circuits involved in normal parallels shall be operated at more than 10 per cent above their rated voltage. Wherever practicable in case of existing equipment and in all cases of new equipment, transformer banks with grounded neutrals on the side which is connected to a power circuit involved in a normal parallel shall not be operated at more than 5 per cent above their rated voltage.

**(e) Switching**

In all switching operations care shall be taken to avoid so far as possible the production of harmful transient disturbances.

**(f) Charging Electrolytic Lightning Arresters**

When, notwithstanding compliance with IV (g), interference is caused by charging electrolytic lightning arresters, such charging shall be done at night, so far as is possible, preferably between 2 a.m. and 4 a.m.

**(g) Abnormal Conditions**

Power companies shall adopt operating rules which shall specifically outline the procedure for their operators during times when a power circuit involved in a parallel is abnormally unbalanced, as will occur with an open, grounded or short-circuited line or transformer winding.

Such rules shall, in general, provide for the discontinuance of operation of the power line until the fault is remedied, excepting only those cases where it is clear that the service rendered the public by continuing operation of this section of power line is of greater importance than the communication service interrupted by such continued operation.

When it is necessary to energize a defective power line in order to locate a fault, care shall be taken to avoid as far as possible repeatedly energizing any section of such line which parallels communication circuits, until the fault has been cleared. Whenever possible, the faulty section of line shall not be energized more than once until disconnected from the section of line involved in the parallel.

To facilitate the study and prevention of disturbances in communication circuits, occasioned by transient conditions of power circuits, accurate record shall be kept of the nature and time of occurrence of failures, changes in operating arrangements and all switching during times of abnormal conditions of Class H power circuits involved in

parallels; and of all transient disturbances in communication circuits. These records shall be made available for use in tracing the causes of such transient disturbances.

**VI. Other Cases of Inductive Interference**

If any case of inductive interference, not otherwise covered by these rules, shall be experienced or become imminent, such as interference from alternating-current railways operating with ground return, constant-current lighting circuits, power circuits carried in cables, power circuits of lower voltage than Class H power circuits, direct current circuits, or interference in communication circuits carried in cable or in subscribers' metallic telephone circuits, the parties concerned shall endeavor to agree upon a procedure for the prevention or mitigation of the interference by applying remedial measures. In the event of disagreement between the parties concerned, the matter shall be referred to this Commission.

**VII. Rules Subject to Laws and Orders of Commission**

These rules are to apply in all cases where there is no conflict with any law of this state or order of this Commission now or hereafter in effect. In case of conflict, where these rules add to the requirement of any law of this state or order of this Commission, these rules shall prevail; otherwise not.

**RAILROAD COMMISSION OF THE  
STATE OF CALIFORNIA,**

By **R. A. PABST**, *Assistant Secretary*