



General Orders 95, 128, & 165

Rules for Construction and Maintenance of
Overhead and Underground Electric
Supply and Communication Systems

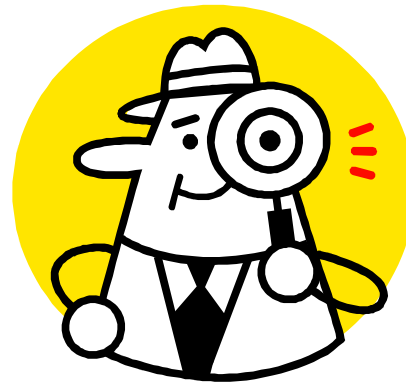
Scope of Class



- Provide general knowledge of the GOs
- Provide details of common infractions

Utilities Safety and Reliability Branch

- Engineers in LA, SF and Sacramento
- Overhead/Under-ground electric lines.
- Propane/natural gas pipelines -- utilities, master-meters
- Investigate incidents-On Call



Utilities Safety and Reliability Branch

- Jurisdiction
 - Investor Owned
 - Co-op
 - CATV
 - Municipal (Polk vs. City of Los Angeles)

Current Orders

- G.O. 95
 - Overhead Line Construction
- G. O. 128
 - Underground Line Construction
- G. O. 165
 - Inspection Requirements (Electric Supply Only)



Development of GOs

- 1911 State legislature enacted laws to regulate erection and maintenance of poles and lines for overhead construction.
- 1915 Railroad Commission assigned to inspect overhead construction.
- 1922 RR Commission issued GO 64, rules for overhead construction.

Development (Cont.)

- RR Commission revised GO 64 and issued GO 64-A in 1929
- GO 95 issued in 1941, from GO 64-A
- GO 128 issued in 1967
- GO 165 issued in 1997

Changes

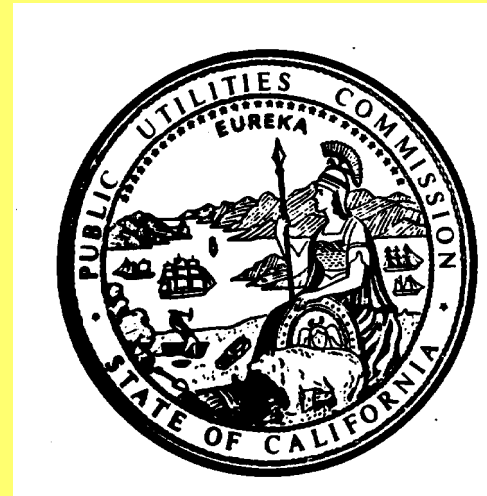
- Any person may petition the Commission under Public Utilities Code Section 1708.5 to adopt, amend, or repeal a regulation.
 - General Order 95/128 rules committee meets regularly to address rule changes, prior to submitting to the CPUC
 - CPUC staff reviews General Orders periodically to determine if changes are needed

Other Documents

- Penal Code Section 385
- Title 25 HCD (Electric design for MHP)
- Cal-OSHA Title 8 Electric Safety Orders
- National Electrical Safety Code
- Company's requirements
- Polk vs City of Los Angeles

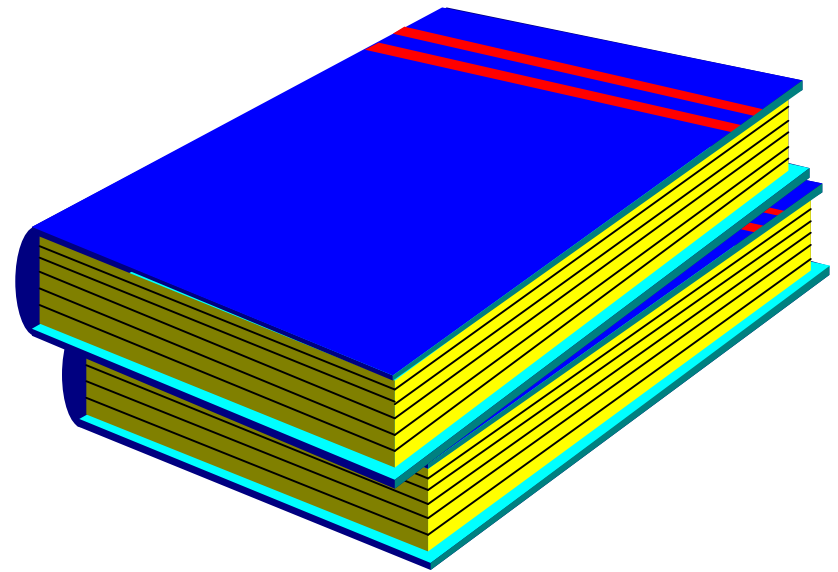
General Order 95

- Rules for Overhead Electric Line Construction



General Order 95

- Sections
- Change list
- Decision No. 34884



Browsing G.O. 95

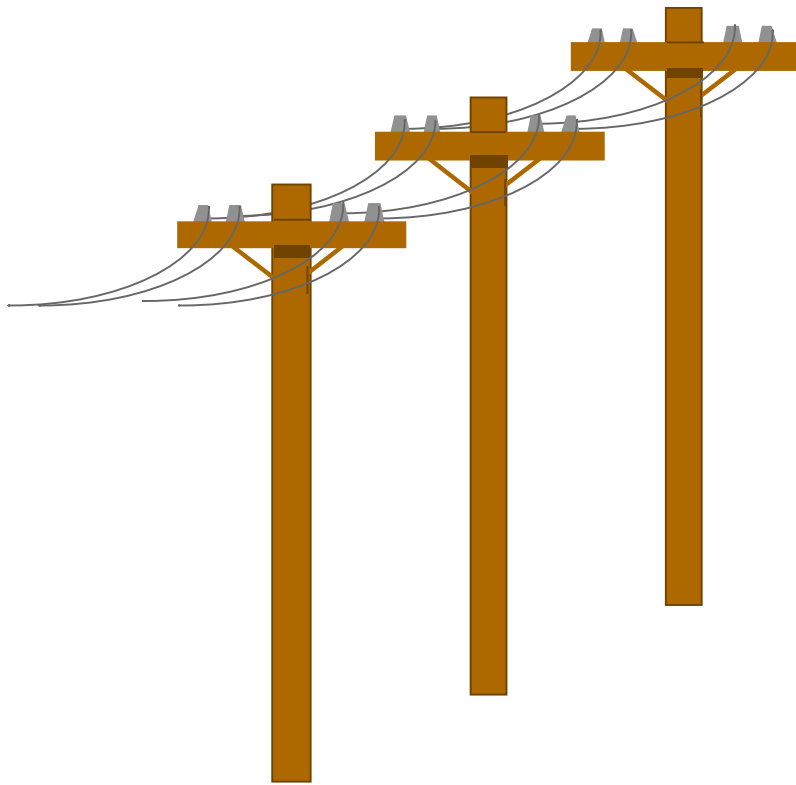
- Section I
 - Purpose of G.O. 95 (Rule 11)
 - Grandfathering (Rules 12.3 and 12.4)
- Section II
 - Definitions

Requirements for All Lines

- Section III and IV
 - Suitable design and good maintenance
 - Proper grounding
 - Clearances
 - Strength requirements



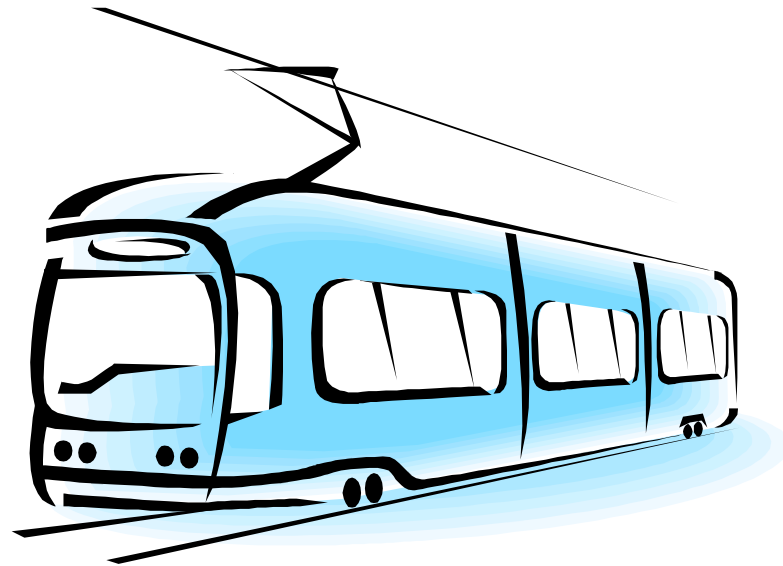
Requirements for Electric Lines



- Sections V and VI
 - Detailed construction requirements for electric supply lines
 - Tower and extra high voltage line

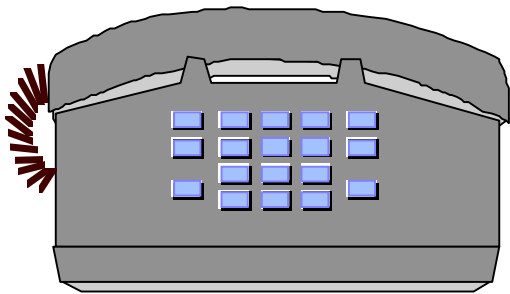
Trolleys and Electric Railroads

- Sections VII
 - Detailed construction requirements for Trolley Lines
 - Detailed construction and inspection requirements Third Rail Lines
 - New GO for 25 kV Electric Railroads



Requirements for Communication Lines

- Section VIII
- Details for
construction of
Communication Lines



Joint Poles or Poles Jointly Used

- Section IX
 - Mutual agreement
 - Must use most stringent requirements
 - Must use preceding rules, but some modifications are permitted and described

Line Crossings, Line Conflicts and Lines Over Railroad Tracks.

- Section X
 - Extra precautions for lines crossing each other or where conflicts may occur.
- Section XI
 - Extra precautions for supply or communications lines over railroad tracks

Appendices

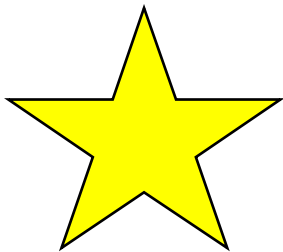
- A. Loading Districts
- B. Mechanical and Loading Data
- C. Sags
- D. Communication Line Construction
- E. Clearance of Poles, Towers, and Structures from RR Tracks ***and Tree Trimming(!)***

Appendices (Cont.)

F. Typical problems

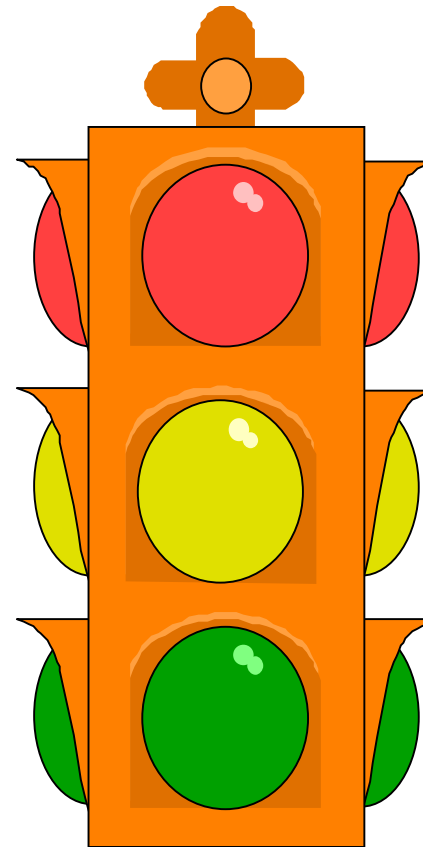
G. Illustrative Diagrams

H. Settlement Agreement



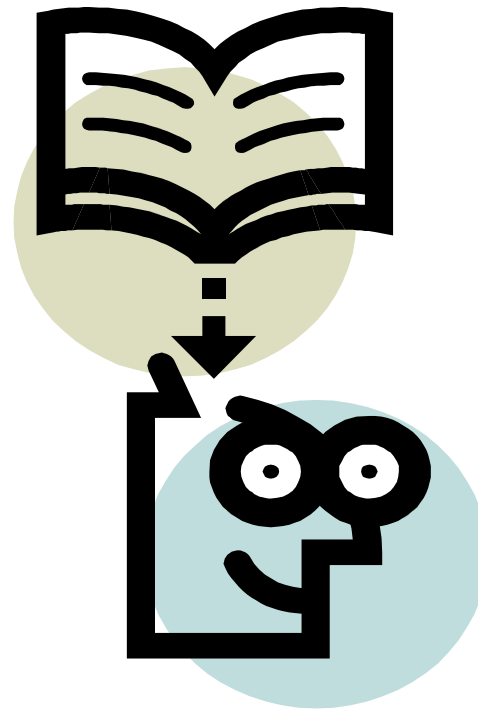
Rule numbering

- Example 1: Rule 54.7
Climbing Space and Rule
84.7
- Example 2: Rule 92.1-F5



General Order 95

- Definitions
- General Provisions

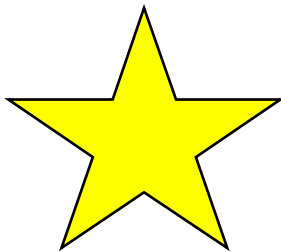


Definitions in Section II



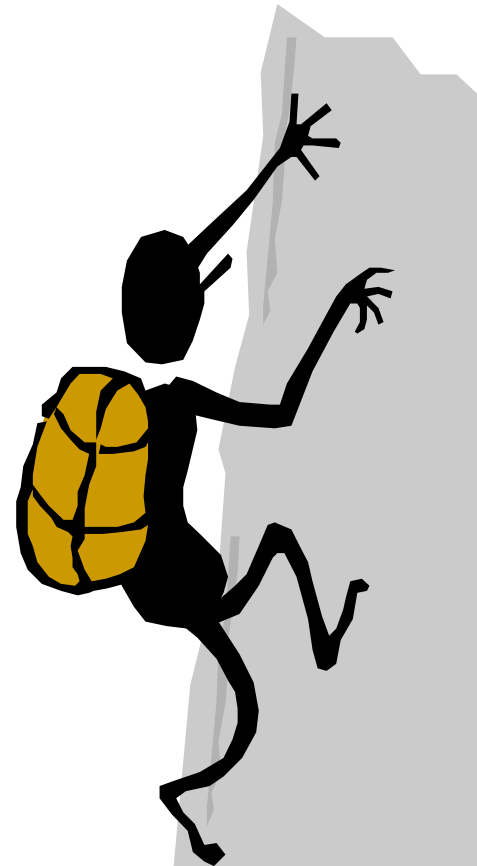
Antenna

- Antenna means a device for emitting and/or receiving radio frequency signals.



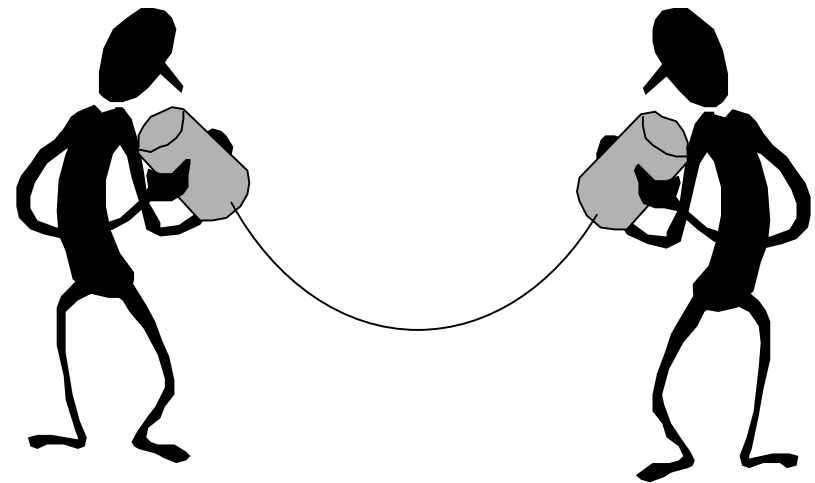
Climbing Space

- Space reserved along the surface of a pole or structure to permit ready access for linemen to equipment and conductors located on the pole



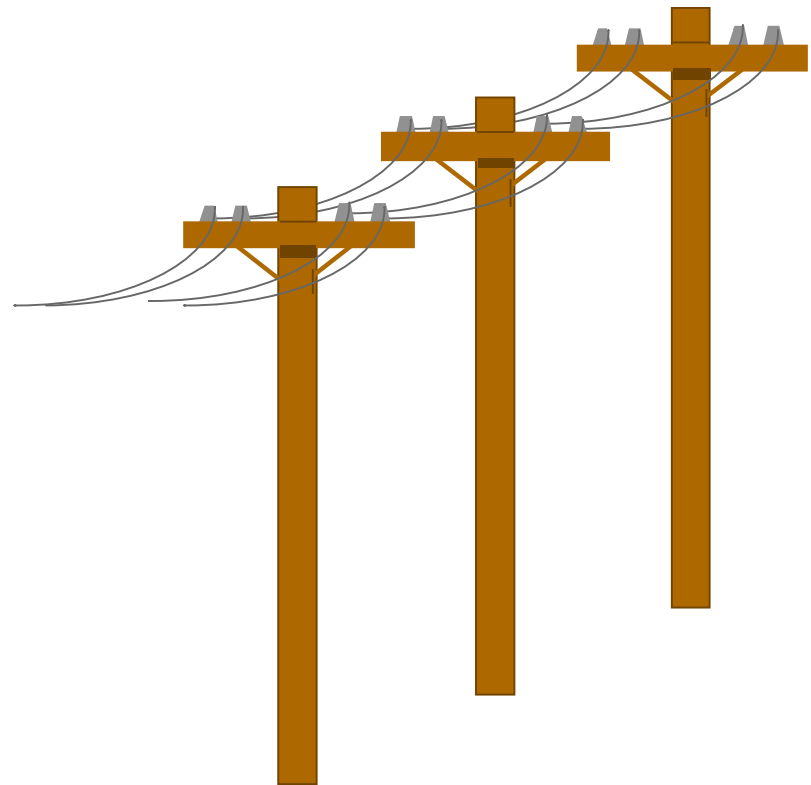
Communication Circuits

- For public or private communication service. Operate at less than 400 Volts to ground , or 750 V between any two points on circuit. Transmitted power is less than 150 watts.

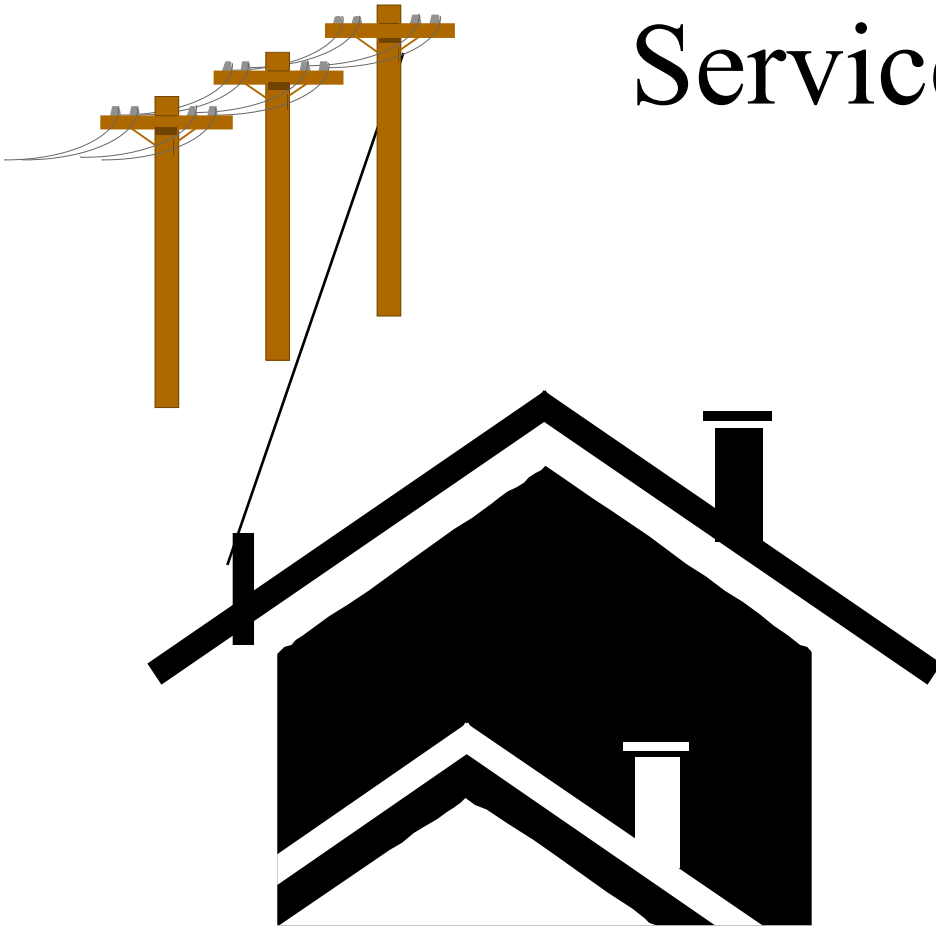


Supply Circuits

- Transmit a supply of electrical energy
- Class E at very high voltage $>300,000\text{V}$
- Class H circuits are $<300,000$ but $> 5000\text{V}$
- Class L circuits are $< 5000\text{V}$



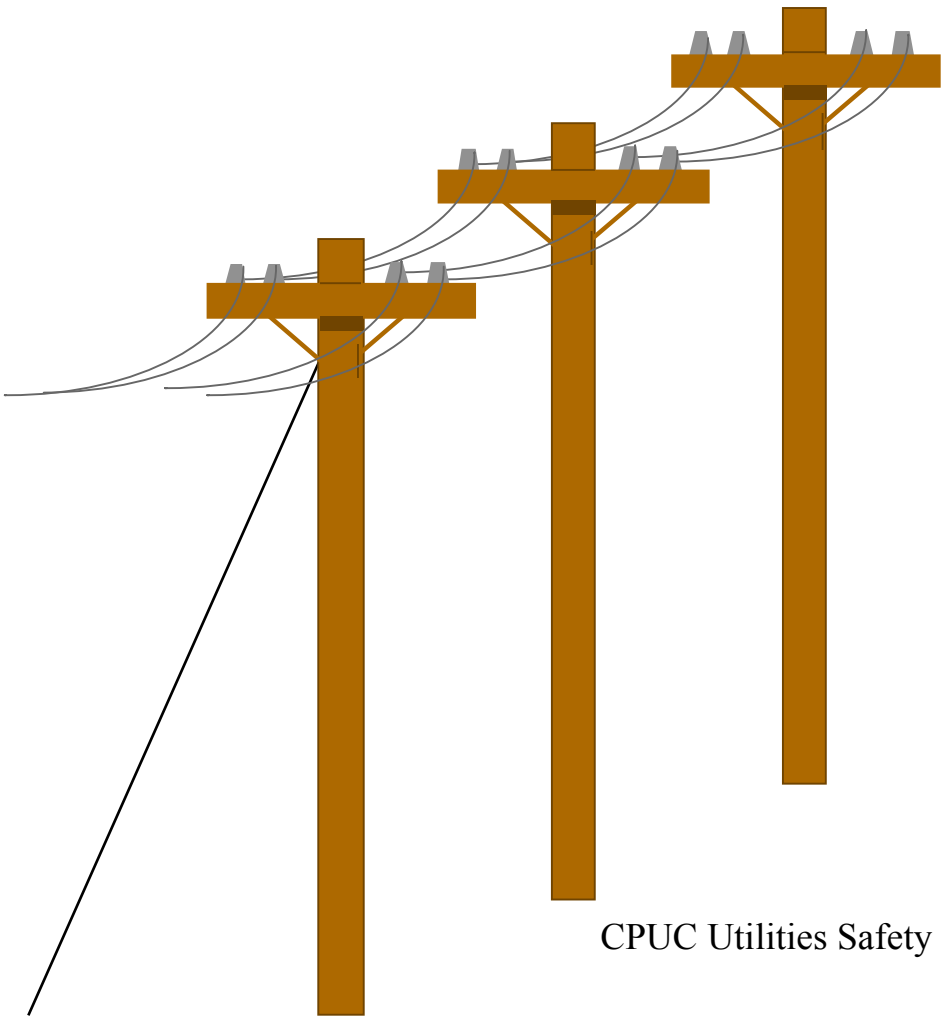
Service Drops



- Conductors strung between a pole line and a building, a structure or meter pole.

Guy

- Tension member, solid or stranded wire used to withstand an unbalanced force on a pole, cross arm or other overhead structure



Lead Wires



- Jumpers, bridle wires, transposition wires, taps
- Connect line conductors to the equipment and apparatus or other line conductors on same overhead structure.

Conductor

- Material suitable for carrying electric current such as wire, cable or bus bar
- Material for transmitting light (fiber optics)



Risers



- Conductors which extend below the ground line and are generally installed on the surfaces of poles.

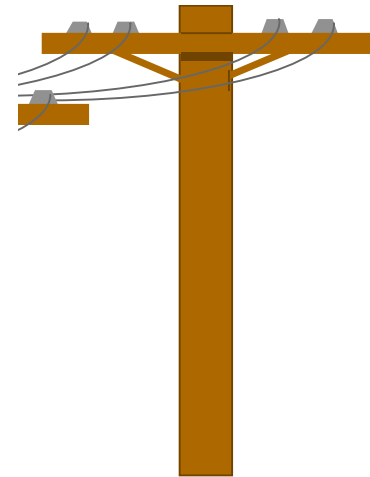
Runs



vertical or lateral
conductors supported in
coverings or casings on
overhead line structures,
or insulated
communication
conductors supported
along surfaces of poles or
cross arms.

Cross Arm

- Horizontal support attached to poles or structures, generally at right angle to the conductor supported



Guard Arm

- A Cross Arm installed above and approximately parallel to a messenger, cable or conductor



Joint Use of Poles or Poles Jointly Used

- Poles or structures occupied by circuits of different ownership or by two or more of the following classes of circuits of the same ownership
 - Communications circuits for public use
 - Railway or trolley circuits
 - Supply circuits other than trolley circuits



General Provisions

General Order 95

Emergency Installation (Rule 12.5)

- During Emergency conditions the requirements of General Order 95 may be deferred.
- Shall be removed, replaced or relocated as soon as practical
- The requirements of Rule 37 for supply conductors should not be waived
- Facilities shall not be installed with a safety factor of less than unity.

Third Party Nonconformance (Rule 12.6)

- When a third party causes a condition on or near a utility facility that does not conform with this Order, the utility shall be allowed reasonable time to address the condition
- While addressing this condition, the utility is in conformance with the Order

Investigation of Accidents (Rule 17)

- Each owner or operator of supply lines shall establish procedures for the investigation of major accidents and failures for the purpose of determining the causes and minimizing the possibility of recurrence.
 - Incidents associated with utility facilities which cause property damage estimated at or about the time of the incident to be more than \$50,000
 - Incidents resulting from electrical contact which cause personal injury which require hospitalization overnight, or result in death

Design, Construction and Maintenance (Rule 31.1)

- Constructed, and maintained for their intended use
- Work should be done in accordance with accepted good practice for the given local conditions



Inspection (Rule 31.2)

- Systems shall be inspected by the operator frequently and thoroughly for the purpose of insuring that they are in good condition so as to conform with these rules.
- This rule does not specify time intervals, that is left up to the operator.

Cooperation to Avoid Conflicts (Rule 31.4)

- Cooperation to Avoid Conflicts
- ***Notice to other utilities when construction or reconstruction may create line conflict in ADVANCE***

Abandoned lines (Rule 31.6)

- Lines or portions of lines abandoned shall be removed by their owners to avoid public nuisance or hazard
- Lines that are permanently abandoned shall be defined as those lines that are determined by their owner to have no foreseeable future use.

General Arrangements of Lines (Rule 32)

- Where two or more systems are concerned in any clearance, that owner or operator who last in point of time constructs or erects facilities, shall establish the clearance required in these rules from other facilities which have been erected previously.
- Where supply and communication circuits or supply circuits of different voltage classifications are involved in crossings, conflicts or joint use, the higher voltage circuit shall in general be carried at the higher level.

Ground and Neutrals (Rule 33)

- Treat common neutral like a phase conductor
- Rule need not apply to overhead lightning protection wires on metal structures or grounded wood structures.
- The grounding of the neutral or any other conductor is permitted only for the purposes of stabilization and protection, not for use as a return conductor.

Ground or Earth as a Conductor

Rule 33.2

- Ground or earth shall not be used as a normal return or circuit conductor.
- The neutral or any other conductor is permitted to be grounded only for the purposes of stabilization and protection.
- “Stray” Voltage

Foreign attachments (Rule 34)

- Nothing in these rules shall be construed as permitting the unauthorized attachment ... of antennas, signs, posters, banners, decoration, wires, lighting fixtures, guys, ropes and other such equipment foreign to the purposes of overhead electric line construction.



Tree Trimming (Rule 35)



- Where overhead wires pass through trees, a reasonable amount of tree trimming shall be done in order that the wires may clear branches and foliage

Tree Trimming (Rule 35)

- The minimum clearances are established in Table 1, Case 13 for vegetation and Supply lines operating above 750 volts.
- When a Communication Line or Supply Line operating at less than 750 volts, shows strain or evidences abrasion from tree contact, the condition shall be corrected.

Clearances of Wires Above Ground (Rule 37, Table 1)

- Rule 37, allows modifications of certain values in Table 1 for:
 - Temperature
 - Loading (Rule 43)
 - Other conditions
- Define how to measure values in respective tables



Clearances of Wires Above Ground (Rule 37, Table 1)

- Table 1
 - Breaks overhead facilities into 7 categories
 - Gives clearances for 14 different conditions
 - Has over 50 footnotes for the table

Service Drop Clearances (Cont)

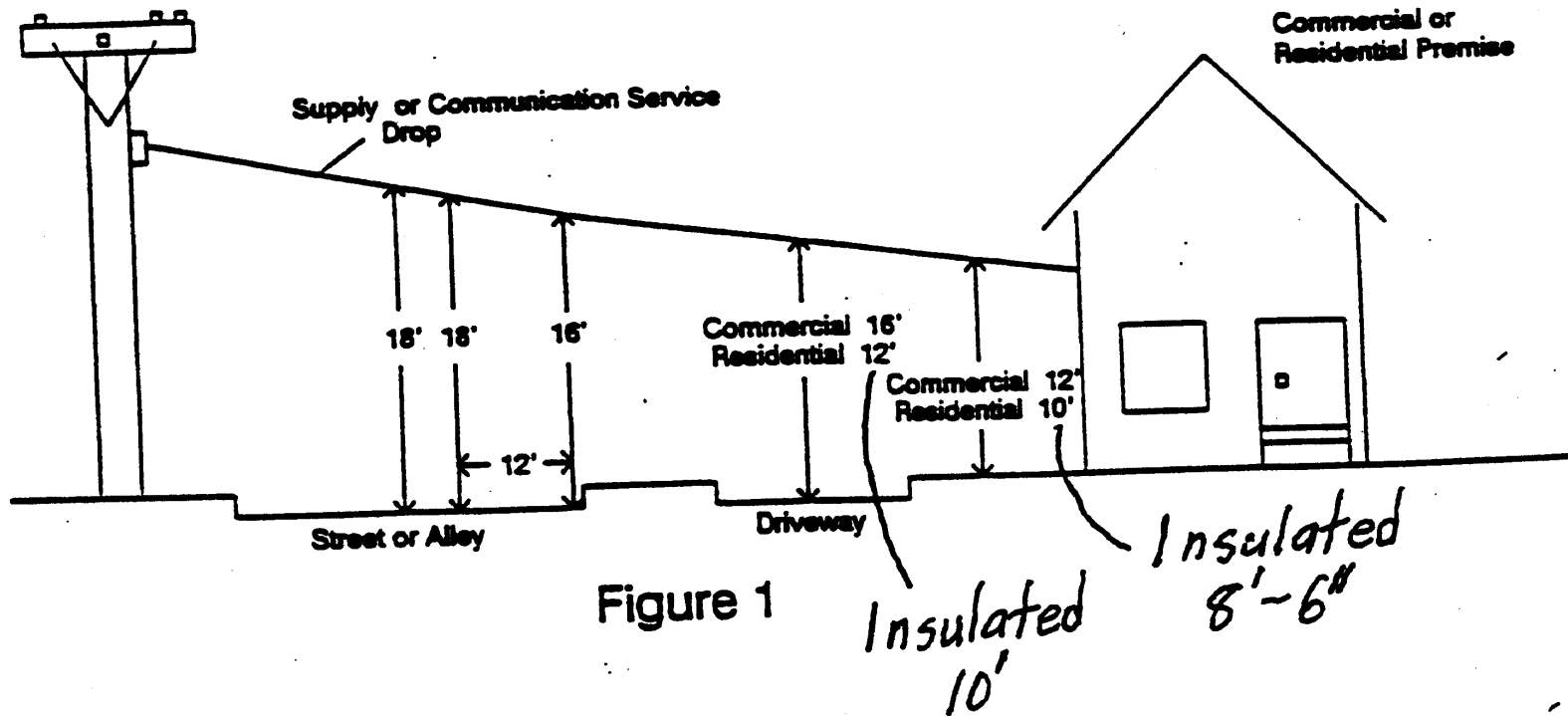


Figure 1

Clearances of Wires from other Wires (Rule 38 & Table 2)

- Table 2
 - Breaks overhead facilities into 11 categories
 - Gives clearances for 21 different conditions
 - Has over 40 footnotes for the table

Clearances of Wires from Signs (Rule 39, Table 2A)

- Rule 39, allows modifications of values in Table 2A for:
 - Temperature
 - Loading (Rule 43)
- Define how to measure values in respective tables



Safety Factors (Section IV)

- Grade of Construction (Rule 42, Table 3)
- Light or Heavy Loading (Rule 43)
- Safety Factor Can Be Determined (Rule 44)
 - Table 4 Lists safety factor at time of installation
 - Rule 44.2 allows for “2/3” reduction of values in Table 4 (due to deterioration) but in no case may safety factor fall below “1”

Setting of Poles (Rule 49.1-C)

- Table 6 shows minimum depths
- If soil is not firm, deeper setting or special methods
- Unguyed pole subject to strain or at corners should be set deeper



Setting of Poles (Rule 49.1-C)

- Poles are branded, to determine how deeply they are set:
 - <50ft, brand is 10 ft
 - >55 ft, brand is 14 ft
- A 10% reduction in the pole setting depth is allowed due to:
 - Ground Erosion
 - Excavation



Service Drop Covering (Rule 49.4-C7a)

- Service drop conductors must be covered with the equivalent of standard double braid weatherproofing or of a design authorized for use by the Commission.

High Voltage Signs (Rule 51.6)

- Poles and cross arms carrying conductors of more than 750V shall be marked High Voltage
- Signs must be secure, legible and clearly distinguishable.



Risers and Runs

(Rules 54.6, 74.6 & 84.6)



- Ground wires of supply circuits must be protected by suitable covering in good repair throughout their length.
- Lateral runs must be covered to outer position of conductor

Service Drop Clearance from Buildings (Rules 54.8 & 84.8)

- Horizontal clearances for Supply Service Drops from doors and windows – 3 feet
- Communication Service Drops
 - Buildings on the premises served – no minimum but can not touch
 - Buildings on other premises – 8 feet
 - Except: Roofs whose slope exceeds 9 inches of rise per 12 inches of run or the service drop does not overhang the building by more than 6 feet

Guy Marker

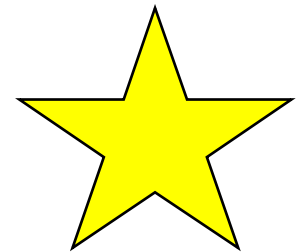
(Rules 56.9, 66.7, 86.9)

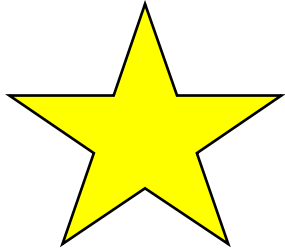


- Anchor guys are required to be marked by securely attached markers and in good repair

Rule 94

- **94.1 Definition**
- **94.2 Maintenance and Inspection**
- **94.3 General Requirements**
- **94.4 Clearances**
- **94.5 Marking**
- **94.6 De-energizing**
- **Exceptions**

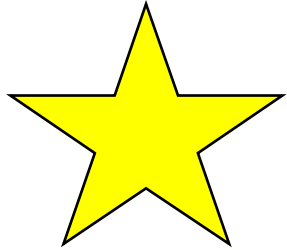




Rule 94 Continued

94.5 Marking

- A. No antenna owner or operator shall install an antenna on a joint use pole unless such installation is subject to an agreement with the pole owner(s) that includes marking requirements that are substantially similar to and achieve at least the same safety standards as those set forth in Appendix H to GO 95.
- B. Joint use poles shall be marked with a sign for each antenna installation as follows:
 - 1) Identification of the antenna operator
 - 2) A 24-hour contact number of antenna operator for Emergency or Information
 - 3) Unique identifier of the antenna installation.



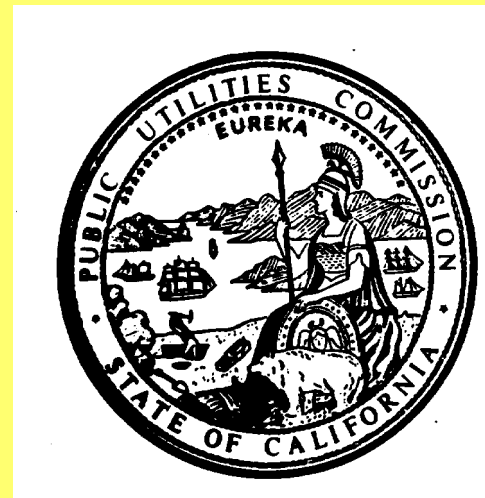
Rule 94 Continued

94.6 De-energizing

No antenna owner or operator shall install an antenna on a joint use pole unless such installation is subject to an agreement with the pole owner(s) that includes de-energizing protocols that are substantially similar to and achieve at least the same safety standards as those set forth in Appendix H to GO 95.

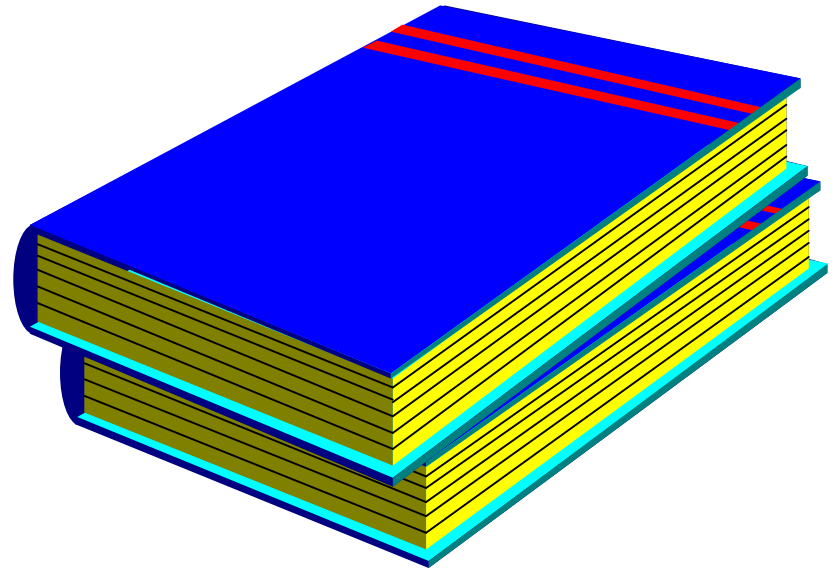
General Order 128

- Rules for Construction of Underground Electric Supply and Communication Systems



General Order 128

- Sections
- Change list
- Decision No. 73195



Browsing G.O. 128

- Section I
 - Purpose of G.O. 128 (Rule 11)
 - Grandfathering (Rules 12.3 and 12.4)
- Section II
 - Definitions

Requirements for Supply Systems

- Section III
 - Clearance and Depths
 - Explosion Protection
 - Guarding Live Parts

Requirements for Communication Systems

- Section IV
 - Clearance and Depths
 - Explosion Protection
 - Guarding Live Parts
 - Police, Fire Alarm, and Traffic Control Circuits

Appendices

- **Appendix A**
 - Summary of Dimensions, Clearances, and Depth Requirements
- **Appendix B**
 - Typical Illustrative Diagrams of Rules
- **Appendix C**
 - Clearance from Railroad Tracks
- **Appendix D**
 - Excerpts from Public Utilities Code

General Order 128

- Definitions
- General Provisions



Definitions



Manhole

- A subsurface enclosure in an underground system containing working space large enough for a person to enter

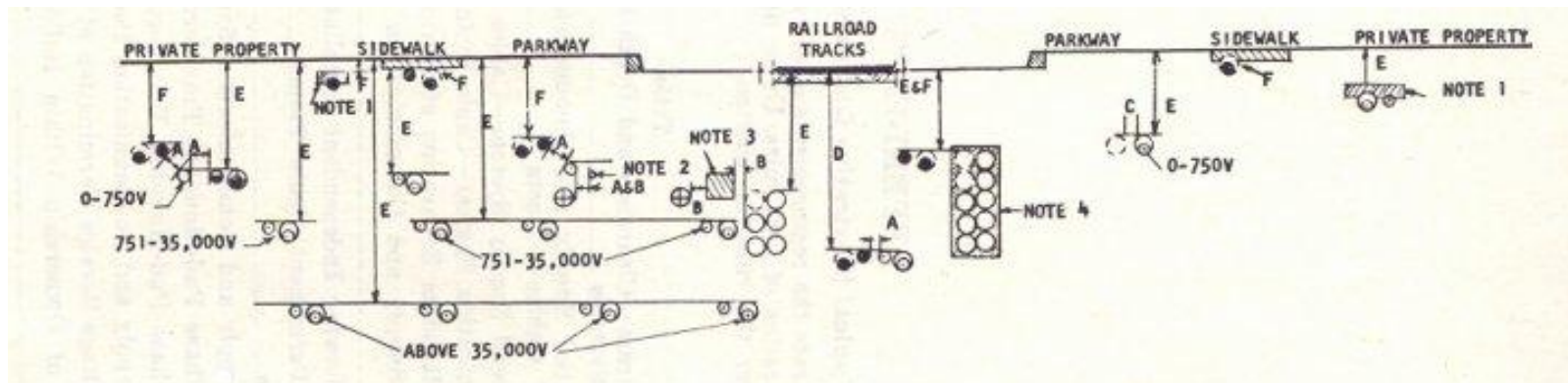


Handhole

- A permanent opening in the route of an underground system, usually smaller than a manhole, with a removable top and affording access to cable runs and associated apparatus

Cover

- The radial distance between the surface of an underground cable or conduit and grade.



Inspection (Rule 17.2)

- Systems shall be inspected by the operator frequently and thoroughly for the purpose of insuring that they are in good condition so as to conform with these rules.
- This rule does not specify time intervals, that is left up to the operator.
- Same as Rule 31.2 of General Order 95

Location Information (Rule 17.7)

- Each party operating or owning facilities shall, upon request, provide information as to location of its underground facilities to any other party contemplating underground construction, or work, in the vicinity thereof.
- Government Code Sections 4216-4216.9

Identification (Rule 17.8)

- Manholes, handholes , subsurface and self-contained surface-mounted equipment enclosures shall be marked as to ownership to facilitate identification by persons authorized to work therein and by other persons performing work in their vicinity.



Investigation of Accidents (Rule 18)

- Each owner or operator of supply lines shall establish procedures for the investigation of major accidents and failures for the purpose of determining the causes and minimizing the possibility of recurrence.
 - Incidents associated with utility facilities which cause property damage estimated at or about the time of the incident to be more than \$50,000
 - Incidents resulting from electrical contact which cause personal injury which require hospitalization overnight, or result in death
- Same as Rule 17, of General Order 95

Design, Construction and Maintenance (Rule 17.1)

- Constructed, and maintained for their intended use
- Work should be done in accordance with accepted good practice for the given local conditions
- Same as Rule 31.1, of General Order 95



APPENDIX A Tables 1 & 2

- Table 1 - Clearance and Depth Requirements for Supply and Communication Systems
- Table 2 - Miscellaneous Dimensions and Clearance Requirements for Supply and Communication Systems

Covers

(Rules 32.7 & 42.7)

- Covers of subsurface enclosures must:
 - Be secured in place
 - Withstand the forces that they will be subject to
 - Require a tool to open

Guarding Live Parts (34.3-B)

- Surface mounted equipment containing live parts shall be installed such that a wire or other material, cannot be passed into the enclosure when closed.

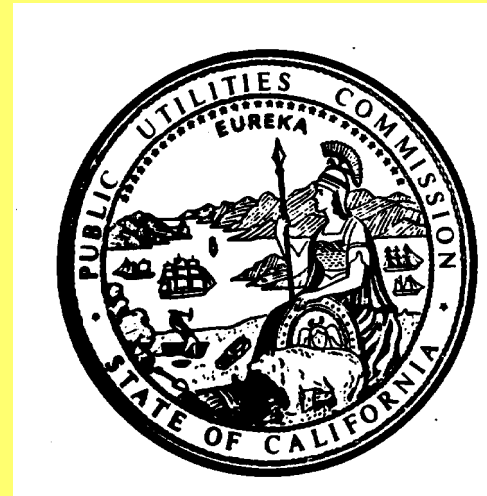
Locking –Padmounted (Rule 34.3-C)

- Padmounted equipment shall be made secure against entry by unauthorized person by:
 - Locks
 - Suitable means



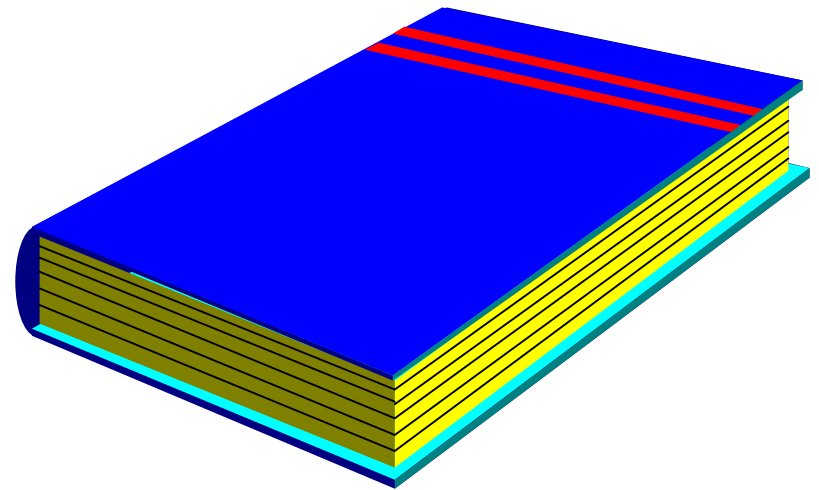
General Order 165

- Inspection Cycles
for
Electric Distribution
Facilities



General Order 165

- I. Purpose**
 - II. Applicability**
 - III. Definitions**
 - IV. Standards for
Inspection, Record-
keeping, and Reporting**
- Appendix A**



Purpose

- The purpose of this General Order is to establish minimum requirements for electric distribution facilities, regarding:
 - maximum allowable inspection cycle lengths
 - condition rating
 - scheduling and performance of corrective action,
 - record-keeping, and
 - reporting

Applicability

- Section II, States GO 165 applies:
 - PG&E
 - PacifiCorp
 - SDG&E
 - SP&P
 - SCE
- Decision 97-03-070
 - Requested comments concerning the application of GO 165 to Municipals and Publicly Owned Electric Utilities
- Decision 98-03-036
 - GO 165 applies to Municipals and Publicly Owned Electric Utilities
- Decision 98-10-059
 - Denied CMUA's request to rehear decision
- Decision 99-12-052
 - Denied CMUA's request to modify 98-03-036

Definitions

- "Urban" shall be defined as those areas with a population of more than 1,000 persons per square mile as determined by the United States Bureau of the Census.
- "Rural" shall be defined as those areas with a population of less than 1,000 persons per square mile as determined by the United States Bureau of the Census.

Definitions

- "Patrol" shall be defined as a simple visual inspection, of applicable utility equipment and structures, that is designed to identify obvious structural problems and hazards. Patrols may be carried out in the course of other company business.
- "Detailed" inspection shall be defined as one where individual pieces of equipment and structures are carefully examined, visually and through use of routine diagnostic test, as appropriate, and (if practical and if useful information can be so gathered) opened, and the condition of each rated and recorded.

Definitions

- "Intrusive" inspection is defined as one involving movement of soil, taking samples for analysis, and/or using more sophisticated diagnostic tools beyond visual inspections or instrument reading.
- "Corrective Action" shall be defined as maintenance, repair, or replacement of utility equipment and structures so that they function properly and safely.

Standards for Inspection, Record-keeping, and Reporting

- Each utility shall conduct inspections of its distribution facilities, as necessary, but in no case may the period between inspections (measured in years) exceed the time specified in the table.

Standards for Inspection, Record-keeping, and Reporting

- For all inspections, within a reasonable period, company records shall specify:
 - The circuit, area, or equipment inspected
 - The name of the inspector, the date of the inspection
 - Any problems identified during each inspection
 - A scheduled date of corrective action.
 - For detailed and intrusive inspections, companies shall also rate the condition of inspected equipment.
 - Upon completion of corrective action, company records will show the nature of the work, the date, and the identity of persons performing the work.

Standards for Inspection, Record-keeping, and Reporting

- Each utility shall file annual reports for every following year by no later than July 1. The report shall identify:
 - The number of facilities, by type which have been inspected during the previous period.
 - Identify those facilities which were scheduled for inspection but which were not inspected
 - The total and percentage breakdown of equipment rated at each condition rating level, including that equipment determined to be in need of corrective action.
 - Present the total and percentage of equipment which was and was not corrected during the reporting period.
 - The percentage of equipment in need of corrective action, but with a scheduled date beyond the reporting period, classified by the amount of time remaining before the scheduled action.
 - All of the above information shall be presented for each type of facility identified in the attached table and shall be aggregated by district.

Table

	Patrol		Detailed		Intrusive	
	Urban	Rural	Urban	Rural	Urban	Rural
Transformers						
Overhead	1	2	5	5	---	---
Underground	1	2	3	3	---	---
Padmounted	1	2	5	5	---	---
Switching/Protective Devices						
Overhead	1	2	5	5	---	---
Underground	1	2	3	3	---	---
Padmounted	1	2	5	5	---	---
Regulators/Capacitors						
Overhead	1	2	5	5	---	---
Underground	1	2	3	3	---	---
Padmounted	1	2	5	5	---	---
Other Assets						
Overhead Conductor and Cables	1	2	5	5	---	---
Streetlighting	1	2	x	x	---	---
Wood Poles under 15 years	1	2	x	x	---	---
Wood Poles over 15 years which have not been subject to intrusive inspection	1	2	x	x	10	10
Wood poles which passed intrusive inspection	---	---	---	---	20	20

Enforcement

- Only the Commission can levy fines
- We rely on utility's desire to have a good system
- Collegial Approach
- What about Communication Utilities?

Current Utilities Safety and Reliability

Branch Issues



- Communications Enforcement
- Substations
- Wireless Antenna Rule
- New GO for 25 kV Electric Railroads