National Aeronautics and
Space Administration

John C. Stennis Space Center
Stennis Space Center, MS
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COMPLIANCE IS MANDATORY

John C. Stennis Space Center
STANDARD FOR THE 13.8KV DISTRIBUTION SYSTEM

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Basic	02.28.11	M. Willis ext. 7678	Initial release, supersedes SSC 99-020.
A	11.17.15	M. Willis Ext. 7678	• Five-year review. • Revised cover sheet to require approval from NASA SSC Center Operations Design & Construction Project Management Division, with concurrence from NASA SSC Center Operations Directorate Operations and Maintenance Division, and NASA SSC Safety and Mission Assurance. • Updated references, definitions, and acronyms. Administrative changes throughout document. • 8.2.9, Services and Metering: Revised sections d and f. • 8.2.10, Clearances: Updated clearance allowance in section b. • 8.3, Underground Construction: Updated section e; and added sections f and g. • 8.3.1: Revised Section f, changing "internal" to "external ground"; and "braided" to "stranded". Revised Section g, deleting "mounted switchgear and", and changing "will" to "shall". Added Section h, "All ground mounted switchgear shall have an arc flash label that conforms to SCWI-8715-0006 requirements for equipment labeling." • 8.3.2, Duct Banks and Manholes: Section e, updated minimum acceptable manhole dimensions; section m, defined manhole strength, dimensions and features; and section 4, updated size of duct banks between manholes. • 8.3.3, Cable: Added section b; and, sections d and e, eliminated references to Cross-Linked Polyethylene. • 8.3.4, Splices, Taps and Terminations: Revised section a, b, c, and e.

B	06.30.20	Delton Rodriguez 8-2499 Matthew Ladner / 8-2386	Updated directorate titles on cover and in header. Subsection 8.3.1-g: Replaced "sticker" with "label." Subsection 8.3.1-h: Added "warning/danger." Subsection 8.3.1-j: Added SSTD-8070-0138-ELEC requirement. Section 10.0: Updated definitions.
B-1	09.15.20	C. Wolfram 8-1620	Administrative update to make current the effective/review dates.
C	11.17.20	Delton Rodriguez 8-2499 Matthew Ladner / 8-2386	Five-year review. Updated references and acronyms.

Table of Contents

1.0 PURPOSE

This John C. Stennis Space Center (SSC) standard (SSTD) is a general guide for the design of 13.8KV electric power distribution facilities at SSC.

2.0 APPLICABILITY

a. The design should achieve economical, durable, efficient and dependable electric power distribution to support National Aeronautics and Space Administration (NASA) and tenant operations at SSC.

b. Where special conditions or problems are not specifically addressed in this SSTD, acceptable industry standards will be followed.

c. Authority for modifications to the existing distribution system, solely for the purpose of meeting criteria in this SSTD, is not implied.

3.0 REFERENCES AND APPLICABLE DOCUMENTS

All references are assumed to be the latest version unless otherwise indicated.

AASHTO, *Standard Specifications for Highway Bridges*
ANSI 05.1, *Standard Specifications and Dimensions for Wood Poles*
ANSI C135.1, *Standard for Zinc-Coated Steel Bolts and Nuts for Overhead Line Construction*
ANSI Z535.4, *Product Safety Signs and Labels*
ANSI/IEEE C2, *National Electrical Safety Code (NESC)*
ASTM A111, *Standard Specification for Zinc-Coated (Galvanized) "Iron" Telephone and Telegraph Line Wire*
ASTM A475, *Standard Specification for Zinc-Coated Steel Wire Strand*
IEEE 48, *Standard for Test Procedures and Requirements for Alternating-Current Cable Terminators Used on Shielded Cables Having Laminated Insulation Rated 2.5KV Through 765KV or Extruded Insulation Rated 2.5KV Through 500KV*
IPCEA/NEMA Standards, *Publication Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy*
NPR 8715.3, *NASA General Safety Program Requirements*
OSHA 29 CFR 1910, *OSHA General Industry Regulations Book*
OSHA 29 CFR 1926, *OSHA Safety and Health Regulations for Construction*
REA Bulletin 160-2, *Mechanical Design Manual for Overhead Distribution*
REA Form 803, *Specifications and Drawings for 14.4/24.9KV Line Construction*
REA Form 804, *Specifications and Drawings for 7.2/12.5KV Line Construction*
SCWI-8715-0006, *Electrical Safety Program*
SORD DWG 12B00-E014, *Electric Power Distribution System 13.8KV Switching SSC Site Plan*
SORD DWG 53000-E001, *Standard Electrical Symbols*

SPR 1440.1, *SSC Records Management Program Requirements*
SSTD-8070-0005-CONFIG, *SSC Preparation, Review, Approval, and Release of SSC Standards*
Standard Handbook For Electrical Engineers
SSTD-8070-0138-ELEC, *SSC Arc Flash Standard*
TM 5-811-1/AFJMAN 32-1080, *U.S. Army Technical Manual/Air Force Joint Manual Electrical Power Supply And Distribution*

4.0 RESPONSIBILITIES

a. Users of this SSTD shall comply with its requirements, ensure use of the correct version of this SSTD and the documents it references, and inform the appropriate organization of needed changes in accordance with SSTD-8070-0005-CONFIG.

b. Responsibilities for the use and control of this SSTD and for the review and approval of revisions or cancellation of this SSTD shall be as specified in SSTD-8070-0005-CONFIG and the applicable documents referenced therein.

5.0 ECONOMIC CONSIDERATIONS

a. When two (2) or more design types are known to exist, the selection of a particular type of design for a given installation will be based on the results of economic studies and site requirements.

b. Study results shall become part of the engineering package to be filed with Central Engineering Files (CEF).

6.0 DESIGN PRINCIPLES

a. Design of new electrical distribution facilities should be performed concurrently with the planning of new buildings and projects at SSC.

b. Factors relating to capacity, availability, reliability, stability, and maintainability of existing or new power distribution systems should be determined prior to proposing new designs required to serve new or modified facilities.

c. Designs for the extension or expansion of the existing 13.8KV distribution system at SSC should be accomplished with the assistance and cooperation of the high voltage system engineer.

d. With the addition of projects of very high electric power demand or consumption, an early determination should be made as to the availability of an adequate and stable source of electric power, and assistance from the local electric utility company should be sought during preliminary design, if required. However, no commitment should be made to obligate NASA, any tenants, contractors, or sub-contractors to procure electrical power.

e. Compatibility with the SSC Master Plan is necessary.

f. Construction methods will be generally compatible with the existing system, but not necessarily identical. Use of outdated, inferior or expensive methods for the sole purpose of matching existing construction is not justified.

7.0 DOCUMENTATION

a. Any alteration or addition to the 13.8KV system shall be accomplished only after approval of the high voltage system engineer and the engineering design group has been obtained and documented.

b. All changes to system configuration shall be documented with "as built" drawings submitted to CEF.

8.0 DETAILED REQUIREMENTS

8.1 General

The configurations covered by this SSTD are of a general nature and do not attempt to cover all conditions encountered in the field.

The electrical distribution system for SSC shall be of either overhead or underground construction.

a. Overhead construction should be the preferred method for all additions or expansions.

b. Underground construction should be utilized in the following instances:
   1. Where overhead lines would constitute hazards, i.e., near explosive storage or aviation facilities;
   2. Where overhead lines would obstruct operations such as crane-type material handling;
   3. Where overhead lines would interfere with communications/electronic equipment or antennas;
   4. Where overhead installations would conflict with current policy or would be incompatible with the environmental or architectural concept, and underground installation is approved, i.e. Building 1100/Administrative Area;
   5. Where areas have such high densities that underground lines are economical, and underground construction is approved;

6. For minor extensions to existing areas served by underground distribution lines; or,
7. For low voltage services to buildings.

8.2 Overhead Construction

8.2.1 General

a. Overhead lines will be provided in all areas as established in section 8.1 of this SSTD.

b. Bare conductors will be utilized for 13.8KV overhead construction and will be installed using either armless or cross arm construction.

c. Armless construction will be used for all new construction except where prohibited by technical considerations.

d. The use of cross arm construction for existing line extensions or pole replacements should be minimized.

e. Where conditions necessitate the use of insulated medium voltage aerial lines, a factory pre-assembled cable attached to a messenger will be used.

f. Poles will normally be installed adjacent to roadways to avoid possible interference with future projects and to facilitate the installation of roadway lighting if required.

g. Consideration shall be given to available short circuit current at each radial tap location.

h. Fused cutouts shall be installed as required to protect tap conductors from burnout conditions.

i. Fused cutouts shall be installed on all radial taps with runs not totally visible from the tap point.

j. Installation will comply with American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE) C2 National Electric Safety Code (NESC) requirements.

k. Typical circuit configurations will comply with Rural Electrification Authority (REA) Bulletin 160-2 or Standard Handbook for Electrical Engineers.

l. Site-wide Operation Repair Documentation (SORD) DWG 53000-E001 will be used for standard electrical symbols.

8.2.2 Poles

a. Concrete poles or solid wood poles will be used at SSC except where unusual requirements dictate the use of steel structures.

b. Wood poles will be per ANSI 05.1.

c. Wood poles shall be roofed, gained, and bored prior to pressure treatment.

d. Poles shall have pole markings located approximately ten (10) feet from the pole butt.

e. Poles shall be sized for proper strength and length as per ANSI 05.1.

f. Poles shall be set to maintain an even profile and maintain all required clearances.

g. Consecutive poles shall not vary more than five (5) feet in height.

h. All poles shall be topped with an aluminum cap upon installation.

i. Minimum setting depth shall be ten (10) percent of pole height plus two (2) feet.

j. Minimum pole class shall be Class 3, except where load calculations require additional pole strength.

8.2.3 Guying

Proper guying will enhance reliability and decrease maintenance costs over the life of the system. Guying may be accomplished using pole-to-ground, pole-to-pole, or a combination of the two (2), with guy strands and anchors sized to suit the installation. The type of anchor most suitable for SSC soil types is the helix or screw anchor, sized for the combined load of all guys attached to it.

a. All points of unbalanced strain on a pole line shall be adequately guyed to protect against excessive conductor sag and unsightly pole lean.

b. The guy strand (wire) shall consist of zinc-coated steel strands meeting American Society of Testing and Materials (ASTM) A111 coating requirements.

c. The guy strand (wire) shall be sized to exceed the calculated breaking strength requirements for each installation.

d. All anchor rods shall be fitted with triple-eye thimbles to accommodate guying at three (3) levels of pole attachment.

8.2.4 Grounding/Overhead (OH), Aerial Construction Static Wire

a. Driven grounds shall be installed at each pole supporting equipment, such as transformers, switches, risers, and lightning arresters, and at each pole as required by sound design practice.

b. In no case shall the distance between grounded poles be more than 600 feet.

c. A resistance of not greater than 25 ohms shall be achieved at each isolated ground location, measured in normally dry conditions not less than 48 hours after rainfall.

d. Grounding rods shall be of copper (Cu) clad steel not less than ¾ inch in diameter by ten (10) feet in length.

e. Multiple rods or sectional rods may be used if needed to meet the specified resistance requirements.

f. Minimum ground wire size for pole installations shall be No. 6 American Wire Gauge (AWG) Cu wire.

g. The site-wide overhead static wire shall be electrically bonded to the ground wire at each pole having a driven ground.

h. The overhead static wire shall be a minimum of 7/16 inch zinc-coated steel, as per ASTM A475, with a breaking strength of not less than 14,500 pound-force.

8.2.5 Circuit Configuration

a. Armless construction will be the preferred configuration for mounting 13.8KV circuits.

b. Cross arms will be used only as required by technical considerations.

c. Original cross arm construction will be phased out where technically and economically feasible.

d. Use of the overhead ground wire dictates a vertical configuration for phase wires for both single and double circuit tangent lines.

e. Requirements for other-than-straight-line circuits are dependent upon the angle of deviation and size of conductor. Allowable angle and guying requirements are shown in the ANSI/IEEE C2.

f. All armless brackets and other hardware will be of a type specifically developed for pole line installation in accordance with industry standards.

g. All steel or wrought iron hardware will be hot-dip galvanized as per ANSI C135.1.

8.2.6 Equipment Poles

a. Poles used to support overhead equipment, such as capacitors, transformers and switches, will generally be of horizontal configuration, using either wood cross arms or specialty brackets for conductor and equipment support.

b. All equipment poles will be provided with grounds meeting the requirements of section 8.2.4 of this SSTD.

c. All riser poles, transformer poles, and dead-end or tap poles will be equipped with 10KV class lightning arresters, as will poles on either side of any normally open switch point.

d. Adjacent poles may be used for mounting arresters when required by space limitations on equipment pole.

8.2.7 Conductors

a. Overhead primary conductors, as a rule, are bare Aluminum Conductor Steel Reinforced (ACSR), Aluminum Conductor Alloy Reinforced (ACAR) or All Aluminum Alloy Conductor (AAAC).

b. Conductors are sized for either main feeder circuits of 400A capacity or branch circuits of 100A capacity. Future circuits will be designed to match existing circuit capacity to minimize stock requirements, such as for wire and clamps.

c. Jumper and transformer connections will be of Cu conductors.

d. Non-permanent jumper connections shall be made using bails and hot line clamps.

e. The maximum tension in a conductor span is limited by the strength of the wire and its supporting elements.

f. ANSI/IEEE C2 permits conductor sags such that, for ice and wind loadings applying, the tension of the conductor must not exceed 60 percent of the conductor's rated breaking strength. The unloaded tension at 60°F must not exceed 35 percent of rated breaking strength before load is applied. Thus, under normal and maximum load conditions, any conductor will not be loaded beyond limits of safety.

g. Sag and tension tables for conductors and conditions are outlined in ANSI/IEEE C2.

8.2.8 Transformers

a. Aerial transformer installations will utilize single-phase units either banked for three-phase or alone for single-phase service.

b. Mounting will be on a single pole utilizing cluster mount brackets. Cutouts and arrestors will similarly be mounded on tri-mount brackets where practical, in lieu of cross arms.

c. In general, aerial transformer installations will be limited to three (3) 100KVA units or less.

d. For three-phase installations greater than 300KV, pad-mounted units are generally more economical than pole-mounted units and should be used where ground space is available.

e. Use of two-pole platform structures is discouraged and should be used only where ground space is unavailable for larger transformer installations.

f. All transformers shall be conventional type (no internal fusing).

g. Completely self-protected (CSP) transformers will not be specified for use.

h. Transformers, whether aerial or pad-mounted, should be located as near the secondary distribution center as practicable and should be protected from vehicular traffic.

i. Proper clearance should be maintained for safety and operational considerations as per ANSI/IEEE C2.

j. Pad-mounted transformers should be positioned to allow use of hot sticks in the high-side compartments.

8.2.9 Services and Metering

a. Secondary voltage services shall be routed underground from transformer to load in all instances, with the exception of temporary (construction) power.

b. Construction power services may be routed overhead to a contractor-provided service pole as depicted in ANSI/IEEE C2.

c. Permanent services shall be sized for the load center installed and routed underground in conduit.

d. All loads shall be metered using utility grade, socket type,120/480V class Kilowatt-hour (KWH) demand meters with remote digital monitoring capability. For Current Transformer (CT) applications, Form 9s meters shall be used and installed into the site standard meter base per SORD DWG 12B00-E014.

e. Meter shall be placed at the transformer or at the load, ahead of the main disconnect.

f. Meter shall be sized for the anticipated load, using CTs and Potential Transformers (PTs) as required. Minimum CT metering accuracy shall be 0.3B0.2 unless otherwise approved.

8.2.10 Clearances

a. Bare current carrying conductors shall be mounted in such a way as to maintain as a minimum all clearances required per ANSI/IEEE C2. A summary of frequently incurred clearance requirements are outlined in ANSI/IEEE C2.

b. Clearance allowance should be made for six (6) feet of pole space dedicated to communications circuits below the primary circuits, located per ANSI/IEEE C2.

c. Unusual requirements not covered herein shall be addressed on an individual basis, using ANSI/IEEE C2 as a guide for minimum needs.

8.3 Underground Construction (UG)

8.3.1 General

a. Underground distribution lines will be provided in all areas as established in section 8.1 of this SSTD.

b. Expansion of the existing underground system will be accomplished using a duct bank-manhole system similar to the existing system, with cable and accessories rated at 15KV.

c. Cable capacity shall match the existing system which utilizes 500 Thousands of Circular Mils (wire measurement) (MCM) Cu for main line feeders and #1/0 Cu for taps.

d. Splices, terminations and taps shall be 15KV dead break connectors.

e. Switching shall be accomplished using above-grade, pad-mounted units. Switchgear using sulfur hexafluoride (SF_6) or vacuum as the insulating medium is required. Cable terminations in pad-mounted switches and termination cabinets will be bolted dead-break in nature and rated for 600 AMPS.

f. All switchgear and termination cabinets will be accompanied with a ground loop or grid that is bonded to the rebar in the slab or to the ground of the pedestal supporting the equipment as well as to the external ground boss of the device. The connection between the device and the ground grid will be 4/0 stranded Cu. All external ground and grid connections will be exothermically made.

g. All ground termination cabinets shall have a generic arc flash warning label conforming to the ANSI Z535.4.

h. All ground mounted switchgear shall have an arc flash warning/danger label that conforms to SCWI-8715-0006 requirements for equipment labeling.

i. Equipment and manhole locations shall be selected for ease of access, operation and maintenance.

j. All installations shall conform to ANSI/IEEE C2.

k. All high voltage switches connecting to service entrance shall have Arc Flash Hazard labels per the requirements of SSTD-8070-0138-ELEC.

8.3.2 Duct Banks and Manholes

a. Manholes for UG systems will be located for ease of access and maintenance, and at possible tap points for future or proposed expansions.

b. Manholes will be spaced not more than 600 feet apart. Actual spacing may be limited by cable-pulling tensions for designs using curved sections of duct bank.

c. Where curves are required to avoid obstructions or to adhere to space limiting requirements, the curve will be the maximum possible and in no case less than a 25-foot radius.

d. The use of 90° bends is permitted only at pole or equipment risers. Risers will be not more than 150 feet from the manhole of the circuit source.

e. Minimum acceptable manhole dimensions are ten (10) feet deep by ten (10) feet by ten (10) feet wide with an access opening to the surface of not less than thirty (30) inches in diameter.

f. Square or rectangular access covers are prohibited.

g. Round covers only will be used to avoid the danger of the cover slipping through the opening.

h. In areas exposed to vehicular traffic, the manhole and cover design will meet the requirements defined per American Association of State Highway and Transportation Officials (AASHTO) Highway Bridges (HB).

i. Actual manhole configuration and dimensions will be dictated by the size and number of circuits entering, with a minimum of six (6) feet of wall space on all sides where cable splices will be racked.

j. Cable entrances into the manhole shall be located so as to avoid sharp cable bends at the duct mouth.

k. Sump shall be located in any corner or in center of manhole, but in no case directly under the access opening.

l. Manhole and duct bank entrance elevations shall be shown.

m. Manholes shall be cast-in-place concrete or pre-cast at the contractor's option if the pre-cast unit provides the same strength, dimensions and features of the cast-in-place unit. The concrete mix may not be less than 4,000 psi. Reinforcing is to be grade 60 rebar or equivalent wire mesh. There is to be minimum 6-inch thick slab base, walls, and flat top.

n. Pull-in irons will be provided opposite each duct entrance and opposite proposed future duct entrances.

o. Cable racks for proper cable and splice support shall be installed on each wall for circuits installed and circuits proposed for future installations.

p. At least one (1) ground rod will be installed in a corner of each manhole for grounding cable sheaths.

q. Duct banks between manholes and between manholes and equipment or risers shall be concrete encased Schedule 40 Polyvinyl Chloride (PVC), except under crossings requiring added strength.

r. Size and number of ducts will be dependent upon the installation, with a 6-inch diameter minimum size between manholes.

s. Number and configuration of ducts should meet present requirements with spare capacity for at least a 25 percent increase in the number of cables, or more, if future requirements are identified.

t. Duct banks should be installed for proper drainage and configured for maximum heat dissipation as shown in ANSI/IEEE C2.

8.3.3 Cable

a. Cable for use on underground distribution shall be soft drawn cable, rated for 15KV service.

b. After termination, cable will be high pot tested to IEEE Standard 576.

c. Cable will be specified as 133 percent insulation level (ungrounded) to allow greater margin for insulation deteriorating and voltage surges.

d. A nonmetallic jacketed cable will be used with Ethylene-Propylene Rubber (EPR) insulation with a PVC sheath in accordance with Insulated Power Cable Engineers Association/National Electrical Manufacturers Association (IPCEA/NEMA) standards.

e. EPR cable meets the National Electrical Code (NEC) requirement for 90°C operation and offer superior overload and short circuit capabilities.

f. The current carrying capacities of underground cables will be in accordance with the ampacity given in the NEC.

g. In general, 500MCM Cu will carry 465 AMPS; and 1/0 Cu, 200 AMPS. However, circuit capacity is affected by operating temperatures, and attention should be given to cable placement within the duct banks, as addressed in the appendix section of this SSTD.

8.3.4 Splices, Taps And Terminations

a. A splice is a mechanical connection point for joining two (2) or more UG cables for the purpose of providing a continuous electric path, plus the necessary components for maintaining symmetrical stress distribution, minimizing voltage gradients, and maximizing protection from environmental contamination. Below grade splices are not allowed except in the case of a temporary repair. Suitable termination cabinets or ground-mounted switchgear should be installed in the case of new construction for above grade connection points.

b. Mechanical connection between cables and termination devices will be made using dead-break terminations with the necessary kits to accomplish the stated objectives.

c. Separable factory pre-formed dead-break terminations are specified for splices and taps to enhance system reliability and provide the ability to disconnect future taps and cable isolation during fault testing.

d. Care must be taken in matching pre-formed kits to the cable diameter and insulation type for the cables to be spliced.

e. Taped splices are not acceptable regardless of the intended use of cold-shrink or heat-shrink materials.

f. Factory pre-formed terminations shall be specified for terminating UG cables for UG/OH transitions or for attachment to equipment terminals.

g. All terminations shall conform to the requirements of IEEE 48 for Class I termination.

h. Class I terminations are suitable for both indoor and outdoor use, and provide for the following:
   1. Electric stress control;
   2. External leakage insulation between conductor and ground; and,
   3. An environmental seal between cable and external contaminants.

i. Class II and III terminations should not be specified due to the high humidity conditions at SSC which could lead to condensation tracking on indoor installations.

9.0 RECORDS AND FORMS

Records and forms required by the procedures of this SSTD shall be maintained in accordance with SPR 1440.1. All records and forms are assumed to be the latest edition unless otherwise indicated. Forms may be obtained from the SSC Electronic Forms repository or from the NASA SSC Forms Management Officer. Quality Records are identified in the SSC Master Records Index.

10.0 DEFINITIONS

Arc Flash – An electrical short circuit through air when insulation or isolation between electrified conductors is breached or can no longer withstand the applied voltage. Temperatures can reach up to 35,000 ºF.

Arc Flash Hazard – A source of possible injury or damage to health associated with the release of energy caused by an electric arc.

Armless Construction – Overhead pole line using steel brackets and post insulators in lieu of wood cross arms with pin-type insulators

Circuit – A conductor or system of conductors through which electric current is intended to flow.

Conductor – A material, usually in the form of a wire, cable, or bus bar, suitable for carrying electric current.

Electrical Safety Program – A documented system consisting of electrical safety principles, policies, procedures, and processes that directs activities appropriate for the risks associated with electrical systems.

Enclosure – The case or housing of apparatus — or the fence or walls surrounding an installation to prevent personnel from unintentionally contacting energized electrical conductors or circuit parts or to protect the equipment from physical damage.

Exposed (as applied to energized electrical conductors or circuit parts) – Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated.

Exposed (as applied to wiring methods) – On or attached to the surface, or behind panels designed to allow access.

Ground – The earth.

High Voltage – Any electrical equipment (lines, wires, switches, relays, transformers, buses, capacitors, rectifiers, etc.) that has the potential to carry or contain voltage equal to or greater than 600 volts. High Voltage work is considered Safety Critical and requires approval of the cognizant safety representative in addition to the cognizant engineer per SPR 8715.1 Safety and Health Program Requirements.

Hot Stick – An insulated pole used to protect workers from electric shock when they are working on energized electric power lines

Label – Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner. (Note: The product shall only have NEC 500 USA markings [Class 1 Division 1 Groups A, B, C & D T6]. No other markings, e.g., EU/ATEX/IECEX, are permitted.")

Low Voltage – Any electrical equipment (lines, wires, switches, relays, transformers, buses, capacitors, rectifiers, etc.) that has the potential to carry or contain voltage up to 600 volts.

Maintenance (condition of) – The state of the electrical equipment considering the manufacturers' instructions, manufacturers' recommendations, and applicable industry codes, standards, and recommended practices.

Ohm – The ohm is the International System of Units (SI) unit of electrical impedance or, in the direct current case, electrical resistance.

Risk – A combination of the likelihood of occurrence of injury or damage to health and the severity of injury or damage to health that results from a risk.

Sag –Vertical distance measured from a conductor to a straight line joining its two (2) points of support

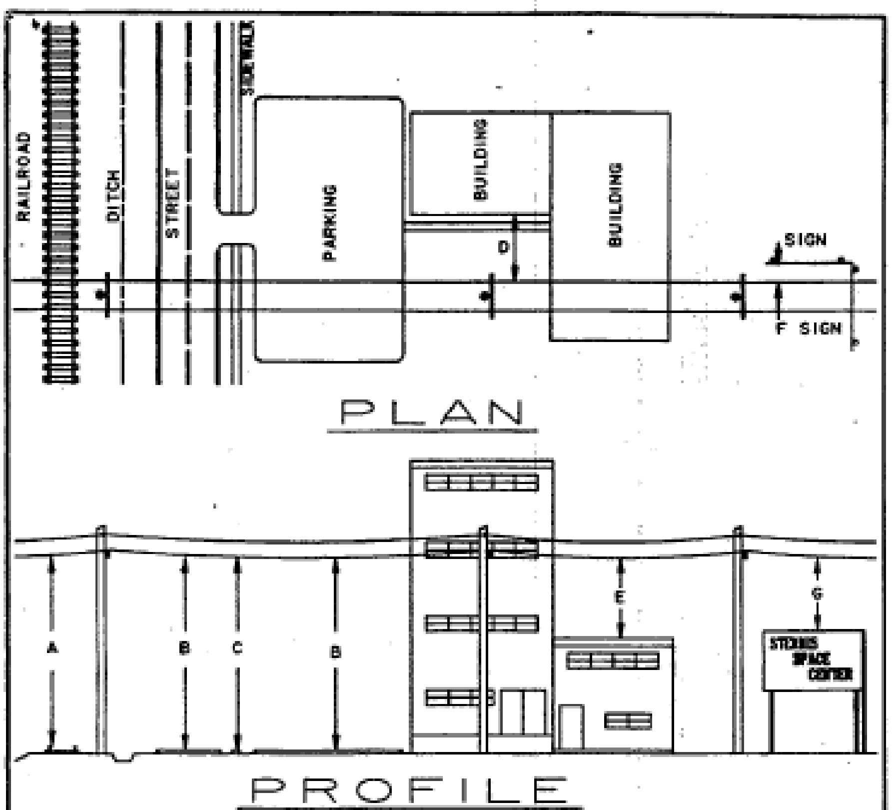
Working On (energized electrical conductors or circuit parts) – Intentionally coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment (PPE) a person is wearing. There are two (2) categories of "working on": Diagnostic (testing) is taking readings or measurements of electrical equipment with approved test equipment that does not require making any physical change to the equipment; Repair is any physical alteration of electrical equipment (such as making or tightening connections, removing or replacing components, etc.).

11.0 ACRONYMS AND ABBREVIATIONS

AAAC All Aluminum Alloy Conductor
AASHTO American Association of State Highway and Transportation Officials
ACAR Aluminum Conductor Alloy Reinforced
ACSR Aluminum Conductor Steel Reinforced
AMPS Measurement For Electric Current
ANSI American National Standards Institute
ASTM American Society of Testing and Materials
AWG American Wire Gauge
C Celsius
CEF Central Engineering Files
CFR Code of Federal Regulations
CSP Completely Self-Protected
CT Current Transformer
Cu Copper
° Degrees
EPR Ethylene-Propylene Rubber
F Fahrenheit
HB Highway Bridges
HDB Hard Drawn Bare
IEEE Institute of Electrical and Electronics Engineers
IPCEA Insulated Power Cable Engineers Association
KVA Kilo Volt Amps
KWH Kilowatt-hour
MCM Thousands of Circular Mils (wire measurement)
MSEC Millisecond
NASA National Aeronautics and Space Administration
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
NESC National Electrical Safety Code
NPR NASA Procedural Requirement
OH Overhead, Aerial Construction
OSHA Occupational Safety and Health Administration
PT Potential Transformer
PVC Polyvinyl Chloride
REA Rural Electrification Authority

SF_6	Sulfur Hexafluoride
SI	International System of Units
SORD	Site-wide Operation Repair Documentation
SSC	John C. Stennis Space Center
SSTD	John C. Stennis Space Center Standard
UG	Underground, Subsurface Construction

12.0 Appendix A



	0-750Volts	750-22,000Volts
A. R.R. Tracks (Top of Rail)	27	28
B. Streets, Parking, Alleys	18	20
C. Pedestrian Traffic Only	15	15
D. Buildings, Horizontal	5	6
E. Buildings, Vertical		
1. Not Accessible to Pedestrians	10	10
2. Accesible to Pedestrians	15	15
3. Accesible to Vehicles	18	20
F. Signs, Tanks, Antennas, Etc.(Horiz.)	5	6
G. Signs, Tanks, Antennas, Etc.(vert.)	5	8

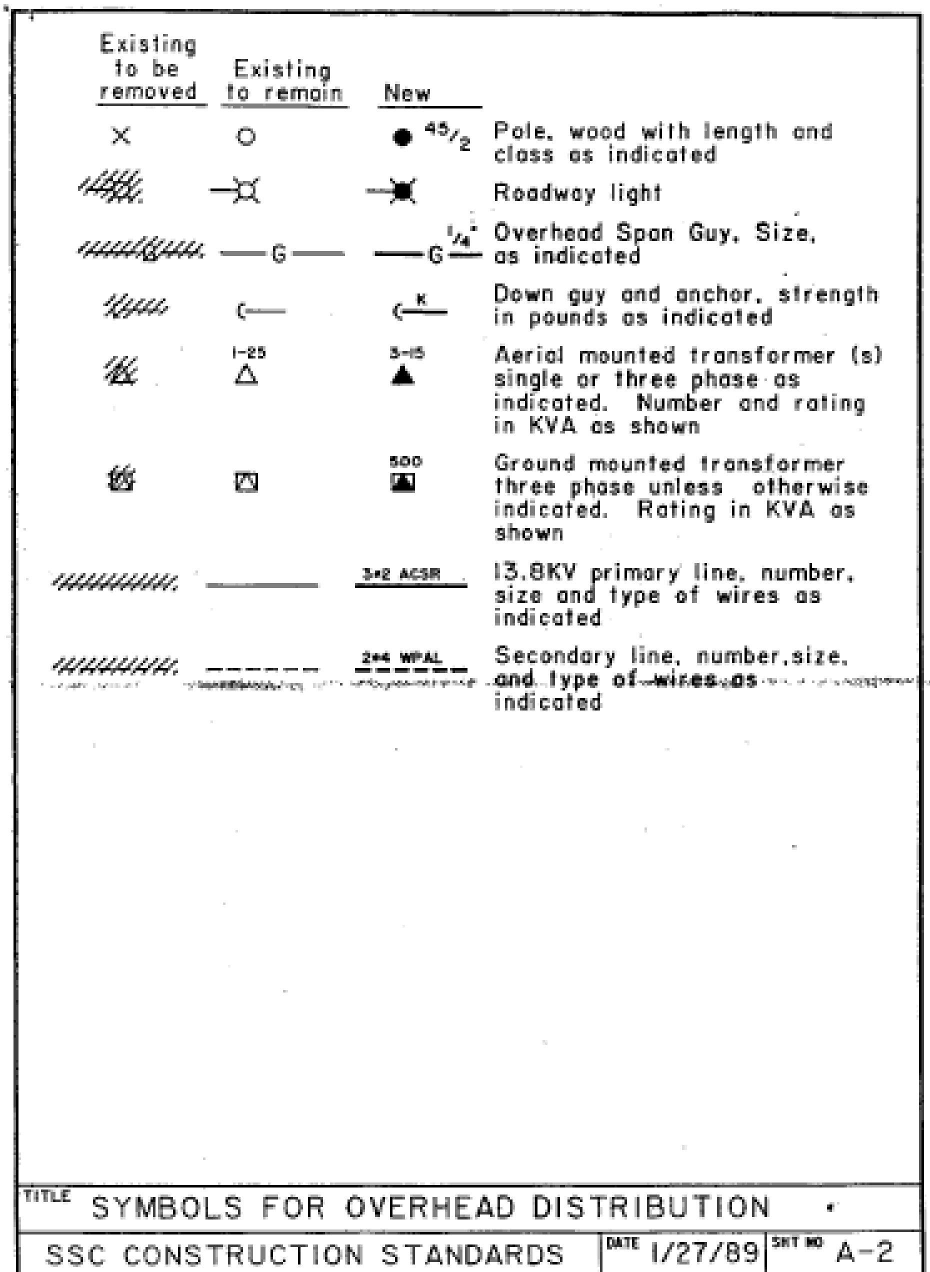
TITLE CONDUCTOR CLEARANCE TABLE (FT.)

SSC CONSTRUCTION STANDARDS DATE 2/1/89 SHT NO A-1

 FIGURE A1

RELEASED - Printed documents may be obsolete; validate prior to use.

RELEASED - Printed documents may be obsolete; validate prior to use.



Existing to be removed
Existing to remain
New
45/2
Pole, wood with length and class as indicated
Roadway light
G
1/4"
Overhead Span Guy, Size, as indicated
K
Down guy and anchor, strength in pounds as indicated
1-25
3-15
Aerial mounted transformer (s) single or three phase as indicated. Number and rating in KVA as shown
500
Ground mounted transformer three phase unless otherwise indicated. Rating in KVA as shown
3#2 ACSR
13.8KV primary line, number, size and type of wires as indicated
2#4 WPAL
Secondary line, number, size, and type of wires as indicated
TITLE SYMBOLS FOR OVERHEAD DISTRIBUTION
SSC CONSTRUCTION STANDARDS
DATE 1/27/89
SHT NO A-2

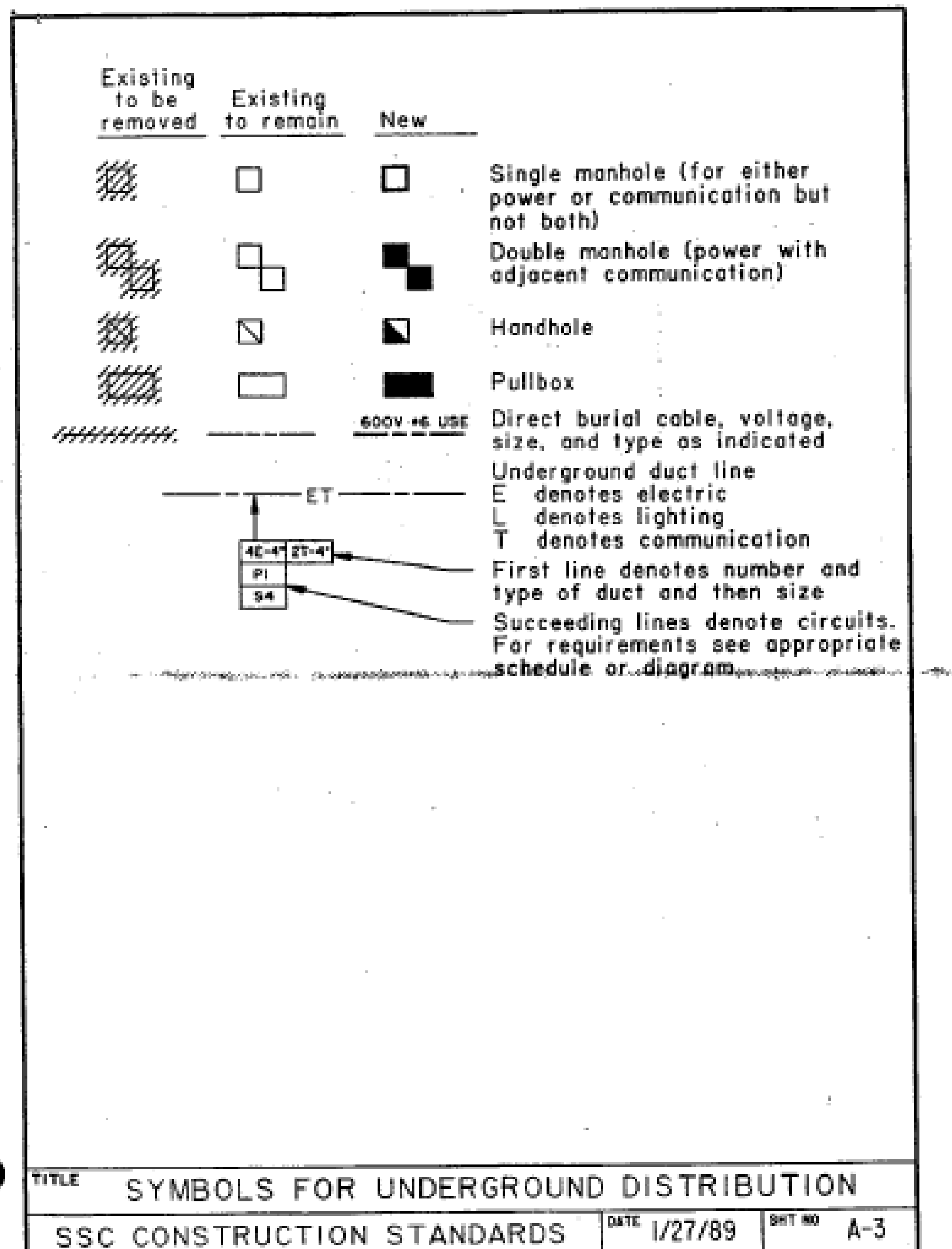


FIGURE A-3
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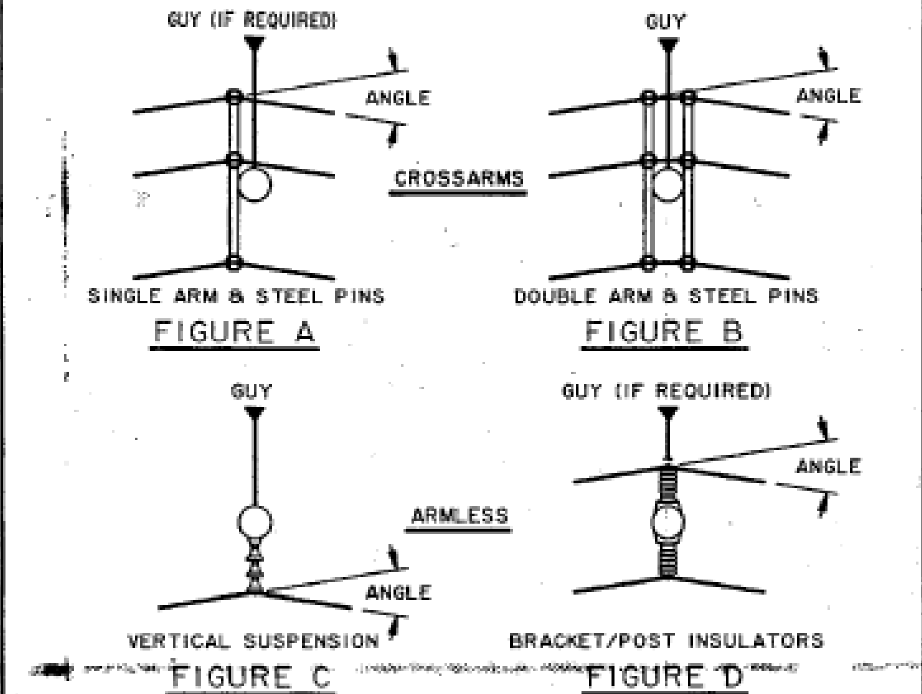

ALLOWABLE ANGLES FOR 150' RULING SPAN CONSTRUCTION

CONDUCTOR		FIGURE A	FIGURE B	FIGURE C		FIGURE D
		MAX ANGLE	MAX ANGLE	MIN ANGLE	MAX ANGLE	MAX ANGLE
NO. 4	ACSR	25°	50°	45°	60°	10°
NO. 2	ACSR	20°	40°	35°	50°	8°
NO. 1/0	ACSR	15°	30°	30°	45°	6°
NO. 2/0	ACSR	12°	25°	25°	40°	5°
NO. 4/0	ACSR	8°	20°	20°	35°	3°
397.5 MCM	ACSR	5°	15°	20°	30°	2°
NO. 6	HDB CU	25°	50°	45°	60°	10°
NO. 4	HDB CU	20°	40°	35°	50°	8°
NO. 2	HDB CU	15°	30°	30°	45°	6°
NO. 1/0	HDB CU	12°	25°	25°	40°	5°
NO. 2/0	HDB CU	8°	20°	20°	35°	3°
NO. 4/0	HDB CU	5°	15°	20°	30°	2°

TITLE ALLOWABLE ANGLES - PRIMARY CONSTRUCTION

SSC CONSTRUCTION STANDARDS	DATE 12/2/88	SHT NO A-4

 FIGURE A-4
RELEASED - Printed documents may be obsolete; validate prior to use.

SUBJECT: Standard For The 13.8KV Distribution System

TABLE A-5. CONDUCTOR MATERIALS - PHYSICAL PROPERTIES

Conductor Material	Size AWG	Size kcmil	Number of strands	Diameter inches	Weight lb/ft	Area in	Rated breaking strength lb
CU (copper, hard-drawn)	6	26.2	Solid	0.162	0.079	0.021	1,280
	4	41.7	7	0.232	0.129	0.033	1,940
	2	66.4	7	0.292	0.205	0.052	3,042
	1	83.7	7	0.328	0.258	0.066	3,804
	1/0	105.6	7	0.368	0.326	0.083	4,752
	2/0	133.1	7	0.414	0.411	0.105	5,926
	4/0	211.6	7	0.527	0.653	0.166	9,154
AAC (all-aluminum conductor)	2	66.4	7	0.292	0.062	0.052	1,350
	1/0	105.6	7	0.368	0.099	0.083	1,990
	2/0	133.1	7	0.414	0.125	0.105	2,510
	3/0	167.8	7	0.464	0.158	0.132	3,040
	4/0	211.6	7	0.522	0.199	0.160	3,830
	-	366.4	19	0.666	0.316	[illegible]	6,150
AAAC (all-aluminum alloy-conductor)	2	77.4	7	0.316	0.073	0.061	2,800
	1/0	123.3	7	0.398	0.116	[illegible]	[illegible]
	2/0	155.4	7	0.477	0.146	0.122	5,390
	3/0	195.7	7	0.502	0.184	0.154	6,790
	4/0	246.9	7	0.563	0.232	0.194	8,560
	-	394.5	19	0.720	0.370	0.310	13,300
ACSR (aluminum-conductor steel reinforced)	2	66.4	6/1	0.316	0.091	0.061	2,850
	1/0	105.6	6/1	0.398	0.145	0.097	4,380
	2/0	133.1	6/1	0.447	0.183	0.122	5,300
	3/0	167.8	6/1	0.502	0.231	0.154	6,620
	4/0	246.9	6/1	0.563	0.291	0.194	8,350
	-	336.4	26/7	0.720	0.463	0.307	14,100

TITLE TABLE - CONDUCTOR MATERIALS - PHYSICAL PROPERTIES

SSC CONSTRUCTION STANDARDS | DATE 2/1/89 | SHT NO A-5

FIGURE A-5

TABLE .A-6. INITIAL STRINGING SAGS FOR 200 FOOT SPANS

Conductors		Stringing temperature								
		30°F			60°F			90°F		
		Loading districts								
Material	AWG copper (aluminum)	Light	Meduim	Heavy	Light	Medium	Heavy	Light	Medium	Heavy
		Stringing sag feet								
AAC	4/0(336.4)	0.8	0.9	1.1	1.1	1.3	1.7	1.6	2.0	2.5
AAAC		0.4	0.5	0.7	0.5	0.7	0.9	0.7	1.0	1.3
ACSR		0.5	0.6	0.8	0.6	0.7	1.0	0.7	1.0	1.4
AAC	2/0(4/0)	0.8	0.9	1.2	1.1	1.4	1.8	1.6	2.2	2.7
AAAC		0.4	0.5	0.6	0.5	0.7	0.9	0.7	0.9	1.3
ACSR		0.6	0.7	0.8	0.7	0.9	1.0	0.9	1.2	1.4
AAC	1/0(3/0)	0.9	0.9	1.7	1.5	1.4	2.5	2.1	2.2	3.3
AAAC		0.4	0.5	0.6	0.5	0.7	0.9	0.7	0.9	1.3
ACSR		0.6	0.7	0.7	0.7	0.9	1.0	0.9	1.2	1.4
AAC	1(2/0)	0.8	0.9	2.2	1.0	1.3	3.0	1.7	2.1	3.8
AAAC		0.4	0.5	0.6	0.5	0.7	0.9	0.7	0.9	1.3
ACSR		0.6	0.7	0.7	0.7	0.8	0.9	0.9	1.2	1.3
AAC	2(1/0)	0.7	0.9	3.5	1.1	1.3	4.2	1.7	2.1	4.8
AAAC		0.4	0.5	0.6	0.5	0.6	0.8	0.6	0.8	1.1
ACSR		0.5	0.6	0.6	0.7	0.8	0.8	0.8	1.1	1.1
AAC	4(2)	0.7	1.0	5.8	0.9	1.6	6.3	1.5	2.4	6.7
AAAC		0.4	0.5	0.6	0.5	0.6	0.7	0.6	0.8	1.1
ACSR		0.5	0.6	0.6	0.6	0.7	0.7	0.7	1.0	1.0
AAC	6(4)	0.7	3.0	9.7	0.9	3.7	10.0	1.4	5.0	10.2
AAAC		0.4	0.5	0.9	0.5	0.6	1.4	0.6	0.8	2.1
ACSR		0.5	0.5	0.9	0.6	0.7	1.4	0.7	0.9	2.0

TITLE TABLE - INITIAL STRINGING SAGS FOR 200 FOOT SPANS		
SSC CONSTRUCTION STANDARDS	DATE 2/1/89	SHT NO A-6

 FIGURE A-6

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RELEASED - Printed documents may be obsolete; validate prior to use.

TABLE A-7. FINAL LOADED TENSIONS FOR 200 FOOT SPANS

Conductors		Loading districts					
		Light 9 lb/ft² horizontal wind no ice 30°f		Medium 4 lb/ft² horizontal wind 1/4-inch radial ice 15°f		Heavy 4 lb/ft² horizontal wind 1/2-inch radial ice 0°f	
Material	AWG copper (aluminum)	Tension lb	Sag ft.	Tension lb	Sag ft.	Tension lb	Sag ft.
AAC	4/0(336.4)	1,675	1.9	2,060	2.2	2,620	2.8
AAAC		3,460	1.0	3,610	1.4	3,970	2.0
ACSR		3,670	1.0	3,650	1.4	4,260	1.9
AAC	2/0(4/0)	1,180	2.1	1,490	2.5	1,920	3.3
AAAC		2,270	1.2	2,430	1.6	2,780	2.4
ACSR		2,250	1.2	2,460	1.7	2,870	2.4
AAC	1/0(3/0)	1,130	1.9	1,270	2.7	1,520	4.0
AAAC		1,810	1.3	1,990	1.8	2,300	2.7
ACSR		1,810	1.4	2,020	1.9	2,430	2.7
AAC	1(2/0)	840	2.3	1,110	2.9	1,260	4.5
AAAC		1,475	1.4	1,650	2.1	1,980	3.0
ACSR		1,480	1.5	1,690	2.1	2,079	2.9
AAC	2(1/0)	700	2.4	960	3.2	1,000	5.5
AAAC		1,230	1.5	1,400	2.3	1,720	3.2
ACSR		1,240	1.5	1,400	2.3	1,800	3.2
AAC	4(2)	520	2.7	675	4.1	680	7.5
AAAC		810	1.8	990	2.9	1,280	4.0
ACSR		850	1.8	1,050	2.8	1,370	3.8
AAC	6(4)	380	3.0	440	5.8	440	10.9
AAAC		550	2.0	730	3.6	880	5.5
ACSR		580	2.1	790	3.4	930	5.2

TITLE TABLE - FINIAL LOADED TENSIONS FOR 200 FOOT SPANS		
SSC CONSTRUCTION STANDARDS	DATE 2/1/89	SHT NO A-7

FIGURE A-7
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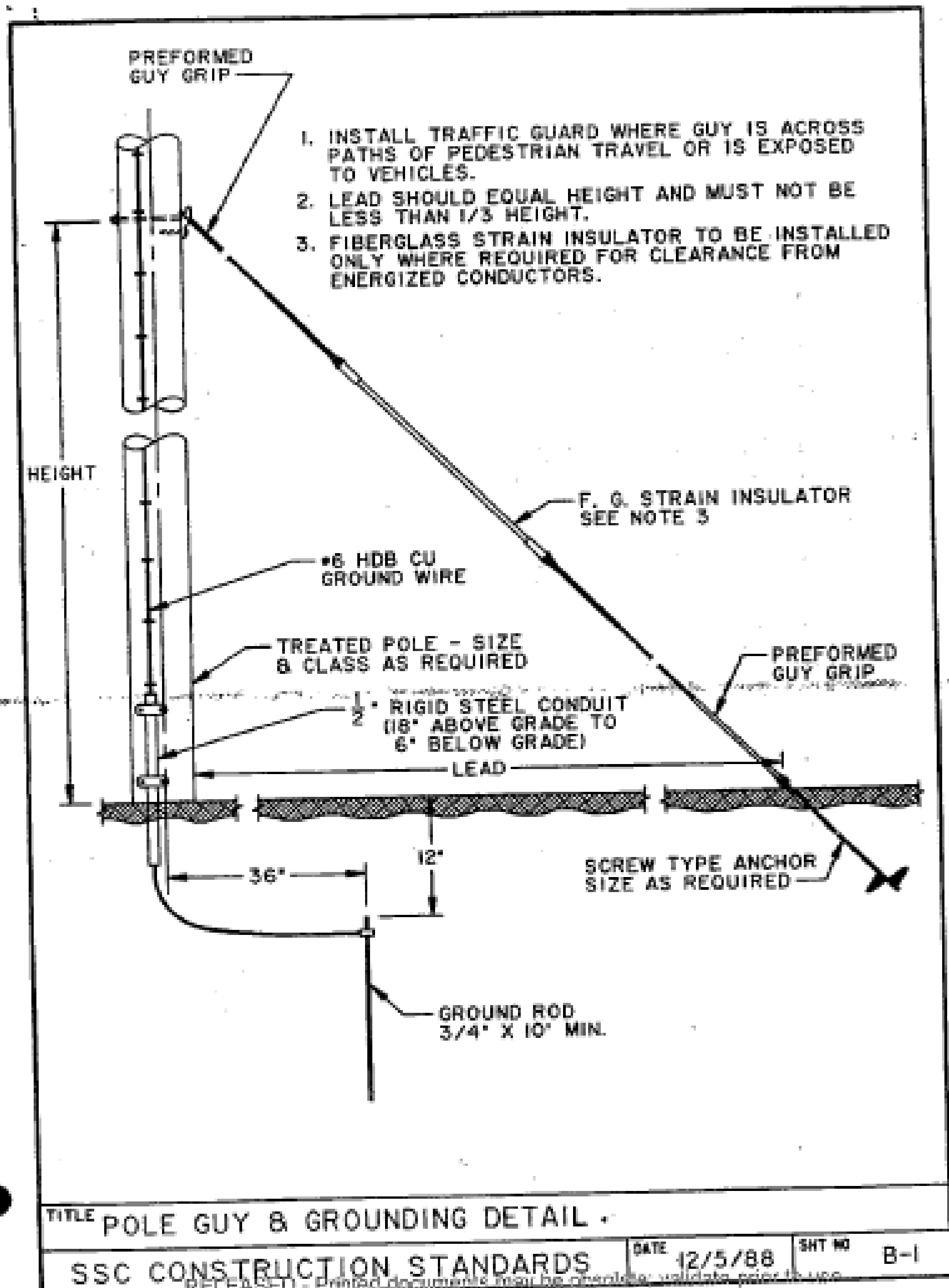
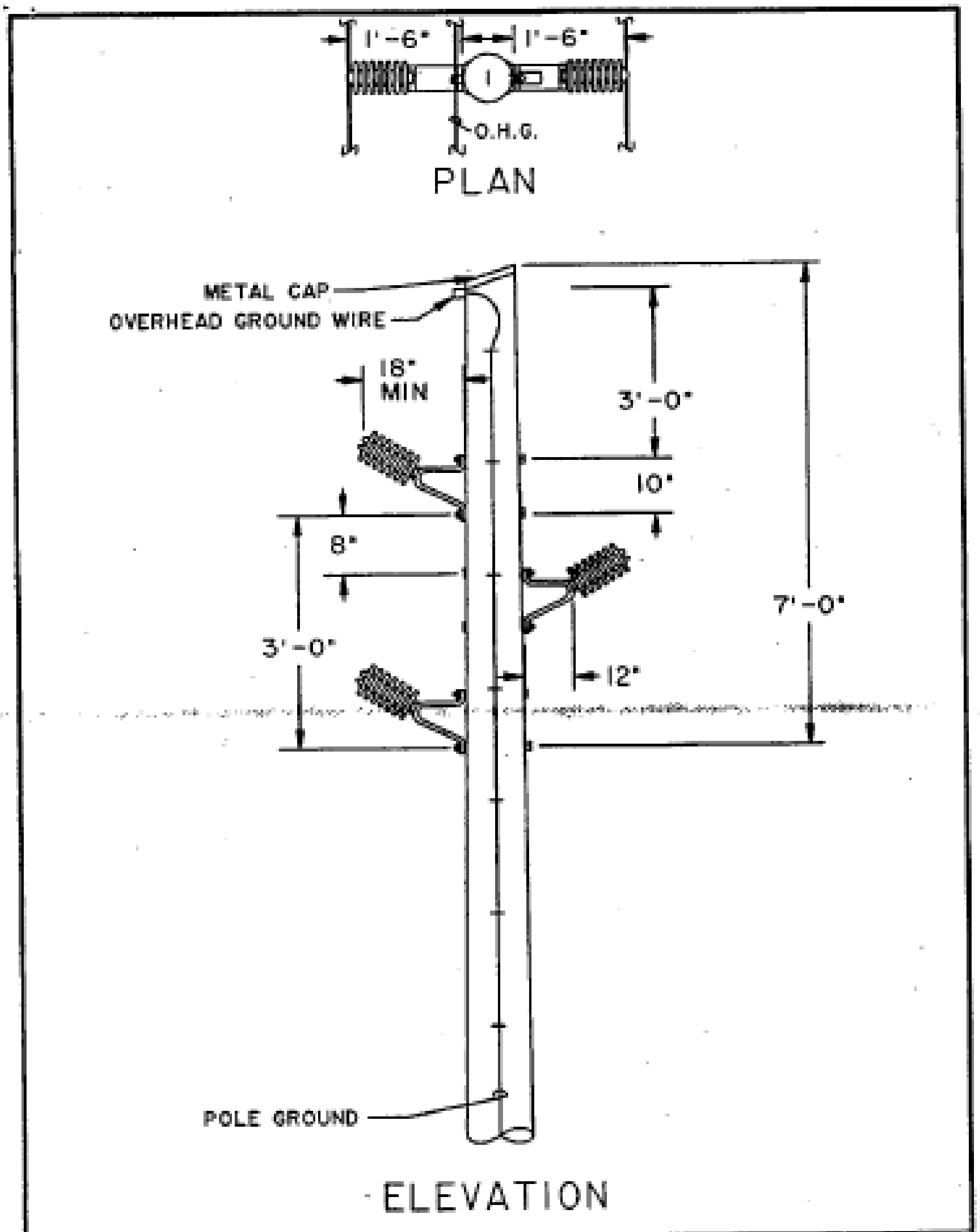


PREFORMED GUY GRIP
1. INSTALL TRAFFIC GUARD WHERE GUY IS ACROSS PATHS OF PEDESTRIAN TRAVEL OR IS EXPOSED TO VEHICLES.
2. LEAD SHOULD EQUAL HEIGHT AND MUST NOT BE LESS THAN 1/3 HEIGHT.
3. FIBERGLASS STRAIN INSULATOR TO BE INSTALLED ONLY WHERE REQUIRED FOR CLEARANCE FROM ENERGIZED CONDUCTORS.
HEIGHT
F. G. STRAIN INSULATOR SEE NOTE 3
#6 HDB CU GROUND WIRE
TREATED POLE - SIZE & CLASS AS REQUIRED
PREFORMED GUY GRIP
1/2" RIGID STEEL CONDUIT (18" ABOVE GRADE TO 6" BELOW GRADE)
LEAD
12"
36"
SCREW TYPE ANCHOR SIZE AS REQUIRED
GROUND ROD 3/4" X 10' MIN.
TITLE POLE GUY & GROUNDING DETAIL
SSC CONSTRUCTION STANDARDS
DATE 12/5/88
SHT NO B-1

FIGURE B-1



TITLE 3Ø TANGENT POLE - SINGLE CIRCUIT ARMLESS

SSC CONSTRUCTION STANDARDS | DATE 11/29/88 | SHT NO C-1

FIGURE C-1

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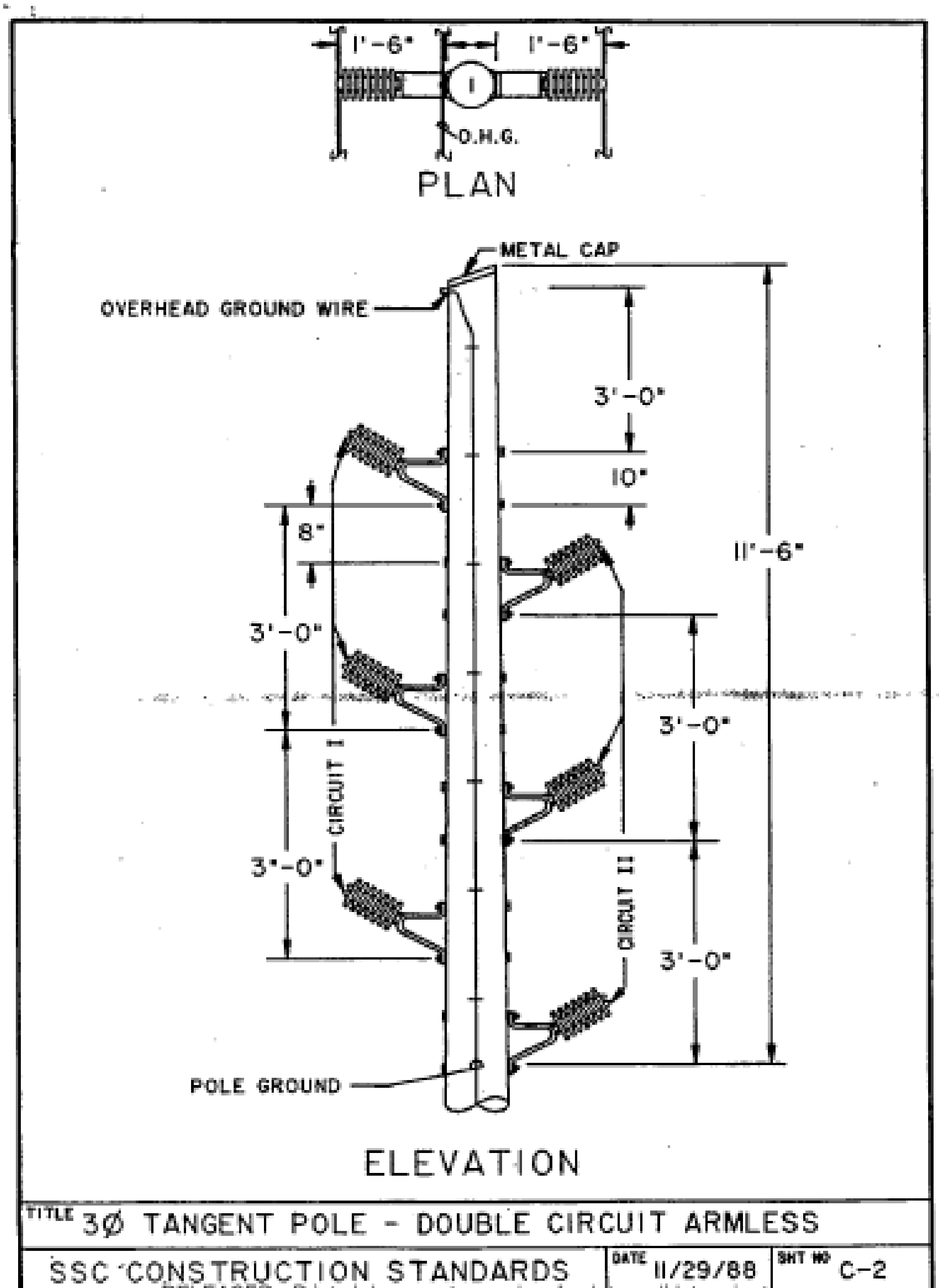
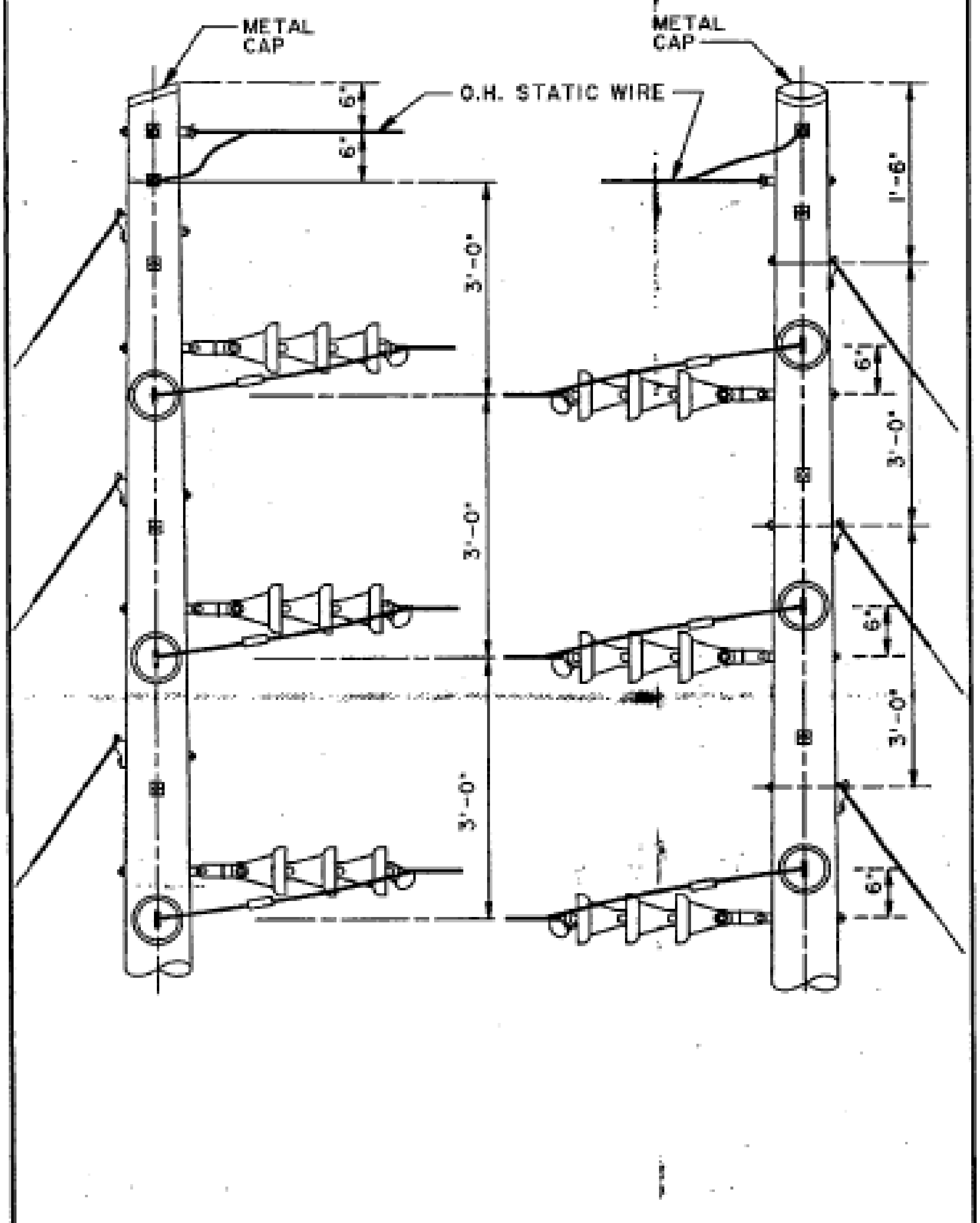


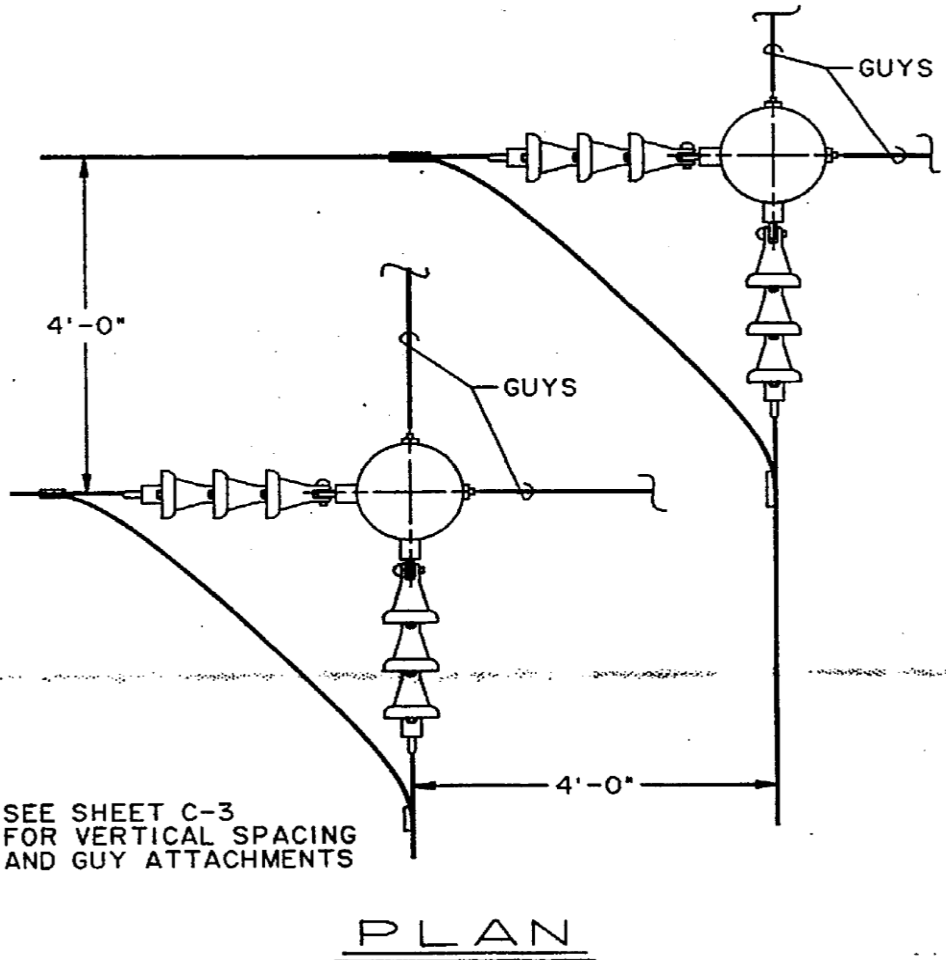
1'-6"
1'-6"
O.H.G.
PLAN
METAL CAP
OVERHEAD GROUND WIRE
3'-0"
10"
8"
11'-6"
3'-0"
3'-0"
CIRCUIT I
3'-0"
CIRCUIT II
3'-0"
POLE GROUND
ELEVATION
TITLE 3Ø TANGENT POLE - DOUBLE CIRCUIT ARMLESS
SSC CONSTRUCTION STANDARDS
DATE 11/29/88
SHT NO C-2

FIGURE C-2



TITLE 3Ø PRIMARY VERTICAL DOUBLE DEAD END, 60° TO 90°		
SSC CONSTRUCTION STANDARDS	DATE 11/29/88	SHT NO C-3

 FIGURE C-3
RELEASED - Printed documents may be obsolete; validate prior to use.

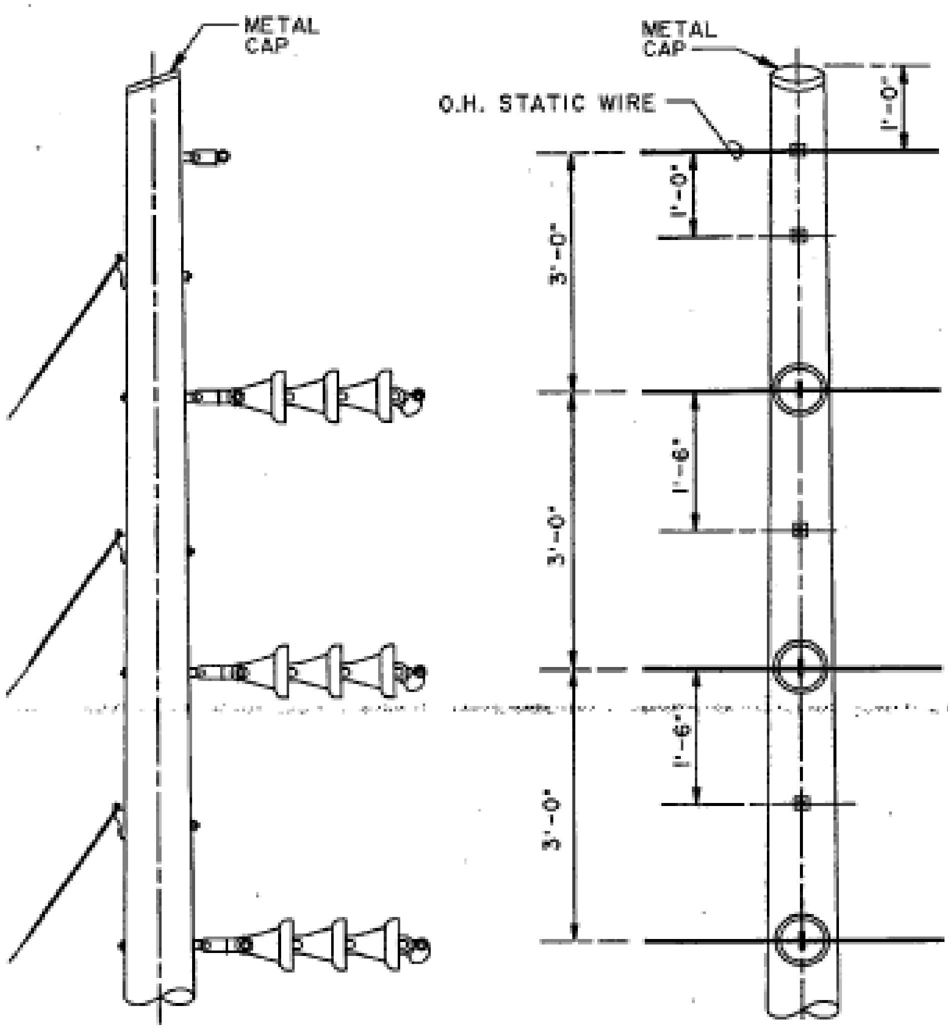


NOTE:
1. SINGLE O.H. GROUND WIRE ON ADJACENT POLES TO BE BRANCHED FOR ATTACHMENT TO BOTH ANGLE POLES.

TITLE 3Ø DOUBLE CKT VERT. CONST. FOR 60° TO 90° ANG.		
SSC CONSTRUCTION STANDARDS	DATE 11/29/88	SHT NO C-4

RELEASED - Printed documents may be obsolete; validate prior to use.

FIGURE C-4



SEE SHT A-4 FOR ALLOWABLE ANGLES

TITLE 3Ø PRIMARY VERTICAL ANGLE CONSTRUCTION		
SSC CONSTRUCTION STANDARDS	DATE 11/29/88	SHT NO C-5

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FIGURE C-5

RELEASED - Printed documents may be obsolete; validate prior to use.

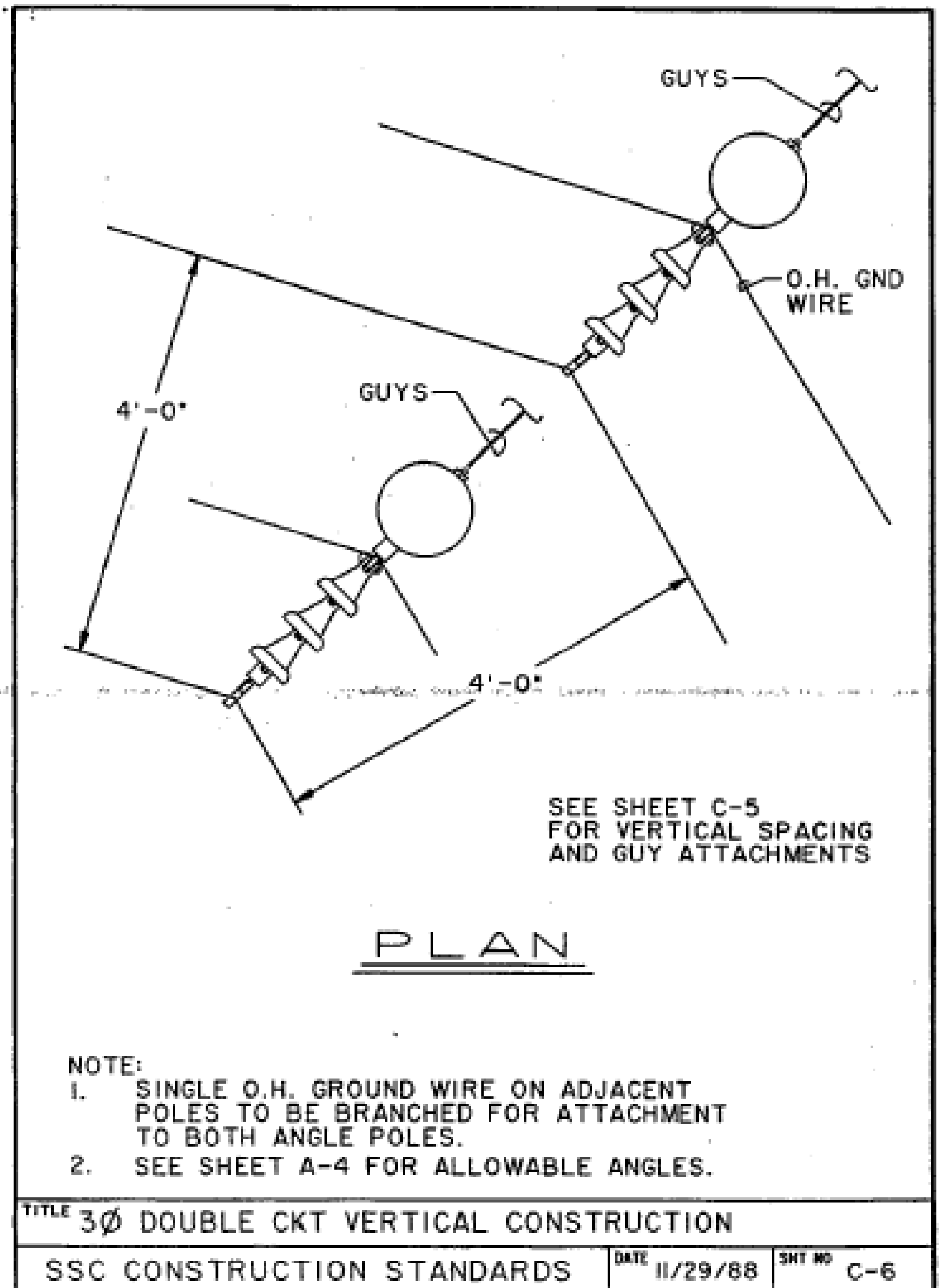
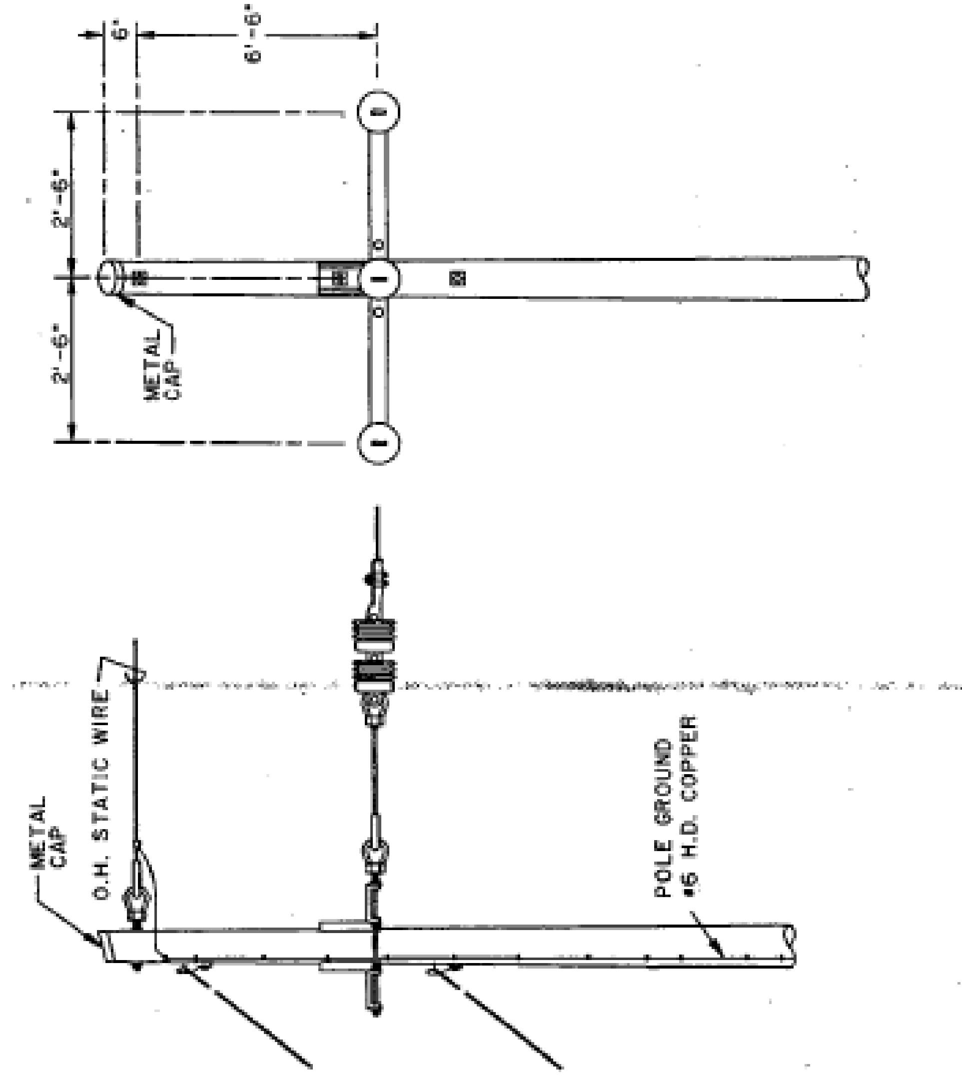


FIGURE C-6
RELEASED - Printed documents may be obsolete; validate prior to use.



NOTES:
1. SEE SHT.B-1 FOR DETAIL OF PRIMARY GUYS.
2. THE MAXIMUM ALLOWABLE LOADED TENSION PER CONDUCTOR FOR THIS CONSTRUCTION IS 4350 POUNDS.

TITLE PRIMARY DEADEND ON DOUBLE STEEL CROSS-ARM		
SSC CONSTRUCTION STANDARDS	DATE 12/6/88	SHT NO C-7

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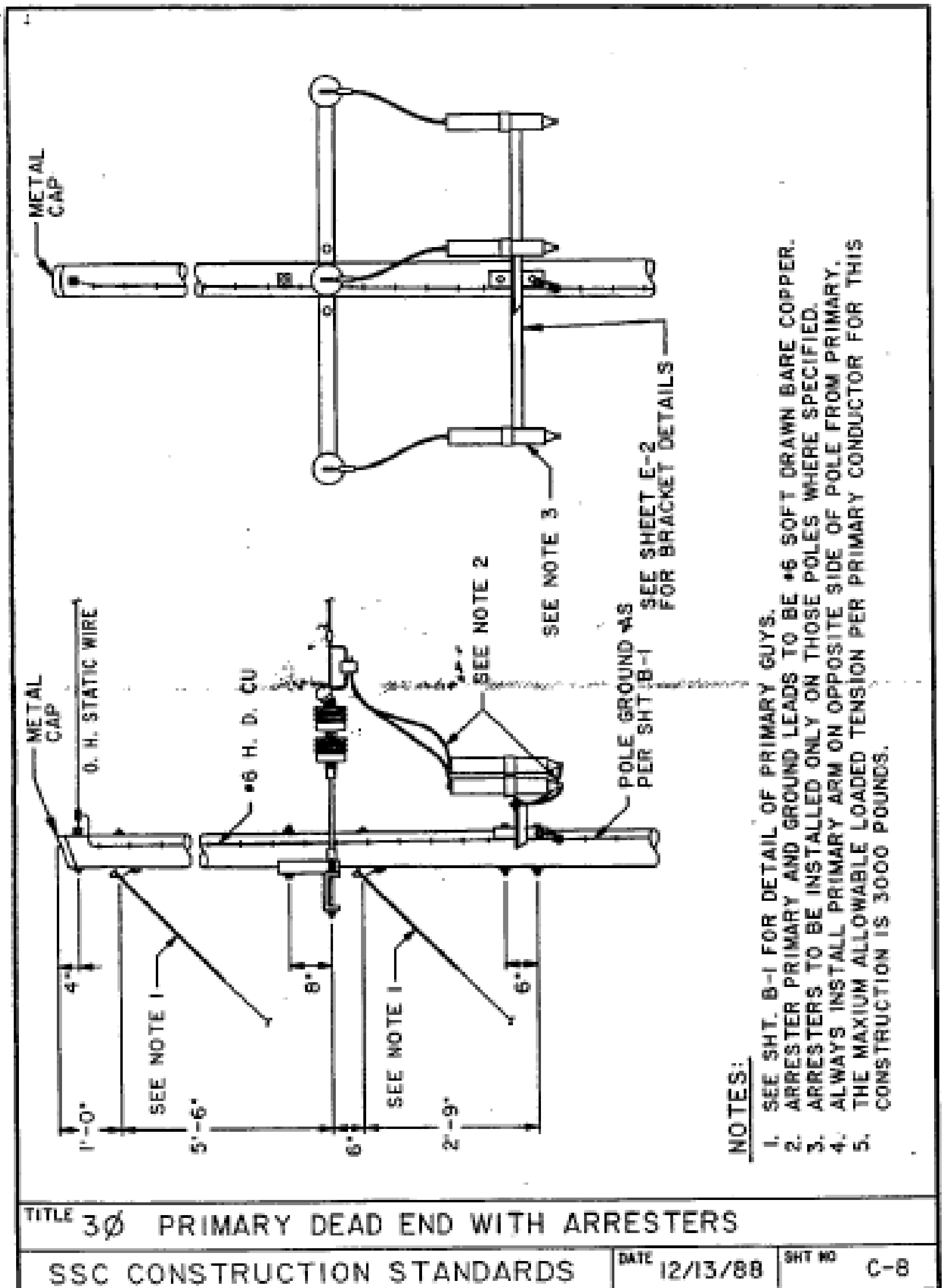
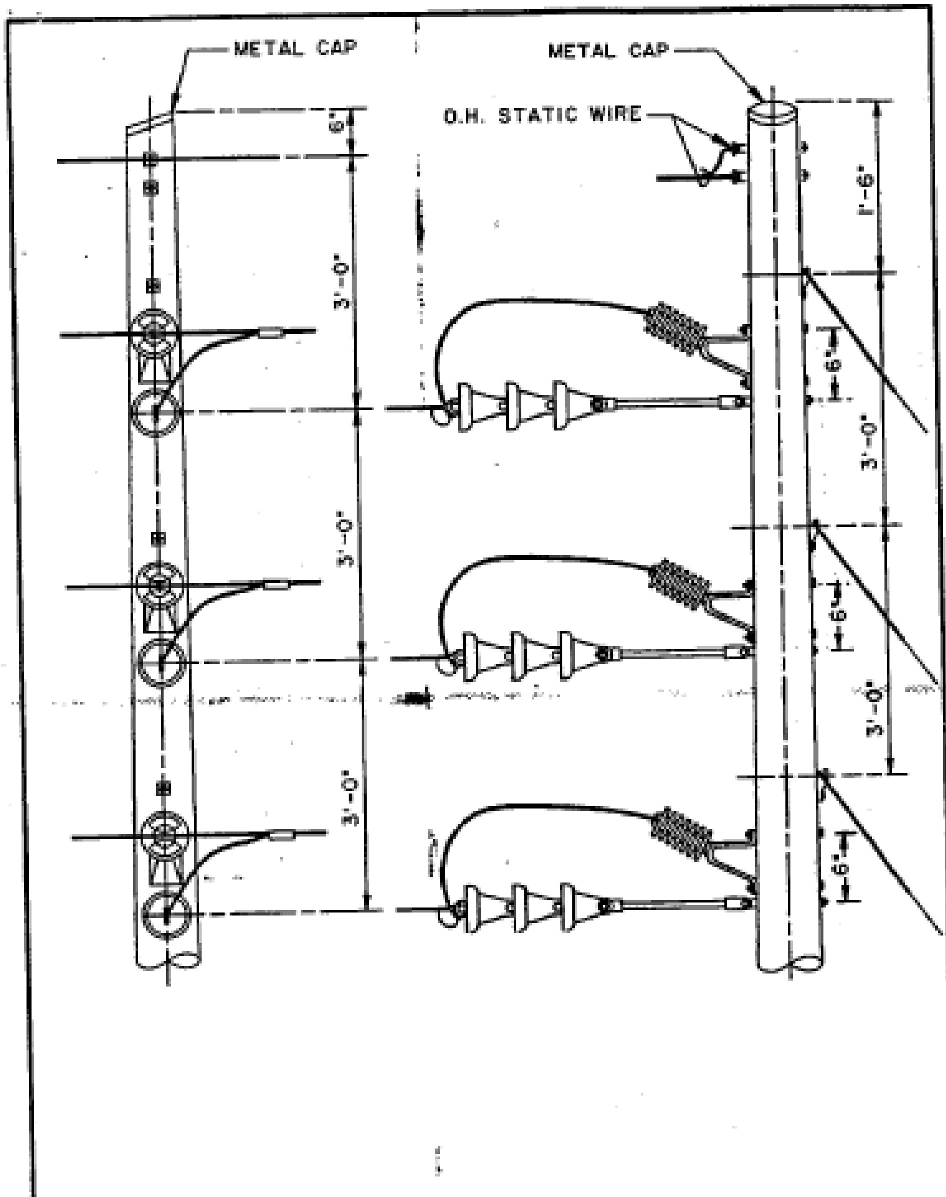
RELEASED - Printed documents may be obsolete; validate prior to use.



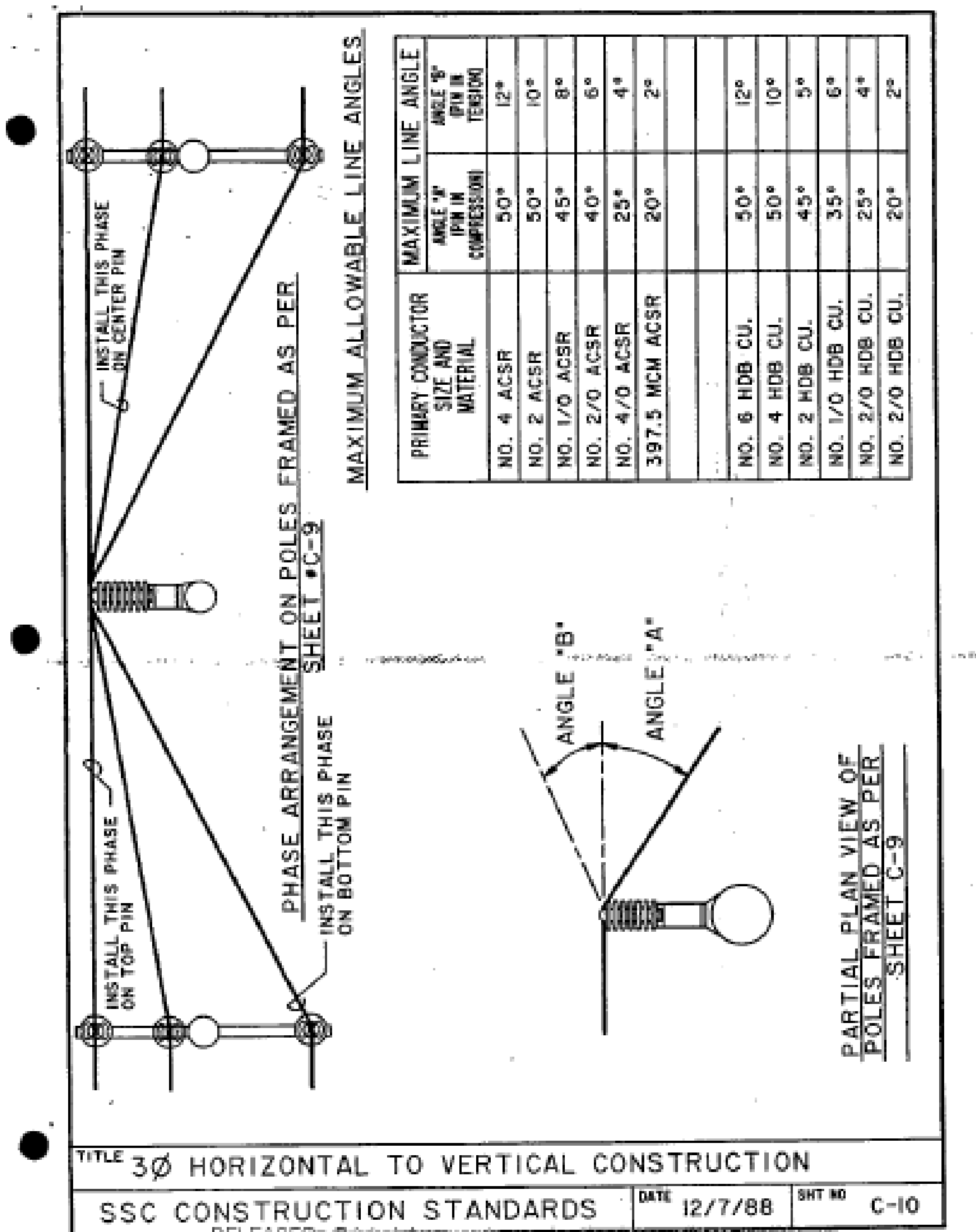
METAL CAP
METAL CAP
O. H. STATIC WIRE
#6 H. D. CU
SEE NOTE 2
SEE NOTE 3
POLE GROUND #4S PER SHT B-1
SEE SHEET E-2 FOR BRACKET DETAILS
SEE NOTE 1
SEE NOTE 1
4"
8"
6"
1'-0"
5'-6"
6"
2'-9"
NOTES:
1. SEE SHT. B-1 FOR DETAIL OF PRIMARY GUYS.
2. ARRESTER PRIMARY AND GROUND LEADS TO BE #6 SOFT DRAWN BARE COPPER.
3. ARRESTERS TO BE INSTALLED ONLY ON THOSE POLES WHERE SPECIFIED.
4. ALWAYS INSTALL PRIMARY ARM ON OPPOSITE SIDE OF POLE FROM PRIMARY.
5. THE MAXIUM ALLOWABLE LOADED TENSION PER PRIMARY CONDUCTOR FOR THIS CONSTRUCTION IS 3000 POUNDS.
TITLE 3Ø PRIMARY DEAD END WITH ARRESTERS
SSC CONSTRUCTION STANDARDS
DATE 12/13/88
SHT NO C-8



TITLE 3Ø TAPS OFF 3Ø ON LINES - VERTICAL CONSTRUCTION				
SSC CONSTRUCTION STANDARDS	DATE	11/29/88	SHT NO	C-9

FIGURE C-9
RELEASED - Printed documents may be obsolete; validate prior to use.

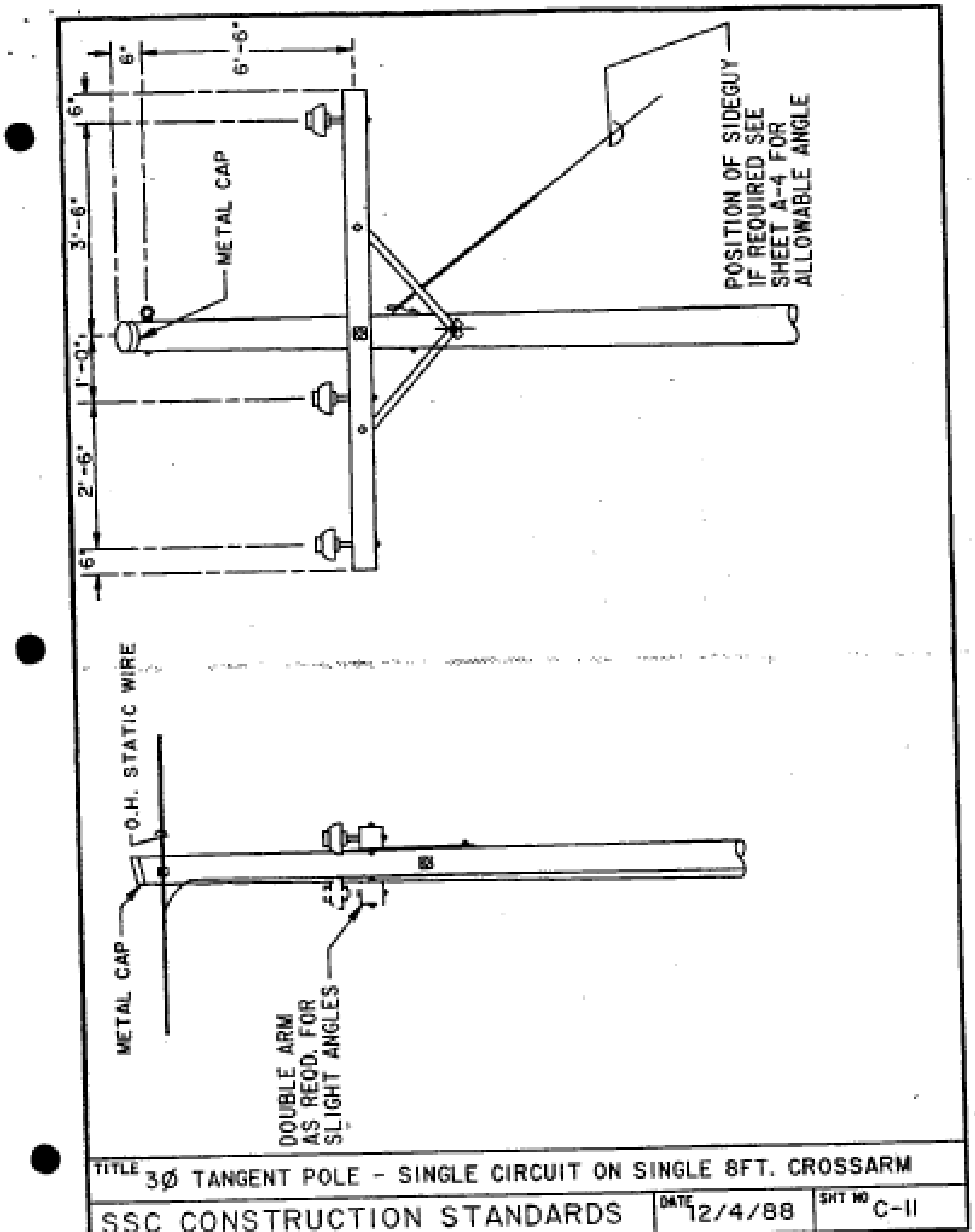
SUBJECT: Standard For The 13.8KV Distribution System



PRIMARY CONDUCTOR SIZE AND MATERIAL	MAXIMUM LINE ANGLE: ANGLE "A" (PIN IN COMPRESSION)	MAXIMUM LINE ANGLE: ANGLE "B" (PIN IN TENSION)
NO. 4 ACSR	50°	12°
NO. 2 ACSR	50°	10°
NO. 1/0 ACSR	45°	8°
NO. 2/0 ACSR	40°	6°
NO. 4/0 ACSR	25°	4°
397.5 MCM ACSR	20°	2°
NO. 6 HDB CU.	50°	12°
NO. 4 HDB CU.	50°	10°
NO. 2 HDB CU.	45°	5°
NO. 1/0 HDB CU.	35°	6°
NO. 2/0 HDB CU.	25°	4°
NO. 2/0 HDB CU.	20°	2°

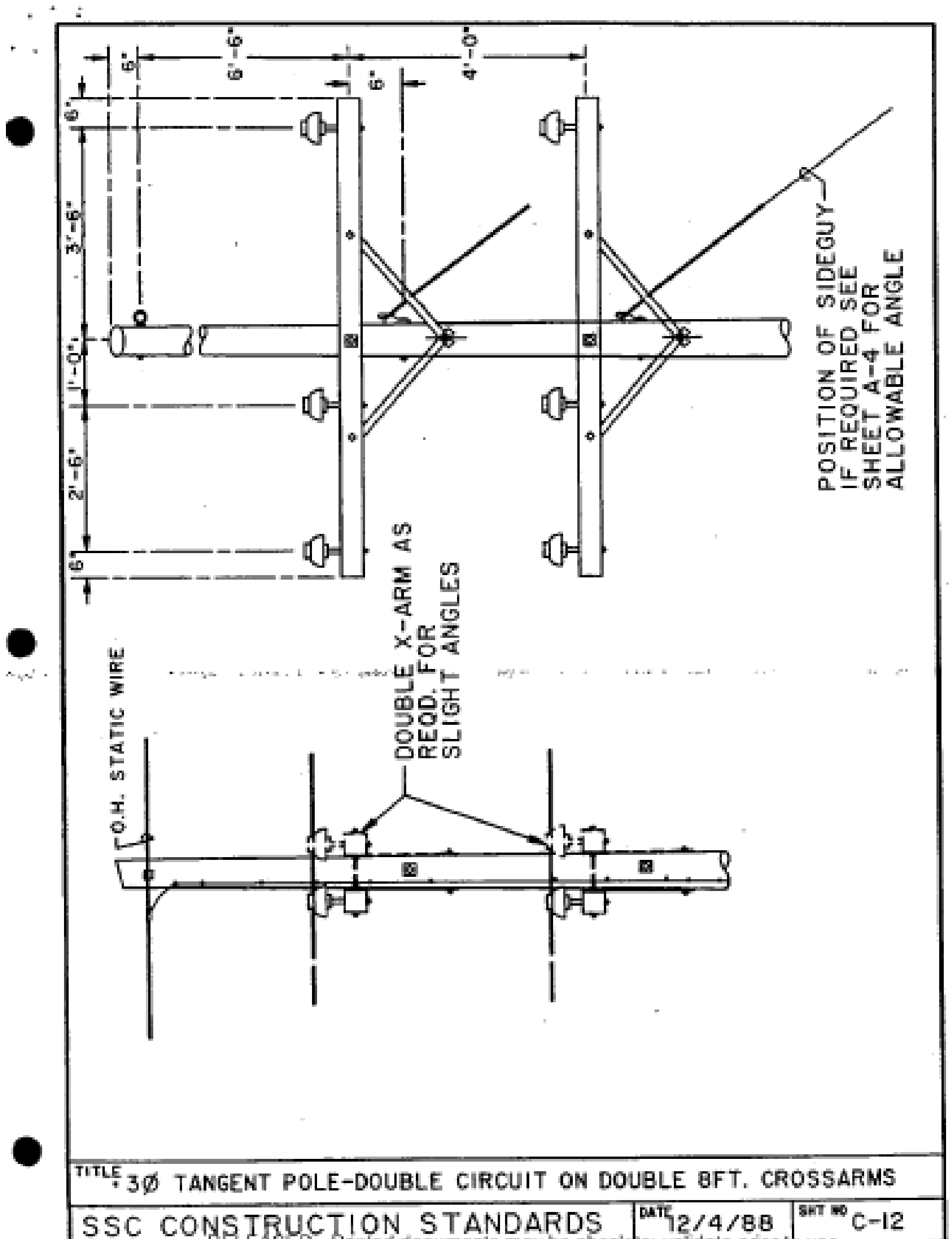
FIGURE C-10

RELEASED - Printed documents may be obsolete; validate prior to use.



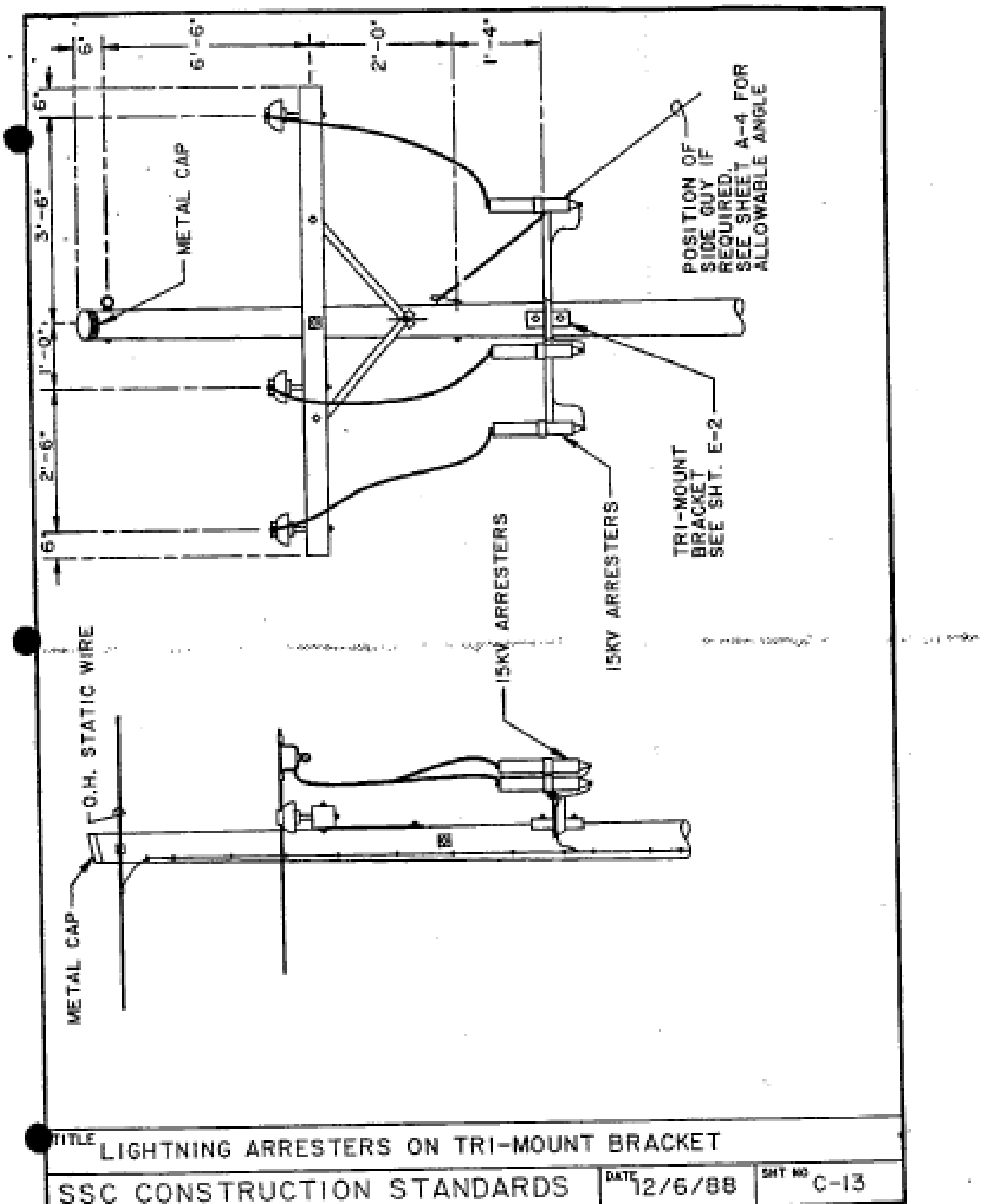
6"
6'-6"
6"
3'-6"
1'-0"
2'-6"
6"
METAL CAP
POSITION OF SIDEGUY IF REQUIRED SEE SHEET A-4 FOR ALLOWABLE ANGLE
O.H. STATIC WIRE
METAL CAP
DOUBLE ARM AS REQD. FOR SLIGHT ANGLES
TITLE 3Ø TANGENT POLE - SINGLE CIRCUIT ON SINGLE 8FT. CROSSARM
SSC CONSTRUCTION STANDARDS
DATE 12/4/88
SHT NO C-11

FIGURE C-11



RELEASED - Printed documents may be obsolete; validate prior to use.

FIGURE C-12



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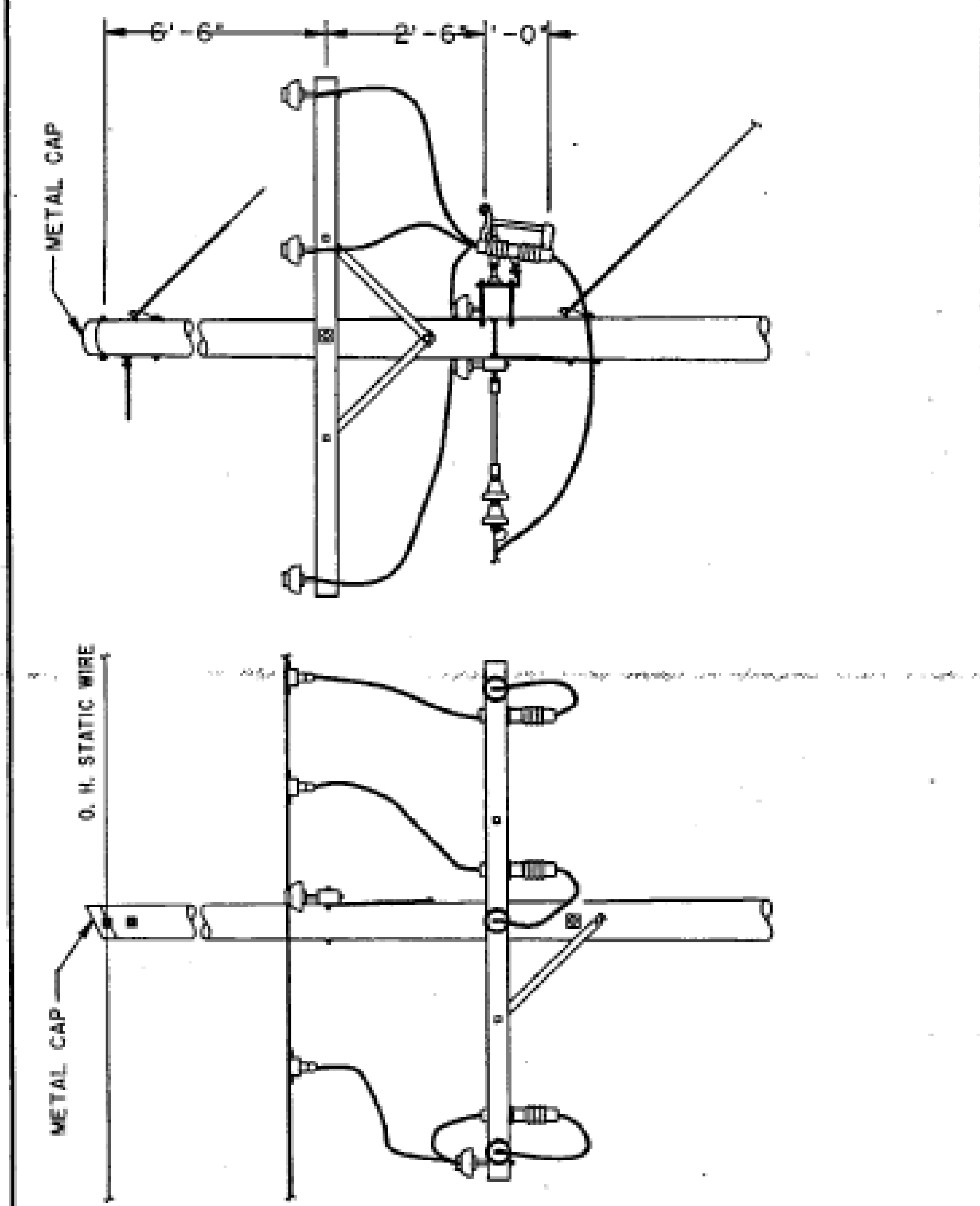
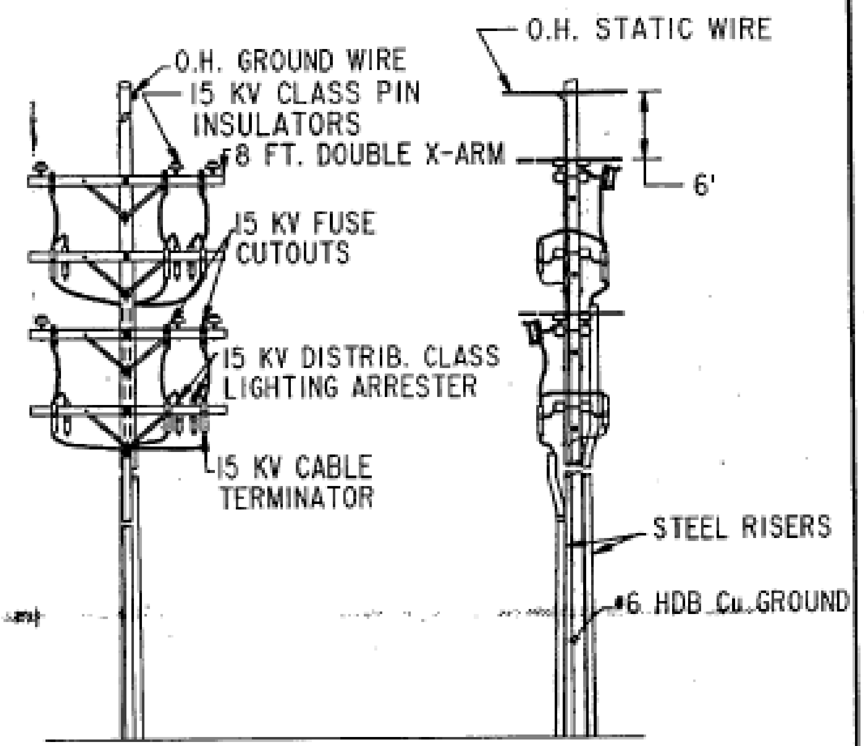
RELEASED - Printed documents may be obsolete; validate prior to use.



TITLE 3Ø TAP OFF 3Ø LINE USING CROSSARM CONSTRUCTION

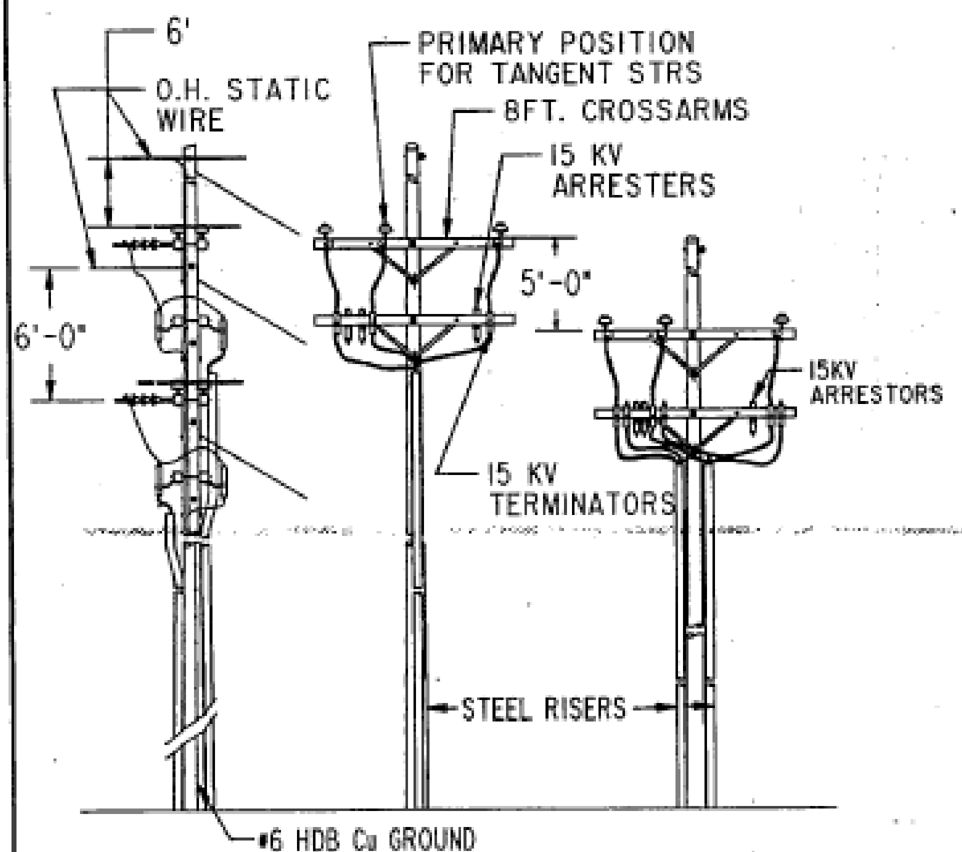
SSC CONSTRUCTION STANDARDS DATE 11/22/88 SHT NO C-14

FIGURE C-14



TITLE TYPICAL DUAL RISER CONFIGURATION		
SSC CONSTRUCTION STANDARDS	DATE 3/27/89	SHT NO C-15

 FIGURE C-15
RELEASED - Printed documents may be obsolete; validate prior to use.

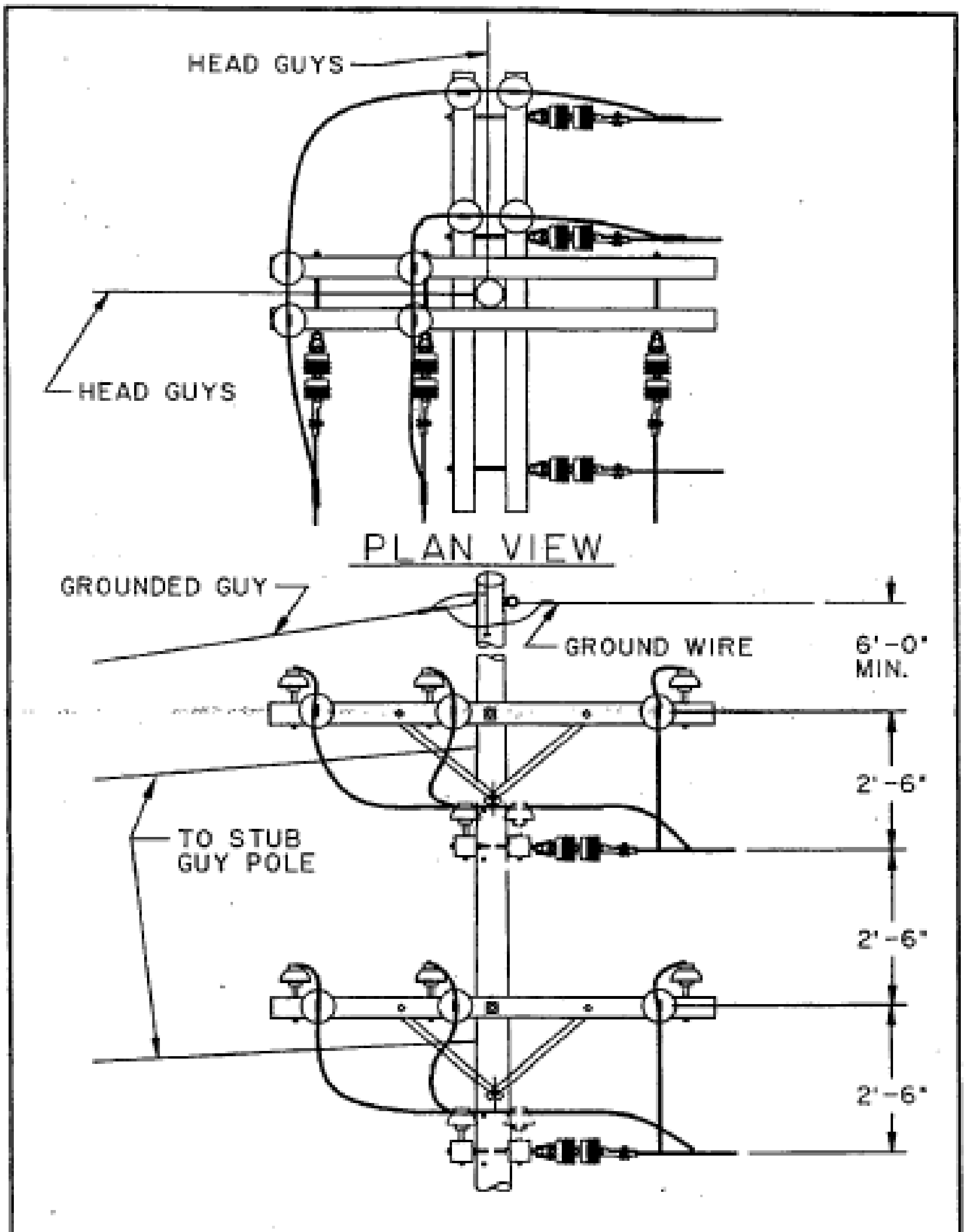


TITLE DEADEND DUAL RISER		
SSC CONSTRUCTION STANDARDS	DATE 3/27/89	SHT NO C-16

 FIGURE C-16

RELEASED - Printed documents may be obsolete; validate prior to use.

RELEASED - Printed documents may be obsolete; validate prior to use.



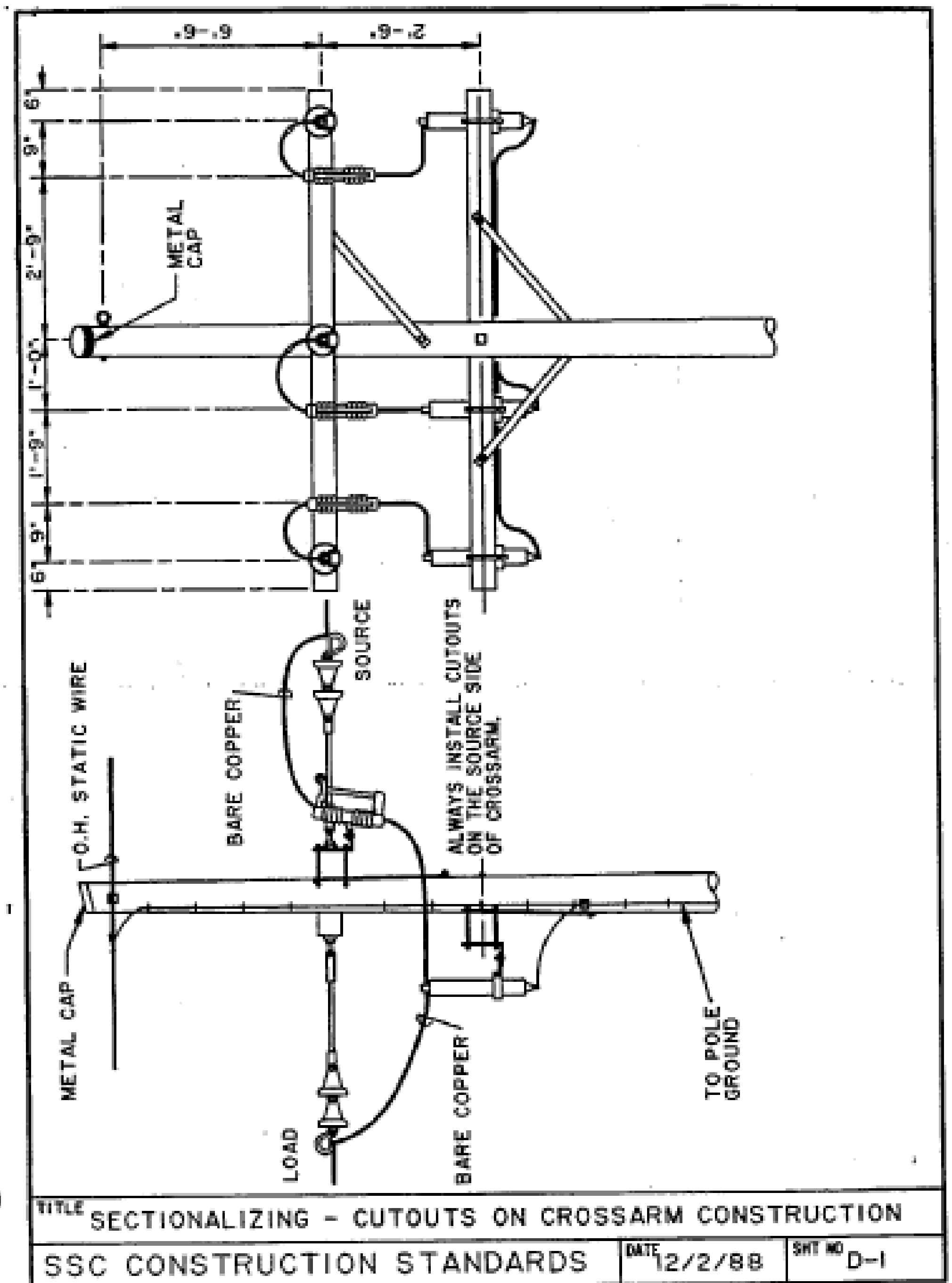
TITLE TYPICAL CORNER CONSTRUCTION 60° TO 120°

SSC CONSTRUCTION STANDARDS DATE 11/29/88 SHT NO C-17

 FIGURE C-17

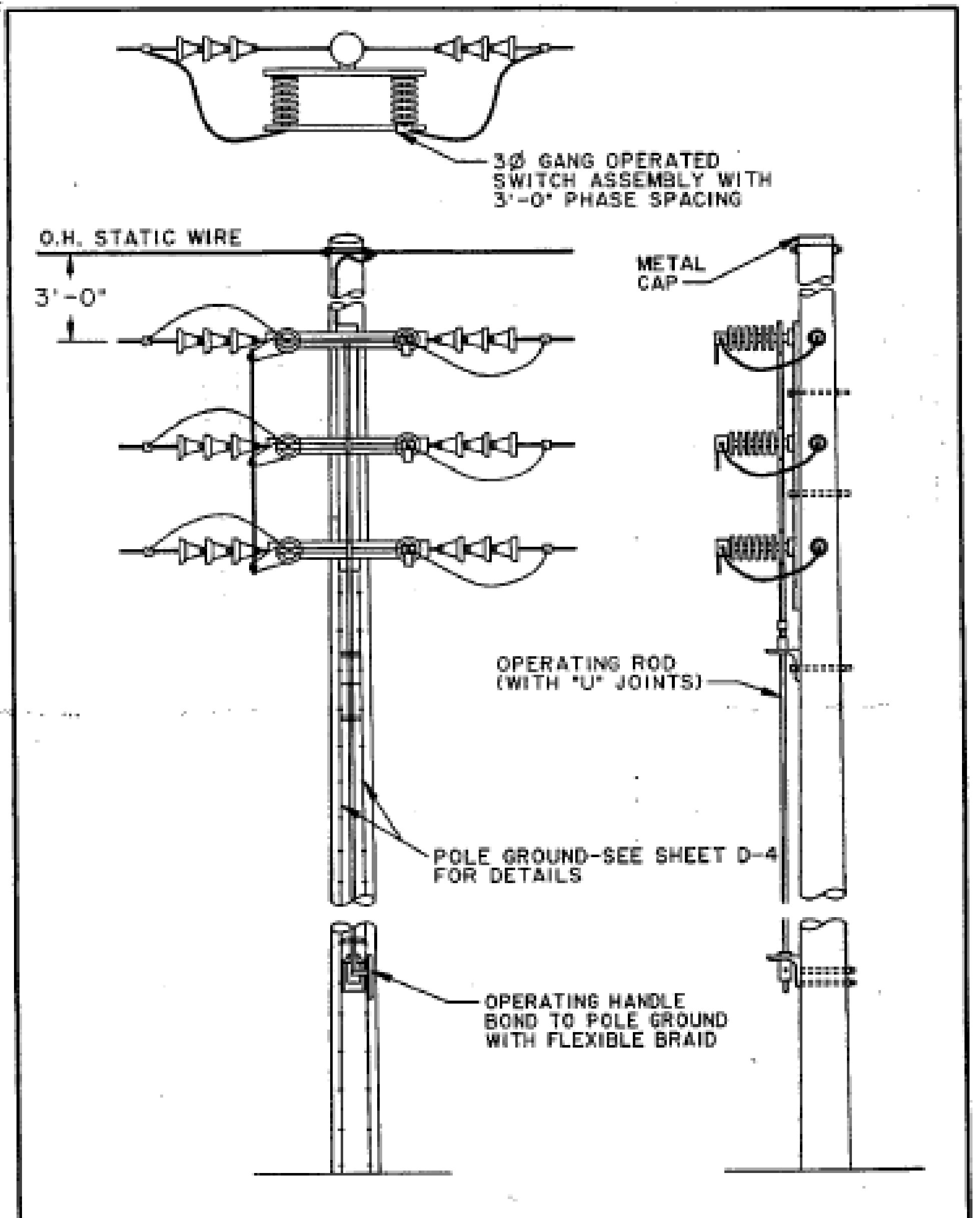
RELEASED - Printed documents may be obsolete; validate prior to use.

RELEASED - Printed documents may be obsolete; validate prior to use.



RELEASED - Printed documents may be obsolete; validate prior to use.

RELEASED - Printed documents may be obsolete; validate prior to use.



TITLE SECTIONALIZING-3Ø G.O.A.B. SWITCH USING ARMLESS CONSTRUCTION

SSC CONSTRUCTION STANDARDS	DATE 2/14/89	SHT NO D-2

FIGURE D-2

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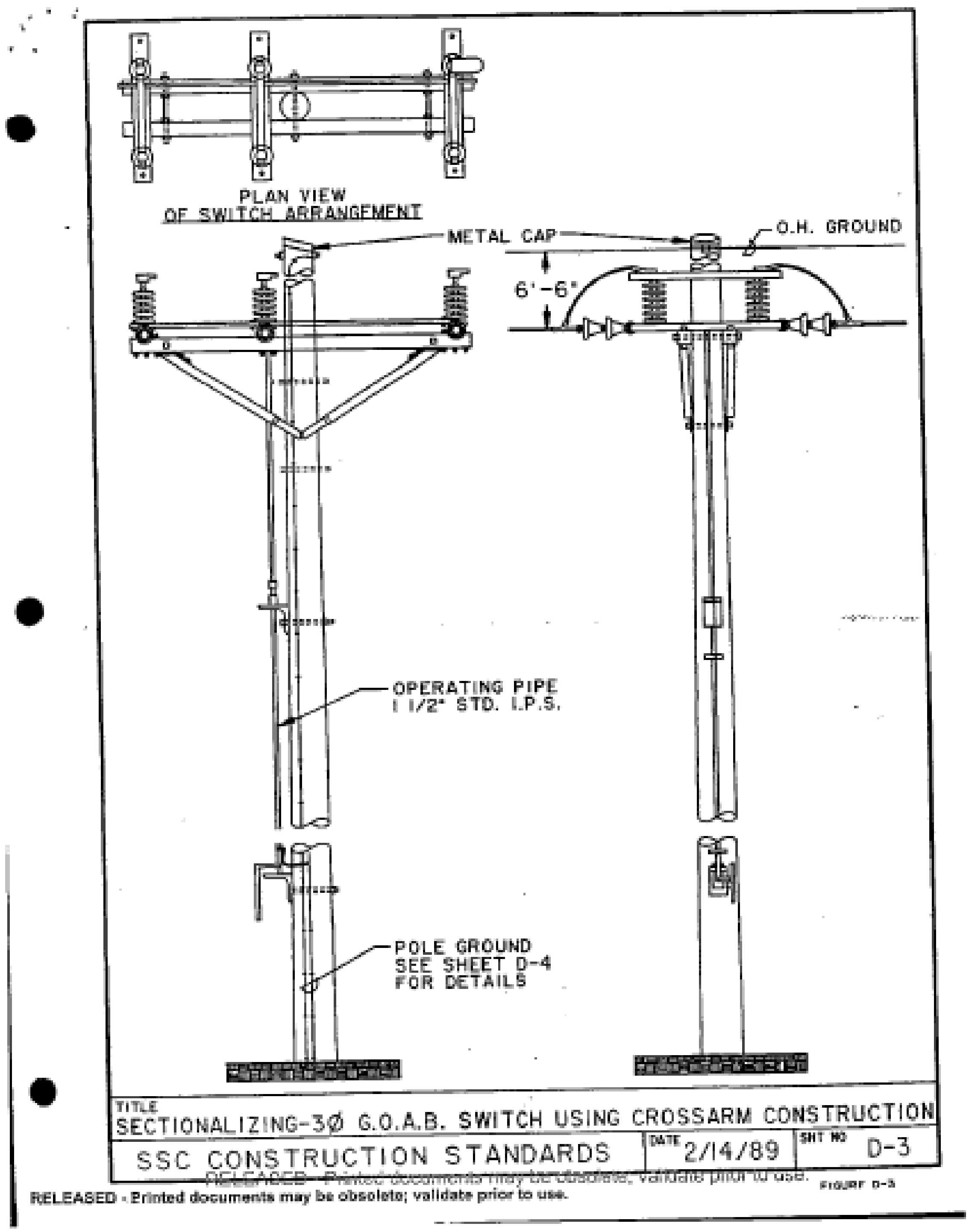

PLAN VIEW
OF SWITCH ARRANGEMENT
METAL CAP
O.H. GROUND
6'-6"
OPERATING PIPE
1 1/2" STD. I.P.S.
POLE GROUND
SEE SHEET D-4
FOR DETAILS
TITLE
SECTIONALIZING-3Ø G.O.A.B. SWITCH USING CROSSARM CONSTRUCTION
SSC CONSTRUCTION STANDARDS
DATE 2/14/89
SHT NO D-3
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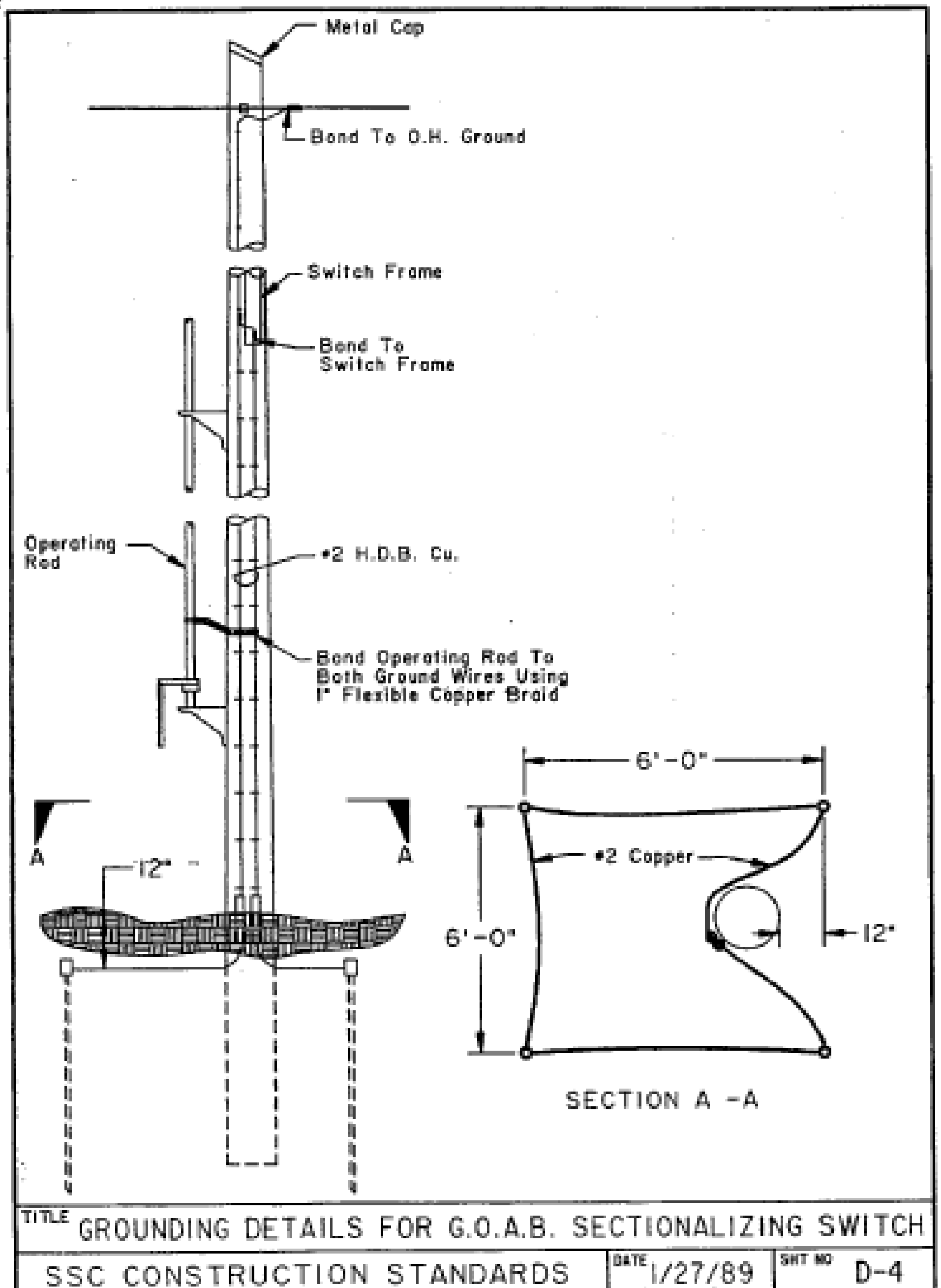
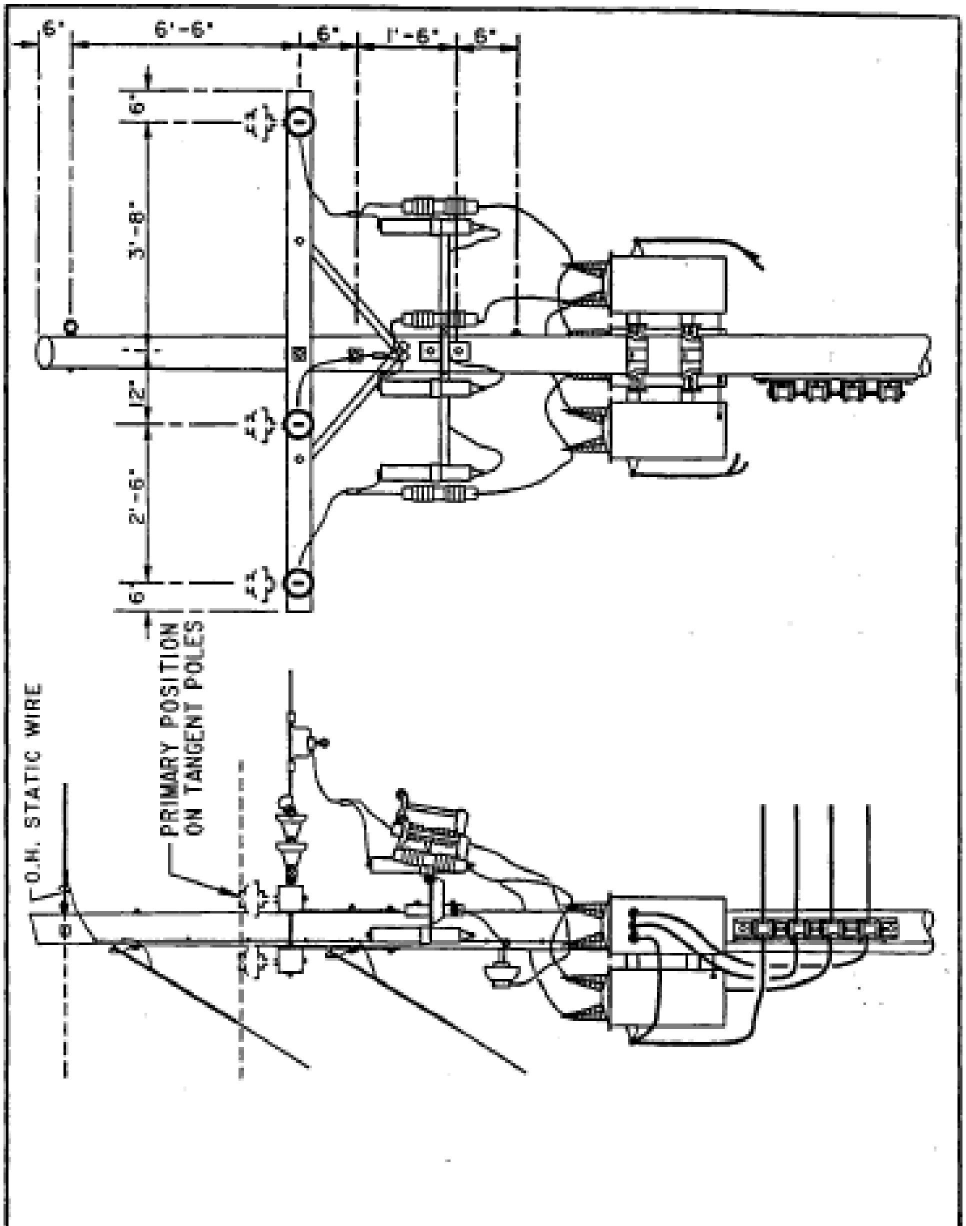


Metal Cap
Bond To O.H. Ground
Switch Frame
Bond To Switch Frame
Operating Rod
#2 H.D.B. Cu.
Bond Operating Rod To Both Ground Wires Using 1" Flexible Copper Braid
A
A
12"
6'-0"
6'-0"
#2 Copper
12"
SECTION A -A
TITLE GROUNDING DETAILS FOR G.O.A.B. SECTIONALIZING SWITCH
SSC CONSTRUCTION STANDARDS
DATE 1/27/89
SHT NO D-4

FIGURE D-4



TITLE
TRANSFORMER BANK ON DEADEND OR TANGENT POLE

SSC CONSTRUCTION STANDARDS	DATE 12/4/88	SHT NO E-1

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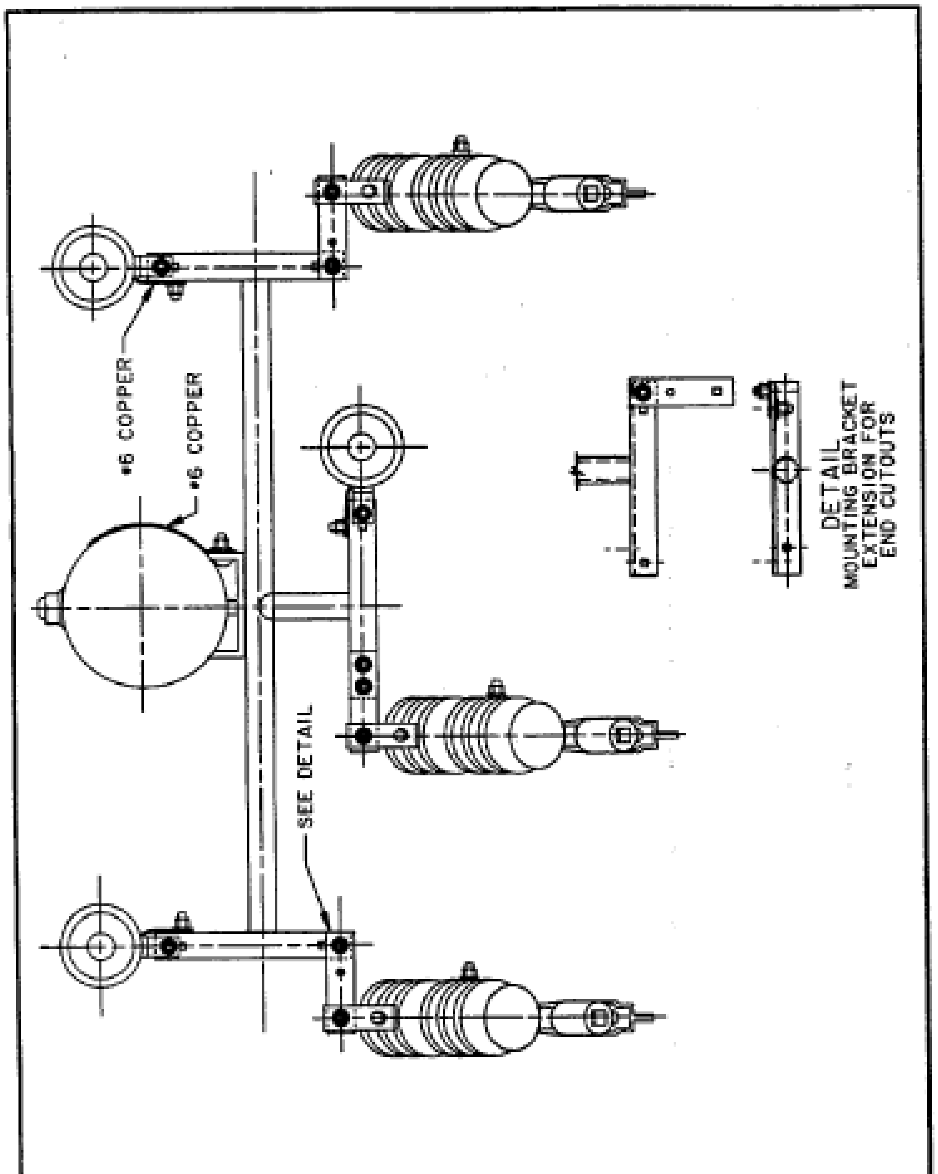
SUBJECT: Standard For The 13.8KV Distribution System



TITLE
TRI-MOUNT BRACKET CUTOUTS AND ARRESTER MOUNTING ASSEMBLY

SSC CONSTRUCTION STANDARDS	DATE 12/9/88	SHT NO E-2

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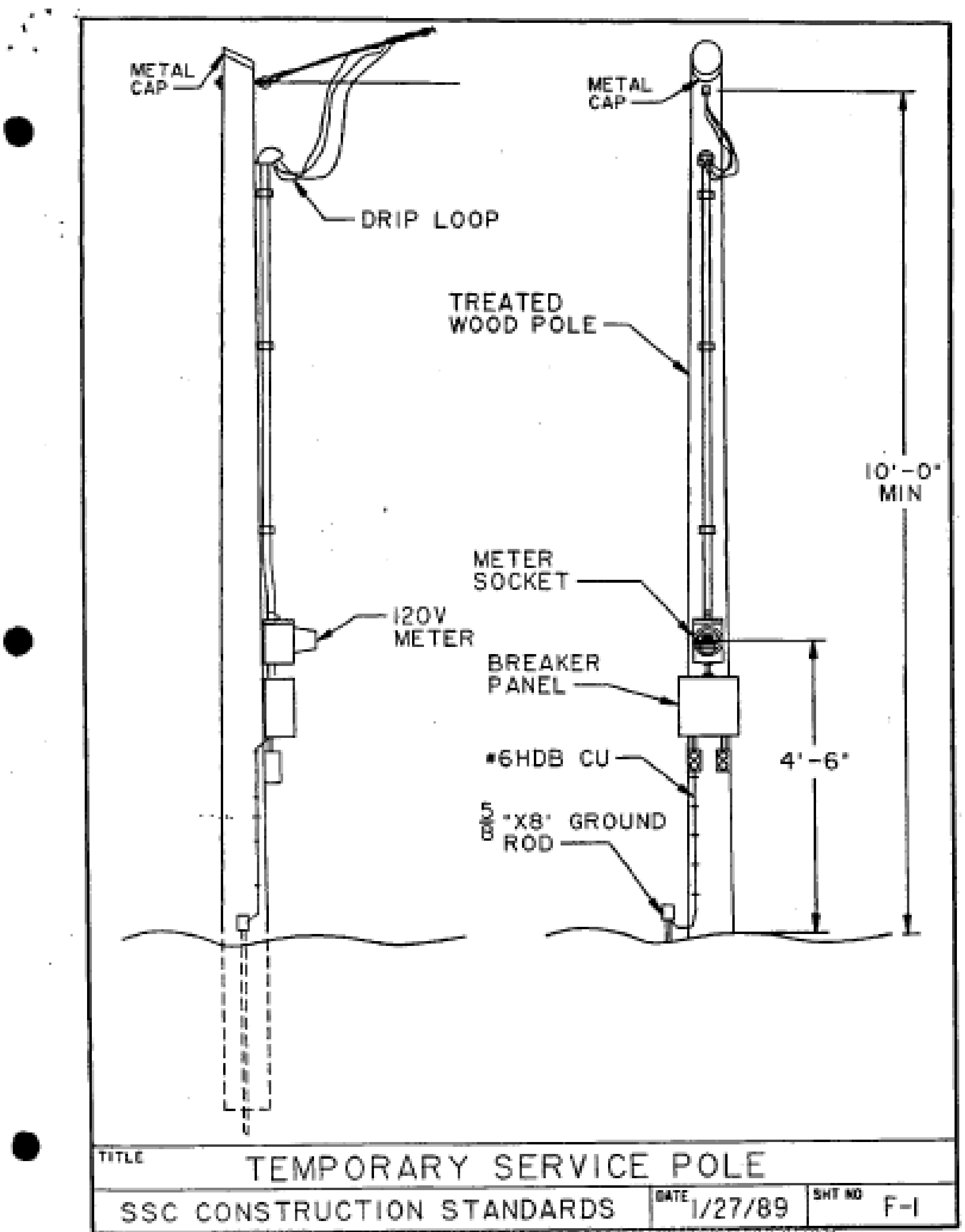
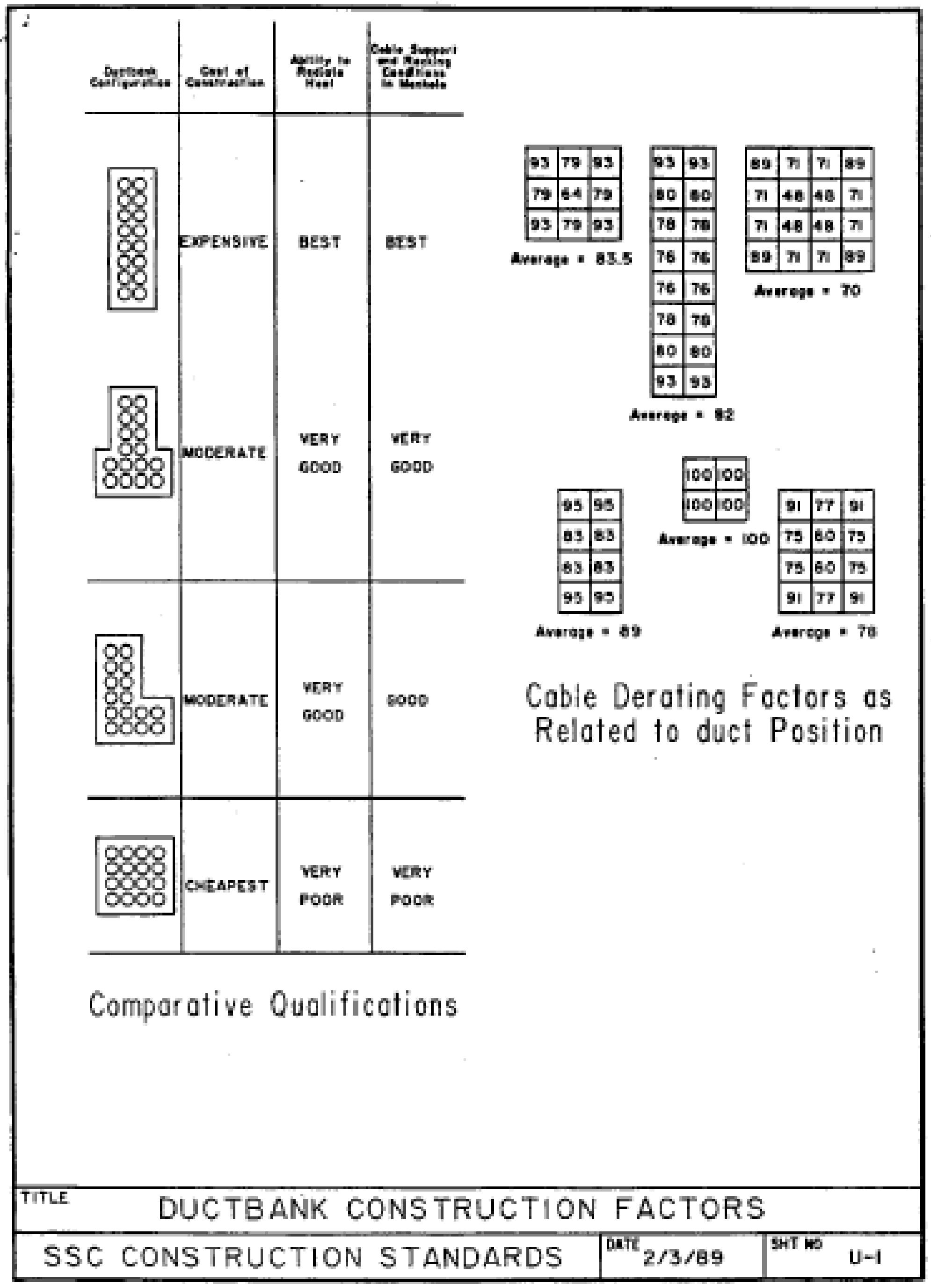


METAL CAP
DRIP LOOP
METAL CAP
TREATED WOOD POLE
10'-0" MIN
METER SOCKET
120V METER
BREAKER PANEL
#6HDB CU
4'-6"
5/8"X8' GROUND ROD
TITLE
TEMPORARY SERVICE POLE
SSC CONSTRUCTION STANDARDS
DATE 1/27/89
SHT NO F-1

FIGURE F-1



STD.ELEC.U-1 RELEASED - Printed documents may be obsolete; validate prior to use. FIGURE U-1

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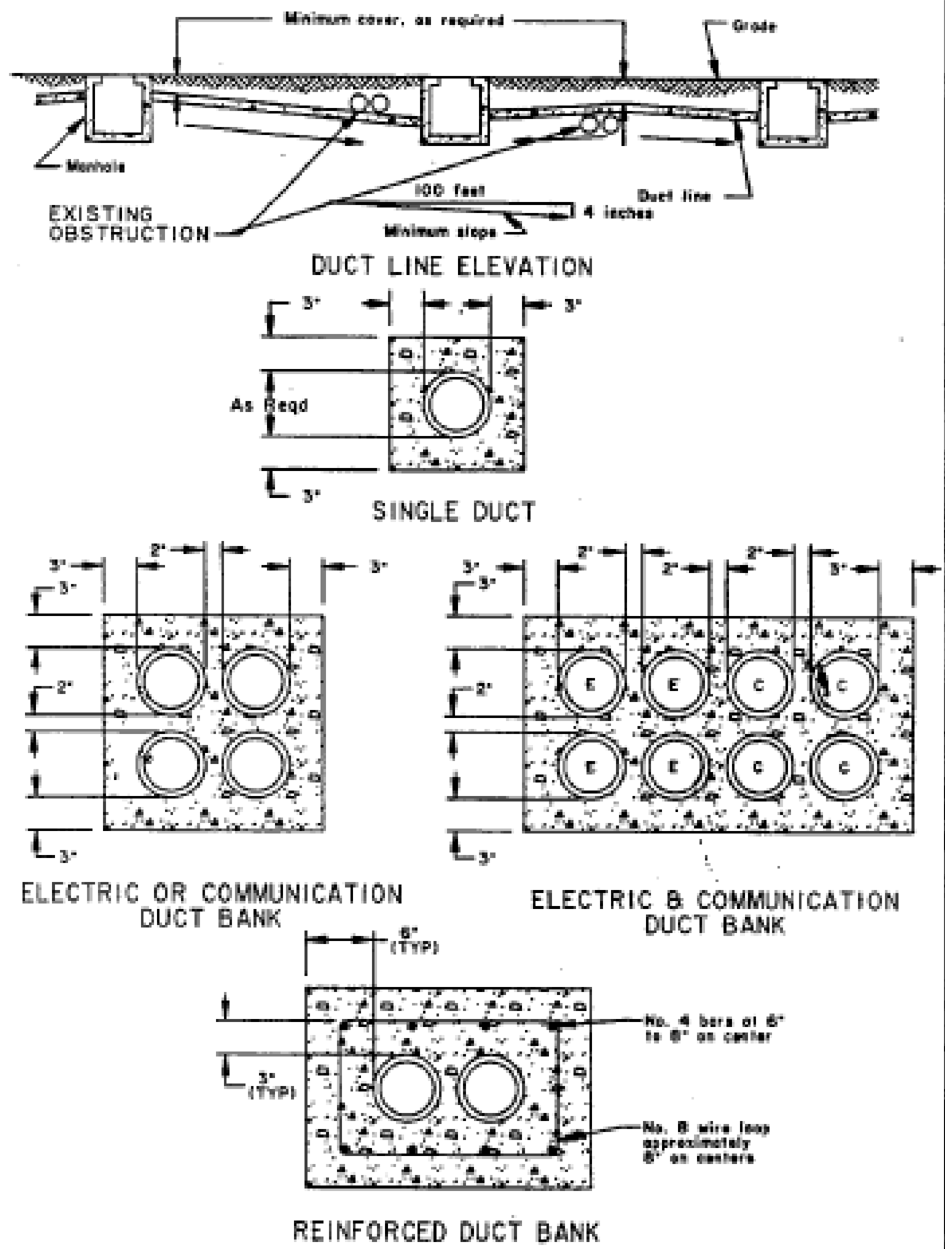

TITLE	TYPICAL DUCTBANK CONSTRUCTION		
SSC CONSTRUCTION STANDARDS	DATE 2/8/89	SHT NO	U-2

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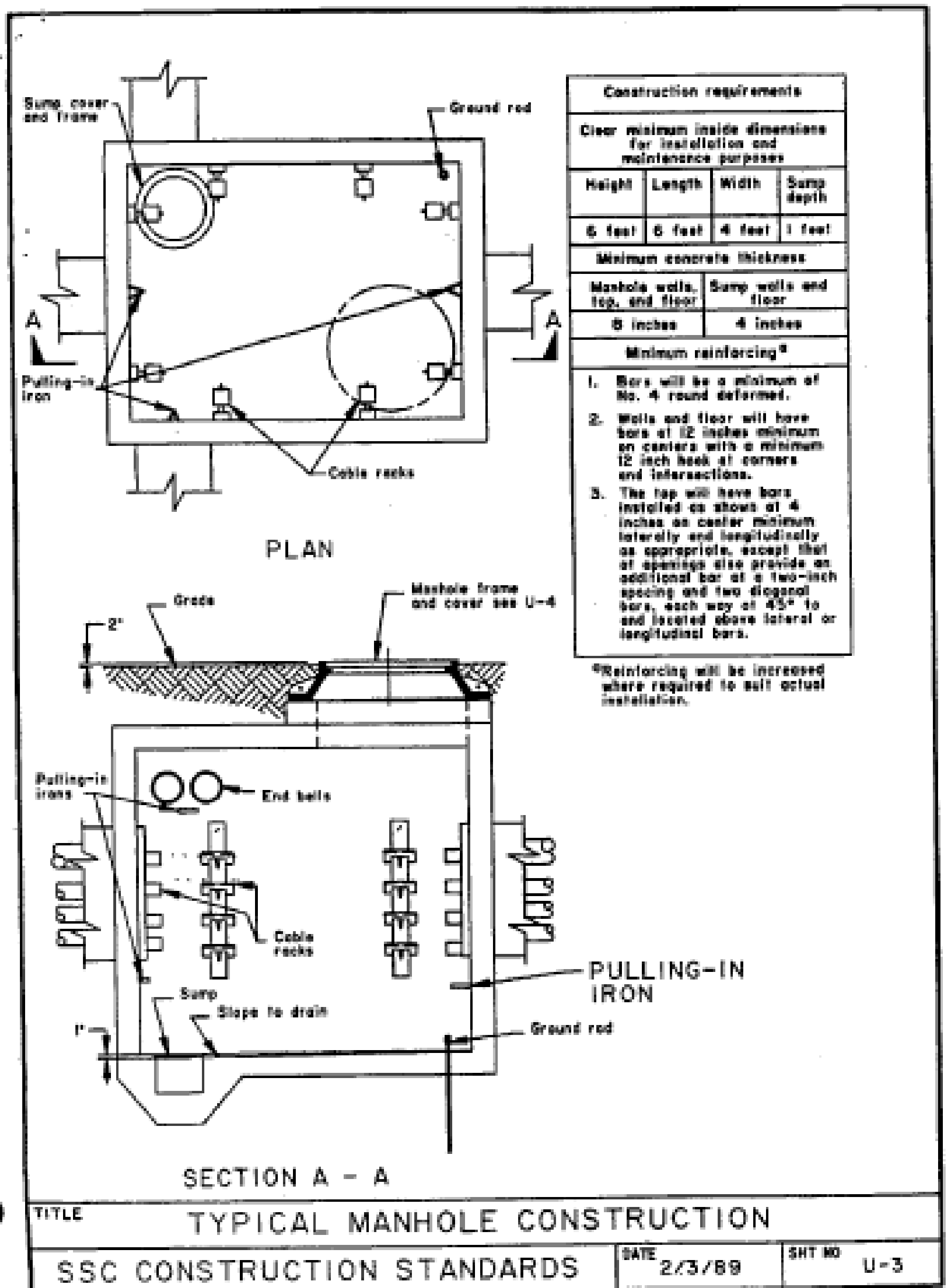
FIGURE U-2



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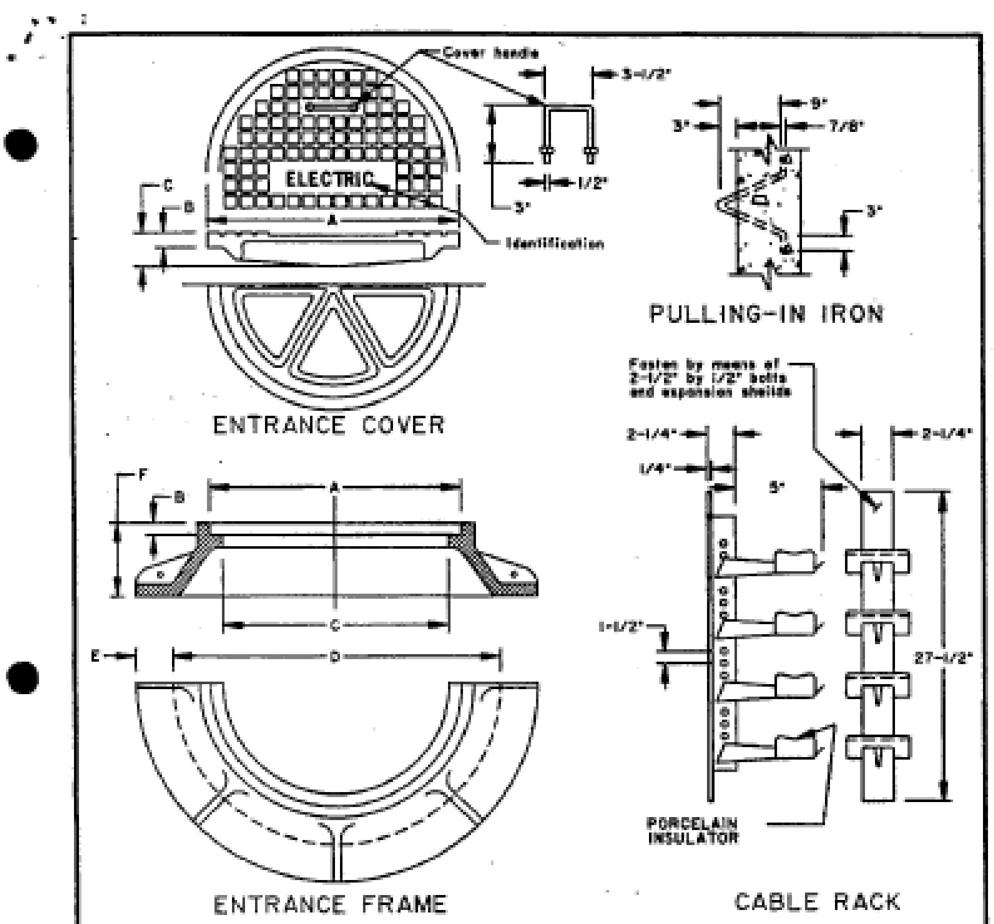

Appurtenance	Fed. Spec. RR-F-621 classification			Dimensions inches							Remarks
	Type	Style	Size	Nominal	A	B	C	D	E	F	
Manhole frame	III	A	30A 30C	30	32	1-3/8 2	30	41	4	10	Nontraffic traffic
Manhole cover	D	–	30A 30B	30	31-7/8	1-3/8 2	2-5/8 3-1/4	–	–	–	Nontraffic traffic
Manhole frame	III	A	30A 30C	36	38	1-3/8 2	36	47	4	10	Nontraffic traffic
Manhole cover	D	–		36	37-7/8	1-3/8 2	2-5/8 3-1/4	–	–	–	Nontraffic traffic

TITLE MANHOLE DETAILS

SSC CONSTRUCTION STANDARDS | DATE 2/3/89 | SHT NO U-4

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STD-ELEC-U-4 FIGURE U-4

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