United States Department of Agriculture

Rural Electrification Administration

REA Bulletin 50-4
Standard D-801

Specifications and Drawings for 34.5/19.9 kV Distribution Line Construction

http://waterheatertimer.org/Names-of-parts-on-electric-pole.html

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UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration

November 20, 1986

REA BULLETIN 50-4
RD-GD-1986-08

SUBJECT: Specifications and Drawings for 34.5/19.9 kV Distribution Line Construction (D-801).

I. **Purpose:** To announce the issuance of REA Standard D-801, Specifications and Drawings for 34.5/19.9 kV Distribution Line Construction.

II. **General:** REA has prepared this bulletin to provide borrowers with standard construction drawings for 34.5/19.9 kV overhead distribution lines. The decision to use 34.5/19.9 kV should be based on the borrower's individual situation and should include an economic analysis.

This bulletin is similar to REA's Specifications and Drawings for 24.9/14.4 kV Line Construction with increased clearance where necessary, the use of post insulators instead of pin insulators, and the use of dual dimensions (customary and metric). The metric dimensions are approximate equivalents for the customary dimensions.

III. **Availability of Standard:** Copies of REA Bulletin 50-4 may be purchased from the Government Printing Office. Questions concerning this standard may be referred to the Chief, Distribution Branch, Electric Staff Division, Rural Electrification Administration, U.S. Department of Agriculture, Washington, D.C. 20250.

Charles R Miller
Assistant Administrator – Electric

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SPECIFICATIONS AND STANDARDS
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SPECIFICATIONS FOR CONSTRUCTION

1. General

All construction work shall be done in accordance with the staking sheets, plans and specifications, and the construction drawings.

The 1987 or latest edition of the National Electrical Safety Code (NESC), ANSI C2, shall be followed except where local regulations are more stringent, in which case local regulations shall govern.

2. Distribution of Poles

In distributing the poles, large, choice, dense poles shall be used at transformer, dead-end, angle, and corner locations.

3. Pole Setting

The minimum depth for setting poles shall be as follows:

Length of Pole	Setting in Soil	Setting in All Solid Rock
feet (meters)	feet (meters)	feet (meters)
20 (6.10)	4.0 (1.22)	3.0 (0.91)
25 (7.62)	5.0 (1.52)	3.5 (1.07)
30 (9.14)	5.5 (1.68)	3.5 (1.07)
35 (10.67)	6.0 (1.83)	4.0 (1.22)
40 (12.19)	6.0 (1.83)	4.0 (1.22)
45 (13.72)	6.5 (1.98)	4.5 (1.37)
50 (15.24)	7.0 (2.13)	4.5 (1.37)
55 (16.76)	7.5 (2.29)	5.0 (1.52)
60 (18.29)	8.0 (2.44)	5.0 (1.52)

“Setting in Soil" depths shall apply:

a. Where poles are to be set in soil.

b. Where there is a layer of soil of more than 2 feet (610 mm) in depth over solid rock.

c. Where the hole in solid rock is not substantially vertical or the diameter of the hole at the surface of the rock exceeds approximately twice the diameter of the pole at the same level.

"Setting in All Solid Rock" depths 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.

Where there is a layer of soil 2 feet (610 mm) 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 All Solid Rock" provided, however, that such depth shall not exceed the depth specified under "Setting in Soil."

On sloping ground, the depth of the hole shall be measured from the low side of the hole.

Poles shall be set so that alternate crossarm gains face in opposite directions, except at terminals and dead ends where the gains of the last two (2) poles shall be on the side facing the terminal or dead end. On unusually long spans, the poles shall be set so that the crossarm is located on the side of the pole away from the long span. Where pole top insulator brackets are used, they shall be located on the opposite side of the pole from the gain.

Poles shall be set 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 so that the conductors are in line.

Poles shall be raked against the conductor strain not less than 1-inch (25 mm) for each 10 feet (3.05 m) of pole length nor more than 2 inches (51 mm) for each 10 feet (3.05 m) of pole length after conductors are installed at the required tension.

Pole backfill shall be thoroughly tamped in full depth. Excess dirt shall be banked around the pole.

Poles which have been in storage for more than 1 year from the date of treatment shall be ground line treated when installed.

4. Grading of Line

When using high poles to clear obstacles such as buildings, foreign wire crossings, railroads, etc., there shall be no upstrain on pin-type or post-type insulators in grading the line each way to lower poles.

5. Guys and Anchors

Guys shall be placed before the conductors are strung and shall be attached to the pole as shown in the construction drawings.

All anchors and rods shall be in line with the strain and shall be installed so that approximately 6 inches (152 mm) of the rod remain out of the ground. In cultivated fields or other locations, as deemed necessary, the projection of the anchor rod above earth may be increased to a maximum of 12 inches (305 mm) to prevent burial of the rod eye. The backfill of all anchor holes must be thoroughly tamped the full depth.

After a cone anchor has been set in place, the hole shall be backfilled with coarse crushed rock for 2 feet (610 mm) above the anchor, tamping during the filling. The remainder of the hole shall be backfilled and tamped with dirt.

6. Locknuts

A locknut shall be installed with each nut, eyenut or other fastener on all bolts or threaded hardware such as insulator studs, upset bolts, double arming bolts, etc.

7. Conductors

Conductors must be handled with care. Conductors shall neither be trampled on nor run over by vehicles. Each reel shall be examined and the wire shall be inspected for cuts, kinks, or other injuries. Injured portions shall be cut out and the conductor spliced. The conductors shall be pulled over suitable rollers or stringing blocks properly mounted on the pole or crossarm if necessary to prevent binding while stringing.

The neutral conductor should be maintained on one side of the pole (preferably the road side) for tangent construction and for angles not exceeding 20°.

With pin-type or post-type insulators, the conductors shall be tied in the top groove of the insulator on tangent poles and on the side of the insulator away from the strain at angles. Post-type insulators shall be tight on the studs and brackets, respectively, and the top groove must be in line with the conductor after tying.

For line angles of 0° to 5° in locations known to be subject to considerable conductor vibration, insulated brackets (material item da) may be substituted for the single and double upset bolts used for supporting the neutral and secondary conductors.

All conductors shall be cleaned thoroughly by wirebrushing before splicing or installing connectors or clamps. A suitable inhibitor shall be used before splicing or applying connectors over conductor.

8. Splices and Dead Ends

Conductors shall be spliced and dead-ended as shown on the construction drawings. There shall be not more than one splice per conductor in any span and splices shall be located at least 10 feet (3.05 m) from the conductor support. No splices shall be located in Grade B crossing spans and preferably not in the adjacent spans. Splices shall be installed in accordance with the manufacturer's recommendations.

9. Taps and Jumpers

Jumpers and other leads connected to line conductors shall have sufficient slack to allow free movement of the conductors. Where slack is not shown on the construction drawings, it will be provided by at least two (2) bends in a vertical plane, or one (1) in a horizontal plane, or the equivalent. In areas where aeolian vibration occurs, special measures to minimize the effects of jumper breaks shall be used as specified.

All leads on equipment such as transformers, reclosers, etc., shall be a minimum of #6 copper conductivity. Where aluminum jumpers are used, a connection to an unplated bronze terminal shall be made by splicing a short stub of copper to the aluminum jumper using a compression connector suitable for the bimetallic connection.

10. Hot-Line Clamps and Connectors

Connectors and hot-line clamps suitable for the purpose shall be installed as shown on the guide drawings. On all hot-line clamp installations, the clamp and jumper shall be installed so that they are permanently bonded to the load side of the line, allowing the jumper to be de-energized when the clamp is disconnected.

11. Surge Arrester Gap Settings

All surge arresters shall be the direct-connected type. The interconnecting leads shall be kept as short as possible.

12. Conductor Ties

Factory-formed ties shall be sagged in accordance with the manufacturer's recommendations.

13. Sagging of Conductors

Conductors shall be sagged in accordance with the conductor manufacturer's recommendations. All conductors shall be sagged evenly. The air temperature at the time and place of sagging shall be determined by a certified thermometer.

The sag of all conductors after stringing shall be in accordance with the engineer's instructions.

14. Secondaries and Service Drops

Secondary conductors may be bare or covered wires or multi-conductor service cable. The conductors shall be sagged in accordance with the manufacturer's recommendations.

Conductors for secondary underbuild on primary lines will normally be bare, except in those instances where prevailing conditions may limit primary span lengths to the extent that covered wires or service cables may be used. Service drops shall be covered wire or service cable.

Secondaries and service drops shall be so installed as not to obstruct climbing space. There shall not be more than one splice per conductor in any span, and splices shall be located at least 10 feet (3.05 m) from the conductor support. Where the same covered conductors or service cables are to be used for the secondary and service drop, they may be installed in one continuous run.

15. Grounds

Ground rods shall be driven full length in undisturbed earth in accordance with the construction drawings. The top shall be at least 12 inches (305 mm) below the surface of the earth. The ground wire shall be attached to the rod with a clamp and shall be secured to the pole with staples. The staples on the ground wire shall be spaced 2 feet (610 mm) apart, except for a distance of 8 feet (2.44 m) above the ground and 8 feet (2.44 m) down from the top of the pole where they shall be 6 inches (152 mm) apart.

All equipment shall have at least two (2) connections from the frame, case or tank to the multi-grounded neutral conductor.

The equipment ground, neutral wires, and surge-protection equipment shall be interconnected and attached to a common ground wire.

16. Clearing Right-of-Way

The right-of-way shall be prepared by removing trees, clearing underbrush, and trimming trees so that the right-of-way is cleared close to the ground and is the width specified, except that low growing shrubs which will not interfere with the operation or maintenance of the line shall be left undisturbed if so directed by the owner. Slash may be chipped and blown on the right-of-way. The landowner's written permission shall be received prior to cutting trees outside the right-of-way. Trees fronting each side of the right-of-way shall be trimmed symmetrically unless otherwise specified. Dead trees beyond the right-of-way which would strike the line in falling shall be removed. Leaning trees beyond the right-of-way, which would strike the line in falling and which would require topping if not removed, shall either be removed or topped, except that shade, fruit, or ornamental trees shall be trimmed and not removed, unless otherwise authorized.

17. Structures Exceeding 200 Feet (60.96 m) in Height and Structures in the Vicinity of Airports

The Federal Aviation Administration (FAA) requires (14 CFR 77) that in cases where structures or conductors will exceed a height of 200 feet (60.96 m), or are within 20,000 feet (6.10 km) of an airport, the nearest regional or area office of the FAA be contacted and FAA Form 7460-1 be filed if necessary.

INDEX OF CONSTRUCTION DRAWINGS

Single Phase:

ZAl	Single Primary Support
ZAl-1	Double PrimarySupport
ZA2	Double PrimarySupport
ZA3	Primary Phase 1- Phase 20° to 60° Angle
ZA4	Primary 1-Phase 60° to 90
ZA5	Deadend (Single)
ZA5-1, ZA5-2, ZA5-2A	Primary, Single Phase Tap
ZA5-3, ZA5-4	Primary, Single Phase Tap
ZA6	Vertical Deadend (Double)
ZA7, ZA7-l	Crossarm Construction Deadend (Single)
ZA8	Crossarm Construction Deadend (Double)
ZA9	Crossarm Construction Double Line Arm
ZA9-1	Crossarm Construction Single Line Arm

Two Phase:

ZBl	Crossarm Construction Single
ZBl-1	Crossarm Construction Double Primary Support
ZB2	Crossarm Construction Double Primary Support
ZB3, ZB3A	Vertical Construction
ZB4-1, ZB4-1A	Vertical Construction
ZB5-1, ZB5-1A	Vertical Construction
ZB7, ZB7-1	Crossarm Construction Deadend (Single)
ZB8	Crossarm Construction Deadend (Double)
ZB9	Crossarm Construction Double
ZB9-1	Crossarm Construction Single
ZB9-2	Crossarm Construction Double
ZB9-3	Crossarm Construction Single

Three Phase:

ZCl	Crossarm Construction Single Primary Support
ZCl-1	Crossarm Construction Double Primary Support
ZCl-2	Crossarm Construction (Large Conductors)
ZCl-3	Crossarm Construction Double Primary Support (Large Conductors)
ZCl-4	Crossarm Construction (Large Conductors)
ZC2	Crossarm Construction Double Primary Support
ZC2-1	Crossarm Construction Double Primary Support
ZC3	Vertical Construction
ZC3L	Vertical Construction (Large Conductors)
ZC3-1	Vertical Construction (Large Conductors)
ZC4-1	Vertical Construction
ZC4-1L	Vertical Construction (Large Conductors)
ZC5-1	Vertical Construction Deadend (Single)
ZCl-1L	Vertical Construction Deadend (Large Conductors

Three Phase (Cont'd):

ZC7, ZC7-1	Crossarm Construction Deadend (Single)
ZC7-2, ZC7-3	Crossarm Construction Deadend (Single)
ZC8	Crossarm Construction Deadend (Double)
ZC8-1	Crossarm Construction Deadend (Double)
ZC8-2	Crossarm Construction Deadend (Double) (Large Conductors)
ZC8-3	Crossarm Construction Deadend (Double) Large Conductors with Unbalanced Loads
ZC9	Crossarm Construction Double Line Arm
ZC9-l	Crossarm Construction Single Line Arm

Three Phase, Double Circuit:

ZDC-Cl	Crossarm Construction Double Circuit Single Primary Support 2 Crossarm Type
ZDC-C2-l	Double Circuit Crossarm Construction 2 Crossarm Type
ZDC-C3	Double Circuit, Vertical Construction
ZDC-C4-l	Double Circuit, Vertical Construction

Guy Assemblies:

ZEl-1, ZEl-2, ZEl-3	Single Down Guy, Through Bolt Type
E2-l, E2-2, E2-3	Single Overhead Guy, Through Bolt Type
E3-2, E3-3, E3-10	Single Down Guy, Wrapped Type
E4-2, E4-3	Single Overhead Guy, Wrapped Type
ZE5-1, ZE5-2	Crossarm Construction Deadend Guy
ZE6-2, ZE6-3	Double Down Guy
ZE7-2L, ZE7-3L	Three Down Guys (Large Conductors)
ZE8-2L, ZE8-3L	Four Down Guys (Large Conductors)
E11, E12	Single Loop Guy, Wrapped Type

Anchor Assemblies:

Fl-1 to Fl-4	Line Anchor Assemblies
F4-l	Service Anchor Assembly
F5-1, F5-2, FS-3	Rock Anchor Assemblies
F6-l, F6-2, F6-3	Swamp Anchor Assembly

Transformer Assemblies:

ZGl05	Single Phase Transformer at 1-Phase Tangent
ZG106	Single Phase Transformer at Deadend
ZG136	Single Phase Transformer on 3-Phase Circuit
Gl50, ZG150	One Auto Transformer
ZG210	Two Transformers, Cluster Mounted Open Wye-Open Delta for 120/240 Volt Power Loads
ZG312	Three Transformers Cluster Mounted 4-Wire Grounded Wye-Grounded Wye for 208/120 Volt Power Loads

Secondary Assemblies:

J5 to J12	Secondary Assemblies

Service Assemblies:

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K10C	Service Assemblies, Cable
K10L, K11L, K14L	Service Assemblies (Large Conductors)
K11C, K14C, K15C	Service Assemblies, Cable
K16C, K17L, K17	Service Assemblies, (For Ranch Type House)

Miscellaneous Assemblies:

ZM2-11	Grounding Assembly Ground Rod Type
ZM2- 12A, ZM2-12A2	Pole Protection Assembly
M2-15A	Grounding Assembly Ground Rod Type for Sectionalizing Air Break Switch
ZM3-1A, ZM3-4	One Sectionalizing Fuse Cutout
ZM3-2, ZM3-3	2 or 3 Sectionalizing Disconnect Switches
ZM3-10A	One Sectionalizing Oil Circuit Recloser
ZM3-16	Sectionalizing Air Break Switch
ZM3-19, ZM3-20	2 or 3 Sectionalizing Oil Circuit Reclosers
ZM3-19A, ZM3-20A	2 or 3 Sectionalizing Oil Circuit Reclosers
ZM3-23	One Sectionalizing Oil Circuit Reclosers with By-Pass Switches
ZM3-24, ZM3-25	2 or 3 Sectionalizing Oil Circuit Reclosers with By-Pass Switches
ZM3-24A, ZM3-25A	2 or 3 Sectionalizing Oil Circuit Reclosers with By-Pass Switches
ZM5-1, ZMS-6, ZMS-9, ZM5-22	Miscellaneous Primary Assemblies
ZM5-7, 8, 18, 20	Miscellaneous Primary Assemblies
ZM5-13, 14, 16, 17, 19, 21, 23	Miscellaneous Primary Assemblies

Voltage Regulators:

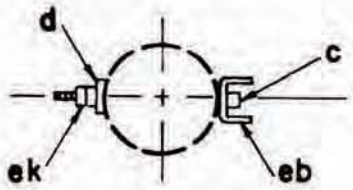
ZM7-l	One Voltage Regulator Platform Mounted

Metering Assembly Guide Drawings:

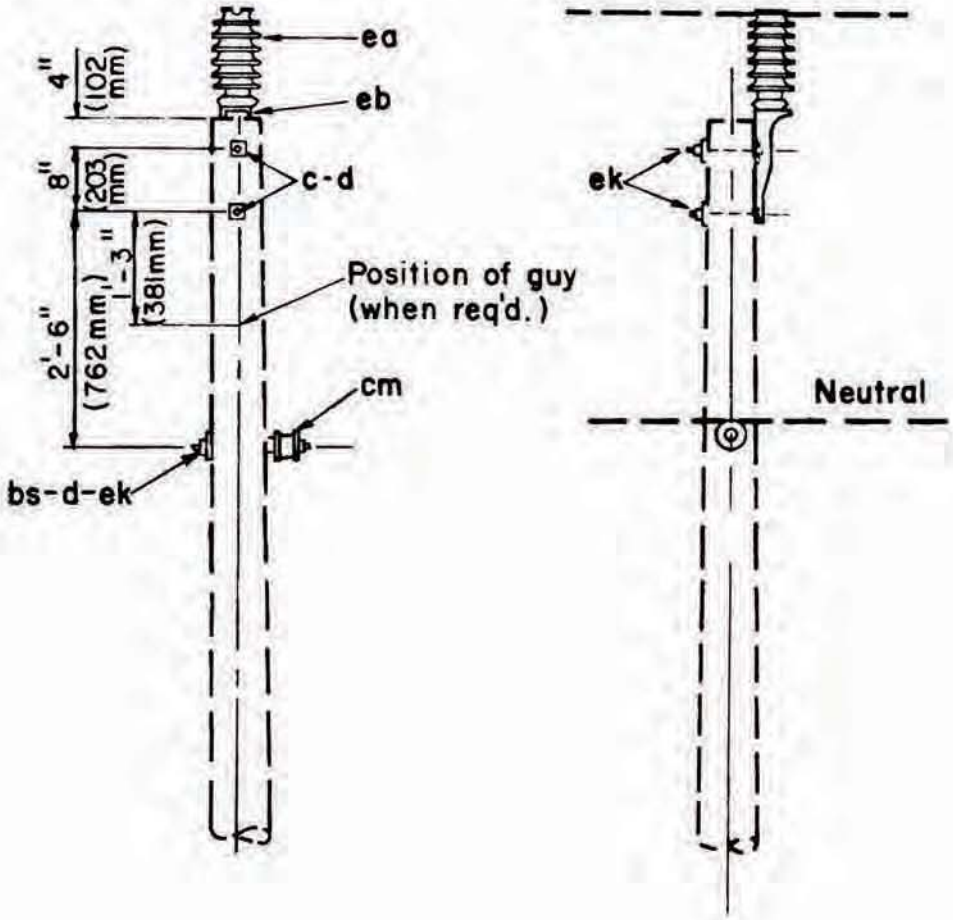
M8	Secondary Metering Guide Single Phase 120/240 Volts
M8-9	Guide to Yard Pole Meter Installation (Showing Pump Service Carried Underground)
M8-10	Guide to Yard Pole Meter Installation (Showing All Building Services Carried Underground)
M8-11	Secondary Metering Guide Three-Phase, 208/120 Volts 4-Wire Grounded Wye
MB-12	Secondary Metering Guide Three-Phase 240 Volts 3 Wire Corner Grounded Delta

Guide Drawings:

Ml9	Crossarm Drilling Guide
M20	Pole Framing Guide
M21	Angle Construction Guide Crossarm to Vertical Const. - 20 to 60 Angle
ZM22-1	Tree Trimming Guide
ZM22-2	Tree Trimming Guide
M24	Cable Service Assembly Guide
M24-10	Assembly Guide of Service Mast for Ranch Type House
M26-5	Security Light Installation Guide (Unmetered) Transformer
M27	Connection Guide Open Wire Services
M27-1	Transformer Connection Guide Triplex Cable Services
M27-2	Transformer Connection Guide Secondary Underbuild
M28	Transformer Connection and Service Take-off Guide from Secondary
ZM29-1A	Tap Assembly Guide
ZM29-1B	Tap Assembly Guide
M41-l	Angle Assembly Guide, Vertical Construction 20 to 60 Angle, Copper Type Conductors with Formed Type Armor Rods
M41-10	Angle Assembly Guide, Vertical Construction 20 to 60 Angle, A.C.S.R. Conductors with Straight or Formed Type Armor Rods
M42-11	Deadend Assembly Guide - Deadend Clamp Method A.C.S.R. Conductors
M42-13	Deadend Assembly Guide (Large Conductors)
M43-4	Tap Assembly Guide Copperweld-Copper and Copper Conductors
M43-10	Tap Assembly Guide, A.C.S.R. Conductors
M52-3, M52-4	Neutral Identification and Pole Numbering Guide
Rl	Clearing Right-of-Way Guide



POLE TOP INSULATOR ASSEMBLY



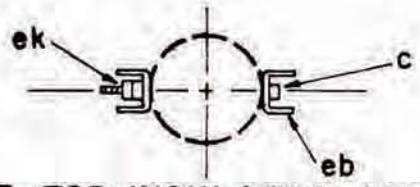
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
bs	1	Bolt, single upset		ea	1	Insulator, post type	
c	2	Bolt, machine, 5/8" x req'd length		eb	1	Bracket, pole top	
d	3	Washer, square, 2 1/4"		ek		Locknuts, as required	
cm	1	Insulator, spool					

Maximum Transverse
Load: 750 lbs. (3336 N)
Angle: 0°-5°

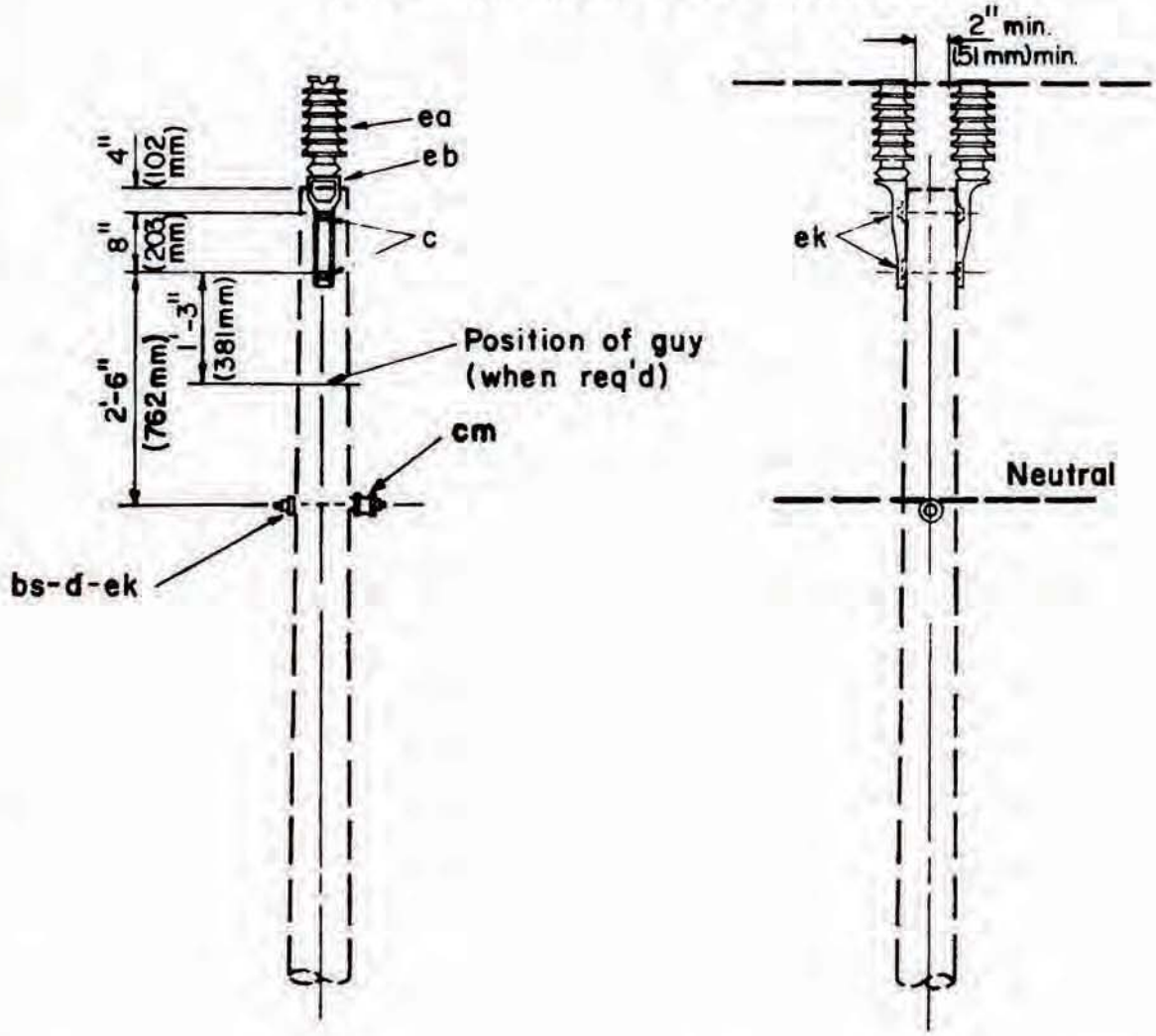
34.5/19.9 kV PRIMARY 1-PHASE, SINGLE PRIMARY SUPPORT

NOV. 1986

ZA1



POLE TOP INSULATOR ASSEMBLY



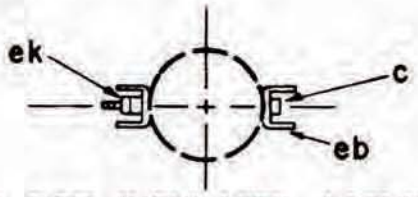
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
bs	1	Bolt, single upset		ea	2	Insulator, post type	
c	2	Bolt, machine, 5/8" x req'd length		eb	2	Bracket, pole top	
d	1	Washer, square, 2 1/4"		ek		Locknuts, as required	
cm	1	Insulator, spool					

Maximum Transverse Load: 750 lbs. (3336 N)/Insulator
1500 lbs. (6672 N) Total
Angle: 0°-5°

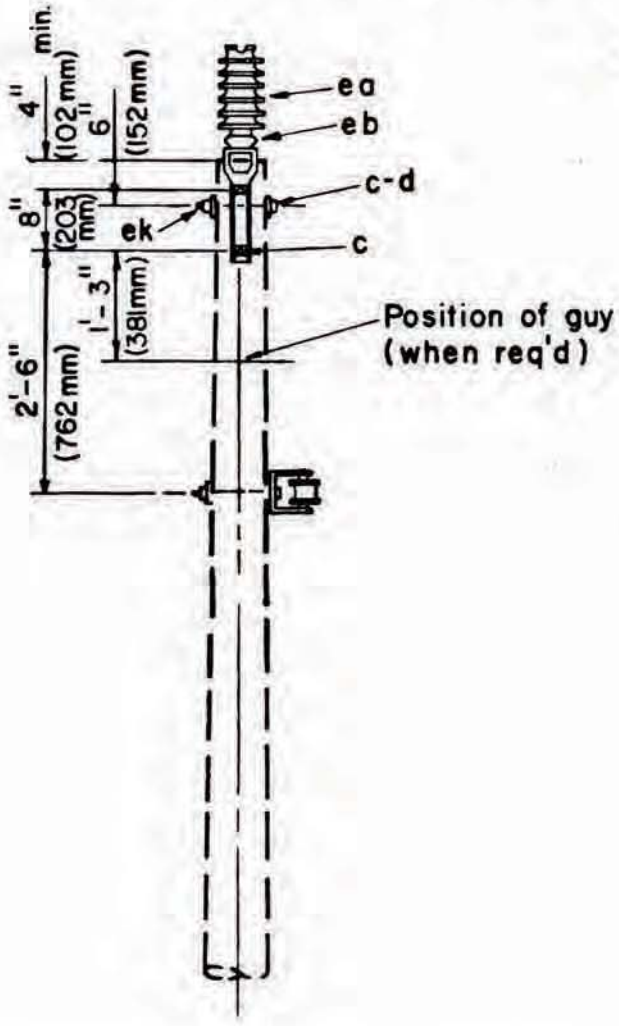
34.5/19.9 kV PRIMARY, 1-PHASE DOUBLE PRIMARY SUPPORT

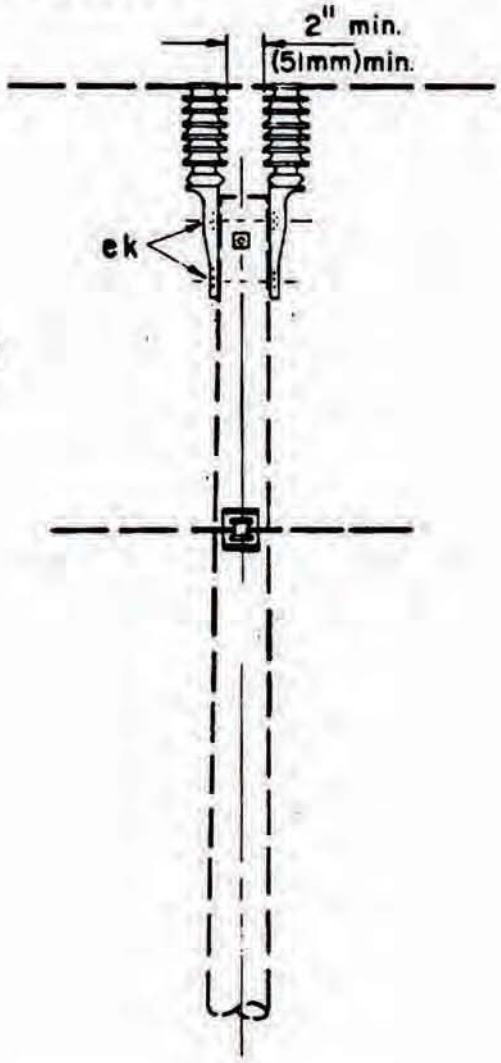
NOV. 1986

ZA1-1



POLE TOP INSULATOR ASSEMBLY





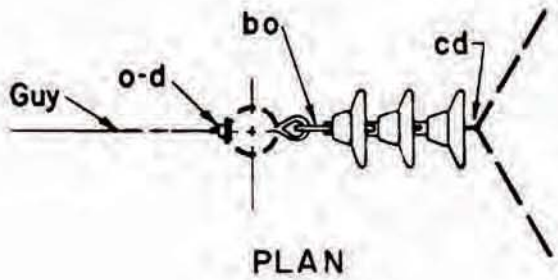
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	4	Bolt, machine, 5/8" x req'd length		ea	2	Insulator, post type	
d	3	Washer, square, 2 1/4"		eb	2	Bracket, pole top	
da	1	Bracket, insulated		ek		Locknuts, as required	

Maximum Transverse
Load : 750 lbs. (3336 N) / Insulator
1500 lbs. (6672 N) Total
Angle : 5°-20°

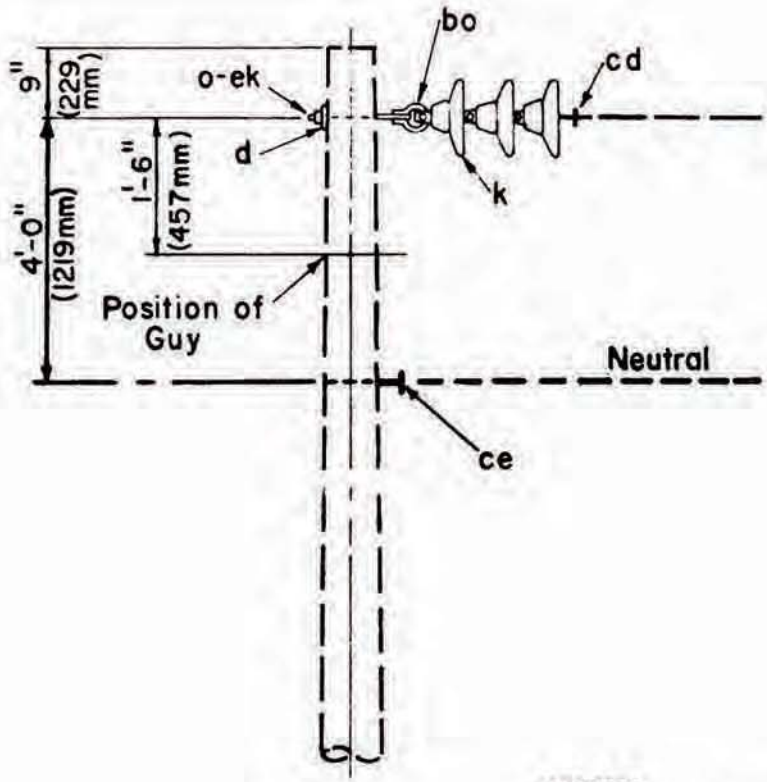
34.5/19.9 kV PRIMARY, 1 PHASE DOUBLE PRIMARY SUPPORTS

NOV. 1986

ZA 2



PLAN



NOTE:
For units ce and cd see guide drawings M41-1 or M41-10

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
bo	1	Shackle, anchor		ek		Locknuts, as required	
ce	1	Angle assembly, neutral		k	3	Insulator, suspension, 10"	
cd	1	Angle assembly, primary		o	1	Bolt, eye, 5/8" x req'd length	
d	1	Washer, square, 2 1/4"					

Angle: 20°-60°

34.5/19.9 kV PRIMARY, 1-PHASE

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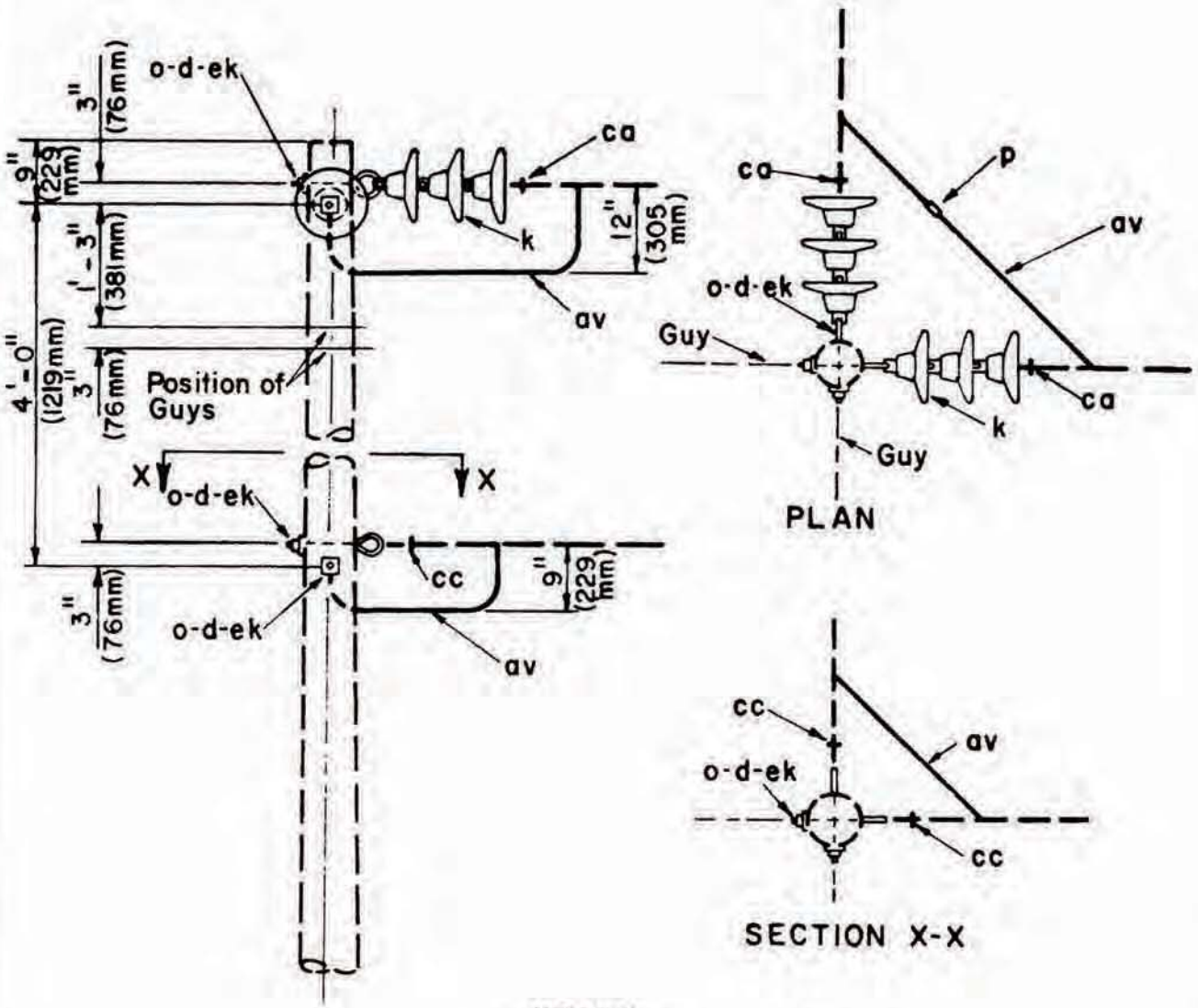
ZA3



NOTES:
For units ca and cc
see guide drawings
M42-11 and M42-13

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
av		Jumpers, as required		ek		Locknuts, as required	
ca	2	Deadend, assembly, primary		o	4	Bolt, eye, 5/8" x req'd length	
cc	2	Deadend, assembly, neutral		p		Connectors, as req'd	
d	4	Washer, square, 2 1/4"		k	6	Insulator, suspension, 10"	

Angle: 60°-90°

34.5/19.9 kV PRIMARY 1-PHASE

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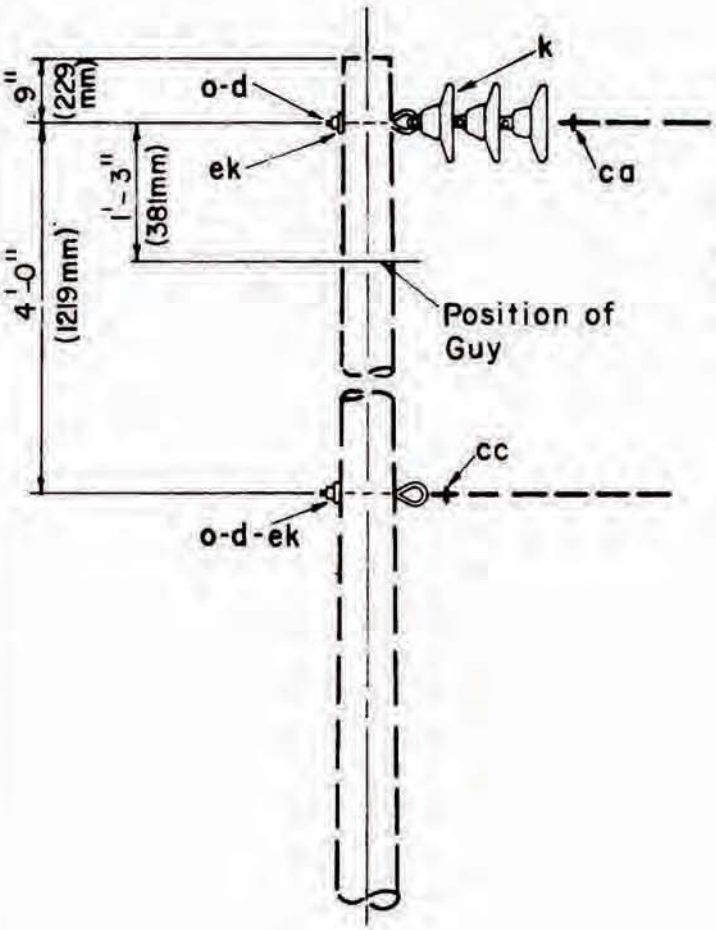
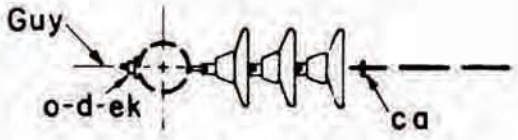
ZA4





PLAN

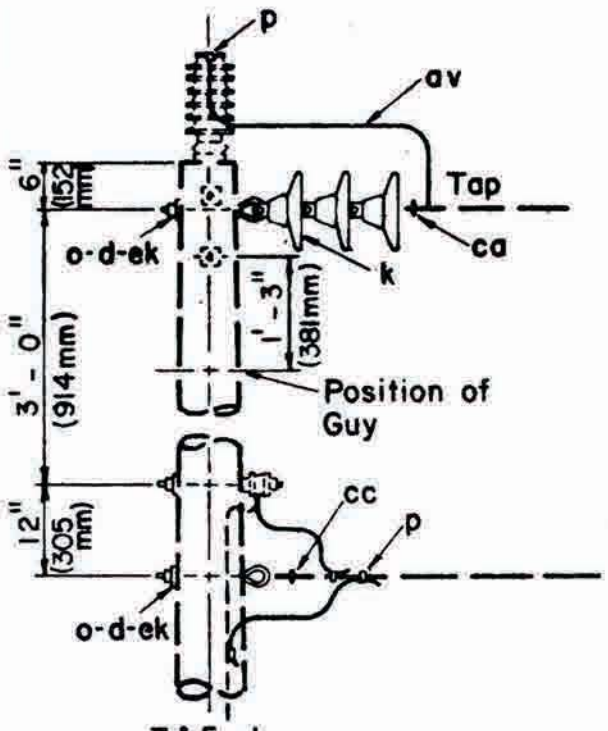
NOTE:
For units ca and cc
see guide drawings
M42-11 and M42-13

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
ca	1	Deadend assembly, primary		ek		Locknuts, as required	
cc	1	Deadend assembly, neutral		k	3	Insulator, suspension, 10"	
d	2	Washer, square, 2 1/4"		o	2	Bolt, eye, 5/8" x req'd length	

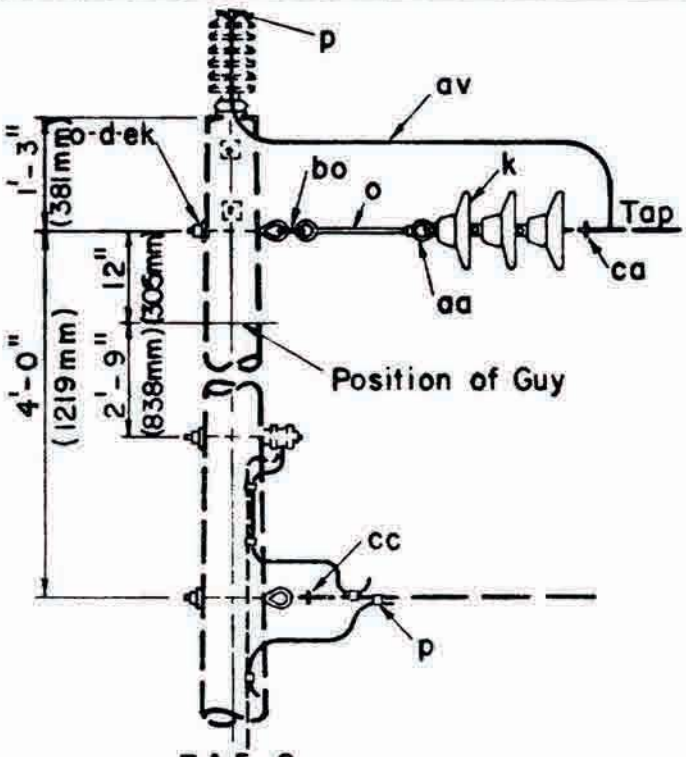
34.5/19.9 kV PRIMARY
1-PHASE, DEADEND (SINGLE)

NOV. 1986

ZA5



ZA5-1



ZA5-2

NOTES:

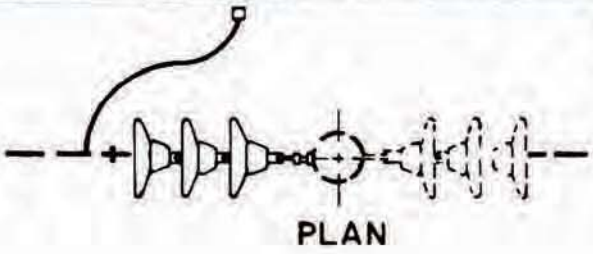
1. ZA5-1 and ZA5-2 assemblies may be used with the following drawings: ZA1, ZA1-1, and ZA2.
2. See drawings ZM29-1A, ZM29-1B for tap assembly guide.
3. Specify ZA5-2A for tap to existing eyebolt.
4. For units ca and cc see guide drawings, M42-11 and M42-13.

		ASSEMBLY UNIT		
		ZA5-1	ZA5-2	ZA5-2A
ITEM	MATERIAL	NO. REQ'D	NO. REQ'D	NO. REQ'D
aa	Nut, eye, 5/8"		1	3
av	Jumpers, as required			
bo	Shackle, anchor		1	1
ca	Deadend assembly, primary	1	1	1
cc	Deadend assembly, neutral	1	1	1
d	Washer, square, 2 1/4"	2	2	
k	Insulator, suspension 10"	3	3	
o	Bolt, eye, 5/8" x req'd length	2	3	1
p	Connectors, as req'd			
ek	Locknuts, as required			

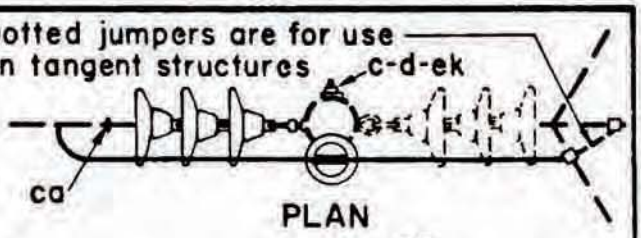
34.5/19.9 kV PRIMARY
SINGLE PHASE TAP

NOV. 1986

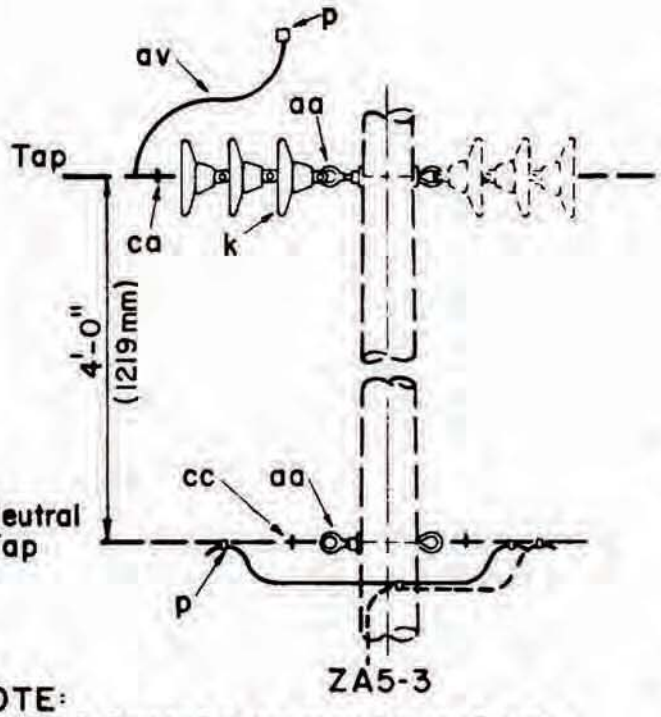
ZA5-1, ZA5-2, ZA5-2A



PLAN

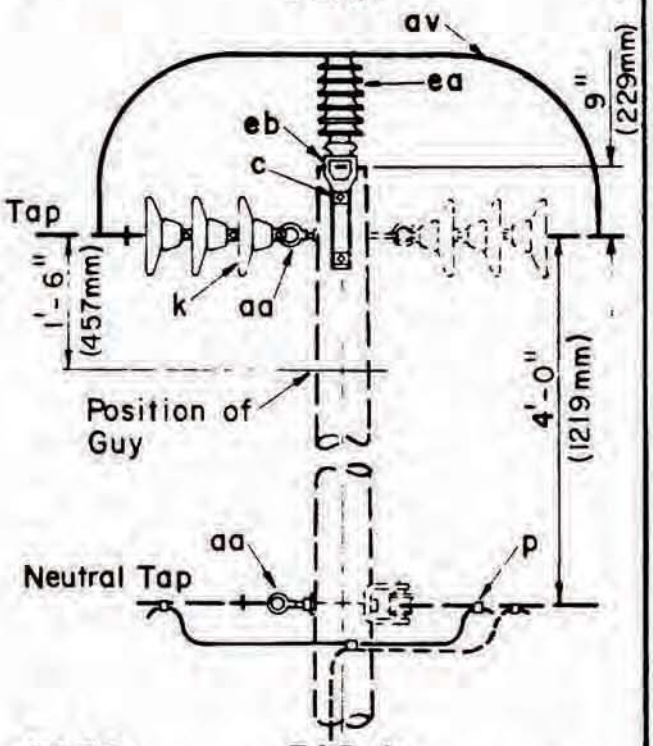


PLAN



ZA5-3

NOTE:
ZA5-3 assembly may be used with the following drawings: ZA4, ZA5, ZB4-1, and ZC4-1.



ZA5-4

NOTE:
ZA5-4 assembly may be used with the following: ZA3, ZA5, ZB3, ZB5-1, ZC3, and ZC5-1

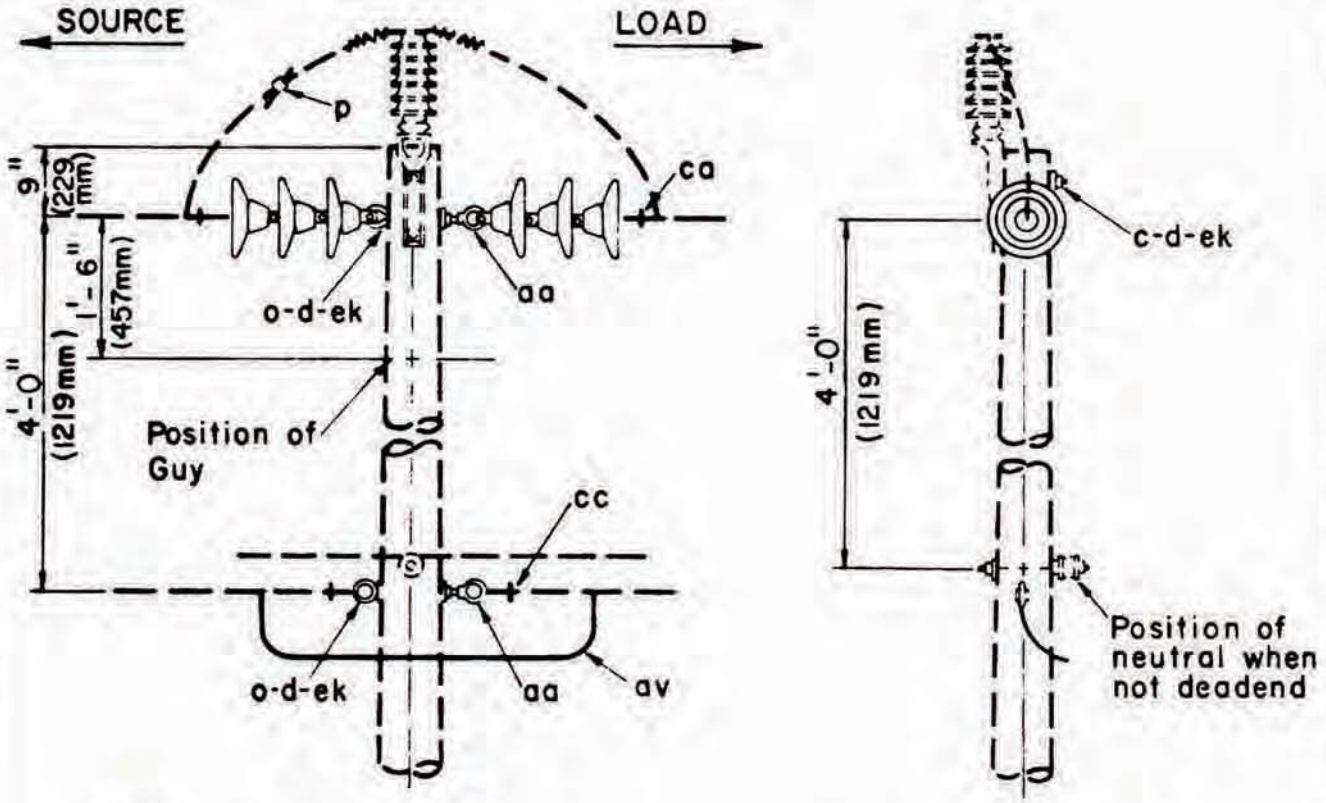
See drawing ZM29-1A, ZM29-1B for tap assembly guide
See drawings M42-11 and M42-13 for units ca and cc.

ITEM	MATERIAL	ASSEMBLY UNIT ZA5-3 Nº REQ'D	ASSEMBLY UNIT ZA5-4 Nº REQ'D
aa	Nut, eye 5/8"	2	2
av	Jumpers, as required		
c	Bolt, machine, 5/8" x req'd		2
ca	Deadend assembly, primary	1	1
cc	Deadend assembly, neutral	1	1
d	Washer, square 2 1/4"		2
ea	Insulator, post type		1
eb	Bracket, pole top		1
ek	Locknuts, as required		
k	Insulator, suspension 10"	3	3
p	Connectors, as required		

34.5/19.9 kV PRIMARY SINGLE PHASE TAP

NOV. 1986

ZA5-3, ZA5-4



NOTE:

ZA6 may be used with drawings such as ZM3-1A, ZM3-10A, ZM3-23, ZM5-18 (as shown)

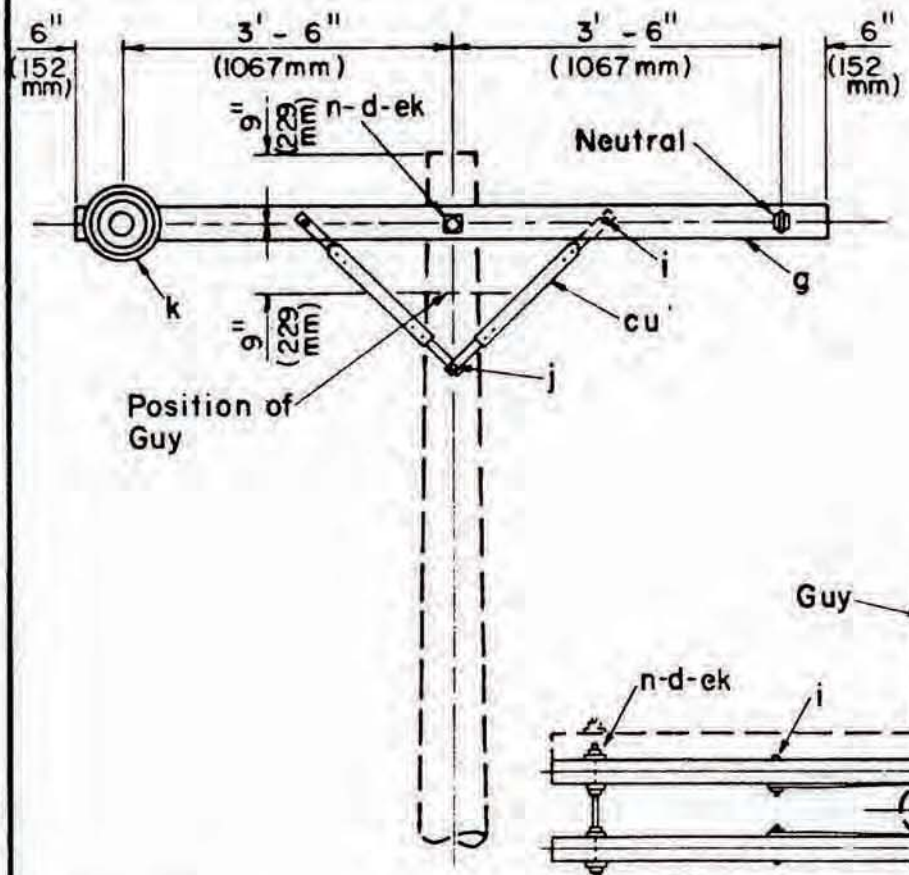
For units ca and cc see guide drawings M42-11 and M42-13.

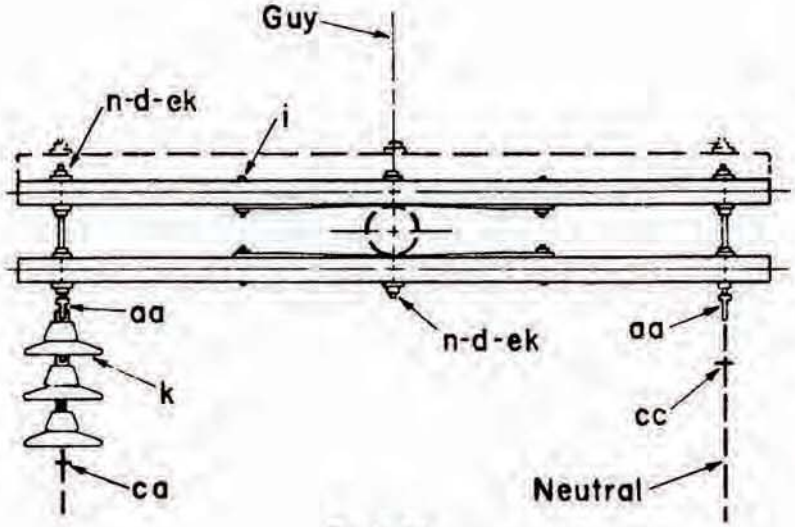
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
aa	2	Nut, eye, 5/8"		d	4	Washer, square, 2 1/4"	
av		Jumpers, as required		ek		Locknuts, as required	
c	2	Bolt, machine, 5/8" x req'd length		k	6	Insulator, suspension, 10"	
ca	2	Deadend assembly, primary		o	2	Bolt, eye, 5/8" x req'd length	
cc	2	Deadend assembly, neutral		p		Connectors, as required	

34.5/19.9 kV PRIMARY, 1-PHASE
VERTICAL DEADEND (DOUBLE)

NOV. 1986

ZA6





PLAN

NOTES:

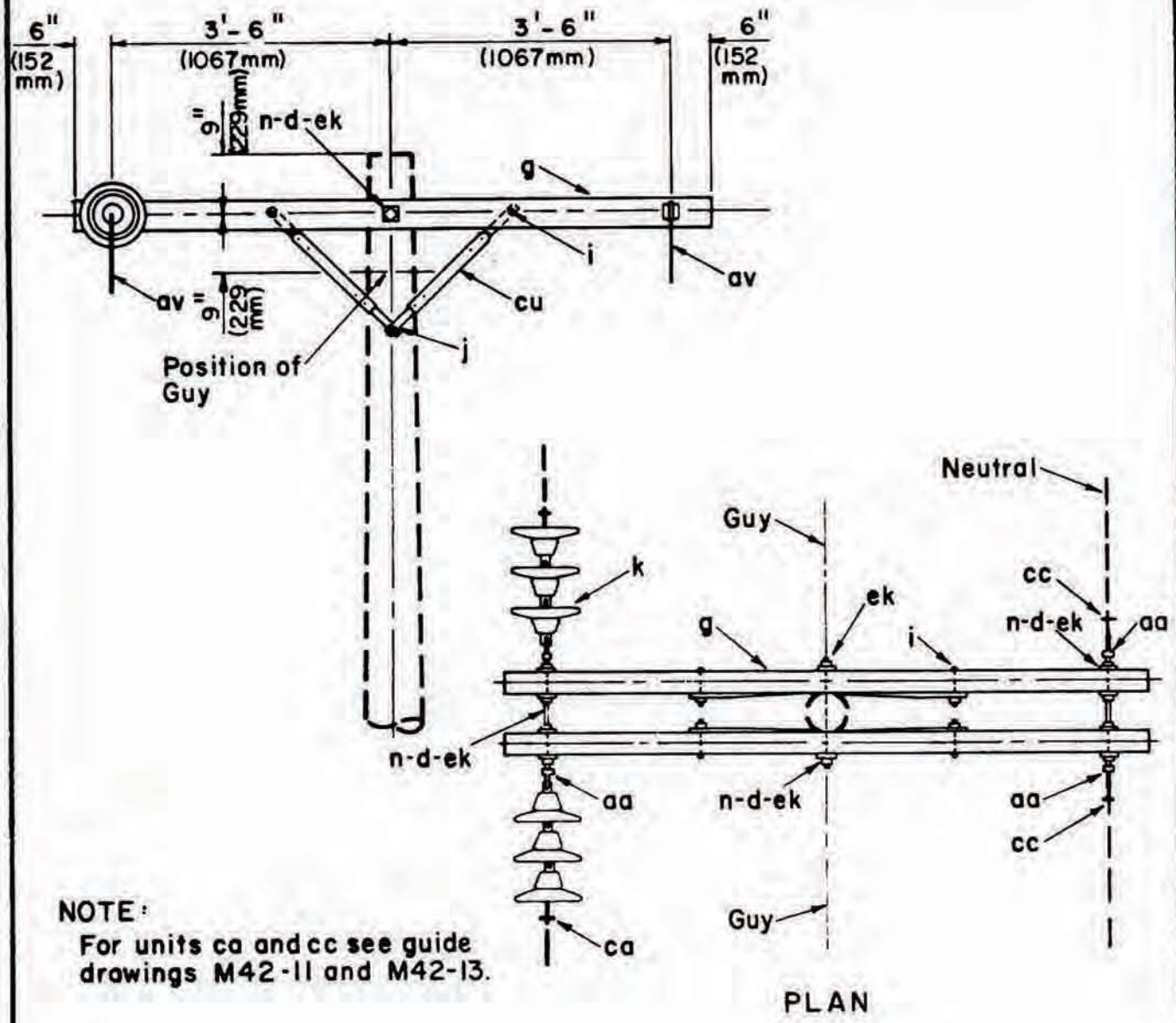
1. See drawing ZE5-1 for crossarm loading limitations
2. Designate as ZA7-1 for assembly with three crossarms
3. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
aa	2	Nut, eye 5/8"		g	2	Crossarm, 3 5/8"x 4 5/8"x 8'-0"	
ca	1	Deadend assembly, primary		i	4	Bolt carriage 3/8" x 4 1/2"	
cc	1	Deadend assembly, neutral		j	2	Screw, lag 1/2" x 4"	
cu	4	Brace, wood 28"		k	3	Insulator, suspension 10"	
d	10	Washer, square , 2 1/4"		n	3	Bolt, double arming, 5/8" x req'd length	
ek		Locknuts, as required					

34.5/19.9 kV PRIMARY 1-PHASE CROSSARM CONSTR.-DEADEND (SINGLE)

NOV. 1986

ZA7, ZA7-1



NOTE:
For units ca and cc see guide drawings M42-11 and M42-13.

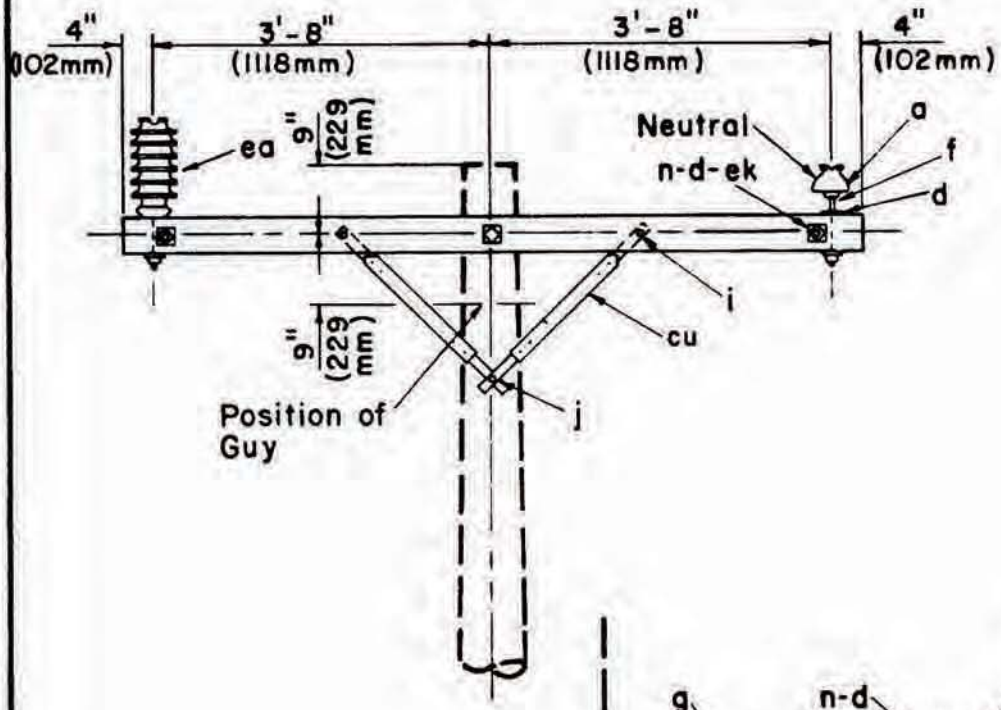
PLAN

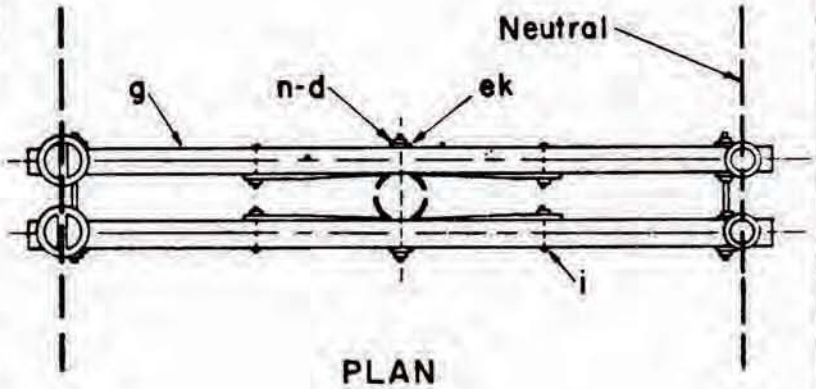
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
aa	4	Nut, eye, 5/8"		g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"	
av		Jumpers, as required		i	4	Bolt, carriage 3/8" x 4 1/2"	
ca	2	Deadend assembly, primary		j	2	Screw, lag 1/2" x 4"	
cc	2	Deadend assembly, neutral		k	6	Insulator, suspension, 10"	
cu	4	Brace, wood, 28"		n	3	Bolt, double arming 5/8" x req'd length	
d	10	Washer, square 2 1/4"		p		Connectors, as required	
ek		Locknuts, as required					

34.5/19.9 kV PRIMARY, 1-PHASE CROSSARM CONSTRUCTION - DEADEND (DOUBLE)

NOV. 1986

ZA8





PLAN

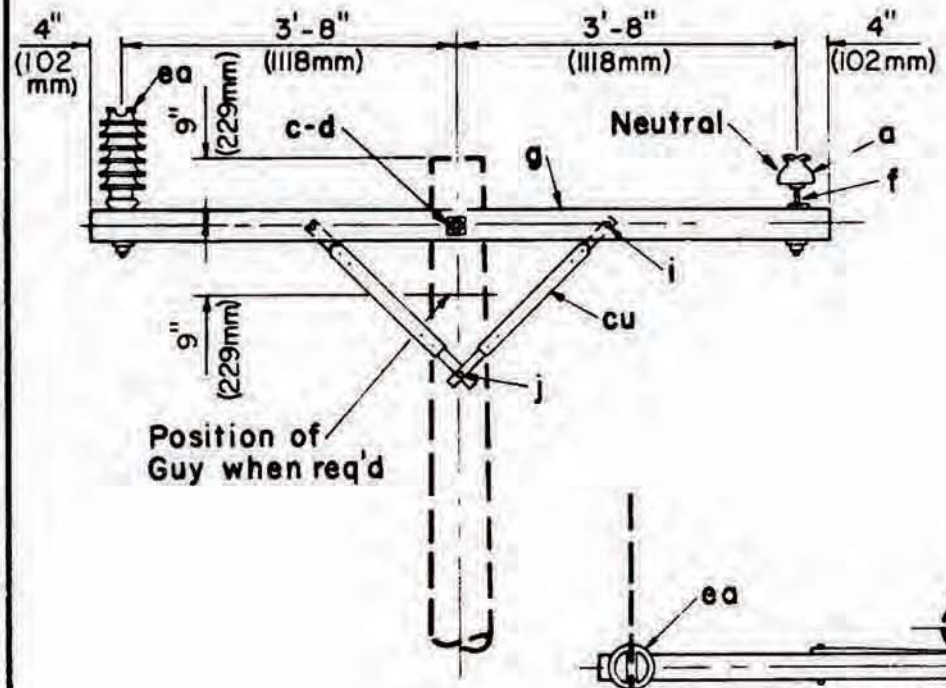
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	2	Insulator, pin type, (ANSI Class 55-3)		j	2	Screw, lag 1/2" x 4"	
d	2	Washer, square 3"		n	3	Bolt, double arming, 5/8" x req'd length	
d	10	Washer, square 2 1/4"		ea	2	Insulator, post type	
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"					
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ek		Locknuts as req'd	
i	4	Bolt, carriage, 3/8" x 4 1/2"		cu	4	Brace, wood, 28"	

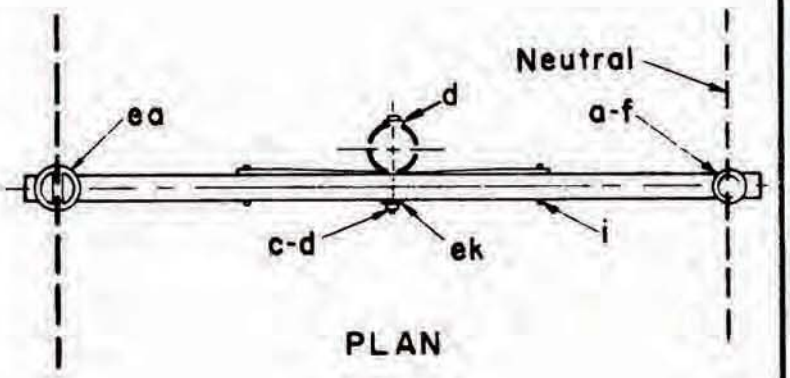
Maximum Transverse
Load: 750lbs (3336N)/Insulator
1500lbs (6672N) Total
Angle: 0°-20°

34.5/19.9 kV, 1-PHASE
CROSSARM CONSTRUCTION-DOUBLE LINE ARM

NOV. 1986

ZA9





PLAN

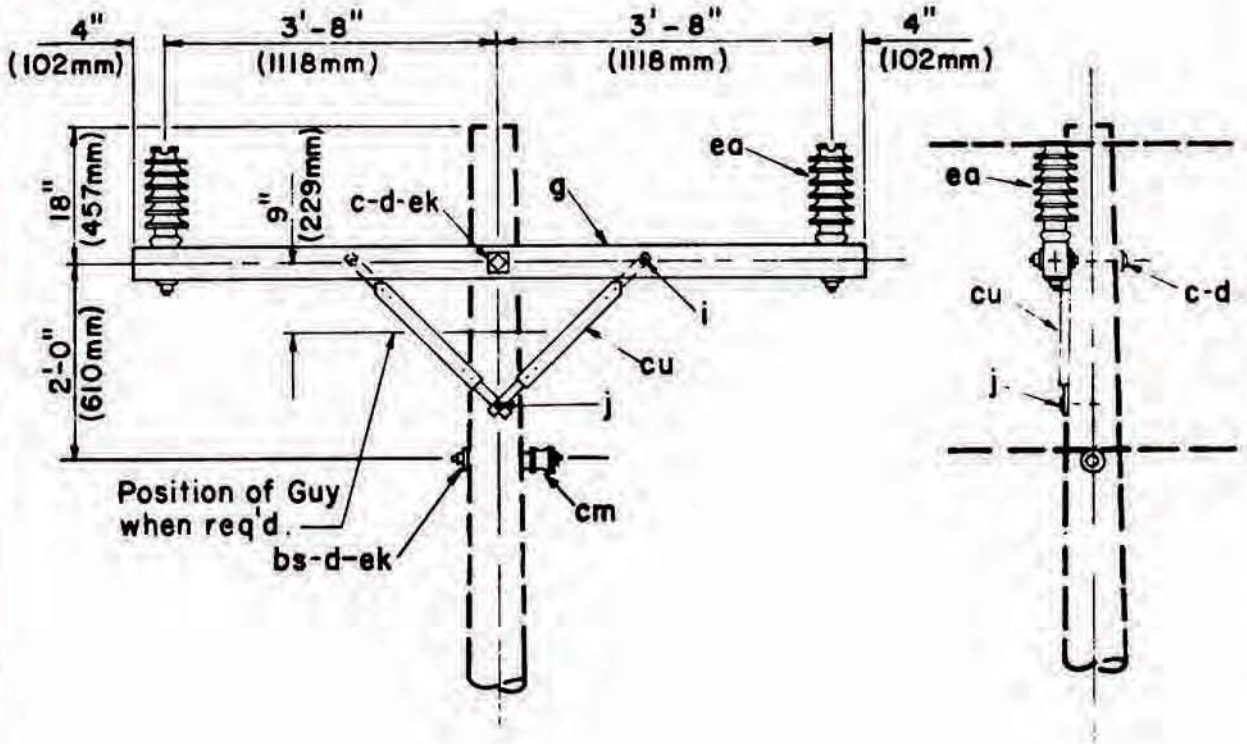
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	1	Insulator, pin type, (ANSI class 55-3)		j	1	Screw, lag 1/2" x 4"	
c	1	Bolt, machine, 5/8" x req'd length		ea	1	Insulator, post type	
d	2	Washer, square, 2 1/4"					
f	1	Pin, crossarm, 5/8" x 10 3/4"		ek		Locknuts, as req'd	
g	1	Crossarm 3 5/8" x 4 5/8" x 8'-0"		cu	2	Brace, wood, 28"	
i	2	Bolt, carriage, 3/8" x 4 1/2"					

Maximum Transverse
Load : 750 lbs (3336 N)
Angle: 0°-5°

34.5/19.9 kV, 1-PHASE
CROSSARM CONSTRUCTION-SINGLE LINE ARM

NOV. 1986

ZA9-1



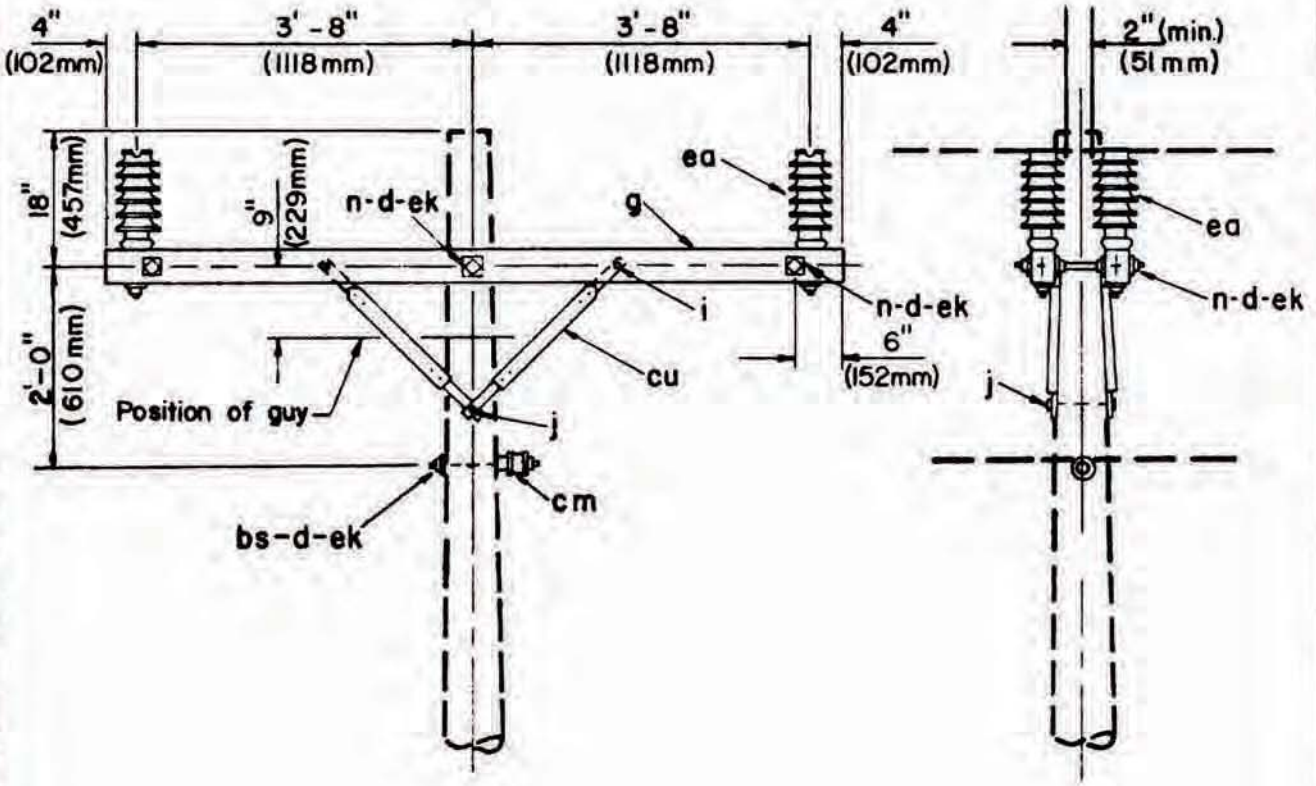
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		bs	1	Bolt, single upset	
d	3	Washer, square, 2 1/4"		cu	2	Brace, wood, 28"	
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"		ea	2	Insulator, post type	
i	2	Bolt, carriage, 3/8" x 4 1/2"		ek		Locknuts, as req'd	
j	1	Screw, lag 1/2" x req'd length		cm	1	Insulator spool	

Maximum Transverse
Load: 750lbs (3336N)
Angle: 0° - 5°

34.5/19.9 kV, TWO PHASE SINGLE PRIMARY SUPPORT

NOV. 1986

ZBI



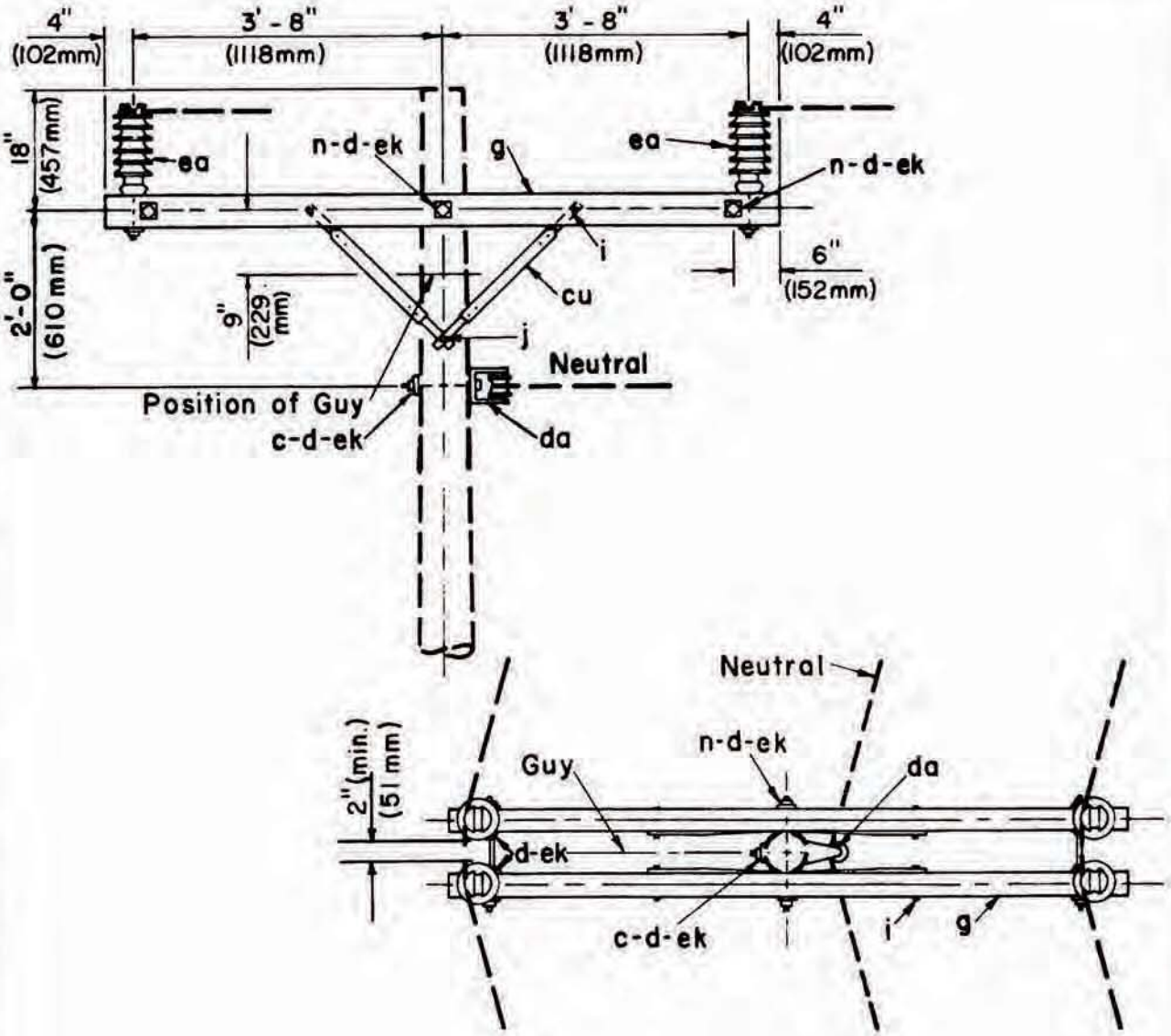
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	11	Washer, square, 2 1/4"		bs	1	Bolt, single, upset	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"		cm	1	Insulator spool	
i	4	Bolt, carriage, 3/8" x 4 1/2"		cu	4	Brace, wood, 28"	
j	2	Screw, lag 1/2" x 4"		ea	4	Insulator, post type	
n	3	Bolt, double arming, 5/8" x req'd length		ek		Locknuts, as req'd	

Maximum Transverse
Load : 750 lbs (3336N) / Insulator
1500 lbs (6672N) Total
Angle : 0°-5°

34.5/19.9 kV, TWO PHASE DOUBLE PRIMARY SUPPORT

NOV. 1986

ZBI-1



ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		n	3	Bolt, double arming, 5/8" x req'd length	
d	11	Washer, square 2 1/4"		ea	4	Insulator, post type	
da	1	Bracket, insulated		ek		Locknuts, as req'd	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"		cu	4	Brace, wood 28"	
i	4	Bolt, carriage, 3/8" x 4 1/2"					
j	2	Screw, lag, 1/2" x req'd length					

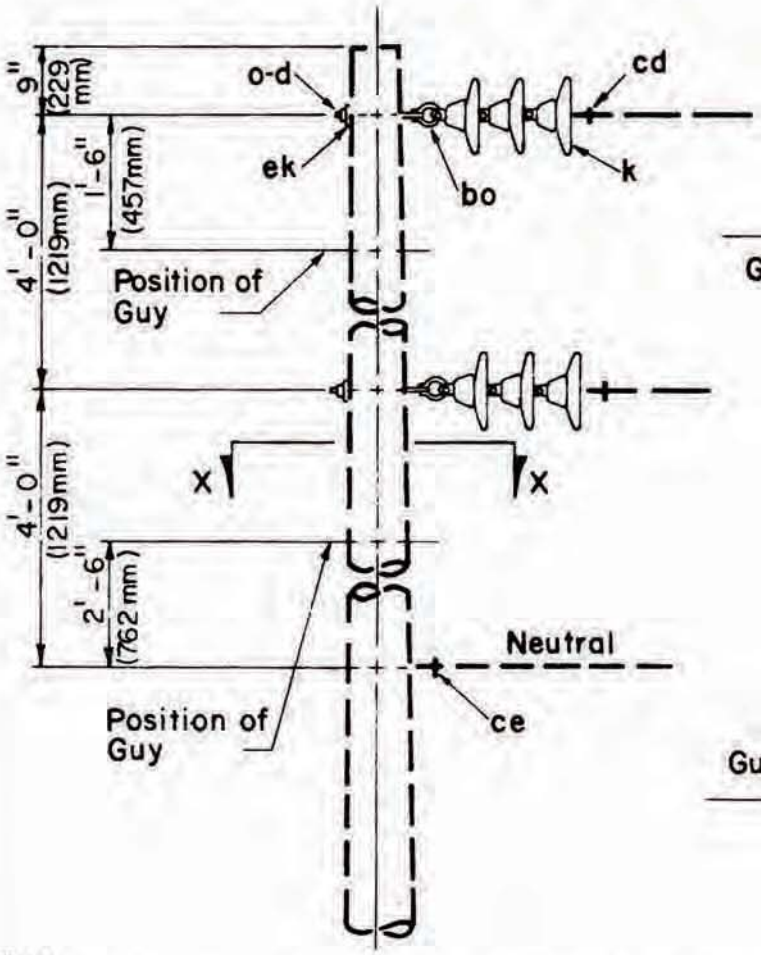
Maximum Transverse
Load: 750 lbs (3336 N)/Insulator
1500 lbs (6672 N) Total

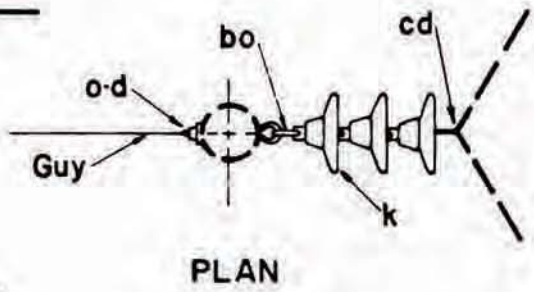
Angle: 5° - 20°

34.5/19.9 kV TWO PHASE DOUBLE PRIMARY SUPPORT

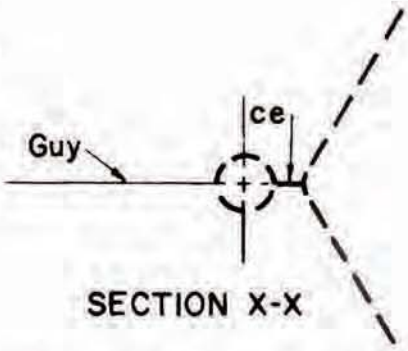
NOV. 1986

ZB2





PLAN



SECTION X-X

Note:

1. If future conversion is likely, allow space at top of pole for middle phase. Designate as ZB3A for this construction.
2. For units cd and ce see guide drawings M41-1 and M41-10.

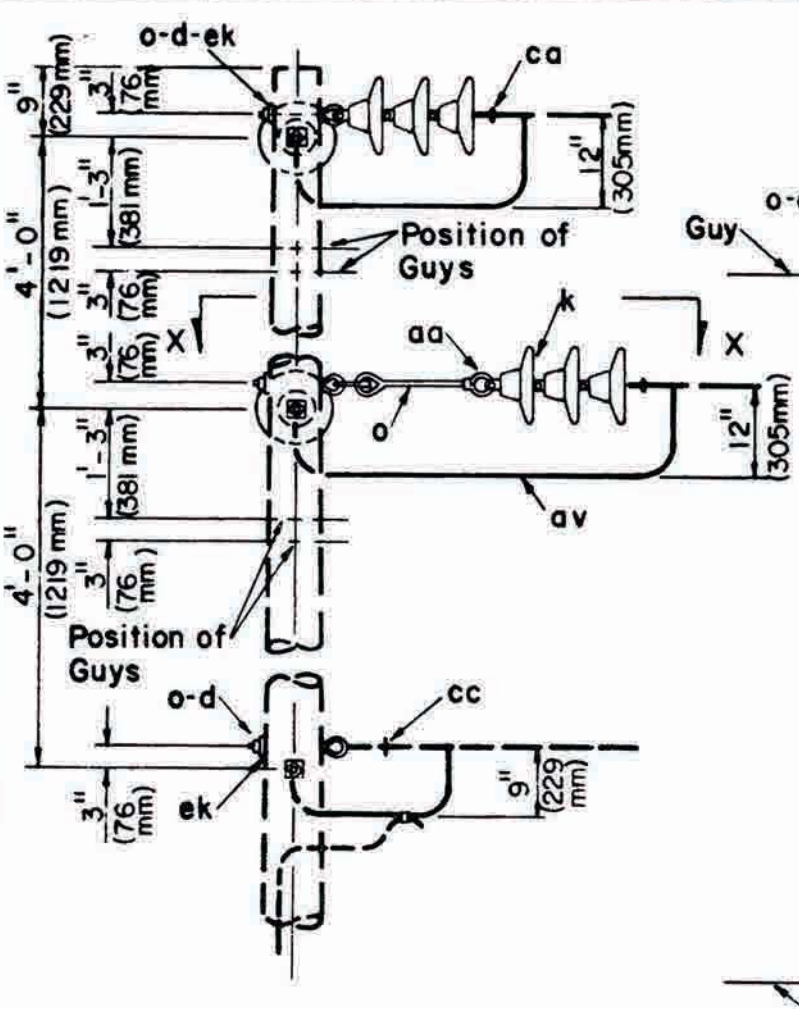
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	2	Washer, square 2 1/4"		cd	2	Angle assembly, primary	
k	6	Insulator, suspension, 10"		ce	1	Angle assembly, neutral	
o	2	Bolt, eye 5/8" x req'd length		ek		Locknuts, as required	
bo	2	Shackle, anchor					

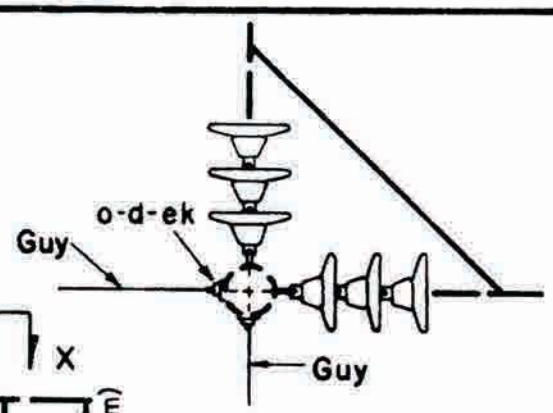
Angle: 20°-60°

34.5/19.9 kV, TWO PHASE VERTICAL CONSTRUCTION

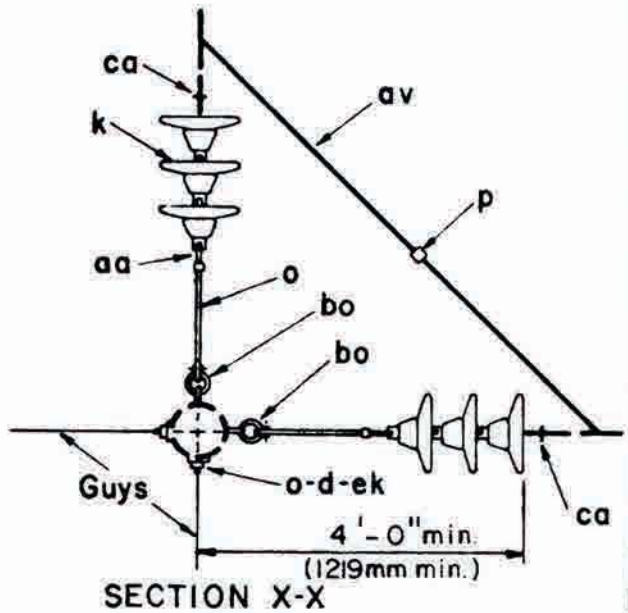
NOV. 1986

ZB3, ZB3A





PLAN



SECTION X-X

NOTE:

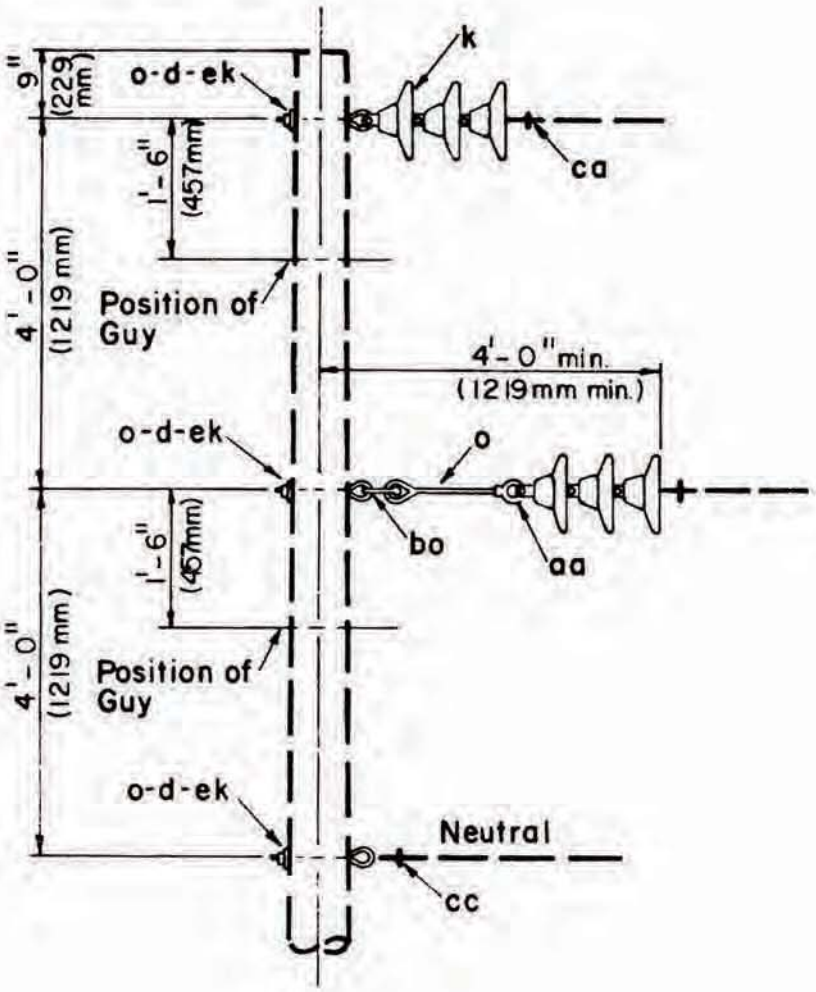
1. If future conversion is likely, allow space at top of pole for middle phase. Designate as ZB4-1A for this construction.
2. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	6	Washer, square, 2 1/4"		av		Jumpers, as required	
k	12	Insulator, suspension, 10"		bo	2	Shackle, anchor	
o	8	Bolt, eye, 5/8" x req'd length		ca	4	Deadend assembly, primary	
p		Connector, as required		cc	2	Deadend assembly, neutral	
aa	2	Nut, eye, 5/8"		ek		Locknuts, as required	

34.5/19.9 kV, TWO PHASE VERTICAL CONSTRUCTION

NOV. 1986

ZB4-1, ZB4-1A



NOTE:

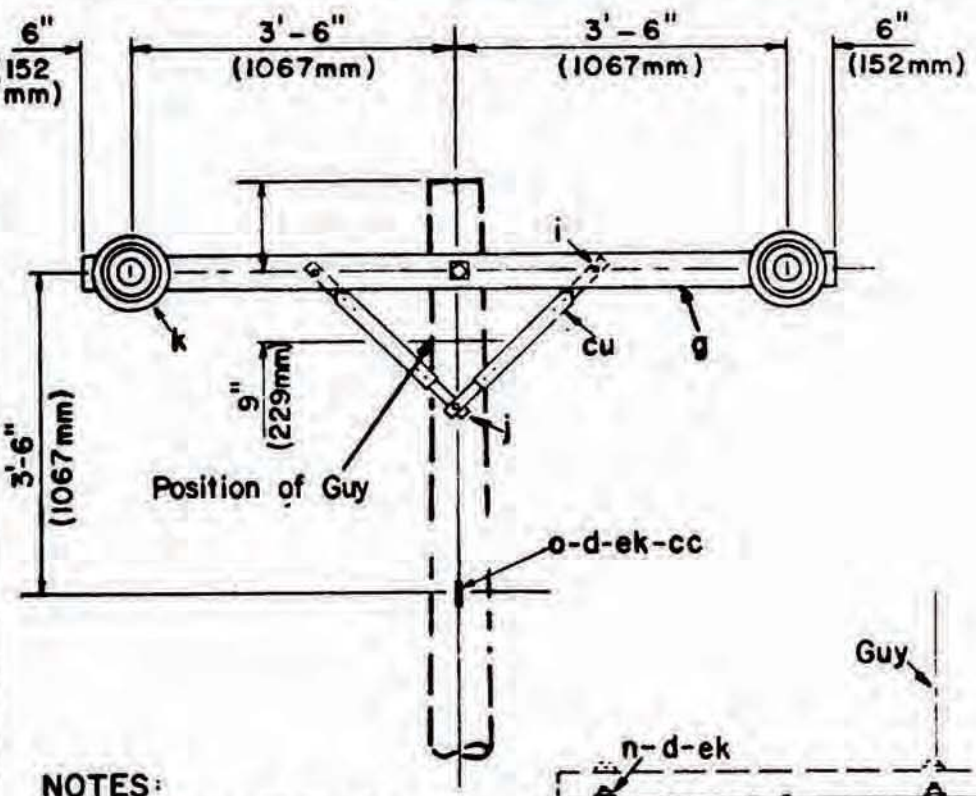
1. If future conversion to three phase is likely, allow space at top of pole for middle phase. Designate as ZB5-1A for this construction
2. For units ca and cc see guide drawings M42-11 and M42-13.

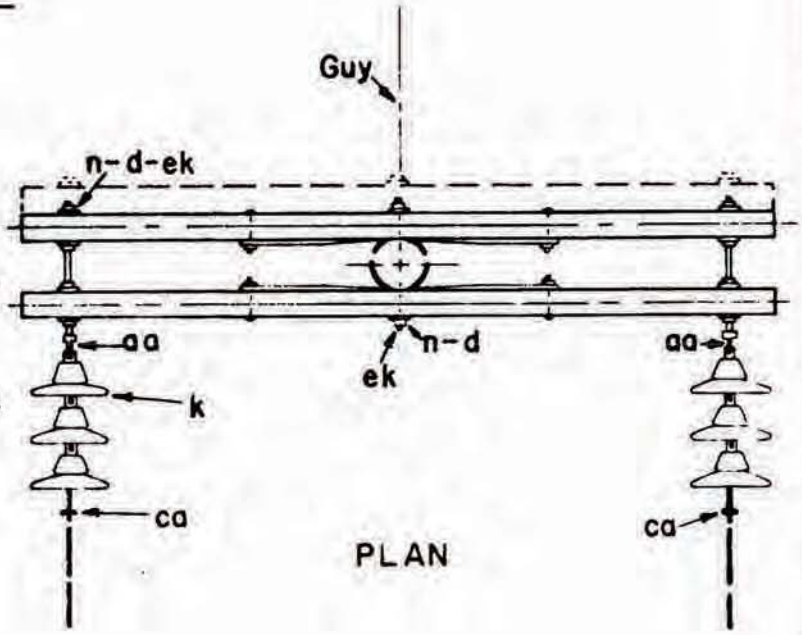
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	3	Washer, square, 2 1/4"		ca	2	Deadend assembly, primary	
k	6	Insulator, suspension, 10"		cc	1	Deadend assembly, neutral	
o	4	Bolt, eye, 5/8" x req'd length		bo	1	Shackle, anchor	
aa	1	Nut, eye, 5/8"		ek		Locknuts, as required	

34.5/19.9 kV TWO PHASE VERTICAL CONSTRUCTION-DEADEND(SINGLE)

NOV. 1986

ZB5-1, ZB5-1A





PLAN

NOTES:

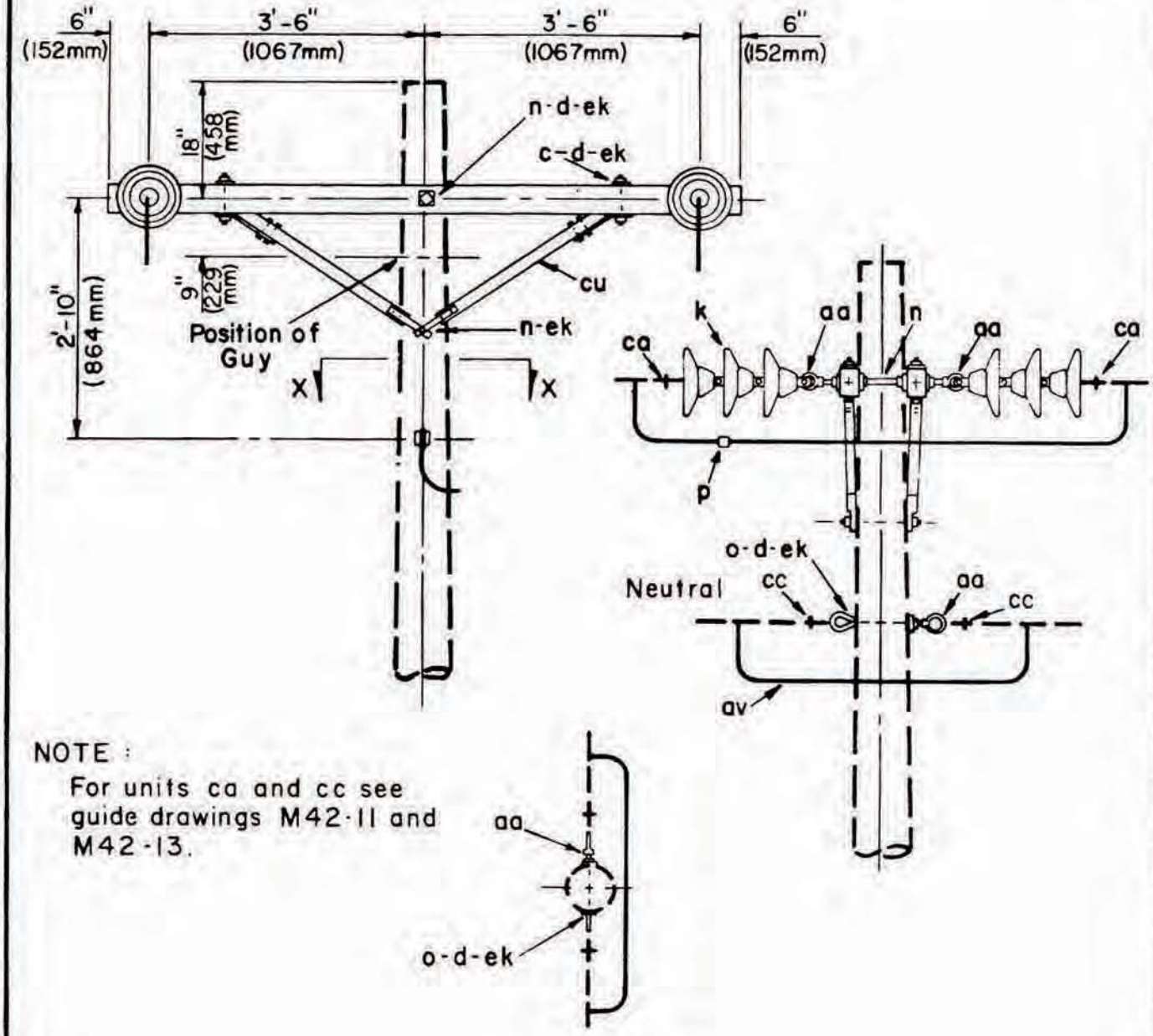
1. See drawing ZE5-1 for crossarm loading limitations.
2. Designate as ZB7-1 for assembly with three crossarms.
3. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	11	Washer, square, 2 1/4"		aa	2	Nut, eye, 5/8"	
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ca	2	Deadend assembly, primary	
l	4	Bolt, carriage 3/8" x 4 1/2"		cc	1	Deadend assembly, neutral	
j	2	Screw, lag, 1/2" x 4"		cu	4	Brace, wood, 28"	
k	6	Insulator, suspension, 10"		ek		Locknuts as required	
n	3	Bolt, double arming, 5/8" x req'd length					
o	1	Bolt, eye, 5/8" x req'd length					

34.5/ 19.9 kV, TWO PHASE CROSSARM CONSTRUCTION - DEADEND (SINGLE)

NOV. 1986

ZB7, ZB7-1



NOTE :
For units ca and cc see guide drawings M42-11 and M42-13.

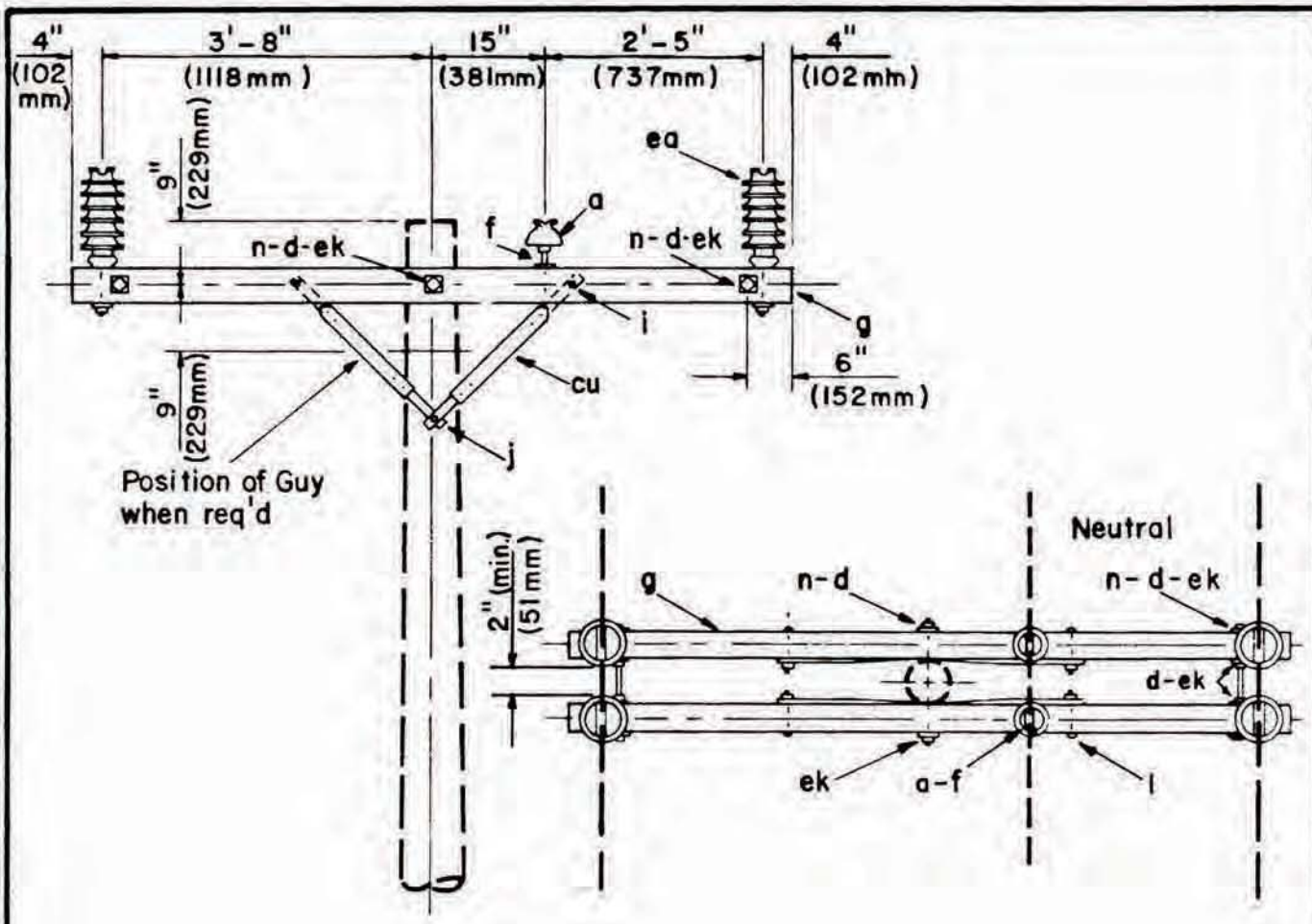
SECTION X-X

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	4	Bolt, machine, 1/2" x req'd length		p		Connectors as required	
d	12	Washer, square 2 1/4"		aa	5	Nut, eye, 5/8"	
d	4	Washer, round 1 3/8" dia.		av		Jumpers as required	
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ca	4	Deadend assembly, primary	
k	12	Insulator, suspension, 10"		cc	2	Deadend assembly, neutral	
n	4	Bolt, double arming, 5/8" x req'd length		cu	2	Brace, wood, 60" span	
o	1	Bolt eye, 5/8" x req'd length		ek		Locknuts, as required	

34.5/19.9 kV, TWO PHASE CROSSARM CONSTRUCTION - DEADEND (DOUBLE)

NOV. 1986

ZB8



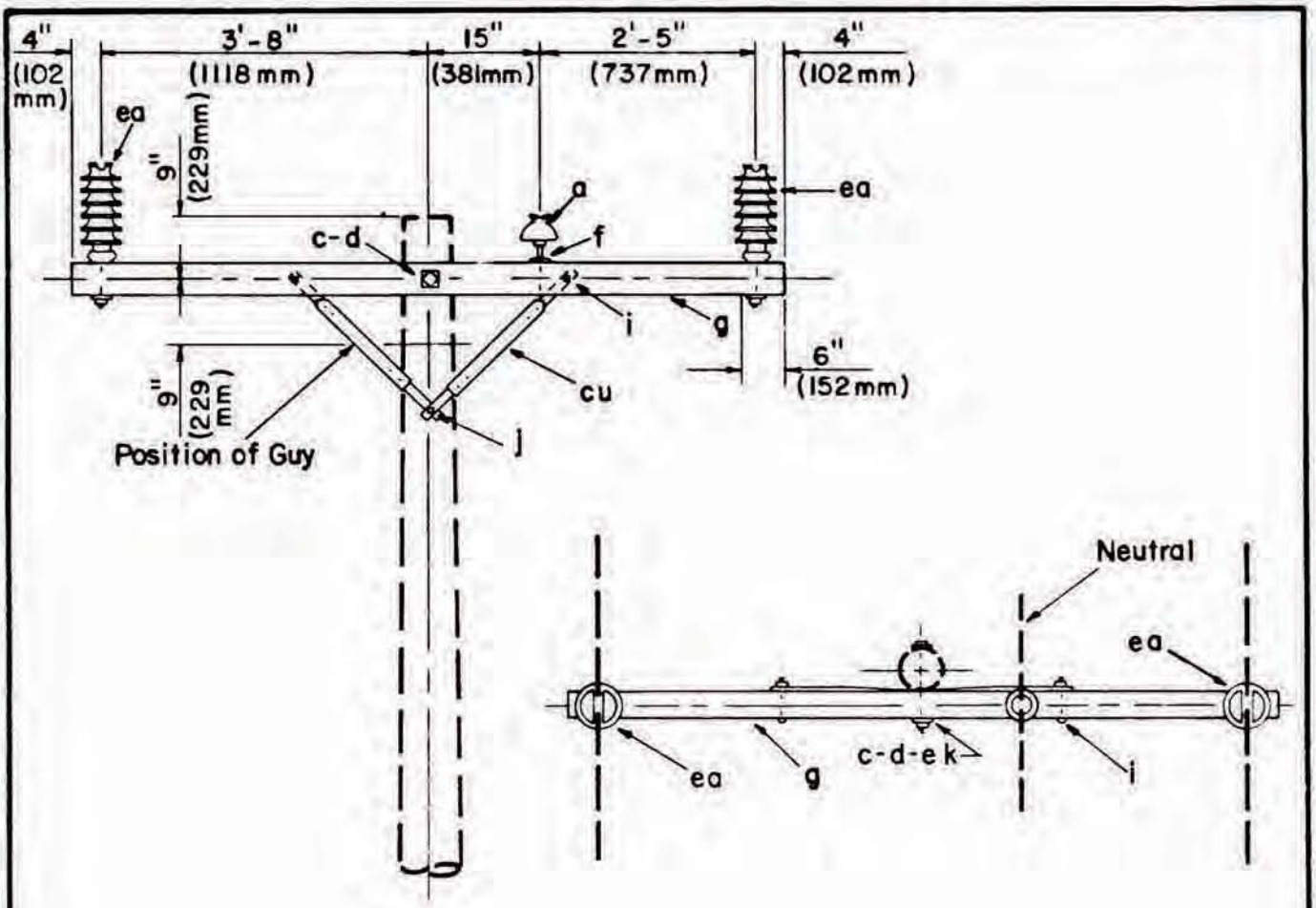
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	2	Insulator, pin type, (ANSI class 55-3)		n	3	Bolt, double arming, 5/8" x req'd length	
d	10	Washer square 2 1/4"		cu	4	Brace, wood, 28"	
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"		ea	4	Insulator, post type	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"					
l	4	Bolt, carriage, 3/8" x 4 1/2"		ek		Locknuts as required	
j	2	Screw lag 1/2" x 4"					

Maximum Transverse
Load: 750 lbs (3336N) / Insulator
1500 lbs (6672N) / Total
Angle: 0° – 20°

34.5/19.9 kV TWO PHASE CROSSARM CONSTRUCTION- DOUBLE LINE ARM

NOV. 1986

ZB9



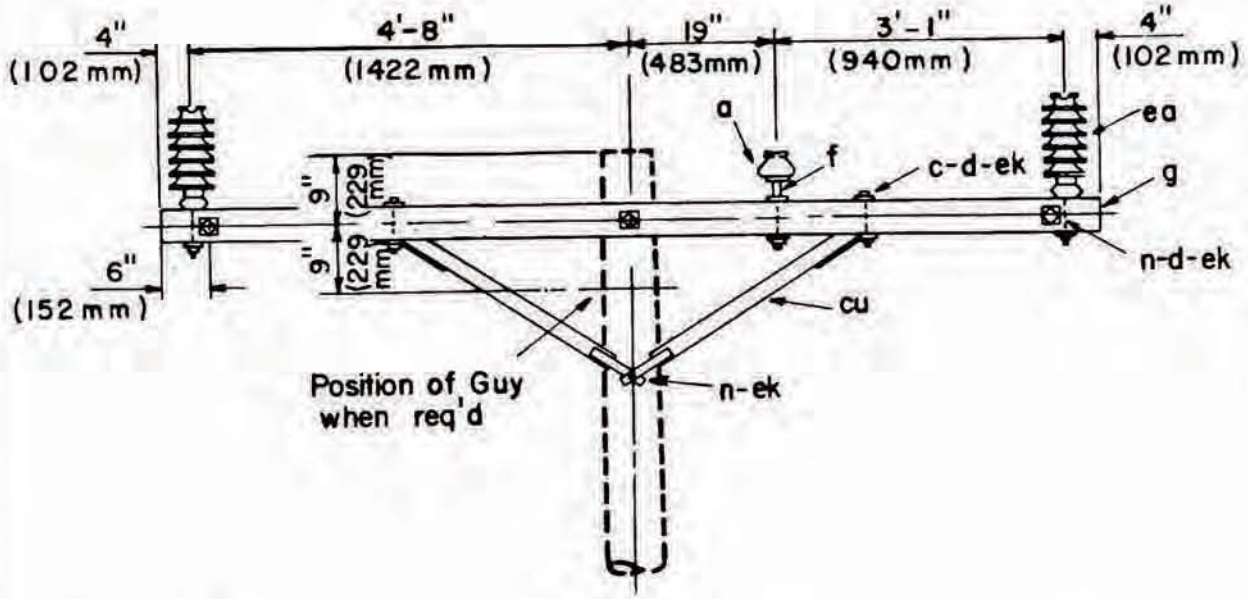
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	1	Insulator, pin type, (ANSI class 55-3)		i	2	Bolt, carriage, 3/8" x 4 1/2"	
c	1	Bolt, machine, 5/8" x req'd length		j	1	Screw, lag, 1/2" x 4"	
d	2	Washer, square, 2 1/4"		cu	2	Brace, wood 28"	
f	1	Pin, crossarm, steel, 5/8" x 10 3/4"					
g	1	Crossarm 3 5/8" x 4 5/8" x 8'-0"		e k		Locknuts as required	
				ea	2	Insulator, post type	

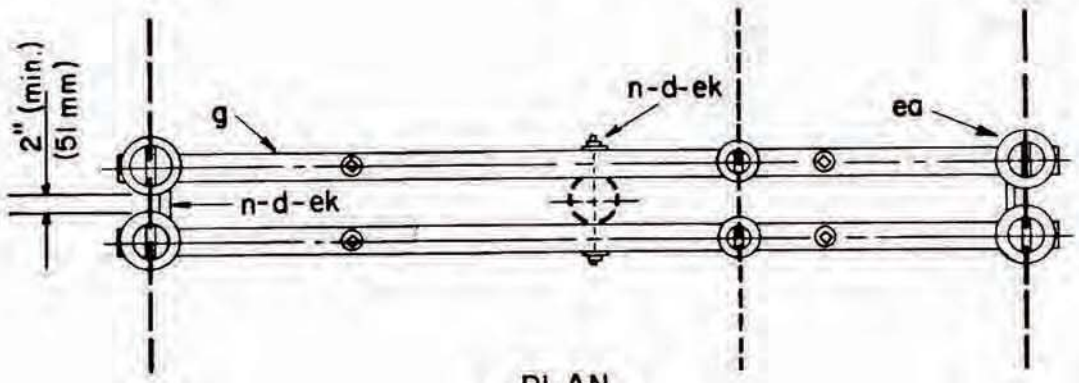
Maximum Transverse
Load : 750 lbs (3336N)
Angle: 0°-5°

34.5/19.9 kV, TWO PHASE CROSSARM CONSTRUCTION-SINGLE LINE ARM

NOV. 1986

ZB9-1





PLAN

This construction should be used where future conversion to three phase is likely.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	2	Insulator, pin type, (ANSI Class 55-3)		n	4	Bolt, double arming, 5/8" x req'd length	
c	4	Bolt, machine 1/2" x req'd length		cu	2	Brace, crossarm, wood, 60" span	
d	10	Washer, square 2 1/4"		ea	4	Insulator, post type	
d	4	Washer, round 1 3/8"					
f	2	Pin, crossarm, steel 5/8" x 10 3/4"		ek		Locknuts as req'd	
g	2	Crossarm 3 5/8" x 4 5/8" x 10'-0"					

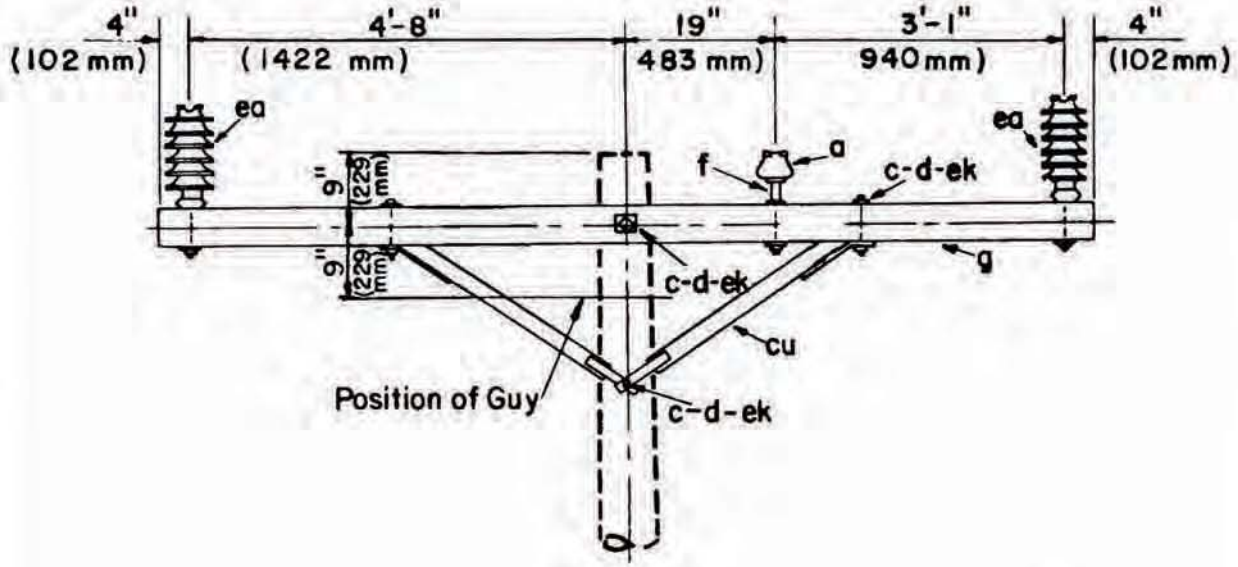
Maximum Transverse
Load 750lbs(3336N) Insulator
1500lbs(6672N) Total

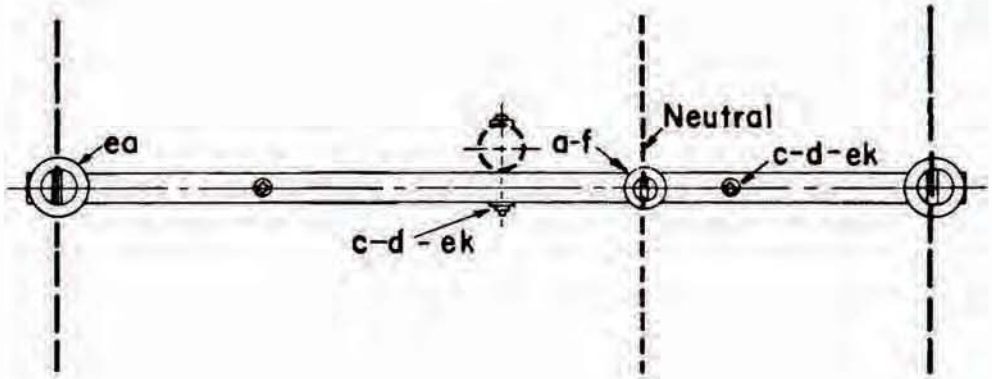
Angle : 0°-20°

34.5/19.9 kV, 2 -PHASE
CROSSARM CONSTRUCTION - DOUBLE LINE ARM

NOV. 1986

ZB9-2





This construction should be used where future conversion to three phase is likely.

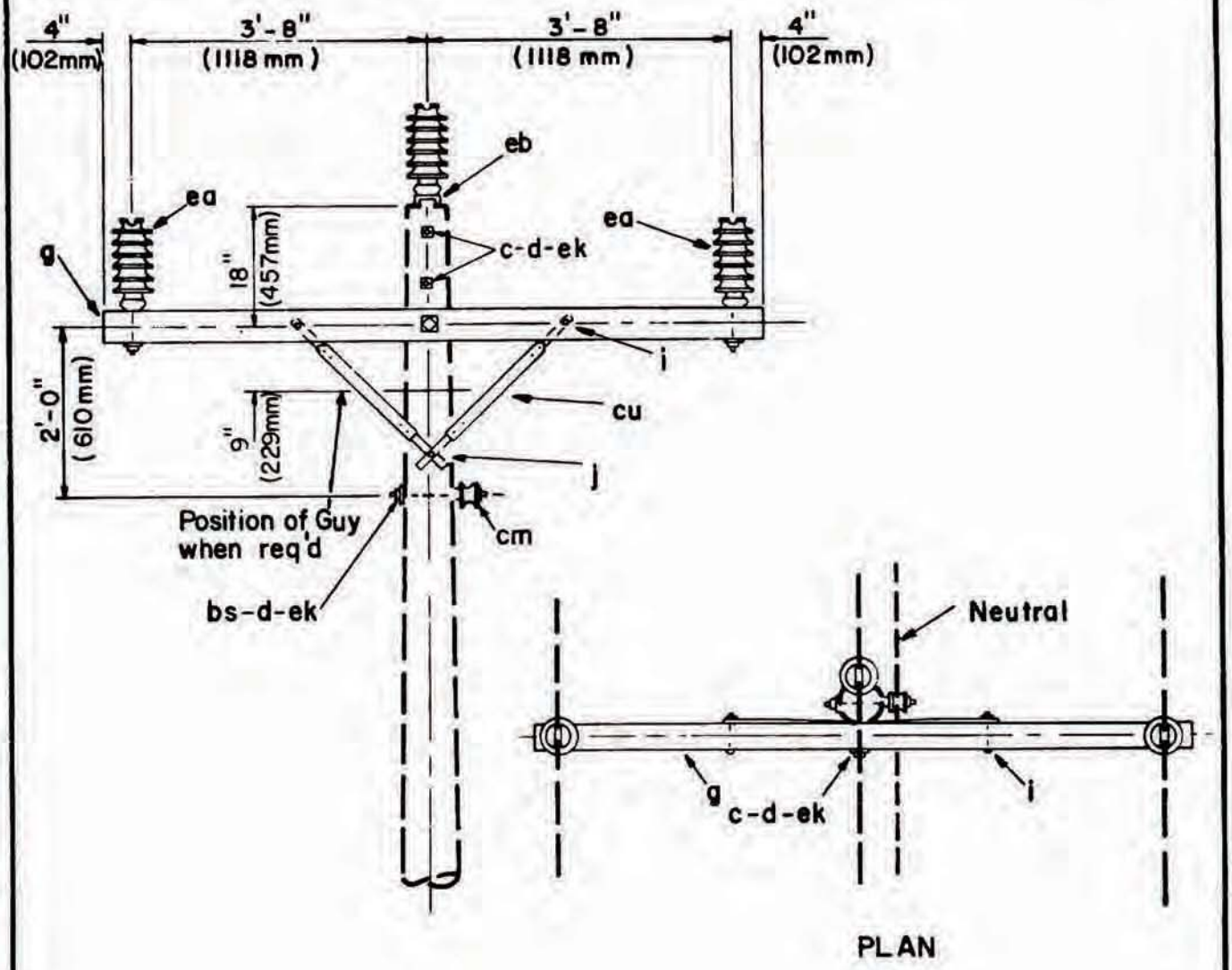
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	1	Insulator, pin type, (ANSI class 55-3)		g	1	Crossarm, 3 5/8"x 4 5/8"x 10'-0"	
c	2	Bolt, machine, 5/8" x req'd length		cu	1	Brace, crossarm, wood, 60" span	
c	2	Bolt, machine, 1/2" x req'd length		ea	2	Insulator, post type	
d	3	Washer, square, 2 1/4"					
d	2	Washer, round, 1 3/8"		ek		Locknuts as required	
f	1	Pin, crossarm, steel 5/8" x 10 3/4"					

Maximum Transverse
Load: 750lbs (3336N)/Insulator
Angle: 0° – 5°

34.5/19.9 kV, 2 -PHASE
CROSSARM CONSTRUCTION - SINGLE LINE ARM

NOV. 1986

ZB9-3



ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	3	Bolt, machine, 5/8" x req'd length		cu	2	Brace, wood 28"	
d	5	Washer, square, 2 1/4"		ea	3	Insulator, post type	
g	1	Crossarm, 3 5/8"x 4 5/8"x 8'-0"		eb	1	Bracket, pole top	
i	2	Bolt, carriage 3/8" x 4 1/2"		ek		Locknuts as required	
j	1	Screw, lag, 1/2" x 4"					
bs	1	Bolt, single, upset					
cm	1	Spool insulator					

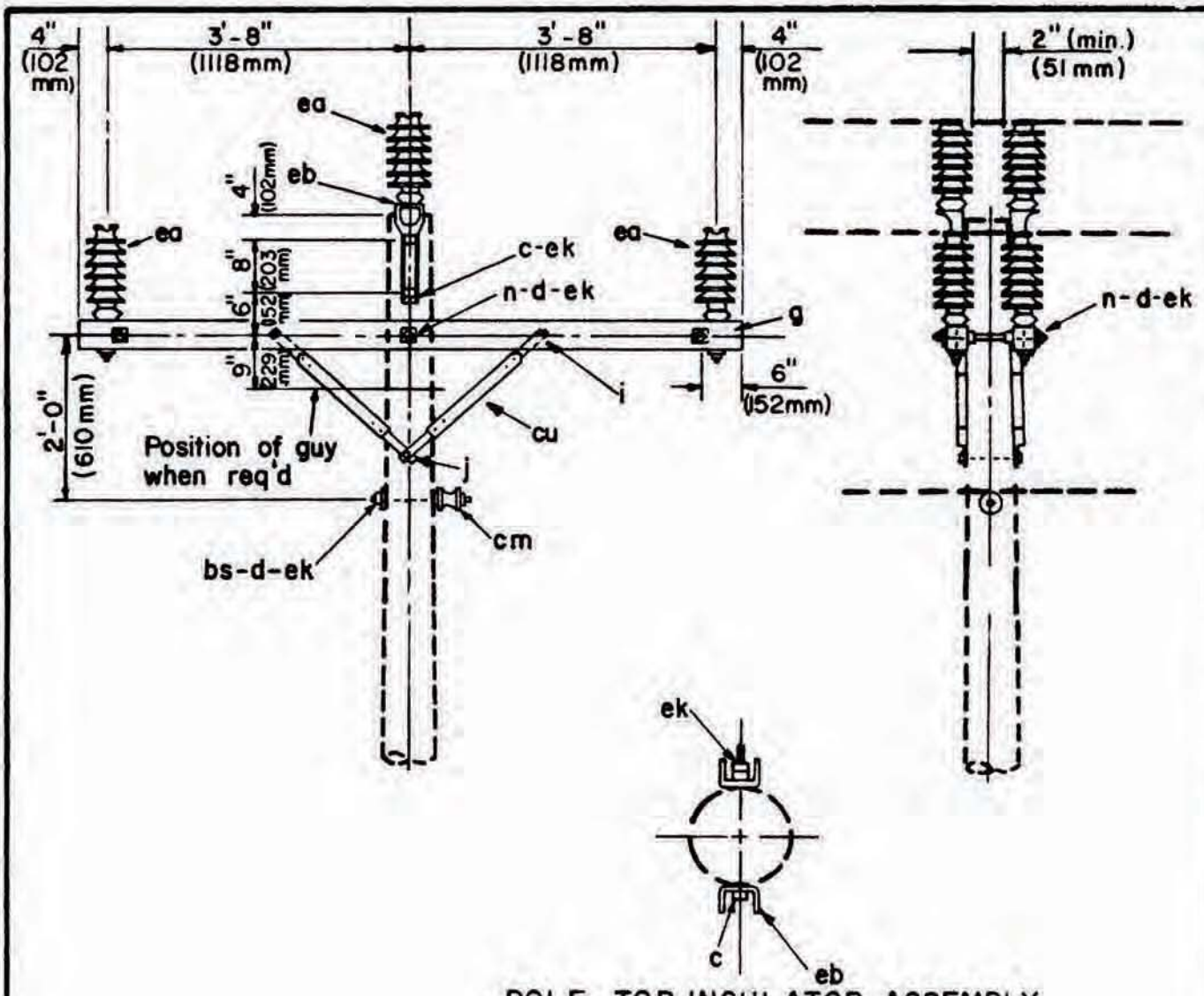
Maximum Transverse Load: 7501bs (3336N) / Insulator

Angle: 0° – 5°

34.5/19.9 kV, 3-PHASE CROSSARM CONSTRUCTION-SINGLE PRIMARY SUPPORT

NOV. 1986

ZC1



POLE TOP INSULATOR ASSEMBLY

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 5/8" x req'd length		cm	1	Spool Insulator	
d	11	Washer, square, 2 1/4"		cu	4	Brace, wood, 28"	
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ea	6	Insulator, post type	
l	4	Bolt carriage 3/8" x 4 1/2"		eb	2	Bracket pole top	
j	2	Screw, Lag 1/2" x 4"		ek		Locknuts as required	
n	3	Bolt, double arming 5/8" x required		bs	1	Bolt, Single upset	

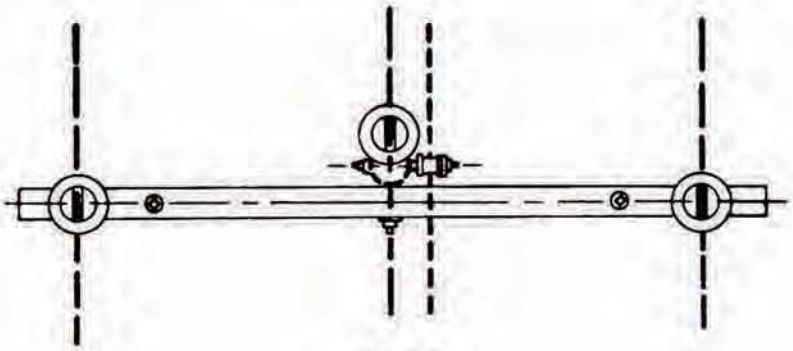
Maximum Transverse
Load: 750 lbs (3336N)/Insulator
1500 lbs (6672N) Total

Angle: 0°-5°

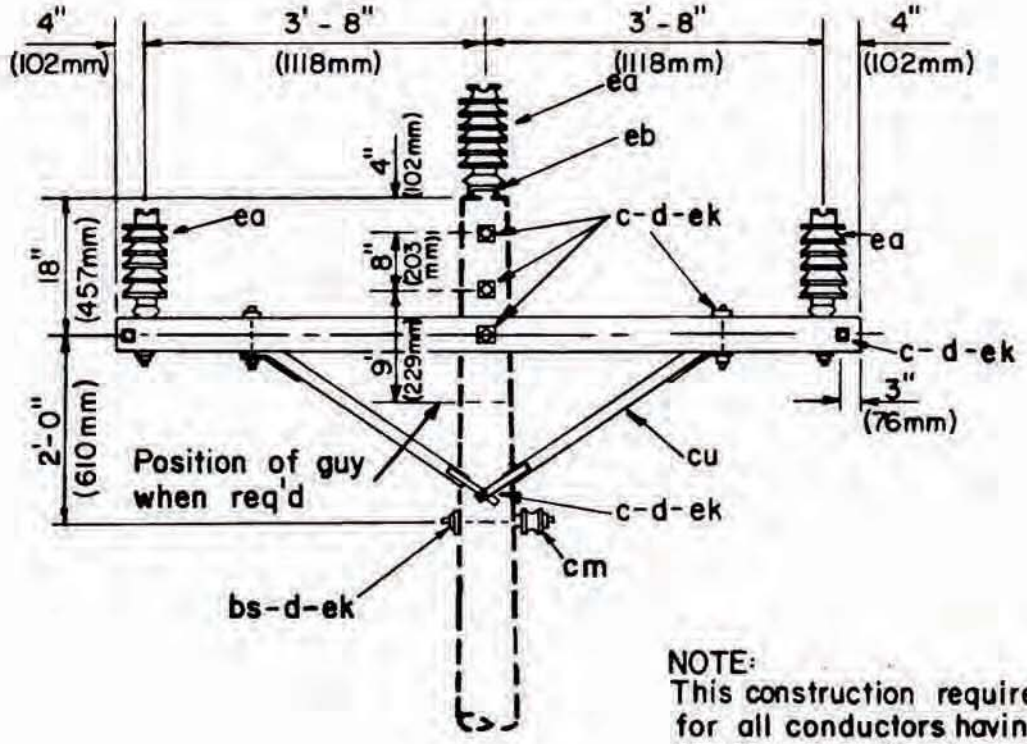
34.5/19.9 kV, 3-PHASE
CROSSARM CONSTRUCTION-DOUBLE PRIMARY SUPPORT

NOV. 1986

ZCI-1



PLAN



NOTE:
This construction required for all conductors having a breaking strength of more than 4500 lbs (20016 N)

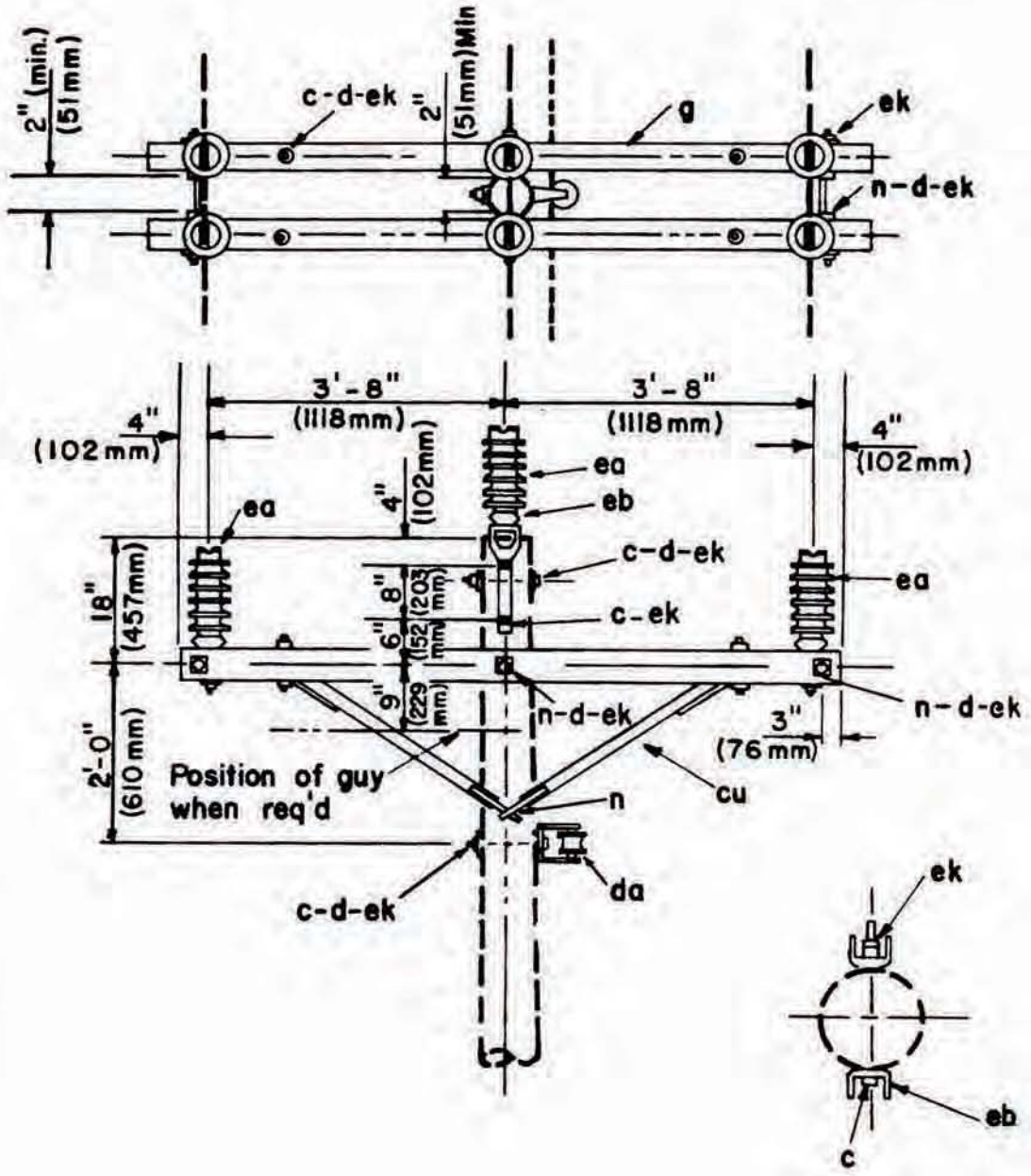
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 1/2" x req'd length		bs	1	Bolt, single upset	
c	6	Bolt, machine, 5/8" x req'd length		cu	1	Brace, wood, 60" span	
d	2	Washer, round 1 3/8" dia.		ea	3	Insulator, post type	
d	10	Washer, square, 2 1/4"		eb	1	Bracket, pole top	
g	1	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ek		Locknuts as required	
				cm	1	Insulator, spool	

Maximum Transverse
Load : 750 lbs (3336 N)/Insulator
Angle: 0°–2°

34.5/19.9 kV
3–PHASE CROSSARM CONSTRUCTION
(LARGE CONDUCTORS)

NOV. 1986

ZC1–2



ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	4	Bolt, machine, 5/8" x req'd length		cu	2	Brace, wood 60" span	
c	4	Bolt, machine, 1/2" x req'd length		da	1	Bracket, insulated	
d	13	Washer, square, 2 1/4"		eb	2	Bracket, pole top	
d	4	Washer, round 1 3/8"		ek		Locknuts as required	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"					
n	4	Bolt, double arming, 5/8" x req'd lnth					
ea	6	Insulator, post type					

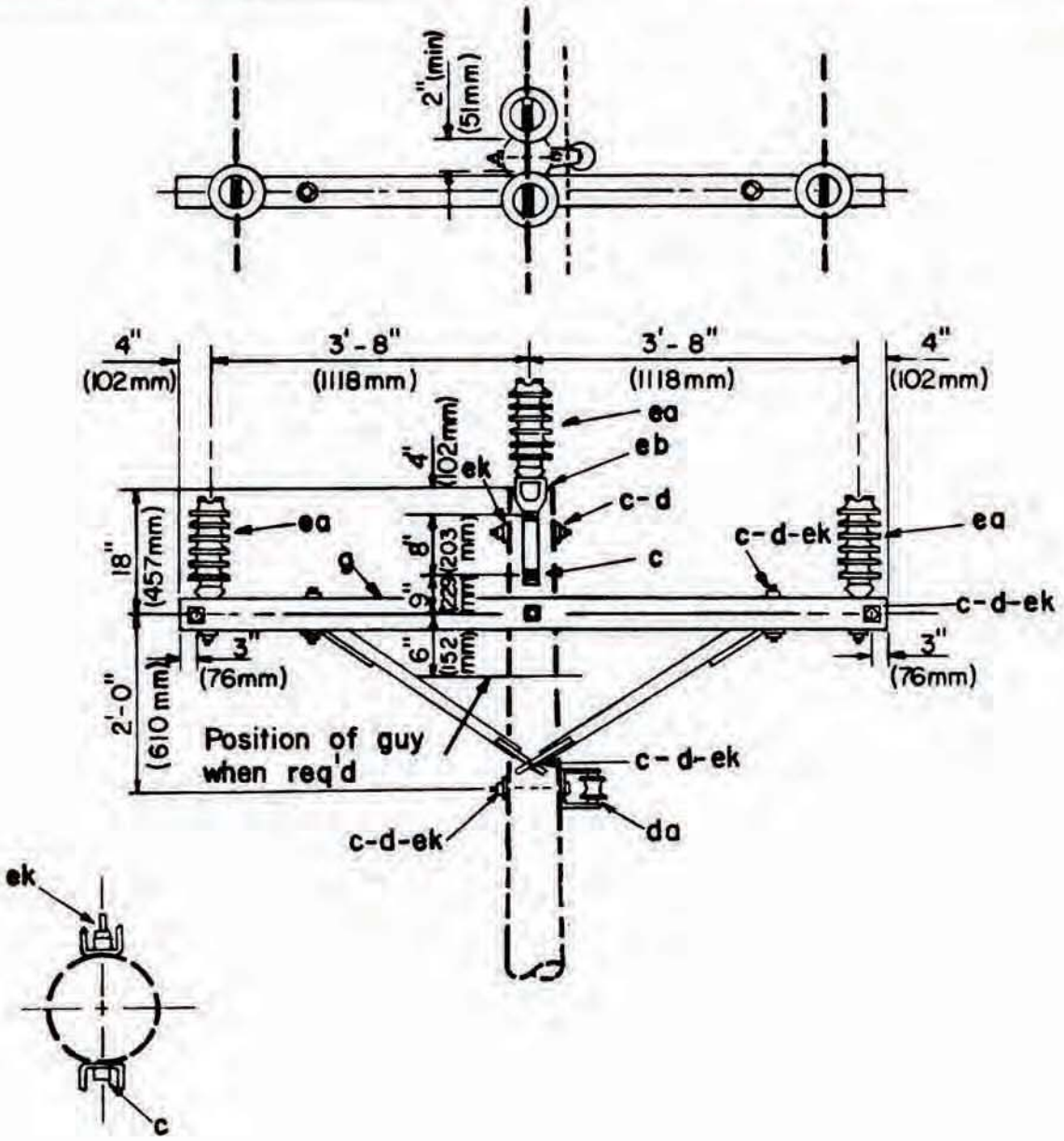
Maximum Transverse Load : 750lbs(3336N) / Insulator
1500lbs(6672N) Total

Angle: 0°– 5°

34.5/19.9 kV, 3-PHASE CROSSARM CONSTRUCTION - DOUBLE PRIMARY SUPPORT (LARGE CONDUCTORS)

NOV. 1986

ZCI-3



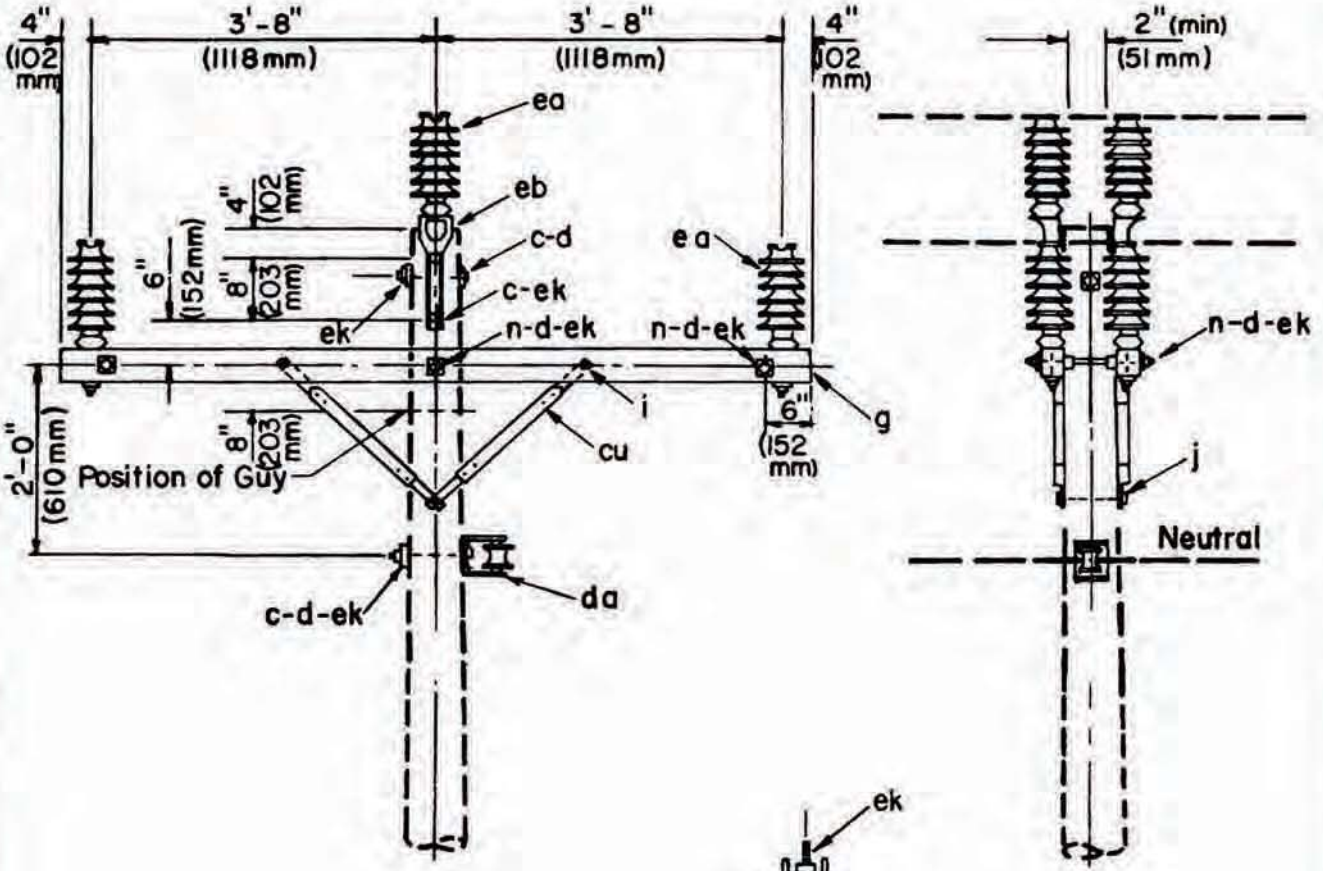
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	8	Bolt, machine, 5/8" x req'd length		da	1	Bracket, insulated	
c	2	Bolt, machine, 1/2" x req'd length		ea	4	Insulator, post type	
d	10	Washer, square, 2 1/4"		eb	2	Bracket, pole top	
d	2	Washer, round, 1 3/8" dia.		ek		Locknuts as required	
g	1	Crossarm 3 5/8" x 4 5/8" x 8'-0"					
cu	1	Brace, wood, 60" span					

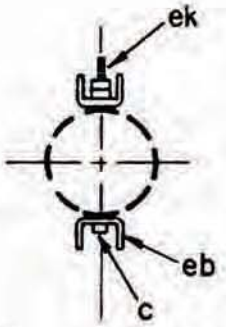
Maximum Transverse
Load: 750lbs (3336N)/insulator
Angle 2° - 5°

34.5/19.9 kV
3-PHASE CROSSARM CONSTRUCTION
(LARGE CONDUCTORS)

NOV. 1986

ZCI-4





POLE TOP INSULATOR ASSEMBLY

NOTE:
When the transverse load is more than 750lbs.(3336N) per insulator, construction similar to ZC3 should be used

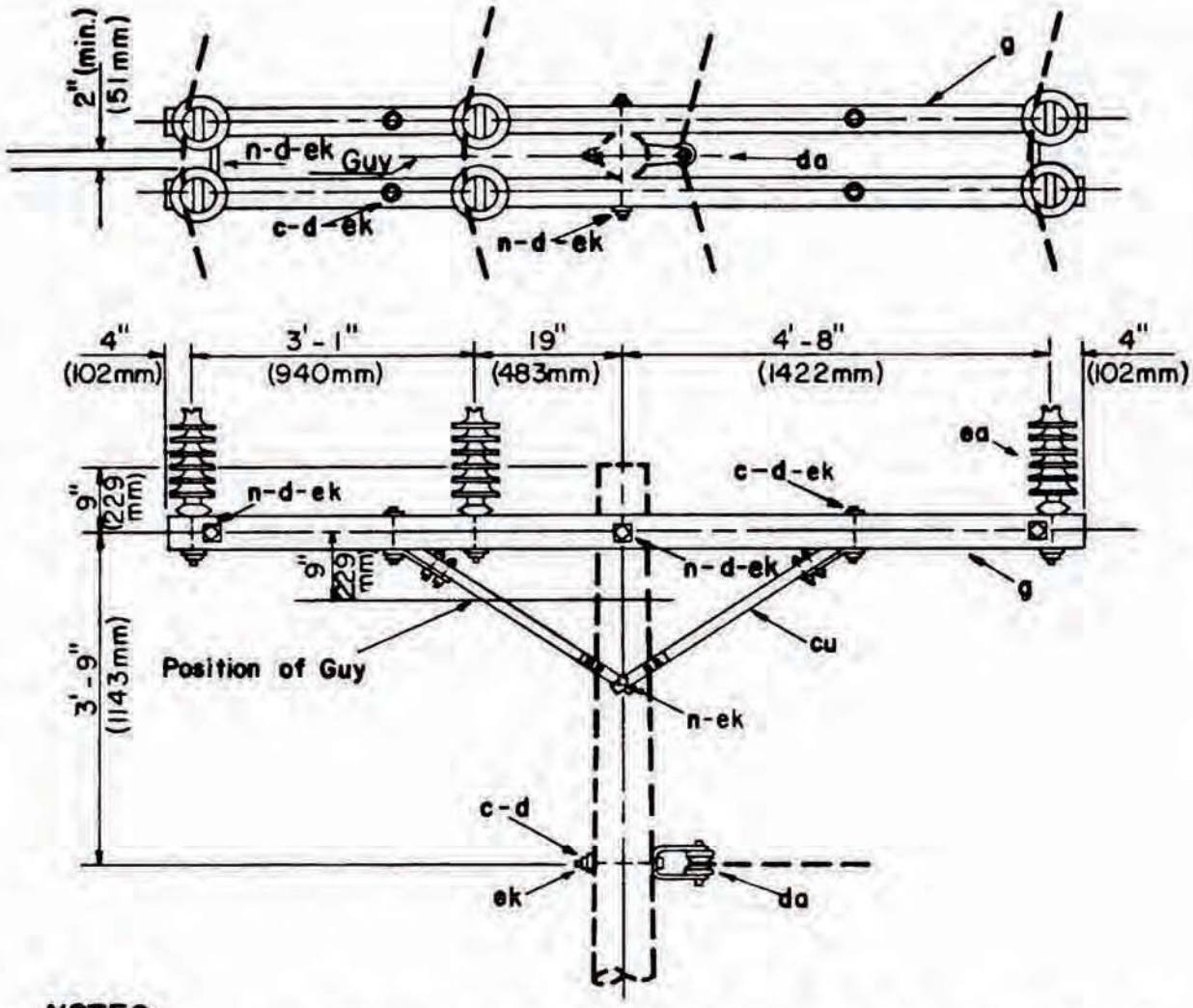
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	4	Bolt machine 5/8"x req'd length		cu	4	Brace, wood, 28"	
d	13	Washer, square 2 1/4"		da	1	Bracket, Insulated	
n	3	Bolt, double arming 5/8"x req'd length		ea	6	Insulator, Post type	
g	2	Crossarm, 3 5/8"x 4 5/8"x 8'-0"		eb	2	Bracket, pole top	
i	4	Bolt carriage 3/8" x 4 1/2"		ek		Locknuts as req'd	
j	2	Screw lag 1/2" x 4"					

Maximum Transverse Load: 750 lbs (3336N)/Insulator
1500 lbs (6672N) Total
Angle 5°-20°

34.5/19.9 kV, 3-PHASE CROSSARM CONSTRUCTION- DOUBLE PRIMARY SUPPORT

NOV. 1986

ZC2



NOTES:

1. Center phase wire or neutral wire may be located on the opposite side of the pole where necessary to avoid crossing of wires
2. Neutral may also be mounted on the crossarm.
3. When the transverse load is more than 750 lbs (3336 N) per insulator construction similar to ZC3-1 should be used.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		g	2	Crossarm, 3 5/8" x 4 5/8" x 10'-0"	
c	4	Bolt, machine, 1/2" x req'd length		n	4	Bolt, double arming, 5/8" x req'd length	
d	11	Washer, square 2 1/4"		cu	2	Brace, wood, 60" span	
d	4	Washer, round 1 3/8" dia.		da	1	Bracket, insulated	
				ek		Locknuts as req'd	

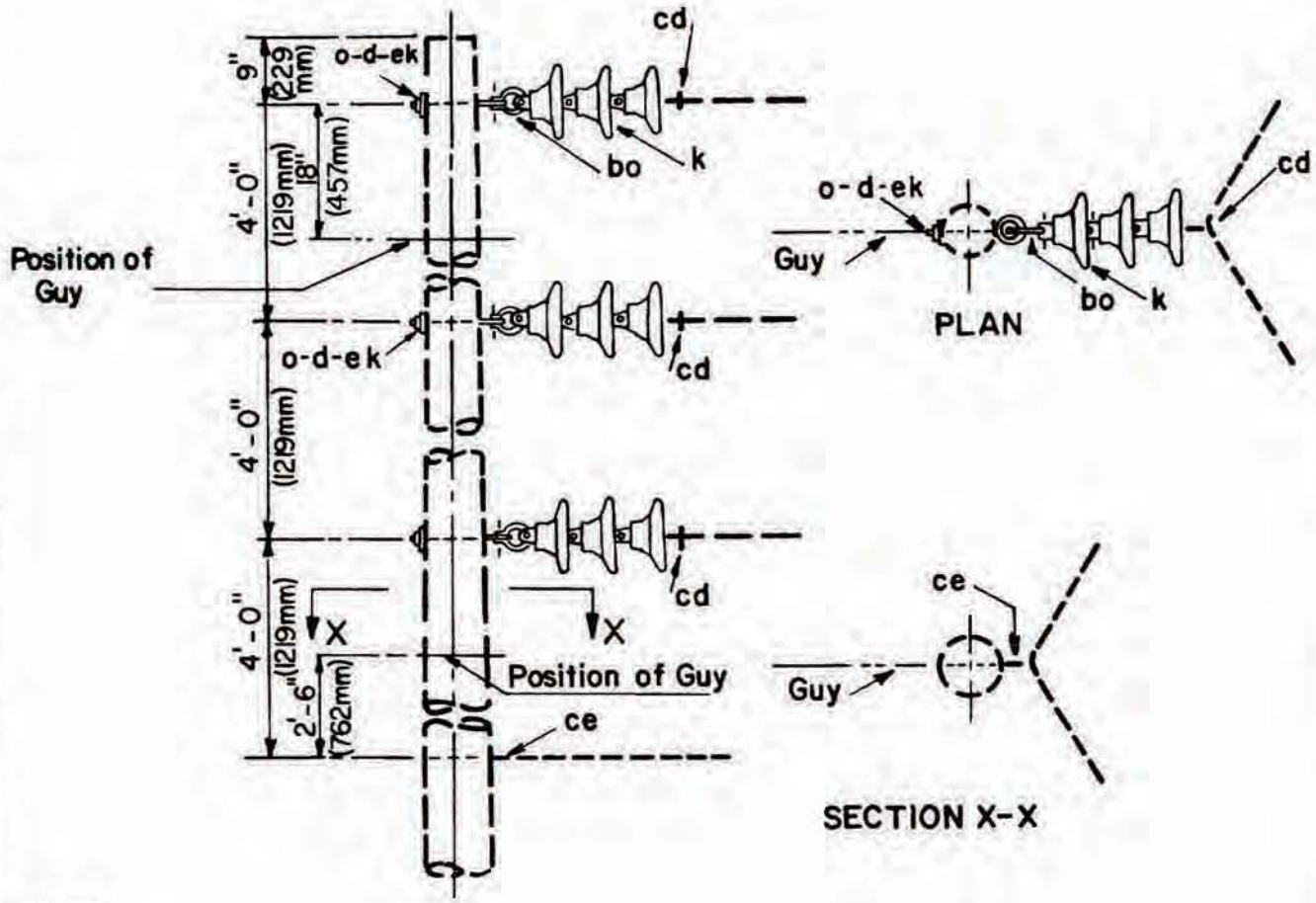
MAXIMUM TRANSVERSE LOAD: 750 lbs (3336 N)/insulator
1500 lbs (6672 N) Total

ANGLE: 5° - 20°

34.5/19.9 kV, 3 PHASE
CROSSARM CONSTUCTION DOUBLE PRIMARY

NOV. 1986

ZC2-1



NOTE:

For units cd and ce see guide drawings M41-1 and M41-10.

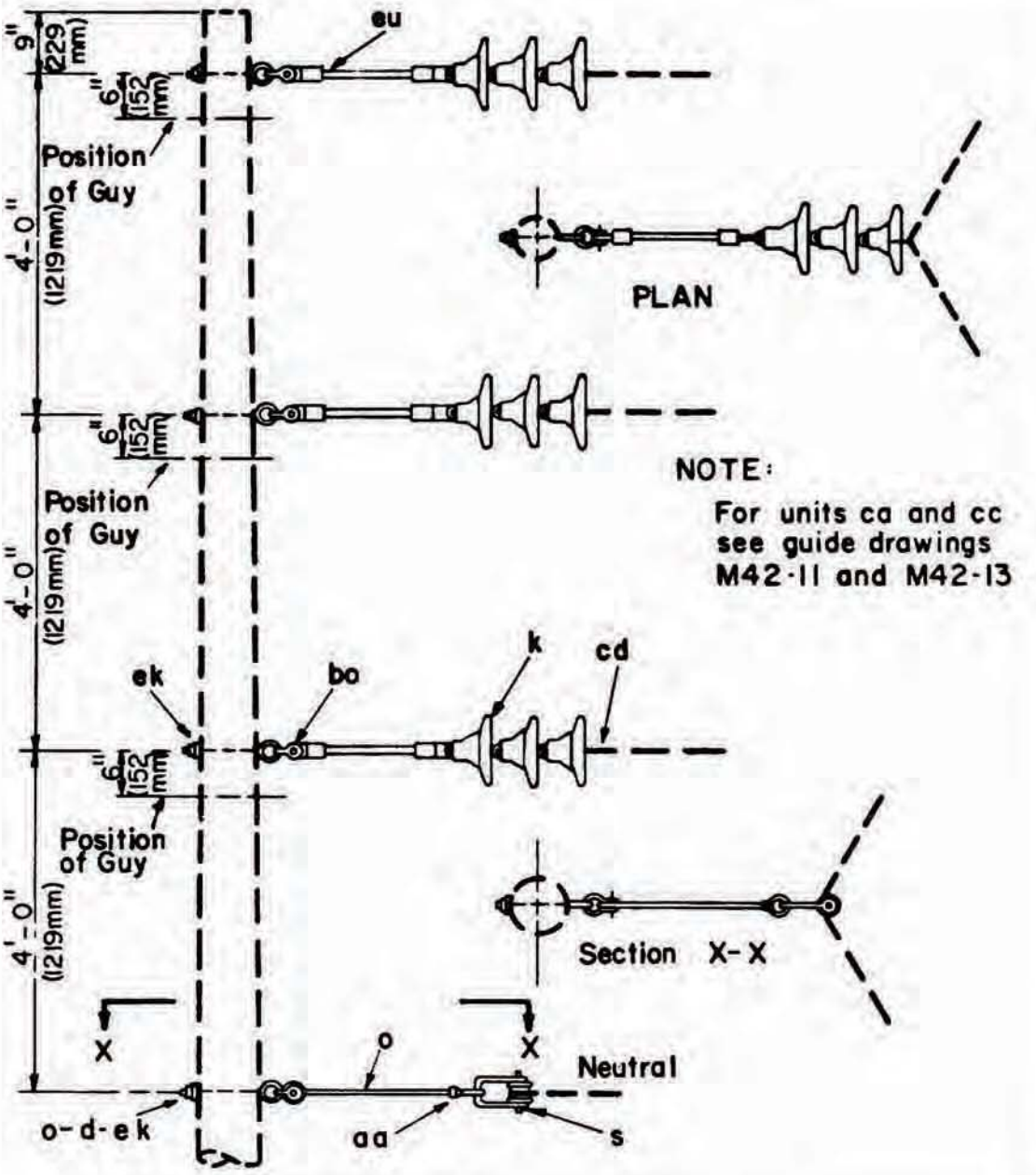
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	3	Washer, square 2 1/4"		cd	3	Angle assembly, primary	
k	9	Insulator, suspension 10"		ce	1	Angle assembly, neutral	
o	3	Bolt, eye, 5/8" x req'd length		ek		Locknuts as required	
bo	3	Shackle, anchor					

Angle: 20°- 60°

34.5/19.9 kV PRIMARY, 3-PHASE VERTICAL CONSTUCTION

NOV. 1986

ZC3



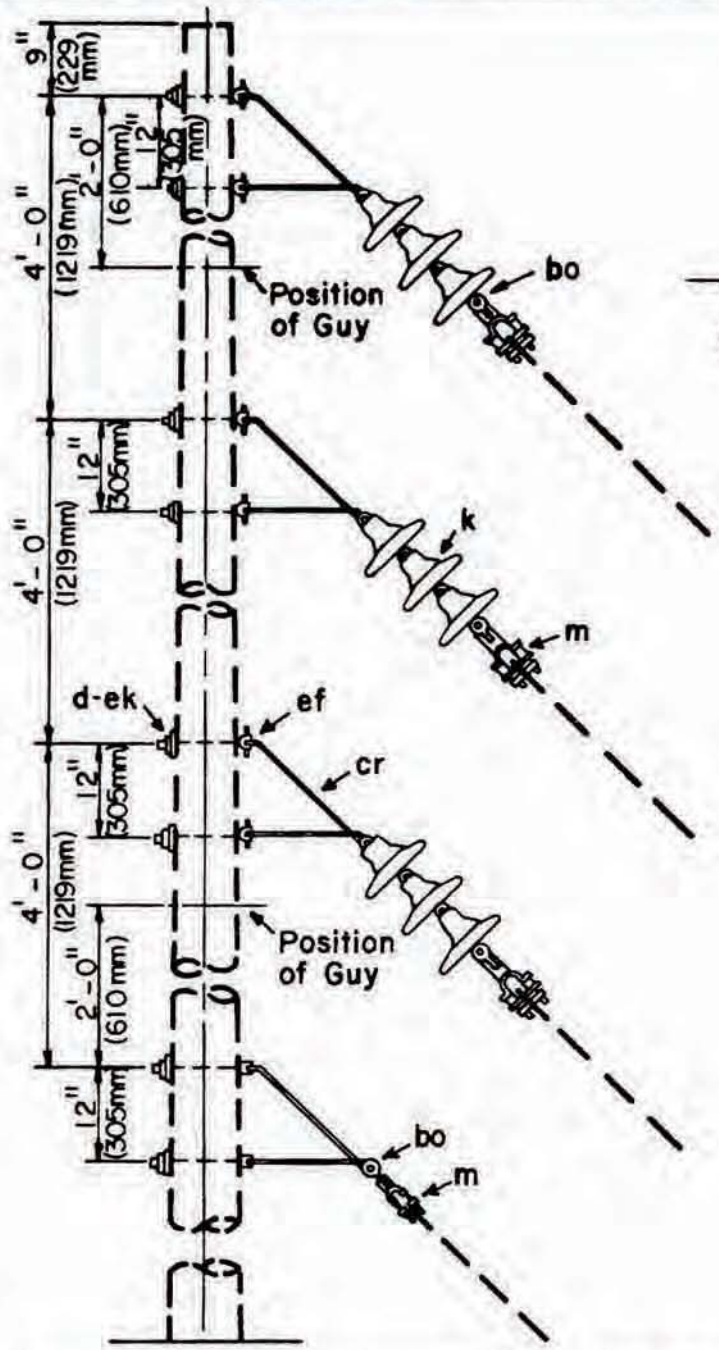
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	4	Washer, square 2 1/4"		bo	4	Shackle, anchor	
k	9	Insulator, suspension, 10"		cd	3	Angle assembly, primary	
o	5	Bolt, eye, 5/8" x req'd length		ek		Locknuts as req'd	
s	1	Clevis, secondary, swinging, insulated		eu	3	Link, extension, insulated	
aa	1	Nut, eye, 5/8"					

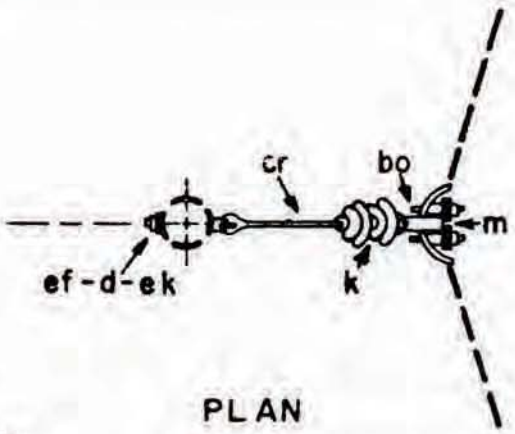
Angle: 20° – 60°

34.5/19.9 kV - THREE PHASE VERTICAL CONSTRUCTION, LARGE CONDUCTORS

NOV. 1986

ZC3L





PLAN

NOTE:
Bond clevis bolts together at each conductor position

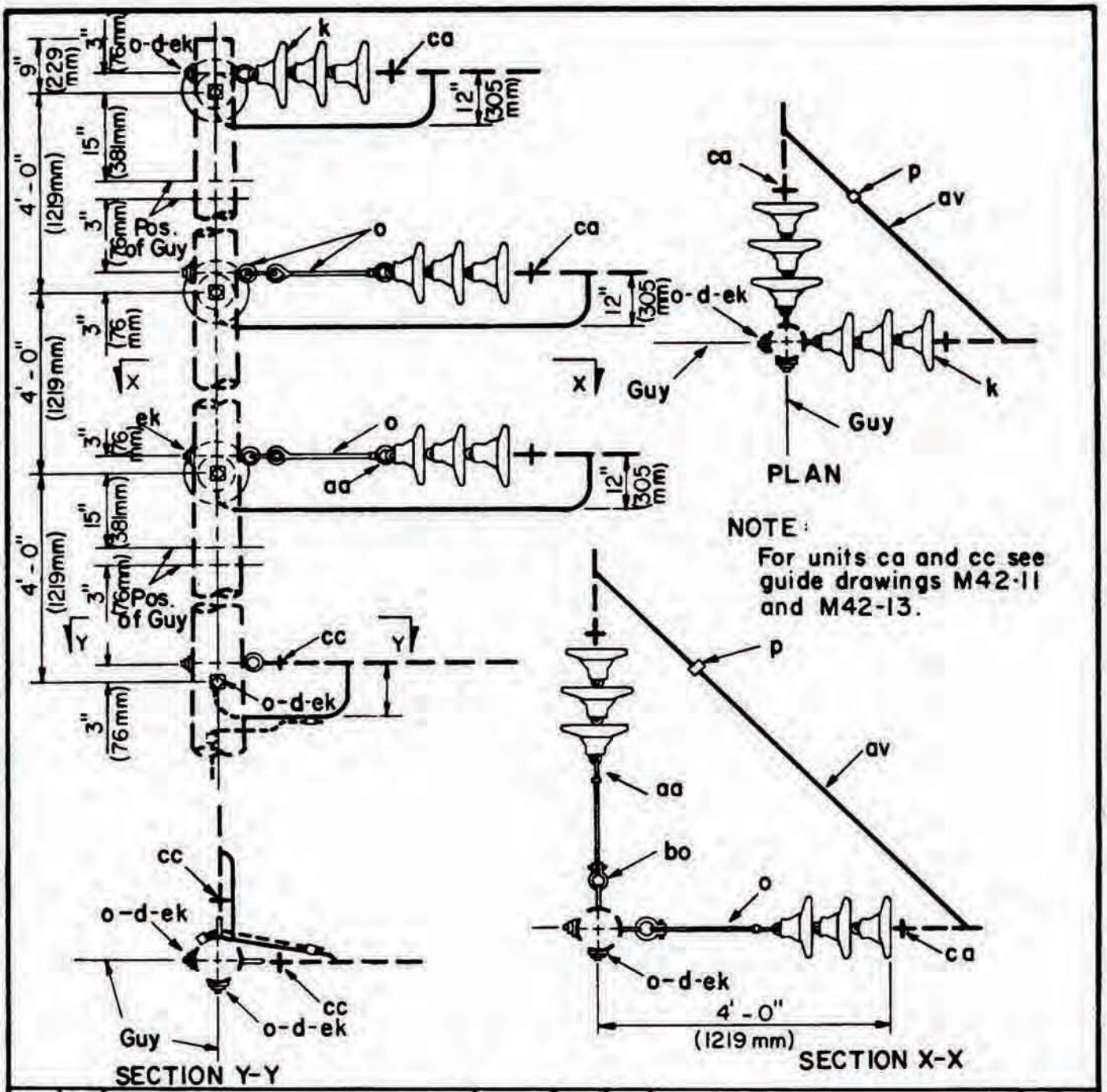
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	8	Washer, square, 2 1/4"		cr	4	Bracket, angle, 5/8"	
k	9	Insulator, suspension, 10"		ef	8	Bolt, clevis, 5/8" x req'd length	
m	4	Clamp, suspension		ek		Locknuts as req'd	
bo	4	Shackle, Anchor					

Angle: 10°-20°

34.5/19.9 kV VERTICAL CONSTRUCTION LARGE CONDUCTORS

NOV. 1986

ZC3-1



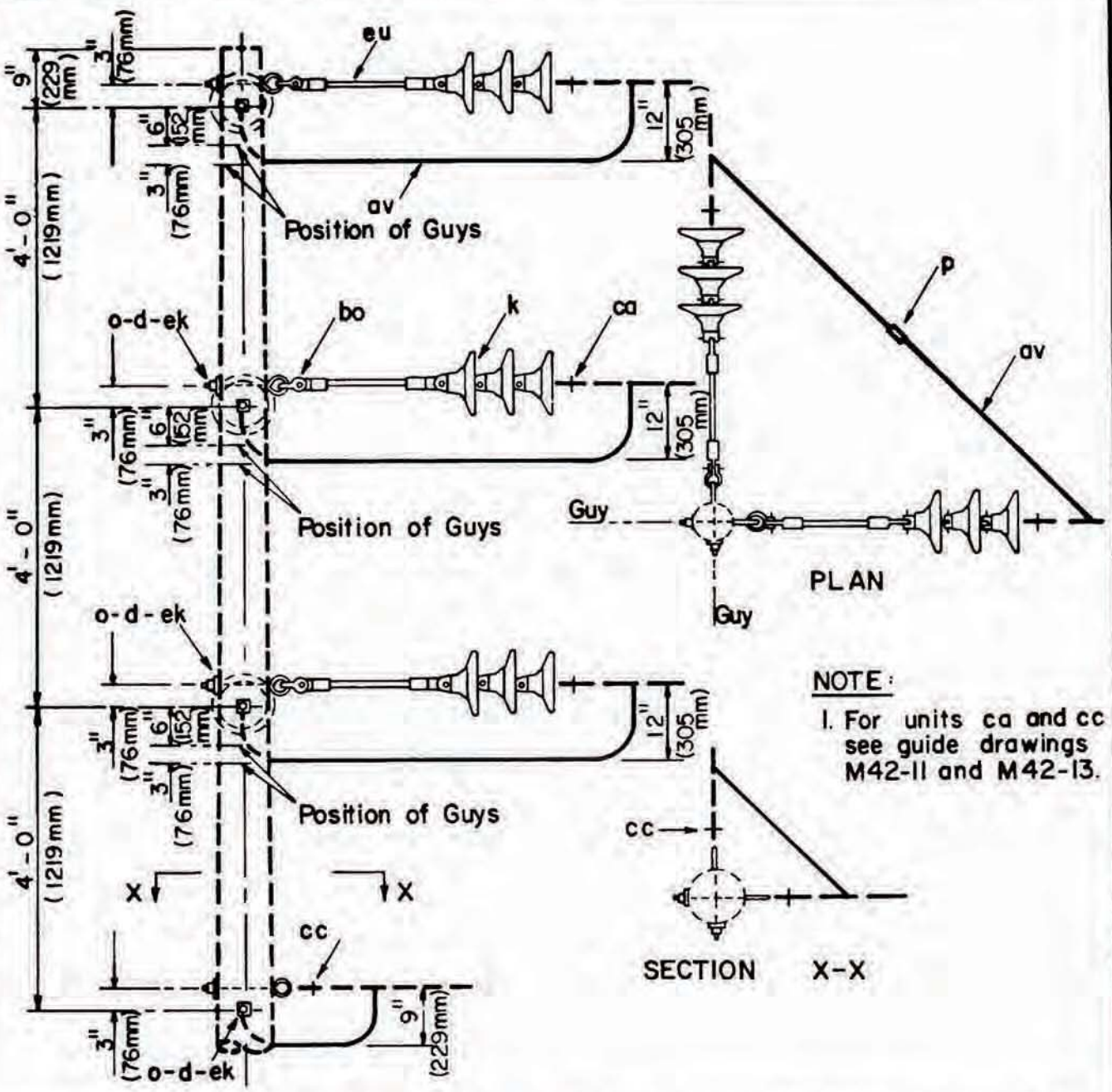
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	8	Washer, square 2 1/4"		av		Jumpers as required	
k	18	Insulator suspension 10"		bo	4	Shackle anchor	
o	12	Bolt, eye, 5/8" x req'd length		ca	6	Deadend assembly, primary	
p		Connectors as req'd		cc	2	Deadend assembly, neutral	
aa	4	Nut, eye 5/8"		ek		Locknuts as required	

Angle 60° - 90°

34.5/19.9 kV, 3-PHASE VERTICAL CONSTRUCTION

NOV. 1986

ZC4-1



NOTE:

1. For units ca and cc see guide drawings M42-11 and M42-13.

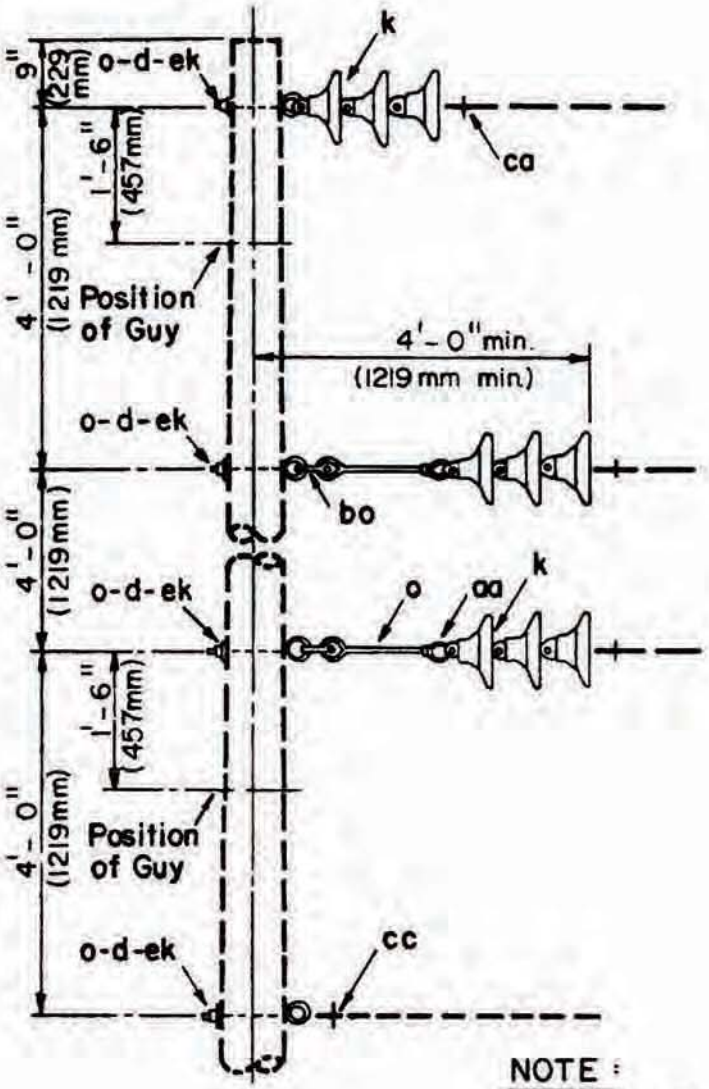
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	8	Washer, square, 2 1/4"		bo	6	Shackle, anchor	
k	18	Insulator, suspension 10"		ca	6	Deadend assembly, primary	
o	8	Bolt, eye 5/8" x req'd length		cc	2	Deadend assembly, neutral	
p		Connectors as req'd		ek		Locknuts as req'd	
av		Jumpers as req'd,		eu	6	Link, extension, insulated	

ANGLE 60° - 90°

34.5/19.9 kV - THREE PHASE VERTICAL CONSTRUCTION, LARGE CONDUCTORS

NOV. 1986

ZC4-IL



NOTE :

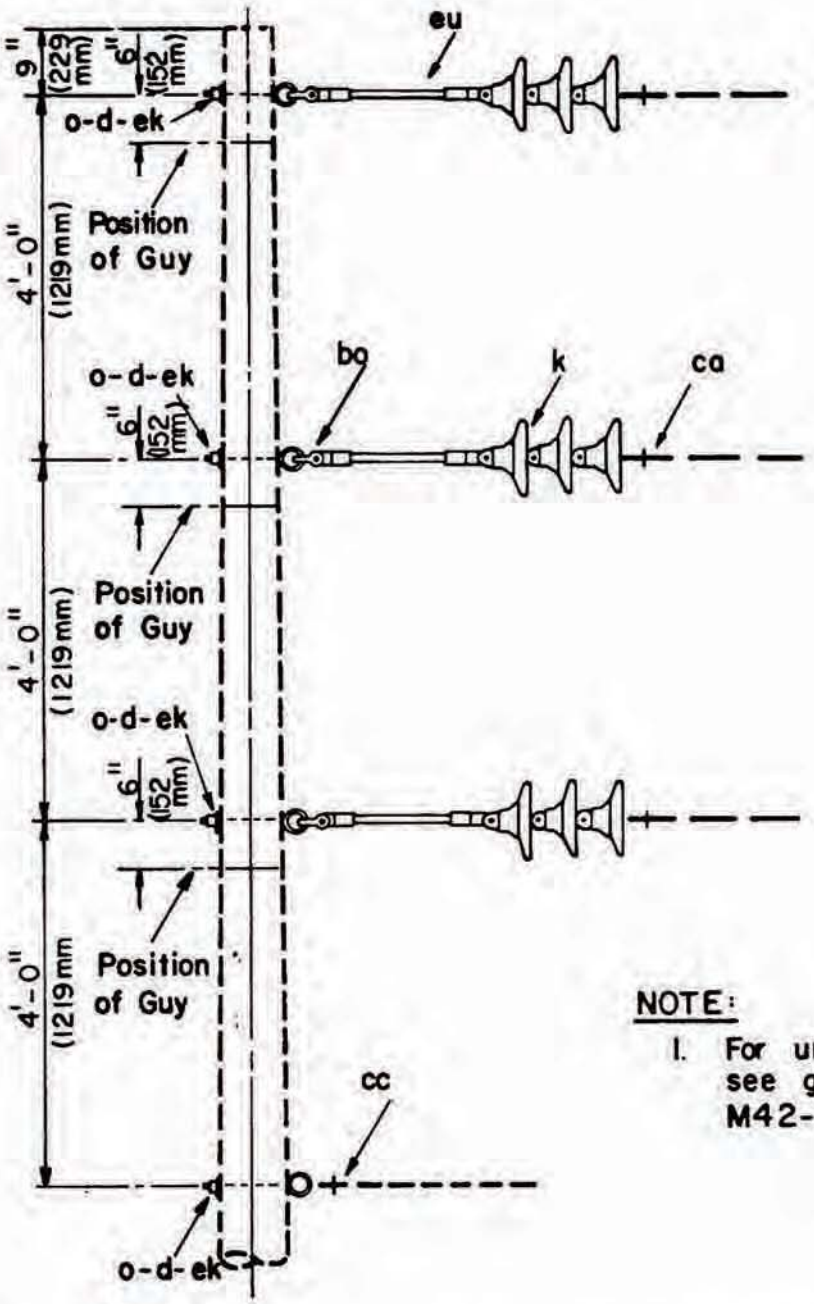
1. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	4	Washer square 2 1/4"		ca	3	Deadend assembly, primary	
k	9	Insulator suspension 10"		cc	1	Deadend assembly, neutral	
o	6	Bolt, eye 5/8" x req'd length		ek		Locknuts as req'd	
aa	2	Nut, eye 5/8"					
bo	2	Shackle anchor					

345/19.9 kV, 3- PHASE
VERTICAL CONSTRUCTION - DEADEND (SINGLE)

NOV. 1986

ZC5-1



NOTE:

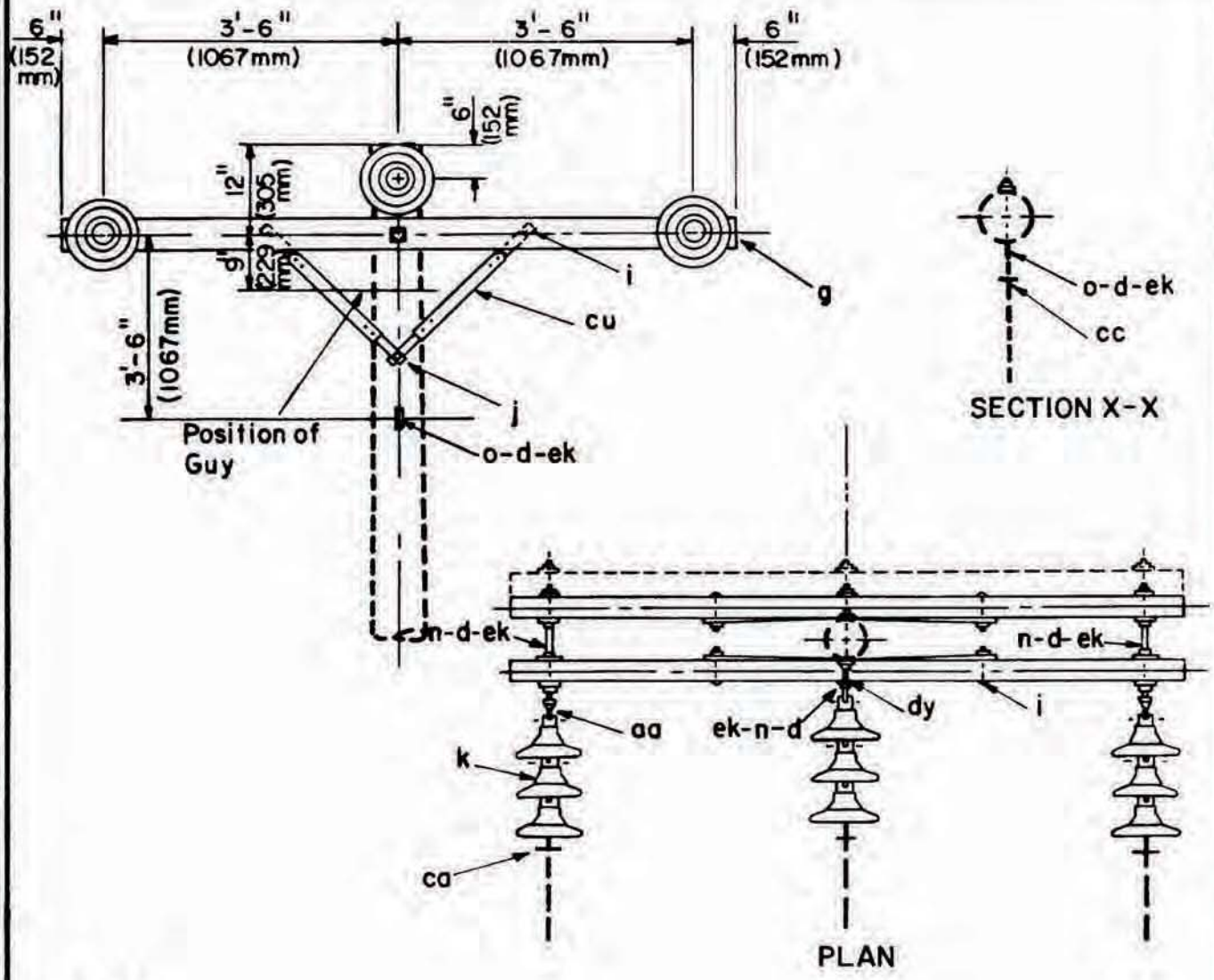
1. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	4	Washer, square, 2 1/4"		cc	1	Deadend assembly, neutral	
k	9	Insulator, suspension 10"		ek		Locknuts as req'd	
o	4	Bolt, eye, 5/8" x req'd length		eu	3	Link, extension, insulated	
bo	3	Shackle, anchor					
ca	3	Deadend assembly, primary					

34.5/19.9 kV - THREE PHASE VERTICAL CONSTRUCTION, DEADEND (SINGLE) LARGE CONDUCTORS

NOV. 1986

ZC5-1L



NOTES:

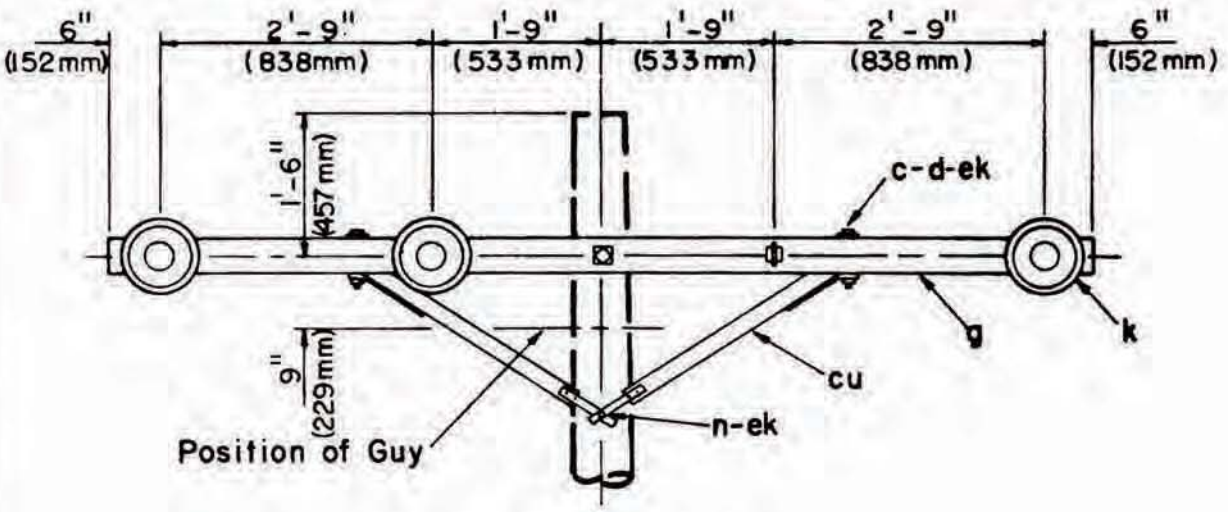
1. See drawing ZE5-1 for crossarm loading limitations.
2. Designate as ZC7-1 for assembly with three crossarms.
3. For units ca and cc see guide drawings M42-11 and M42-13.

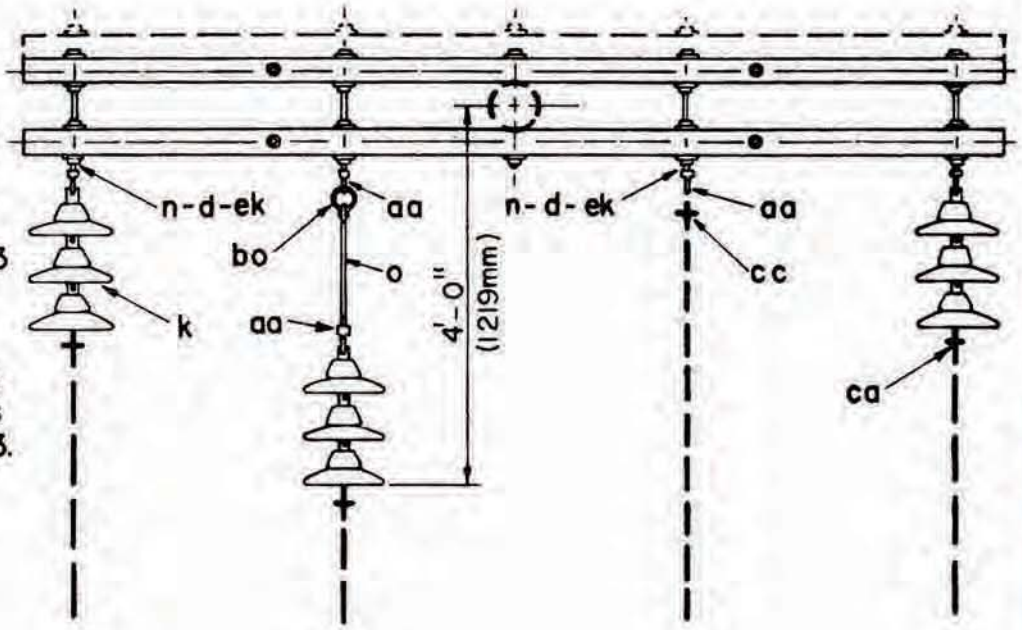
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	13	Washer, square, 2 1/4"		aa	2	Nut, eye 5/8"	
g	2	Crossarm 3 5/8"x 4 5/8" x 8'-0"		ca	3	Deadend assembly, primary	
l	4	Bolt, carriage, 3/8" x 4 1/2"		cc	1	Deadend assembly, neutral	
j	2	Screw, lag 1/2" x 4"		cu	4	Brace, wood 28"	
k	9	Insulator suspension		dy	1	Bolt, eye, double arming 5/8" x req'd length	
n	3	Bolt, double arming 5/8" x req'd length		ek		Locknuts as required	

34.5/19.9 kV, 3-PHASE
CROSSARM CONSTRUCTION - DEADEND (SINGLE)

NOV. 1986

ZC7, ZC7-1





NOTES:

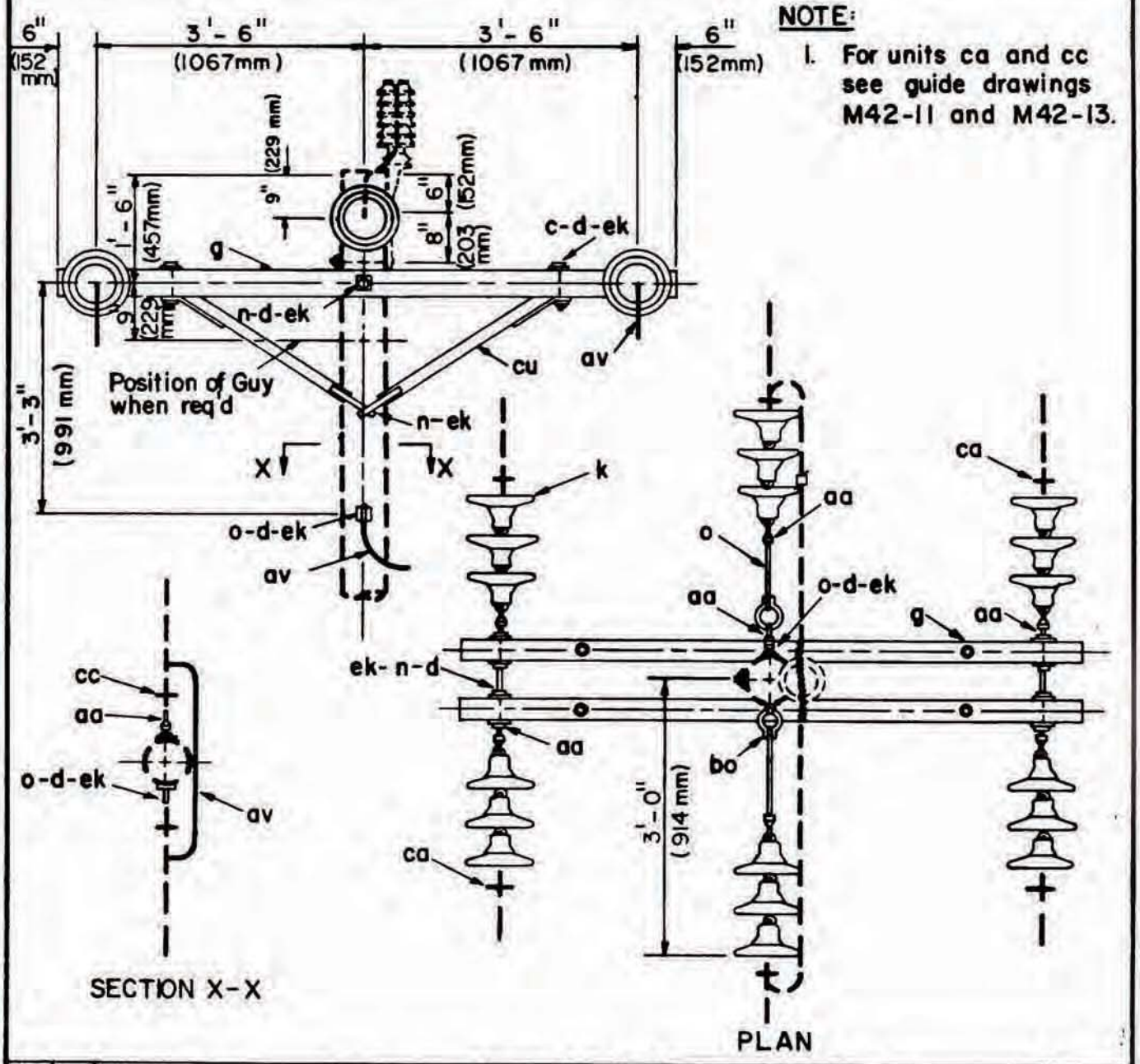
1. See drawing ZE5-1 for crossarm loading limitations.
2. Designate as ZC7-3 for assembly with 3 crossarms.
3. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	4	Bolt, machine, 1/2" req'd length		aa	5	Nut, eye 5/8"	
d	18	Washer, square, 2 1/4"		bo	1	Shackle, anchor	
d	4	Washer, round, 1 3/8" dia.		ca	3	Deadend assembly, primary	
g	2	Crossarm, 3 5/8"x 4 5/8" x 10'-0"		cc	1	Deadend assembly, neutral	
k	9	Insulator, suspension 10"		cu	2	Brace, crossarm, wood, 60" span	
n	6	Bolt, double arming, 5/8"x req'd length		ek		Locknuts, as req'd	
o	1	Bolt, eye, 5/8" x req'd length					

34.5/19.9 kV 3-PHASE CROSSARM CONSTRUCTION-DEADEND (SINGLE)

NOV. 1986

ZC7-2, ZC7-3

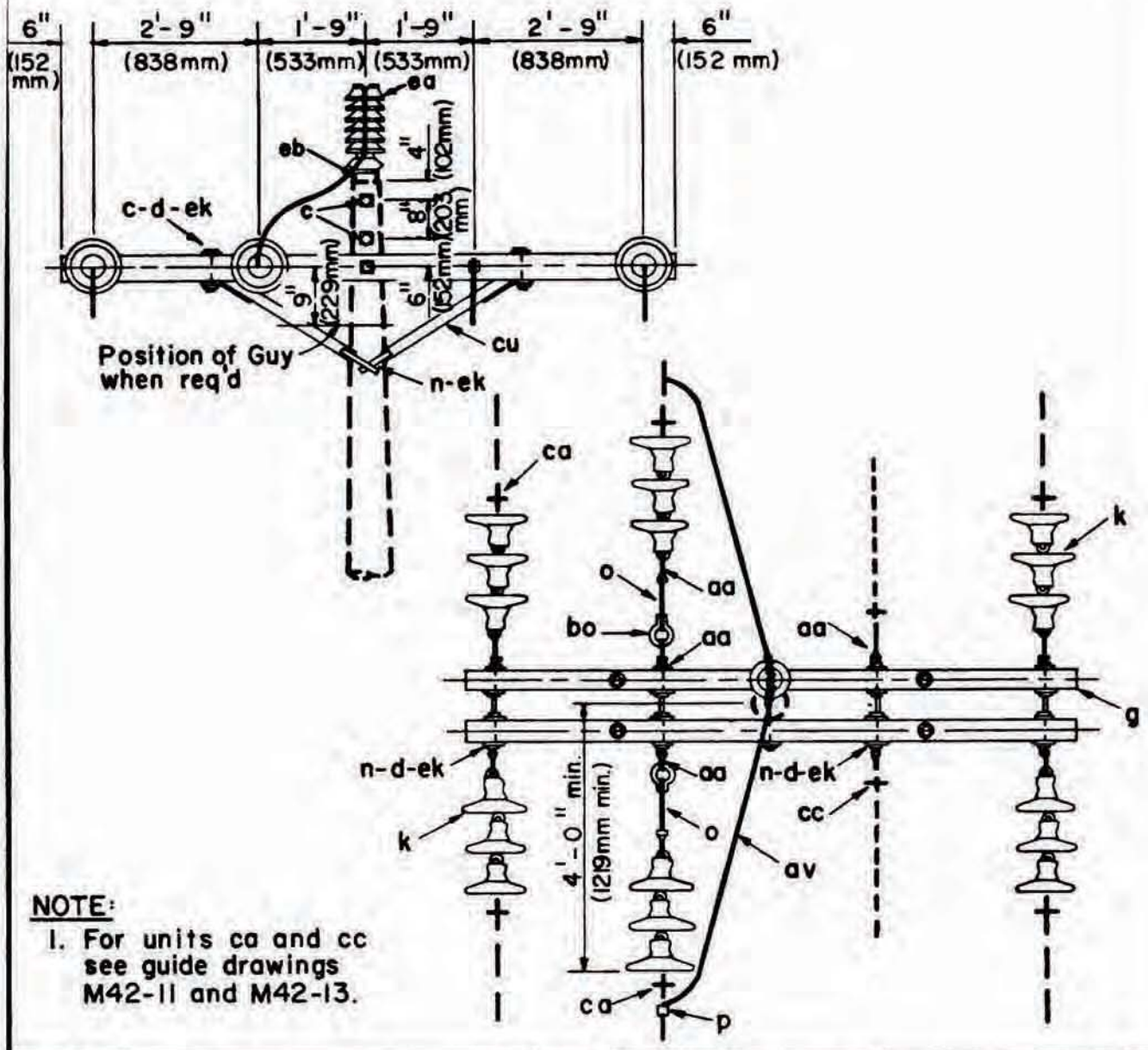


ITEM	NO	MATERIAL		ITEM	NO	MATERIALS	
c	4	Bolt, machine, 1/2" x req'd length		aa	8	Nut, eye, 5/8"	
d	14	Washer, square, 2 1/4"		av		Jumpers and leads as req'd	
d	4	Washer, round 1 3/8" dia.		bo	2	Shackle, anchor	
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ca	6	Deadend assembly, primary	
k	18	Insulator, suspension 10"		cc	2	Deadend assembly, neutral	
n	4	Bolt, double arming, 5/8" x req'd length		cu	2	Brace, wood, 60" span	
o	4	Bolt, eye, 5/8" x req'd length		ek		Locknuts as req'd	
p		Connectors as req'd					

34.5/19.9 kV, 3-PHASE CROSSARM CONSTRUCTION-DEADEND(DOUBLE)

NOV. 1986

ZC8



NOTE:

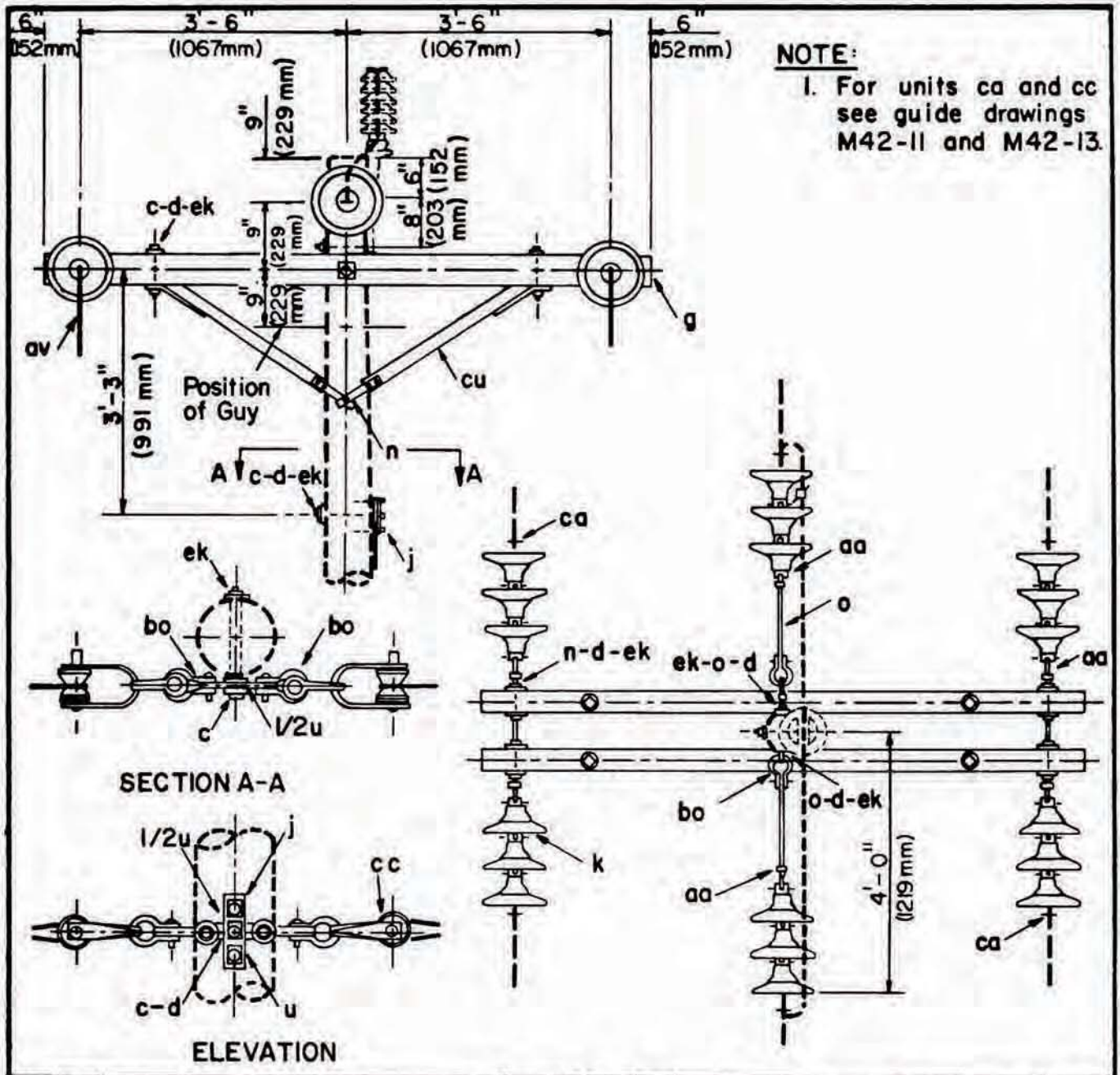
1. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO	MATERIAL		ITEM	NO	MATERIAL	
c	2	Bolt, machine 5/8" x req'd length		aa	10	Nut, eye, 5/8"	
c	4	Bolt, machine 1/2" x req'd length		av		Jumpers or leads required	
d	4	Washer round 1 3/8" dia.		bo	2	Shackle, anchor	
d	20	Washer square 2 1/4"		ca	6	Deadend assembly, primary	
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		cc	2	Deadend assembly, neutral	
k	18	Insulator, suspension 10"		cu	2	Brace, crossarm, wood 60" span	
n	6	Bolt, double arming 5/8" x req'd length		ea	1	Insulator, post type	
o	2	Bolt, eye 5/8" x req'd length		eb	1	Bracket pole	
p		Connectors as required		ek		Locknuts as required	

34.5/19.9 kV, 3-PHASE CROSSARM CONSTRUCTION - DEADEND (DOUBLE)

NOV. 1986

ZC8-1



NOTE:

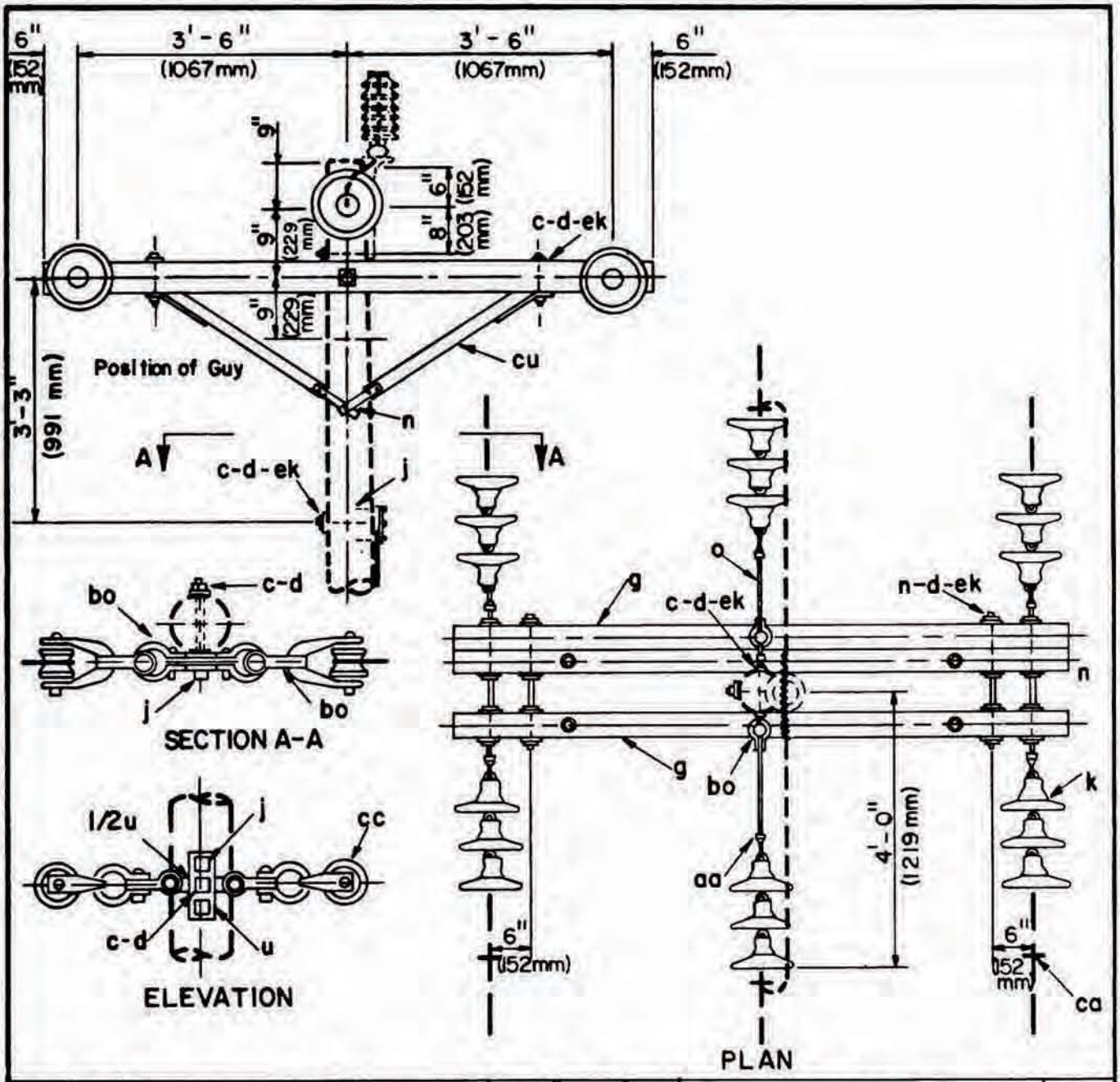
1. For units ca and cc see guide drawings M42-11 and M42-13.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		p		Connectors as required	
c	4	Bolt, machine, 1/2" x req'd length		u	1 1/2	Clamp guy, 6" -heavy duty	
d	13	Washer, square 2 1/4"		aa	7	Nut, eye, 5/8"	
d	4	Washer, round, 1 3/8" dia.		av		Jumpers as required	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"		bo	6	Shackle, anchor	
j	2	Screw lag 1/2" x 4"		ca	6	Deadend assembly, primary	
k	8	Insulator suspension 10"		cc	2	Deadend assembly, neutral	
n	4	Bolt, double arming 5/8" x req'd length		cu	2	Brace, wood, 60" span	
o	3	Bolt, eye, 5/8" x req'd length		ek		Locknuts as req'd	

34.5/19.9 kV, 3-PHASE CROSS ARM CONSTRUCTION-DEADEND(DOUBLE) (LARGE CONDUCTORS)

NOV. 1986

ZC8-2

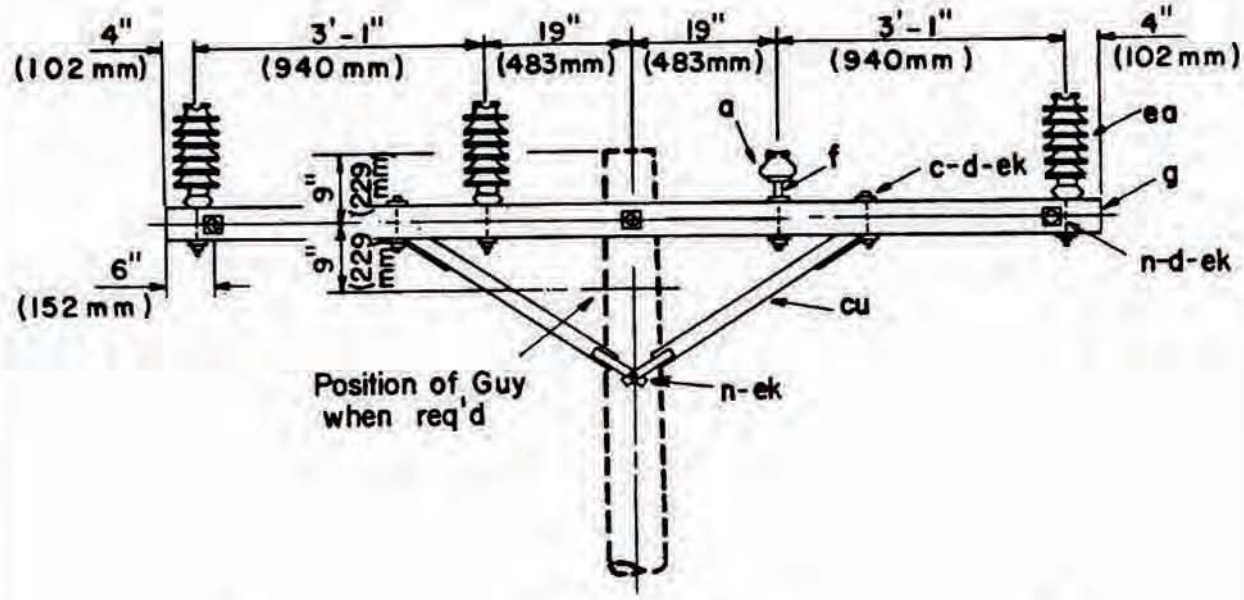


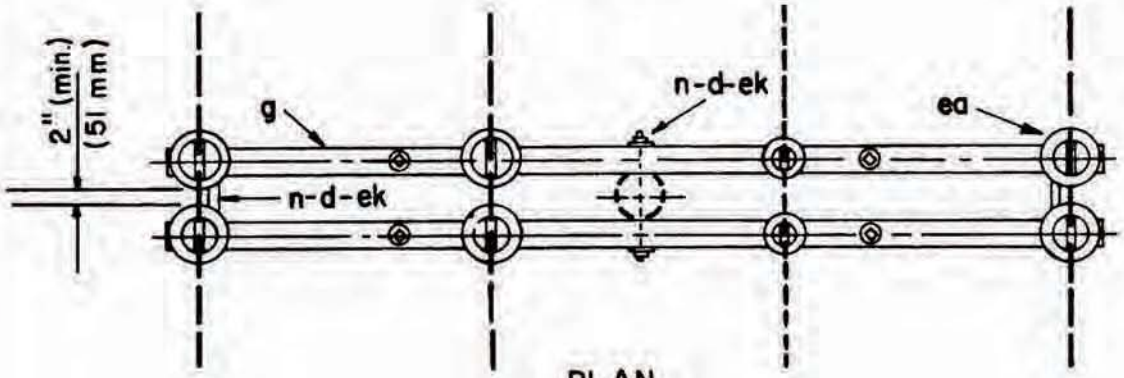
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		p		Connectors as req'd	
c	4	Bolt, machine, 1/2" x req'd length		u	1 1/2	Clamp, guy, 6" heavy duty	
d	21	Washer square, 2 1/4"		aa	7	Nut, eye 5/8"	
d	4	Washer round 1 3/8"		av		Jumpers as required	
g	3	Crossarm 3 5/8"x4 5/8" x 8'-0"		bo	6	Shackle, anchor	
j	2	Screw lag 1/2" x 4"		ca	6	Deadend assembly, primary	
k	18	Insulator, suspension 10"		cc	2	Deadend assembly, neutral	
n	6	Bolt, double arming 5/8" x req'd length		cu	2	Brace, wood, 60" span	
o	3	Bolt, eye, 5/8" x req'd length		ek		Locknuts as req'd	

34.5/19.9 kV, 3-PHASE
CROSSARM CONSTRUCTION-DEADEND (DOUBLE)
LARGE CONDUCTORS WITH UNBALANCED LOADS

NOV. 1986

ZC8-3





PLAN

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	2	Insulator, pin type, (ANSI Class 55-3)		n	4	Bolt, double arming, 5/8" x req'd length	
c	4	Bolt, machine 1/2" x req'd length		cu	2	Brace, crossarm, wood, 60" span	
d	10	Washer, square 2 1/4"		ea	6	Insulator, post type	
d	4	Washer, round 1 3/8"					
f	2	Pin, crossarm, steel 5/8" x 10 3/4"		ek		Locknuts as req'd	
g	2	Crossarm 3 5/8" x 4 5/8" x 10'-0"					

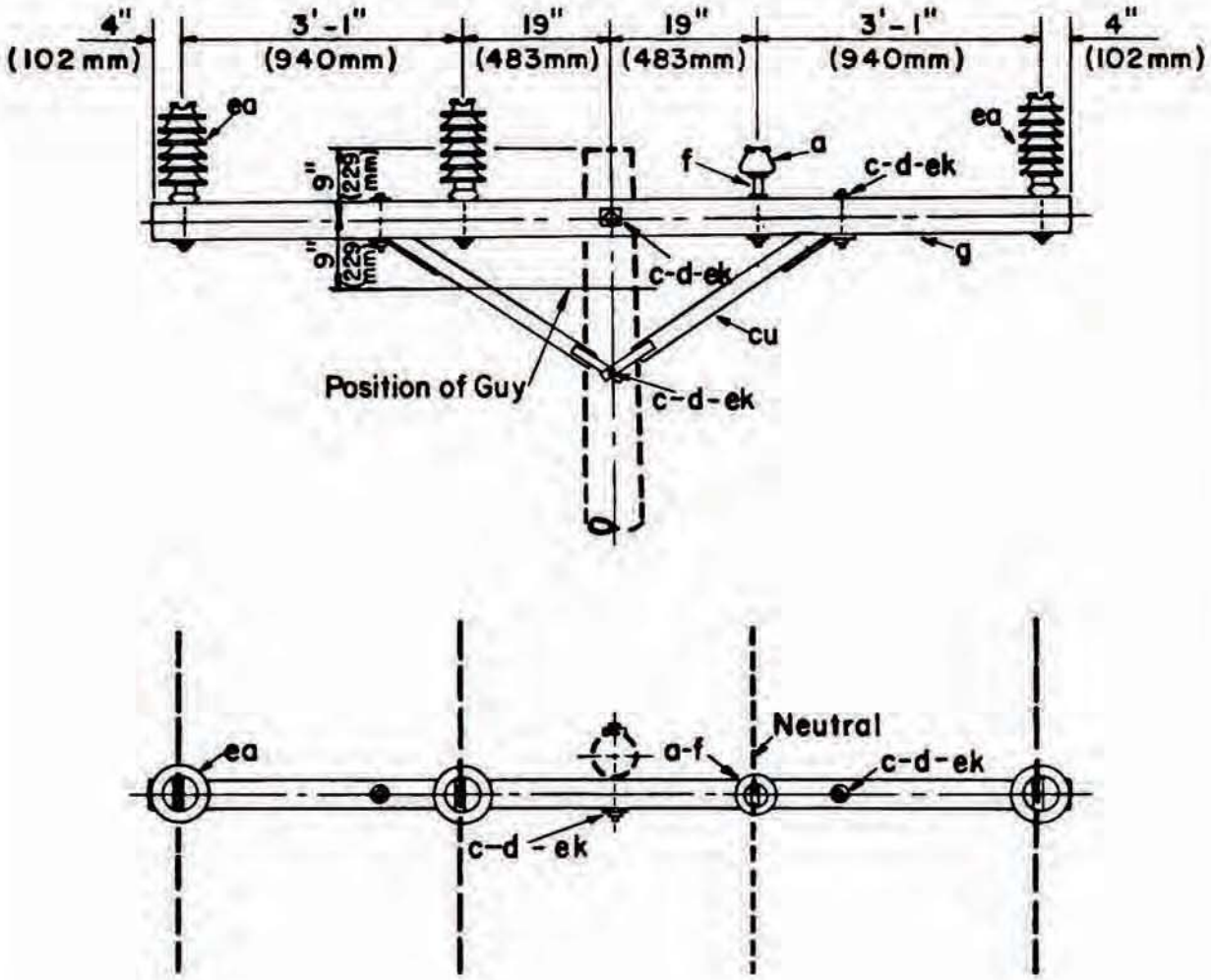
Maximum Transverse Load : 750lbs(3336N) Insulator
1500lbs(6672N) Total

Angle : 0°-20°

34.5/19.9 kV, 3-PHASE
CROSSARM CONSTRUCTION - DOUBLE LINE ARM

NOV. 1986

ZC9



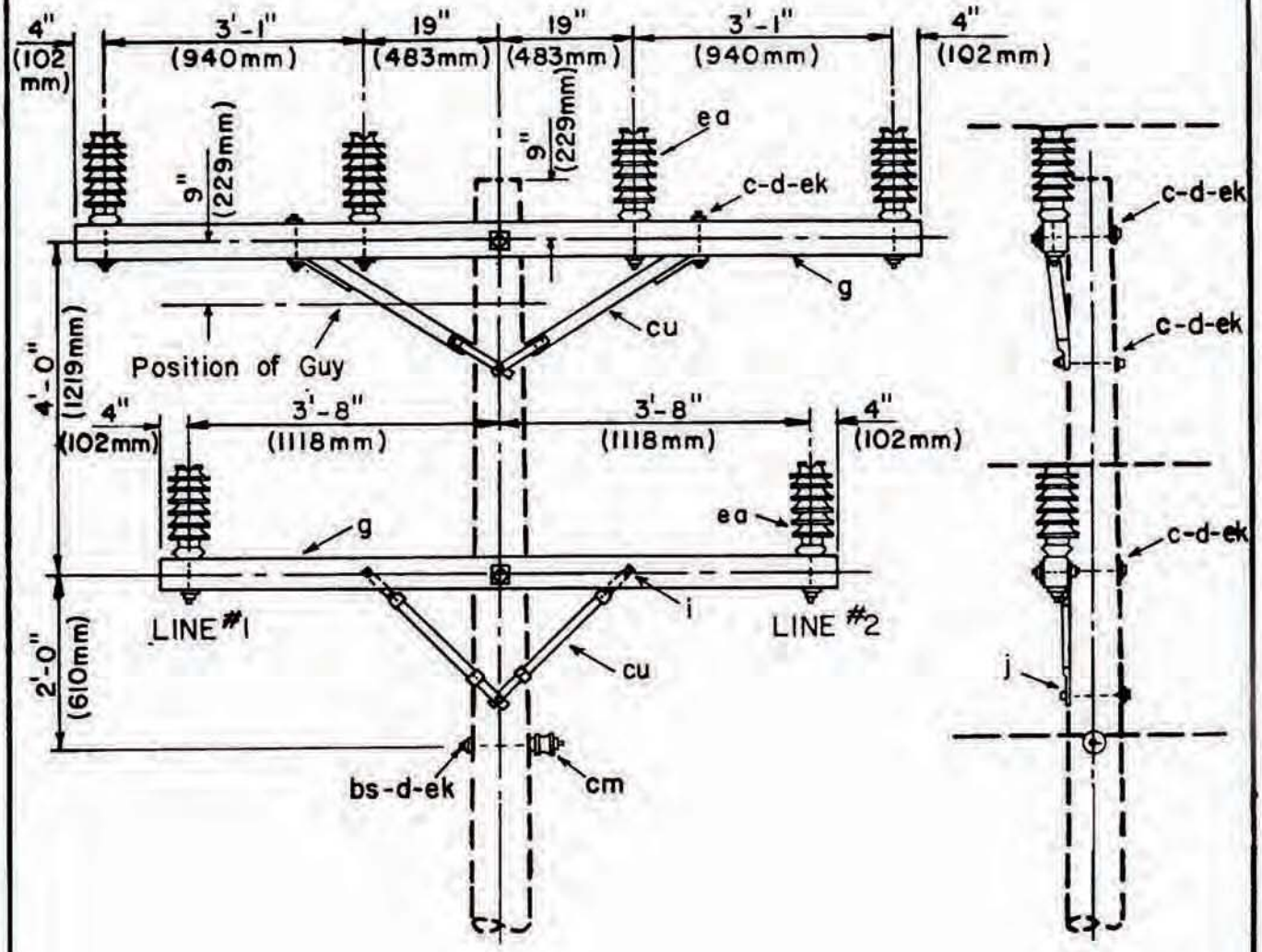
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
a	1	Insulator, pin type, (ANSI class 55-3)		g	1	Crossarm, 3 5/8" x 4 5/8" x 10'-0"	
c	2	Bolt, machine, 5/8" x req'd length		cu	1	Brace, crossarm, wood, 60" span	
c	2	Bolt, machine, 1/2" x req'd length		ea	3	Insulator, post type	
d	3	Washer, square, 2 1/4"					
d	2	Washer, round, 1 3/8"		ek		Locknuts as required	
f	1	Pin, crossarm, steel 5/8" x 10 3/4"					

Maximum Transverse
Load: 750lbs (3336N)/Insulator
Angle: 0°-5°

34.5/19.9 kV, 3-PHASE
CROSSARM CONSTRUCTION - SINGLE LINE ARM

NOV. 1986

ZC9-1



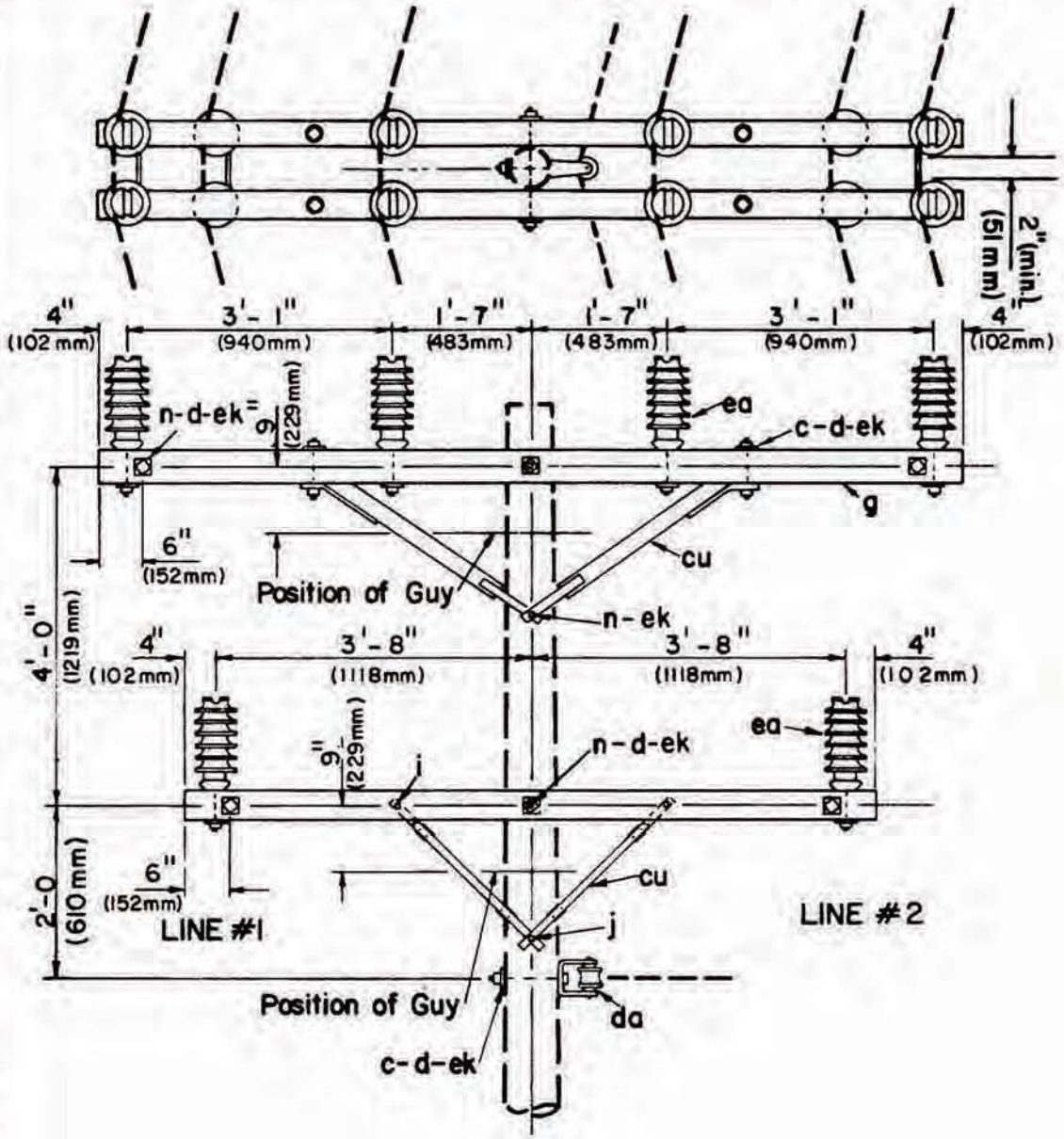
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	3	Bolt, machine, 5/8" x req'd length		j	1	Screw, lag, 1/2" x 4"	
c	2	Bolt, machine, 1/2" x req'd length		bs	1	Bolt, single upset	
d	6	Washer, square, 2 1/4"		cu	1	Brace, wood, 60" span	
d	2	Washer, 1 3/8" diam.		cu	2	Brace, wood, 28"	
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'-0"		cm	1	Insulator, spool	
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"		ea	6	Insulator, post type	
l	2	Bolt, carriage, 3/8" x 4 1/2"		ek		Locknut, as req'd	

Maximum Transverse
Load: 750 lbs. (3336 N)
Angle: 0°-5°

34.5/19.9 kV, 3-PHASE
CROSSARM CONSTRUCTION - DOUBLE CIRCUIT
SINGLE PRIMARY SUPPORT

NOV. 1986

ZDC-C1



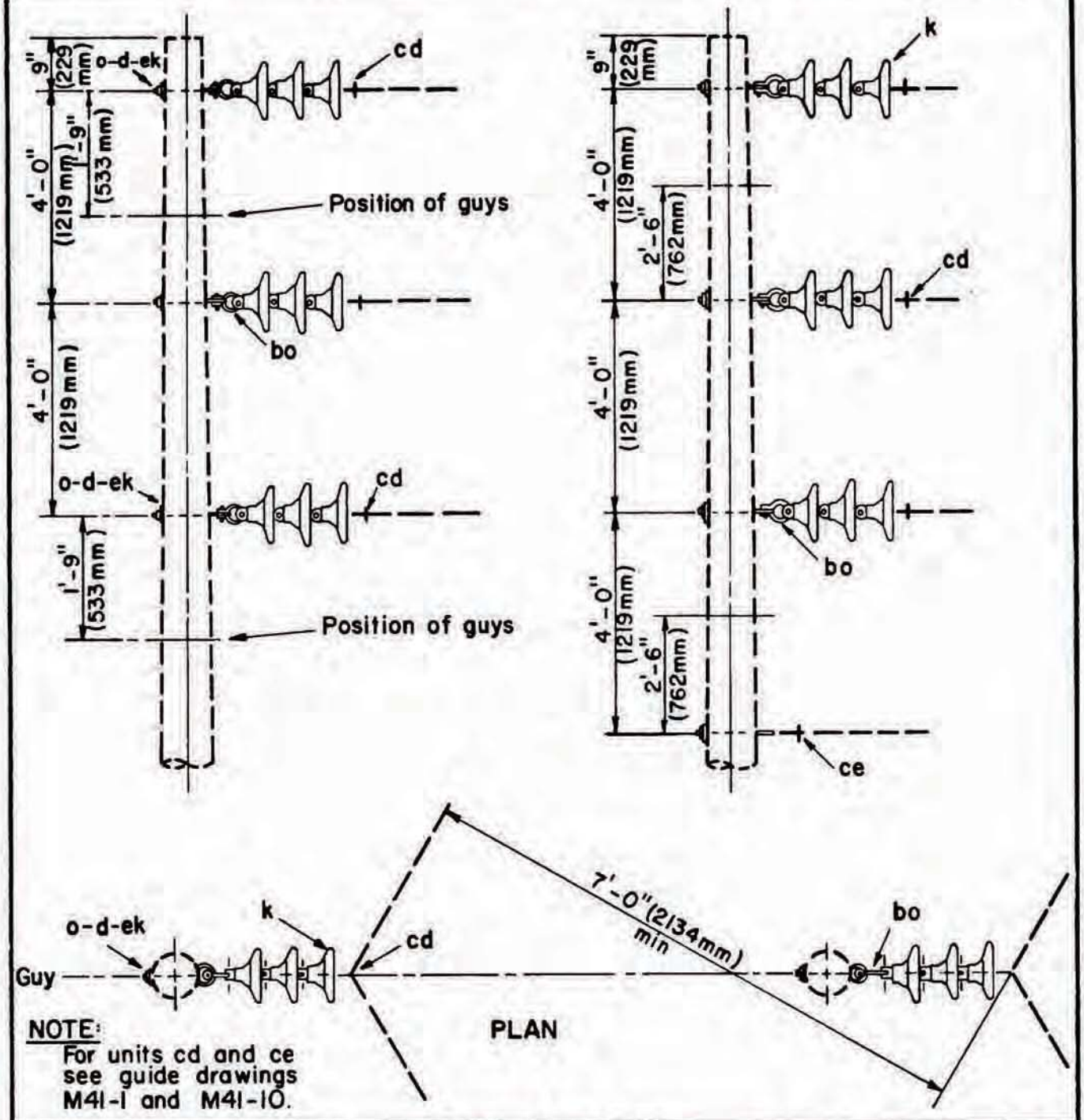
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		j	2	Screw, lag, 1/2" x 4"	
c	4	Bolt, machine, 1/2" x req'd length		n	7	Bolt, double arming, 5/8" x req'd length	
d	21	Washer, square, 2 1/4"		cu	4	Brace, wood 28"	
d	4	Washer, round, 1 3/8"		cu	2	Brace, wood, 60" span	
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'-0"		da	1	Bracket, insulated	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"		ea	12	Insulator, post type	
i	4	Bolt, carriage, 3/8" x 4 1/2"		ek		Locknuts	

Maximum Transverse
Load: 750 lbs.(3336N)/Insulator
1500 lbs.(6672N) Total
Angle: 5° – 20°

34.5/19.9 kV 3-PHASE CROSSARM CONSTRUCTION – DOUBLE CIRCUIT

NOV. 1986

ZDC-C2-1



NOTE:
For units cd and ce see guide drawings M41-1 and M41-10.

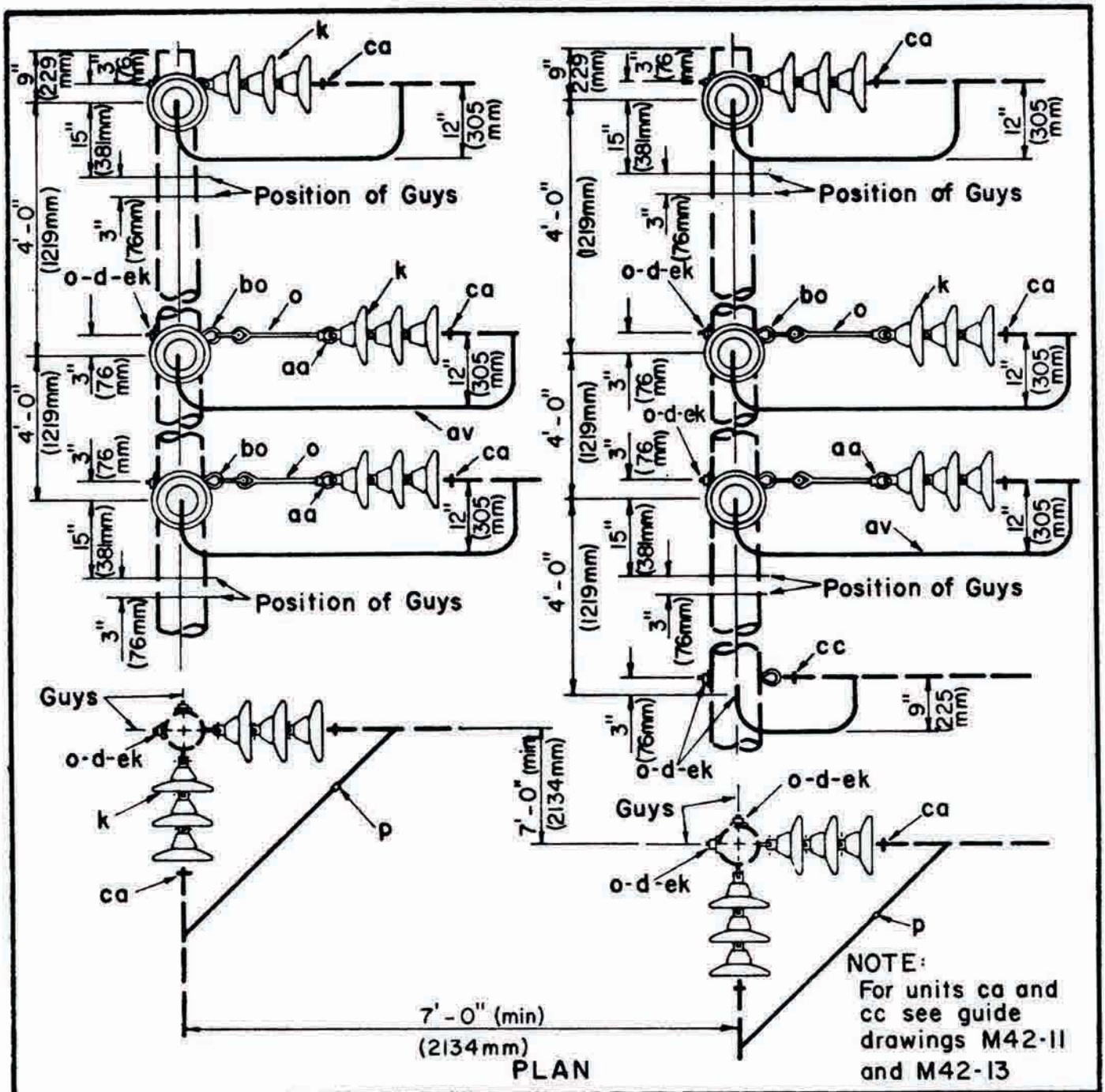
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	6	Washer, square, 2 1/4"		cd	6	Angle assembly, primary	
k	18	Insulator, suspension, 10"		ce	1	Angle assembly, neutral	
o	6	Bolt eye 5/8" x req'd		ek		Locknuts as req'd	
bo	6	Shackle, anchor					

Angle: 20°-60°

34.5/19.9 kV, 3-PHASE VERTICAL CONSTRUCTION DOUBLE CIRCUIT

NOV. 1986

ZDC-C3



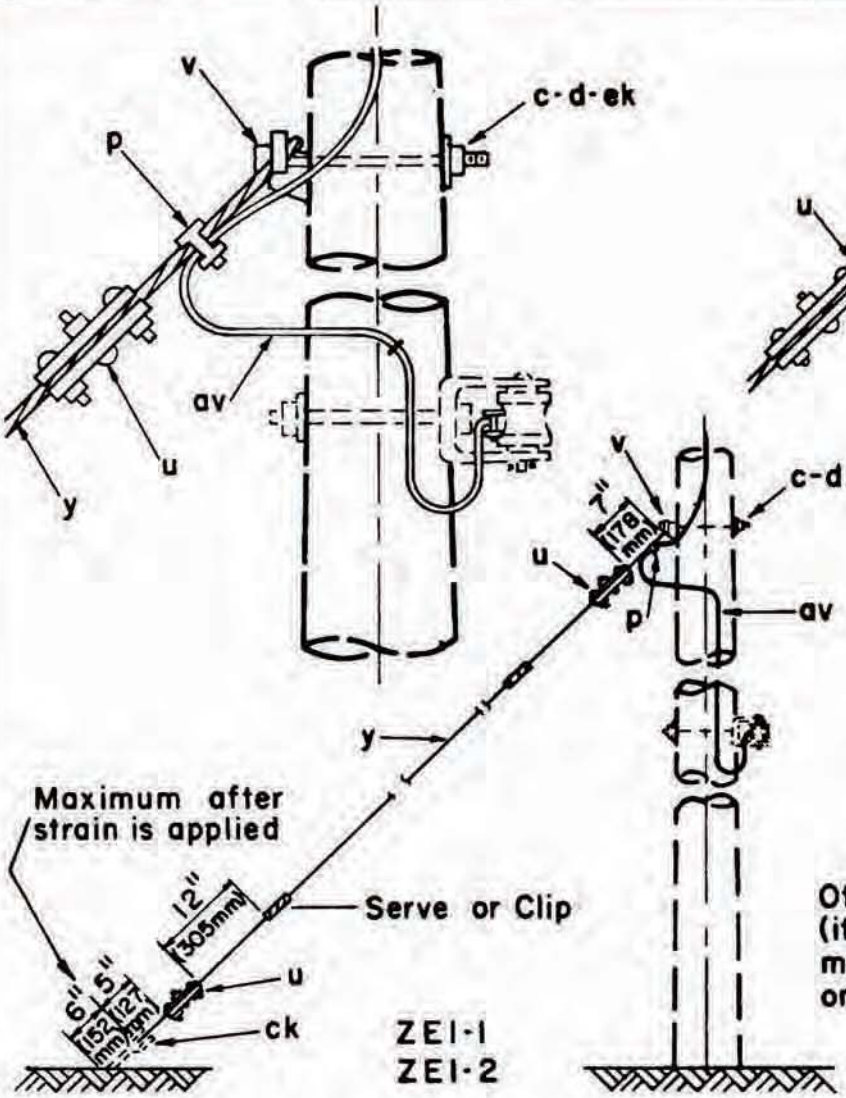
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
d	14	Washer, square, 2 1/4"		av		Jumpers, as req'd	
k	36	Insulator, suspension, 10"		bo	8	Shackle, anchor	
o	22	Bolt, eye 5/8" x req'd length		ca	12	Deadend assembly, primary	
p		Connectors, as req'd		cc	2	Deadend assembly, neutral	
aa	8	Nut, eye, 5/8"		ek		Locknuts, as req'd	

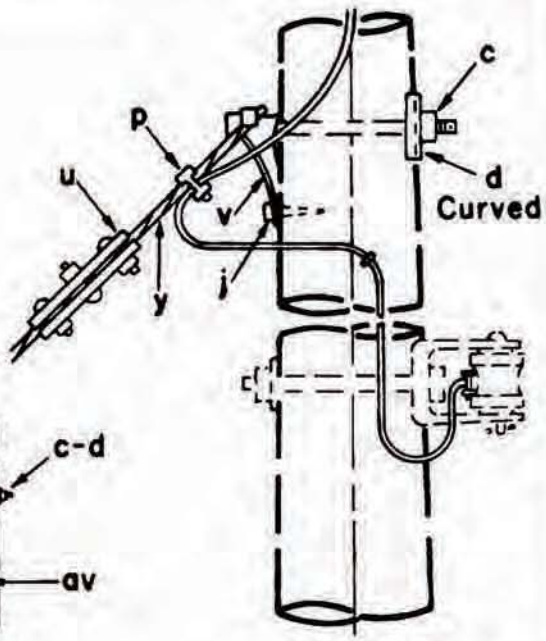
Angle : 60°-90°

34.5/19.9 kV, 3-PHASE, DOUBLE CIRCUIT VERTICAL CONSTRUCTION

NOV. 1986

ZDC-C4-1





ZE1-3

This may be substituted for wrapped type guy provided guy tension will not exceed 8500 lbs. (37808N).

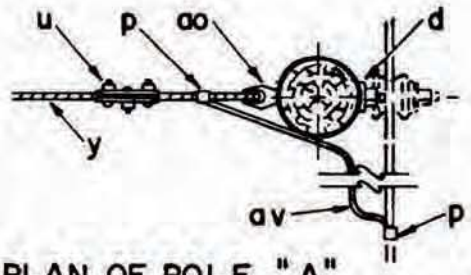
Other accepted and equivalent (item u) dead-end material may be substituted for the ones shown.

		ASSEMBLY UNIT		
		ZE1-1 1/4" Guy Wire	ZE1-2 3/8" Guy Wire	ZE1-3 7/16" Guy Wire
ITEM	MATERIAL	NO REQ'D.	NO REQ'D.	NO REQ'D.
c	Bolt, machine, 5/8" x req'd length	1	1	1
d	Washer, square 2 1/4"	1	1	
d	Washer, curved, 3"x 3"			1
j	Screw, lag 1/2" x 4"			1
p	Connectors, as req'd			
u	Deadend for guy strand	2-Light Duty	2-Heavy Duty	2-Heavy Duty
v	Guy attachment	1	1	1-Heavy Duty
y	Guy wire, S.M., 7 strand	req'd length	req'd length	req'd length
av	Jumper, No.4 stranded Al. alloy or equiv.	1	1	1
ck	Clamp, anchor rod bonding	1	1	1
ek	Locknuts as req'd			

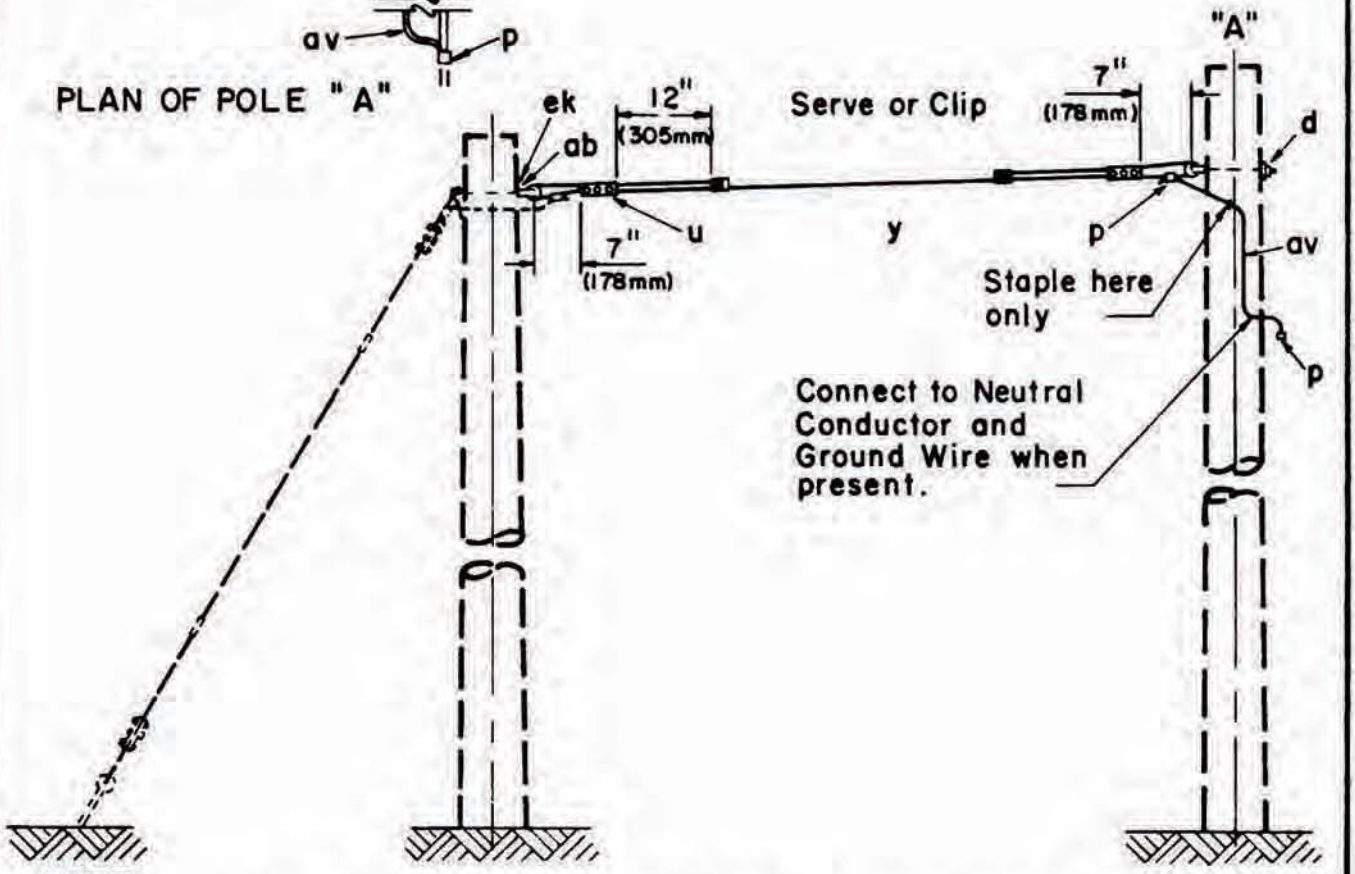
34.5 / 19.9 kV
SINGLE DOWN GUY, THROUGH BOLT TYPE

NOV. 1986

ZE1-1, ZE1-2, ZE1-3



PLAN OF POLE "A"



NOTE:
Other accepted and equivalent items of deadend material may be substituted for the 3-bolt clamp shown.

		ASSEMBLY UNIT		
		E2-1 1/4" Guy Wire	E2-2 3/8" Guy Wire	E2-3 7/16" Guy Wire
ITEM	MATERIAL			
d	Washer, square 2 1/4"	1		
d	Washer, round 3"		1	1
u	Deadend for guy strand	2-Light Duty	2-Heavy Duty	2-Heavy Duty
y	Guy wire, S.M. 7-strand	req'd length	req'd length	req'd length
ab	Nut, thimble type eye, 5/8"	1	1	1
ao	Bolt, thimble type, 5/8"	1	1	1
av	Jumpers, no. 4 stranded, Al. alloy or equiv.	1	1	1
p	Connectors, as req'd			
ek	Locknuts as req'd			

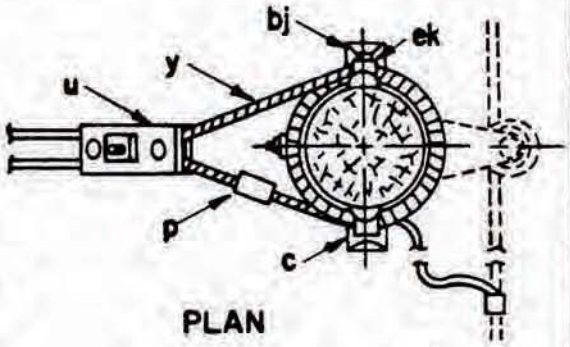
34.5/19.9 kV
SINGLE OVERHEAD GUY, THROUGH BOLT TYPE

NOV. 1986

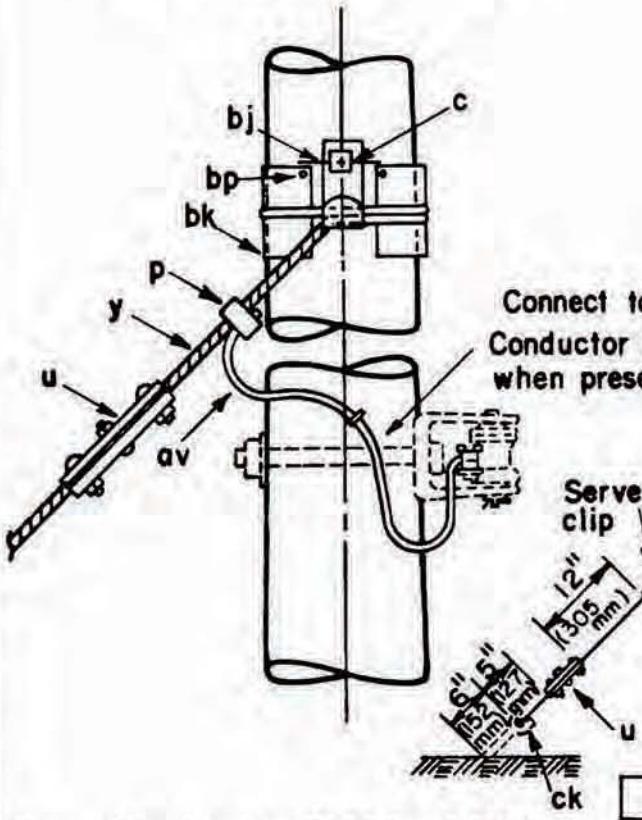
E2-1, E2-2, E2-3

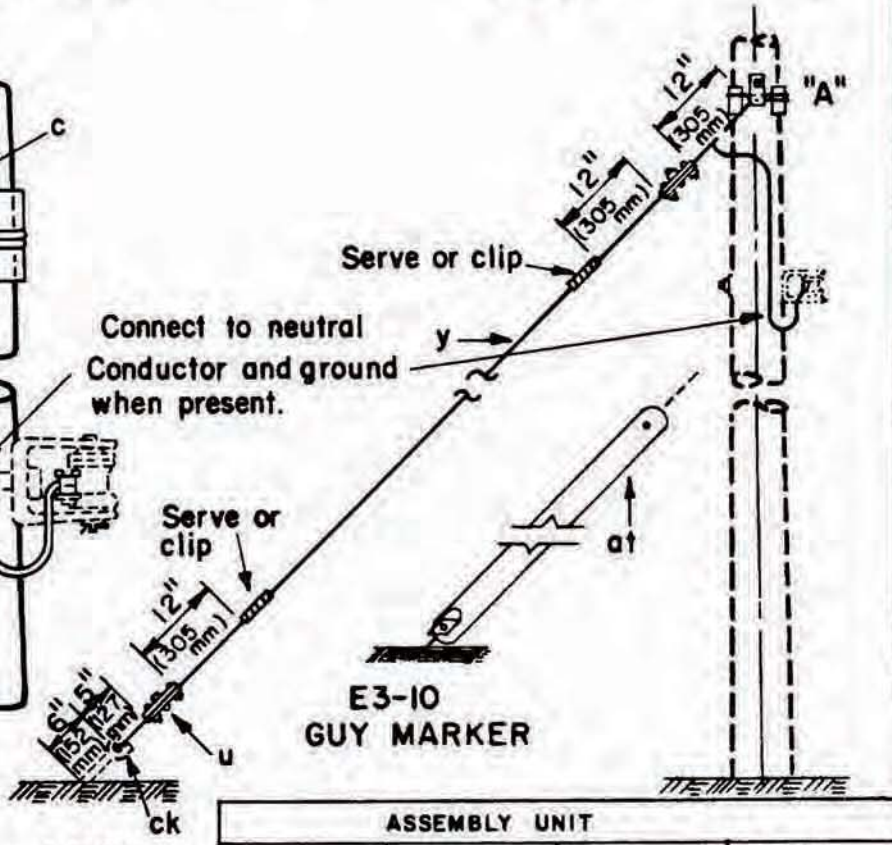
NOTES:

1. Other accepted and equivalent (item u) guy clamps may be substituted for the 3- bolt clamps shown.
2. Assemblies E1-2 and E1-3 (throughbolt type) are preferred units.



PLAN





E3-10
GUY MARKER

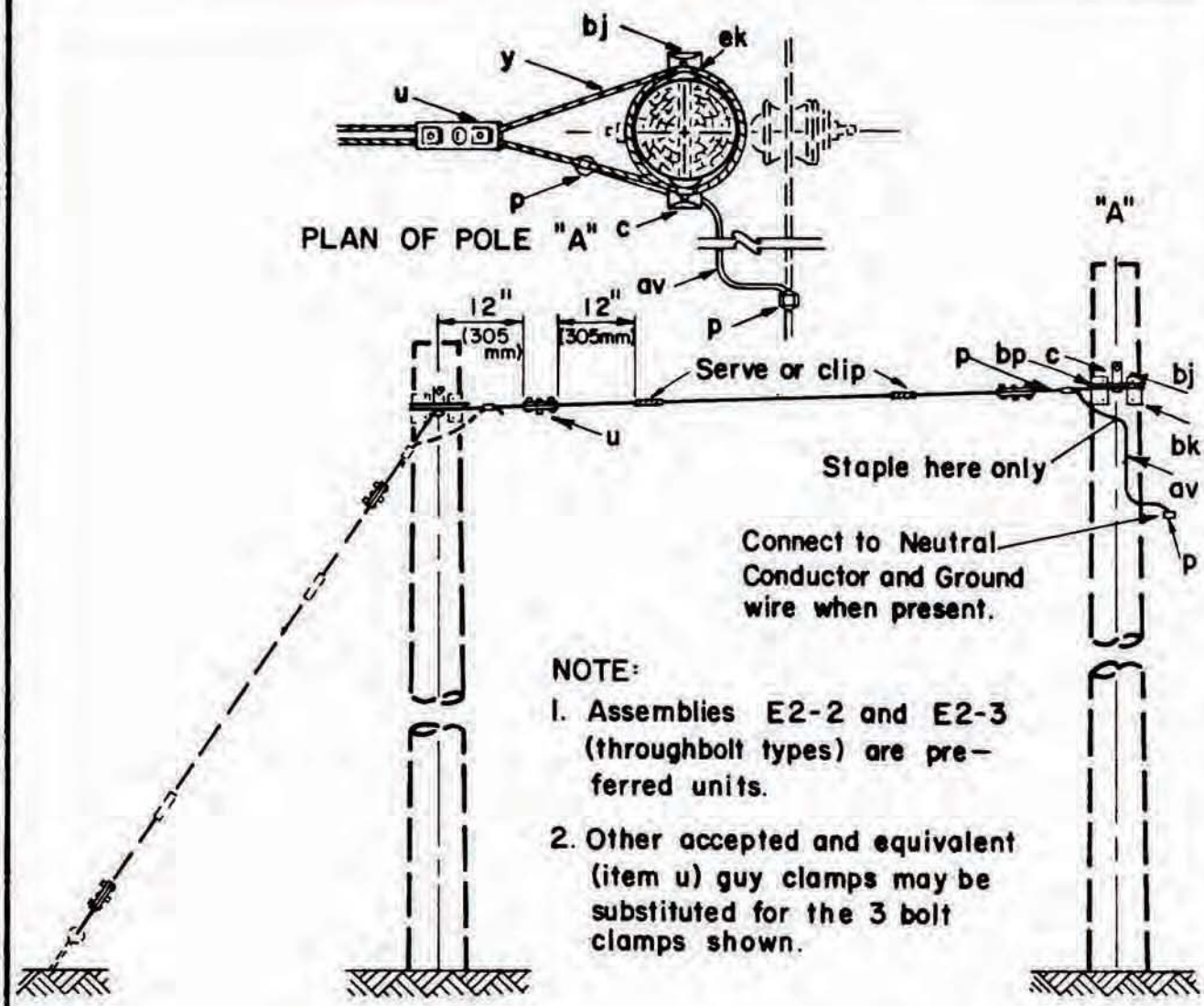
See guide drawings M30-1 and M30-2.

ITEM	MATERIAL		ASSEMBLY UNIT E3-2 3/8" Guy Wire No. REQ'D	ASSEMBLY UNIT E3-3 7/16" Guy Wire No. REQ'D	ASSEMBLY UNIT E3-10 Guy Marker
c	Bolt, machine, 5/8" x req'd length		1	1	
p	Connectors, as req'd				
u	Clamp, guy		2-Heavy Duty	2-Heavy Duty	
y	Guy Wire, S-M, 7-strand		req'd length	req'd length	
av	Jumper, no. 4 stranded AL alloy or eqiv.				
at	Guy marker, 8'-0" min. length				1
bj	Guy Hook, J		2	2	
bk	Guy Plate, 4" x 8", 14 gauge		2	2	
bp	Nail, 8 penny, galv.		8	8	
ck	Clamp, anchor rod bonding		1	1	
ek	Locknuts as req'd				

34.9/19.9 kV
SINGLE DOWN GUY, WRAPPED TYPE

NOV. 1986

E3-2, E3-3, E3-10

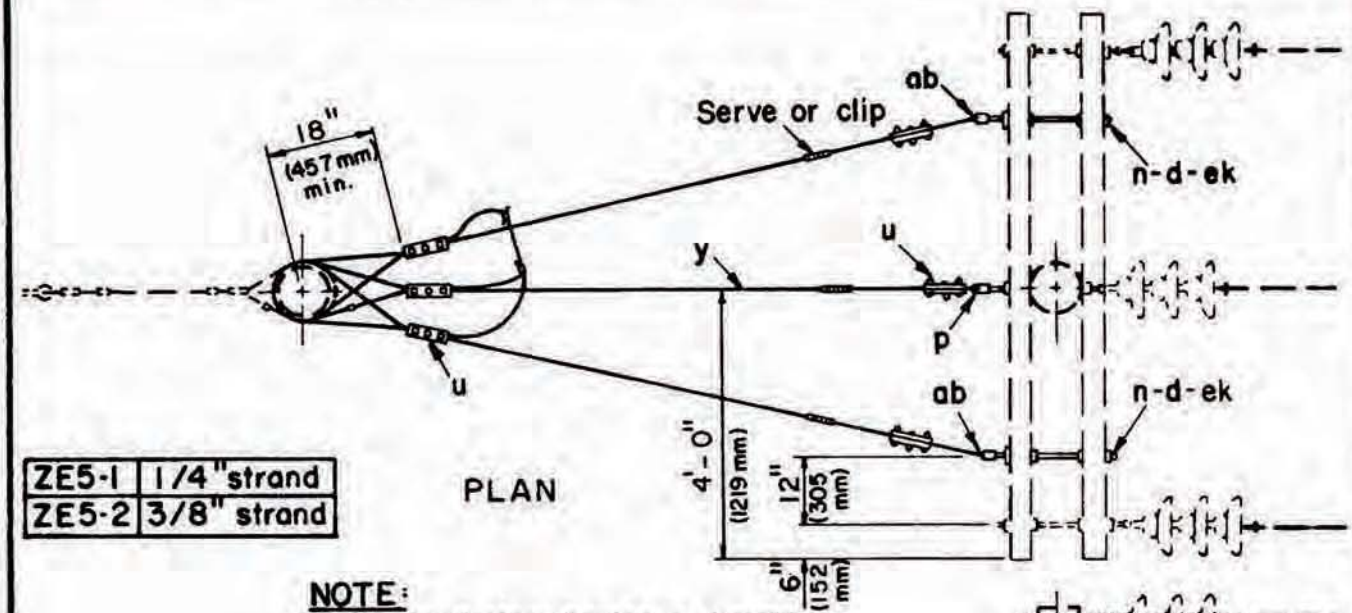


		ASSEMBLY UNIT		
		E4-2 3/8" Guy Wire	E4-3 7/16" Guy Wire	
ITEM	MATERIAL	No. REQ'D	No. REQ'D	
c	Bolt, machine, 5/8" x req'd length	1	1	
p	Connectors, as req'd			
u	Deadend for guy strand	2-Heavy Duty	2-Heavy Duty	
y	Guy Wire, SM, 7 strand	req'd length	req'd length	
av	Jumper, no. 4 stranded Al. alloy or equiv.	1	1	
bj	Guy Hook, J	2	2	
bk	Guy Plate 4"x 8", 14 gauge	2	2	
bp	Nail, 8 penny, galv.	8	8	
ek	Locknuts as req'd			

34.5/19.9 kV
SINGLE OVERHEAD GUY WRAPPED TYPE

NOV. 1986

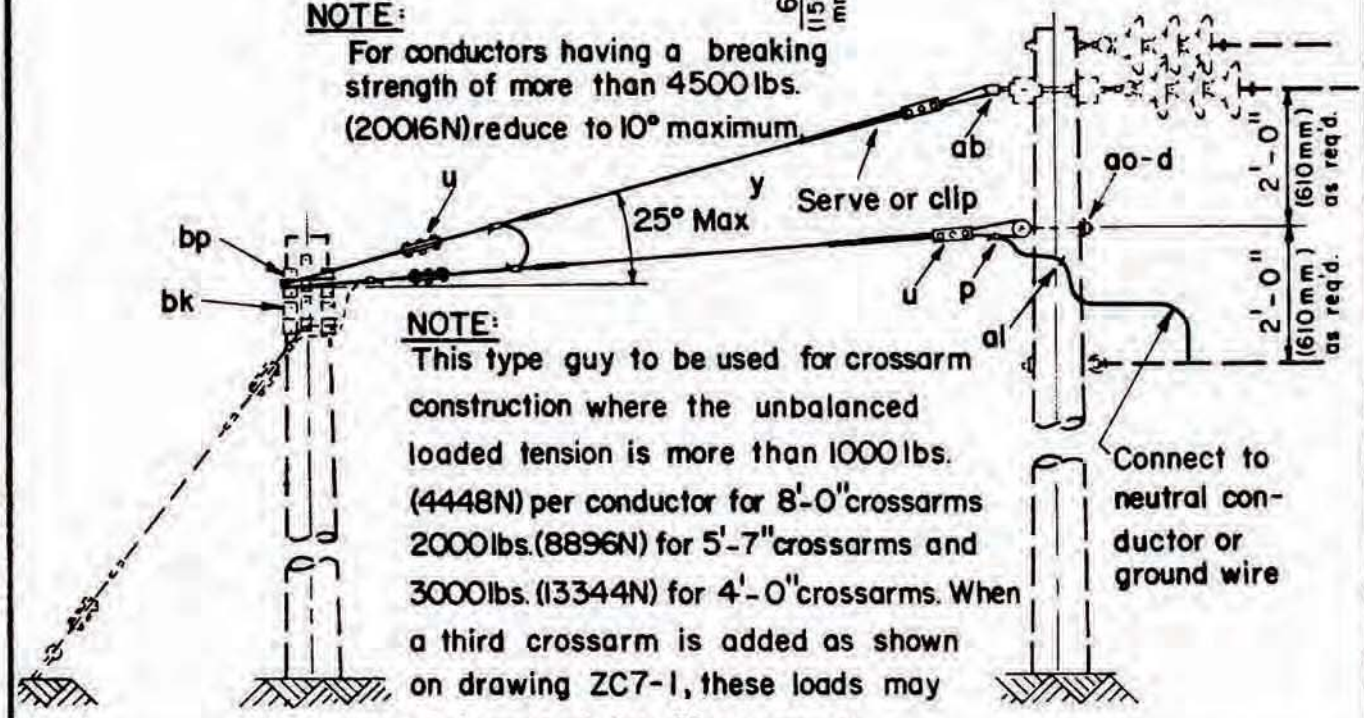
E4-2, E4-3



ZE5-1	1/4"strand
ZE5-2	3/8" strand

PLAN

NOTE:
For conductors having a breaking strength of more than 4500 lbs. (20016N) reduce to 10° maximum.



NOTE:
This type guy to be used for crossarm construction where the unbalanced loaded tension is more than 1000 lbs. (4448N) per conductor for 8'-0" crossarms 2000 lbs. (8896N) for 5'-7" crossarms and 3000 lbs. (13344N) for 4'-0" crossarms. When a third crossarm is added as shown on drawing ZC7-1, these loads may be increased by fifty percent.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	1	Bolt, machine, 5/8" x req'd length		al	1	Staple, ground wire	
d	9	Washer, square, 2 1/4"		ao	1	Bolt, thimble type eye, 5/8" x req'd length	
n	2	Bolt, double arming, 5/8" x req'd length		av		Jumper, no.4 stranded Al. alloy or equiv.	
p		Connectors as req'd		bj	2	Guy Hook, J	
u	6	Deadend for guy strand		bk	2	Guy Plate, 4"x 8", 14 guage	
y		Wire, guy, S.M. 7 strand, as req'd		bp	8	Nail, 8 penny, galv.	
ab	2	Nut, thimble type eye, 5/8"		ek		Locknuts as req'd	

34.5/19.9 kV DEADEND GUY CROSSARM CONSTRUCTION

NOV. 1986

ZE5-1, ZE5-2

NOTES:

1. When two guys are attached to one anchor rod use 3/4" x 8'-0" twin thimble type eye rod.

2. Spacing between anchors shall be sufficient to provide maximum holding power for each anchor.

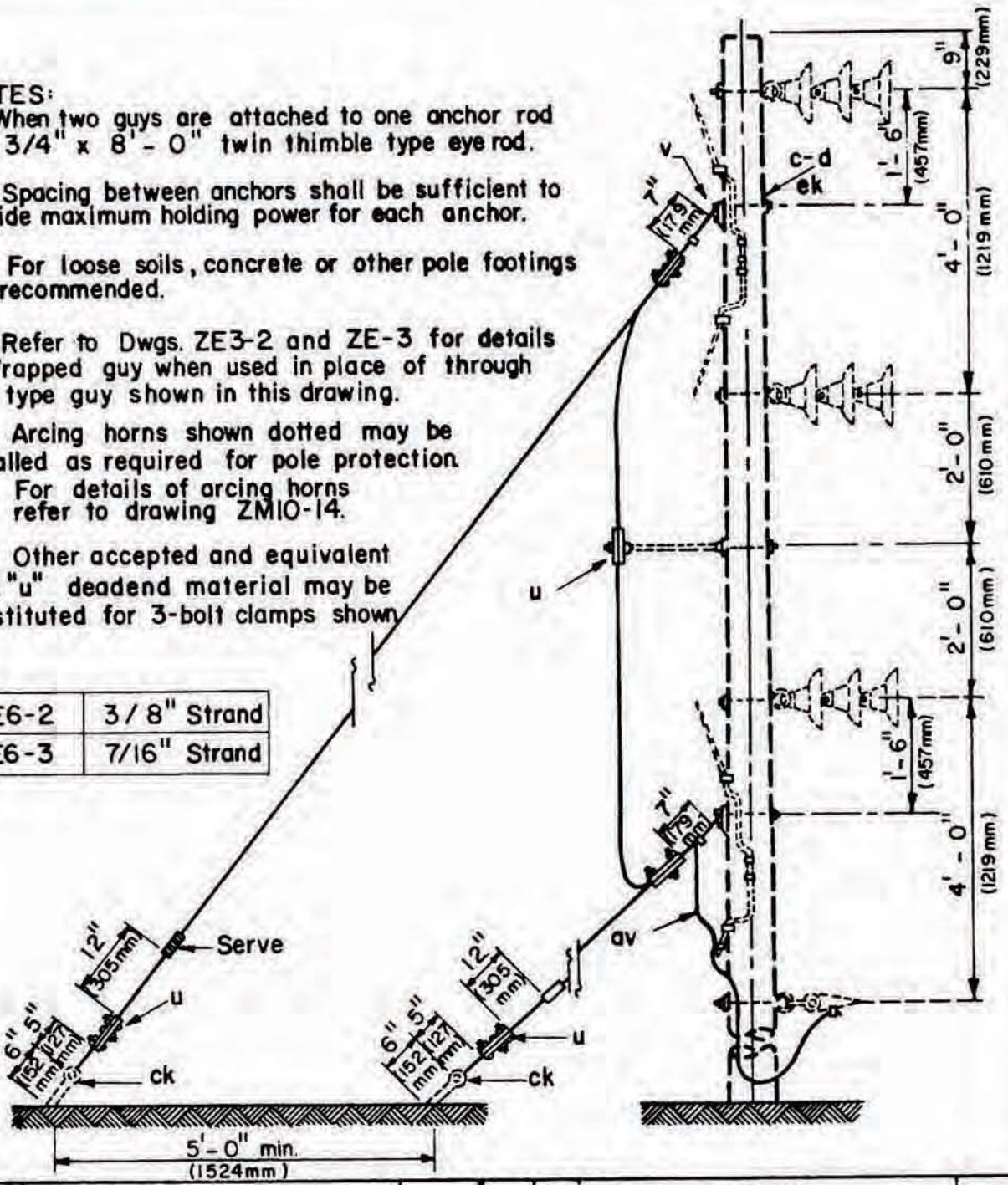
3. For loose soils, concrete or other pole footings are recommended.

4. Refer to Dwgs. ZE3-2 and ZE-3 for details of Wrapped guy when used in place of through bolt type guy shown in this drawing.

5. Arcing horns shown dotted may be installed as required for pole protection. For details of arcing horns refer to drawing ZM10-14.

6. Other accepted and equivalent item "u" deadend material may be substituted for 3-bolt clamps shown.

ZE6-2	3/8" Strand
ZE6-3	7/16" Strand



ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 5/8" x req'd length		y		Guy Wire S.M., 7 strand	
d	2	Washer, square, 2 1/4"		av		Jumpers as required	
p		Connectors as req'd		ck		Clamp, guy bond, as req'd	
u	5	Deadend for guy strands, heavy duty		ek		Locknuts as required	
v		Guy attachment (heavy duty for ZE6-3)					

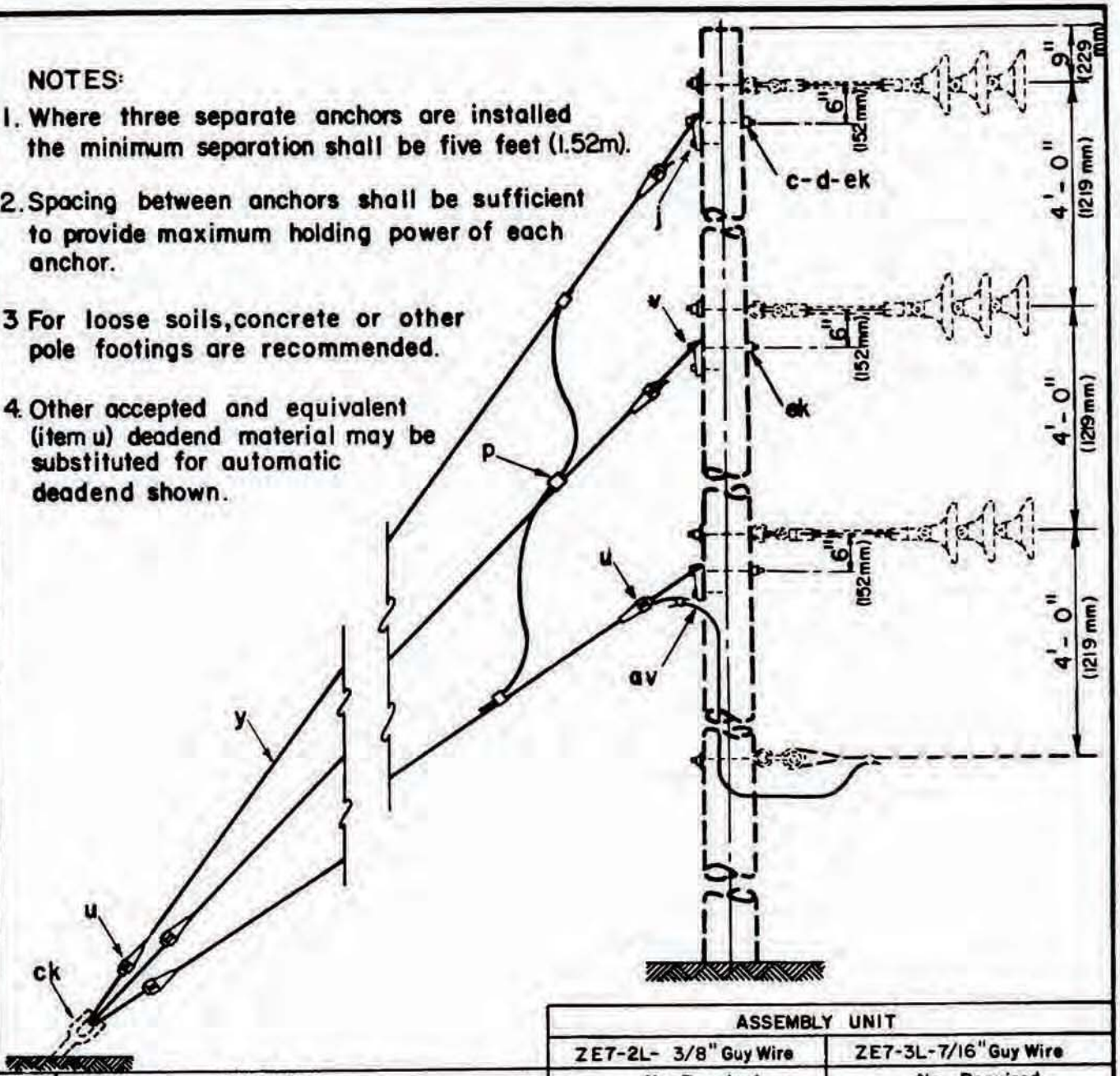
34.5/19.9 kV DOUBLE DOWN GUY

NOV. 1986

ZE6-2, ZE6-3

NOTES:

1. Where three separate anchors are installed the minimum separation shall be five feet (1.52m).
2. Spacing between anchors shall be sufficient to provide maximum holding power of each anchor.
3. For loose soils, concrete or other pole footings are recommended.
4. Other accepted and equivalent (item u) deadend material may be substituted for automatic deadend shown.



		ASSEMBLY UNIT	
		ZE7-2L- 3/8" Guy Wire	ZE7-3L-7/16" Guy Wire
ITEM	MATERIAL	No. Required	No. Required
c	Bolt, machine, 5/8" x req'd length	3	3
d	Washer, curved, 3" x 3" x 5/16"	3	3
j	Screw, lag, 1/2" x 4"	3	3
p	Connectors as req'd		
u	Deadend for guy strand	6	6
v	Guy attachment, mall iron, heavy duty	3	3
y	Guy wire, S.M., 7 Strand	req'd length	req'd length
av	Jumpers, No. 4 stranded Al. alloy or equiv.	as req'd	as req'd
ck	Clamp, guy bonding, as req'd		
ek	Locknuts as req'd		

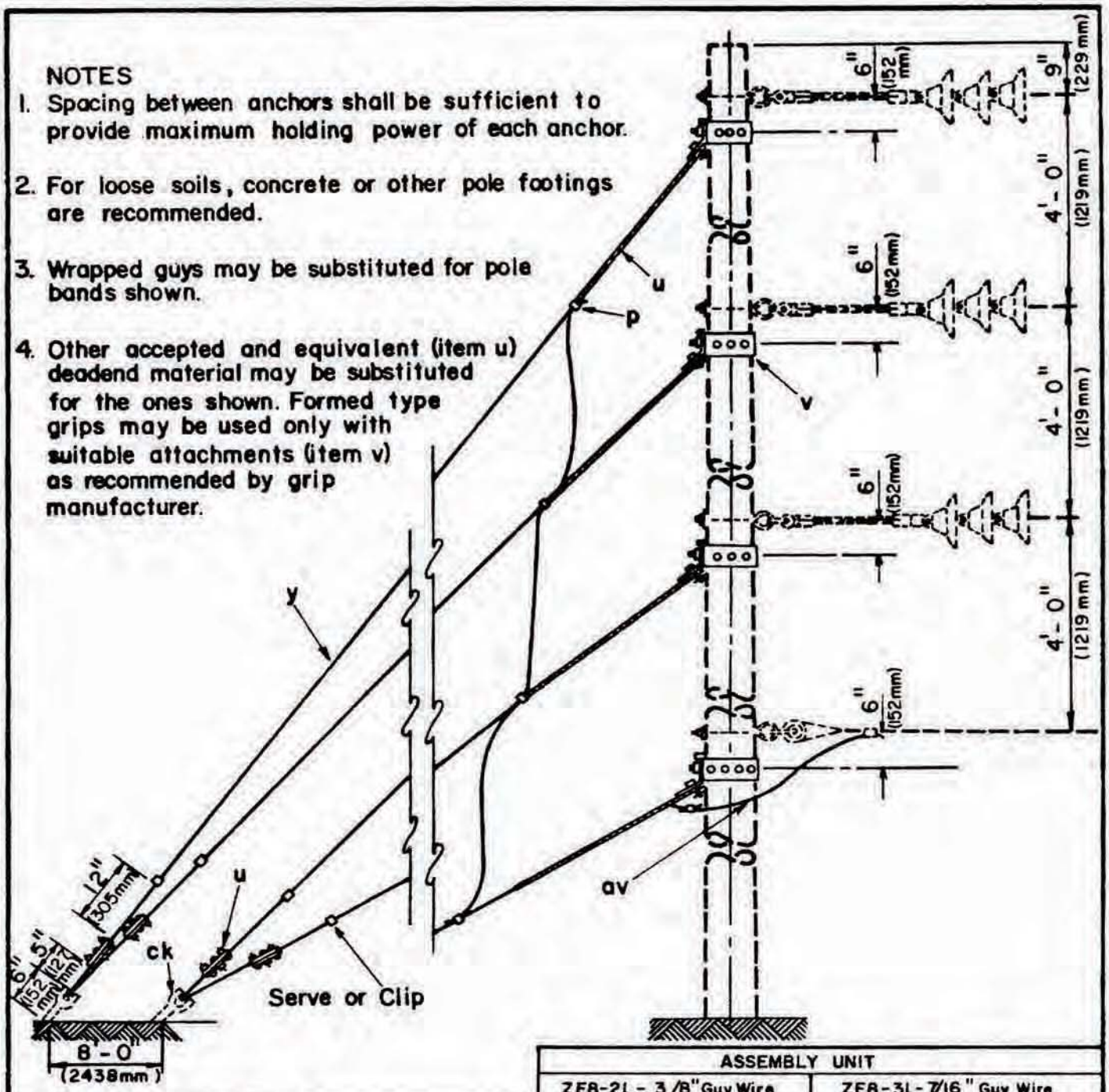
34.5/19.9 kV - THREE DOWN GUYS (LARGE CONDUCTORS)

NOV. 1986

ZE7-2L, ZE7-3L

NOTES

1. Spacing between anchors shall be sufficient to provide maximum holding power of each anchor.
2. For loose soils, concrete or other pole footings are recommended.
3. Wrapped guys may be substituted for pole bands shown.
4. Other accepted and equivalent (item u) deadend material may be substituted for the ones shown. Formed type grips may be used only with suitable attachments (item v) as recommended by grip manufacturer.

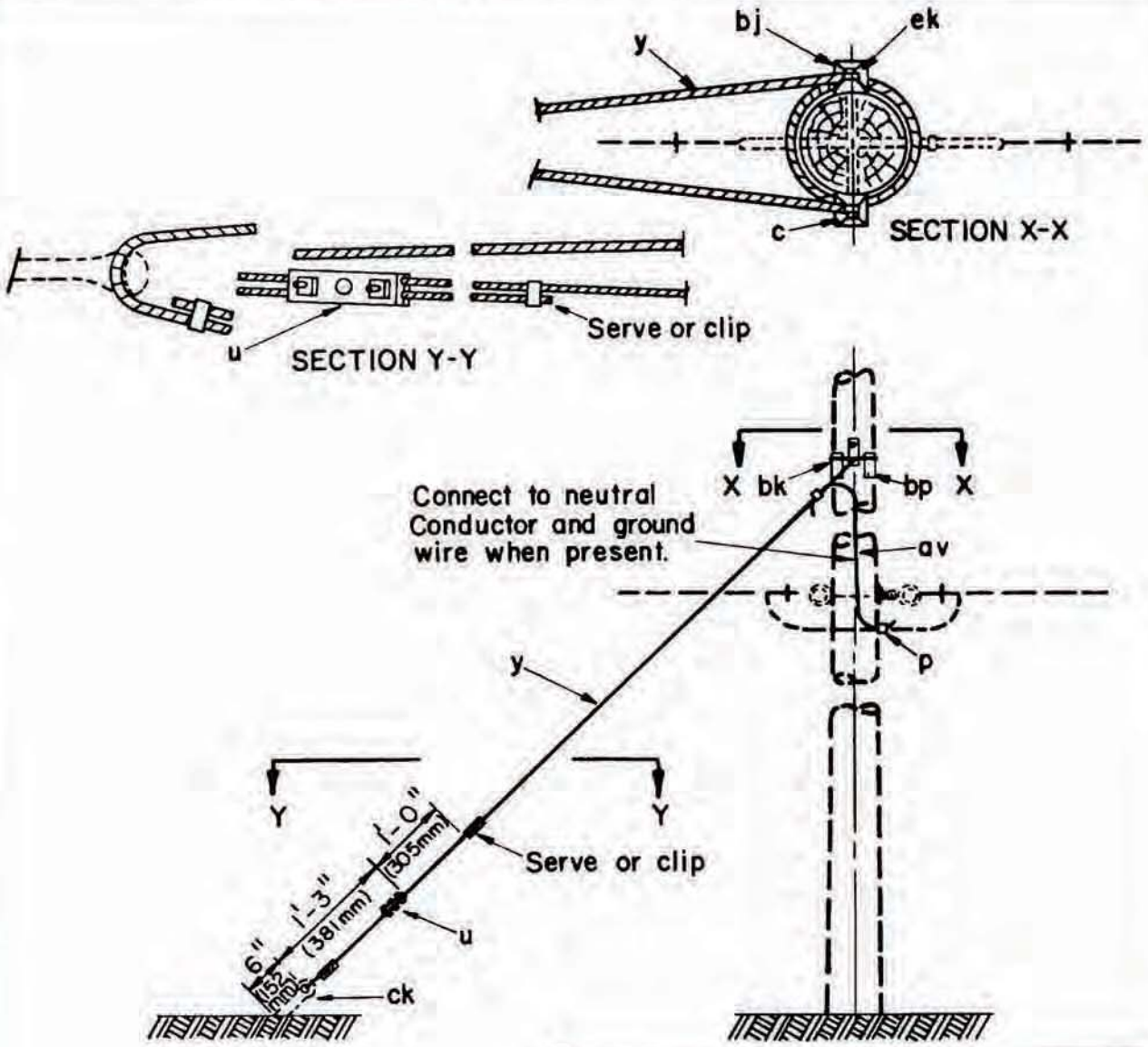


ITEM	MATERIAL	ASSEMBLY UNIT ZE8-2L- 3/8" Guy Wire No. Req'd	ASSEMBLY UNIT ZE8-3L- 7/16" Guy Wire No. Req'd
p	Connectors, as req'd		
u	Deadend for guy strand	8	8
v	Guy attachment, pole band type	4	4
y	Guy Wire, S.M. 7 strand	req'd length	req'd length
av	Jumpers, No. 4 stranded Al. alloy or equiv.	as req'd	as req'd
ck	Clamp, guy bonding	2	2

34.5/19.9 kV FOUR DOWN GUYS (LARGE CONDUCTORS)

NOV. 1986

ZE8-2L, ZE8-3L

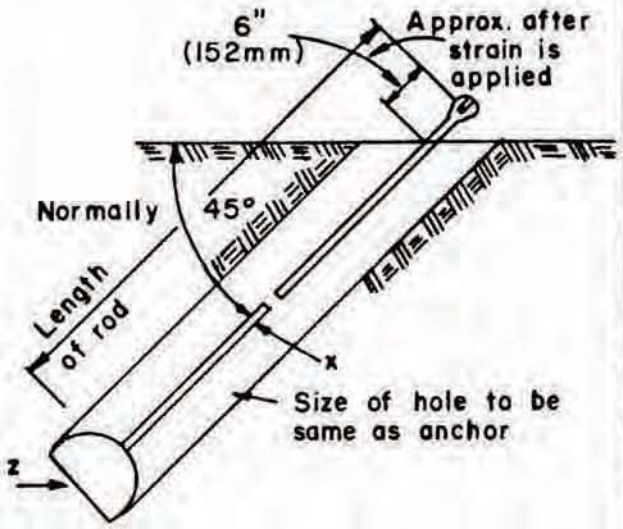


		ASSEMBLY UNIT			
		E11 1/4" Guy Wire	E12 3/8" Guy Wire		
ITEM	MATERIAL	No. Req'd	No. Req'd		
c	Bolt, machine, 5/8" x req'd length	1	1		
p	Connectors as req'd				
u	Clamp, guy	1- Light Duty	1- Heavy Duty		
y	Guy Wire, S.M., 7 strand	Req'd length	Req'd length		
av	Jumper, # 4 stranded Al. alloy or equiv.				
bj	Guy hook, J	2	2		
bk	Guy plate, 4" x 8", 14 guage	2	2		
bp	Nail, 8 penny, galv.	8	8		
ck	Clamp, anchor rod bonding	1	1		
ek	Locknuts as req'd				

345/19.9 kV
SINGLE LOOP GUY, WRAPPED TYPE

NOV. 1986

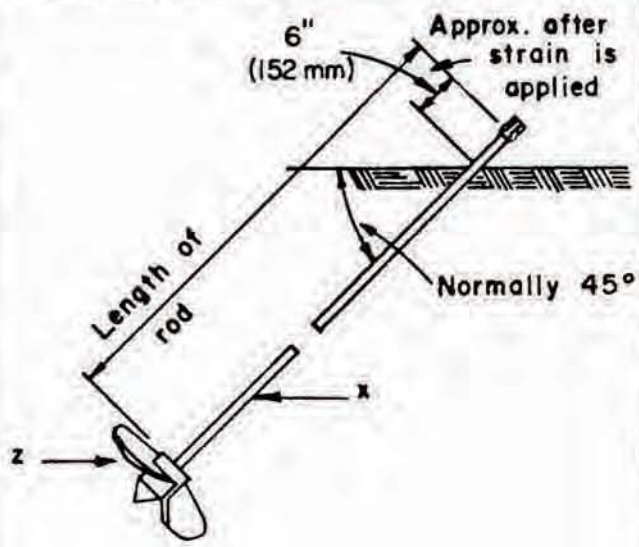
E11, E12



CONE

FI-1C, FI-2C, FI-3C

Rating is designated maximum holding power in hardpan and rocky soil.

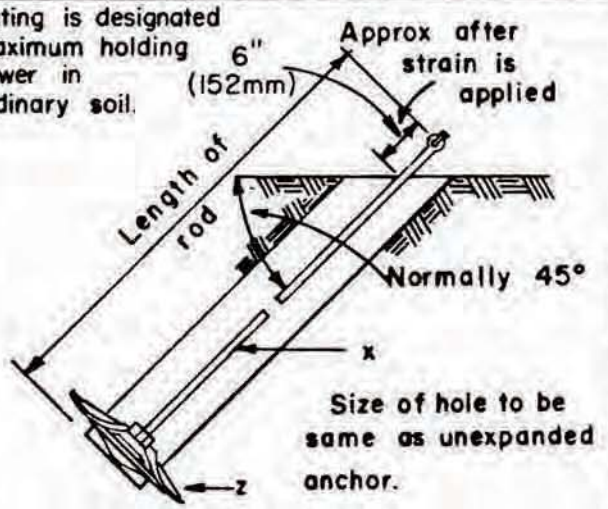


SCREW

FI-1S, FI-2S, FI-3S, FI-4S

Rating is designated maximum holding power in ordinary soil.

Rating is designated maximum holding power in ordinary soil.

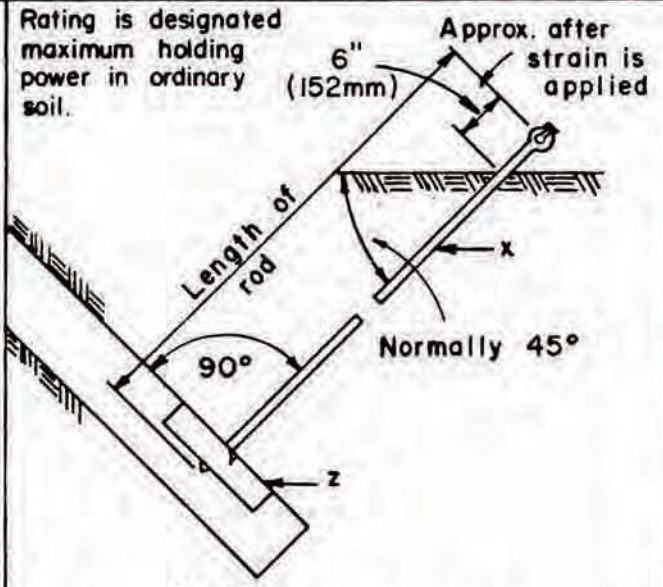


EXPANDING

FI-1, FI-2, FI-3, FI-4

Note: Projection of anchor rods above earth may be increased to a max of 12" (305mm) in cultivated fields or other locations where necessary to prevent burying of the rod eye.

Rating is designated maximum holding power in ordinary soil.



PLATE

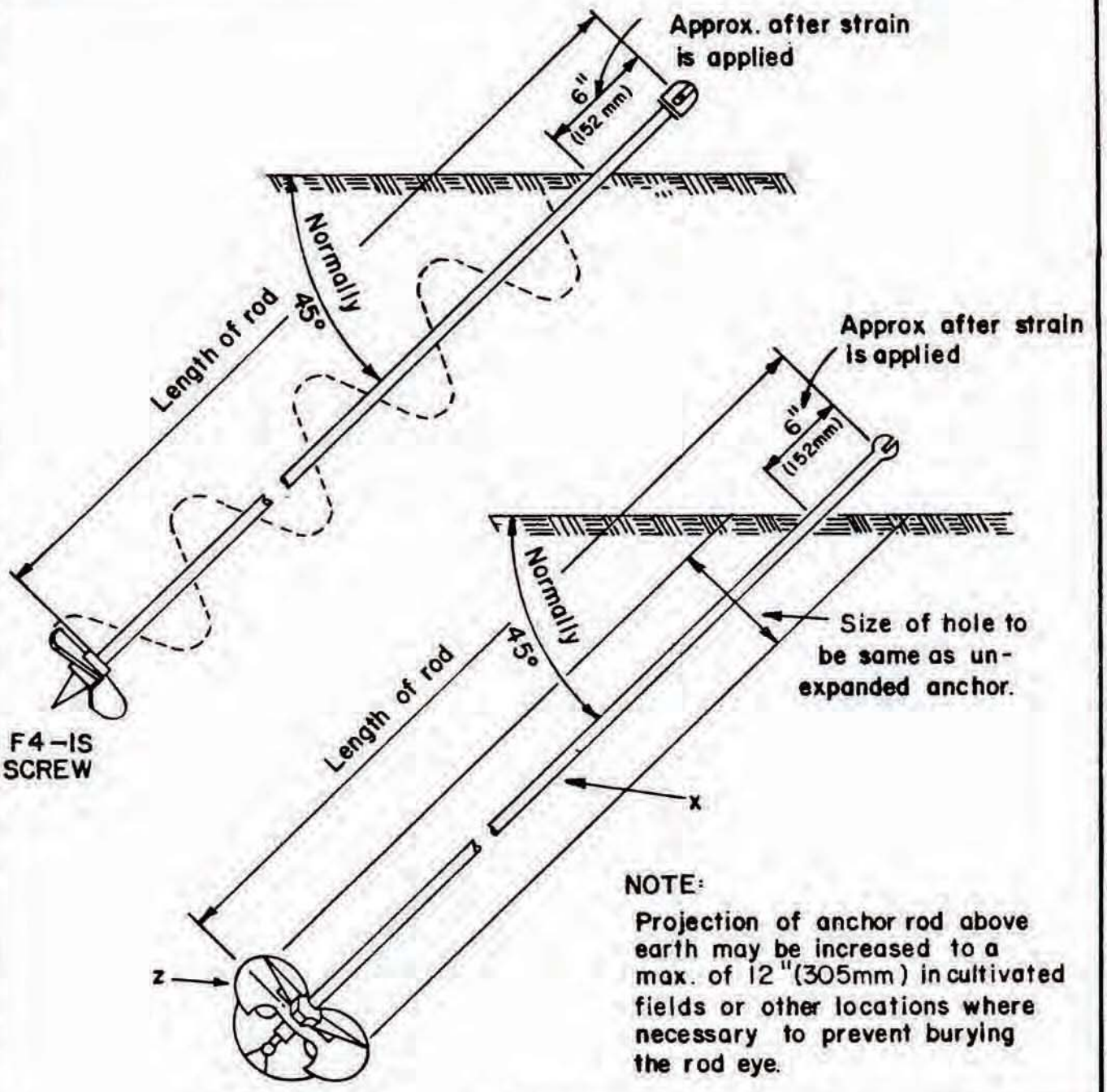
FI-1P, FI-2P, FI-3P, FI-4P

		ASSEMBLY UNIT							
		FI-1		FI-2		FI-3		FI-4	
Holding Power in Ordinary Soil	Pounds	6000		8000		10000		12000	
	Newtons	26688		35584		44480		53376	
ITEM	MATERIAL	NO.		NO.		NO.		NO.	
x	Rod, anchor, thimble eye	1	5/8"x7'-0"	1	5/8"x7'-0"				
x	Rod, anchor, twin eye					1	3/4"x8'-0"	1	3/4"x8'-0"
z	Anchor _____ type	1		1		1		1	

LINE ANCHOR ASSEMBLIES

NOV. 1986

FI-1 TO 4



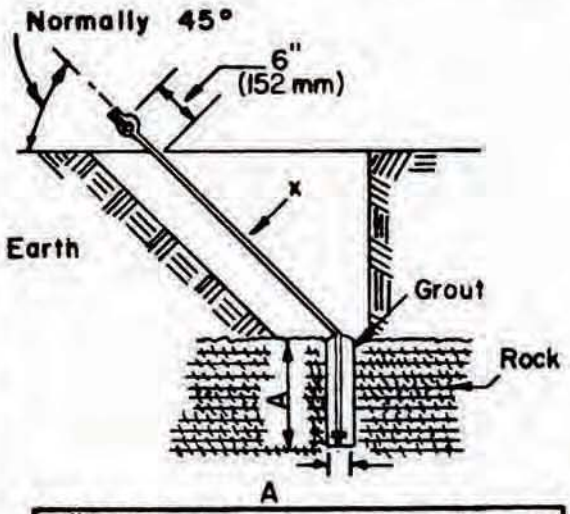
NOTE:
Projection of anchor rod above earth may be increased to a max. of 12"(305mm) in cultivated fields or other locations where necessary to prevent burying the rod eye.

		ASSEMBLY UNIT							
		F4-IS		F4-IE					
ITEM	MATERIAL	NO.		NO.					
x	Rod, anchor, thimble type eye 5/8"x 6'-0"			1	5/8" x 6'-0"				
z	Anchor, service	1		1					
	Designated maximum holding power in sand		2500 # (11120N)		2500 # (11120N)				

SERVICE ANCHOR ASSEMBLY

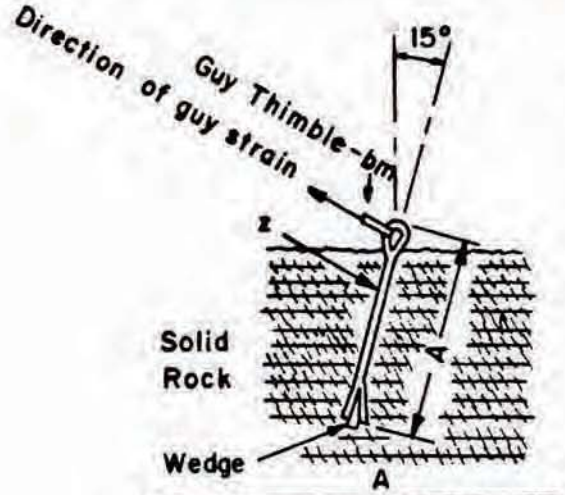
NOV. 1986

F4-1



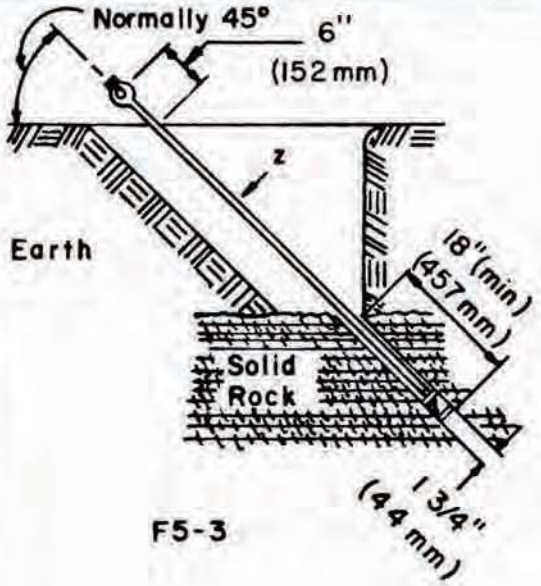
18" (457mm) min. for sound solid rock
30" (762mm) min. for stratified rock

F5-1



Guy Bolt	18" (457 mm)
Rock Anchor	15" (381 mm)

F5-2



F5-3

NOTES:

1. Only one guy shall be attached to a rock anchor. Where more than one guy is required space anchors 2 feet (610 mm) minimum and where practical they shall be in direct line with pole.

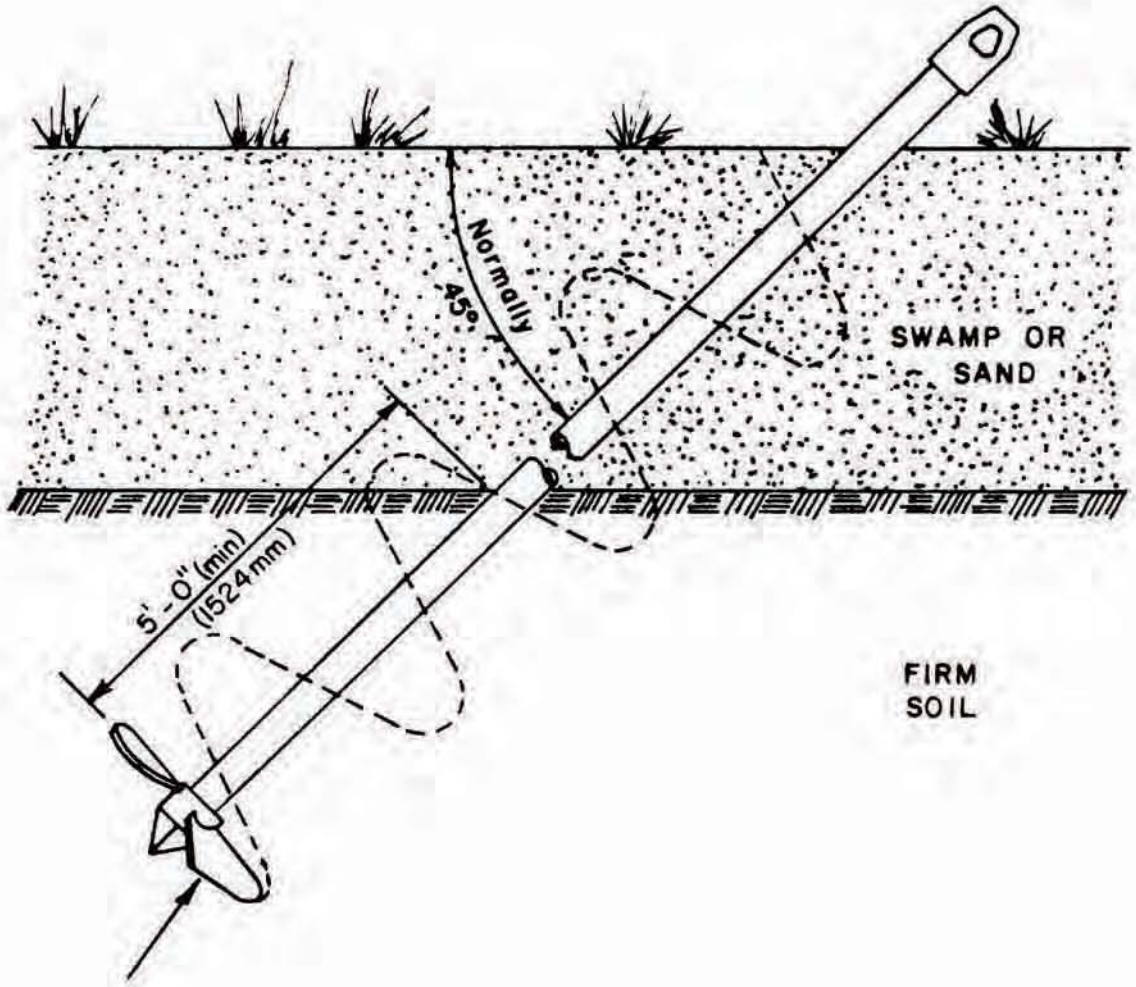
2. Do not anchor to any boulder which measures less than 5 feet (1524mm) in two directions at right angles to each other.

		ASSEMBLY UNIT			
		F5-1	F5-2	F5-3	
ITEM	MATERIAL	No. REQ'D	No. REQ'D	No. REQ'D	
x	Rod, anchor or thimble type eye	1			
z	Anchor, rock		1	1	
bm	Thimble, guy		1		

ROCK ANCHOR ASSEMBLIES

NOV. 1986

F5-1, F5-2, F5-3

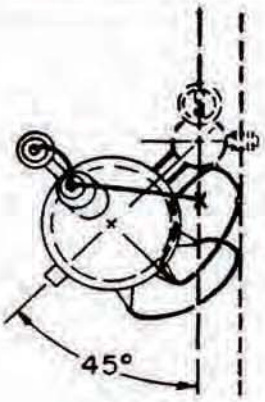


		ASSEMBLY UNIT							
		F6-1		F6-2		F6-3			
ITEM	MATERIAL	NO.	TYPE	NO.	TYPE	NO.	TYPE	NO.	TYPE
2	Anchor, swamp	1	10"	1	12"	1	15"		
	Designated maximum holding power		6000 # 26688N		8000 # 35584N		10000 # 44480N		
	Nut, thimble type eye	1		1		1			
	Pipe, galvanized, as req'd								

SWAMP ANCHOR ASSEMBLY

NOV. 1986

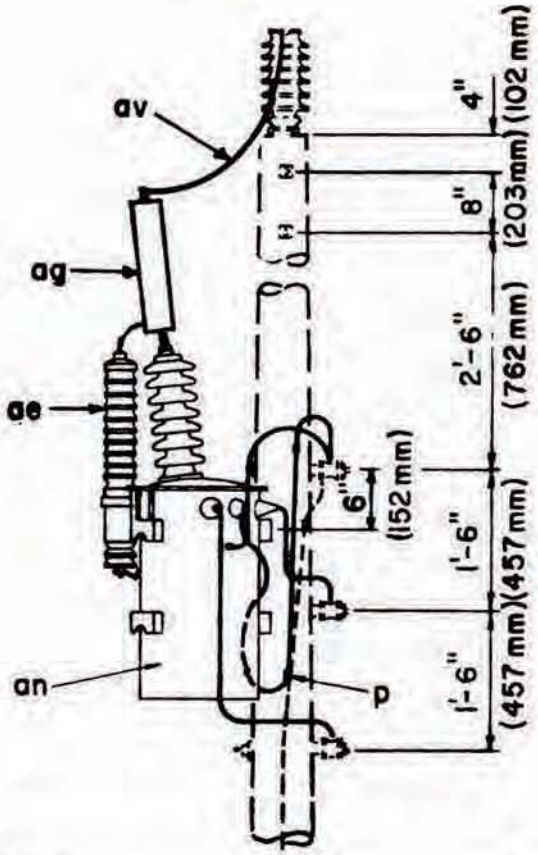
F6-1, F6-2, F6-3

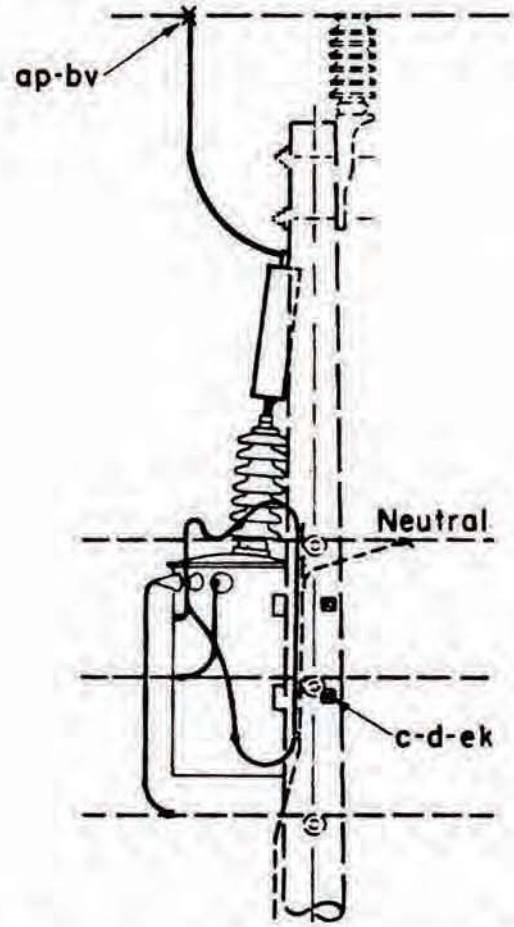


PLAN

NOTES:

1. See guide drawings for details of transformer secondary and service connections
2. Arresters must be connected directly to transformer bushing.
3. Current limiting fuse (item ag) to be used in locations where the available fault current exceeds 800A.



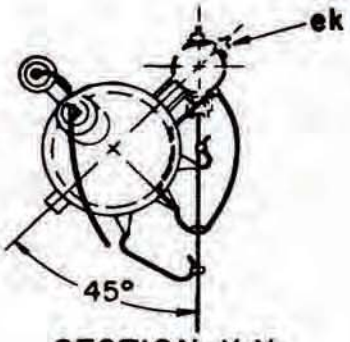


ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 5/8" x req'd length		ap	1	Clamp, hot line, tap assembly	
d	2	Washer, square, 2 1/4"		av		Jumpers, stranded, as required	
p		Connectors, as required		bv	1	Rods, armor	
ae	1	Arrester, surge		ek		Locknuts as required	
an	1	Transformer, CSP		ag	1	Fuse, current limiting	

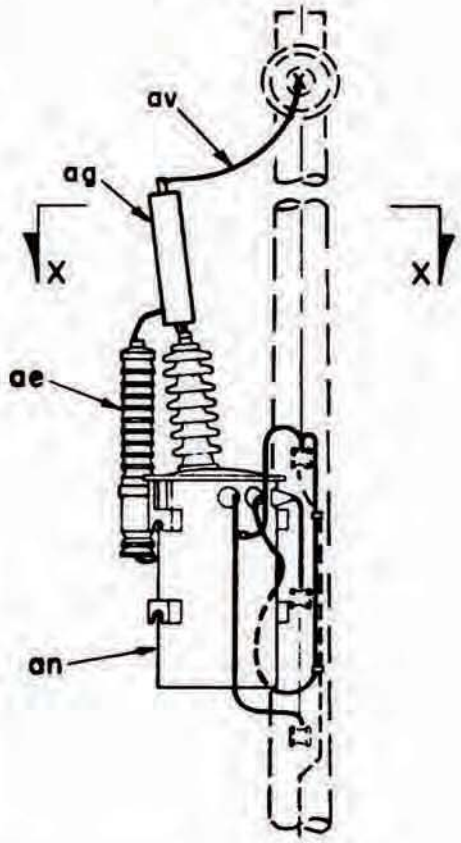
34.5/19.9 kV SINGLE PHASE TRANSFORMER AT 1-PHASE TANGENT

NOV. 1986

ZG105

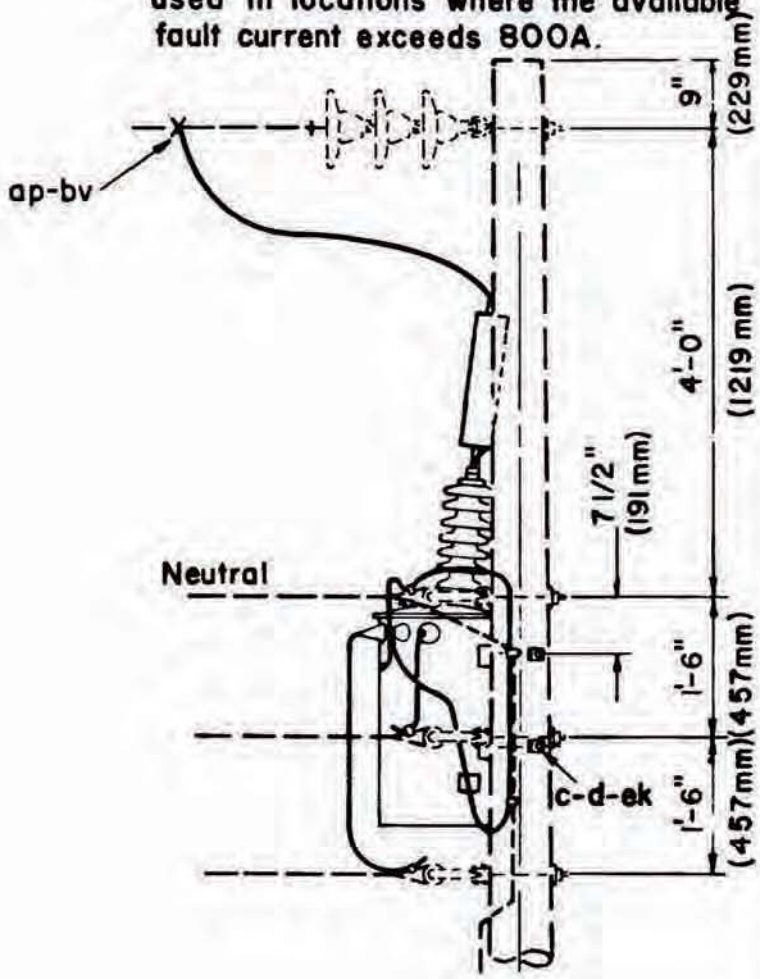


SECTION X-X



NOTES:

1. See guide drawings for details of transformer secondary and service connections
2. Arresters must be connected directly to transformer bushing.
3. Current limiting fuse (item ag) to be used in locations where the available fault current exceeds 800A.

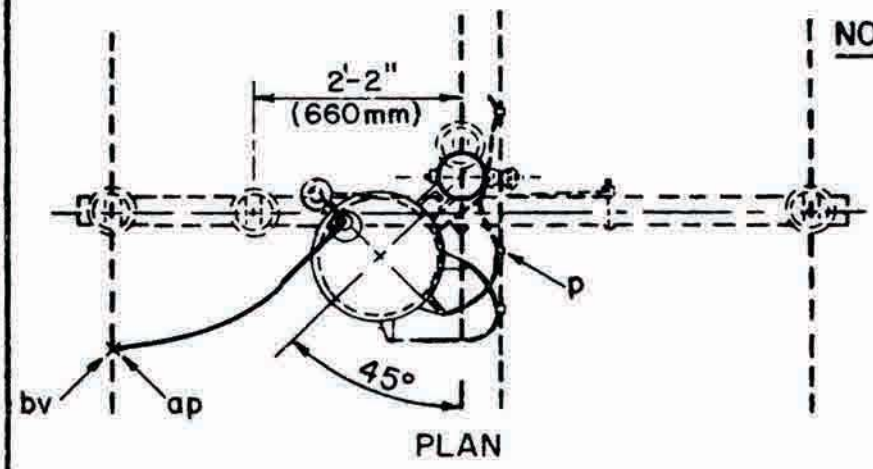


ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt machine 5/8" x req'd length		ap	1	Clamp, hot line tap, assembly	
d	2	Washer, square 2 1/4"		av		Jumpers, stranded, as req'd	
p		Connectors, as req'd		bv	1	Rods, armor	
ae	1	Arrester, surge		ek		Locknuts as req'd	
an	1	Transformer, CSP		ag	1	Fuse, current limiting	

34.5/19.9 kV SINGLE PHASE TRANSFORMER AT DEADEND

NOV. 1986

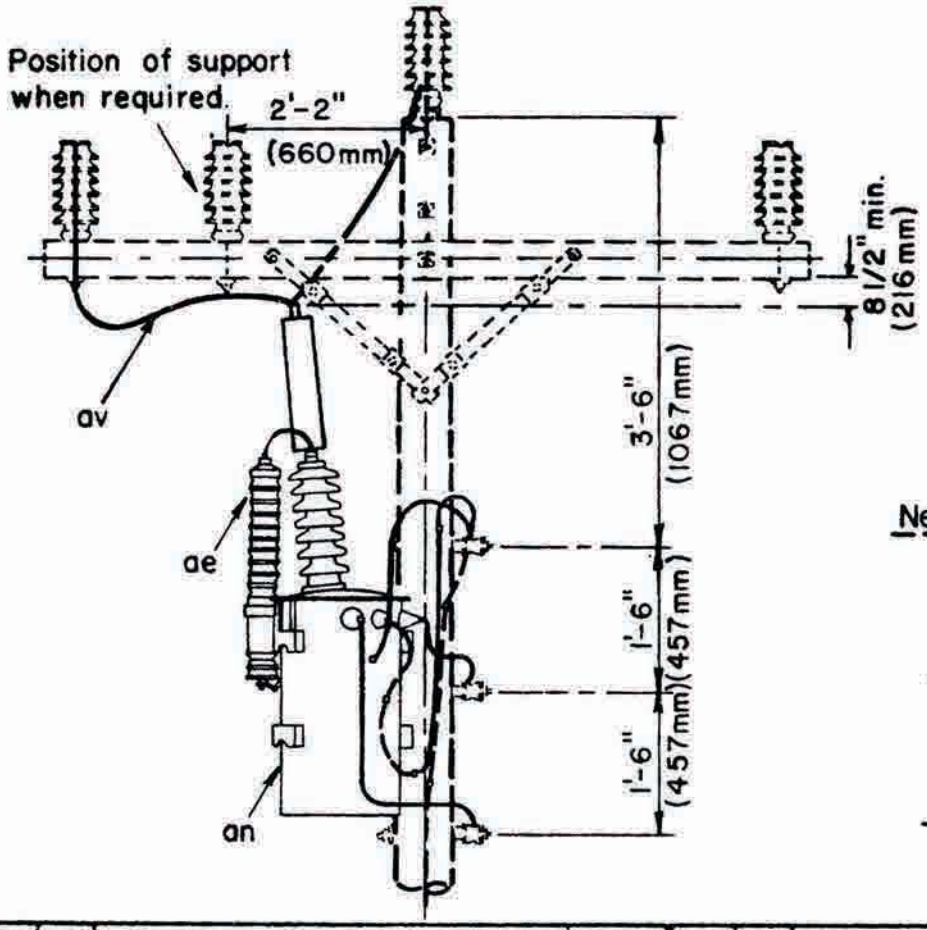
ZG106

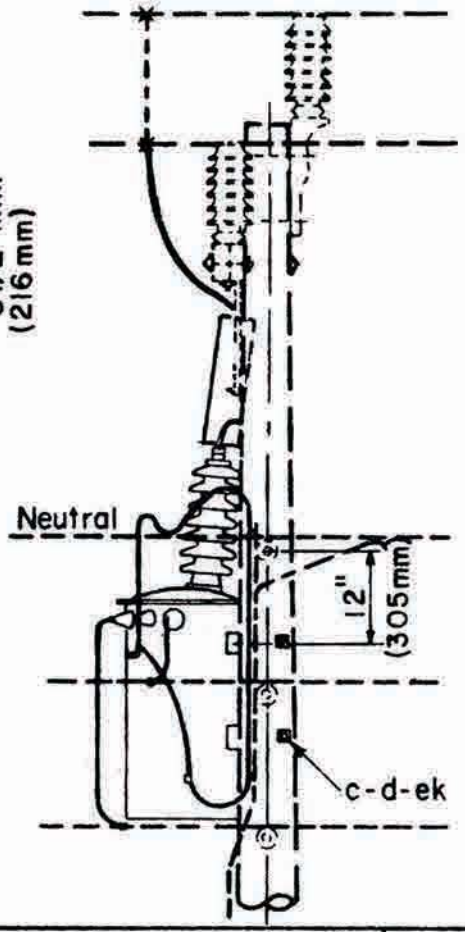


PLAN

NOTES:

1. See guide drawings for details of transformer and service connections.
2. Reverse for connection to other outside phase.
3. Current limiting fuse (item ag) to be used in locations where the available fault current exceeds 800A.



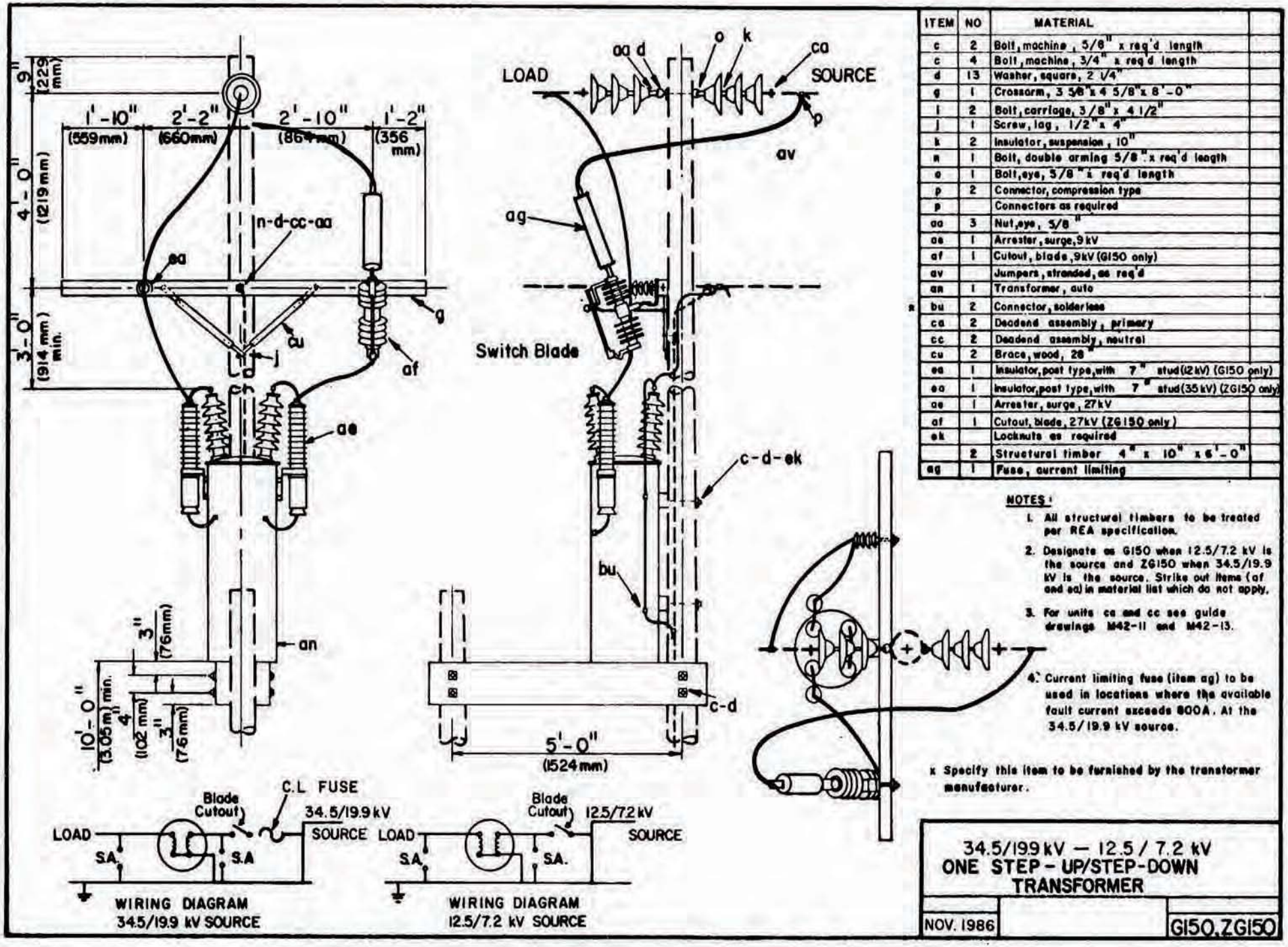


ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 5/8" x req'd length		an	1	Transformer, CSP	
d	2	Washer, square 2 1/4"		ap	1	Clamp, hot line, tap assembly	
p		Connectors as required		av	1	Jumpers, stranded, as required	
ae	1	Surge arrester		bv	1	Rods, armor	
ag	1	Fuse, current limiting		ek		Locknuts	

34.5/19.9 kV SINGLE PHASE TRANSFORMER ON THREE PHASE CIRCUIT

NOV. 1986

ZG136



ITEM	NO	MATERIAL	
c	2	Bolt, machine, 5/8" x req'd length	
c	4	Bolt, machine, 3/4" x req'd length	
d	13	Washer, square, 2 1/4"	
g	1	Crossarm, 3 5/8"x 4 5/8"x 8'-0"	
i	2	Bolt, carriage, 3/8" x 4 1/2"	
j	1	Screw, lag, 1/2" x 4"	
k	2	Insulator, suspension, 10"	
n	1	Bolt, double arming 5/8" x req'd length	
o	1	Bolt, eye, 5/8" x req'd length	
p	2	Connector, compression type	
p		Connectors as required	
aa	3	Nut, eye, 5/8"	
ae	1	Arrester, surge, 9 kV	
af	1	Cutout, blade, 9kV (G150 only)	
av		Jumpers, stranded, as req'd	
an	1	Transformer, auto	
bu	2	Connector, solderless	x
ca	2	Deadend assembly, primary	
cc	2	Deadend assembly, neutral	
cu	2	Brace, wood, 28"	
ea	1	Insulator, post type, with 7" stud (12 kV) (G150 only)	
ea	1	Insulator, post type, with 7" stud (35 kV) (ZG150 only)	
ae	1	Arrester, surge, 27kV	
af	1	Cutout, blade, 27kV (ZG150 only)	
ek		Locknuts as required	
	2	Structural timber 4" x 10" x 6'-0"	
ag	1	Fuse, current limiting	

NOTES:

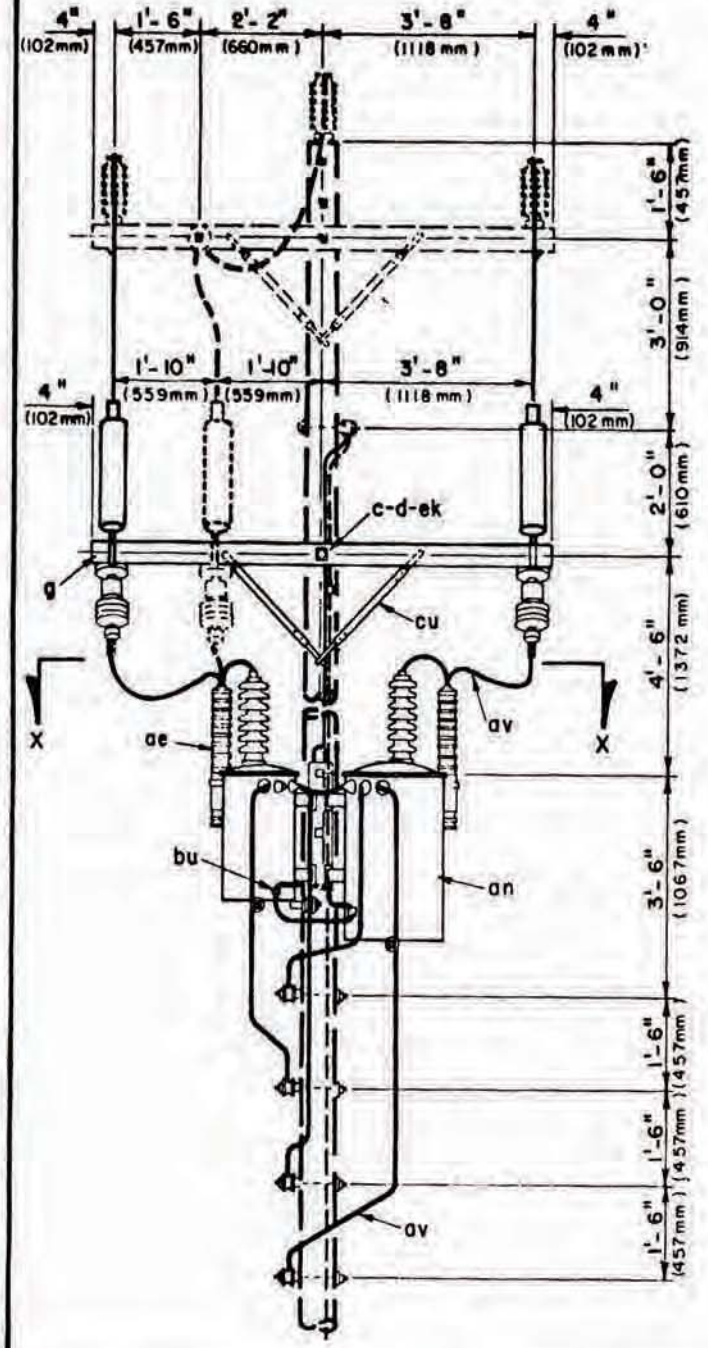
1. All structural timbers to be treated per REA specification.
2. Designate as G150 when 12.5/7.2 kV is the source and ZG150 when 34.5/19.9 kV is the source. Strike out items (af and ea) in material list which do not apply.
3. For units ca and cc see guide drawings M42-11 and M42-13.
4. Current limiting fuse (item ag) to be used in locations where the available fault current exceeds 800A. At the 34.5/19.9 kV source.

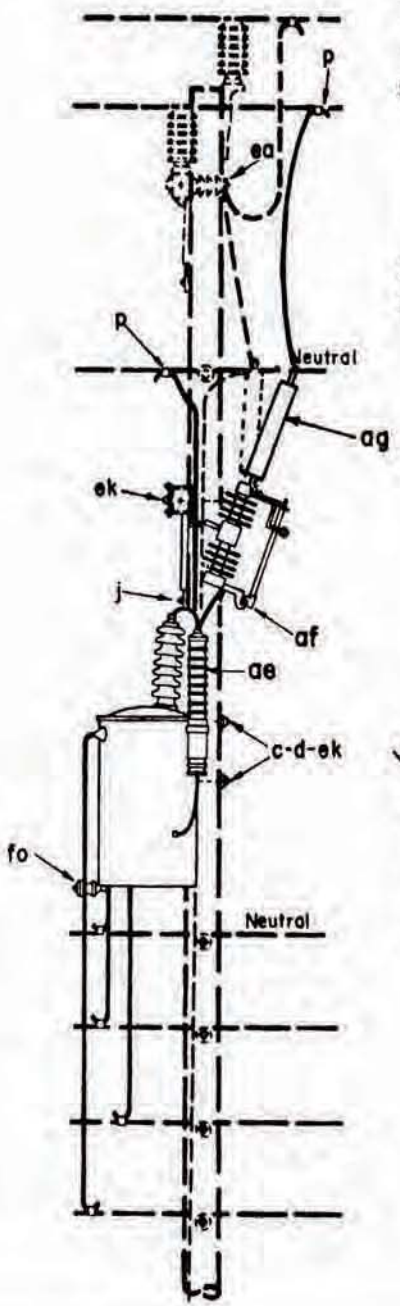
x Specify this item to be furnished by the transformer manufacturer.

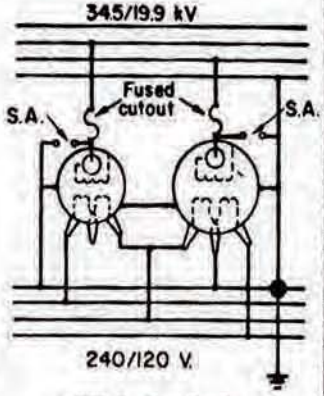
34.5/19.9 kV — 12.5/7.2 kV ONE STEP-UP/STEP-DOWN TRANSFORMER

NOV. 1986

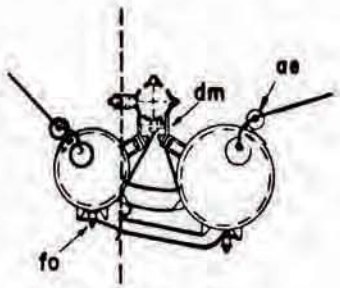
G150, ZG150







WIRING DIAGRAM



SECTION X-X

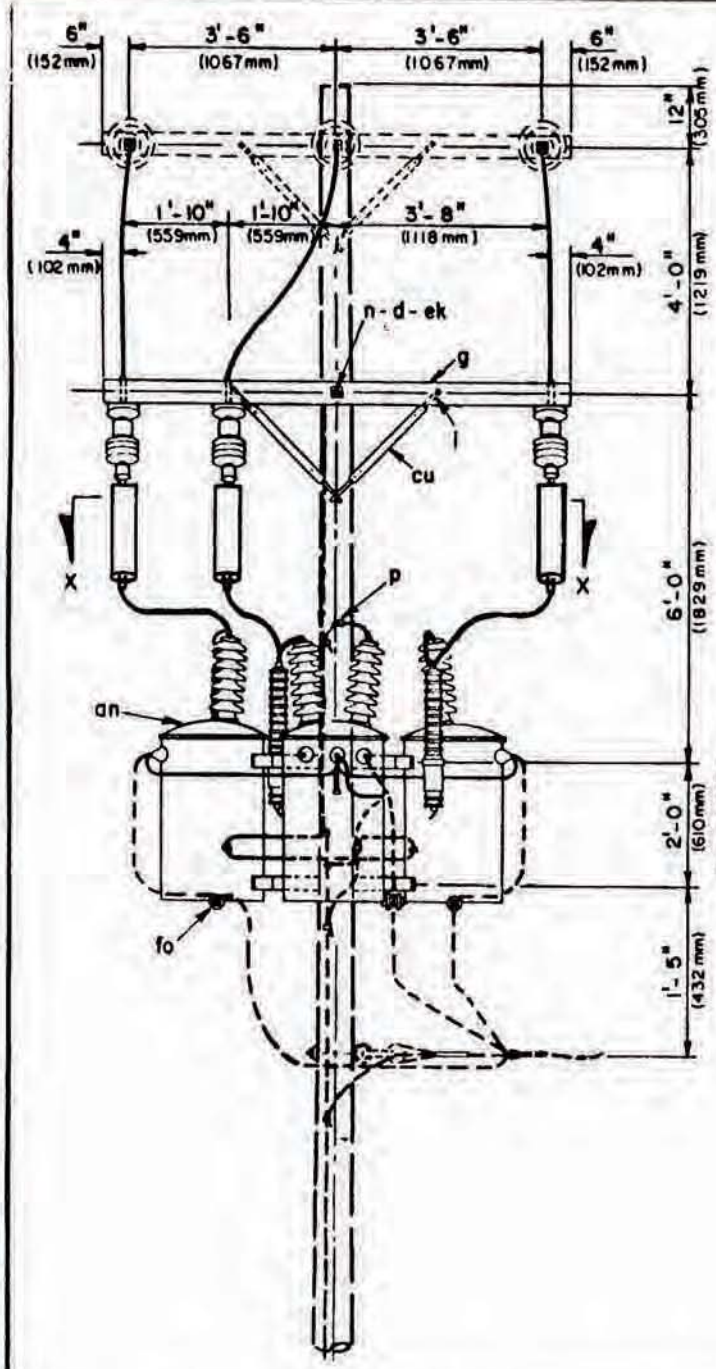
ITEM	NO.	MATERIAL
c	3	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 1/2" x 8'-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
p	2	Connector, compression type
p		Connectors, as required
an	2	Transformer, conventional 25kva. max.
av		Jumper, bare, stranded, as required
ae	2	Surge arrester
af	2	Cutout
dm	1	Bracket, transformer
ea		Insulator, post type, with 7" stud
fo	3	Transformer, secondary bracket
ek		Locknuts
cu	2	Brace, wood, 28"
ag	3	Fuse, current limiting

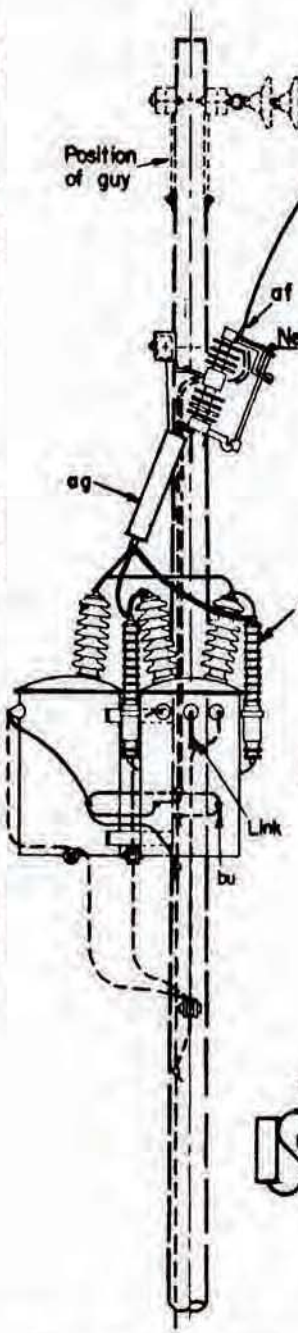
Note:

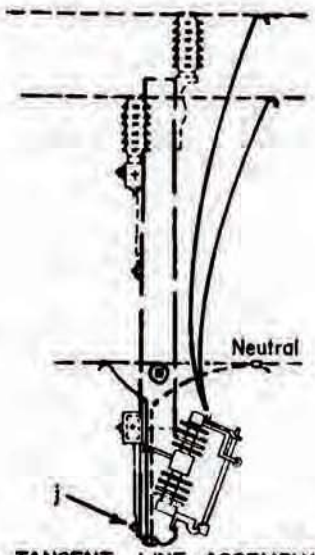
Current limiting fuse (item ag) to be used in locations where the available fault current exceeds 800A.

34.5/19.9 kV
TWO TRANSFORMERS, CLUSTER MOUNTED
OPEN WYE – OPEN DELTA
SINGLE PHASE AND THREE PHASE POWER LOAD

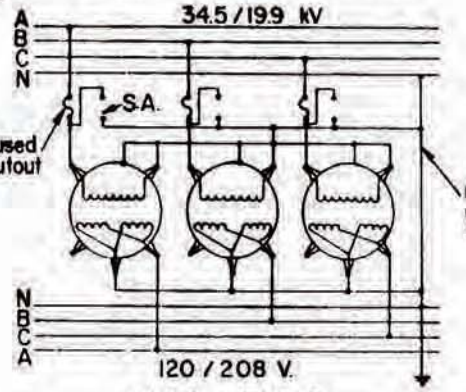
NOV. 1986 | | ZG210



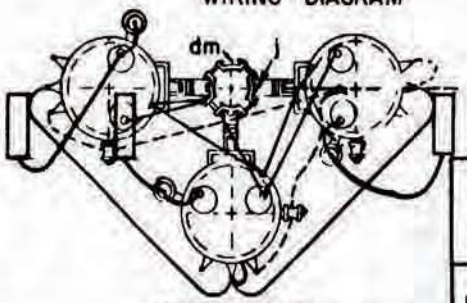




TANGENT LINE ASSEMBLY



WIRING DIAGRAM



SECTION X-X

ITEM	NO	MATERIAL
d	10	Washer, square, 2 1/4"
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"
i	4	Bolt, carriage 3/8" x 4 1/2"
j		Screw, lag 1/2" x 4" as req'd
n	3	Bolt, double arming, 5/8" x req'd length
p	3	Connector, compression type
p		Connectors, as required
oe	3	Surge arrester
af	3	Cutout
an	3	Transformer, 100 kVA max
ay		Jumper, secondary, weatherproof
av		Jumper, bare, stranded as req'd.
* bu	3	Connector, solderless
cu	4	Brace, wood 28"
dm		Bracket, transformer, cluster and adapter plates as required
ek		Locknuts
fo	3	Transformer secondary bracket insulated
*	3	Link, grounding
ag	3	Fuse, current limiting

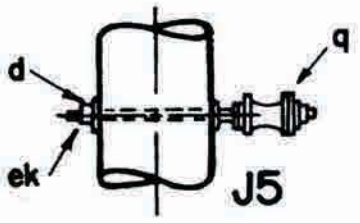
* Specify these items to be furnished by the manufacturer.

NOTES:

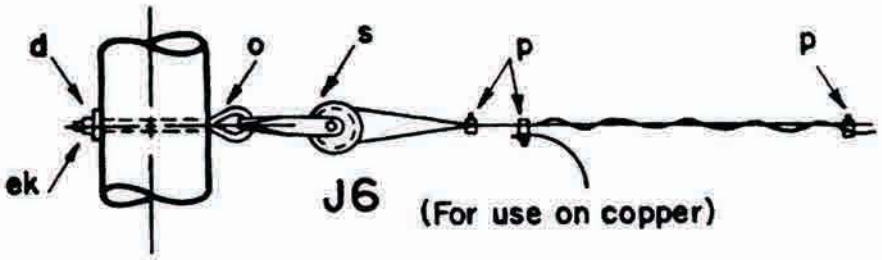
1. For transformers 75 kVA and larger use two cluster brackets
2. Single bushing transformers may be used if desired
3. Re-connect internal windings of secondary as shown
4. For metering, see drawing M8-11
5. Current limiting fuse (item ag) to be used in locations where the available fault current exceeds 800A.

34.5/19.9 kV
THREE TRANSFORMERS, CLUSTER MOUNTED
4-WIRE GROUNDED WYE - GROUNDED WYE
FOR 120/208 VOLT POWER LOADS

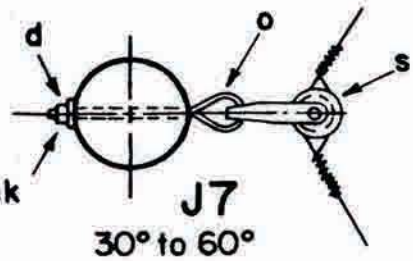
NOV. 1986 | ZG312



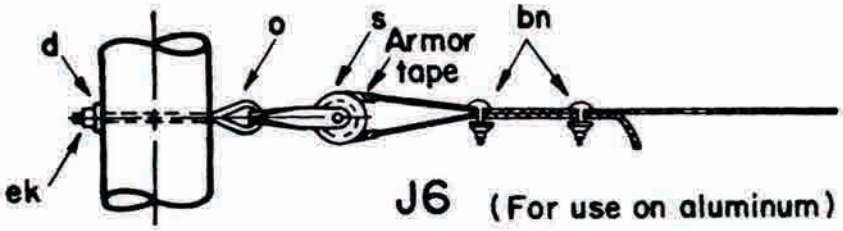
J5



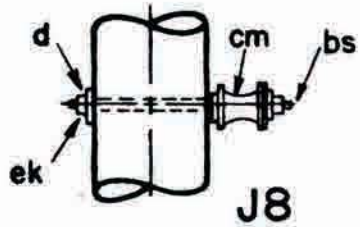
J6 (For use on copper)



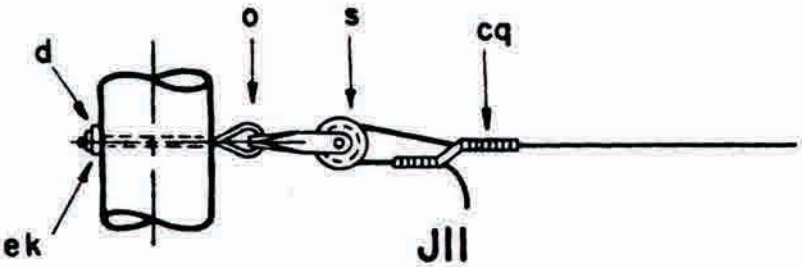
J7
30° to 60°



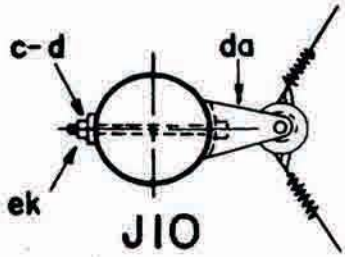
J6 (For use on aluminum)



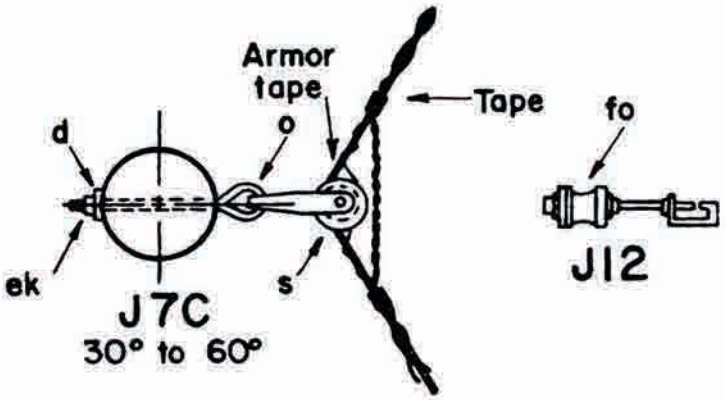
J8



J11



J10
5° to 60°



J7C
30° to 60°

J12

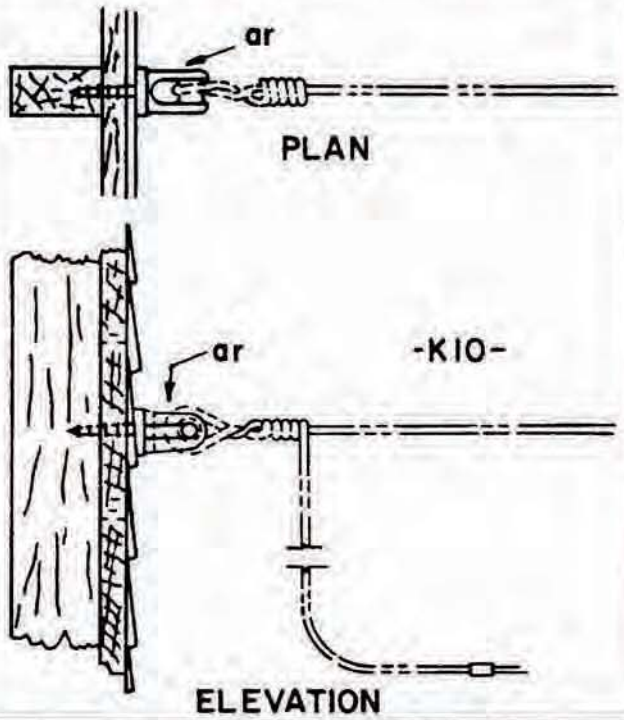
For use on Self Supporting Service Cable

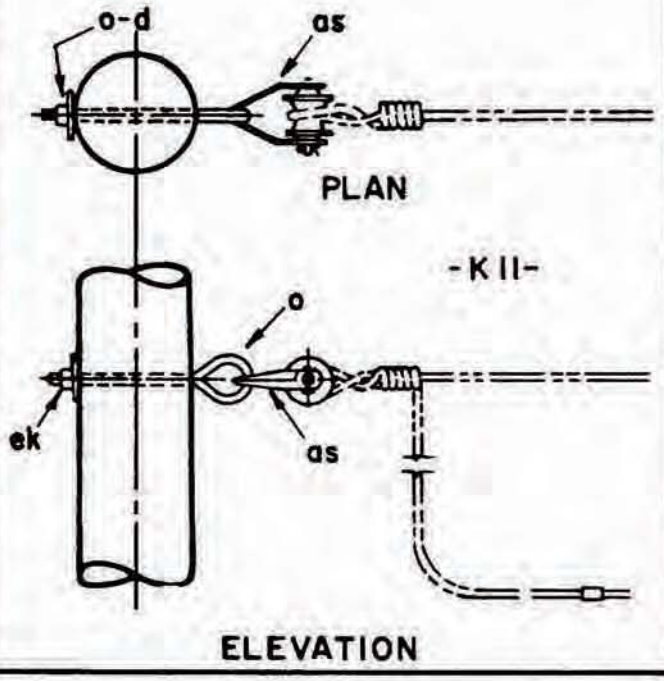
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c		Bolt, machine, 5/8" x req'd length	bs		Bolt, single, upset
d		Washer, square 2 1/4"	bn		Clamp, loop, deadend
o		Bolt, eye, 5/8" x req'd length	cq		Sleeve, offset, splicing
p		Connectors as req'd	da		Bracket, insulated
q		Bolt, double upset, insulated	fo		Transformer secondary bracket
s		Clevis, secondary, swinging, insulated	ek		Locknuts as req'd
cm		Insulator, spool			

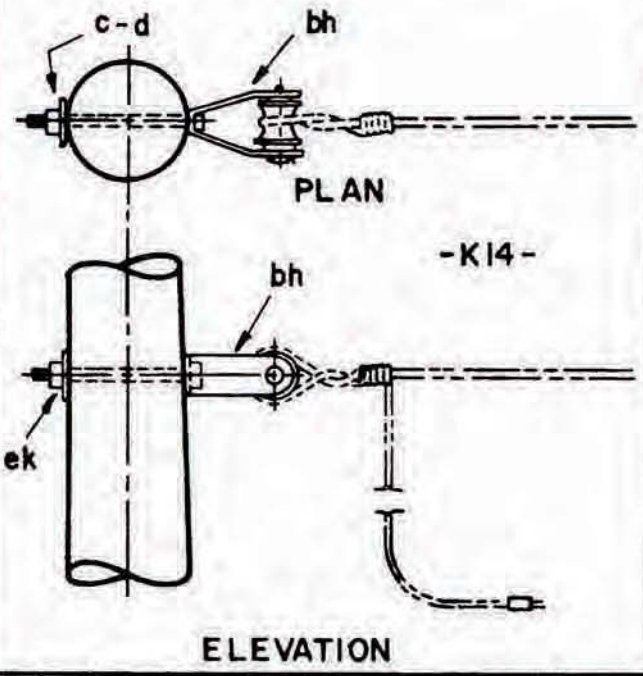
SECONDARY ASSEMBLIES

NOV. 1986

J5 to J12







NOTE :

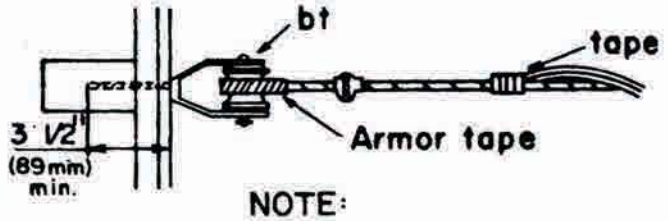
Service connectors to be insulated compression type.

ITEM	NO	MATERIAL		ITEM	NO	MATERIAL	
c		Bolt, machine, 5/8" x req'd length		as		Clevis, service, swinging, insulated	
d		Washer, square 2 1/4"		bh		Clevis, service, deadend, insulated	
o		Bolt, eye, 5/8" x req'd length		ek		Locknuts as req'd	
ar		Wire holder					

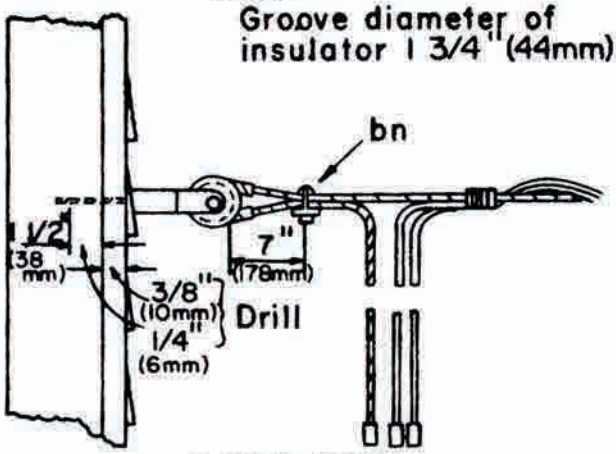
SERVICE ASSEMBLIES

NOV. 1986

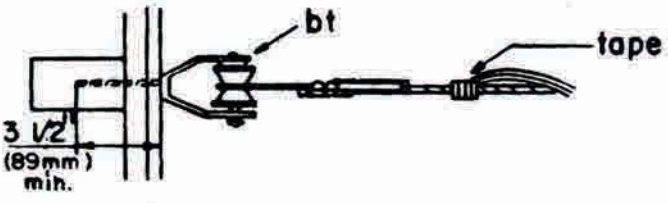
K10, K11, K14

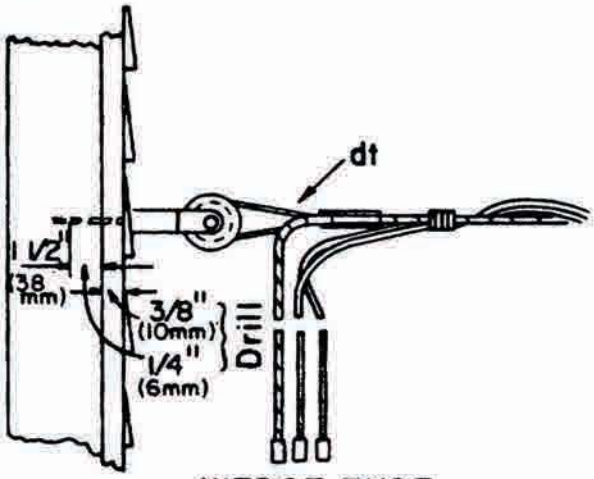


NOTE:
Groove diameter of insulator 1 3/4" (44mm) min.

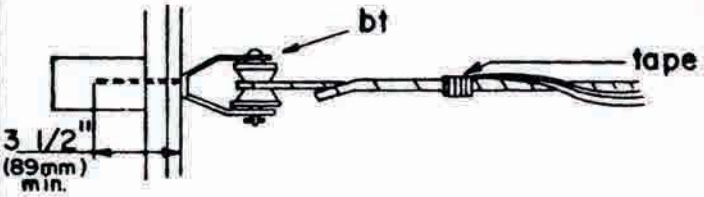


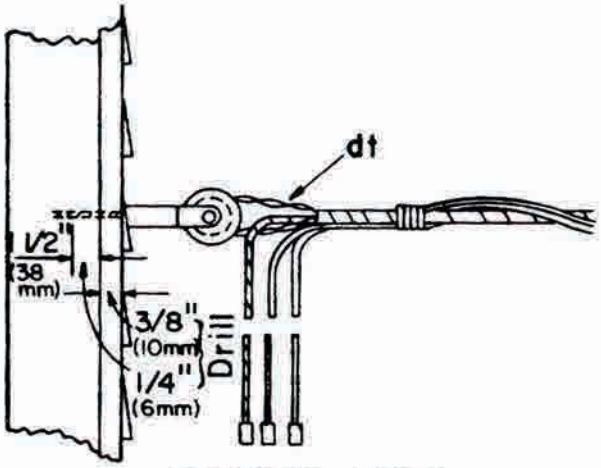
LOOP TYPE



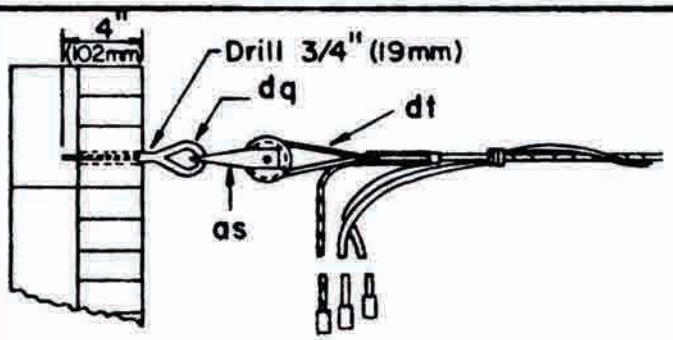


WEDGE TYPE





FORMED TYPE



BRICK OR MASONRY

NOTE:
Wedge and preformed service dead-ends in sizes shown on page dt of the List of Materials may be subst. for those shown on K11C, K14C, K15C, and K16C. This type construction should be used for 3 or 4 conductor service cables with bare ACSR neutral. Service connectors to be insulated compression type.

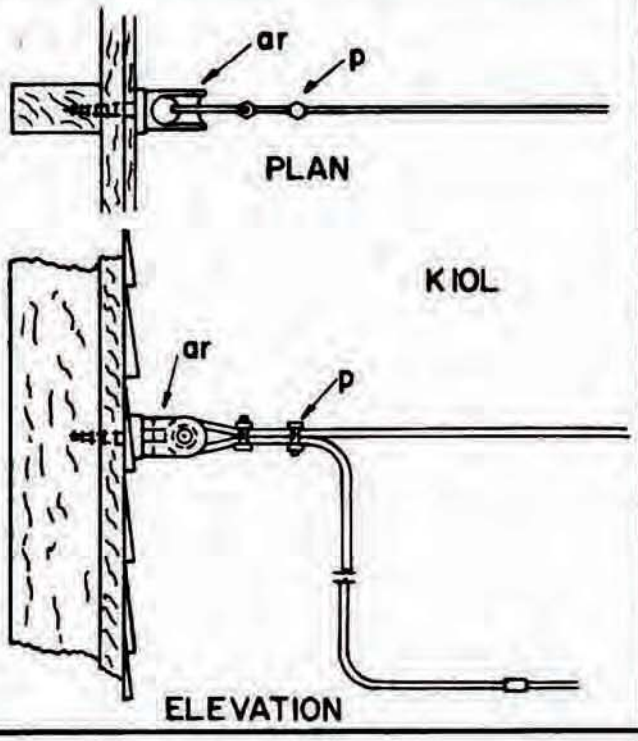
ITEM	NO.	MATERIAL	
p		Connectors, as req'd	
as		Clevis, service, insulated	
bn		Clamp, loop deadend	
bt		Wire holder, clevis type, insulated	
		#24 woodscrew	

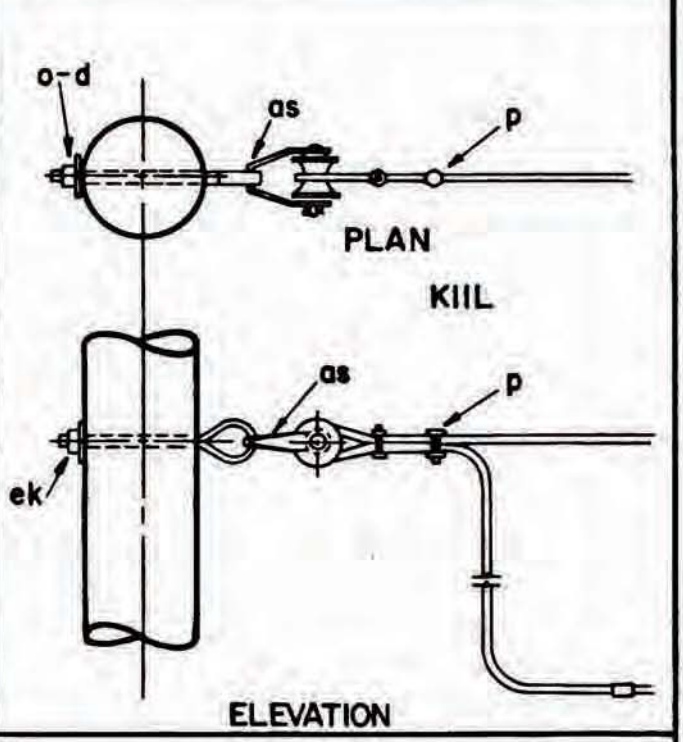
ITEM	NO.	MATERIAL	
dt		Service deadend, wedge type	
dt		Service deadend, formed type	
dq		Eye screw, elliptical 1/2" x 6"	
		3/4" x 3 1/2" expansion shield	

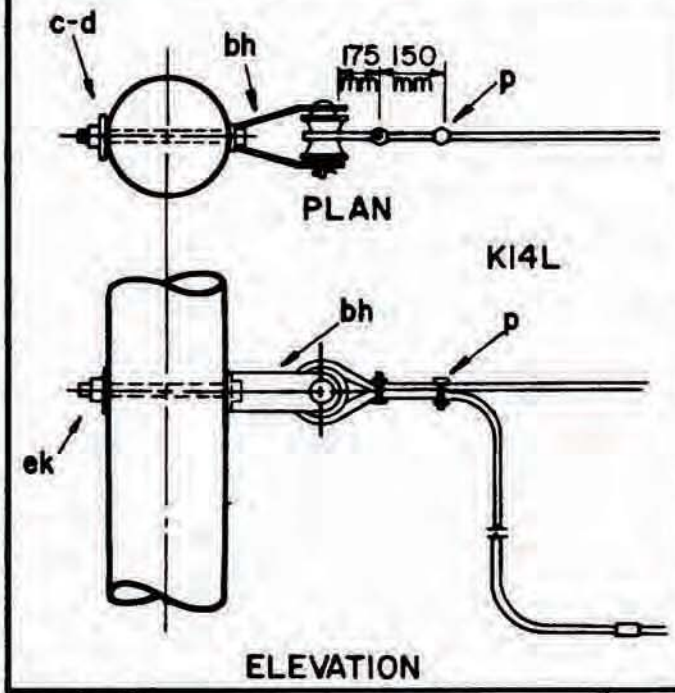
SERVICE ASSEMBLIES, CABLE

NOV. 1986

K10C







NOTE

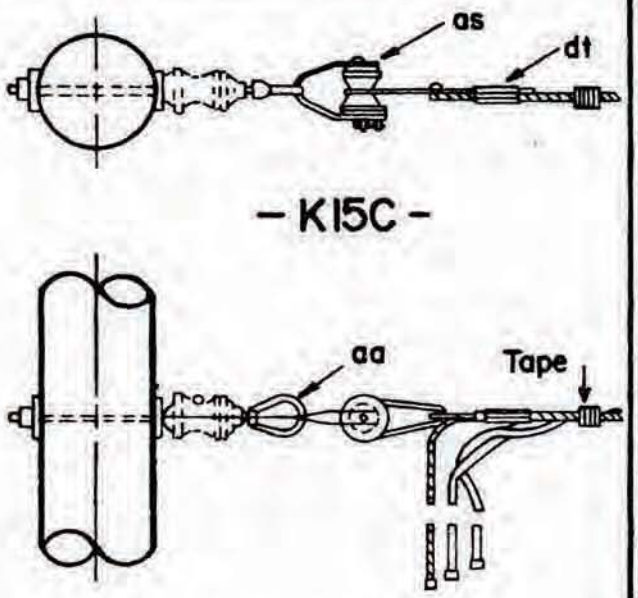
1. This type construction should be used for #2 covered aluminum and larger.
2. Service connectors to be insulated compression type.

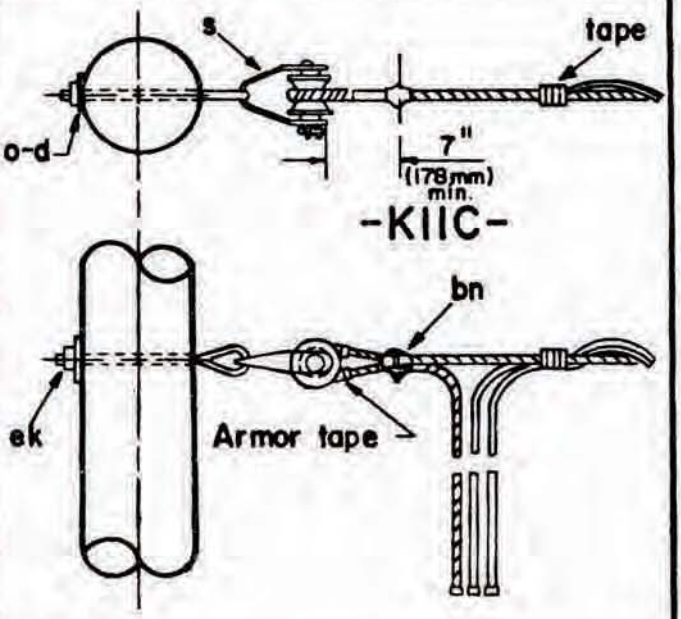
ITEM	NO	MATERIAL		ITEM	NO.	MATERIAL	
c		Bolt, machine, 5/8" x req'd length		ar		Wireholder	
d		Washer, square 2 1/4"		as		Clevis, service, swinging, insulated	
o		Bolt, eye, 5/8" x req'd length		bh		Clevis service, deadend, insulated	
p		Connectors, as req'		ek		Locknuts as req'd	

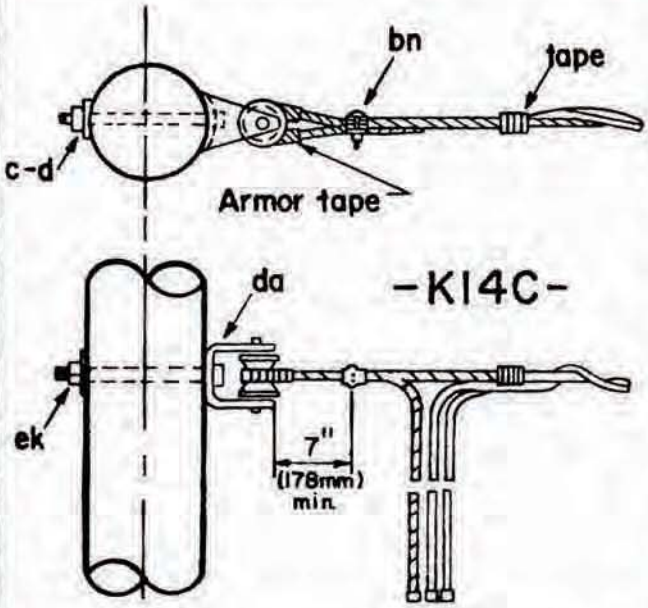
SERVICE ASSEMBLIES (LARGE CONDUCTORS)

NOV. 1986

K10L, K11L, K14L







NOTES:

This type construction should be used for 3 or 4 conductor service cables with bare ACSR neutral.

Service connectors to be insulated compression type.

Groove diameter of insulators 1 3/4" (44 mm) minimum for loop deadend.

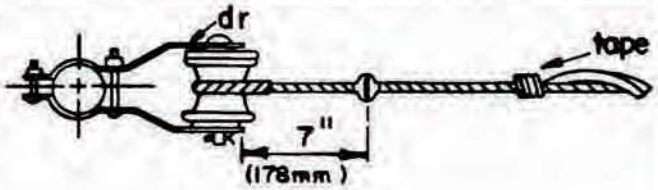
ITEM	NO.	MATERIAL	
c		Bolt machine, 5/8" x req'd length	
d		Washer, square, 2 1/4"	
o		Bolt, eye, 5/8" x req'd length	
p		Connectors as req'd	
s		Clevis, secondary, swinging, insulated	
aa		Nut, eye	

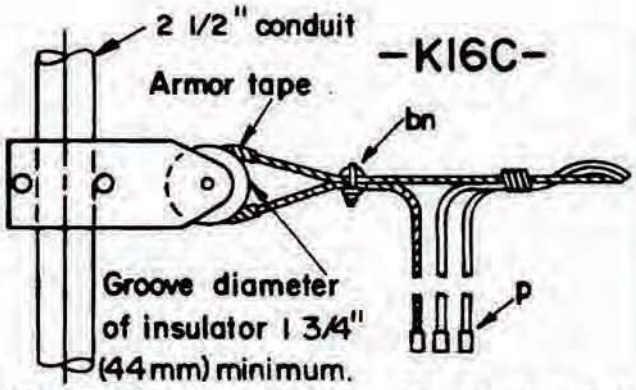
ITEM	NO.	MATERIAL	
as		Clevis, service swinging	
bn		Clamp, loop deadend	
da		Bracket, insulated swinging	
dt		Service deadend	
ek		Locknuts as req'd	

SERVICE ASSEMBLIES, CABLE

NOV. 1986

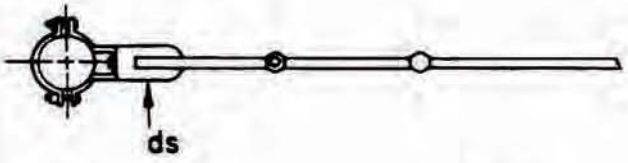
K11C, K14C, K15C

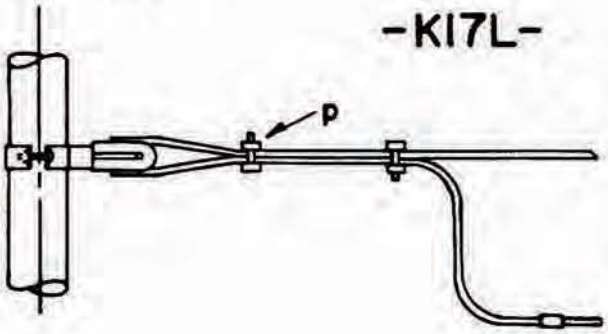




-K16C-

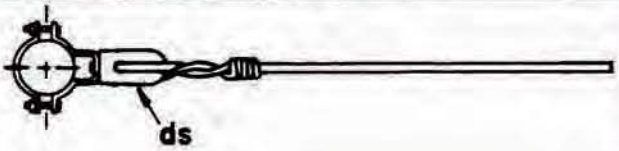
NOTE: This type constr. should be used for three conductor service cables with bare ACSR neutral.



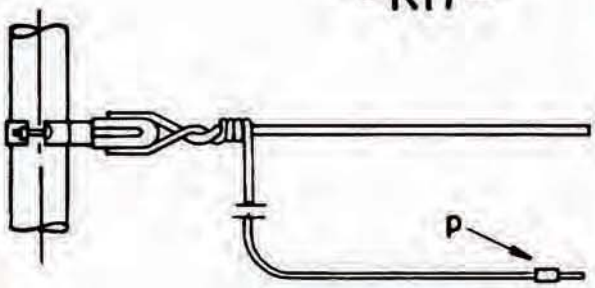


-K17L-

NOTE: This type constr. should be used for No. 2 covered aluminum conductor.



-K17-



NOTES:

1. Service connectors to be insulated compression type.
2. For arrangement of service assembly units see drawing M24-10.

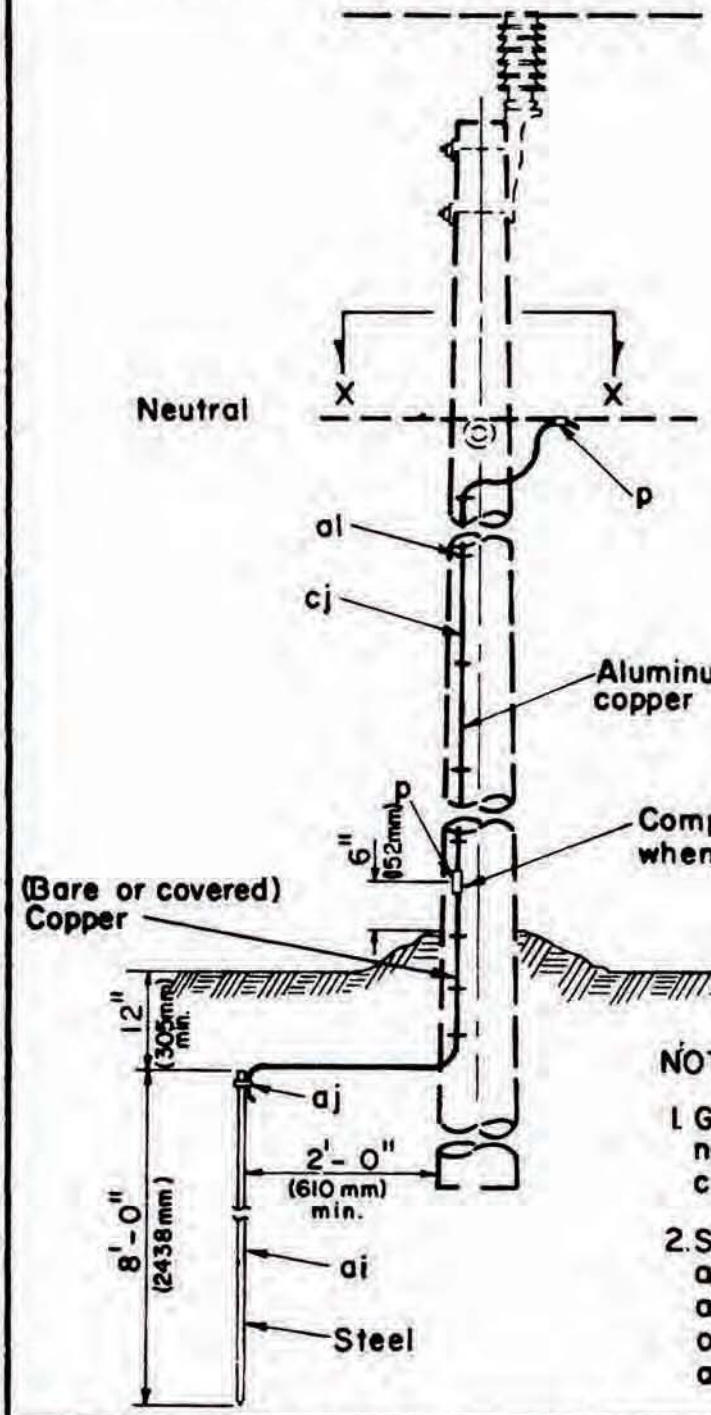
ITEM	NO.	MATERIAL	
p		Connectors as req'd	
bn		Clamp, loop deadend	

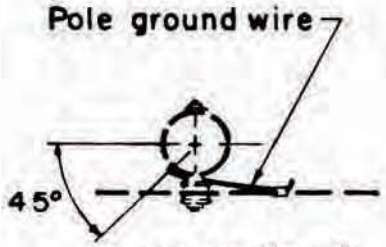
ITEM	NO.	MATERIAL	
dr		Clevis, conduit insulated	
ds		Wireholder, conduit	

SERVICE ASSEMBLIES (FOR RANCH TYPE HOUSE)

NOV. 1986

K16C,K17L,K17





SECTION "X-X"

NOTES:

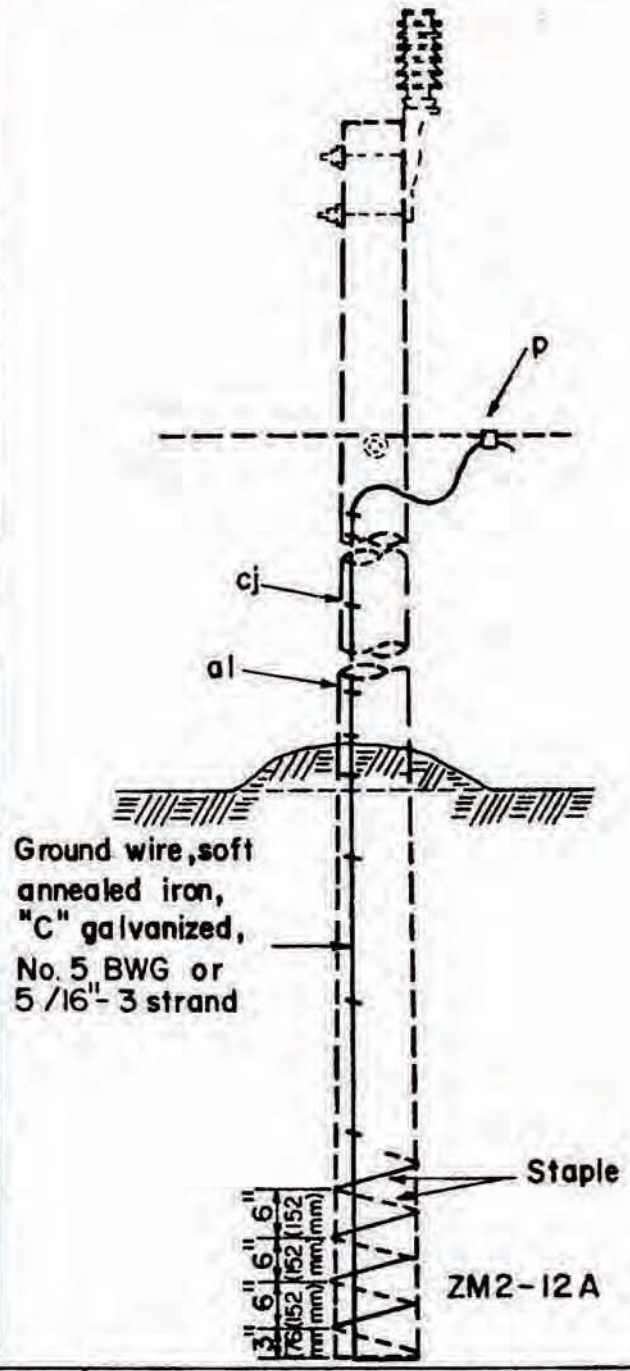
1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Staples on ground wire shall be 2'-0" (610 mm) apart except for a distance of 8'-0" (2438 mm) above ground and 8'-0" (2438 mm) from top of pole where they shall be 6" (152 mm) apart.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
p		Connectors, as required		al		Staples, ground wire, as required	
ai	1	Rod, ground, steel, 5/8" dia. min.		cj		Ground wire, No. 6 copper or equiv.	
aj	1	Clamp, ground rod				conductivity as required	

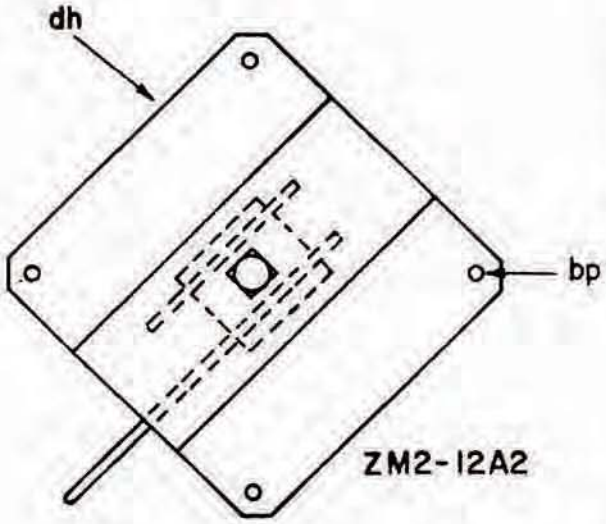
GROUNDING ASSEMBLY - GROUND ROD TYPE

NOV. 1986

ZM2-11



PLAN OF PLATE



NOTES:

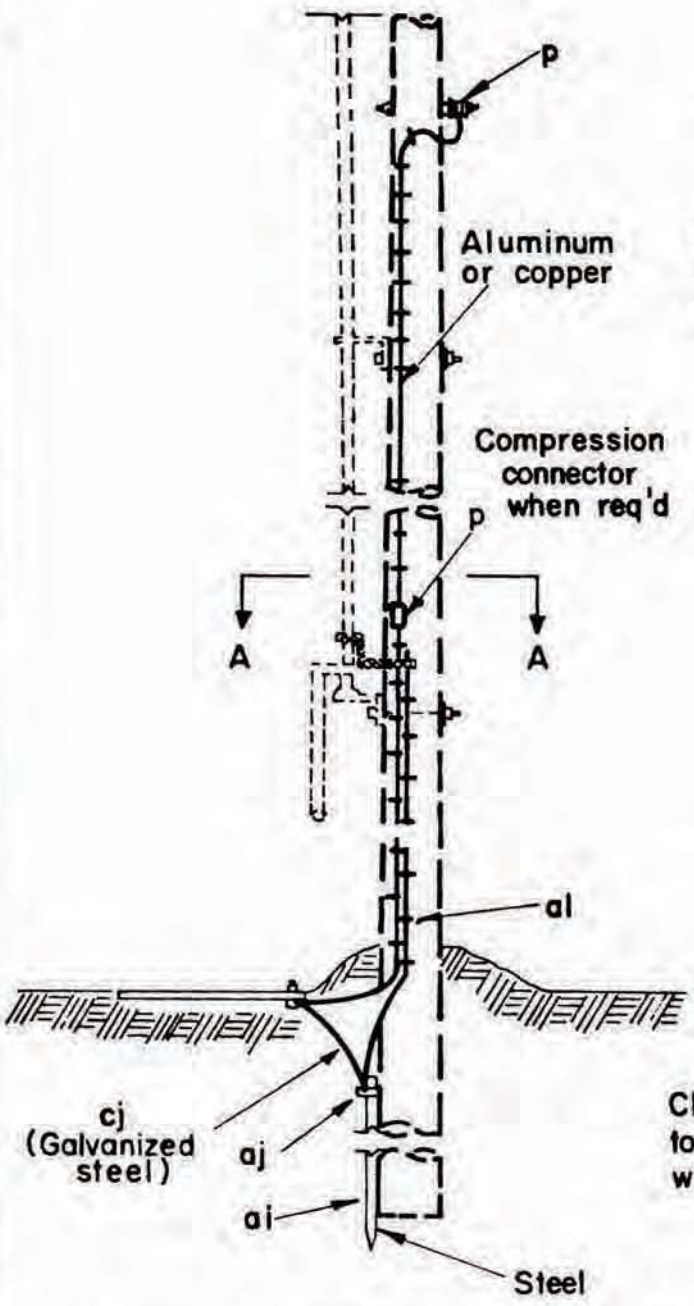
1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Staples on ground wire shall be 2'-0" (610 mm) apart except for a distance of 8'-0" (2438 mm) above ground and 8'-0" (2438 mm) from top of pole where they shall be 6" (152 mm) apart.

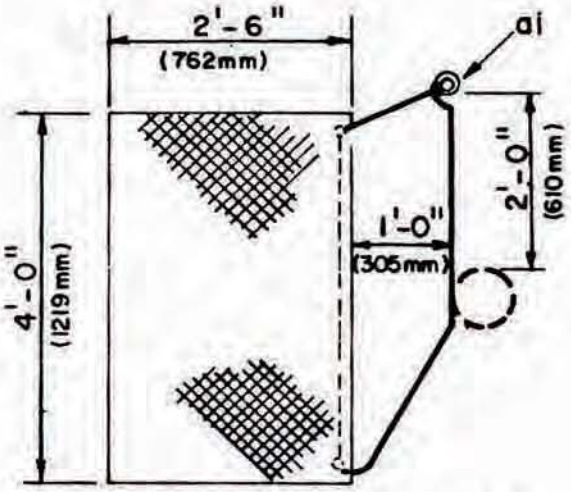
ITEM	MATERIAL	ASSEMBLY UNIT ZM2-12A	ASSEMBLY UNIT ZM2-12A2
p	Connectors	as req'd	as req'd
al	Staples, ground wire	as req'd	as req'd
bp	Nails, galvanized, 1", round head	—	4
cj	Ground wire, soft annealed iron, "C" galvanized, No. 5 BWG		
	or 5/16"- 3 strand	as req'd	as req'd
dh	Grounding plate, butt type, galvanized steel	—	1

POLE PROTECTION ASSEMBLY
WRAP-AROUND TYPE (A): PLATE TYPE (A2)

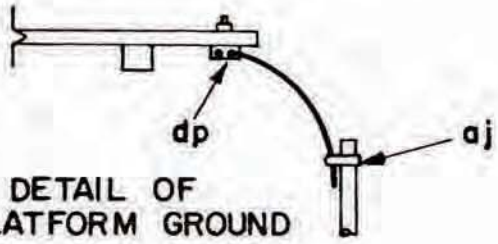
NOV. 1986

ZM2-12A, ZM2-12A2

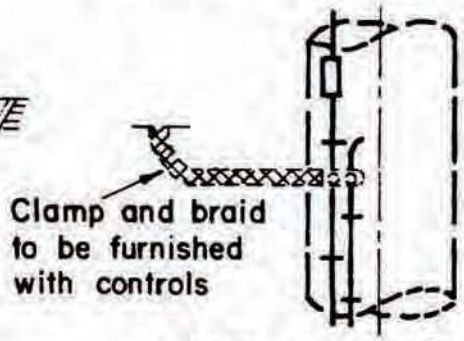




DETAIL OF PLATFORM



DETAIL OF PLATFORM GROUND



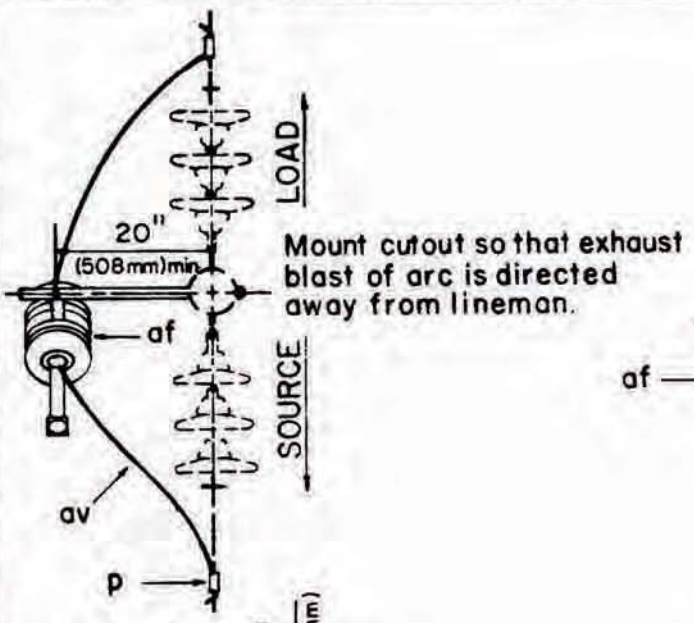
DETAIL OF SECTION "A-A"

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
p		Connectors, as req'd		cj		Ground wire, No. 2 copper or equiv.	
ai	1	Rod, ground, steel, 5/8" dia. x 8'-0"				conductivity, as req'd	
aj	1	Clamp, ground rod		dp	2	Grounding connector and lockwasher	
al		Staples, ground wire, as req'd			1	Grounding iron platform plate	

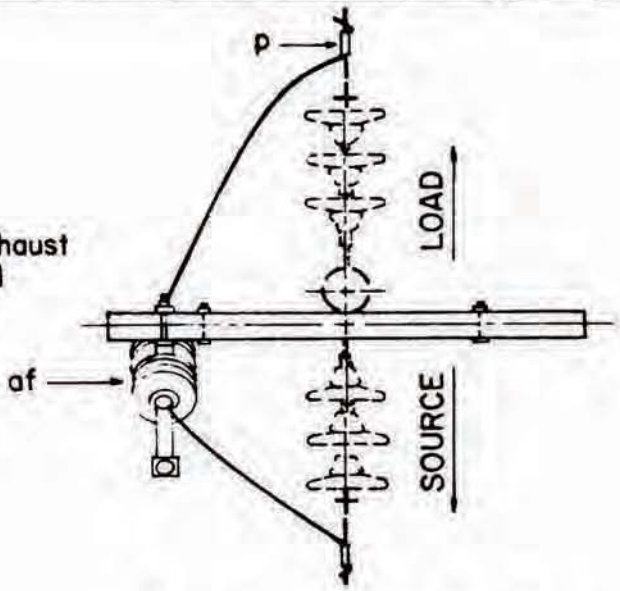
GROUNDING ASSEMBLY – PLATFORM TYPE FOR SECTIONALIZING AIR BREAK SWITCH

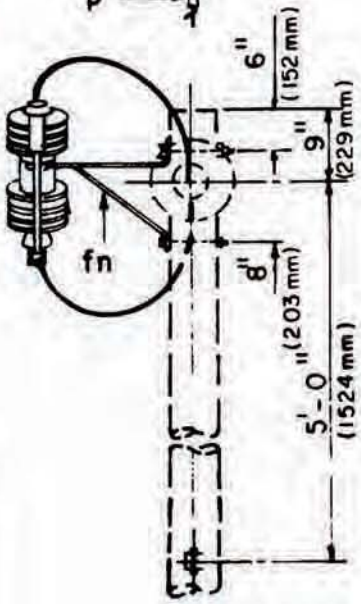
NOV. 1986

M2-15 A

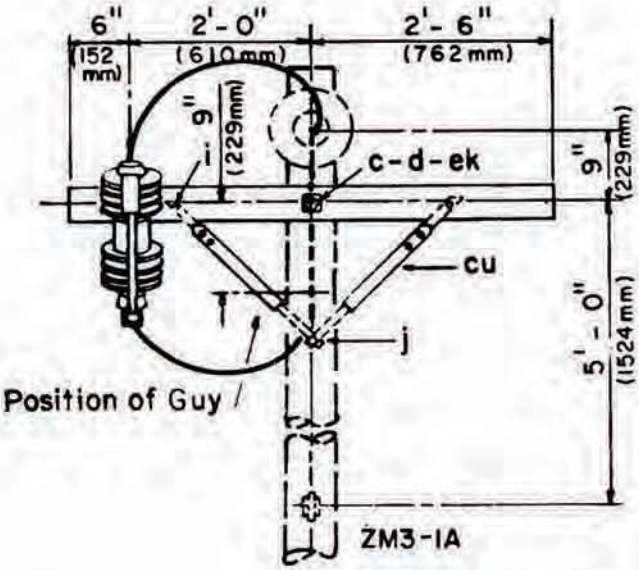


Mount cutout so that exhaust blast of arc is directed away from lineman.





ZM3-4



ZM3-1A

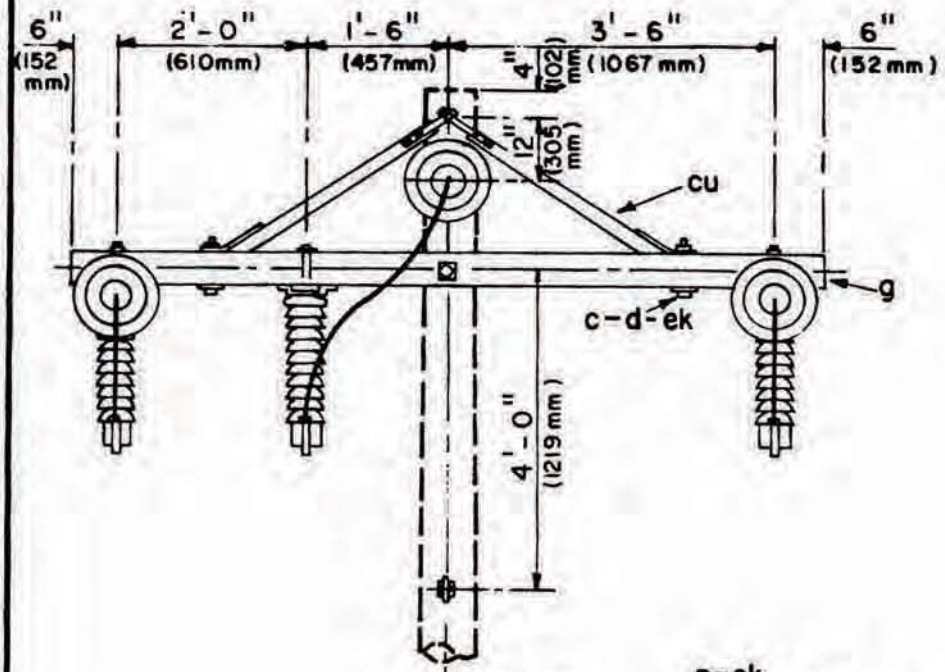
ITEM	MATERIAL	ZM3-4 NO. REQUIRED	ZM3-1A NO. REQUIRED
c	Bolt, machine, 5/8" x required length	2	1
d	Washer, square, 2 1/4"	2	2
g	Crossarm, 3 5/8"x 4 5/8"x 5'-0"		1
i	Bolt, carriage, 3/8"x 4 1/2"		2
j	Screw, lag, 1/2" x 4"		1
p	Connector, compression type	2	2
af	Cutout, fuse, single shot	1	1
av	Leads or jumpers as required		
cu	Brace, wood, 28"		2
ek	Locknuts		
fn	Bracket, extension	1	

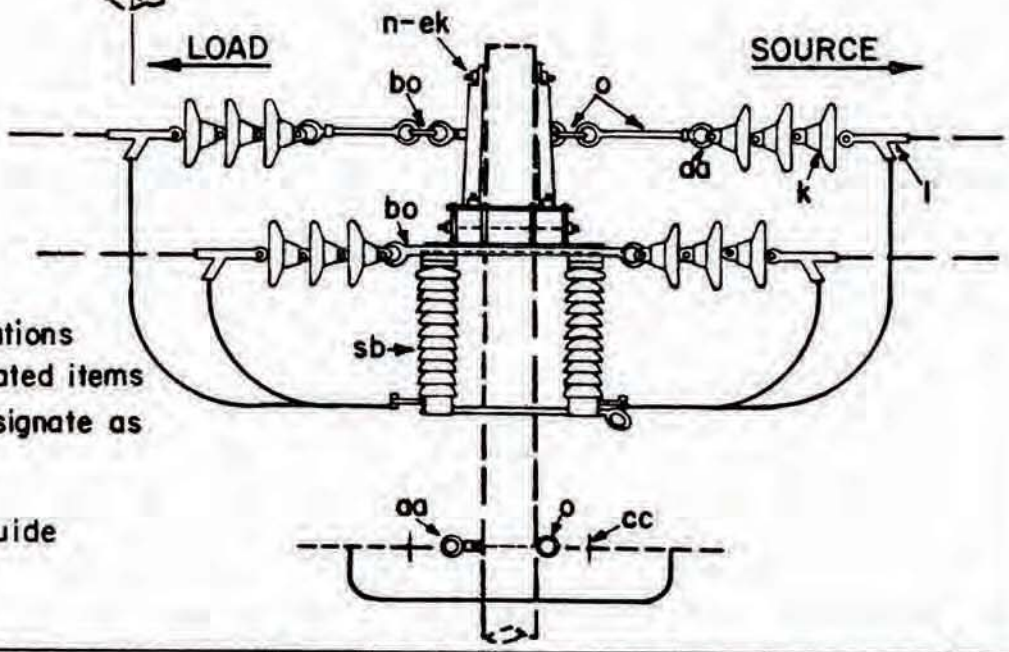
34.5/19.9 kV, 1-PHASE

ONE SECTIONALIZING FUSE CUTOUT

NOV. 1986

ZM3-1A, ZM3-4





NOTES:

For V-phase installations omit switch and related items on center phase. Designate as ZM3-2.

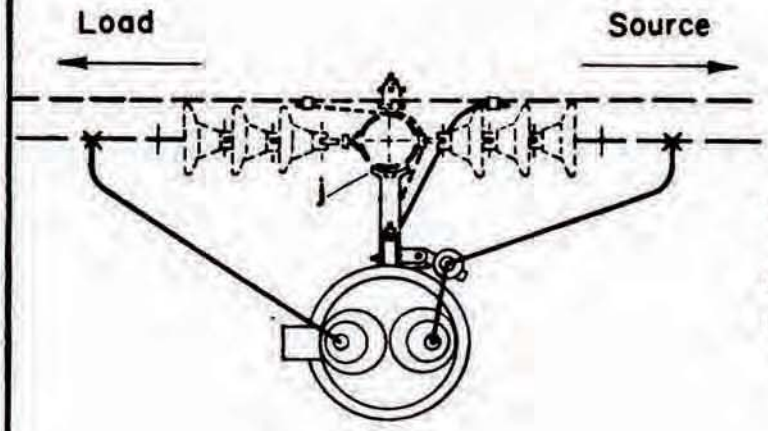
For unit cc see guide drawing M41-1.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	4	Bolt, machine, 1/2" x req'd length		bo	6	Shackle, anchor	
d	4	Washer, round, 1 3/8"		cc	2	Deadend assembly neutral	
d	3	Washer, square, 2 1/4"		cu	2	Brace, crossarm, wood, 60" span	
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"		ek		Locknuts as req'd	
k	18	Insulator, suspension, 10"		sb	3	Switch, disconnect with mounting	
l	6	Clamp, deadend				hardware	
n	2	Bolt, double arming, 5/8" x req'd length					
o	4	Bolt, eye, 5/8" x req'd. length					
aa	4	Nut, eye, 5/8"					

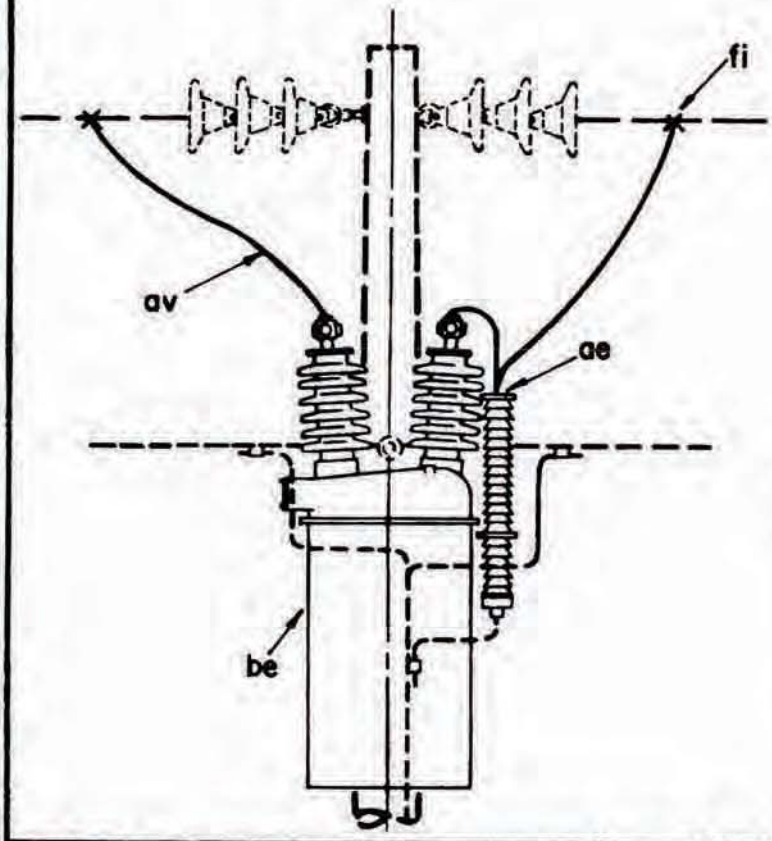
34.5 / 19.9 kV TWO OR THREE SECTIONALIZING DISCONNECT SWITCHES

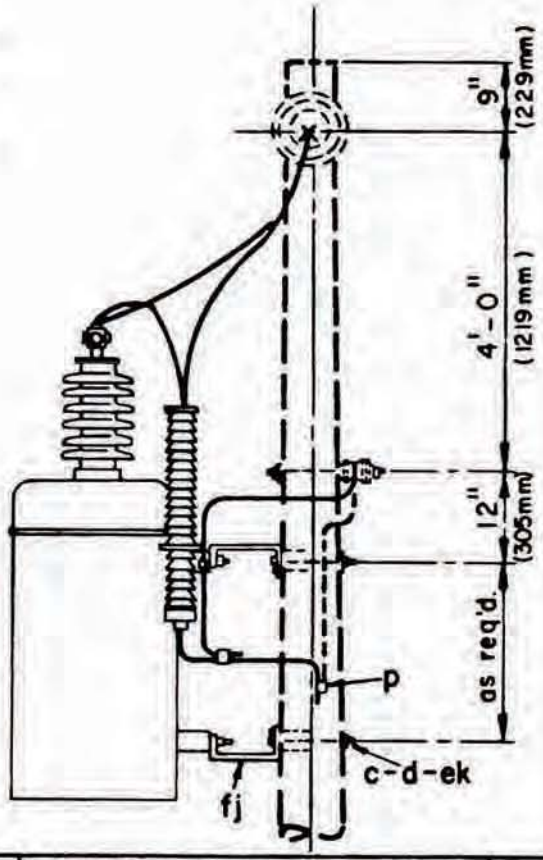
NOV. 1986

ZM3-2, ZM3-3



NOTE:
The recloser terminal bushing connected directly to the coil should be connected to the source.



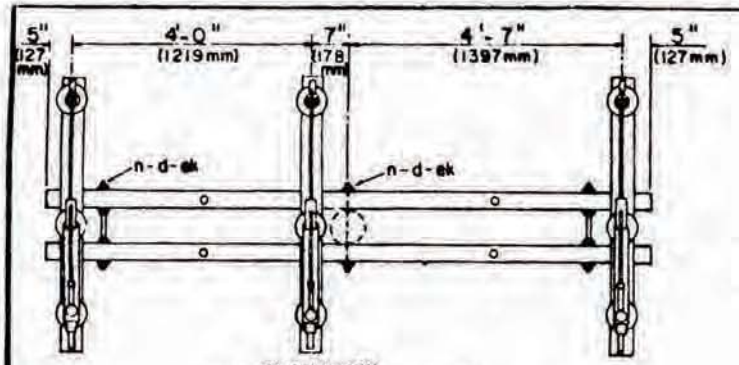


ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 5/8"x req'd length		be	1	Recloser, oil circuit	
d	2	Washer, square, 2 1/4"		ek		Locknuts as req'd	
j	4	Screw, lag, 1/2"x 4"		fi	2	Connector, hot line	
ae	1	Arrestor, surge		fj	2	Bracket, extension	
av		Jumpers, strand		p		Connectors as req'd	

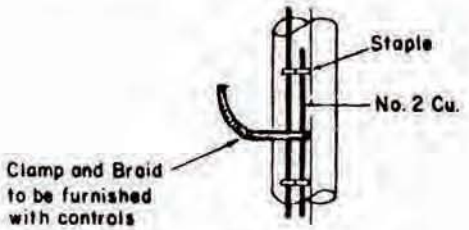
34.5/19.9 kV
ONE SECTIONALIZING OIL CIRCUIT RECLOSER

NOV. 1986

ZM3-10A

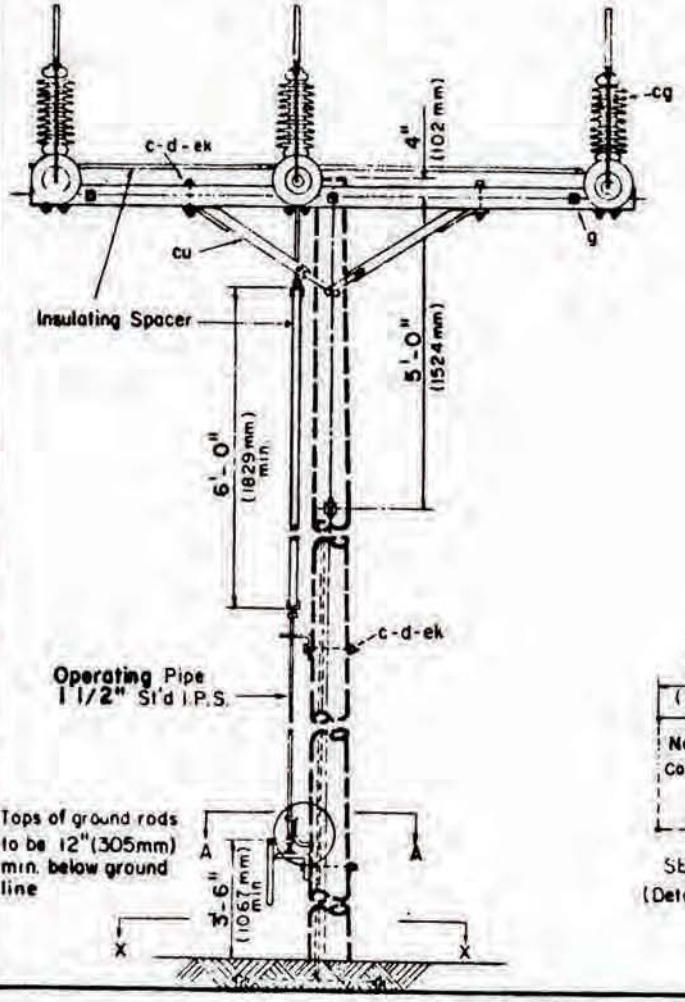


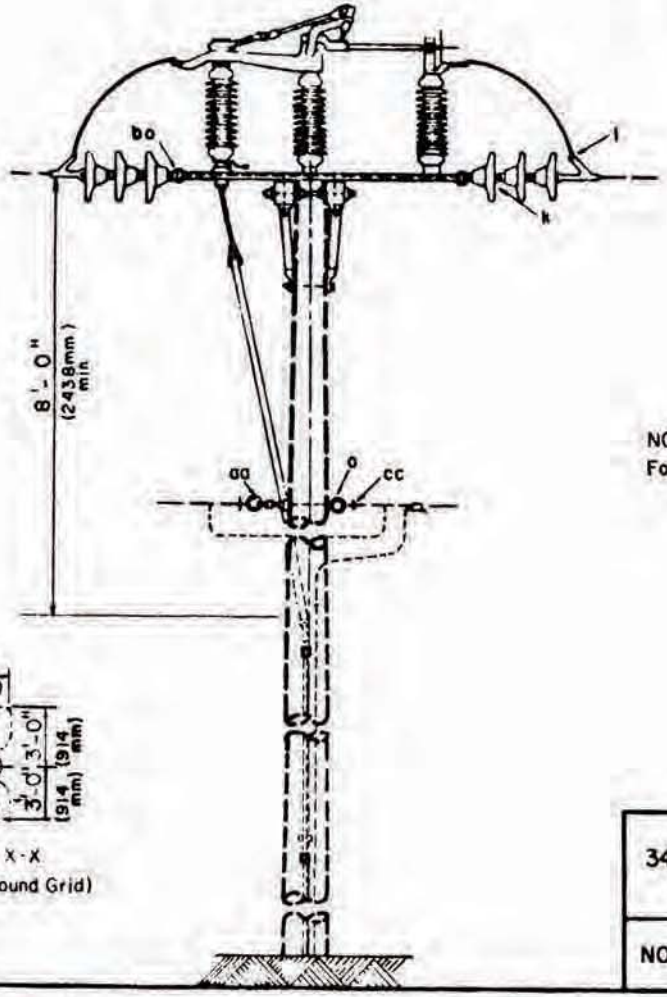
PLAN VIEW
OF SWITCH ARRANGEMENT

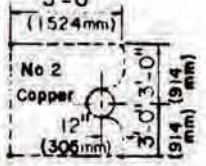


DETAIL OF A-A

ITEM	NO	MATERIAL
c	14	Bolt, machine, 5/8" x req'd length
c	4	Bolt, machine, 1/2" x req'd length
d	25	Washer, 2 1/4" square
d	4	Washer, round 1 3/8" dia
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'-0"
k	12	Insulator, suspension, 10"
l	6	Clamp, deadend
n	4	Bolt, double arming, 5/8" x req'd. length
bo	6	Shackle, anchor
cg	1	Switch, airbreak, 3 pole unit 35kv with operating mechanism
cu	2	Brace, wood, 60" span
cc	2	Deadend assembly, neutral
o	1	Bolt, eye, 5/8"
oo	1	Nut, eye, 5/8"
ek		Locknuts, as required





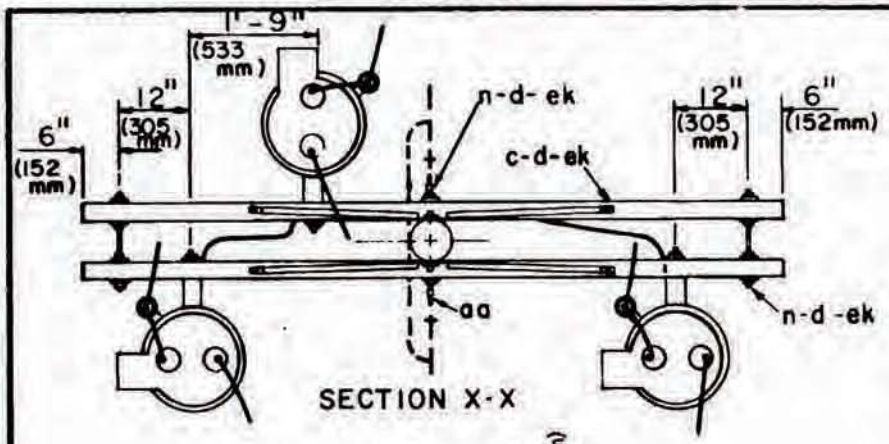


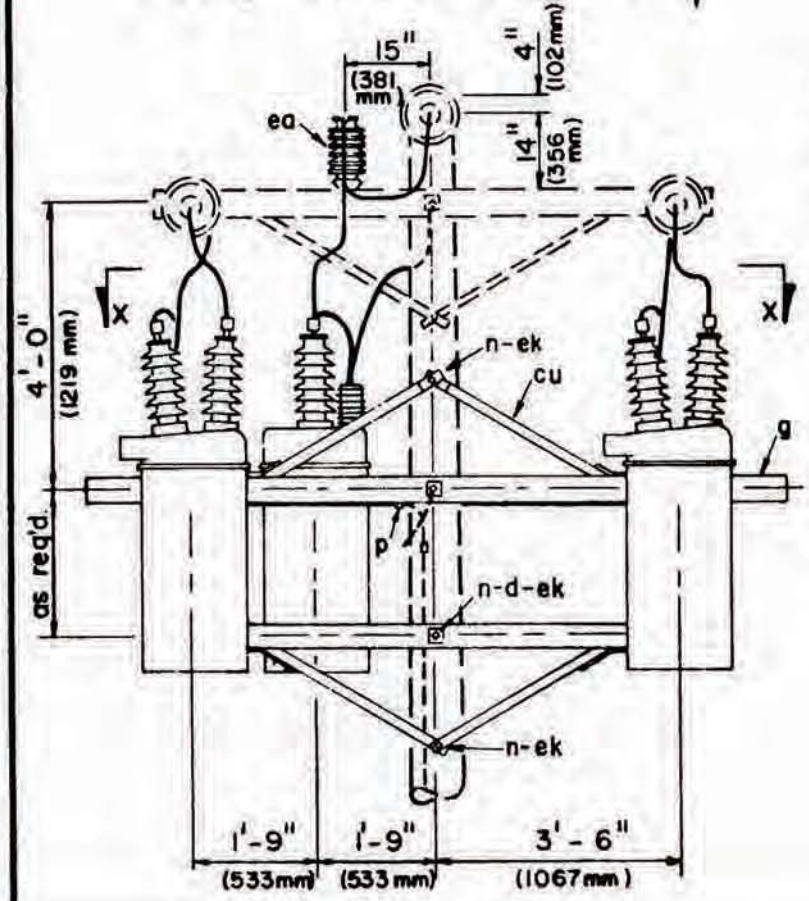
SECTION X-X
(Detail of Ground Grid)

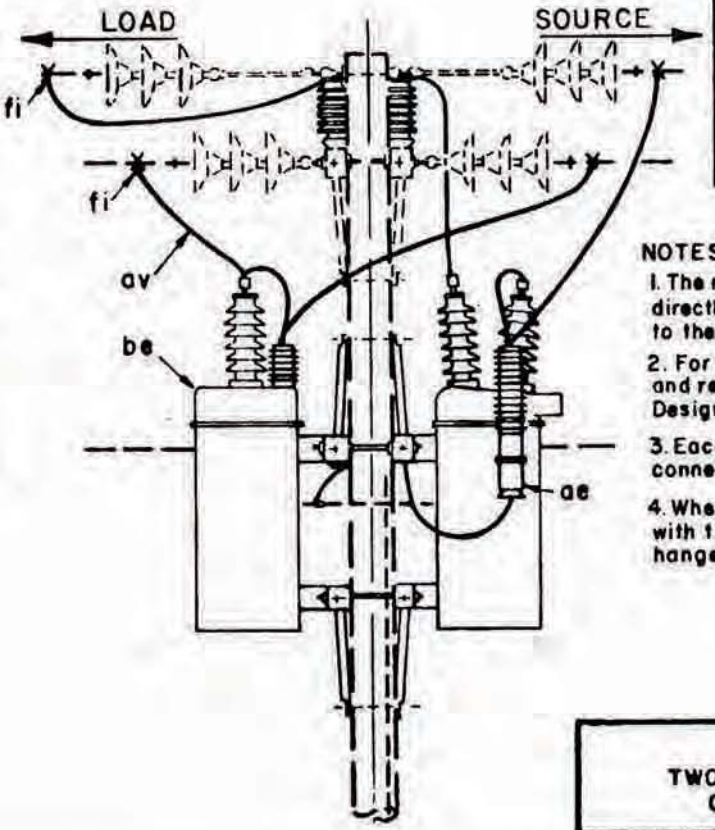
NOTE.
For grounding assembly, see drawing ZM2-15

34.5/19.9 kV PRIMARY, 3-PHASE 4-WIRE STAR SECTIONALIZING AIR BREAK-SWITCH

NOV. 1986		ZM3-16







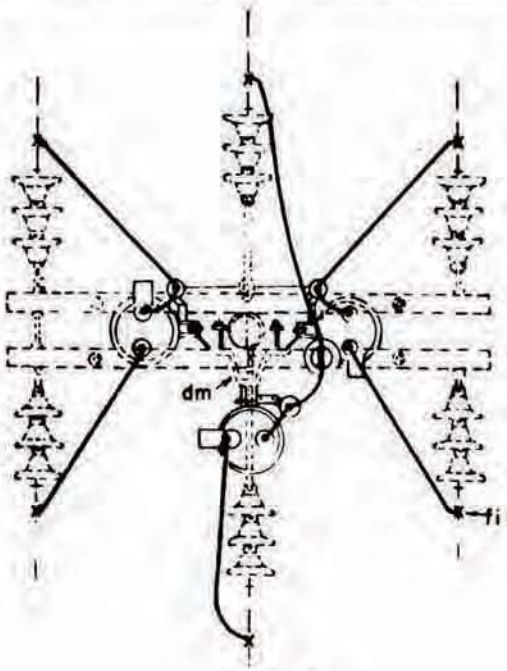
ITEM	NO REQ	MATERIAL
c	3	Bolt, machine, 5/8" x req'd length
c	8	Bolt, machine, 1/2" x req'd length
d	23	Washer square, 2 1/4"
d	8	Washer 1 3/8" dia.
g	2	Crossarm 3 5/8" x 4 5/8" x 10'-0"
g	2	Crossarm 3 5/8" x 4 5/8" x 8'-0"
n	8	Bolt, double arming, 5/8" x req'd lgth
p		Connectors as req'd
aa	1	Nut, eye 5/8"
ae	3	Surge arrester
av		Jumpers, stranded as req'd
be	3	Recloser, oil circuit
cu	4	Brace wood 60" span
ea	2	Insulator, post type
fi	6	Connector, hot line, tap assembly
ek		Lockouts, as required

NOTES:

1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. For V-Phase installations omit recloser and related items on center phase. Designate as assembly ZM3-19.
3. Each recloser tank shall have two connections to ground
4. Where suitable hanger is not furnished with the recloser a standard transformer hanger may be used as indicated.

34.5/19.9 kV
TWO OR THREE SECTIONALIZING
OIL CIRCUIT RECLOSER

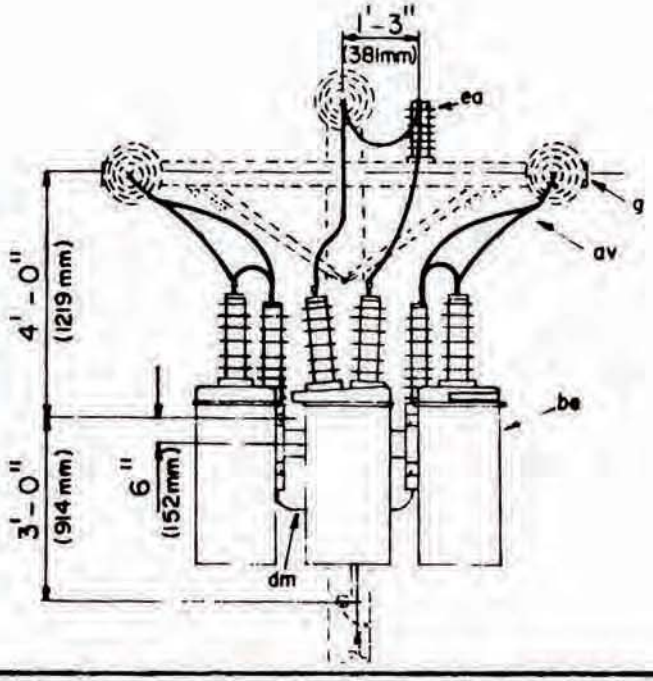
NOV. 1986		ZM3-19, ZM3-20

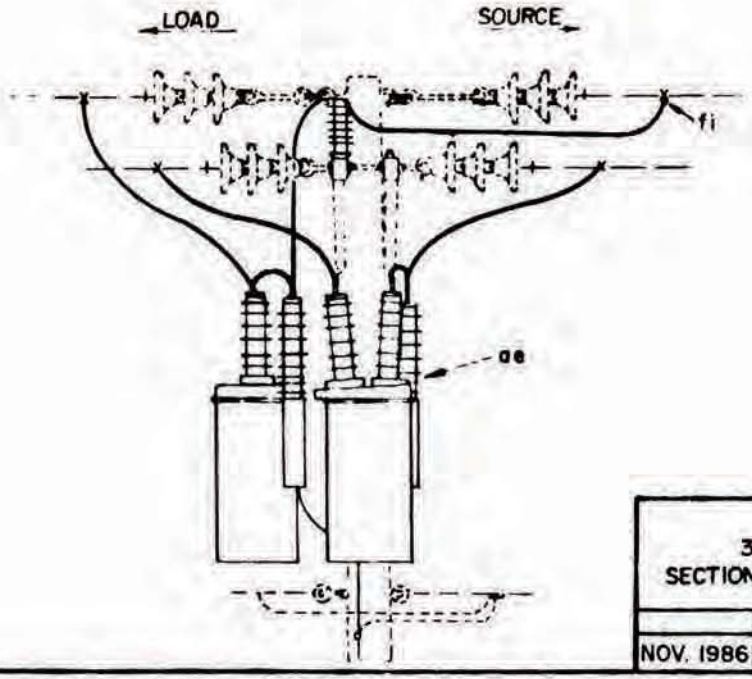


NOTES:

1. The recloser terminal bushing marked source should be connected to the source.
2. For V-phase installations omit recloser and related items on center phase. Designate as assembly ZM3-19A.
3. Each recloser tank shall have two connections to ground.

ITEM	NO	MATERIAL
ea	1	Insulator, post type
be	3	Recloser, oil circuit
p		Connectors as req'd
ae	3	Surge, arrester
fi	6	Connector, hot line
av		Jumpers, stranded, as req'd
dm	1	Bracket, cluster type, with 14" adapter plate

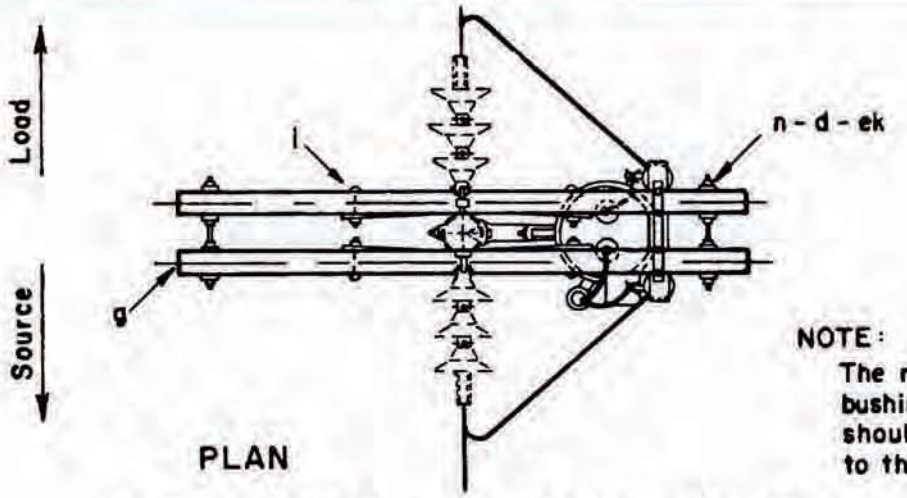




34 5/19.9 kV. TWO OR THREE SECTIONALIZING OIL CIRCUIT RECLOSERS

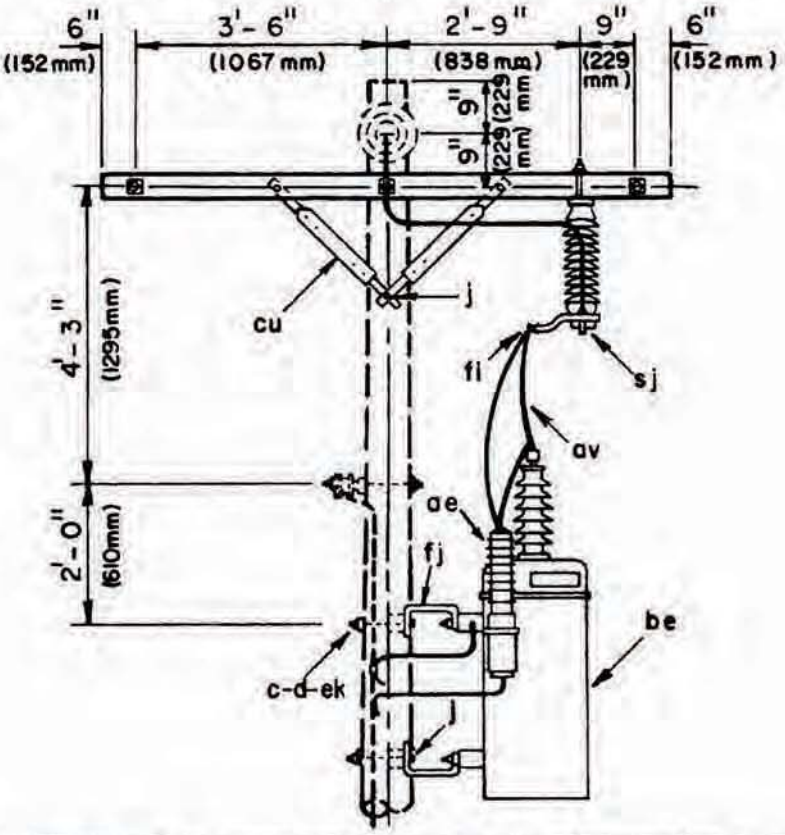
NOV. 1986

ZM3-19A, ZM3-20A



PLAN

NOTE:
The recloser terminal bushing marked source should be connected to the source.

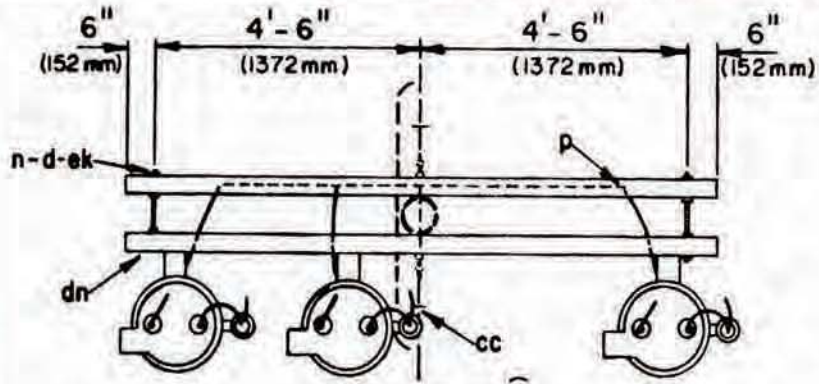


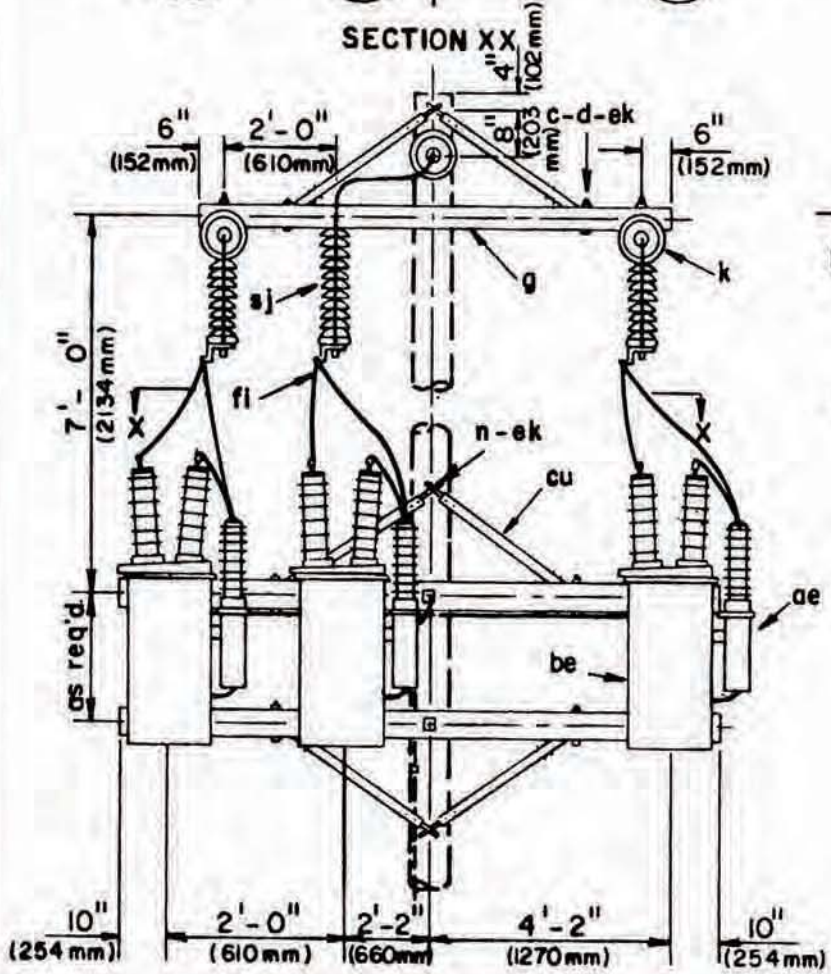
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c	2	Bolt, machine, 5/8" x req'd. length		ae	1	Lightning arrester	
d	12	Washer, square, 2 1/4"		av		Jumpers, stranded, as required	
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"		be	1	Recloser, oil circuit	
i	4	Bolt, carriage, 3/8" x 4 1/2"		cu	4	Brace, wood, 28"	
j	6	Screw, lag, 1/2" x 4"		ek		Locknuts	
n	3	Bolt, double arming 5/8" x req'd. length		fi	2	Connector, hot line	
p		Connectors, as required		sj	1	Switch, recloser, by-pass	
fj	2	Bracket, extension					

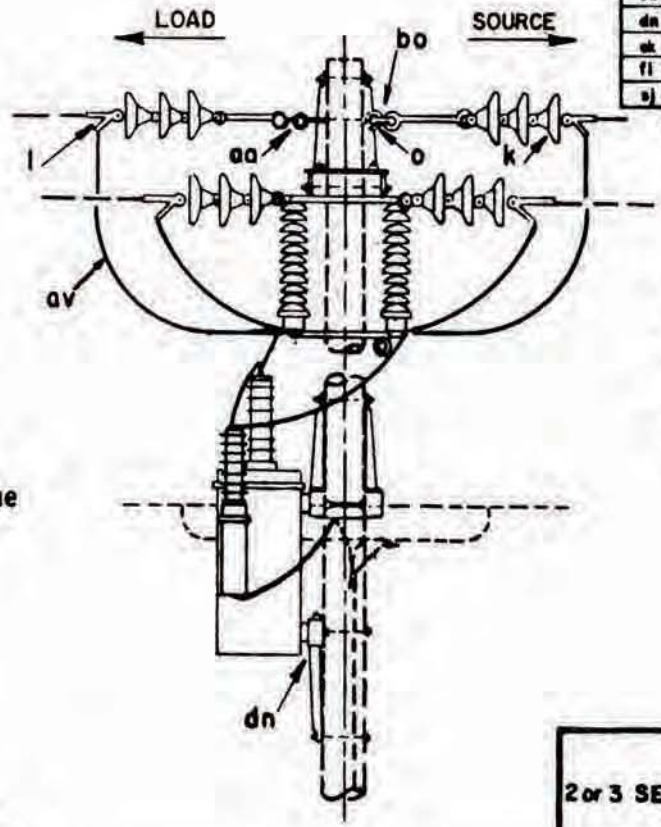
34.5 / 19.9 kV
ONE SECTIONALIZING OIL CIRCUIT RECLOSER WITH BY-PASS SWITCH

NOV. 1986

ZM3-23







ITEM	NO.	MATERAL
c	10	Bolt, machine, 1/2" x req'd length
c	14	Bolt, machine, 5/8" x req'd length
d	10	Washer, round, 1 3/8" dia.
d	14	Washer, square 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
g	3	Crossarm, 3 5/8" x 4 5/8" x 10'-0"
k	18	Insulator suspension 10"
l	6	Clamp, deadend
n	6	Bolt, double armieg, 5/8" x req'd length
o	3	Bolt, eye, 5/8"
p		Connectors as required
aa	5	Nut, eye, 5/8"
ae	3	Surge arrester
av		Jumpers, stranded as required
be	3	Recloser, oil circuit
bo	6	Shackle anchor
cc	2	Deadend assembly, neutral
cu	5	Brace, crossarm, wood, 60" span
dn	3	Hanger, T-crossarm, as required *
ek		Locknuts, as required
fl	6	Connector, hot line
sj	3	Switch recloser by-pass

* Specify this item to be furnished by the recloser manufacturer.

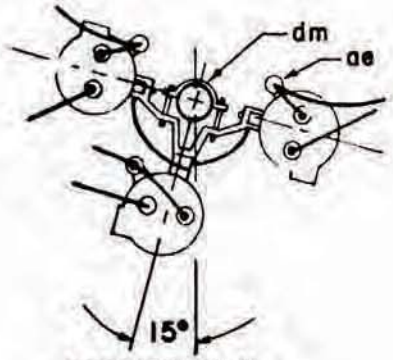
NOTES:

1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. For V-Phase installations omit recloser and related items on center phase. Designate as ZM3-24.
3. Each recloser tank shall have two connections to ground.
4. Where suitable hanger is not furnished with the recloser a standard transformer hanger may be used as indicated.

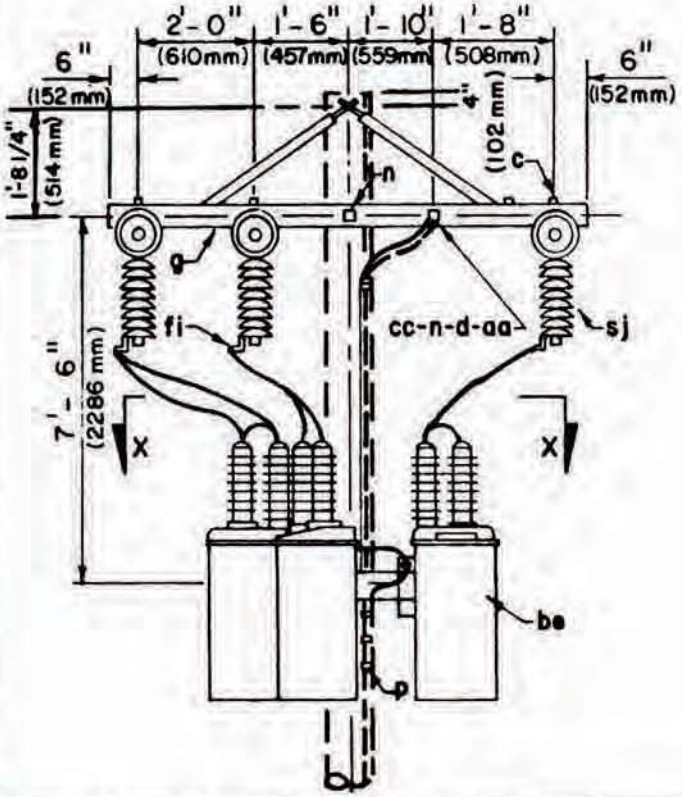
34.5/19.9 kV
2 or 3 SECTIONALIZING OIL CIRCUIT RECLOSERS WITH BY-PASS SWITCHES

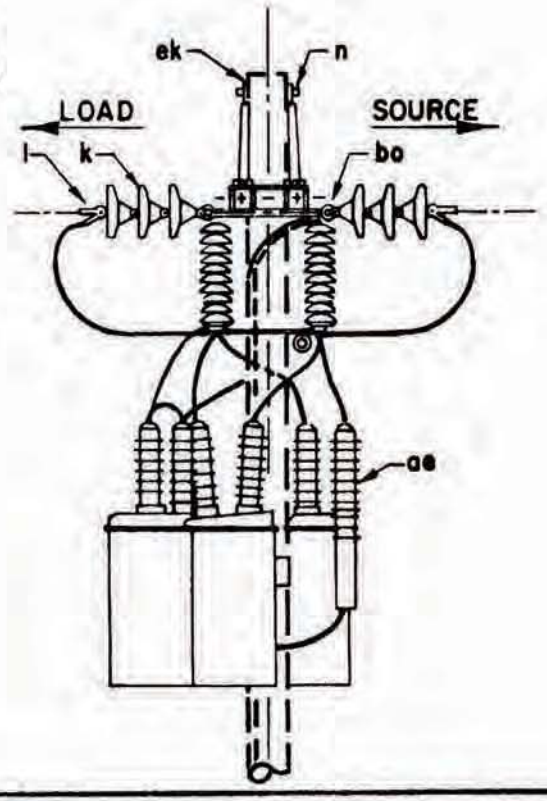
NOV. 1986

ZM3-24, ZM3-25



SECTION X-X





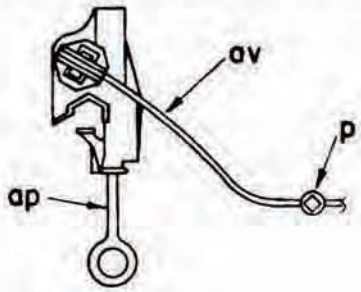
ITEM	NO.	MATERIAL
c	12	Bolt, machine, 5/8" x req'd length
c	4	Bolt, machine, 1/2" x req'd length
d	6	Washer, square, 2 1/4"
d	4	Washer, round, 1 3/8" dia.
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
k	18	Insulator, suspension, 10"
l	6	Clamp, deadend
n	3	Bolt, double arming, 5/8" x req'd length
p		Connectors, as req'd
aa	2	Nut, eye, 5/8"
ae	3	Lightning arrester
av		Jumpers, stranded, as req'd
be	3	Recloser, oil circuit
bo	6	Shackle, anchor
cc	2	Deadend assembly
cu	2	Brace, crossarm, wood, 60" span
dm	1	Bracket, cluster type, with adapter plate as req'd
ek		Locknuts, as req'd
fl	6	Connector, hot line, top assembly
sj	3	Switch, recloser by-pass

NOTES

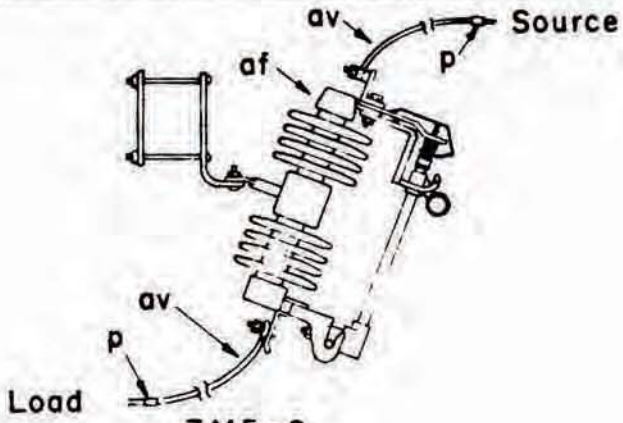
1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. For V-Phase installations omit recloser and related items on center phase. Designate as ZM3-24A.
3. Each recloser tank shall have two connections to ground.
4. Where suitable hanger is not furnished with the recloser a standard transformer hanger may be used as indicated.

34.5 / 19.9 kV
2 or 3 SECTIONALIZING OIL CIRCUIT RECLOSERS WITH BY-PASS SWITCHES

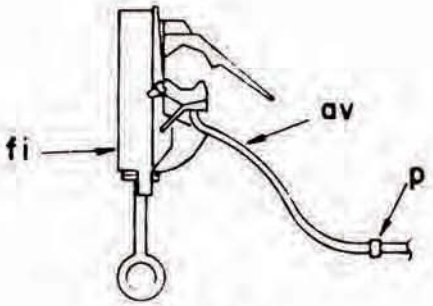
NOV. 1986		ZM3-24A, ZM3-25A



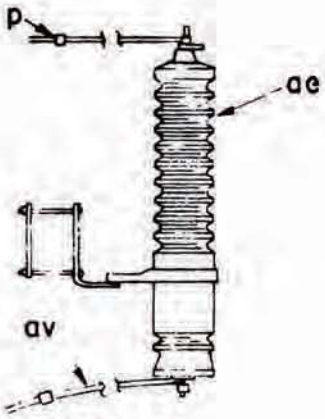
ZM5-1



ZM5-9



ZM5-22



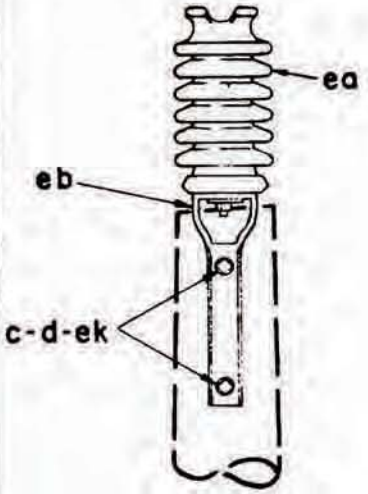
ZM5-6

ITEM	MATERIAL	ZM5-1	ZM5-6	ZM5-9	ZM5-22
p	Connector	1	2	2	1
ae	Surge arrester		1		
af	Cutout, single-shot			1	
ap	Clamp, hot line	1			
av	Jumper	1	2	2	1
fi	Connector, hot line				1

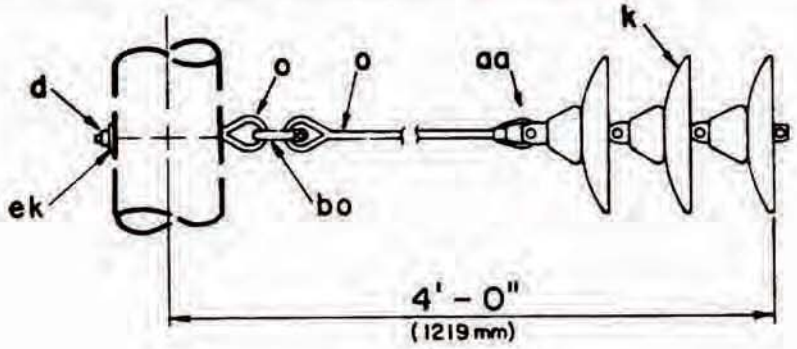
MISCELLANEOUS PRIMARY ASSEMBLY

NOV. 1986

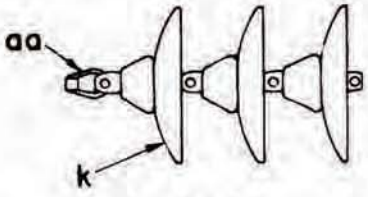
ZM5-1, ZM5-6, ZM5-9, ZM5-22



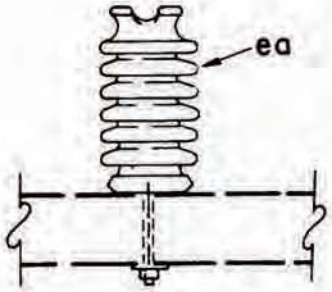
ZM5-18



ZM5-8



ZM5-20



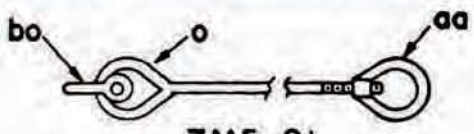
ZM5-7

ITEM	MATERIAL	ZM5-7	ZM5-8	ZM5-18	ZM5-20
c	Bolt, machine 5/8" x req'd length			2	
d	Washer, square 2 1/4"		1	2	
k	Insulator, suspension 10"		3		3
o	Bolt, eye 5/8" x req'd length		2		
aa	Nut, eye 5/8"		1		1
bo	Shackle anchor		1		
ea	Insulator, post type	1		1	
eb	Bracket, pole top			1	
ek	Locknuts, as required				

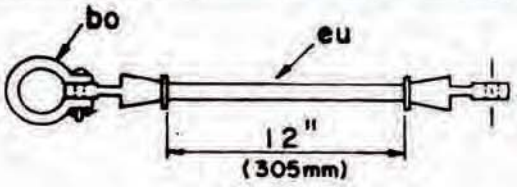
34.5/19.9 kV
MISCELLANEOUS PRIMARY ASSEMBLIES

NOV. 1986

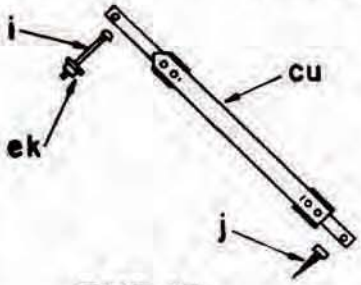
ZM5-7,8,18,20



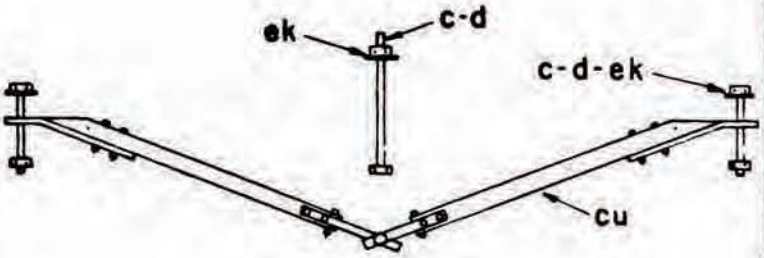
ZM5-21



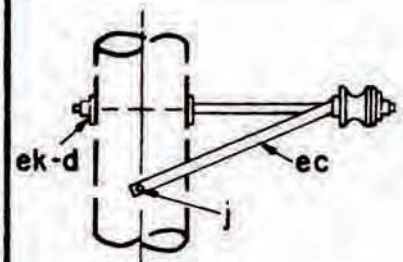
ZM5-23



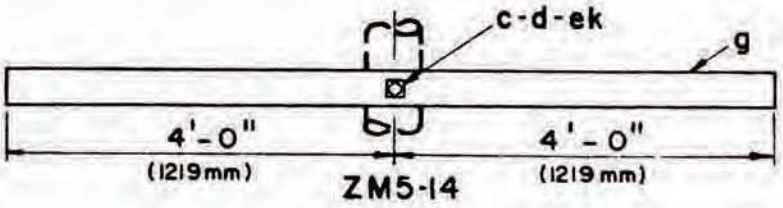
ZM5-17



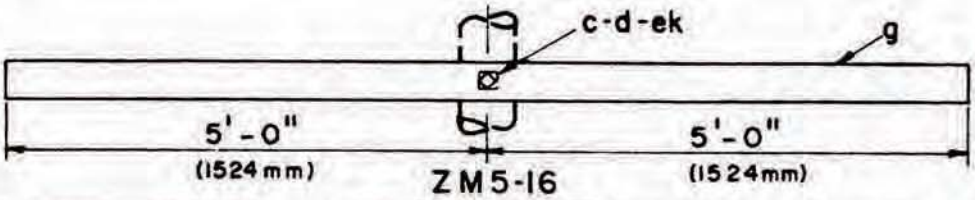
ZM5-13



ZM5-19



ZM5-14



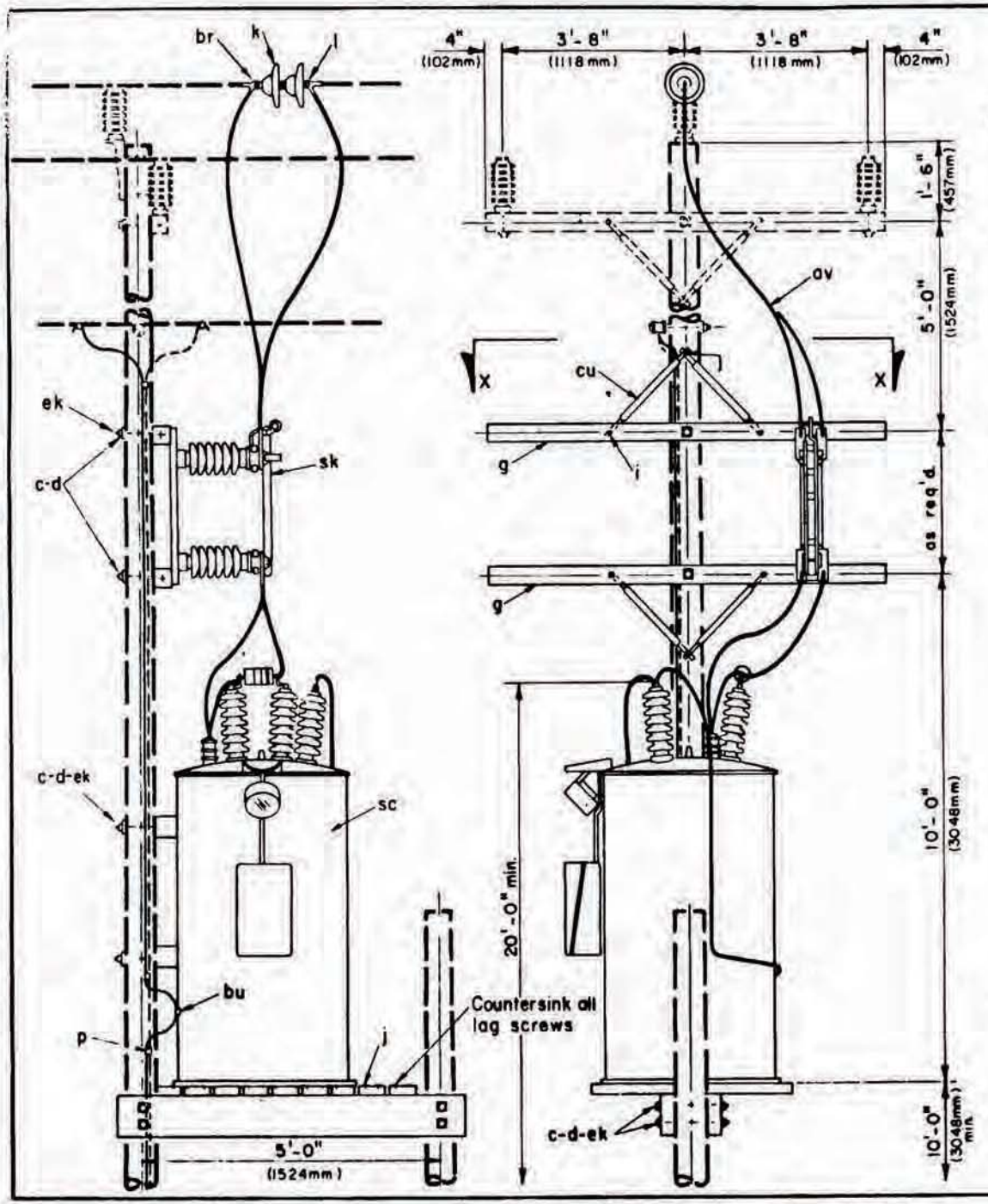
ZM5-16

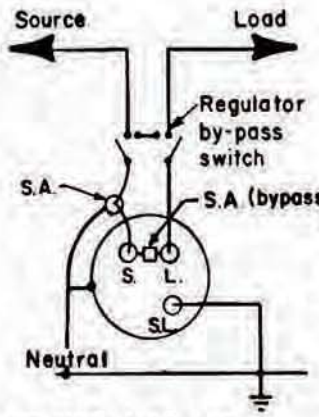
ITEM	MATERIAL	ZM5-13	ZM5-14	ZM5-16	ZM5-17	ZM5-19	ZM5-21	ZM5-23
c	Bolt, machine, 5/8" x req'd length	1	1	1				
c	Bolt, machine, 1/2" x req'd length	2						
d	Washer, square 2 1/4"	1	2	2		1		
d	Washer, round 1 3/8" dia.	2						
g	Crossarm 3 5/8" x 4 5/8" x 8'-0"		1					
g	Crossarm 3 5/8" x 4 5/8" x 10'-0"			1				
i	Bolt, carriage 3/8" x 4 1/2"				1			
j	Screw, lag 1/2" x 4"				1	2		
o	Bolt, eye 5/8" x req'd length						1	
aa	Nut, eye 5/8"						1	
bo	Shackle anchor						1	1
cu	Brace wood	1			1			
ec	Bracket, offset, neutral, insulated					1		
ek	Locknuts	3	1	1	1	1		
eu	Link, extension, insulated							1

MISCELLANEOUS PRIMARY ASSEMBLIES

NOV. 1986

ZM5-13,14,16,17,19,21,23

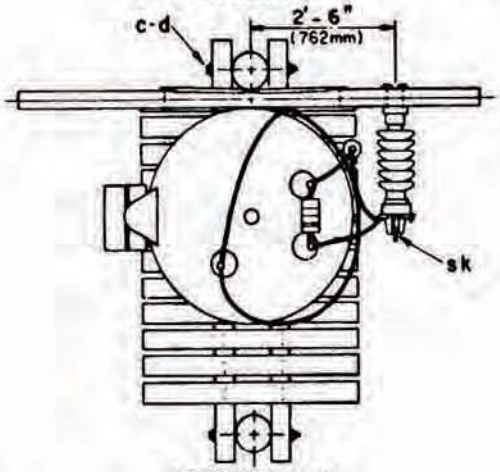




WIRING DIAGRAM

ITEM	NO.	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	4	Bolt, machine, 5/8" x req'd length
c	4	Bolt, machine, 3/4" x req'd length
d	4	Washer, round, 1 3/8"
d	16	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8 x 4 5/8 x 8'-0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw lag 1/2" x 4"
j		Screw lag 1/2" x 5" as req'd
l	2	Clamp, deadend
p		Connectors, as req'd
ae	1	Surge arrester
* ae	1	By-pass arrester
av		Jumpers, stranded, as req'd
br	1	Chain link, 5/8" x 3/4"
* bu	1	Connector, solderless
cu	4	Brace, wood, 28"
sc	1	Regulator, step type
sk	1	Regulator, by-pass switch
k	2	Insulator, suspension, 10"
	2	Structural timber, 4" x 10" x 6'-0"
		Planks, 2" or 3" thick, length as req'd.
ek		Locknuts, as req'd

* Specify this item to be furnished by the manufacturer

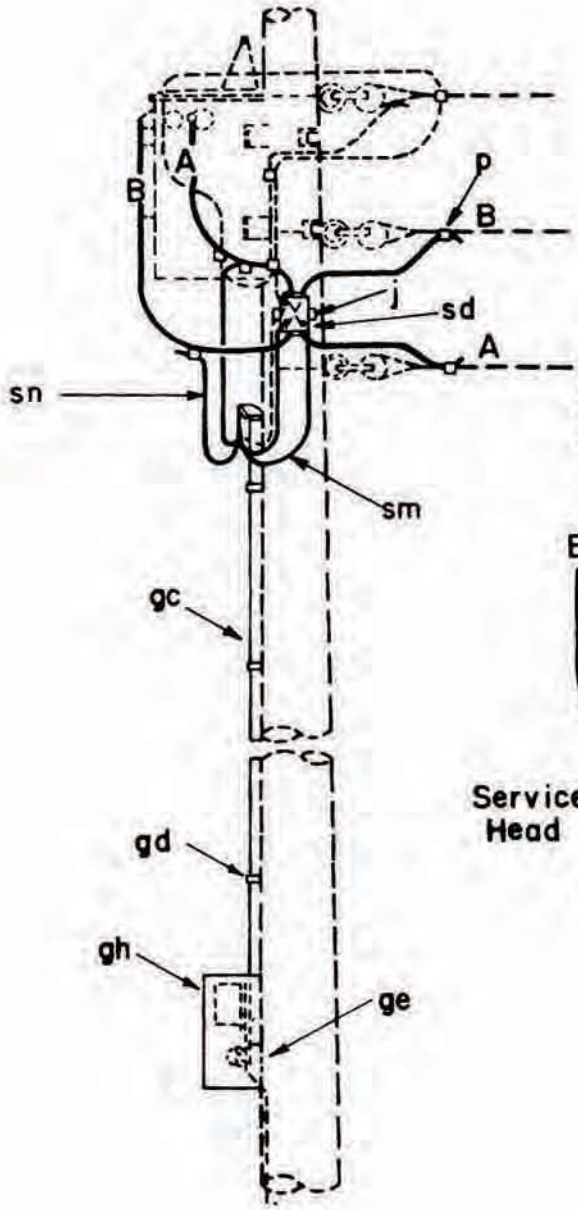


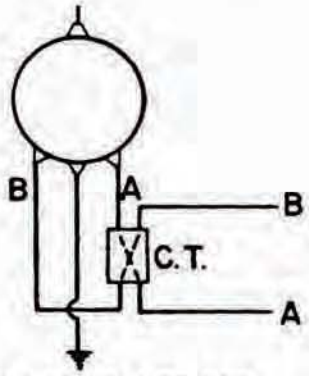
SECTION X-X

NOTE: All structural timber and planks to be treated per REA specification

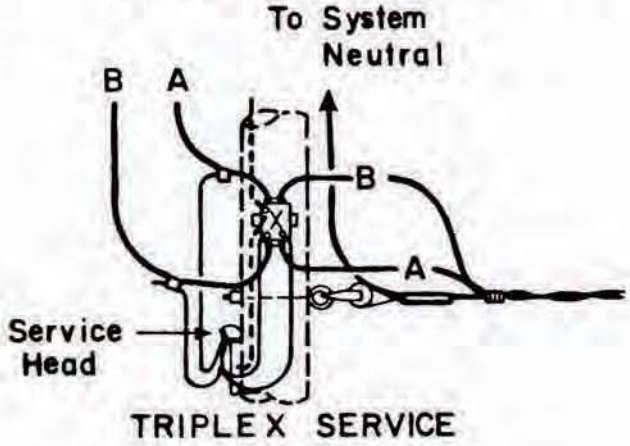
34.5/19.9 kV
SINGLE PHASE STEP VOLTAGE REGULATOR
PLATFORM MOUNTED

NOV. 1986 | | ZM7-1





NOTE: WIRING DIAGRAM
For more detailed wiring diagram, see REA Bulletin 161-12



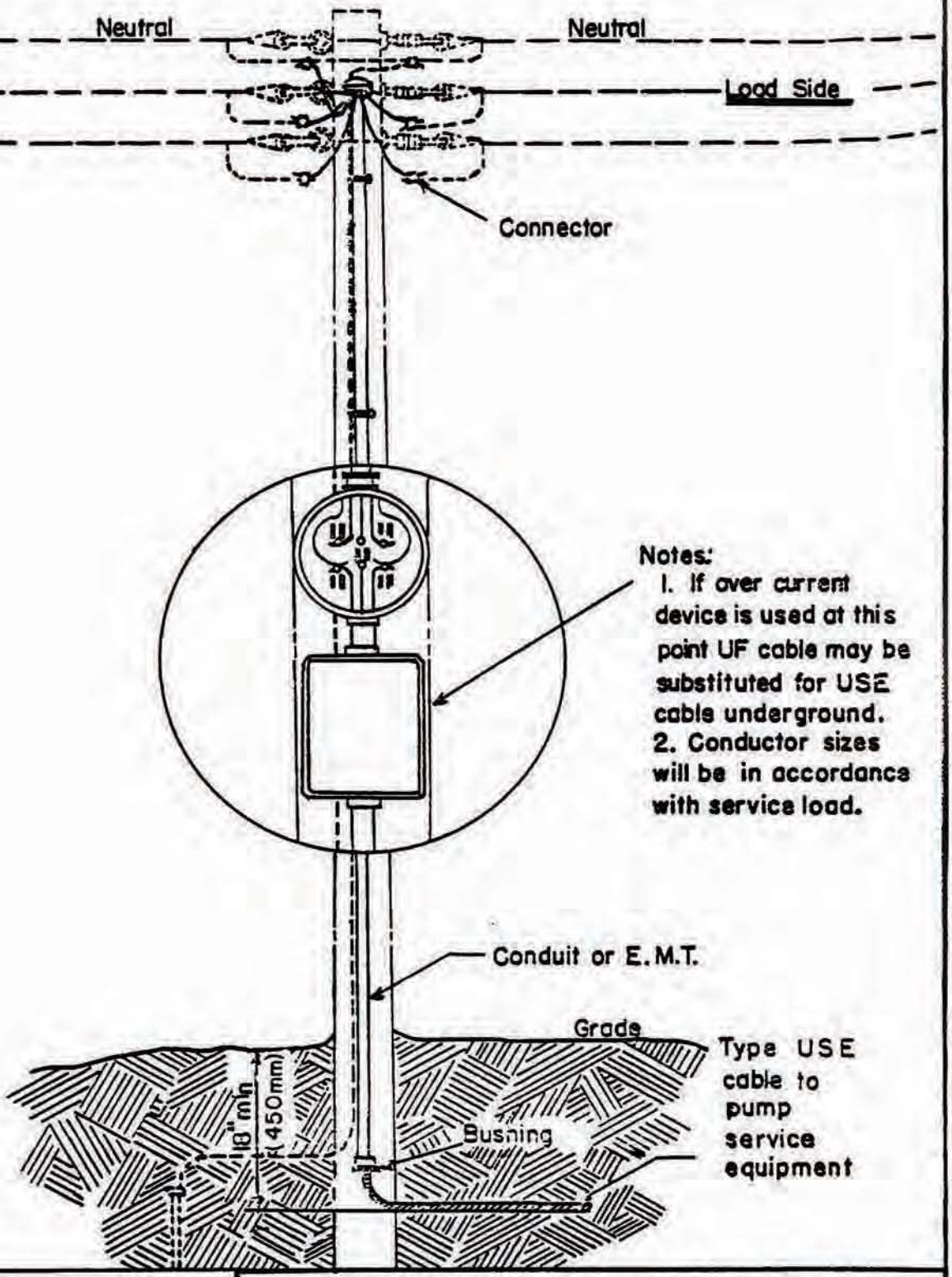
TRIPLEX SERVICE

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
j	2	Screw, lag, 1/2" x 4"		gh	1	Meter box, meter and test block	
p		Connectors, as req'd		sd	1	Transformer, current	
gc		Conduit, 1 1/4", as req'd		sm		Wire, No. 12, insulated for current	
gd		Straps, conduit, as req'd		sn		Wire, No. 14, insulated for potential	
ge	1	Condulet, type "LB"			1	Service head	

SECONDARY METERING GUIDE
SINGLE PHASE 120/240 VOLTS

NOV. 1986

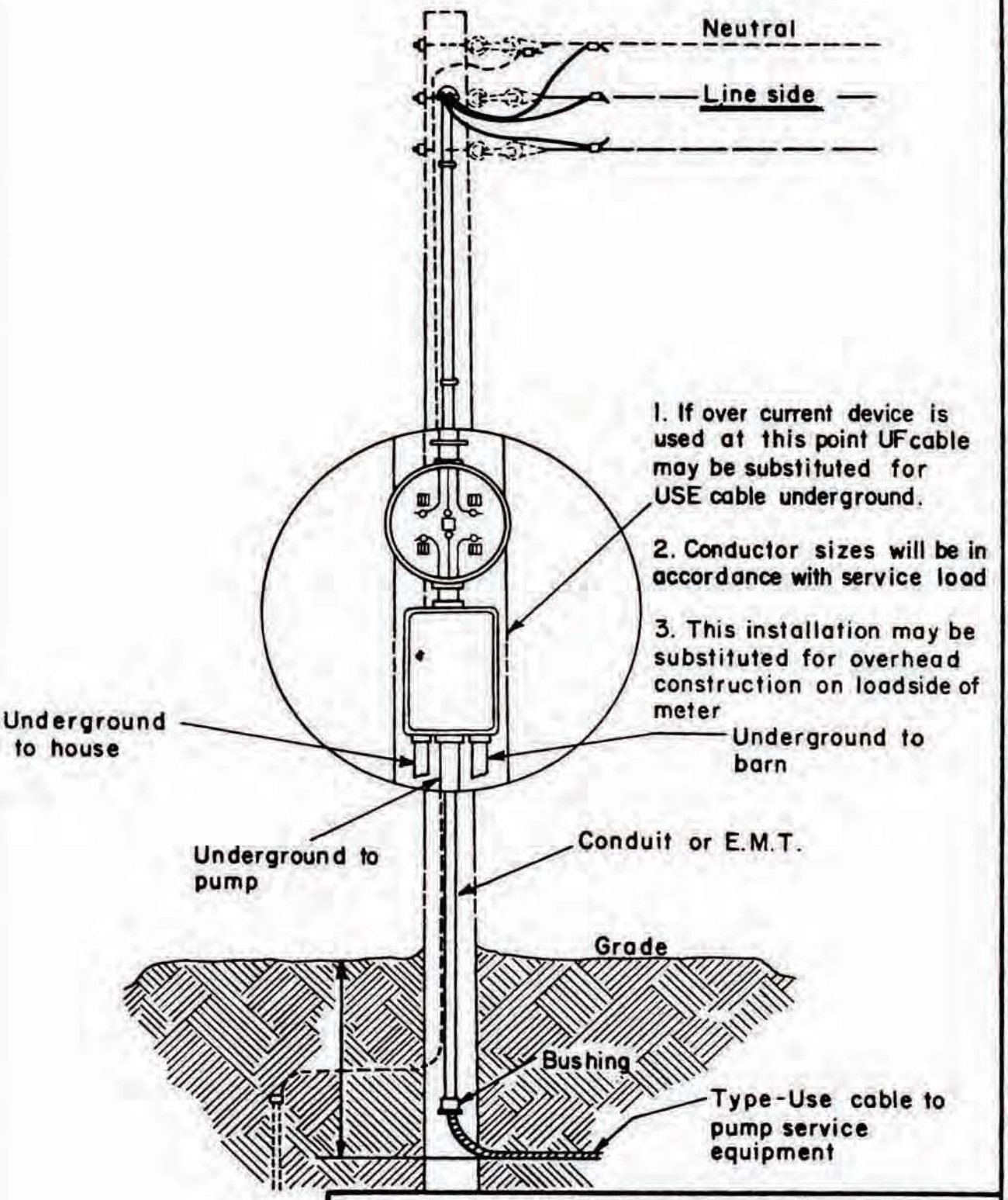
M8



GUIDE TO YARD POLE METER INSTALLATION (SHOWING PUMP SERVICE CARRIED UNDERGROUND)

NOV. 1986

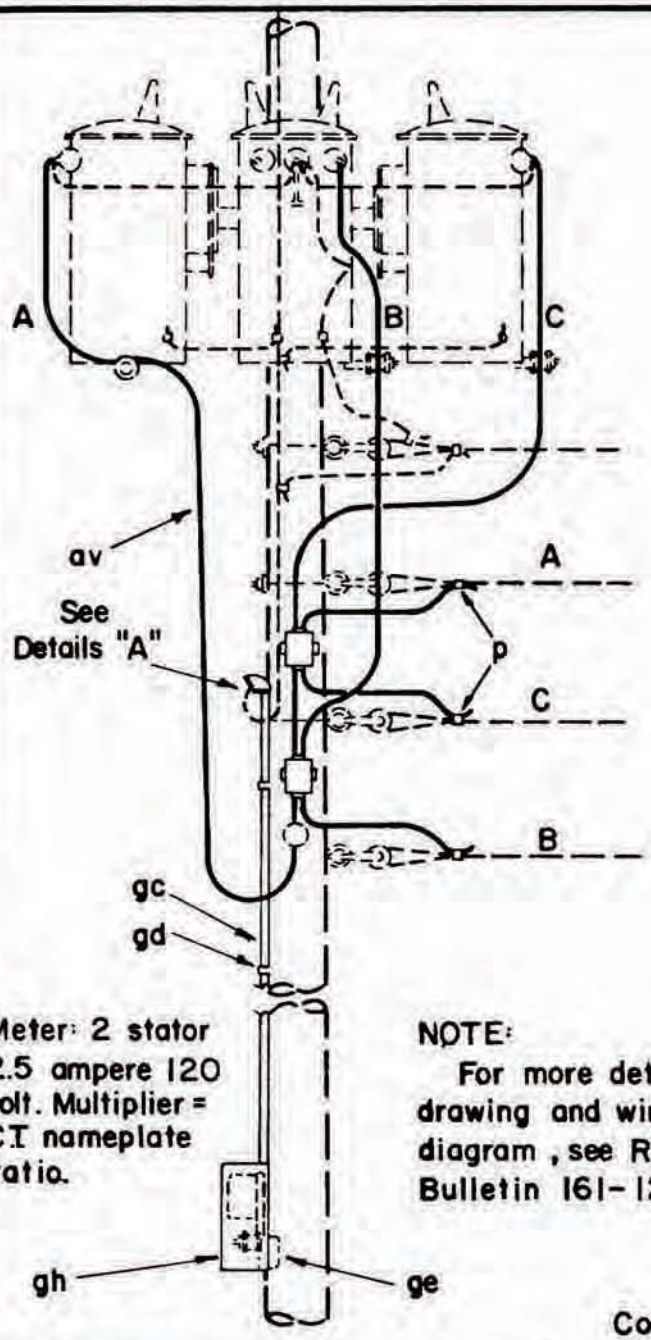
M8-9



GUIDE TO YARD POLE METER INSTALLATION
(SHOWING ALL BUILDING SERVICES CARRIED UNDERGROUND)

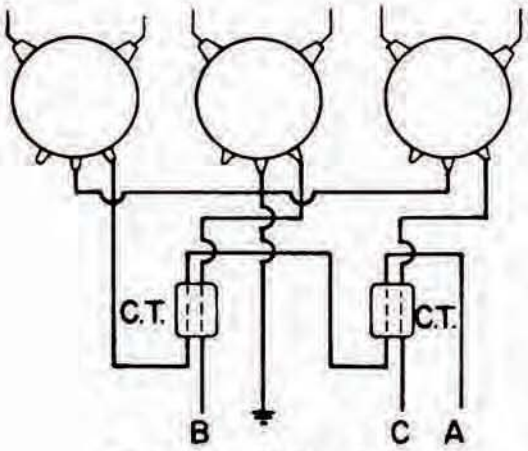
NOV. 1986

M8-10

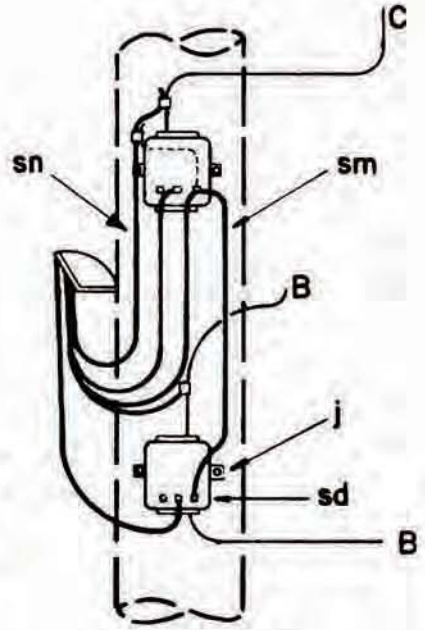


Meter: 2 stator 2.5 ampere 120 volt. Multiplier = C.T. nameplate ratio.

NOTE:
For more detailed drawing and wiring diagram, see REA Bulletin 161-12.



WIRING DIAGRAM



DETAIL "A"

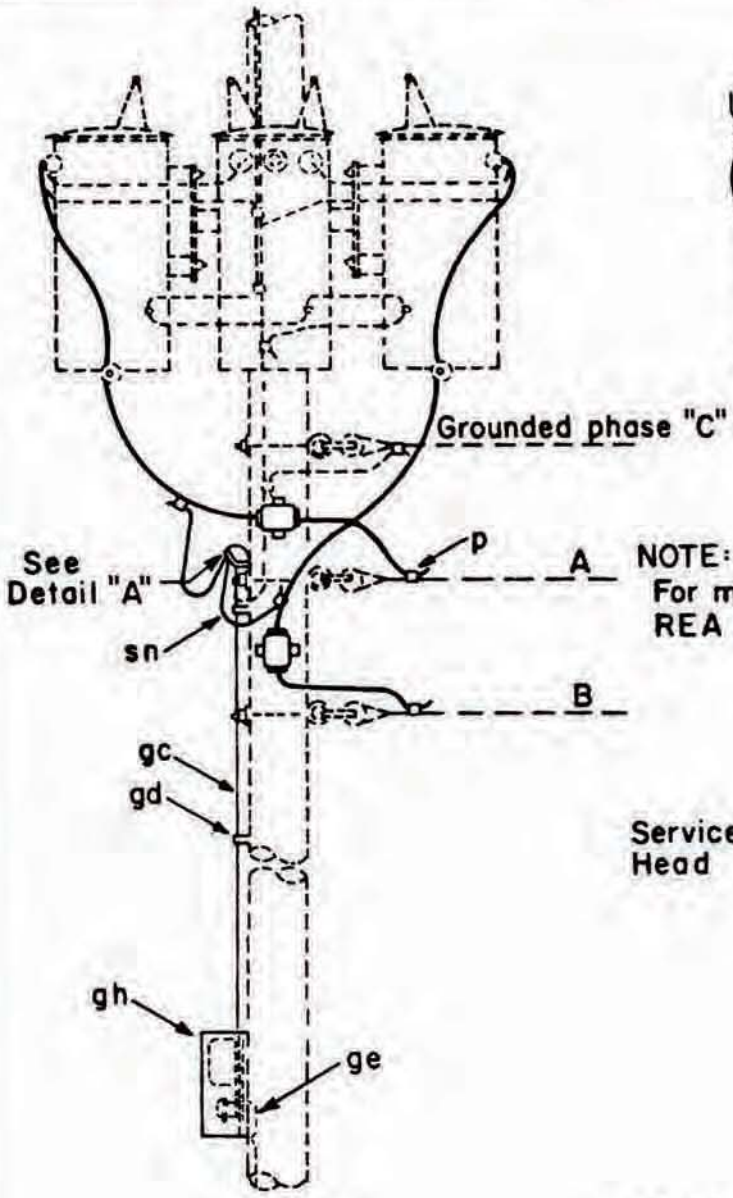
Connections from C.T.'s to Service Head

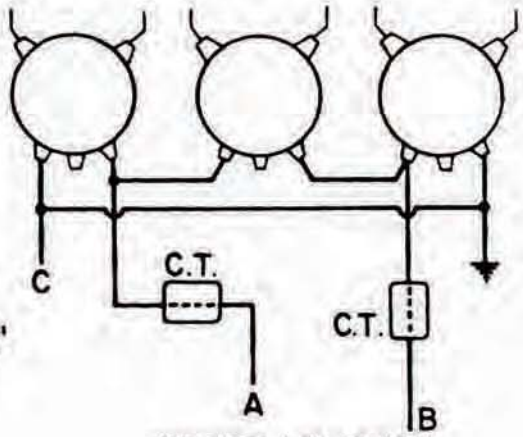
ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
j	4	Screw, lag		gh	1	Meter box, meter and test block	
p		Connectors, as req'd		sd	2	Transformer, current	
av		Jumpers, insulated		sm		Wire, No. 12, insul. for current	
gc		Conduit, 1 1/4", as req'd		sn		Wire, No. 14, insul. for potential	
gd		Straps, conduit, as req'd			1	Service head	
ge	1	Condulet, type "LB"					

SECONDARY METERING GUIDE
THREE PHASE, 208/120 VOLTS
4 WIRE GROUNDED WYE

NOV. 1986

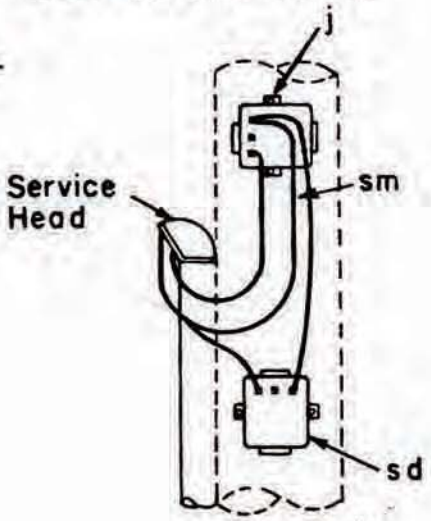
M8-11





WIRING DIAGRAM

NOTE:
For more detailed wiring diagram, see REA Bulletin 161-12



DETAIL "A"
Connections from C.T.'s to Service Head

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
j	4	Screw, lag, 1/2" x 4"		gh	1	Meter box, meter and test block	
p		Connectors, as req'd		sd	2	Transformer, current	
gc		Conduit, 1 1/4", as req'd		sm		Wire, No. 12, insul. for current	
gd		Straps, conduit, as req'd		sn		Wire, No. 14, insul. for potential	
ge	1	Conduiet type "LB"					

SECONDARY METERING GUIDE
THREE PHASE 240 VOLTS
3 WIRE CORNER GROUNDED DELTA

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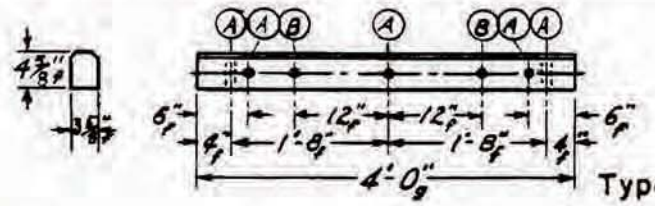
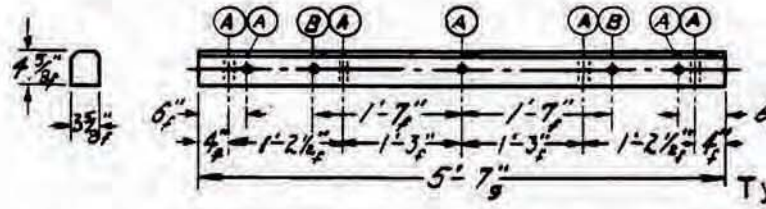
M 8-12



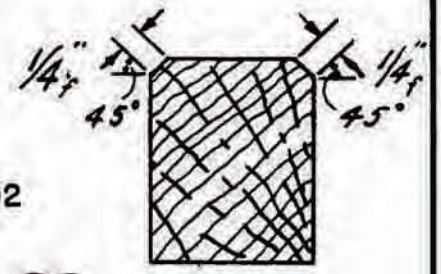
Type 01

TOLERANCES
SIZES OF HOLES

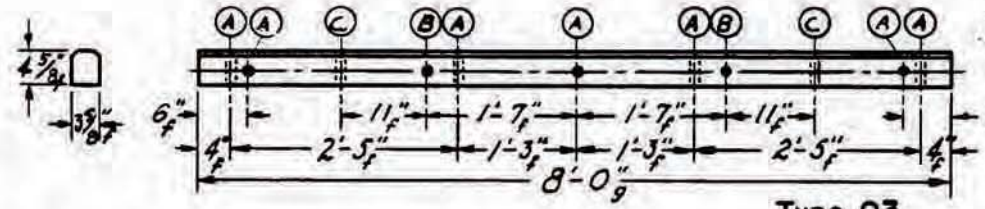
	Nominal	Go	No Go
(A)	1 1/16"	5/8"	3/4"
(B)	7/16"	3/8"	1/2"
(C)	9/16"	1/2"	5/8"



Type 02

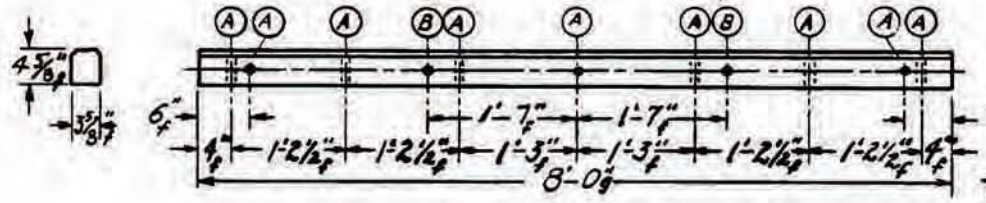


TYPICAL ENLARGED SECTION

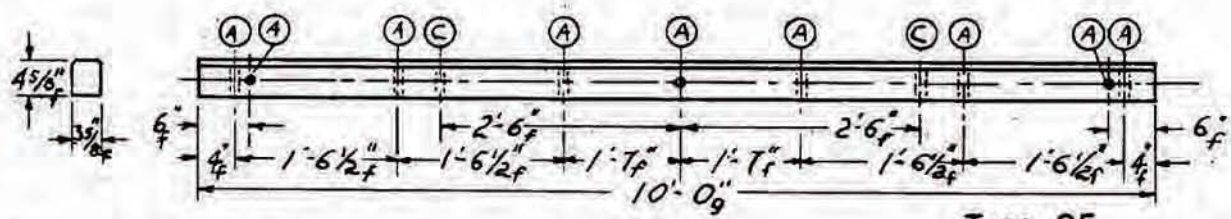


Type 03

f --- ± 1/8"
g --- ± 1/4"



Type 04

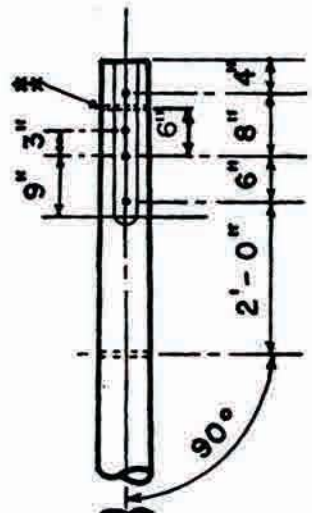


Type 05

CROSSARM DRILLING GUIDE

NOV. 1986

M19



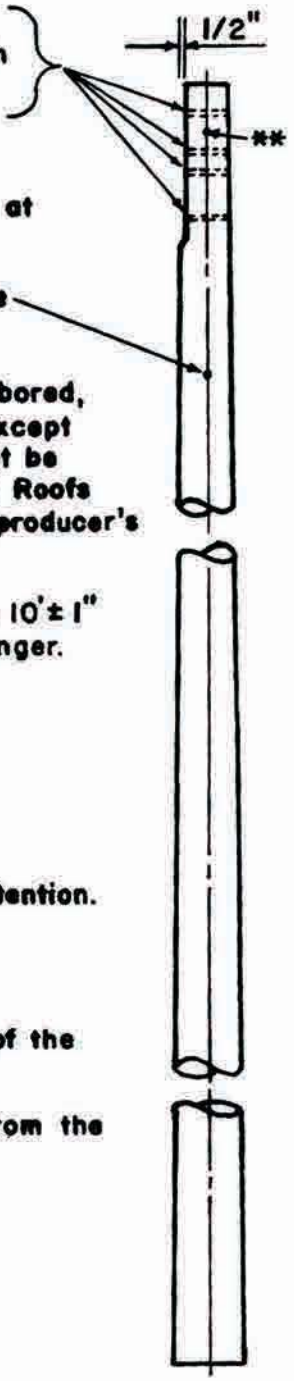
Through-bolt holes must be parallel and in the same plane.

HOLES: Drill 11/16" diameter.

GAINS: Gains are to be flat with plane at right angles to bolt hole.

Neutral bolt hole must be at 90° angle with through-bolt holes.

All poles shorter than 50 feet must be bored, roofed and gained before treatment, except that Class 7 and smaller poles need not be gained unless requested by purchaser. Roofs may be flat or at a 15° angle at the producer's option.



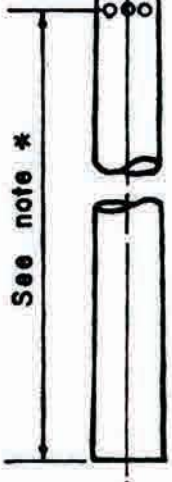
*Bottom of brand or center of metal disk shall be 10'± 1" from pole butt; 14'± 1" mark for poles 55' and longer.

If insured warranted pole, Brand "IW".

Manufacturer's Mark and Date of Treatment, (Month and Year).

Brand with proper length and class.

Brand with species, preservative code and retention.



Tolerance:

Holes

On the gain ± 1/8" from the centerlines of the holes.

On the side opposite the gain ± 1/4" from the centerlines of the holes.

Location – measured from roof
Gain side ± 1/4"
Opposite side ± 1/2"

Diameter ± 1/16"
Gains out of parallel ± 1/2"

** Optional, anti-split bolt hole to be drilled only when so specified by the purchaser.

Brand butt with proper length and class

POLE FRAMING GUIDE

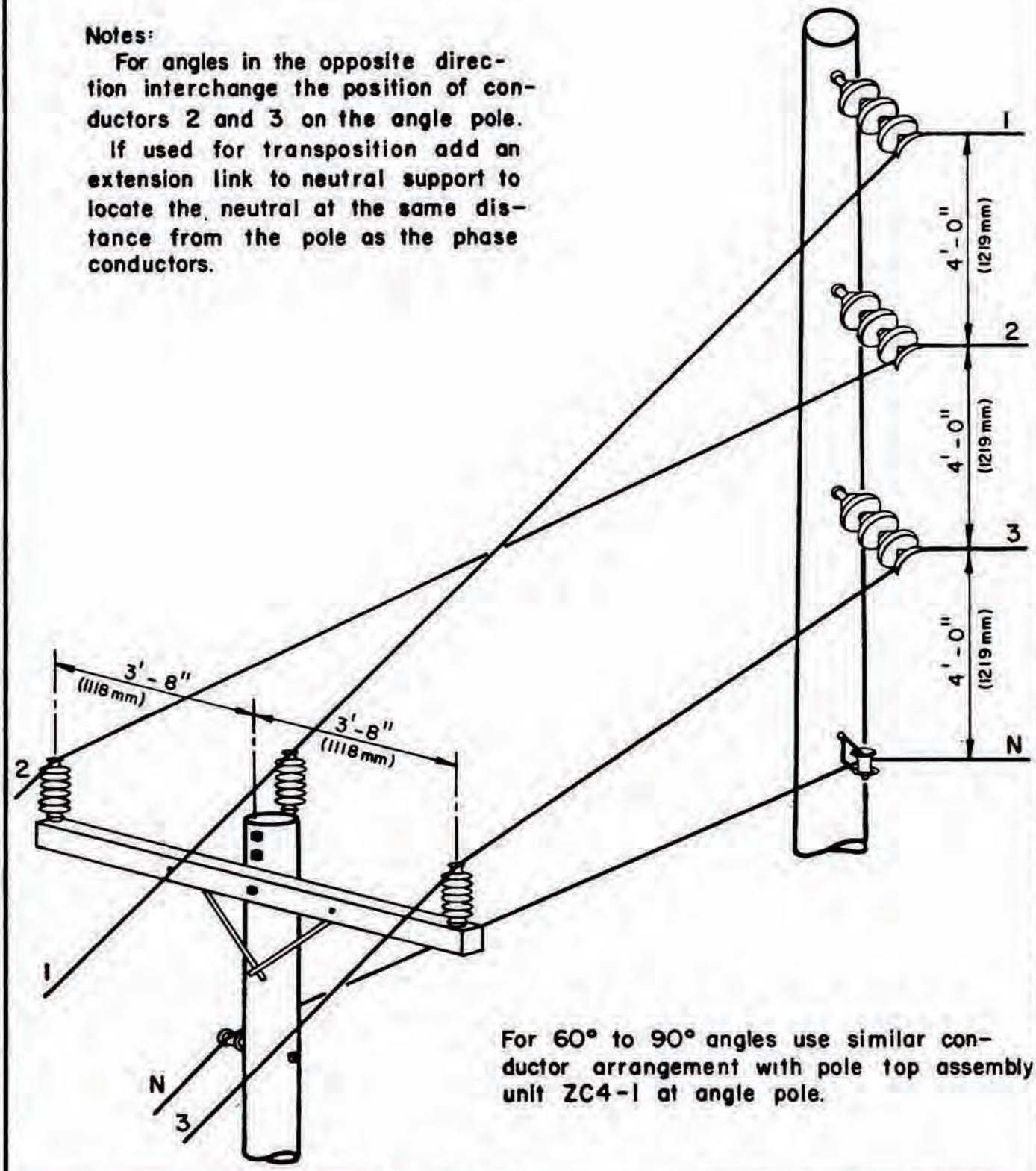
NOV. 1986

M20

Notes:

For angles in the opposite direction interchange the position of conductors 2 and 3 on the angle pole.

If used for transposition add an extension link to neutral support to locate the neutral at the same distance from the pole as the phase conductors.



For 60° to 90° angles use similar conductor arrangement with pole top assembly unit ZC4-1 at angle pole.

ANGLE CONSTRUCTION GUIDE
CROSSARM TO VERTICAL CONST.-20° TO 60°ANGLE

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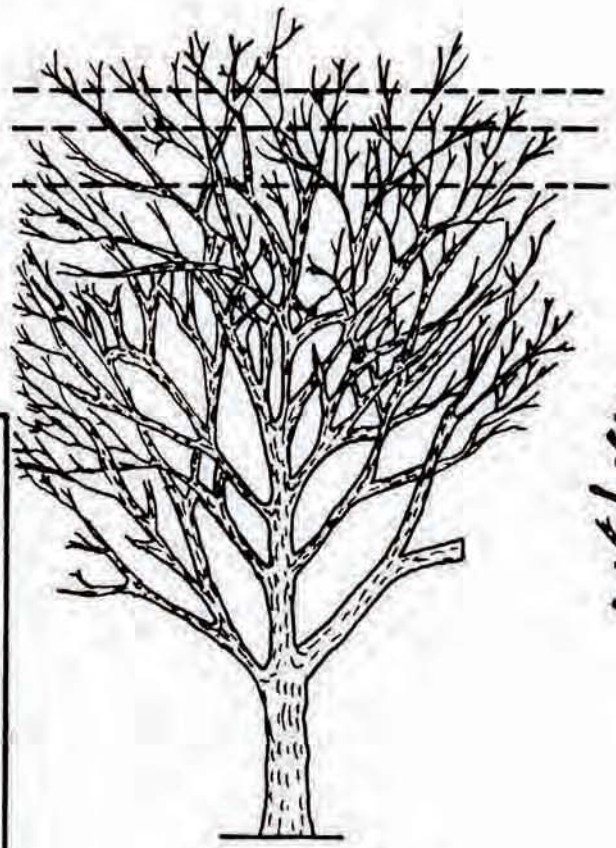
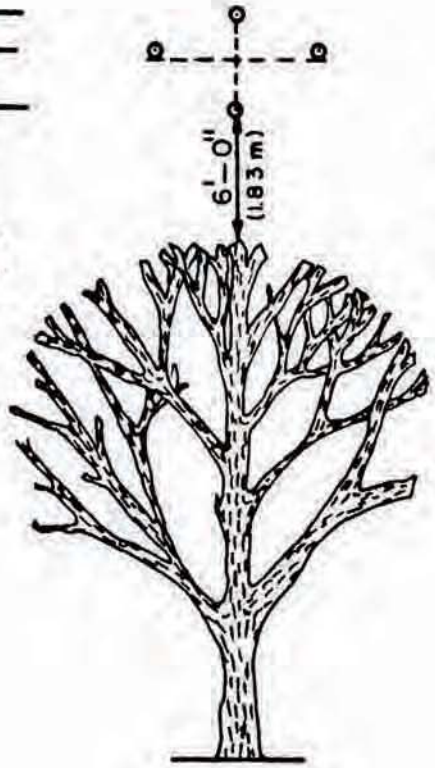
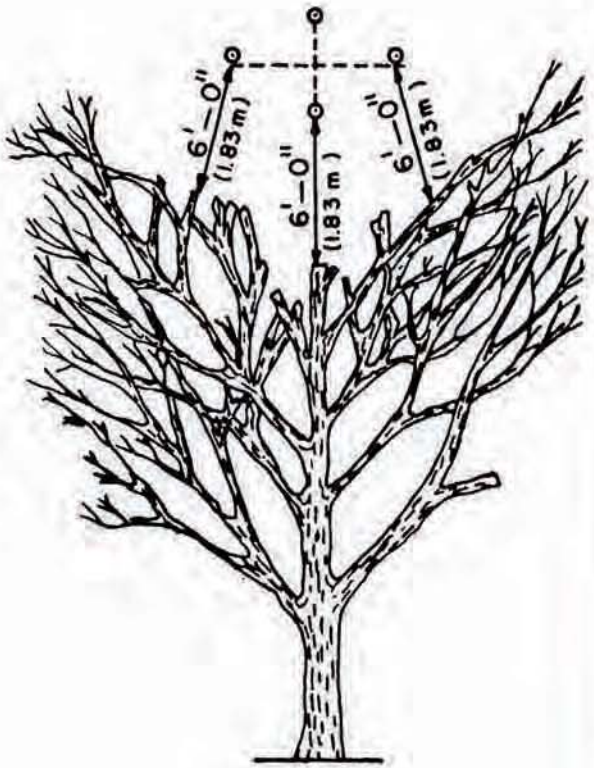
M21



Before Trimming



Right Way



Wrong Way

NOTE:

No parts of tree should be closer than 6'–0" (1.83 m) from open wiring.
Trimming should leave tree with symmetrical appearance.

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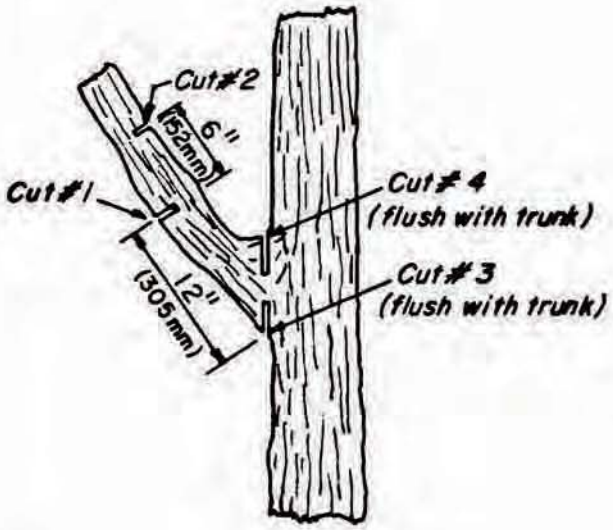
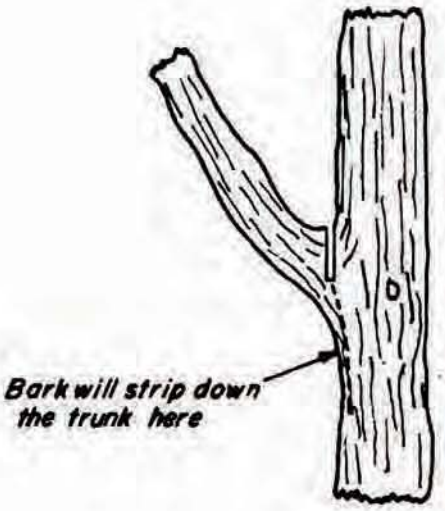
TREE TRIMMING GUIDE

ZM22-1



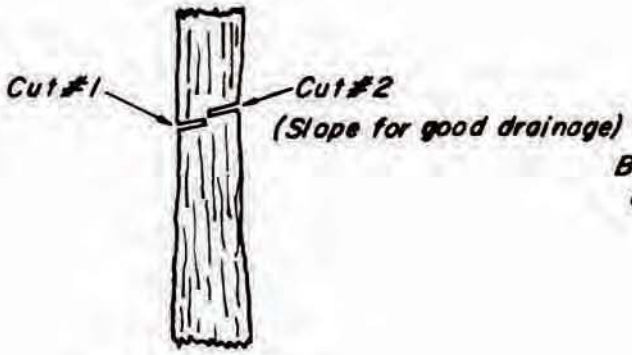
Right Way



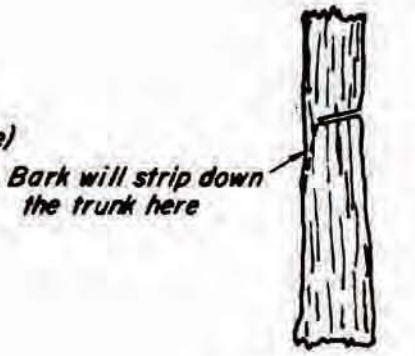
Wrong Way

For small branches
omit Cuts #1 and #2

REMOVAL OF HEAVY SIDE LIMB



Right Way



Wrong Way

REMOVAL OF VERTICAL LIMB

NOTE: Coat final cut with tree paint.

TREE TRIMMING GUIDE

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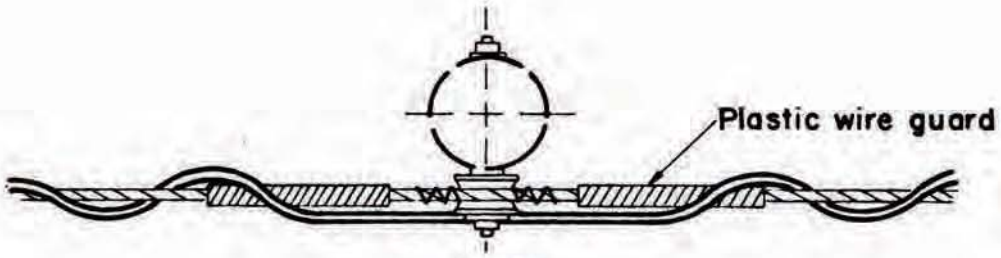
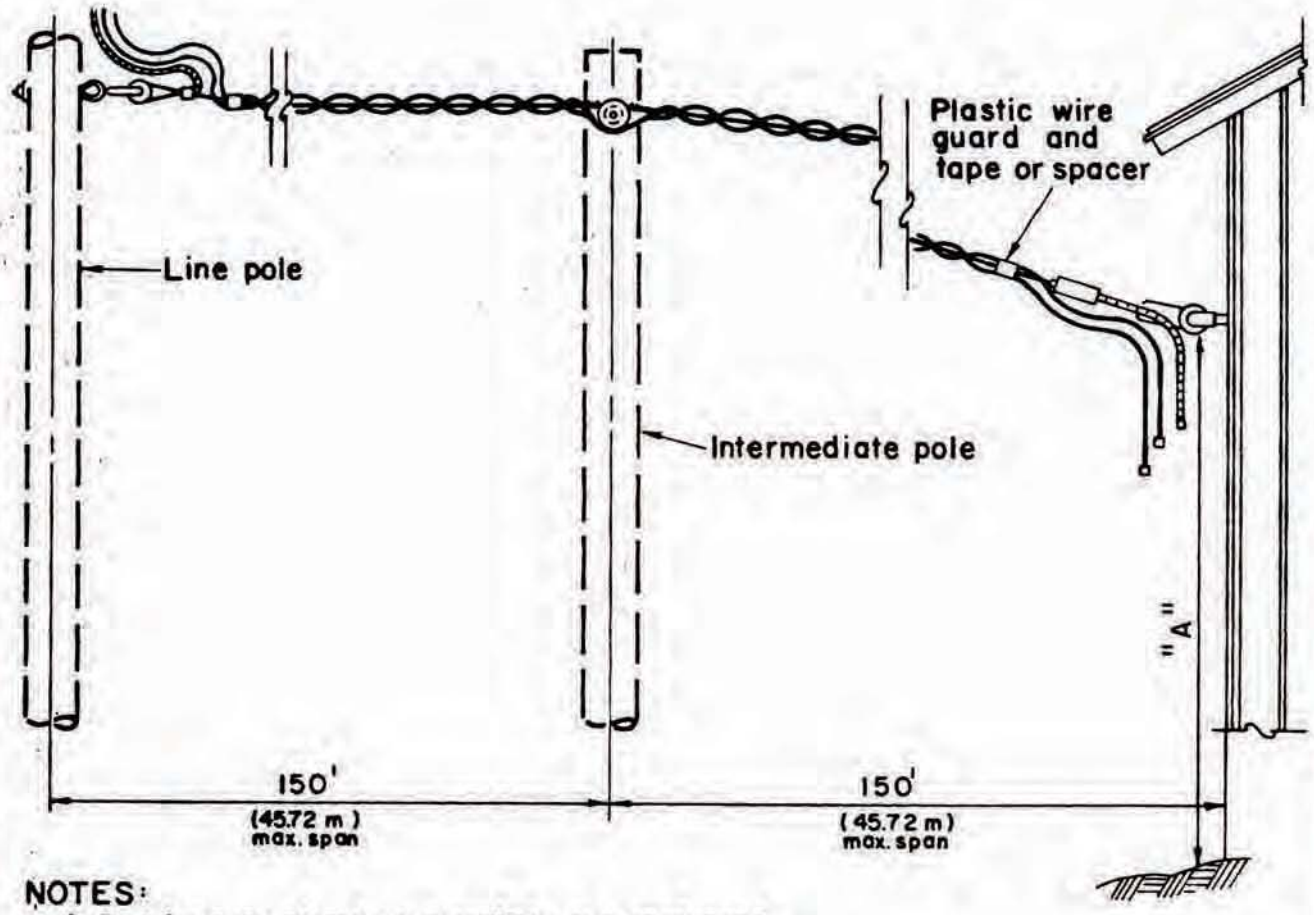


PLAN



NOTES:

1. Services as short as possible are preferred.
2. Refer to secondary and service assemblies for construction details.

Clearance "A" mininum

To bottom of drip loop	10'(3.05 m)
To service assembly and service drop conductor in span.	12'(3.66m)

CABLE SERVICE ASSEMBLY GUIDE

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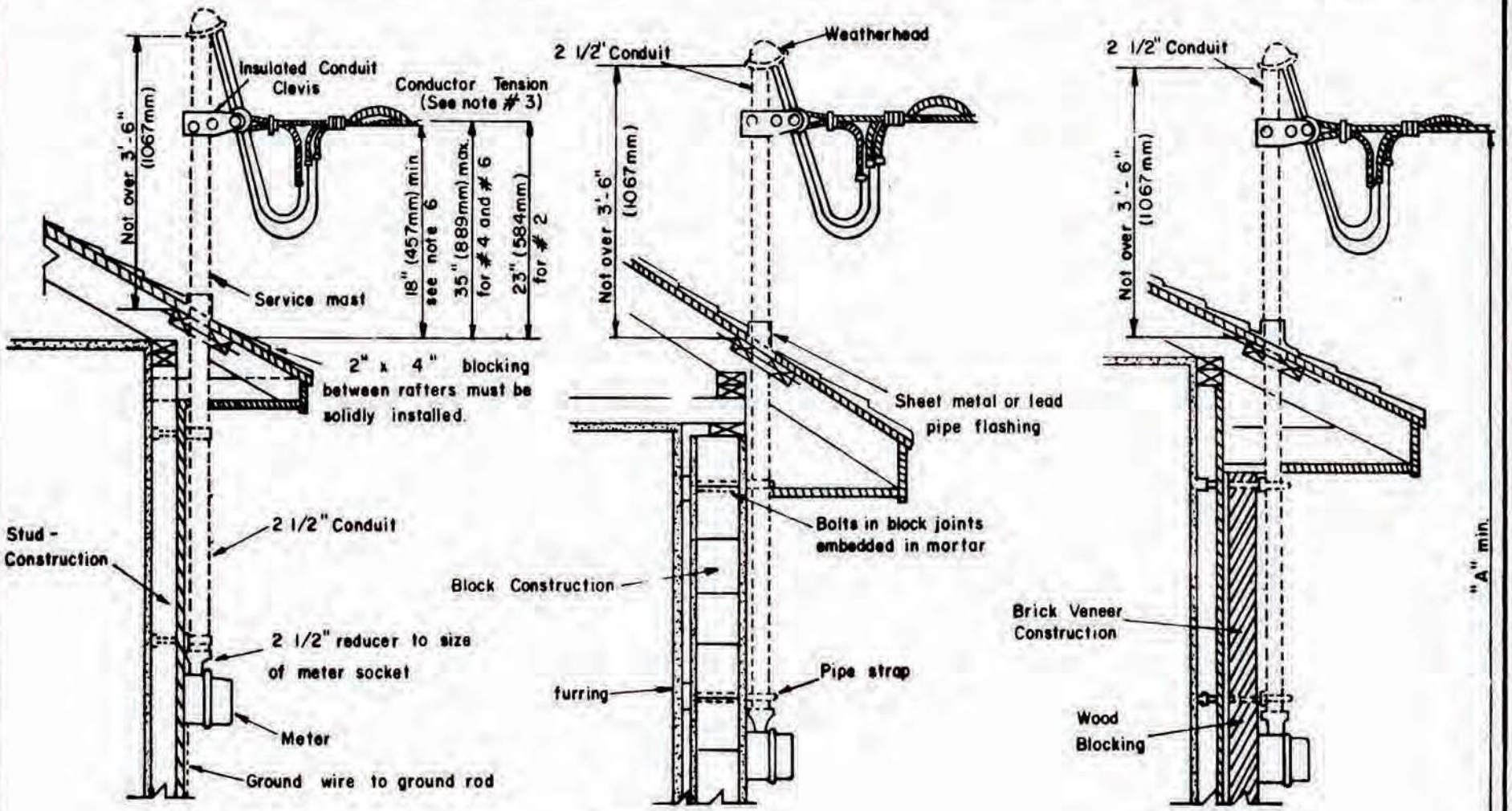
M 24



Clearance "A"	Minimum
To bottom of drip loop	10'-0" (3.05 m)
To service assembly & service drop conductor in span	12'-0" (3.66 m)

NOTES:

1. If length of conduit exceeds 10 feet (3.05 m) coupling will be permitted on end adjacent to meter.
2. Meter to be located 5'-6" (1676 mm) from ground level.
3. Maximum tension of conductor not to exceed 50% of ultimate strength.
4. For service assemblies see drawings K16C, K17, K17L.
5. Service connectors to be insulated compression type.
6. This dimension applies to both drip loop and span.

ASSEMBLY GUIDE OF SERVICE MAST FOR RANCH TYPE HOUSE

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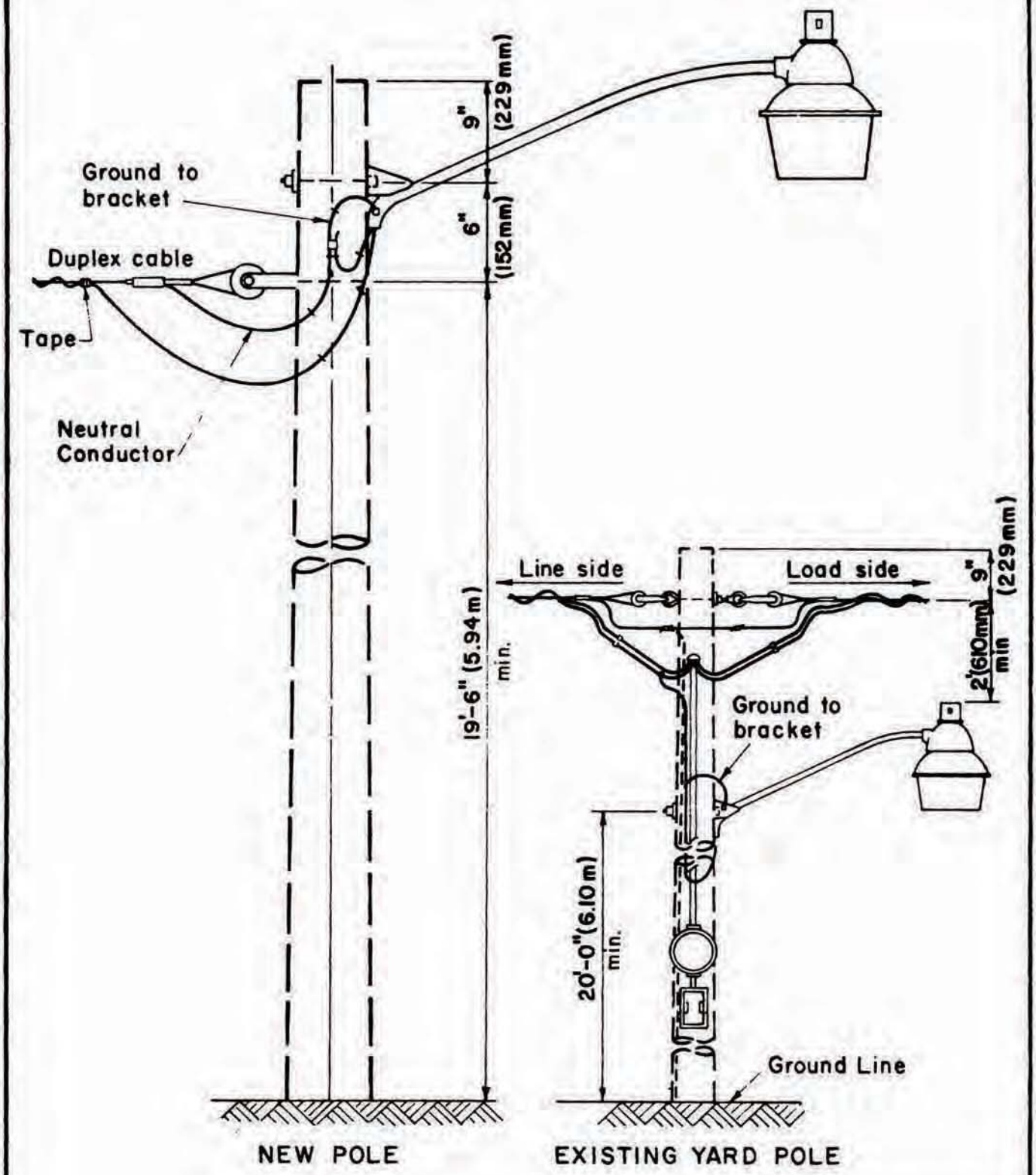
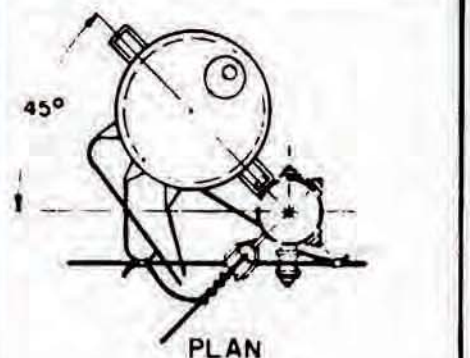
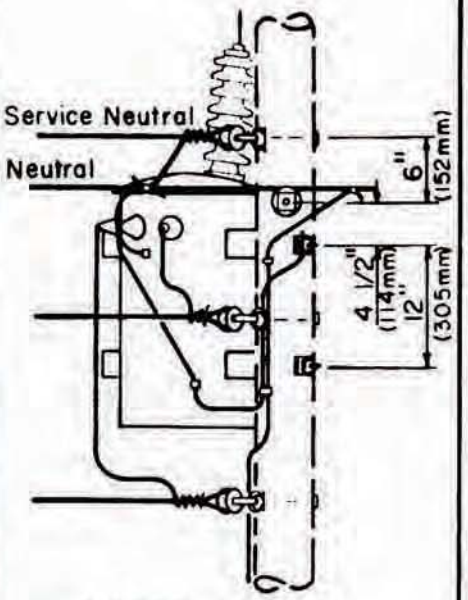


SECURITY LIGHT INSTALLATION GUIDE
(UNMETERED)

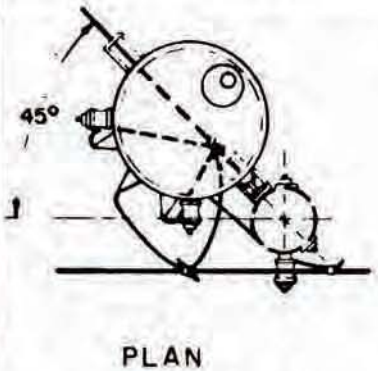
NOV. 1986		M 26-5

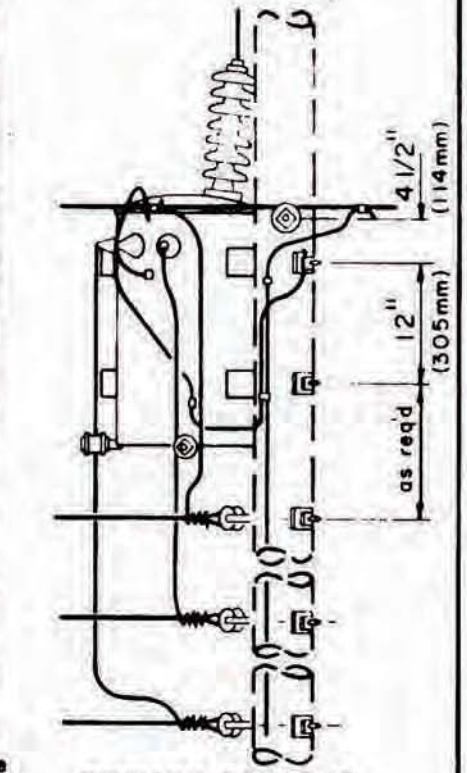




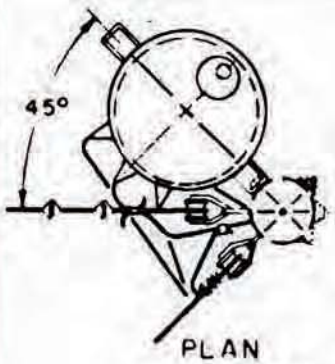
PRIMARY TANGENT
SERVICE TAKE-OFF AT
TRANSFORMER LEVEL

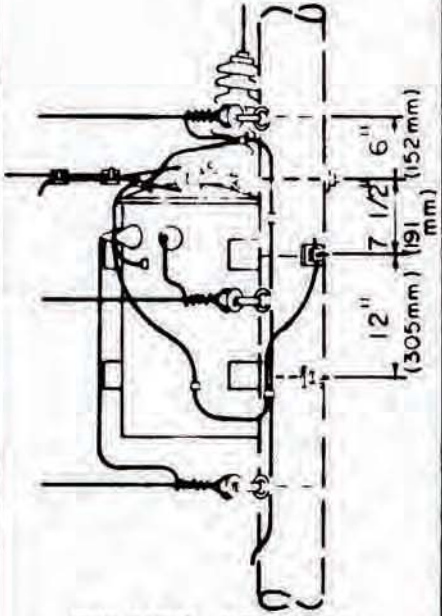
NOTE:
Transformers may be mounted in alternate posistions and quadrants as practical in order to facilitate services in directions not shown.



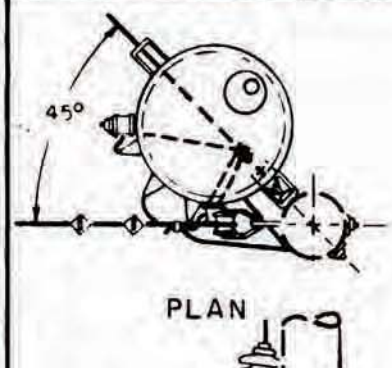


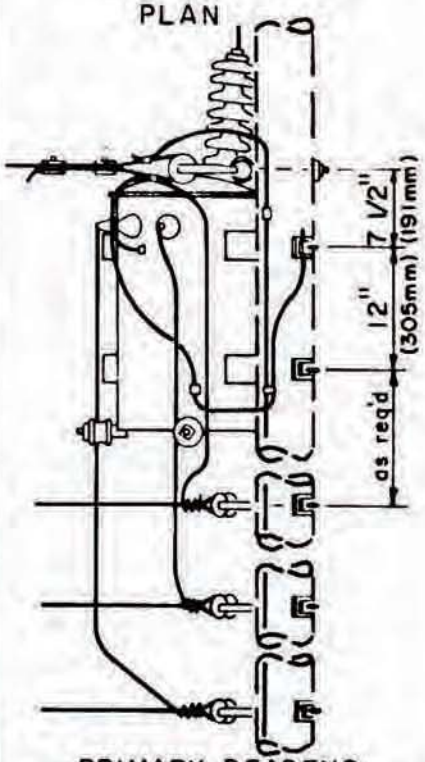
PRIMARY TANGENT
SERVICE TAKE-OFF BELOW
TRANSFORMER





PRIMARY DEADEND
SERVICE TAKE-OFF AT
TRANSFORMER LEVEL





PRIMARY DEADEND
SERVICE TAKE-OFF BELOW
TRANSFORMER

TRANSFORMER CONNECTION GUIDE OPEN WIRE SERVICES

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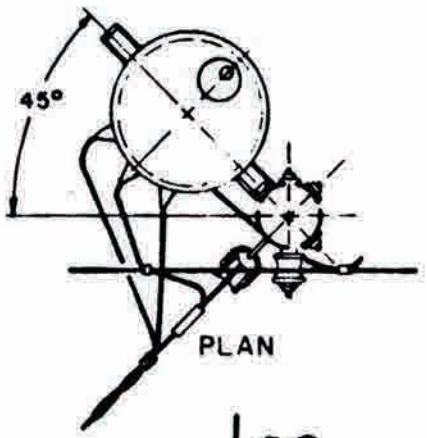
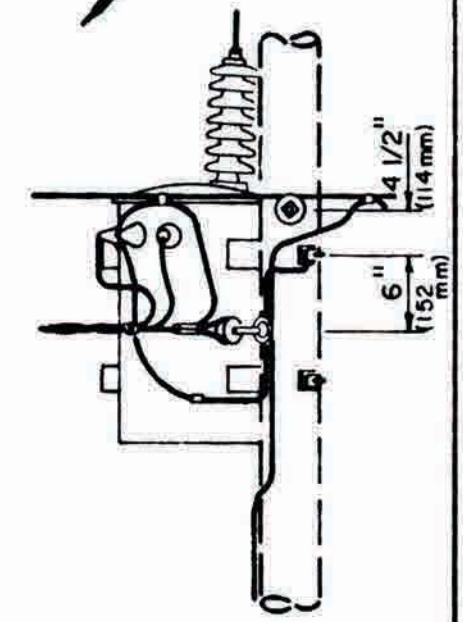
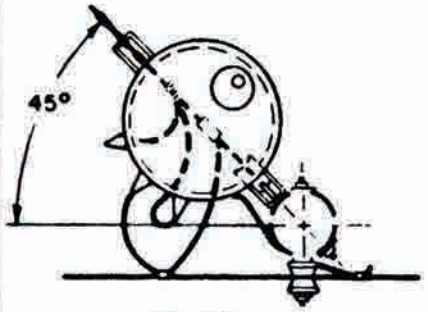
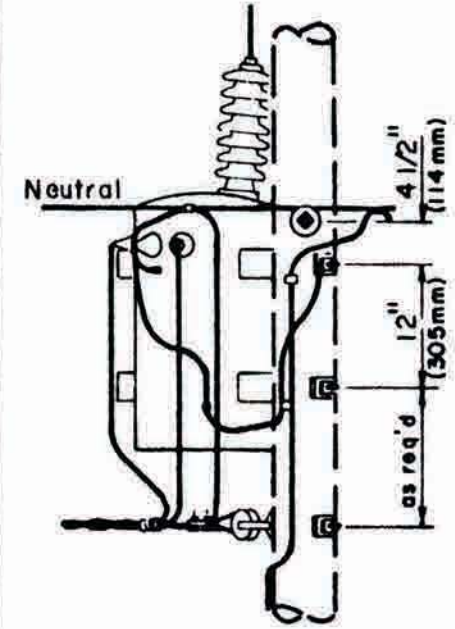
M 27



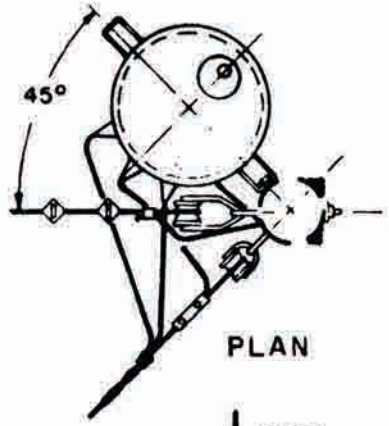


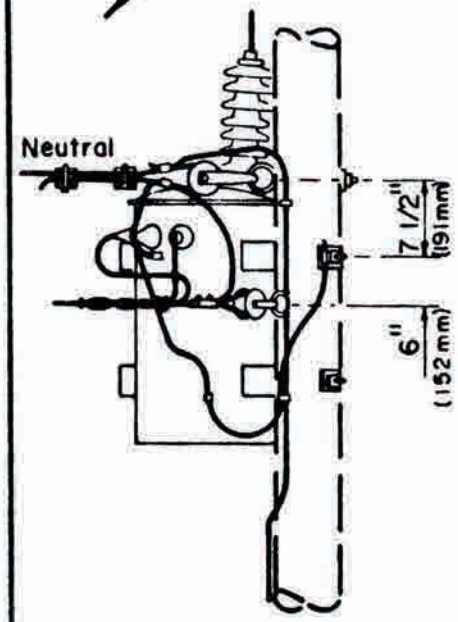
PRIMARY TANGENT SERVICE TAKE-OFF AT TRANSFORMER



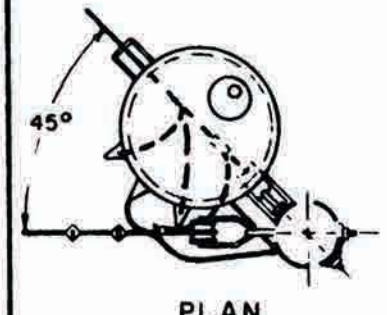


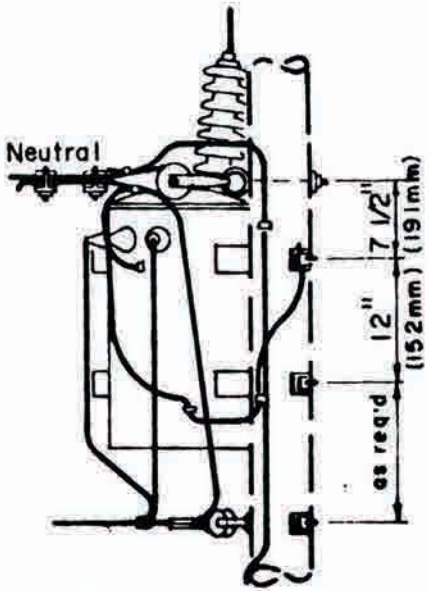
PRIMARY TANGENT SERVICE TAKE-OFF BELOW TRANSFORMER





PRIMARY DEADEND SERVICE TAKE-OFF AT TRANSFORMER





PRIMARY DEADEND SERVICE TAKE-OFF BELOW TRANSFORMER

NOTES

1. Secondary bushing not to be used for bi-metal connection.
2. Transformers may be mounted in alternate positions and quadrants as practical in order to facilitate services not shown.

TRANSFORMER CONNECTION GUIDE
TRIPLEX CABLE SERVICES

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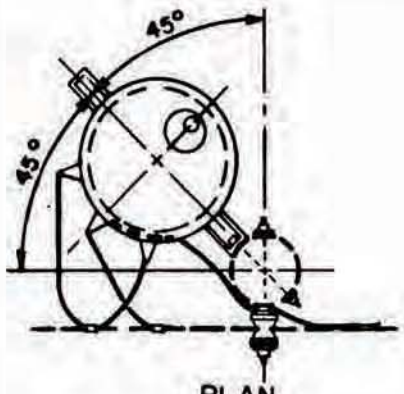
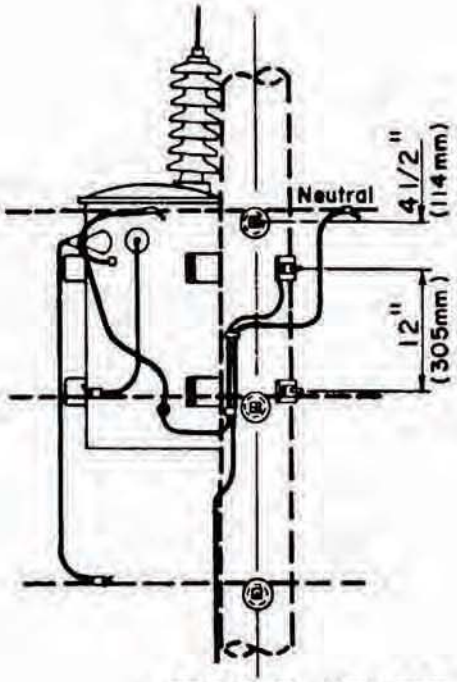
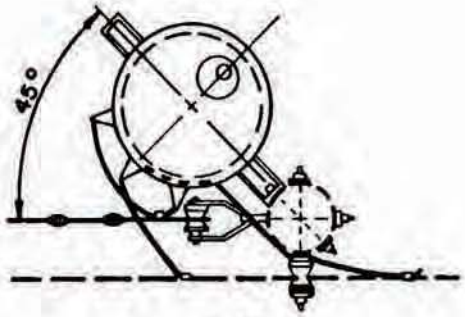
M27-1



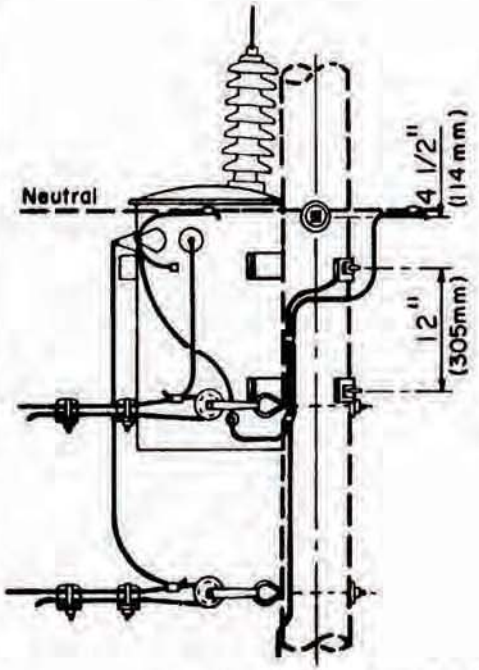
PLAN



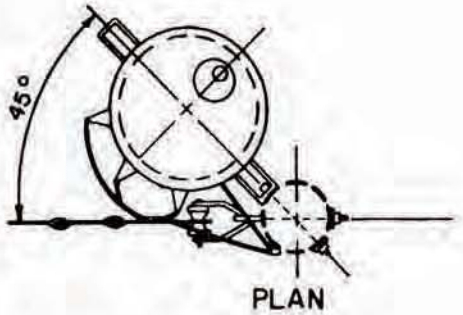
PRIMARY TANGENT
SECONDARY TANGENT



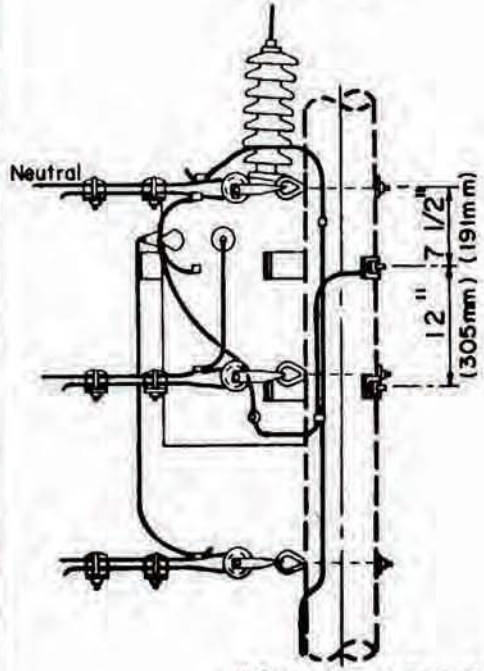
PLAN



PRIMARY TANGENT
SECONDARY DEADEND



PLAN



PRIMARY DEADEND
SECONDARY DEADEND

TRANSFORMER CONNECTION GUIDE
SECONDARY UNDERBUILD

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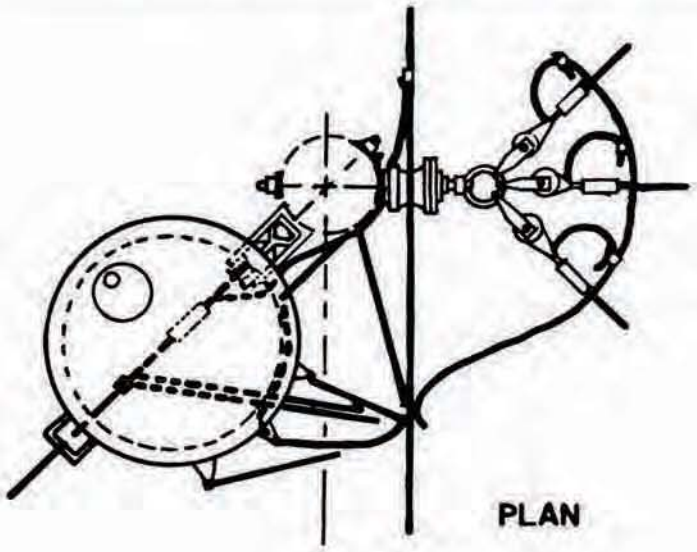
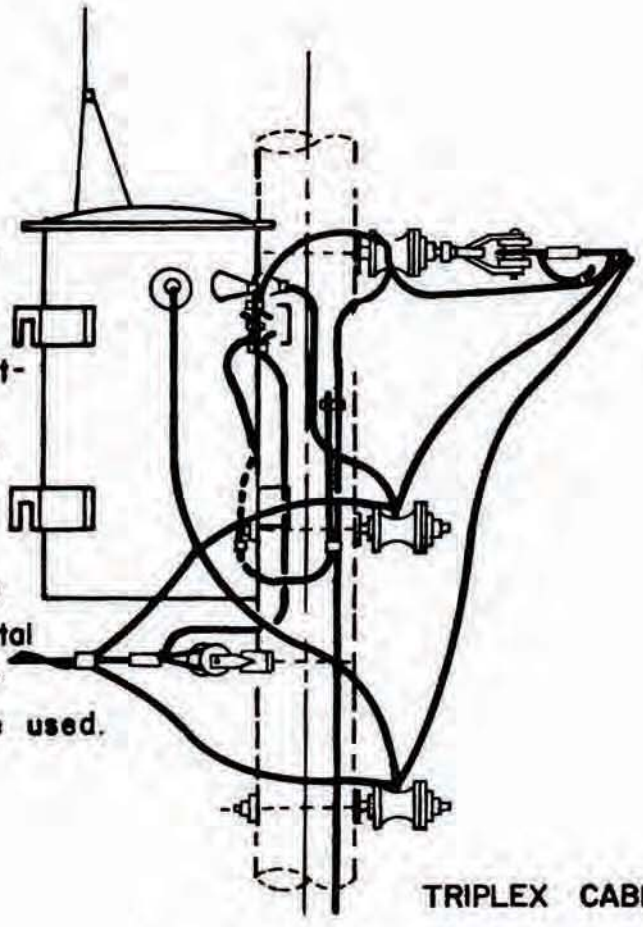


PLAN



TRIPLEX CABLE

NOTES:

1. Use compression type connectors.
2. Stranded aluminum alloy or stranded soft-drawn copper is recommended for the grounding loop conductor.
3. Secondary bushing not to be used for bi-metal connection. Spades or copper studs may be used.

TRANSFORMER CONNECTION AND SERVICE TAKE-OFF GUIDE FROM SECONDARY

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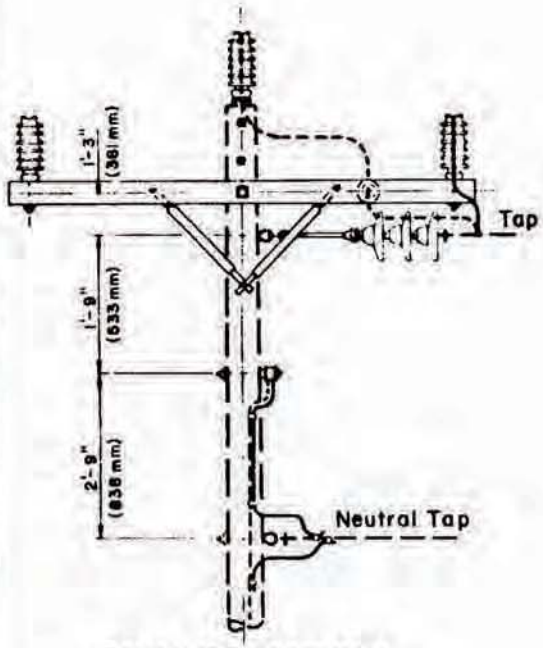
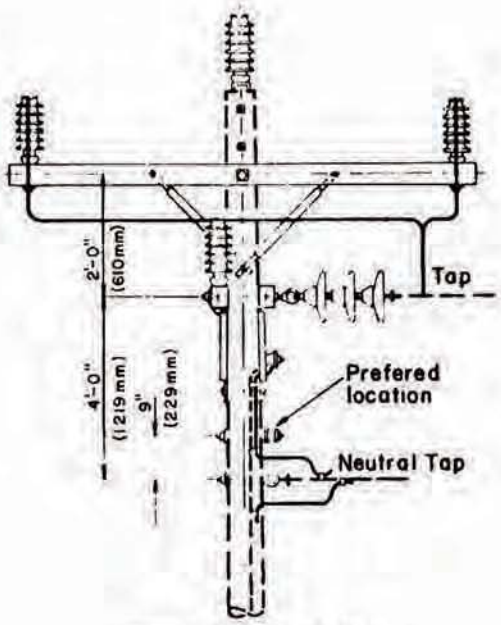
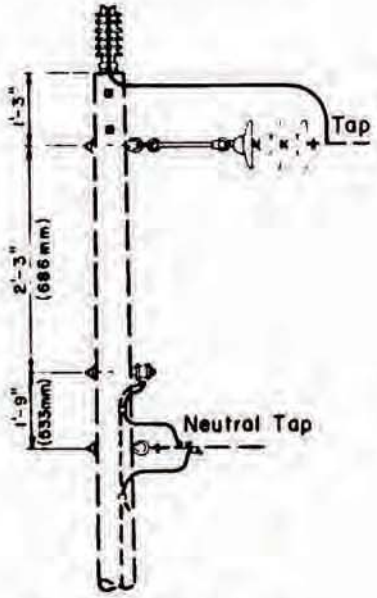


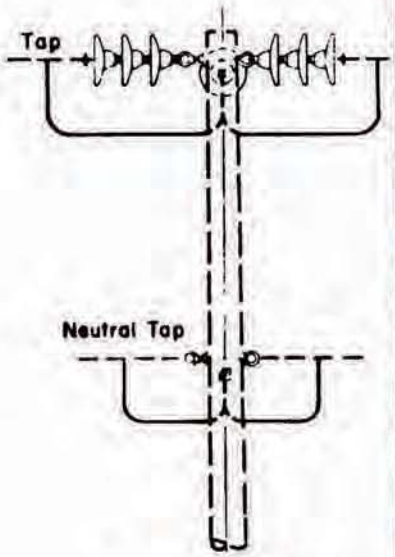
COMPLETE ASSEMBLY
ZC1, ZA5-2 and ZM5-7 (if needed)



COMPLETE ASSEMBLY
ZC1 and ZB7



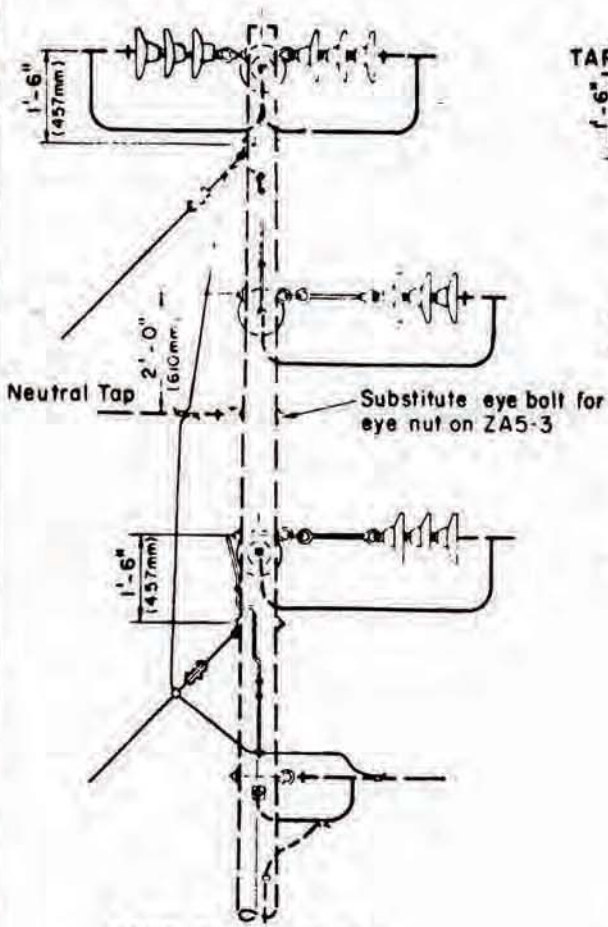
COMPLETE ASSEMBLY
ZA5-2 and ZA1



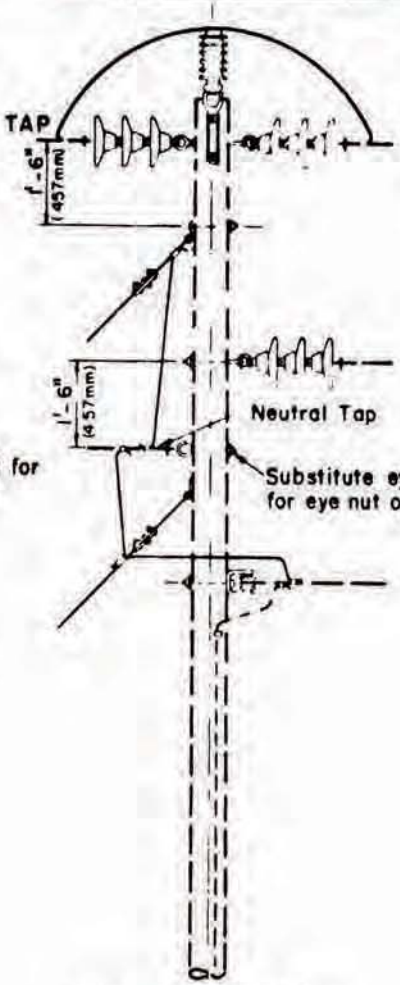
COMPLETE ASSEMBLY
ZA5-3 and ZA4

NOTE
This drawing illustrates the addition of standard tap assemblies to other standard pole top assemblies

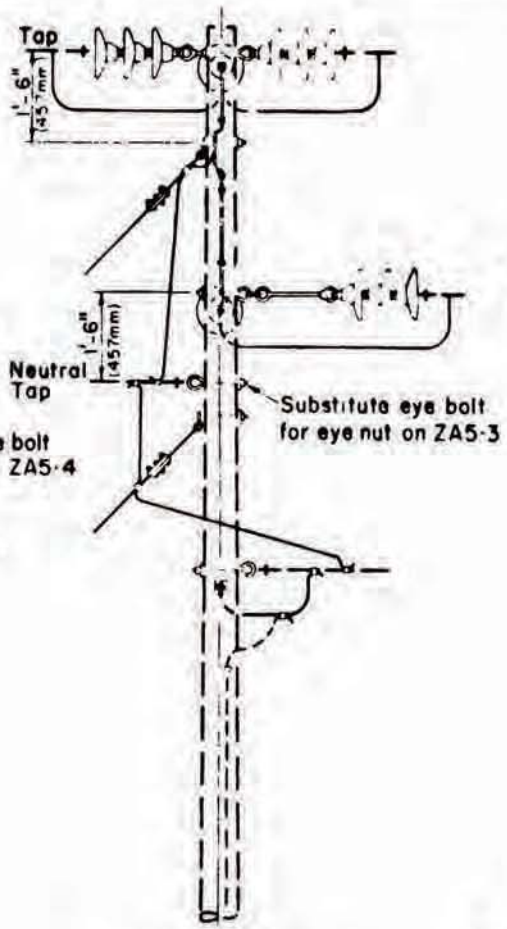
TAP ASSEMBLY GUIDE		
NOV. 1986		ZM29-1A



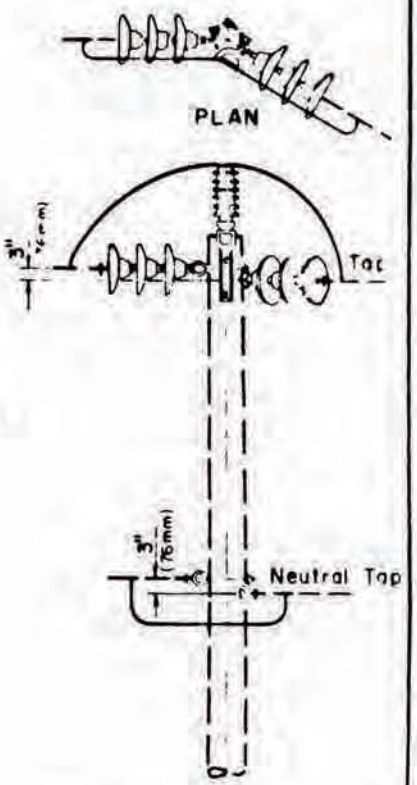
COMPLETE ASSEMBLY
ZA5-3, ZC4-1 and ZM10-14



COMPLETE ASSEMBLY
ZA5-4, ZB3 and ZM10-14



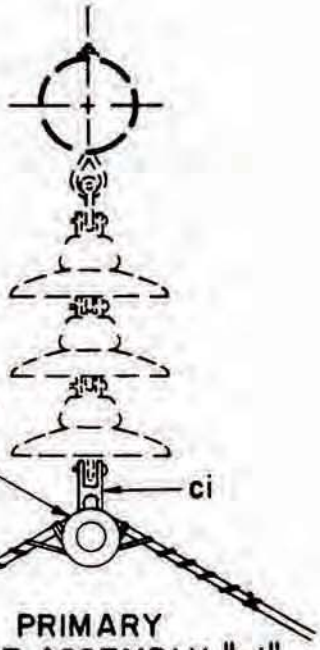
COMPLETE ASSEMBLY
ZA5-3, ZB4-1 and ZM10-14



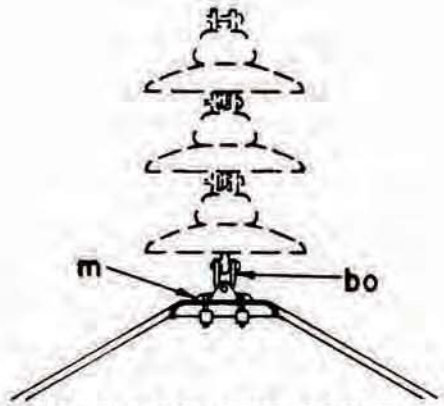
COMPLETE ASSEMBLY
ZA5-3 and ZA5

NOTE
This drawing illustrates the addition of standard tap assemblies to other standard pole top assemblies

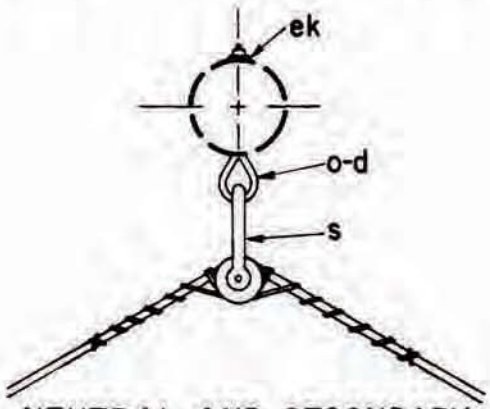
TAP ASSEMBLY GUIDE		
NOV. 1986		ZM29-1B



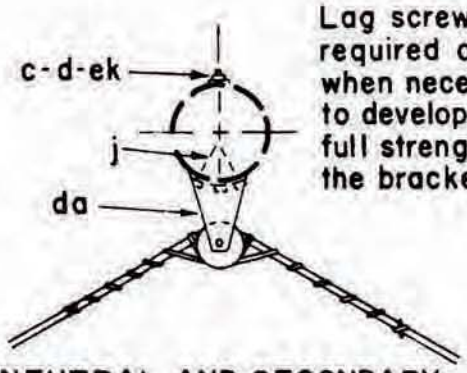
PRIMARY ANGLE ASSEMBLY "cd" except at telephone crossing



FOR TELEPHONE CROSSING ANGLE ASSEMBLY "cd" with 2-bolt suspension clamp



NEUTRAL AND SECONDARY ANGLE ASSEMBLY "ce" except at crossings of railroad tracks and limited access highways.



Lag screws required only when necessary to develop the full strength of the bracket.

NEUTRAL AND SECONDARY ASSEMBLY "ce"
*except at crossings of railroad tracks and limited access highways.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c		Bolt, machine, 5/8" x req'd. length		j		Screw, lag, 1/2" x 4"	
m		Clamp, suspension		bo		Shackle, anchor	
s		Clevis, secondary, swinging, insulated		o		Bolt, eye, 5/8" x req'd. length	
ek		Locknuts, as req'd.		ci		Clevis, thimble, side opening	
d		Washer, square, 2 1/4"		da		Bracket, insulated	

ANGLE ASSEMBLY GUIDE, VERTICAL CONSTRUCTION 20° TO 60° ANGLE, COPPER TYPE CONDUCTORS WITH FORMED TYPE ARMOR RODS

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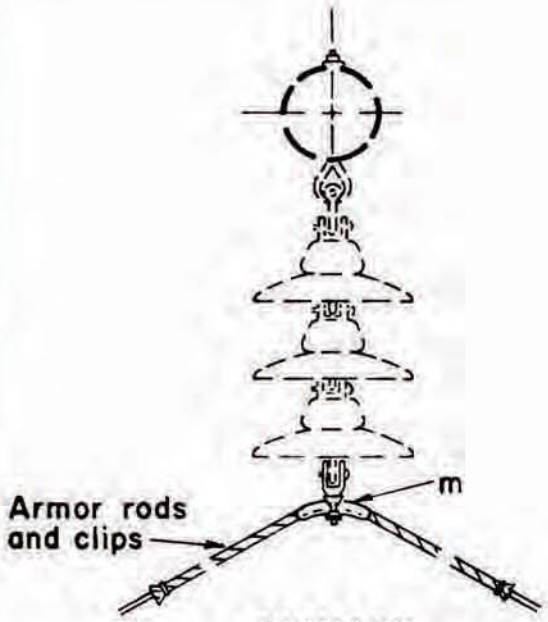
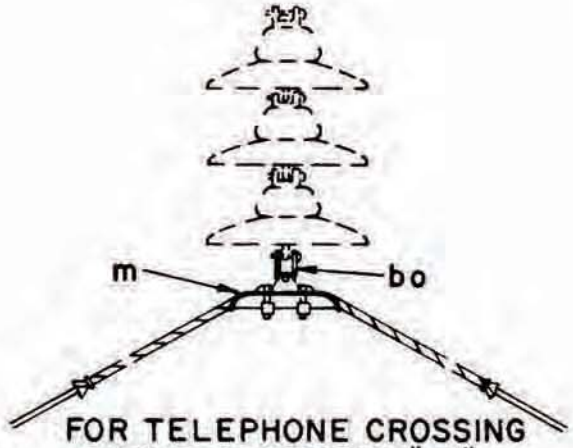
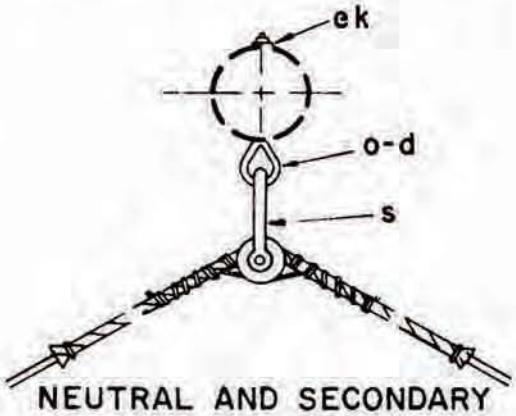
M41-1



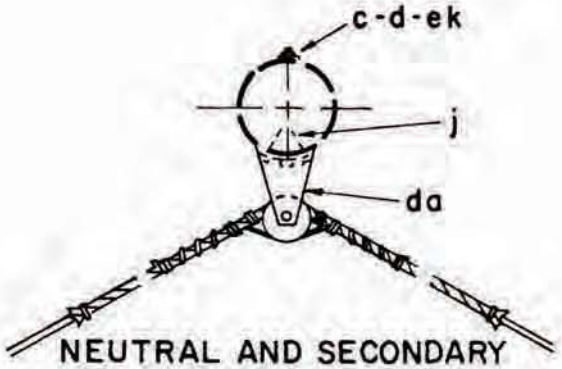
PRIMARY
ANGLE ASSEMBLY "cd"
except at telephone crossing



FOR TELEPHONE CROSSING
ANGLE ASSEMBLY "cd"
with 2-bolt suspension clamp



NEUTRAL AND SECONDARY
ANGLE ASSEMBLY "ce"
except at crossings of railroad
tracks and limited access
highways.



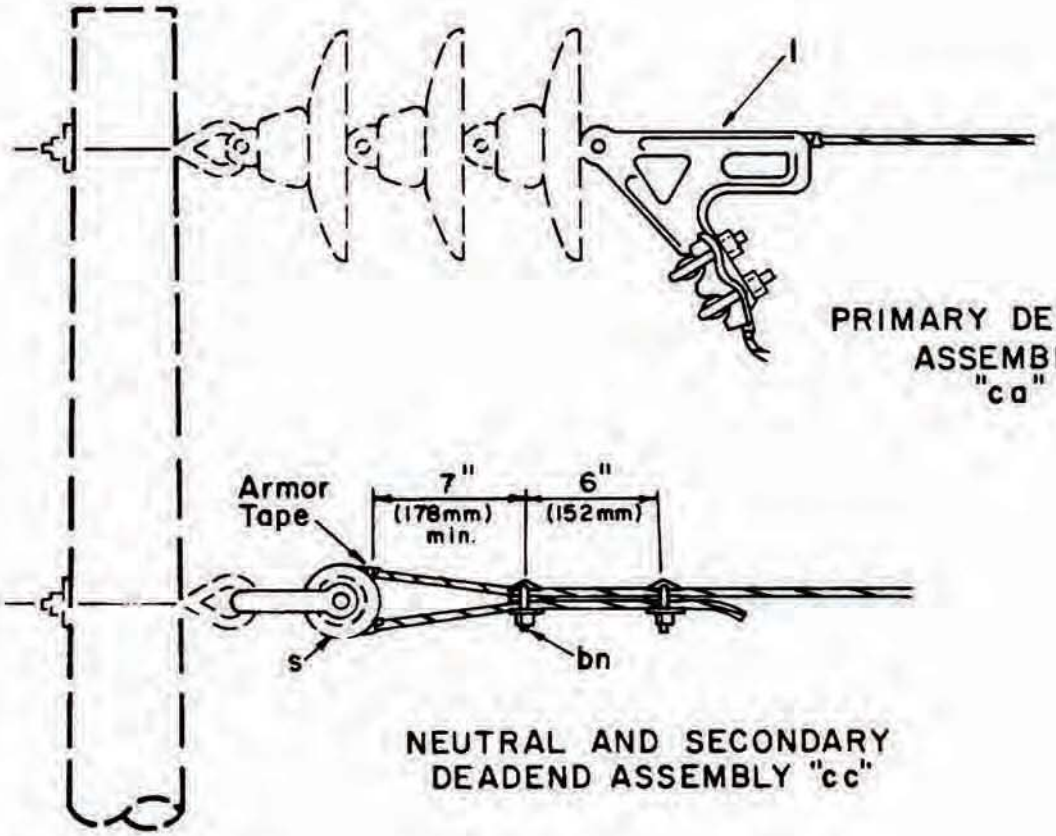
NEUTRAL AND SECONDARY
ASSEMBLY "ce"
except at crossings of railroad
tracks and limited access
highways.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
c		Bolt, machine, 5/8" req'd length		d		Washer, square 2 1/4"	
m		Clamp, suspension		j		Screw, lag, 1/2" x 4"	
s		Clevis, secondary, swinging, insulated		bo		Shackle, anchor	
ek		Locknuts, as required		o		Bolt, eye, 5/8" x req'd length	
				da		Bracket, insulated	

ANGLE ASSEMBLY GUIDE, VERTICAL CONSTRUCTION 20° TO 60° ANGLE, ACSR CONDUCTORS WITH STRAIGHT OR FORMED TYPE ARMOR RODS

NOV. 1986

M41-10



PRIMARY DEADEND ASSEMBLY "ca"

NEUTRAL AND SECONDARY DEADEND ASSEMBLY "cc"

NOTES:

1. Armor tape wrapping to extend not more than two wraps beyond the mouth of spool insulator.
2. For 1/0 and larger use spool of 3" (76 mm) minimum groove diameter on neutral and secondary deadend.

ITEM	NO.	MATERIAL		ITEM	NO	MATERIAL	
1		Clamp, deadend		bn		Clamp, loop deadend	
s		Clevis, secondary, swinging, insulated					

DEADEND ASSEMBLY GUIDE
DEADEND CLAMP METHOD
A.C.S.R. CONDUCTORS

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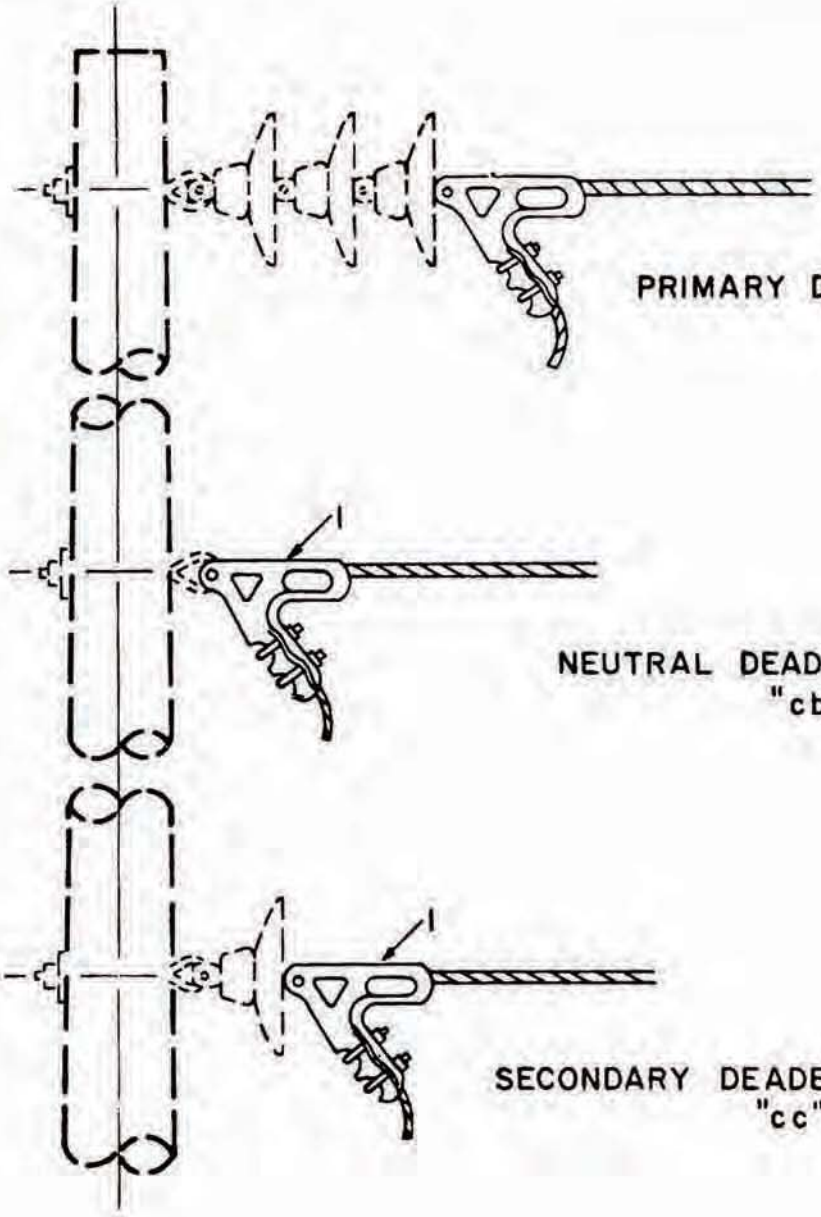
M42-11



PRIMARY DEADEND ASSEMBLY
"ca"

NEUTRAL DEADEND ASSEMBLY
"cb"

SECONDARY DEADEND ASSEMBLY
"cc"

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
1		Clamp, deadend					

DEADEND ASSEMBLY GUIDE (LARGE CONDUCTORS)

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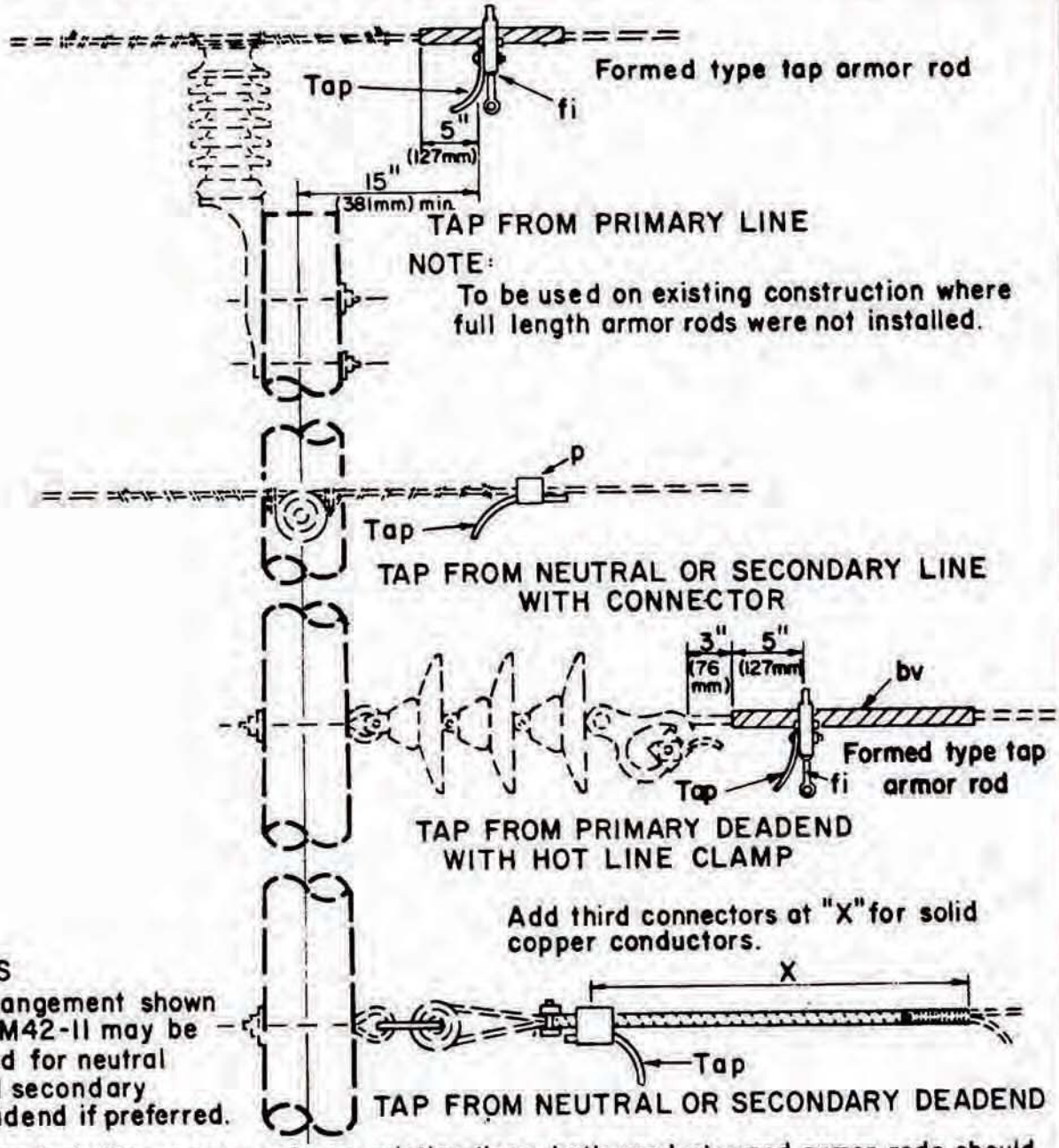
M 42-13



NOTES

1. Arrangement shown on M42-11 may be used for neutral and secondary deadend if preferred.
2. When installing armor rods on existing lines, both conductor and armor rods should be wire brushed to provide clean contact surfaces. A corrosion inhibitor should be applied before or immediately after brushing.
3. Taps to be slack.

Size of solid conductor	X
No. 6 Copper	18" (457mm)
No. 4 Copper	20" (508mm)

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
p		Connectors, as required		bv		Tap armor rods, bronze	
fi		Connectors, hot line tap assembly					

TAP ASSEMBLY GUIDE
COPPERWELD-COPPER AND COPPER CONDUCTORS

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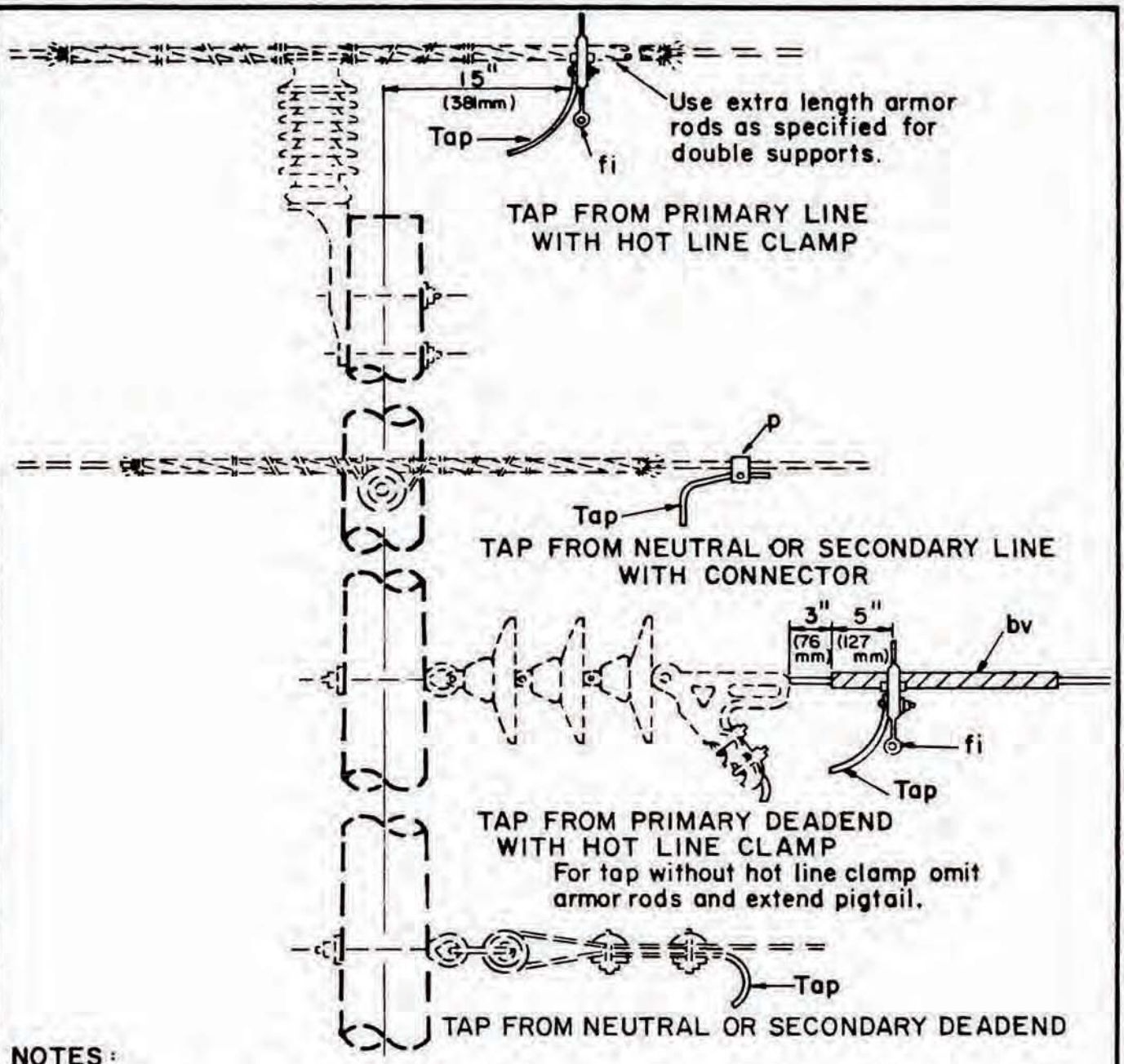
M43-4



NOTES:

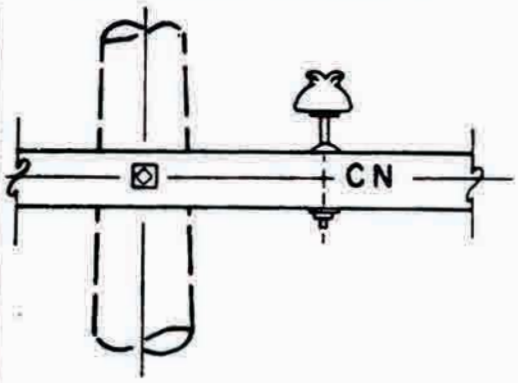
1. On new construction, tap may be made directly over armor rods provided conductor is thoroughly cleaned and inhibitor used before installing.
2. When installing armor rods on existing lines, conductor should be wire brushed thoroughly and inhibitor used before installing rods.

ITEM	NO.	MATERIAL		ITEM	NO.	MATERIAL	
p		Connector		bv		Tap armor rods, formed type	
fi		Connector, hot line tap assembly					

TAP ASSEMBLY GUIDE A.C.S.R. CONDUCTORS

NOV. 1986

M 43-10

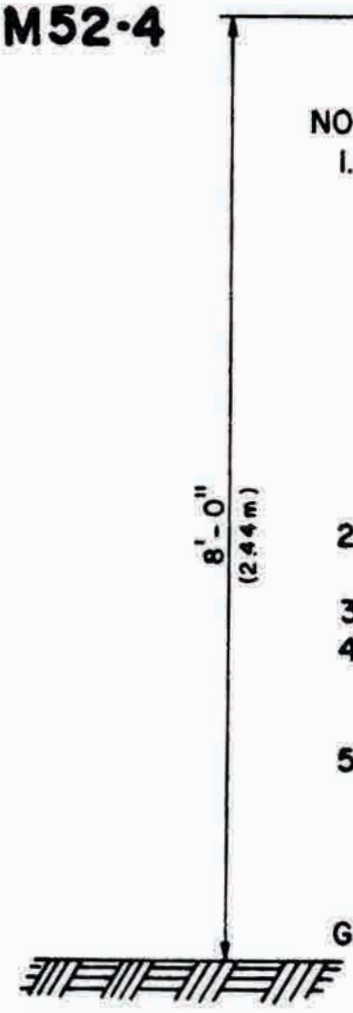


M52-4

IA 23

M52-3

May be placed
IA
23
instead of as shown



NOTES:

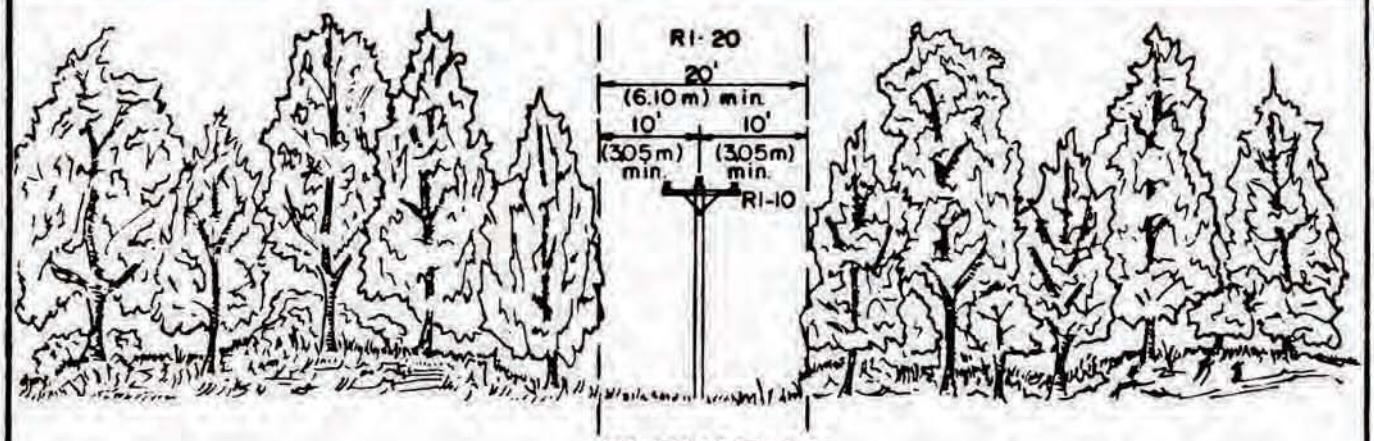
1. Numbers and letters shall:
   a) be of cutout aluminum or electroplated soft steel, fastened to pole with galvanized or aluminum barbed 1" round head nails; or
   b) be either die stamped or printed with a reflectorized background on individual pieces of aluminum and mounted in an aluminum holder and fastened to pole with aluminum barbed round head nails. If numbers smaller than 1 1/2" are used, they shall be reflectorized.
2. Pole legends to be 1 1/2" to 3" high. Reflectorized numbers and letters may be 1" to 3" high.
3. "CN" to be 2" high.
4. Pole to be staggered 30° from direct facing highway. When line crosses highway or R.R., legend should face same.
5. On poles having limited climbing space due to special special equipment, pole legend should be so located as to leave climbing space quadrant unobstructed.

ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
az		Pole numbers and letters as req'd	ea		Letters, "CN" with 1" nail

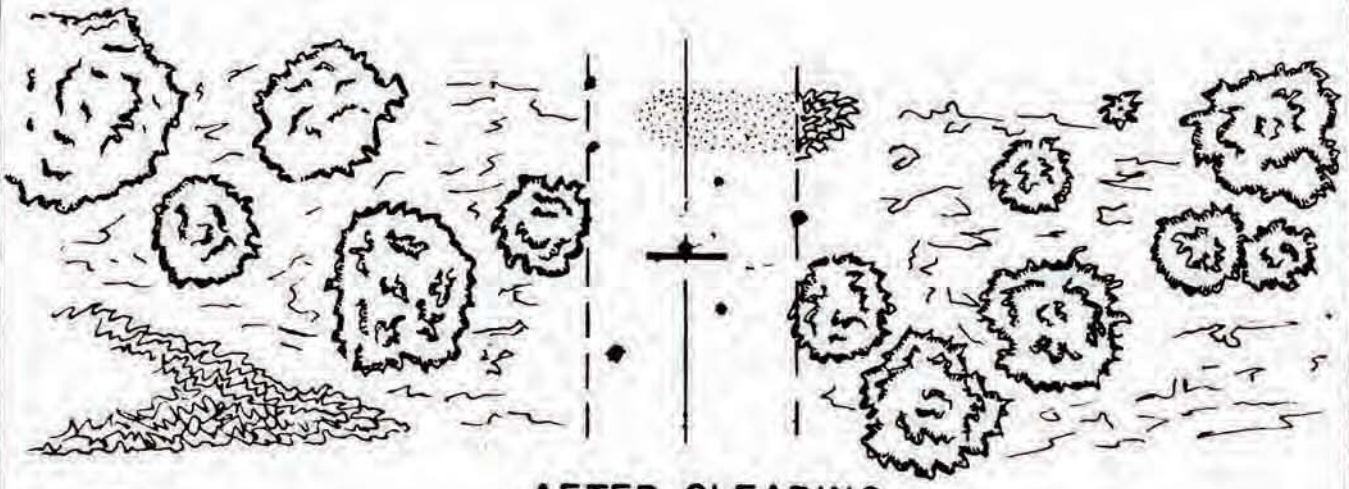
NEUTRAL IDENTIFICATION AND POLE NUMBERING GUIDE

NOV. 1986

M52-3, M52-4



ELEVATION



AFTER CLEARING

BEFORE CLEARING

CLEARING RIGHT-OF-WAY GUIDE

NOV. 1986		RI

*U.S. Government Printing Office : 1987 201-061/60728