

SECTION 16302

OVERHEAD ELECTRICAL WORK  
02/84

PART 1 GENERAL

1.1 SUMMARY

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)  
51 EAST 42ND STREET, SUITE 1202  
NEW YORK, NY 10017  
(212) 697-1336

\-AEIC CS5-\ 1979 Specifications for Polyethylene and Cross-Linked Polyethylene Insulated Shielded Power Cables Rated 5 through 69 kV (6th Edition)

\-AEIC CS6-\ 1979 Specification for Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 through 60 kV (3rd Edition)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)  
1430 BROADWAY  
NEW YORK, NY 10018  
(212) 354-3300

\-ANSI B16.11-\ 1980 Forged Steel Fittings, Socket-Welded and Threaded

\-ANSI C2-\ 1981 National Electrical Safety Code

\-ANSI C12.10-\ 1978 Watthour Meters

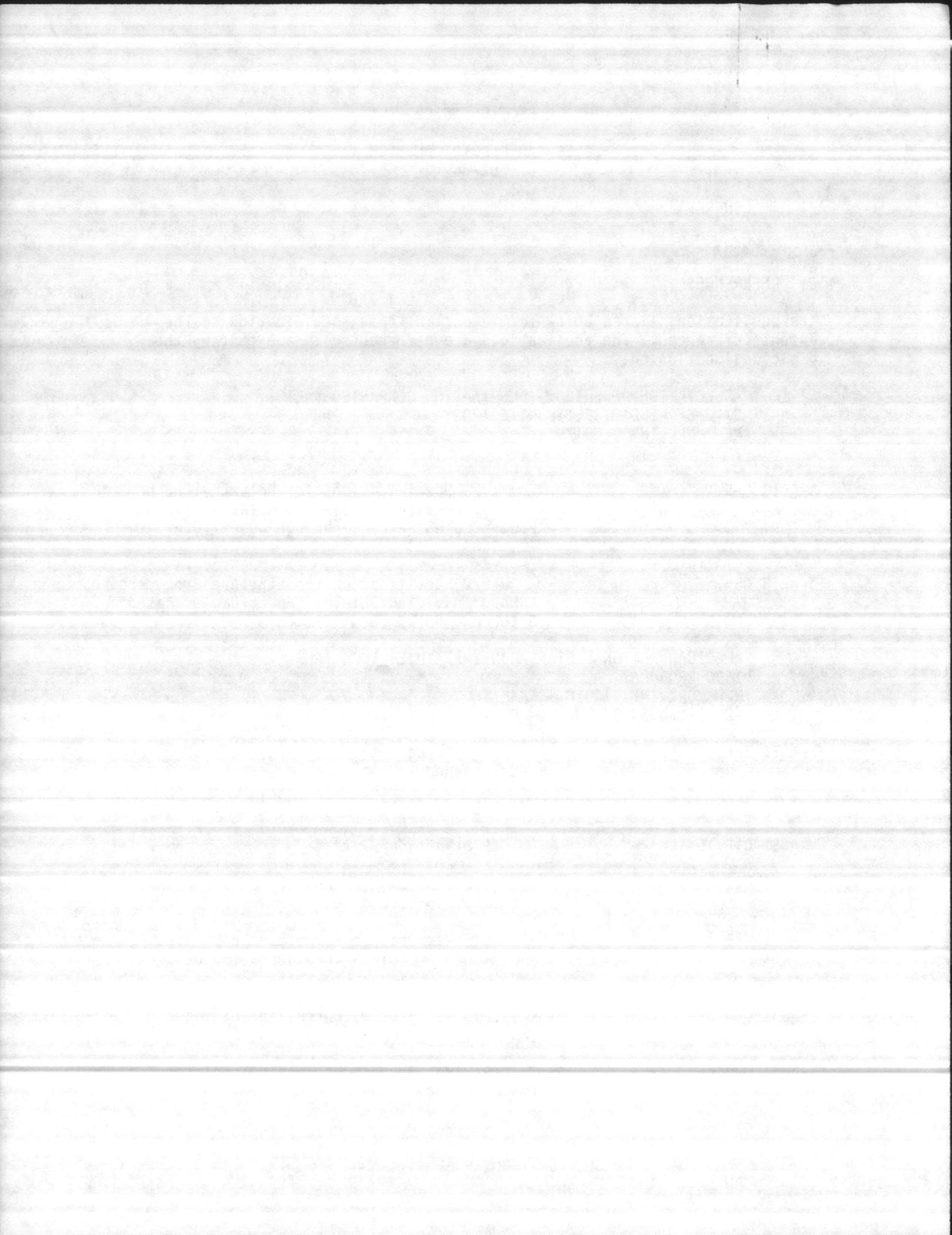
\-ANSI C12.11-\ 1978 Instrument Transformers for Metering Purposes, 15 KV and Less

\-ANSI C29.2-\ 1977 Wet Process Porcelain Insulators and- Toughened Glass Insulators (Suspension Type)

\-ANSI C29.3-\ 1980 Wet Process Porcelain Insulators (Spool Type)

\-ANSI C29.4-\ 1977 Wet Process Porcelain Insulators (Strain Type)

\-ANSI C29.5-\ 1977 Wet Process Porcelain Insulators



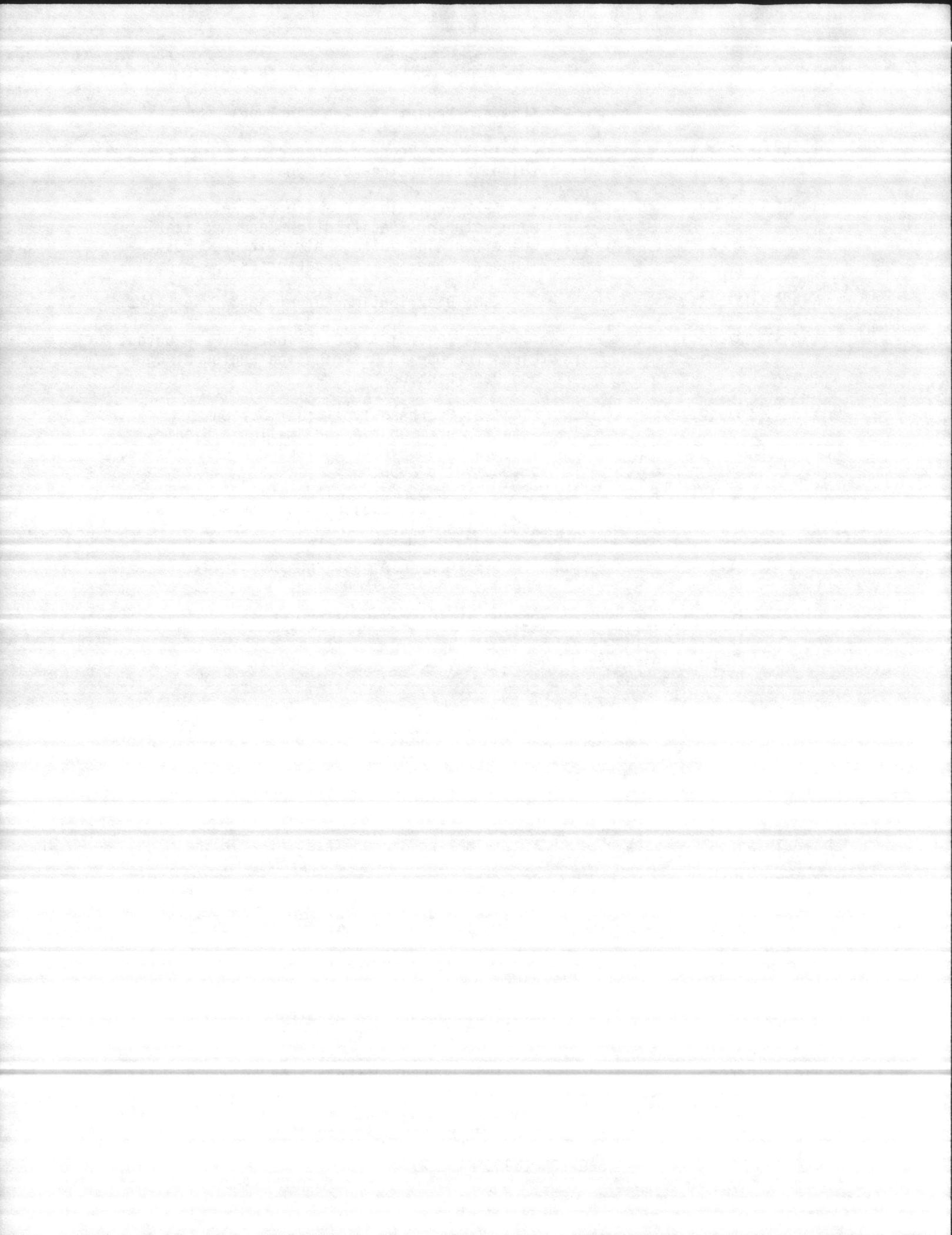
SPECS-IN-TACT

(Low and Medium Voltage Pin Type)

- \-ANSI C29.7-\ 1983 Wet Process Porcelain Insulators (High Voltage Line-Post Type)
- \-ANSI C37.32-\ 1972 Schedules of Preferred Ratings, Manufacturing Specifications and Application Guide for High Voltage Air Switches, Bus Supports, and Switch Accessories
- \-ANSI C37.42-\ 1981 Distribution Cutouts and Fuse Links
- \-ANSI C37.43-\ 1969 (Rev. 1974) Distribution Fuse Cutout Links for Use in Distribution Enclosed, Open, and Open-Link Cutouts
- \-ANSI C57.12.20-\ 1981 Overhead Type Distribution Transformers 500 KVA and Smaller: High Voltage 67,000 Volts and Below: Low Voltage, 15,000 Volts & Below
- \-ANSI 05.1-\ 1979 Specifications and Dimensions for Wood Poles
- \-ANSI Z55.1-\ 1967 Gray Finishes for Industrial Apparatus and Equipment

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)  
1916 RACE STREET  
PHILADELPHIA, PA 19103  
(215) 299-5585

- \-ASTM A120-\ 1982 Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary uses
- \-ASTM A153-\ 1982 Zinc-coating (Hot-Dip) on Iron and Steel Hardware
- \-ASTM A475-\ 1978 Zinc-Coated Steel Wire Strand
- \-ASTM B1-\ 1981 Hard-Drawn Copper Wire
- \-ASTM B2-\ 1981 Medium Hard-Drawn Copper Wire
- \-ASTM B3-\ 1974 (Rev. 1980) Soft or Annealed Copper Wire
- \-ASTM B8-\ 1981 Concentric-Lay-Stranded Copper Conductors, Hard, Medium Hard, or Soft
- \-ASTM B228-\ 1981 Concentric-Lay-Stranded Copper-Clad Steel Conductors
- \-ASTM B231-\ 1981 Concentric-Lay-Stranded



SPECS-IN-TACT

Aluminum 1350 Conductors

\-ASTM B232-\ 1981 Concentric-Lay-Stranded Aluminum  
Conductors, Coated Steel Reinforced (ACSR)

\-ASTM B397-\ 1981 Concentric-Lay-Stranded 500-H19  
Aluminum-Alloy 5005-H19 Conductors

\-ASTM B399-\ 1981 Concentric-Lay-Stranded  
Aluminum-Alloy 6201-T81 Conductors

AMERICAN WOOD-PRESERVERS' ASSOCIATION (AWPA)  
108 HARLEY COURT  
P.O. BOX 849  
STEVENSVILLE, MD 21666  
(301) 643-4163

\-AWPA C1-\ 1984 All Timber Products - Preservative  
Treatment by Pressure Processes

\-AWPA C4-\ 1984 Poles Preservative Treatment by  
Pressure Process

\-AWPA C25-\ 1970 Standard for the Preservative  
Treatment of Crossarms by the Pressure  
Process

INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)  
IEEE PUBLICATIONS CENTER  
445 HOES LANE  
PISCATAWAY, NJ 08854  
(201) 981-1393

\-IEEE 48-\ 1975 High Voltage Alternating Current  
Cable Terminations

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)  
2101 L STREET, N.W., SUITE 300  
WASHINGTON, DC 20037  
(202) 457-8474

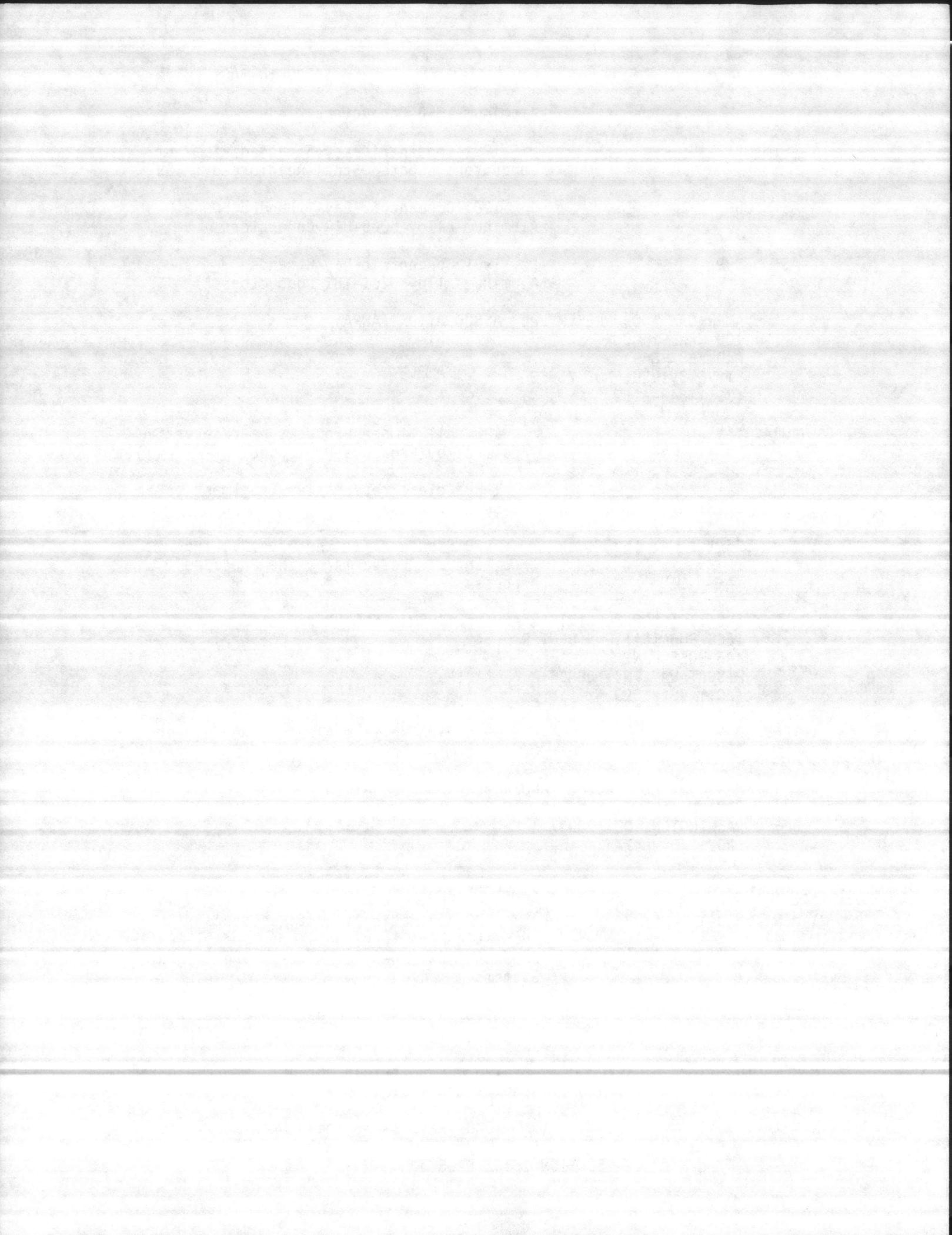
\-NEMA LA1-\ 1976 (Rev. 1980) Surge Arresters

\-NEMA SG13-\ 1977 Automatic Circuit Reclosers,  
Automatic-Line Sectionalizers, and Oil Filled  
Capacitor Switches for Alternating Current  
Systems

\-NEMA TC2-\ 1978 (Rev. 1981) Electrical Plastic  
Tubing (EPT) and Conduit (EPC-40 and EPC-80)

\-NEMA TC3-\ 1982 PVC Fittings for Use with Rigid PVC  
Conduit and Tubing

\-NEMA TR1-\ 1980 (Rev. 1983) Transformers,



Regulators, and Reactors

\-NEMA WC7-\                    1982 Cross-Linked Thermosetting  
Polyethylene Insulated Wire and Cable for the  
Transmission and Distribution of Electric  
Energy (IPCEA S-66-52A)

\-NEMA WC8-\                    1976 (Rev. 1983) Ethylene-Propylene-  
Rubber Insulated Wire and Cable for the  
Transmission and Distribution of Electrical  
Energy (IPCEA S-68-516)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)  
PUBLICATIONS DEPARTMENT  
BATTERYMARCH PARK  
QUINCY, MA 02269  
(617) 770-3000

\-NFPA 70-\                    1984 National Electrical Code

RURAL ELECTRIFICATION ADMINISTRATION (REA)  
U.S. DEPARTMENT OF AGRICULTURE  
MANAGEMENT SERVICES DIVISION  
14TH STREET AND INDEPENDENCE AVENUE, S.W., ROOM 4024-S  
WASHINGTON, DC 20250  
(202) 382-1255

\-REA 43-5-\                    1981 List of Materials Acceptable fo Use  
On Systems of REA Electrification Borrowers

\-REA 44-3-\                    1975 Wood Crossarms (Solid and  
Laminated), Transmission Timbers and Pole  
Keys (DT-5B/PE-16), DEC

\-REA 50-17-\                    REA Specification DT-5C for Wood Poles,  
Stubs, and Anchor Logs

UNDERWRITERS LABORATORIES, INC. (UL)  
333 PFINGSTEN ROAD  
NORTHBROOK, IL 60062  
(312) 272-8800

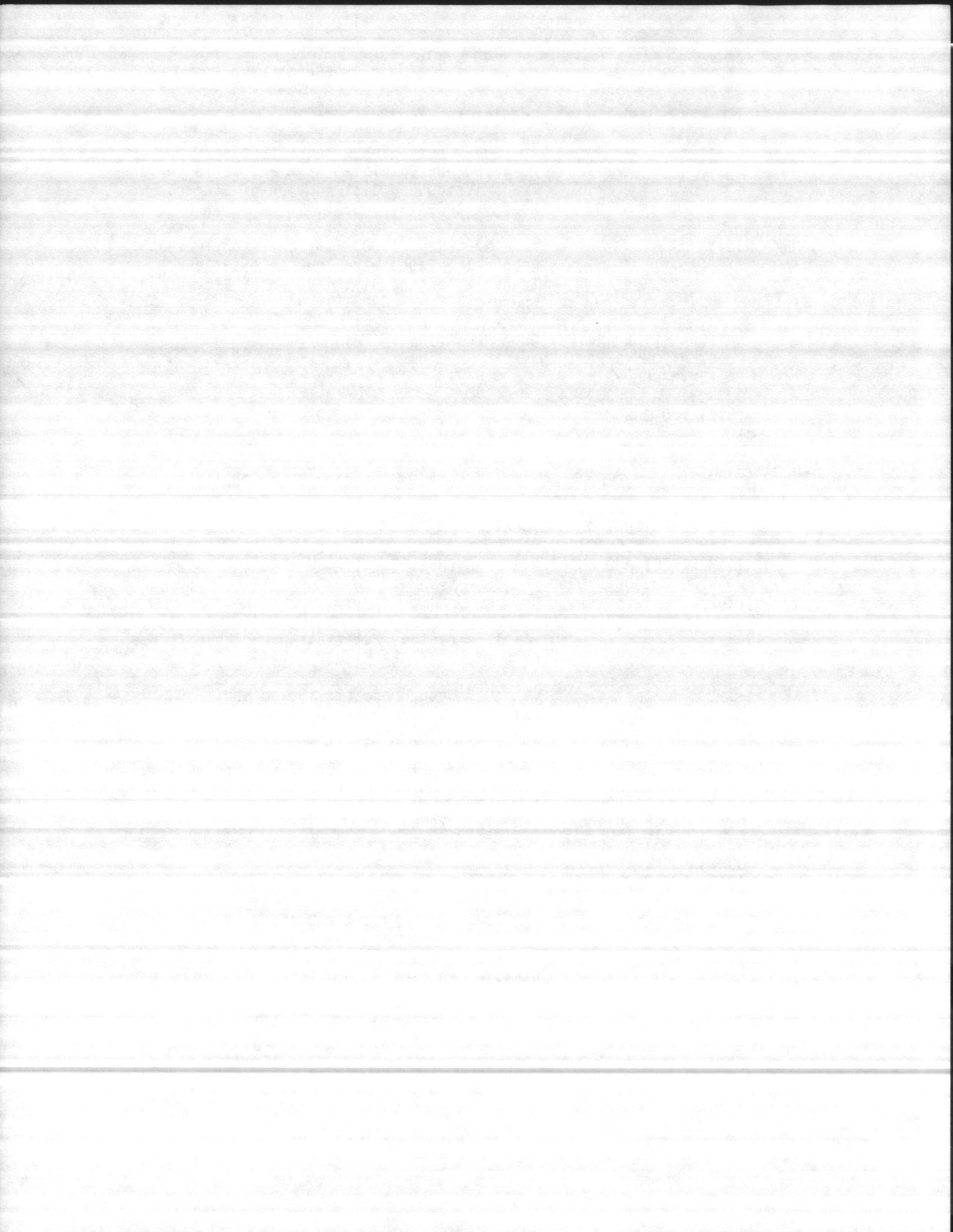
\-UL 6-\                    1981 Rigid Metallic Conduit

\-UL 83-\                    1980 (Rev. 1983) Thermoplastic-Insulated  
Wires & Cables

\-UL 510-\                    1982 Insulating Tape

1.3 GENERAL REQUIREMENTS

Section \=16011=\, "Electrical General Requirements, applies to this  
section with additions and modifications specified herein.



1.3.1 [Underground Service

Underground service into buildings shall terminate at a point 5 feet outside the building and projections thereof, except that service conductors shall be continuous to the interior terminating point indicated. Connections of the underground service to the service switch, panelboard or load center are included in Section \=16402=\, "Interior Wiring Systems." Ends of the underground conduit shall be protected by threaded metal caps until connections are made. Underground service from 5 feet outside the building to the underground terminal pole shall be provided under this section and shall have materials and installation as specified in Section \=16301=\, "Underground Electrical Service."]

1.3.2 [Overhead Service

Overhead service conductors into buildings shall terminate at the service entrance fittings or weatherhead outside the building. The installation and connection of service entrance equipment to the overhead service conductor is included in Section \=16402=\, "Interior Wiring Systems." The nearby support bracket for the overhead wires shall be not less than [\_\_\_\_\_] feet above the finished grade at the building.]

1.3.3 Electrical Characteristics

Electrical characteristics for this project shall be [\_\_\_\_\_] kV primary, [single] [three] phase, [three] [four] wire, [\_\_\_\_\_] hertz, [wye] [delta] connected and [\_\_\_\_\_] volts secondary, [single] [three] phase, [three] [four] wire, [wye] [delta] connected. Final connections to the power distribution system at the existing [substation] [manhole] [\_\_\_\_\_] shall be made by the [Contractor as directed by the Contracting Officer] [Government].

1.3.4 Connections to Existing Electrical Systems

Notify the Contracting Officer in writing at least [\_\_\_\_\_] [15] days prior to the date the connections are required; approval shall be received before any service is interrupted. Furnish all material required to make connections into the existing systems, and perform all excavating, backfilling, and other incidental labor as required.

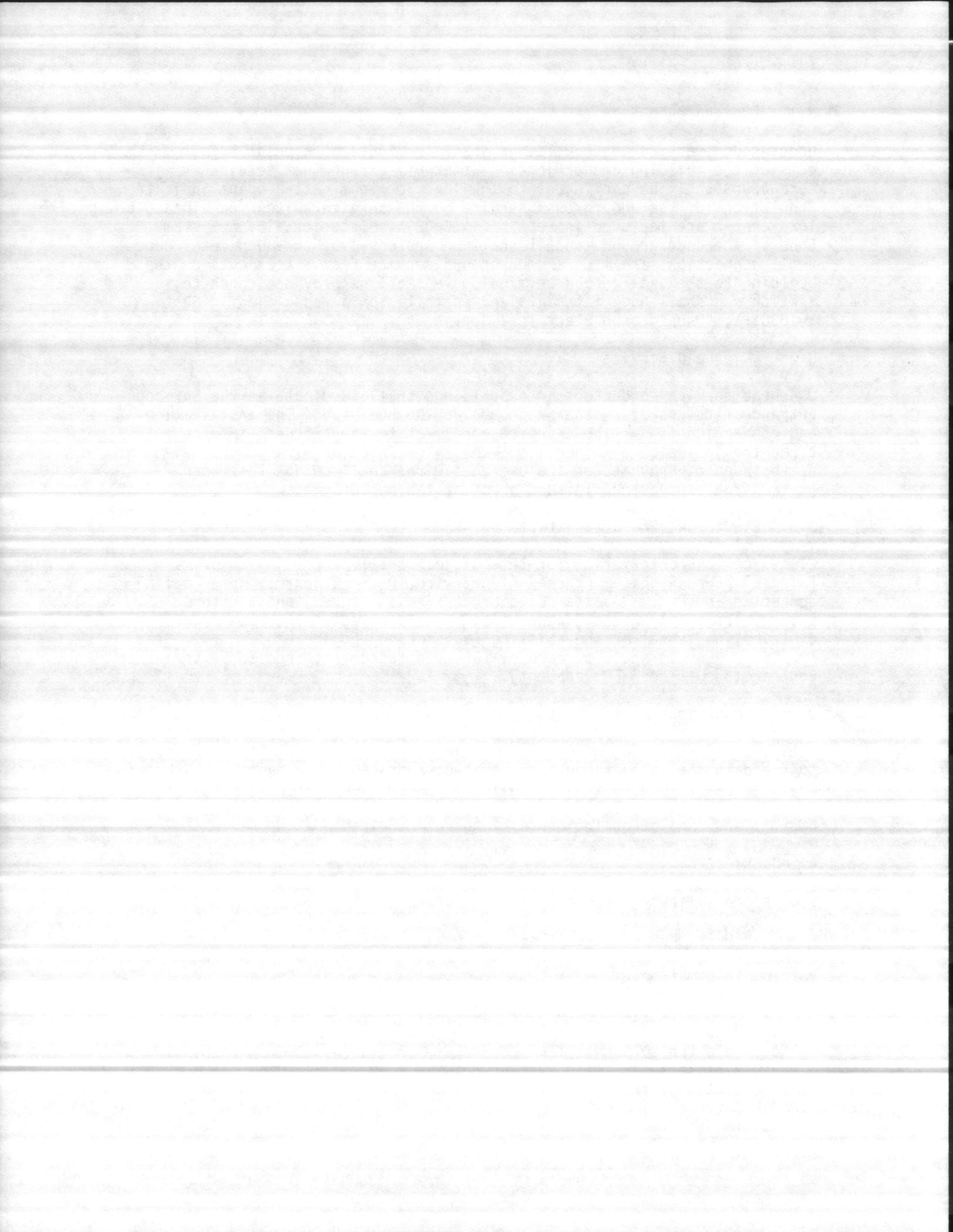
1.4 SUBMITTALS

Submit the following information for approval:

1.4.1 \\*SD-17, Manufacturer's Catalog Data

Catalog Information:

- a. Conductor (list each size and type)
- b. Insulator (list each size and type)
- c. Pole top switch
- d. Reclosers
- e. Sectionalizers
- f. Cutouts
- g. Transformers



- h. Instrument transformers (metering, P.T. & C.T.)
- i. Meter test block
- j. Meter
- k. Tapes\*\

1.4.2 \\*SD-31, Detail Drawings

Shop Drawings:

- a. Pole top switch
- b. Sectionalizers\*\

1.4.3 \\*SD-33, Fabrication/Erection/Installation Drawings

A set of Manufacturer's erection drawings and information will be supplied by the Contractor, for the use of the inspector on job site.\*\

1.4.4 \\*SD-70, Test Reports

Manufacturer's Certification:

- a. Transformer tests: Certify that routine tests per \-NEMA TR1-\ have been made on each transformer.
- b. Aluminum/copper splices, connectors, lugs, and fittings\*\

1.4.5 \\*SD-71, Inspection Reports

Pressure-Treated Wood Poles: The Contractor shall be responsible for the quality of treated wood poles. Each pole shall be permanently marked or branded, by the producer, in accordance with \-AWPA M6-\, and \-REA 50-17-\. The Contractor shall provide the Contracting Officer's Representative (COR) with the inspection report of an independent inspection agency, approved by the Contracting Officer, that offered products comply with applicable AWPA and REA Standards. The REA approved Quality Mark "WQC" on each pole will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.\*\

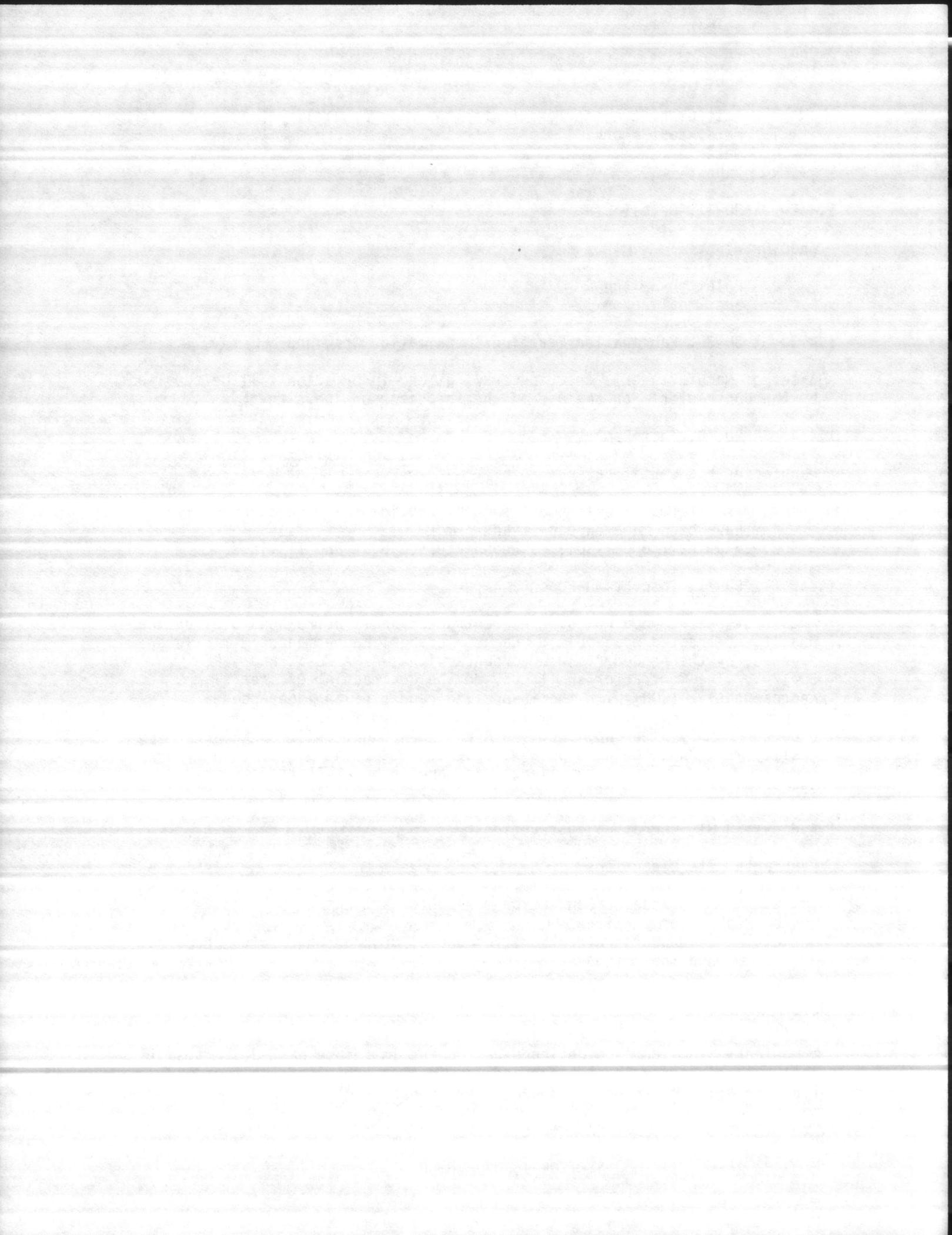
1.4.6 \\*SD-81, Operating Instructions

Manufacturer's Directions:

- a. Aluminum/copper connection make-up directions
- b. Cable terminations
- c. Manufacturer's directions for use of ground megger with proposed method indicated\*\

1.4.7 \\*SD-91, Records

Certification of Competency: Submit cable splicer's certificate of competency. Splicer's experience during the immediate past 3 years shall include performance in splicing and terminating cables of the type and classification being provided under this contract.\*\



PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials specified herein or shown on the contract drawings which are identical to materials listed in \-REA 43-5-\ shall be considered as conforming to all requirements.

2.2 POLES

Wood poles machine trimmed by turning, [Douglas Fir] [Lodgepole Pine] [Southern Yellow Pine] [\_\_\_\_\_] conforming to \-ANSI 05.1-\ and \-REA 50-17-\ . Poles must be gained, bored and roofed before treatment. Poles shall be treated with [creosote], [pentachlorophenol], [ammoniacal copper arsenate (ACA)], [chromated copper arsenate (CCA), except that Douglas fir and western larch poles shall not be treated with CCA] in accordance with \-AWPA C1-\ and \-AWPA C4-\ as referenced in \-REA 50-17-\ . \\*SD-71, The quality of each pole shall be assured with the "WQC" (Wood Quality Control) Brand on each piece, or by an approved inspection agency report.\*\

2.3 WOOD CROSSARMS

Wood crossarms conforming to \-REA 44-3-\ . Crossarms shall be pressure treated with [pentachlorophenol] [Chromated Copper Arsenate (CCA)] [Ammoniacal Copper Arsenite (ACA)]. Treatment shall conform to \-AWPA C25-\ .

2.3.1 Crossarm Braces

[Flat steel] [steel angle] for [28-inch span with 8-foot crossarms] [60-inch span with [10-foot] [8 foot] cross arm].

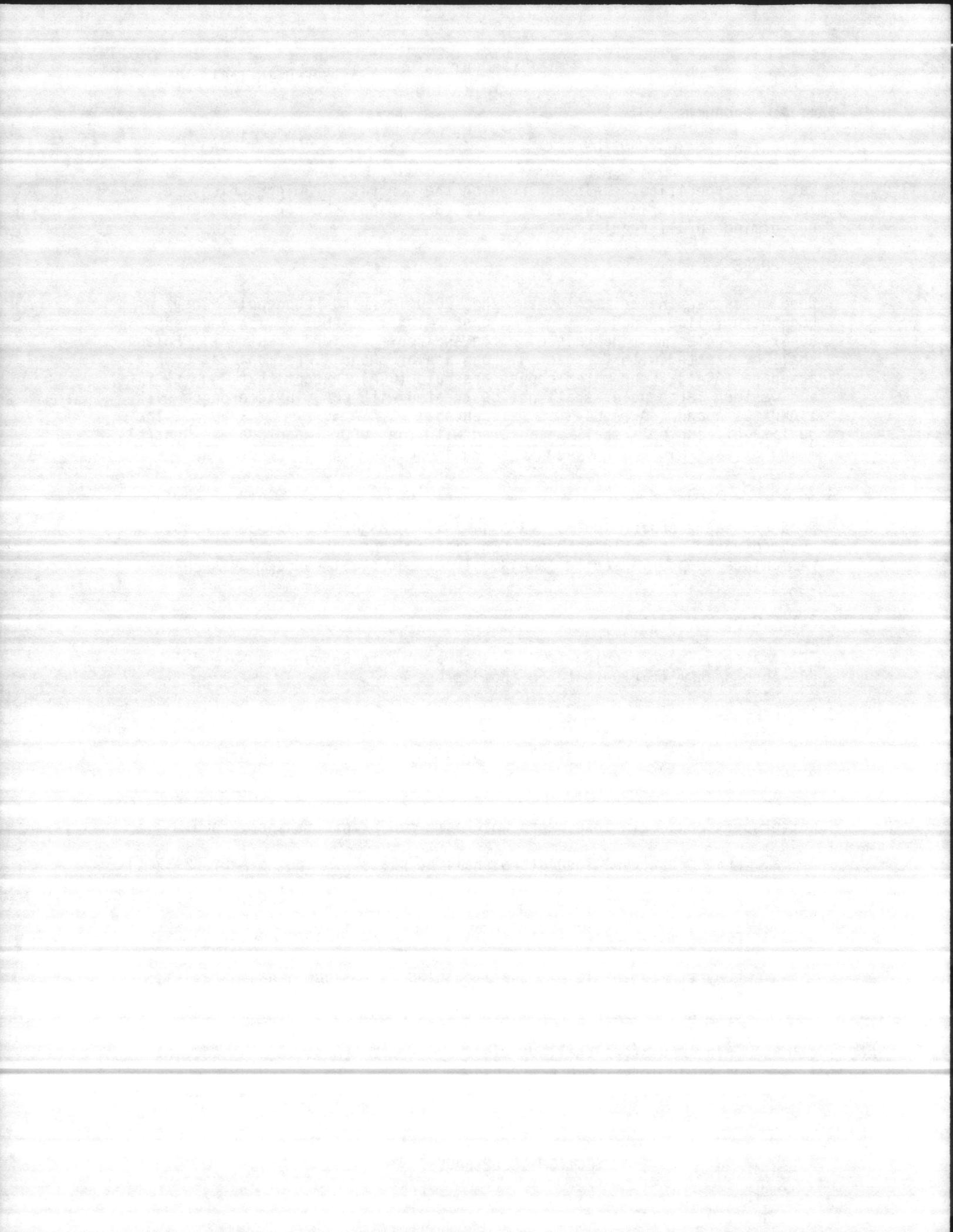
2.4 HARDWARE

Pole line hardware shall be hot dip galvanized conforming to \-ASTM A153-\ .

2.5 INSULATORS

Wet-process porcelain insulators which are radio interference freed.

- a. [Line post type insulators shall be class \_\_\_\_\_ per \-ANSI C29.7-\]
- b. [Suspension insulators shall be class \_\_\_\_\_ per \-ANSI C29.2-\]
- c. [Spool insulators shall be class \_\_\_\_\_ per \-ANSI C29.3-\]
- d. [Guy strain insulators shall be class \_\_\_\_\_ per \-ANSI C29.4-\]  
[except they shall be fiberglass type when used with underground terminal or when other interference problems exist]
- e. [Pin insulators shall be class \_\_\_\_\_ per \-ANSI C29.5-\ and shall be radio interference freed.]



## 2.6 CONDUCTORS

Overhead conductors of bare [copper] [copper clad steel] [aluminum] [aluminum alloy] [aluminum conductor steel reinforced (ACSR)] of the sizes and types indicated.

### 2.6.1 Solid Copper

Solid copper conductors, hard-drawn, medium-hard-drawn, and soft drawn shall conform to \-ASTM B1-\, \-ASTM B2-\, and \-ASTM B3-\ respectively. Stranded conductors shall conform to \-ASTM B8-\.

### 2.6.2 Copper Clad

Copper-clad steel conductors shall conform to \-ASTM B228-\.

### 2.6.3 Aluminum Conductor

Aluminum conductors shall conform to \-ASTM B231-\.

#### 2.6.3.1 Aluminum Alloy Conductors

Aluminum alloy conductors shall conform to \-ASTM B397-\ or \-ASTM B399-\.

#### 2.6.3.2 Steel Reinforced Conductors

Aluminum conductors, steel reinforced, shall conform to \-ASTM B232-\.

### 2.6.4 Secondary-Service Conductors

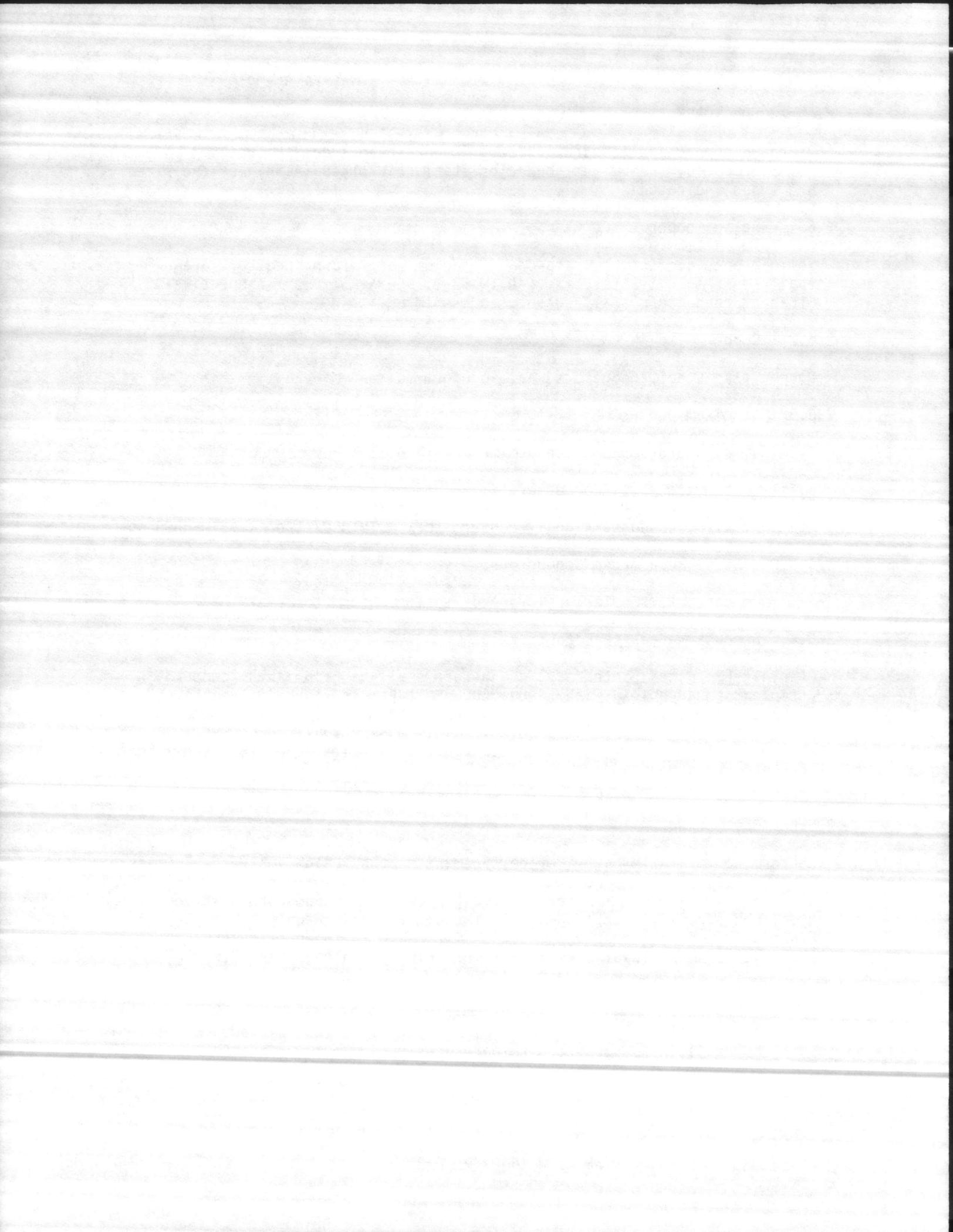
[Aerial] [Service] [Secondary] conductors shall be [aluminum] [copper], [triplex] [quadruplex] with [300] [600] volt [cross-linked polyethylene] [neoprene] insulation on the phase wires. The neutral shall be bare [ACSR] [aluminum alloy] [copper] messenger. Minimum size shall be No. 2 AWG stranded unless otherwise indicated. [Aerial service conductors shall be [copper] [stranded aluminum], [cross-linked polyethylene] [neoprene] covered weatherproof. Minimum size will be No. [4] [6] AWG.

### 2.6.5 Guy Strand

Conforming to \-ASTM A475-\ Grade [Soemans-Marton] [High - Strength] Class A or B, galvanized Strand Steel Cable. [Guy strand shall be \_\_\_\_\_ inch in diameter with a minimum breaking strength of \_\_\_\_\_ pounds] [Guy strand type, and size will be [automatic] [factory-formed] [3-bolt clamp] [indicated] guy terminations designed for use with the particular strand and developing at least the ultimate breaking strength of the strand.

## 2.7 GUY GUARDS

Guy guards shall be [galvanized steel] [plastic, yellow colored,] 8 feet long and resistant at sub-zero temperatures.



2.7.1 Guy Attachment

Thimble eye guy attachment with a lift plate on the down side.

2.8 ANCHORS AND ANCHOR RODS

Anchors and anchor rods shall be, [plate] [expanding] [concrete] [screw] anchors presenting the holding area indicated on the drawings as a minimum. Anchor rods shall be [twin] thimble-eye, [3/4] [1]-inch diameter by 8 feet long and must be hot dip galvanized. As described below.

2.8.1 Screw Anchors

Screw type swamp anchors having a manufacturer's rating at least equal to the rating indicated and extra heavy pipe rods conforming to \-ASTM A120-\, Schedule 80, and couplings conforming to \-ANSI B16.11-\, fitting class 6000.

2.8.2 Plate Anchors

Plate type anchors shall have an area of at least \_\_\_\_\_ square inches, and shall be rated by the manufacturer for pounds or more in "loose-dry" soil.

2.9 GROUND RODS

Shall be of [copper-encased steel] [solid copper] [copper clad steel] [sectional type] ground rods at least 3/4 inch in diameter and 10 feet. Die-stamp each near the top with the name or trademark of the manufacturer and the length of the rod in feet. The rods shall have a hard, clean, smooth, continuous, surface throughout the length of the rod.

2.9.1 Ground Wire

Soft drawn copper wire ground conductors shall be no smaller than No. 6 AWG. Ground wire protectors may be either PVC or half round wood molding.

2.10 SURGE ARRESTERS

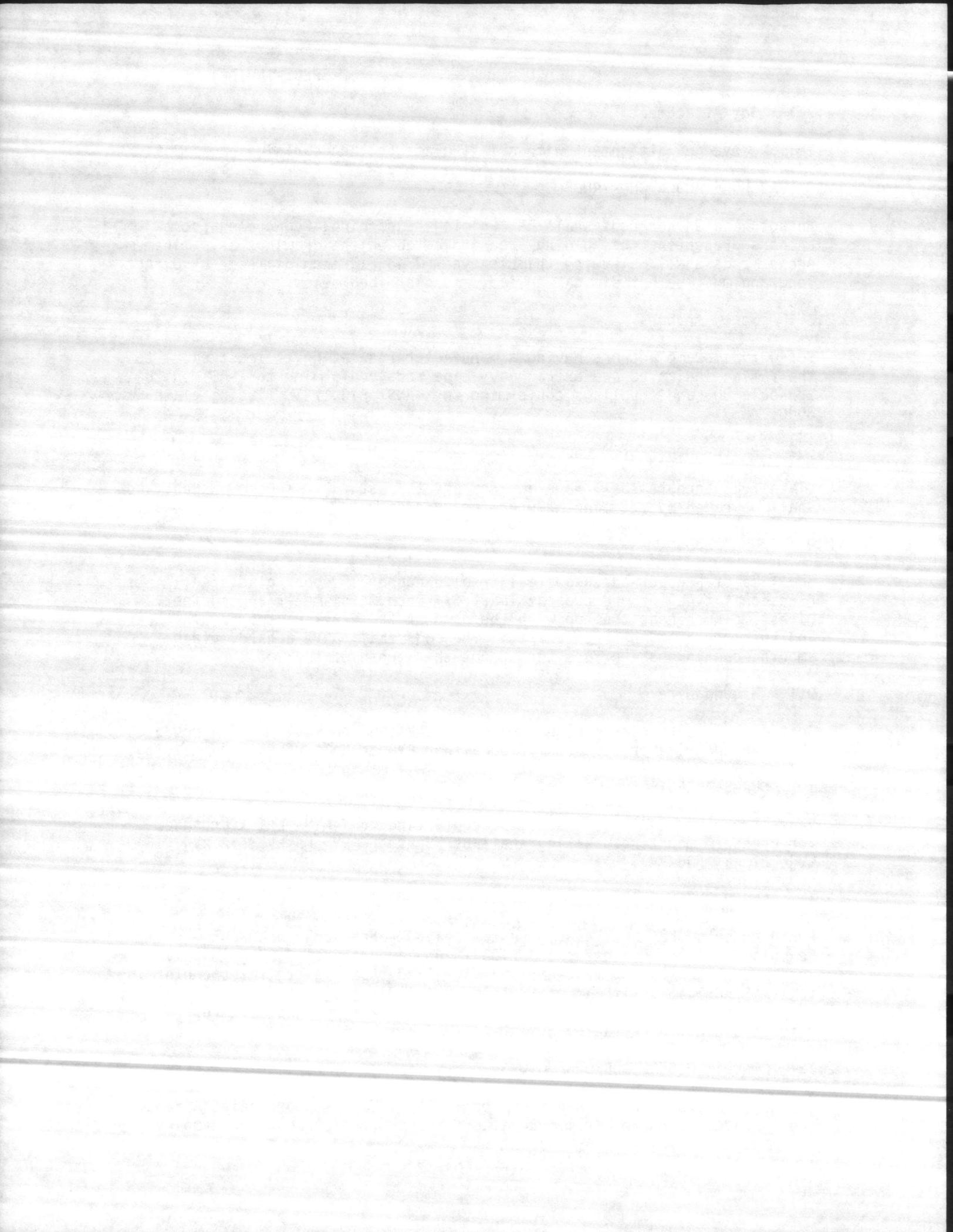
Valve type surge arrestors shall be conforming to \-NEMA LA1-\ arranged for crossarm mounting. Rating shall be [3 kV] [6 kV] [9 kV] [12 kV] [15 kV] [27 kV] [36 kV].

2.11 FUSED CUTOUTS

Fused cutouts shall be [heavy] [extra heavy] [enclosed] [drop-out] [expulsion] fused cutouts rated [100] [200] amperes at [7.8] [14.4] kV ungrounded, conforming to \-ANSI C37.42-\ and type [k] [t] fuses conforming to \-ANSI C37.43-\ with ampere ratings [as indicated] [equal to 150 percent of the transformer full load rating.] Open link type fuses and fuse cutouts are not acceptable.

2.12 CONDUIT RISERS AND CONDUCTORS

Rigid galvanized steel conduit conforming to \-UL 6-\ [to a point 8 feet above grade, with wood or impregnated fiber protection above that point.]



[to a point 8 feet above grade with PVC conduit conforming to \-NEMA TC2-\, Type EPC-80-PVC and \-NFPA 70-\ of no less than 2-1/2-inch diameter, with fittings conforming to \-NEMA TC3-\ for the entire portion of the riser more than 8 feet above grade.]

2.12.1 Secondary Riser

600 volt [secondary] [metering] riser conductors shall be copper, [THW] [THWN] [\_\_\_\_\_] conforming to \-UL 83-\.

2.12.2 Primary Riser

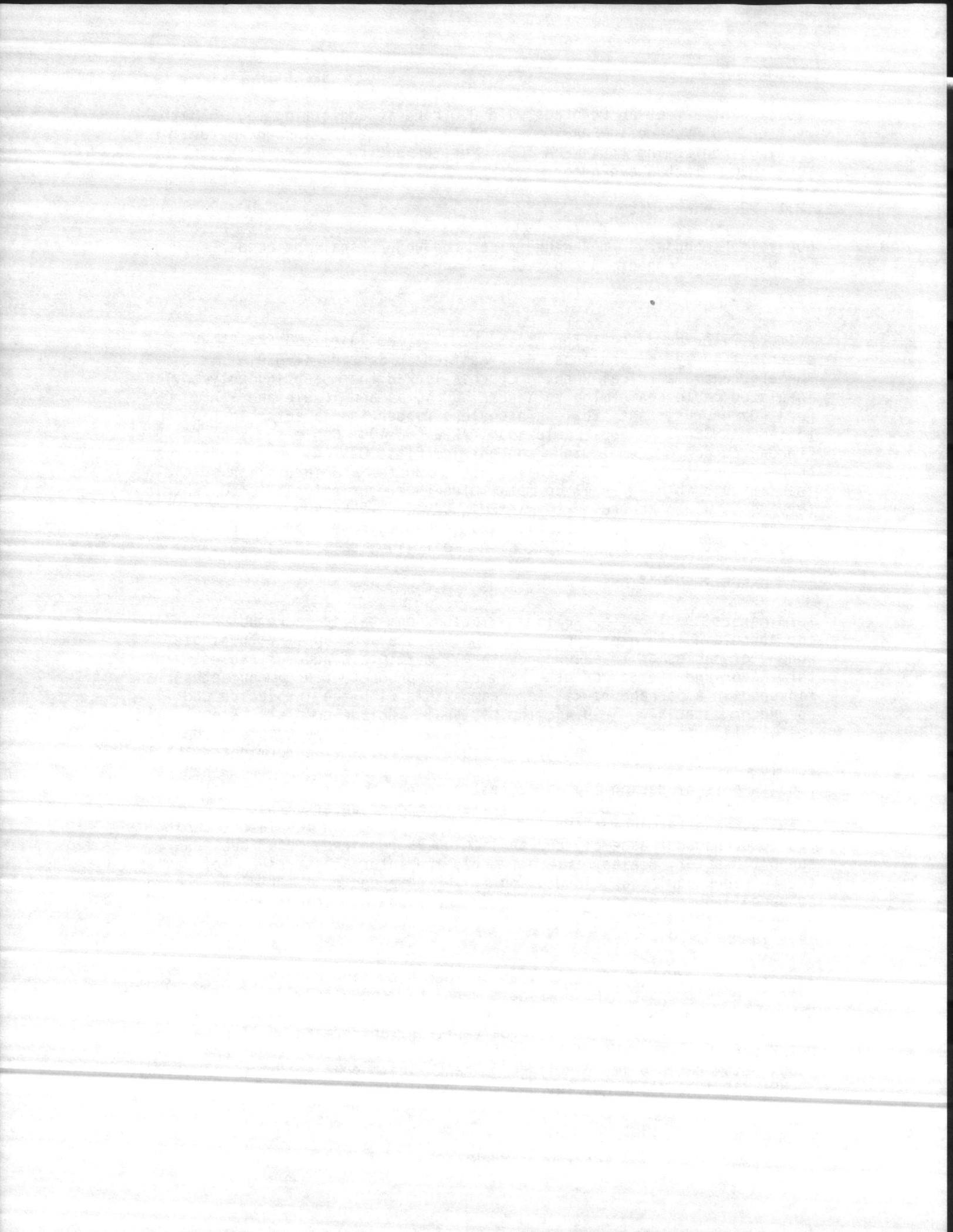
Primary riser conductors for [34.5] [13.2] [12.47] [11.5] [4.16] kV distribution system shall be [as specified in Section \=16301=\, "Underground Electrical Work."] [[cross linked thermosetting polyethylene insulated cable conforming to \-NEMA WC7-\, as applicable and \-AEIC CS5-\] [or] [Ozone resistant ethylene propylene rubber insulated cable conforming to \-NEMA WC8-\, as applicable and \-AEIC CS6-\]. Cable shall be [single] [three] conductor, employing [concentric, Class B] [compact round] stranded copper conductor[s]. Cable shall have conductor and insulation shielding. Insulation shielding shall be metal wire type consisting of a concentric serving of wires according to [\-NEMA WC7-\] [\-NEMA WC8-\]. Cable shall be rated \_\_\_\_\_ kV with insulation and jacket thickness of \_\_\_\_\_ and \_\_\_\_\_ mils respectively. Cable shall have a polyvinyl chloride jacket.] \_\_\_\_\_

2.13 CABLE TERMINATIONS

Terminators shall be for solid insulation nonmetallic jacketed cables of the porcelain insulator type. Terminators shall be applied to single conductor cables or to each conductor of multiple conductor cables. The terminator and all components shall be the product of one manufacturer and finished in a package or kit form compatible with the insulation and conductor material. \\*SD-44, The kit shall include complete assembly and installation instructions. Contractor shall supply one complete copy of all manufacturer's instructions and information.\*\ The terminator shall comply with all requirements of \-IEEE 48-\ Class 1 except that the requirements of design tightness test need not be met. However, the terminator shall not exclude any filler compound under either test or service. The terminator shall consist of a porcelain insulator, cable connector-hoodnut assembly and aerial lug as required, metal body and support bracket, sealed cable entrance, and internal stress relief device for shielded cable, and insulating filler compound or material.] Provide as specified in Section \=16301=\, "Underground Electrical Work."

2.14 TRANSFORMERS (POLE TYPE)

\-ANSI C57.12.20-\ self-cooled, 65 degrees C continuous temperature rise, mineral oil-immersed type. Transformers shall be rated \_\_\_\_\_ kVA, \_\_\_\_\_ kV BIL, \_\_\_\_\_ kV class for operation on a \_\_\_\_\_ kV [delta] [wye] system. Minimum impedance shall be \_\_\_\_\_ percent. [Transformers shall have four 2-1/2 percent rated kVA high voltage taps, [\_\_\_\_\_] [two] above and [\_\_\_\_\_] [two] below rated primary voltage.] Tank finish coat shall be light gray, \-ANSI Z55.1-\, color No. 70.



2.15 POLE TOP SWITCH

Pole top switch [sectionalizer, and recloser] shall be [vertical] [horizontal] type switches, three-pole gang operated, with a padlock arrangement for locking in both open and closed positions. Steel parts shall be hot dip galvanized. The operating rods shall be isolated from the switch by an insulating link or section located as close to the switch as possible. [The switch shall be designed for double crossarm mounting and for breaking a 3/4-inch coating of ice before the contacts are opened or closed.] The switch shall comply with \-ANSI C37.32-\ for the voltage and current requirements indicated. Sectionalizer and Recloser, shall comply with \-NEMA SG13-\.

2.16 METERING EQUIPMENT

Pole mounted metering equipment shall include current transformers, potential transformers, kwh meter, [meter test switch block,] metering enclosure, wire, conduit and fittings.

2.16.1 Potential Transformers

Potential transformers shall be rated for outdoor service fitted for crossarm mounting and secondary connection box for conduit connection. Voltage rating shall be [2.4] [4.16] [7.2] [12.0] [12.47] [\_\_\_\_\_] kV to 120 volts a.c. 60 Hz. Transformers shall conform to the requirements of \-ANSI C12.11-\, BIL [45] [60] [75] [95] kV and accuracy Class 0.3 (min.) of [75 VA.] [burden Y].

2.16.2 Current Transformers

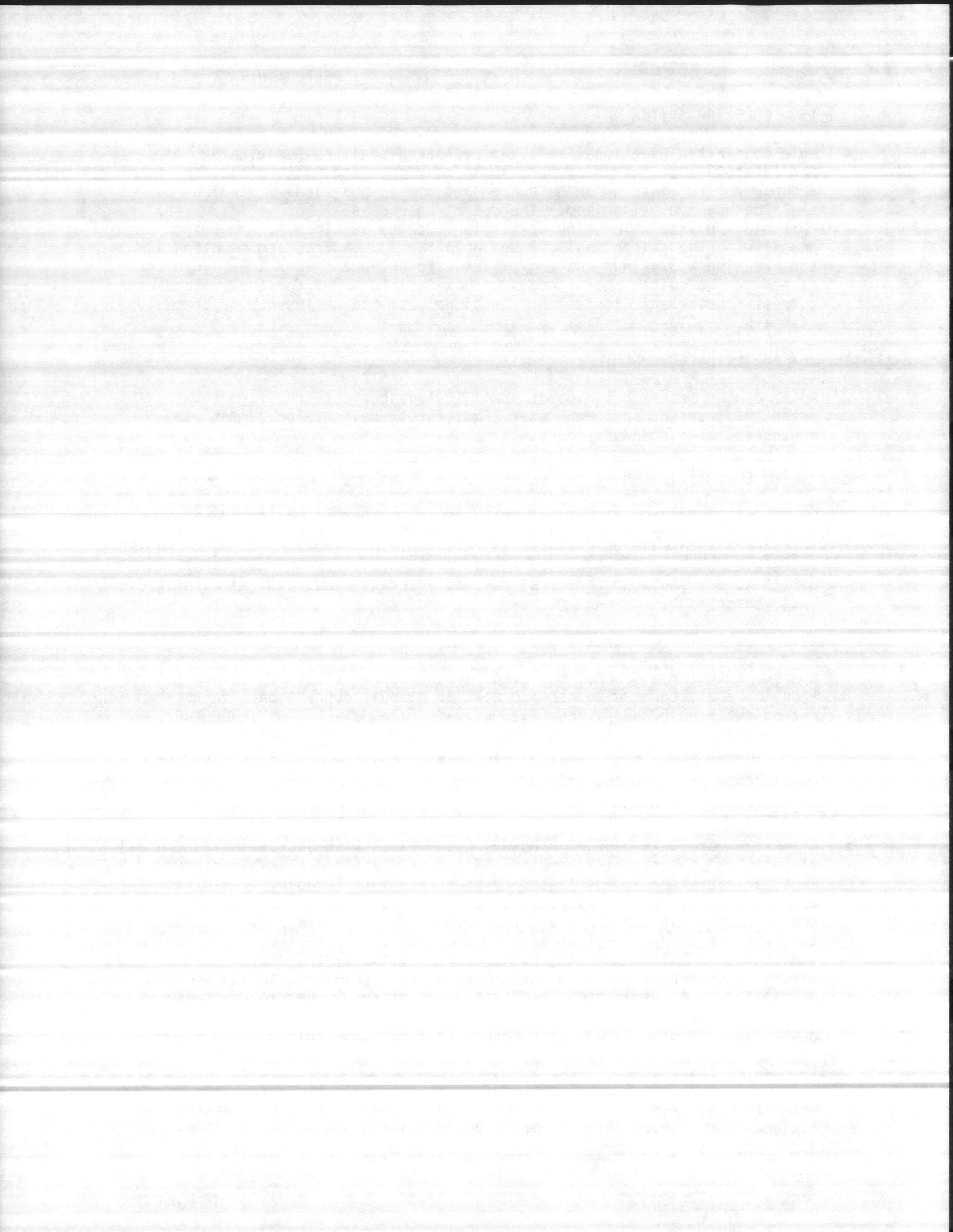
Current transformers shall be rated for outdoor service with crossarm mounting and secondary connection box for conduit connection. Voltage rating shall be [2.4] [4.16] [7.2] [12.47] [12.0] [\_\_\_\_\_] kV. Current rating shall be \_\_\_\_\_ to 5 amperes. Transformers shall conform to the requirements of \-ANSI C12.11-\, BIL [4.5] [60] [75] [95] kV and accuracy Class 0.3 at [B2.0] [50 VA].

2.16.3 Kilowatts Meter

Kilowatts meter, [socket] ["A base"] type, [two] [two and one half] [three] element, 120 volts, 2-1/2 amperes, 60 Hz with a five dial kWh register. Register ratio shall be selected to provide a meter reading multiplier of even hundreds after applying the product of the indicated current transformer ratio and the indicated potential transformer ratio. Indicate the meter reading multiplier on the meter face. Meters shall comply with \-ANSI C12.10-\ for [5A] [5S] [6A] [6S]. Provide block interval demand element type for [15] [30] minute interval with [dial and sweep hand pointer operated by a pusher] [provide cumulative register]. Provide matching meter socket with [manual] [automatic] current short-circuiting device. Meter shall have provisions for future pulse initiation.

2.17 METER TEST BLOCK

Meter test block shall consist of a group of open knife type switches designed for the isolation of metering devices at the meter location by



opening each circuit individually. Current switches shall short circuit the current supply before opening the meter circuit. Switch handles of potential switches shall be black. Switch handles of current switches shall be red.

### 2.17.1 Metering Enclosure

Metering enclosure shall be of galvanized steel, weatherproof construction with pole mounting bracket, and 3/4-inch exterior plywood, full size backboard and hinged door arranged for padlocking in closed position. Internal space shall be adequate to house the equipment and wiring but not smaller than 20 inches by 30 inches by 11 inches deep. Metal shall be painted manufacturer's standard finish.

### 2.18 ELECTRICAL TAPES

Tapes shall be UL listed for electrical insulation and other purposes in wire and cable splices. Terminations, repairs and miscellaneous purposes. Electrical tapes shall comply with \-UL 510-\.

### 2.19 CALKING COMPOUND

Compound for the sealing of conduit risers shall be of a putty like consistency workable with the hands at temperatures as low as 35 degrees F, shall not slump at a temperature of 300 degrees F, and shall not harden materially when exposed to air. The compound shall readily calk or adhere to clean surfaces of the materials with which it is designed to be used. The compound shall have no injurious effects upon the hands of workmen or upon the materials.

## PART 3 EXECUTION

### 3.1 INSTALLATION

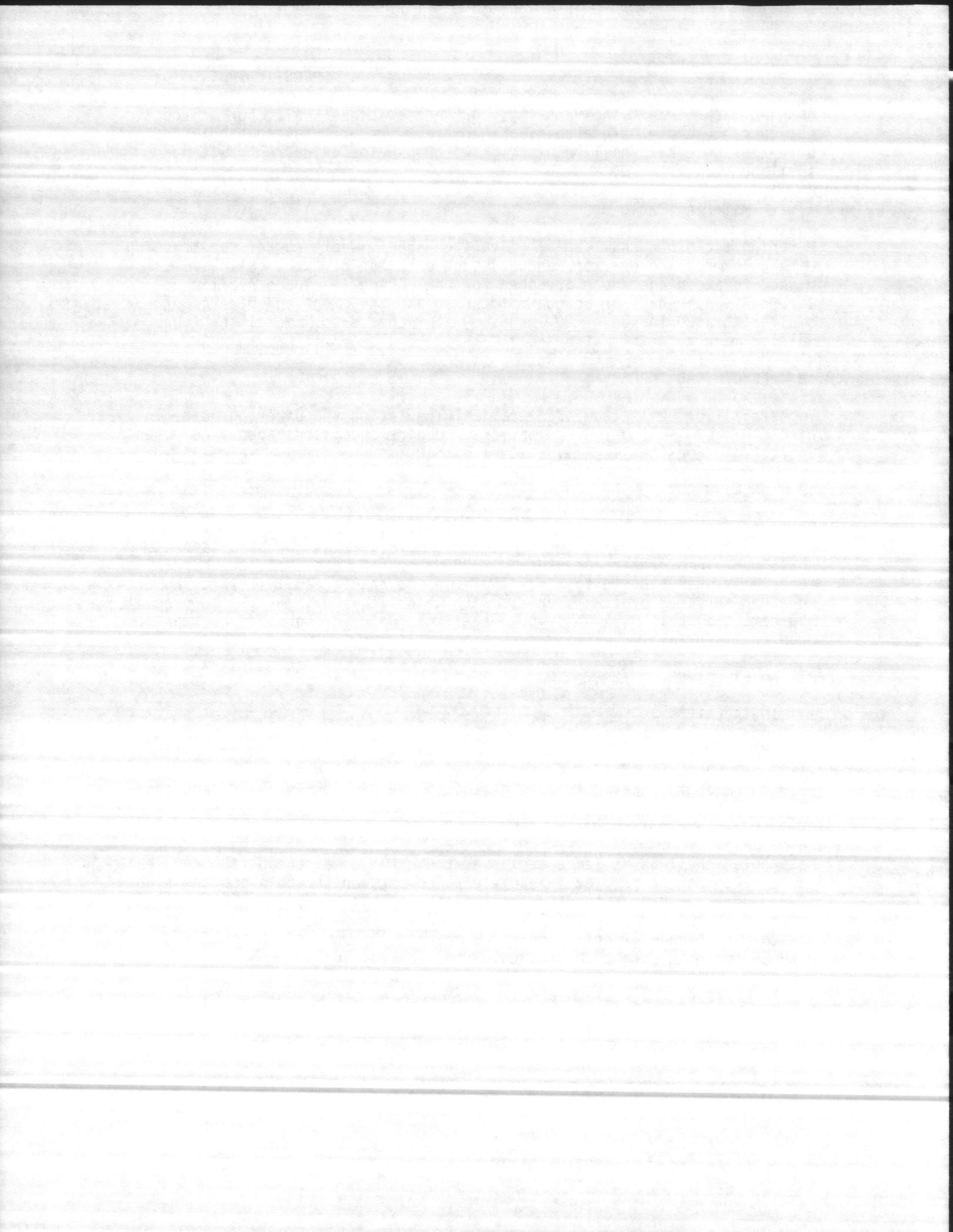
Provide overhead pole line installation conforming to the requirements of [\-SSS [\_\_\_]-\] [\-ANSI C2-\] for grade B construction of overhead lines in [light] [medium] [heavy] loading districts and NEC for overhead services.

#### 3.1.1 Pole Setting

Pole holes shall be at least as large at the top as at the bottom and shall be large enough to provide 4 inch clearance between the pole and the side of the hole. [Poles set in tropical areas, of the Pacific Ocean, that are infested by the Formosan termite, Coptotermes formosanus Shirake, shall have a 6-inch band of soil around and down to the base of the pole treated with 2-3 gallons of a 2 percent chlordane termiticide solution.]

##### 3.1.1.1 Setting Depth of Pole

Pole setting depths shall be as follows:



SPECS-IN-TACT

Length of Pole (feet)	Setting in Soil (feet)	Setting in Solid Rock (feet)
-----	-----	-----
20	4.0	3.0
25	5.0	3.5
30	5.5	3.5
35	6.0	4.0
40	6.0	4.0
45	6.5	4.5
50	7.0	4.5
55	7.5	5.0
60	8.0	5.0

3.1.1.2 Setting in Soil, Sand, and Gravel

"Setting in Soil" depths shall apply where pole holes are in soil, sand, or gravel or any combination of these; where the soil layer over solid rock is more than 2 feet deep; where the hole in solid rock is not substantially vertical; or where the diameter of the hole at the surface of the rock exceeds twice the diameter of the pole at the same level. [At corners, dead ends and other points of extra strain, poles 40 feet or more long shall be set 6 inches deeper.]

3.1.1.3 Setting in Solid Rock

"Setting in Solid Rock" shall apply where poles are to be set in solid rock and where the hole is substantially vertical, approximately uniform in diameter and large enough to permit the use of tamping bars the full depth of the hole.

3.1.1.4 Setting With Soil Over Solid Rock

Where there is a layer of soil 2 feet or less in depth over solid rock, the depth of the hole shall be the depth of the soil in addition to the depth specified under "Setting in Solid Rock" provided, however, that such depth shall not exceed the depth specified under "Setting in Soil."

3.1.1.5 Setting on Sloping Ground

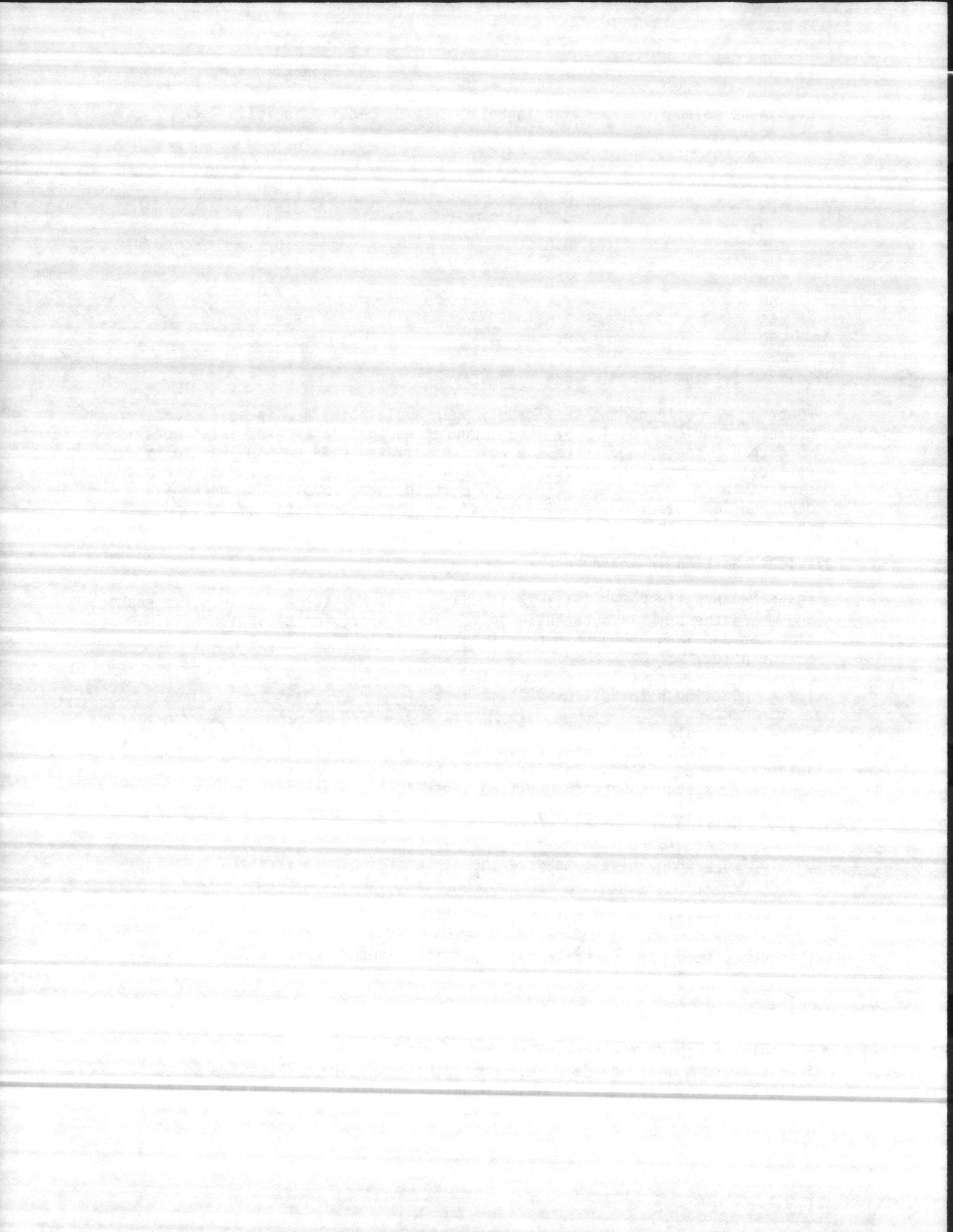
On sloping ground, always measure the depth of the hole from the low side of the hole.

3.1.1.6 Backfill

Thoroughly tamp pole backfill for the full depth of the hole and mound the excess fill around the pole.

3.1.1.7 Setting the Crossarms

Set poles so that alternate crossarm gains face in the opposite directions, except at terminals and dead ends where the gains of the last two poles shall be on the side facing the terminal or dead end. On unusually long spans, set the poles so that the crossarm comes on the side of the pole away from the long span. Where pole top pins are used, they shall be on



the opposite side of the pole from the gain, with the flat side against the pole.

#### 3.1.1.8 Alignment of Poles

Set poles in alignment and plumb except at corners, terminals, angles, junctions, or other points of strain, where they shall be set and raked against the strain, not less than 2 inches for each 10 feet of pole length above grade, nor more than 4 inches for each 10 feet of pole length after conductors are installed at the required tension.

#### 3.1.1.9 Pole Caps

Provide plastic pole caps with 1/4-inch sealing rings and four nailing tabs. Fill sealing area with either a bituminous, elastigum roof cement or an acceptable preservative paste to the level of the sealing ring to eliminate the possibility of condensation. Place on pole top and nail each tab down with a 1-1/4-inch nail.

#### 3.1.2 Anchors and Guys

Place anchors in line with the strain and as nearly as possible a distance from the pole equal to the vertical distance from the pole ground line to the point of guy attachment on the pole.

##### 3.1.2.1 Setting Anchors

Set anchors in place with the anchor rod aligned with, and pointing directly at, the guy attachment on the pole with the anchor rod projecting 6 to 9 inches out of the ground to prevent burial of the rod eye.

##### 3.1.2.2 Backfilling Near the Anchors

Backfill patent, plate, expanding, concrete, or cone type anchors [with tightly tamped coarse rock 2 feet immediately above the anchor and then] with tightly tamped earth filling the [remainder of the] hole.

##### 3.1.2.3 Screw Anchors

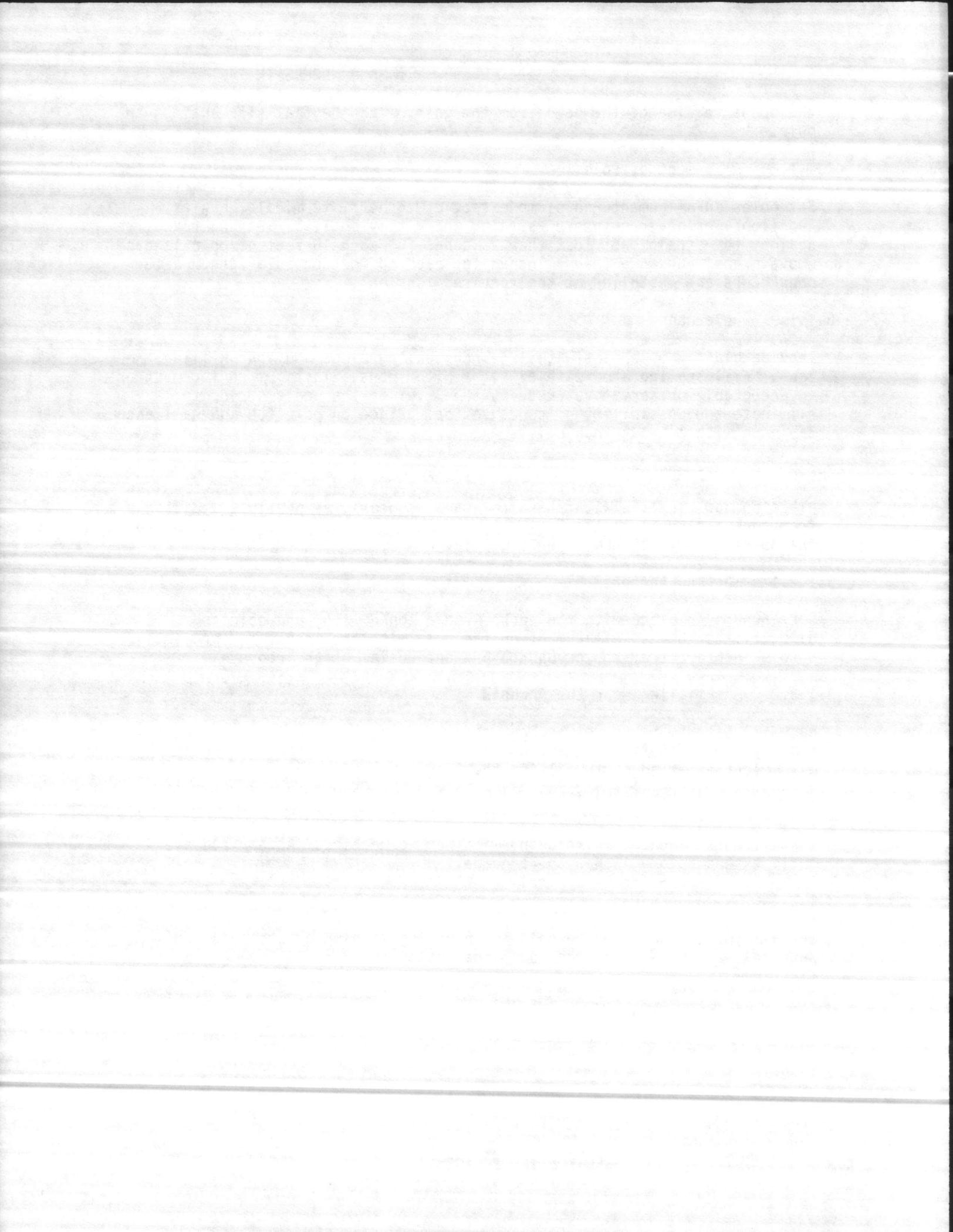
Install screw anchors by torquing with boring machine. Anchor rod eye shall extend 6 to 9 inches above grade.

##### 3.1.2.4 Swamp Anchors

Install swamp anchors by torquing with boring machine or wrenches, adding sections of pipe as required until the anchor helix is fully engaged in firm soil.

##### 3.1.2.5 Rock Anchors

Rock anchors shall not be used if there is any visible fracture in the stone.



### 3.1.2.6 Setting Guy Strands

Complete the anchor and guy installation, dead end to dead end, and tighten the guy before wire stringing and sagging is begun on that line section. [Provide strain insulators at a point on the guy strand 8 feet (minimum) from the ground and 6 feet (minimum) from the surface of the pole.] [Effectively ground and bond guys to the system neutral.]

### 3.1.3 Hardware

Install hardware with washer against the wood and with nuts and lock nuts applied wrench tight. Use locknuts on all threaded hardware connections. Locknuts should be M-F style and not the palnut style.

### 3.1.4 Grounding

+Provide grounding for pole lines conforming to [SSS [ ]]-] [ANSI C2-] except that each separate ground electrode shall have a resistance to the solid earth not exceeding 25 ohms.+ When work in addition to that indicated or specified, is directed in order to obtain the specified ground resistance the provisions of the contract covering "changes" shall apply.

#### 3.1.4.1 Ground Rod Connections

Make ground rod connections on pole lines by [thermit weld] [using a compression connector] for all ground wire or wire to rod connections.

#### 3.1.4.2 Thermit Welding

Make thermit welds strictly in accordance with the manufacturer's written recommendations. Welds which have puffed up or which show convex surfaces indicating improper cleaning, are not acceptable. No mechanical connectors are required at thermit weldments.

#### 3.1.4.3 Other Metal Parts

Ground noncurrent carrying metal parts of equipment or enclosures.

#### 3.1.4.4 Surge Arresters

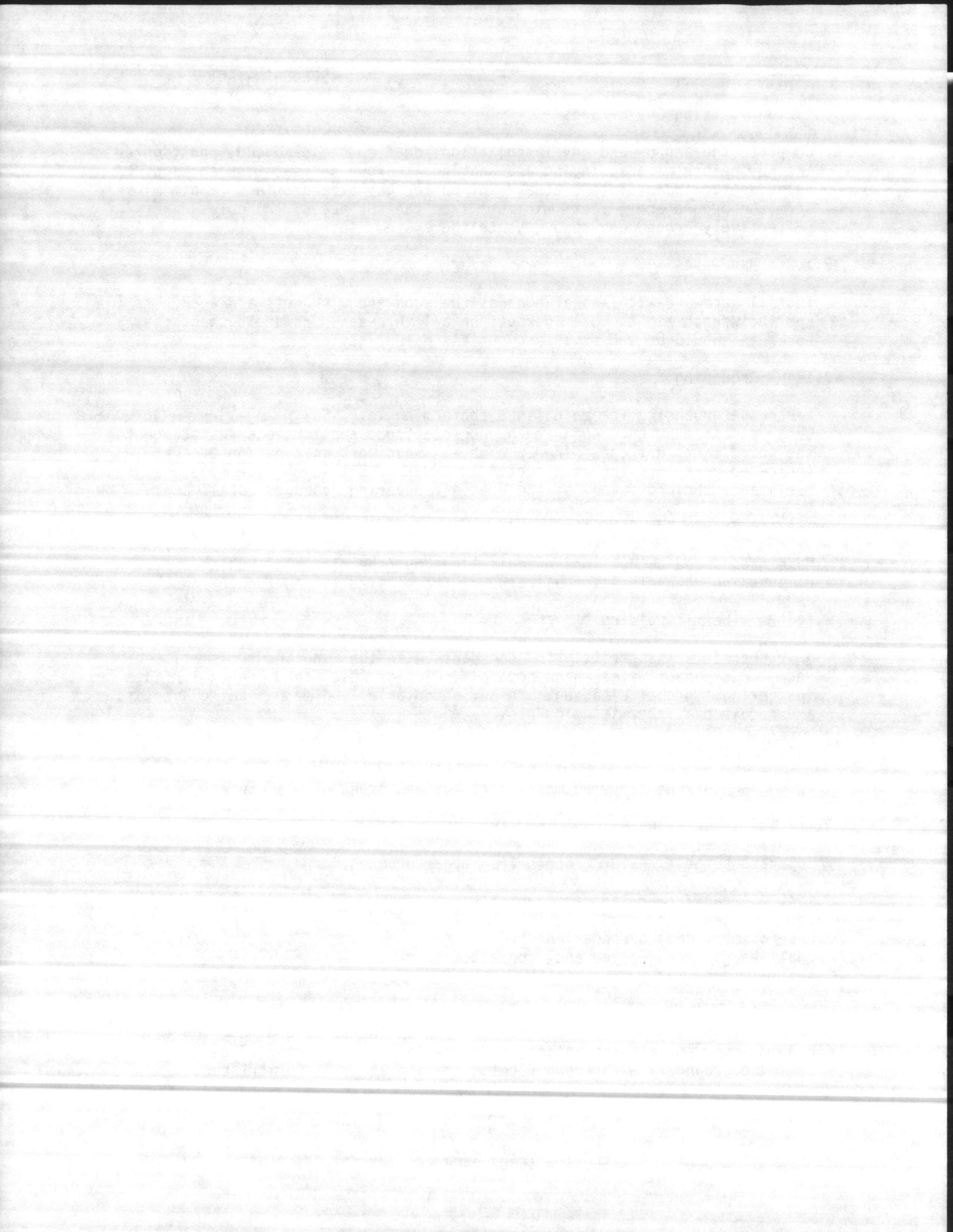
Separate surge arrester grounds from other grounds.

#### 3.1.4.5 Transformer Tank and Neutrals

The [primary and] secondary neutral[s] [and the tank of each transformer] shall be [interconnected and] connected to ground.

#### 3.1.4.6 Protective Molding

Protect grounding conductors which are run on the surface of wood poles by wood molding [or plastic molding of equal mechanical strength] extending from the ground line throughout communication and transformer spaces.



### 3.1.5 Conductors

Conductors shall be handled with all care necessary to prevent nicking, kinking, gouging, flattening, or otherwise deforming or weakening the conductor or impairing its conductivity. Remove all damaged sections of conductor and splice the conductor.

#### 3.1.5.1 Splices

Conductor splices, as installed, shall exceed the ultimate rated strength of the conductor and shall be of the type recommended by the conductor manufacturer. No splice shall be permitted within 10 feet of any support.

#### 3.1.5.2 Ties

Ties on pin insulators shall be tight against the conductor and insulator and ends shall be turned down flat against the conductor so that no wire ends project.

#### 3.1.5.3 Reinstalling Conductors

Existing conductors to be reinstalled or resagged shall be strung to "FINAL" sag table values for the particular conductor type and size involved.

#### 3.1.5.4 New Conductor Installation

String new conductors to "INITIAL" sag table values recommended by the manufacturer for the conductor type and size of conductor and ruling span indicated.

#### 3.1.5.5 Aluminum Protection

Protect [Aluminum] [ACSR] conductors by armor rod at pin insulators and by flat aluminum wire at attachments made of galvanized or coated iron or steel.

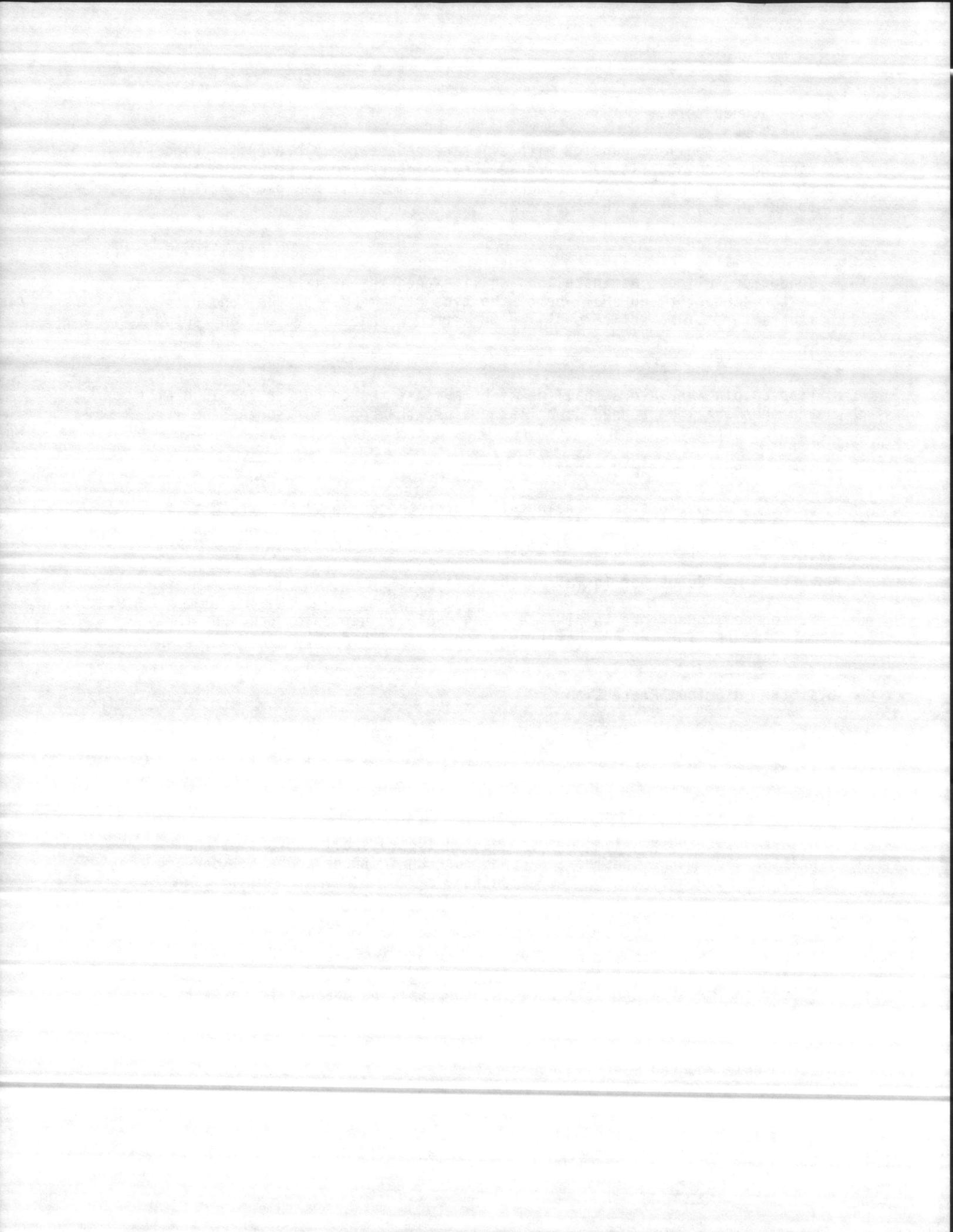
#### 3.1.5.6 Fittings

Dead end fittings[, clamp or compression type,] shall conform to the written recommendations of the conductor manufacturer and shall develop the full ultimate strength of the conductor.

#### 3.1.5.7 Aluminum Connections

\\*SD-44, Make aluminum connections to any other material using only splices, connectors, lugs, or fittings designed for that specific purpose. Submit the manufacturer's directions for applying these fittings for reference and one additional copy maintained at the job site for the use of the inspector.\*\

### 3.1.6 Pole Mounted Metering Equipment



3.1.6.1 Primary Meters

Install primary metering transformers [as indicated] [according to the manufacturer's drawings]. Make connections to the metering circuits within each transformer conduit connection box.

3.1.6.2 Installing Meter System

Metering enclosure shall house the kWh meter and the meter test block. Secure the enclosure to the pole at a height of 6 feet above grade to the center of the enclosure. Ground the enclosure.

- a. Connect the meter as indicated.
- b. Connect the meter test block between the meter and the metering transformers to isolate the meter for removal, test or adjustment.
- c. Phase sequence and color code of potential and current leads shall be identical. Mark wires which are connected to transformer terminals identified with polarity marks (dots) by a colored plastic tape around the wire at each end.
- d. No splices are permissible in metering circuits. Wire shall be trained at the sides and bottom of the enclosure back board and secured by plastic wraps.

3.1.7 Pole Top Switch Installation

\\*SD-33, Install pole top switch strictly according to the manufacturer's erection drawings and information.\*\

3.1.7.1 Operating Handle

Locate approximately 5 feet above ground on field side of the pole.

3.1.8 Risers

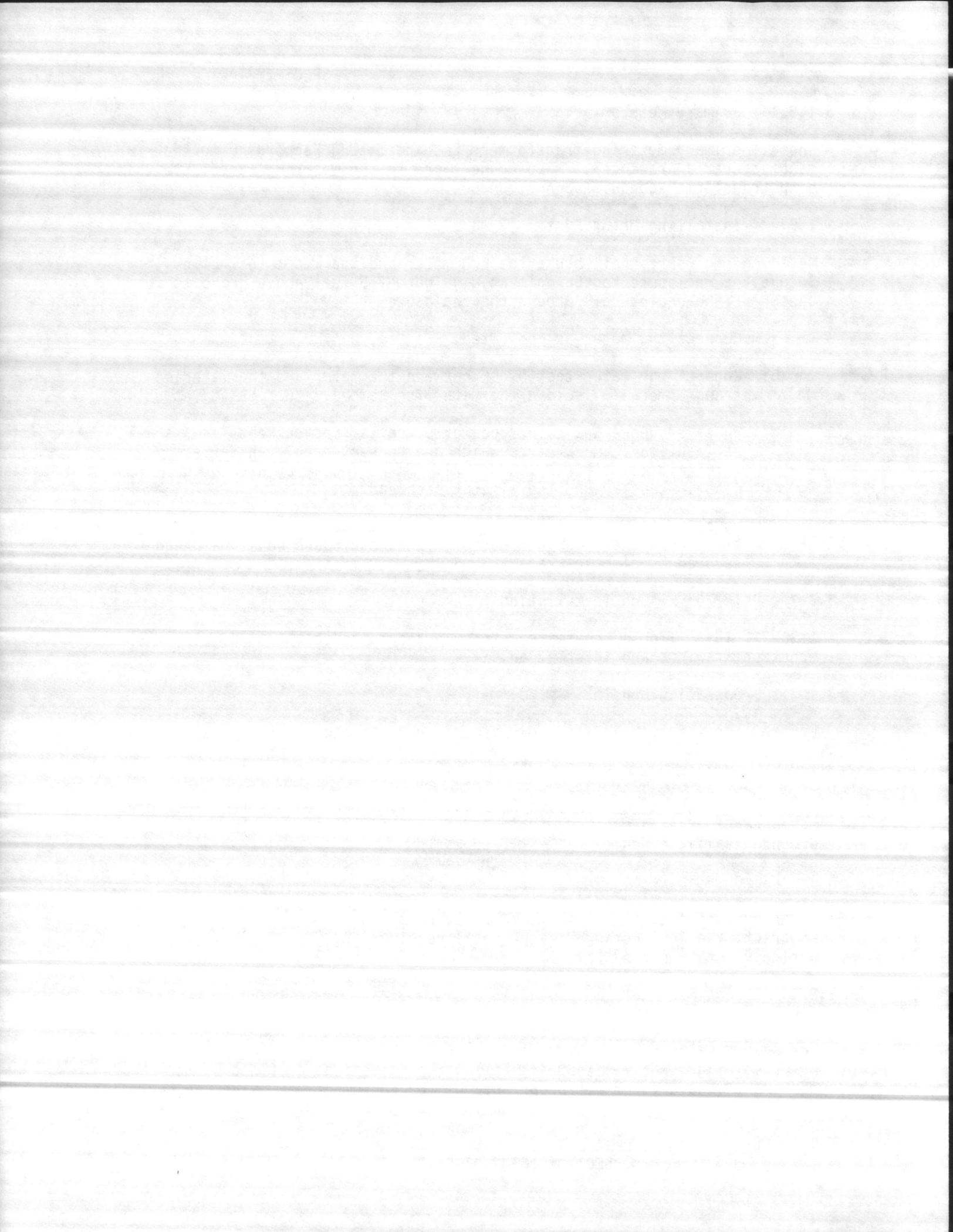
Secure conduits on poles by two hole galvanized steel pipe straps spaced no more than 10 feet apart and within 3 feet of any outlet or termination. Ground metallic conduits.

3.2 FIELD TESTS

As an exception to requirements that may be stated elsewhere in the contract, the Contracting Officer shall be given [5] [ ] working days notice prior to [each] [ ] tests[s].

3.2.1 Ground Rod Tests

\+Do not connect the ground rods until they have been tested for ground resistance value. Use a portable ground testing megger to test each ground or group of grounds.+ \\*SD-44, Follow the directions provided by the equipment manufacturer for proper use of the equipment. Provide one copy of the directions for the use of the observing inspectors.\*\



3.2.2 Test Transformer

\+Test transformer secondary voltages and adjust the voltage at the transformer to provide a secondary voltage of [120/240] [120/208] [\_\_\_\_\_]. \-NEMA TR1-\..+\

3.2.3 Meter

\+Check disc rotation to assure that it turns in the correct direction for each current-potential phase circuit individually.+\\

3.2.4 Devices Subject to Manual Operation

\+Each device subject to manual operation shall be operated at least three times, demonstrating satisfactory operation each time.+\\

-- End of Section --

