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INFORMATION SHEET

PRESIDING: Finley, Beatty, Brown-Bland, Dockham, Patterson, and Clodfelter
PLACE: Dobbs Building, Raleigh, NC
DATE: Wednesday, November 8, 2017
TIME: 2:00 p.m. – 5:00 p.m.
DOCKET NO.: EC-23, Sub 50
COMPANY: Blue Ridge Electric Membership Corporation
DESCRIPTION: Blue Ridge Electric Membership Corporation, Petitioner, -v- Charter Communications Properties, LLC, Respondent
VOLUME: 2

APPEARANCES
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Marcus W. Trathen, Esq.

WITNESSES
Lee Layton
Wilfred Arnett

EXHIBITS

Petitioner's Exhibit 1 (I/A)
Layton Cross Exhibit 1 (I/A)
WA Exhibit 1 through WA Exhibit 23 (I/) (Admitted in Volume 3)
Rebuttal Exhibits WA-24 through WA-35 (I/) (Admitted in Volume 3) (Confidential WA-34 filed in Volume 3)

COPIES ORDERED: Email including Confidential: George, Trathen, Millen, Mitchell, Harden, Tilley
REPORTED BY: Kim Mitchell
TRANSCRIBED BY: Kim Mitchell
DATE TRANSCRIBED: December 29, 2017
TRANSCRIPT PAGES: 136
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Filed Jan. 8th

NORTH CAROLINA UTILITIES COMMISSION
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APPEARING FOR: BLUE RIDGE EMC

APPLICANT ____ COMPLAINANT ✓ INTERVENO R ____
PROTESTANT ____ RESPONDENT ____ DEFENDANT ____

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APPEARING FOR: BLUE RIDGE EMC

APPLICANT _____ COMPLAINANT ✓ INTERVENO R _____
PROTESTANT _____ RESPONDENT _____ DEFENDANT _____

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APPLICANT _____ COMPLAINANT ✓ INTERVENO R _____
PROTESTANT _____ RESPONDENT _____ DEFENDANT _____

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APPEARING FOR: Charter Communications

APPLICANT ____ COMPLAINANT ____ INTERVENO R ____
PROTESTANT ____ RESPONDENT ✓ DEFENDANT ____

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APPEARING FOR: Charter Communications

APPLICANT ____ COMPLAINANT ____ INTERVENO R ____
PROTESTANT ____ RESPONDENT ✓ DEFENDANT ____

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Petitioner's Ex. 1

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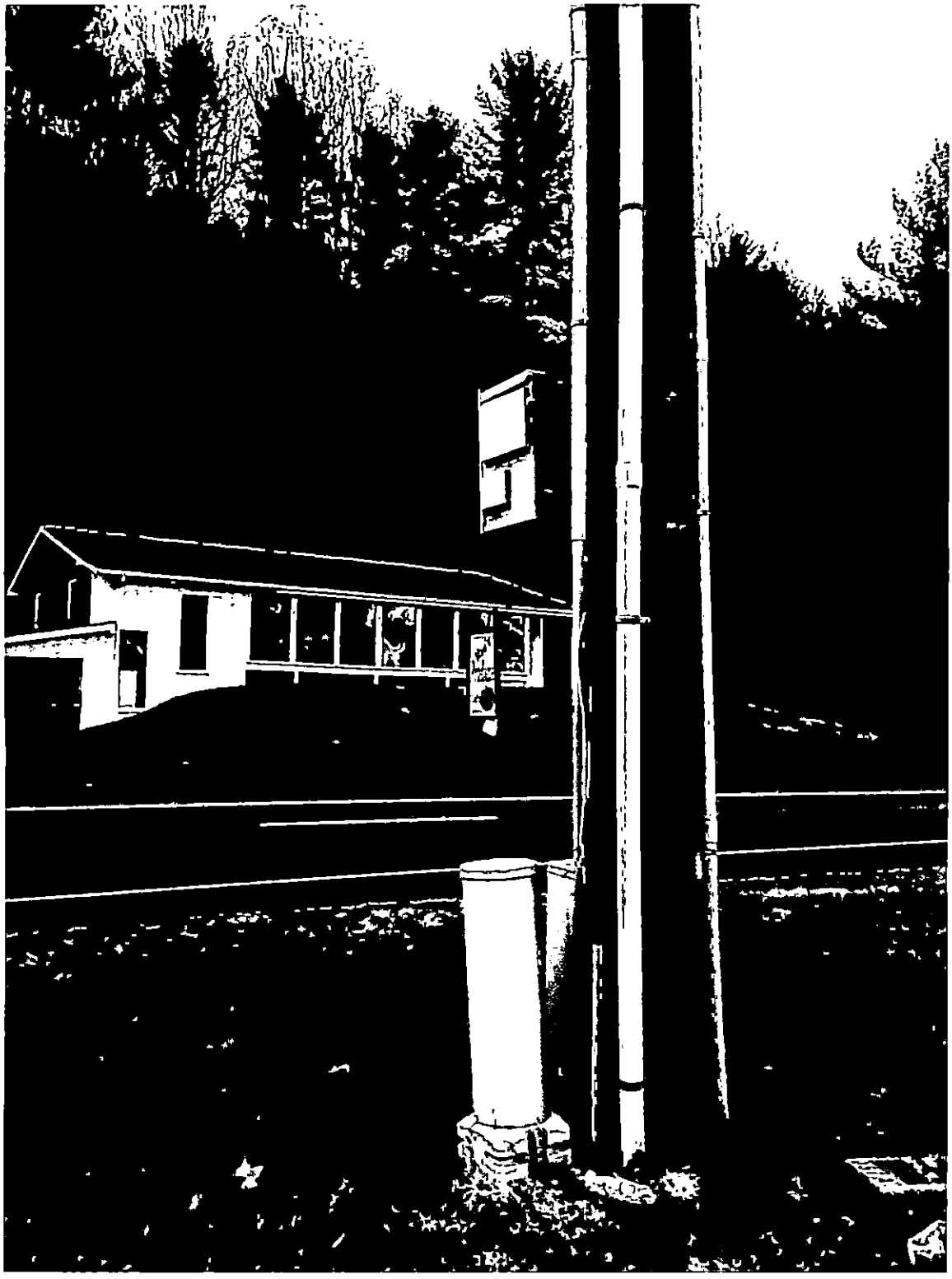


Layton Cross Ex. 1
I/A
VZ/VZ

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service

RUS BULLETIN 1728F-804

SUBJECT: **Specifications and Drawings for 12.47/7.2 kV Line Construction**

Incorporated by reference in 7 CFR Part 1728

TO: All RUS Electric Borrowers
RUS Electric Staff

EFFECTIVE DATE: October 2005

OFFICE OF PRIMARY INTEREST: Distribution Branch, Electric Staff Division

FILING INSTRUCTIONS: This bulletin is a revision of previous RUS Bulletin 50-3 (D-804), (dated May 9, 1983) "Specifications and Drawings for 12.5/7.2 kV Line Construction" and has been renumbered, renamed and updated as RUS Bulletin 1728F-804, "Specifications and Drawings for 12.47/7.2 kV Line Construction." Replace previous Bulletin 50-3 with this bulletin. This bulletin should be filed with 7 CFR 1728.

PURPOSE: The specifications and drawings of this bulletin have been published to set forth RUS requirements, specifications and standards for the construction of 12.47/7.2 kV overhead electric distribution lines and associated equipment and construction assembly units that RUS electric borrowers install.

GENERAL: This new bulletin 1728F-804 was derived from previous RUS Bulletin 50-3 identified above. Listed below are some of the significant changes and additions that were made during the update of this bulletin:

(a) RUS has discontinued 82 assemblies and 24 guide drawings previously in Bulletin 50-3. Borrowers shall no longer use these discontinued assemblies and guide drawings for new construction.

(b) A total of 167 assemblies and 8 guide drawings were re-used, redrawn, and renumbered using the new RUS standard numbering format. (New Exhibit 5 at the end of the bulletin briefly explains the new numbering format.) The new drawings of these re-used assemblies and guide drawings show in parentheses the old assembly and guide drawing numbers from Bulletin 50-3. Borrowers must use the new assembly and guide drawing numbers, however, ***borrowers may elect to continue using the old numbers of these assembly and guide drawings, but only for the 167 assemblies and 8 guide drawings and their old numbers if they make the following changes:***

(1) Make washer additions or changes on 37 of the re-used assemblies, and,

(2) Make other slight material changes to 35 of the old assemblies.

(c) Exhibit 3 at the end of this bulletin tabulates: (1) all of the discontinued assemblies and guide drawings of old Bulletin 50-3, (2) all of the re-used assemblies and guide drawings with both their old and new numbers, and (3) the required washer and material changes (if any) in the transition from the re-used old assembly to the new assembly.

(d) This new bulletin contains a total of 214 new assemblies (95 of which are narrow profile assemblies) and 32 new guide drawings.

(e) The bulletin has been reformatted into 19 separate sections or categories. Each of the sections contains an index of drawings and the construction drawings of assemblies designed to perform a similar function. Ten of the sections contain new and revised construction specifications and informational details pertaining to the assemblies within the section.

(f) "Design parameters", which define and usually limit maximum line angles or mechanical loading (tension), have been added to most of the drawings.

(g) New tables have been added to define maximum line angles on pole top assemblies and permitted unbalanced conductor tensions on crossarm assemblies. Page 1 of Exhibit 1 documents the formula and data used to determine the maximum line angles in the tables in Exhibit 1. Exhibit 2 documents the formula and data used to determine permitted unbalanced conductor tensions on crossarms.

(h) Each drawing has been given a new, shorter, and more uniform title or name.

(i) Three sets of coordinated "narrow profile," one, two and three-phase assemblies for all line angles have been incorporated into this bulletin.

(j) New specifications explaining the conditions that borrowers may modify the assemblies and drawings of this bulletin are provided in the "General Construction Specifications."

(k) New specifications and conditions for the use of stirrups were added in Section L.

(l) New specifications and conditions for grounding or insulating guy wires were added in Section G.

Curtis M. Anderson
Acting Administrator
Rural Utilities Service

April 1, 2005
Date

BULLETIN 1728F-804: INDEX

BULLETIN 1728F-804: INDEX *(Continued)*

BULLETIN 1728F-804: INDEX *(Continued)*

GENERAL CONSTRUCTION SPECIFICATIONS

All construction shall be performed in a safe, thorough, and skillful manner in accordance with the staking sheets, plans and specifications, and the construction drawings.

The provisions of 7 CFR 1724.50, "Compliance with National Electrical Safety Code (NESC)" apply to all borrower electric system facilities regardless of the source of financing. A borrower must ensure that its electric system including all distribution, transmission, and generating facilities, is designed, constructed, operated, and maintained in accordance with all of the applicable provisions of:

(1) the most current provisions of the NESC, and

(2) all applicable and current electrical and safety requirements of any State or local governmental entity.

Any electrical standard requirements established by RUS are in addition to, and not a substitution for nor modification of (1) and (2) listed immediately above.

The permitted loading, strength, and spacing (separation) of structures, assemblies and conductors shown on the assembly drawings in this bulletin are based on and are in compliance with the 2002 Edition of the NESC.

Copies of the NESC may be obtained from the Institute of Electrical and Electronics Engineers, Inc., (IEEE) at the following address:

IEEE Customer Service
445 Hoes Lane, PO Box 1331
Piscataway, NJ 08855-1331
Telephone: 1-800-678-4333

Overhead distribution circuits shall be constructed with not less than the Grade C strength requirements as described in section 26, Strength Requirements, of the NESC when subjected to the loads specified in NESC Section 25, Loadings for Grades B and C. Distribution lines that underbuild transmission circuits or that cross over limited access highways and railroad tracks shall be constructed with not less than the Grade B strength requirements as described in NESC Section 26.

The drawings of equipment and materials shown in the construction assemblies depict the general categories of items found in RUS Informational Publication 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers" ("List of Materials"). Any drawing of any piece of equipment or material that resembles a specific product of a manufacturer is unintentional.

GENERAL CONSTRUCTION SPECIFICATIONS (*Cont.*)

Materials to be used for construction are designated by one or two lower-case alphabetic characters shown on the drawings and in the "ITEM" column in the drawing material blocks. For example, "b" designates a steel, pole top pin. A borrower shall use, at its discretion, any of the applicable pole top pins from category "b" of the "List of Materials

The drawings in this bulletin show the use of two, 4 1/4 inch, American National Standards Institute (ANSI) Class 52-9A suspension insulators for 12.47/7.2 kV primary deadends. However, borrowers may alternatively use two, 6-inch, ANSI Class 52-1 suspension insulators, or one polymer distribution insulator, all of which are contained in category "k" in the "List of Materials." In the case of polymer insulators, the quantity ("QTY") of the insulators to be used must be modified accordingly in the material blocks of the drawings.

Normally crossarm pins and post-type insulators come equipped with washers and locknuts. Thus, the washers and locknuts for crossarm pins are not tallied in the "QTY" (quantity) columns in the material boxes on the construction drawings. However, the crossarm pin washers and locknuts are shown on the construction drawings in parenthesis to depict proper construction. If crossarm pins or post type insulators are purchased without washers, locknuts or studs, the quantity totals in the material boxes on the construction drawings will need to be adjusted accordingly.

Locknuts shall be installed on all threaded material and hardware in addition to nuts and washers. The threads on installed bolts shall protrude past the lock washers a minimum of one inch but not more than two inches.

Sometimes it may be prudent or necessary to modify RUS standard distribution assemblies to solve encountered construction problems. For example, a standard C6.1 assembly may need to be modified with heavy-duty crossarm braces (assembly W3.2) to support large conductors. RUS has not produced the scores of new assemblies like the example because the resulting bulletin would be quite unwieldy. Therefore, borrowers themselves may develop and use assemblies similar to the example without additional RUS approval. Borrowers' assemblies not specifically approved by RUS shall not have component spacing less than, or permitted longitudinal loads (strengths) greater than those on correlated RUS standard assemblies. Borrowers need to properly account for the new assembly material and assign assembly numbers recognizably different than RUS standard assembly numbers.

RUS approval and assembly number changes are not required to add the following types of information to RUS assembly drawings: material inventory numbers, bolt lengths, jumper wire sizes, types of connectors, armor rods, etc.

CONDUCTOR INSTALLATION SPECIFICATIONS

Conductors shall be handled with care and shall not be trampled on or run over by vehicles. Each reel shall be examined and the wire shall be inspected for cuts, kinks, or other damage. Damaged 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 to prevent binding or damage while stringing.

Conductors shall be sagged evenly and in accordance with the conductor manufacturer's recommendations. The air temperature at the time and place of sagging shall be determined by the use of a certified thermometer. The sag of all conductors after stringing shall be in accordance with the engineer's instructions.

For new construction, splices shall be no closer than 1,000 feet from one another and there shall be no more than 3 splices per mile in any primary phase or neutral conductor. Furthermore, splices shall not be located within 10 feet of any supporting structure. For all construction, splices shall not be located in Grade B crossing spans and preferably not in adjacent spans. Splices shall be installed in accordance with the manufacturer's specifications and recommendations.

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

CONSTRUCTION SPECIFICATIONS FOR POLE TOP ASSEMBLIES

The neutral conductor shall be installed on the same side (preferably the roadside) of all tangent and small angle poles throughout each line section. See "Construction Specifications for Poles and Crossarms" in Section W of this bulletin for additional pole and crossarm construction specifications.

Neutral attachments may be lowered on standard pole top assemblies a distance not exceeding 2 feet for the purpose of economically meeting conductor clearance requirements of the NESC.

Neutral attachments may be lowered on standard pole top assemblies a distance not exceeding an additional 6 feet for the purpose of performing construction and future line maintenance on these assemblies from bucket trucks designed for such work.

The conductor shall be tied to the top groove of pin-type or post-type insulators on tangent poles. On angle structures the conductor shall be tied on the side of the insulator opposite the direction of the strain. Pin-type and post-type insulators shall be tight on the pins and brackets, respectively, and the top groove shall be in line with the conductor after tying. Borrowers shall not allow any upstrain on pin-type or post-type insulators.

A 3 inch by 3 inch (minimum), square, curved washer (item "d") shall be used abutting the pole when installing primary deadend, neutral deadend and guy assemblies directly to the pole. These washers mitigate the crushing of wood fibers and facilitate the permitted longitudinal loads shown on the construction drawings.

A 2 ¼ inch (minimum) square washer shall be placed under the shoulder of 7.2 kV crossarm insulator pins whose surface area abutting the crossarm is less than 4 square inches. These washers mitigate the crushing of wood fibers and facilitate the permitted transverse loading shown in the maximum line angle tables in Exhibit 1.

The maximum line angles on tangent construction assemblies shall be limited to 5 degrees for small conductors and 2 degrees for conductors larger than # 1/0 because of likely slippage of the neutral conductor off of a spool-type insulator. Furthermore, based on additional calculations by the design engineer, these maximum line angles may need to be reduced for NESC Grade B construction.

Deadend and suspension angle pole top assemblies attached directly to poles shall be designed to hold the sum of all expected loads multiplied by the appropriate overload factors of NESC Table 253-1.

RUS has applied the applicable strength factors for Grade C construction from NESC Table 261-1A in the calculations for permitted longitudinal loading shown in the design parameters on the drawings. The permitted longitudinal loading on primary deadend assemblies attached directly to poles is based on 50 percent of the rated ultimate strength of the suspension insulators shown on the assembly drawings.

CONSTRUCTION SPECIFICATIONS FOR POLE TOP ASSEMBLIES *(cont.)*

The maximum line angles for pole top primary assemblies in the tables in Exhibit 1 are based on the RUS designated maximum load on crossarm insulator pins, post type insulators, or pole top pins and the assumed conductor tensions tabulated on page 1 of Exhibit 1. The applicable overload factors from NESC Table 253-1, for Grade C construction, have already been applied in the calculations for the maximum line angles. For large conductor sizes, the design engineer may need to calculate new (smaller) maximum line angles for NESC Grade B construction.

The permitted unbalanced conductor tensions on primary deadend assemblies attached to crossarms are based on the results of the equations and methodology explained in Exhibit 2 of this bulletin. RUS has applied the overload factors of NESC Table 253-1 and used the assumed conductor tensions tabulated on page 1 of Exhibit 1 to calculate the permitted unbalanced conductor tensions shown in Tables A and B of Exhibit 2 of this bulletin. The permitted unbalanced conductor tensions on crossarm assemblies shall be reduced by 40 percent for NESC Grade B construction.

RUS categorizes conductor sizes as follows:

- **Small conductors** are conductors with a rated breaking strength of less than 4,500 pounds (20,000 newtons), e.g., 1/0 Aluminum Conductor - Steel Reinforced (ACSR) and smaller.

- **Large conductors** are conductors with a rated breaking strength of 4,500 pounds (20,000 newtons) or greater but less than 10,000 pounds (45,000 newtons), e.g., 2/0 ACSR through 4/0 ACSR or 336.4 kcmil (18/1) ACSR.

- **Extra large conductors** are conductors with a rated breaking of 10,000 pounds (45,000 newtons) or greater, e.g., 266.8 kcmil (26/7) ACSR and larger.

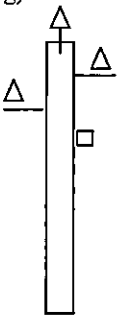
Primary pole top assemblies identified as "large conductors" in the drawing titles shall be used to support large and extra large conductors. Large conductor assemblies may also be used for small conductors. Furthermore, large and extra large conductors may be installed on assemblies not designated as large conductors provided that the expected transverse or longitudinal loads (multiplied by the appropriate NESC overload factors) do not exceed the permitted loads or tensions shown on the design parameters of the drawings. For any conductor size, the horizontal, vertical or transverse loads shall not exceed the permitted strength of crossarms, crossarm pins, insulators, or insulator bracket assemblies. Usually, extra large conductors require that pin type and post type insulators have a "C" neck for conductor sizes up through 477.0 (18/1) ACSR and "J" necks for conductor sizes up to 795 kcmil, depending on the armor rods selected.

NARROW PROFILE ASSEMBLIES GROUPED BY BRACKET CONFIGURATION

"STANDARD" ASSEMBLIES (1-foot, 9-inch spacing)

(APPLICATIONS: Convert existing standard 1-phase; Standard pole framing)

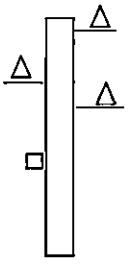
MAX. LINE ANGLES	1-PHASE	2-PHASE	3-PHASE
Tangent	A1.1, A1.2	**B1.1N, B1.2N**	**C1.1N, C1.2N**
"	A1.1P, A1.2P	**B1.1NP, B1.2NP**	**C1.1NP, C1.2NP**
" (NESC Grade B)	A2.1, A2.2	**B2.1N, B2.2N**	**C2.1N, C2.2N**
" (NESC Grade B)	A2.1P, A2.2P	**B2.1NP, B2.2NP**	**C2.1NP, C2.2NP**
Table I	A1.3	**B1.3N**	**C1.3N**
Table II	A1.3P	**B1.3NP**	**C1.3NP**
Table III	A2.3	**B2.3N**	**C2.3N**
Table III			**C2.3NG**
Table IV	A2.3P	**B2.3NP**	**C2.3NP**



"STAGGERED" ASSEMBLIES (2-foot spacing)

(APPLICATIONS: New construction; Transmission underbuild)

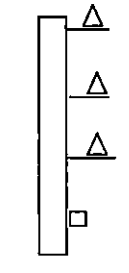
MAX. LINE ANGLES	1-PHASE	2-PHASE	3-PHASE
Tangent	**A1.4N, A1.5N**	**B1.4N, B1.5N**	**C1.4N, C1.5N**
"	**A1.4NP, A1.5NP**	**B1.4NP, B1.5NP**	**C1.4NP, C1.5NP**
" (NESC Grade B)	**A2.4N, A2.5N**	**B2.4N, B2.5N**	**C2.4N, C2.5N**
" (NESC Grade B)	**A2.4NP, A2.5NP**	**B2.4NP, B2.5NP**	**C2.4NP, C2.5NP**
Table II	**A1.6N**	**B1.6N**	**C1.6N**
Table II	**A1.6NP**	**B1.6NP**	**C1.6NP**
Table IV	**A2.6N**	**B2.6N**	**C2.6N**
Table IV	**A2.6NP**	**B2.6NP**	**C2.6NP**



"VERTICAL" ASSEMBLIES (4-foot spacing)

(APPLICATIONS: Large line angles; Tree and building clearances)

MAX. LINE ANGLES	1-PHASE	2-PHASE	3-PHASE
Tangent		**B1.7N, B1.8N**	**C1.7N, C1.8N**
"		**B1.7NP, B1.8NP**	**C1.7NP, C1.8NP**
" (NESC Grade B)	(Same as	**B2.7N, B2.8N**	**C2.7N, C2.8N**
" (NESC Grade B)		**B2.7NP, B2.8NP**	**C2.7NP, C2.8NP**
Table II	"Staggered"	**B1.9N**	**C1.9N**
Table II		**B1.9NP**	**C1.9NP**
Table IV	Assemblies)	**B2.9N**	**C2.9N**
Table IV		**B2.9NP**	**C2.9NP**



MISC. ASSEMBLIES

A1.04N, A1.04NP	Single support brackets and insulators (Single-phase, Table II)
A2.04N, A2.04NP	Double support brackets and insulators (Single-phase, Table IV)
A5.3NG	Single-phase tap guide (Narrow profile)
A5.4NG	Single-phase tap guide with cutout and arrester (Narrow profile)
D1.4N, D1.4NP	Single support - Double-circuit ("Staggered assembly", Tangent)
D1.45, D1.5NP	Single support - Double-circuit ("Staggered assembly", Tangent)
D2.9N, D2.9NP	Double support - Double-circuit ("Vertical assembly", Table IV)
P1.1NG	Surge arrester on narrow profile bracket (Single-phase, Guide)
S1.1N	Cutout on narrow profile bracket (Single-phase)

Note: Number suffixes "N", "P", and "G" denote Narrow profile assembly, Post type insulator assembly, and Guide drawing (no materials), respectively.

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

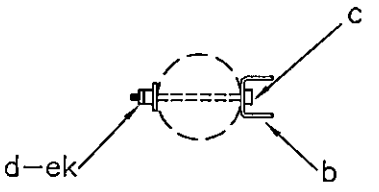
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
A1.01	(M5-2)	SINGLE SUPPORT - PRIMARY
A1.01P	(M5-18)	
A1.011	(M5-5)	
A1.011P	(M5-7)	
A1.011L		
A1.04N		SINGLE SUPPORT – NARROW PROFILE
A1.04NP		
A1.1	(A1)	SINGLE SUPPORT (TANGENT)
A1.2	(A1A)	
A1.1P	(A1P)	SINGLE SUPPORT (TANGENT) (POST INSULATORS)
A1.2P	(A1AP)	
A1.3		SINGLE SUPPORT
A1.3P		SINGLE SUPPORT (POST INSULATORS)
A1.4N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
A1.5N		
A1.4NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
A1.5NP		(POST INSULATORS)
A1.6N		SINGLE SUPPORT – NARROW PROFILE
A1.6NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
A1.11	(A9-1)	SINGLE SUPPORT ON CROSSARM
A1.11P	(A9-1P)	SINGLE SUPPORT ON CROSSARM (POST INSULATORS)
A1.12G		SINGLE PHASE JUNCTION GUIDE
A2.01		DOUBLE SUPPORT - PRIMARY
A2.01P		
A2.021		
A2.021P		
A2.04N		DOUBLE SUPPORT – NARROW PROFILE
A2.04NP		
A2.1	(A1-1)	DOUBLE SUPPORT (TANGENT)
A2.2	(A1-1A)	

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

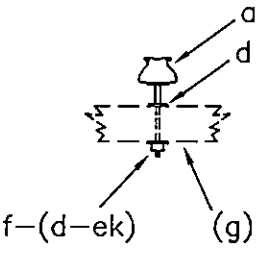
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
A2.1P	(A1-1P)	DOUBLE SUPPORT (TANGENT) (POST INSULATORS)
A2.2P	(A1-1AP)	
A2.3	(A2)	DOUBLE SUPPORT
A2.3P	(A2P)	DOUBLE SUPPORT (POST INSULATORS)
A2.4N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
A2.5N		
A2.4NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
A2.5NP		(POST INSULATORS)
A2.6N		DOUBLE SUPPORT – NARROW PROFILE
A2.6NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
A2.21	(A9)	DOUBLE SUPPORT ON CROSSARMS
A2.21P	(A9P)	DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)
A3.1	(A3)	SUSPENSION ANGLE
A3.2		
A3.3		
A3.4		SUSPENSION ANGLE
A3.5		
A3.6		
A3.7		
A3.8		
A3.9		
A4.1	(A4)	DEADEND ANGLE (90° - 150°)
A4.2		DEADEND ANGLE (15° - 90°)
A5.01	(M5-24)	SINGLE DEADENDS
A5.02	(M5-8)	
A5.03		
A5.1	(A5)	SINGLE DEADENDS
A5.2	(A5-2)	
A5.3		

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

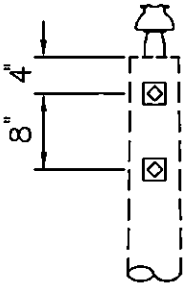
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
A5.4		SINGLE DEADENDS
A5.5		
A5.6		
A5.7		
A5.8		
A5.9		
A5.2G		SINGLE PHASE TAP GUIDE
A5.3NG		SINGLE PHASE TAP GUIDE – NARROW PROFILE
A5.4NG		SINGLE PHASE TAP GUIDE – NARROW PROFILE (WITH CUTOUT AND ARRESTER)
A5.21	(A7)	SINGLE DEADEND ON CROSSARMS
A5.31	(A7-1)	
A6.1	(A6)	DOUBLE DEADEND (STRAIGHT)
A6.2		DOUBLE DEADEND (FEED THROUGH)
A6.21	(A8)	DOUBLE DEADEND ON CROSSARMS
A6.22G		DOUBLE DEADEND GUIDE (FEED THROUGH ON CROSSARMS)

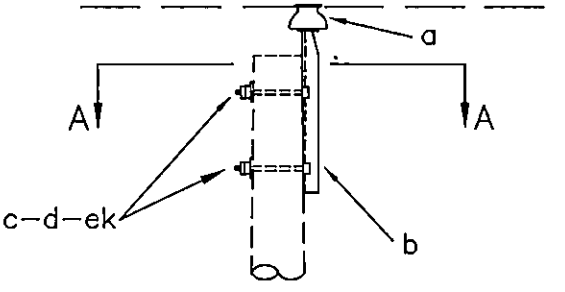


SECTION A–A

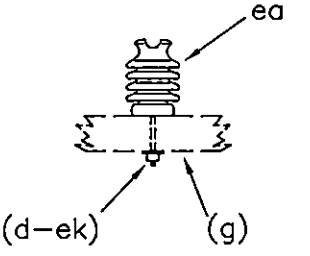


A1.011

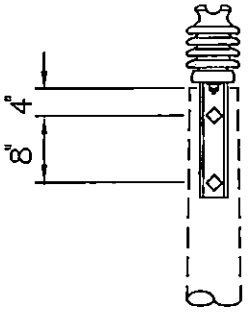


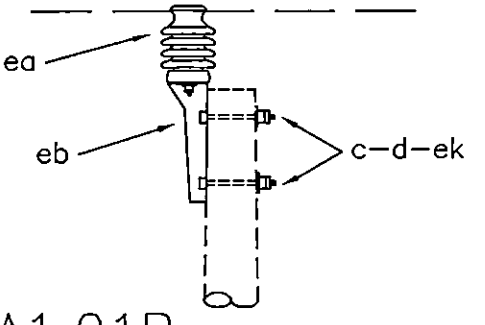


A1.01

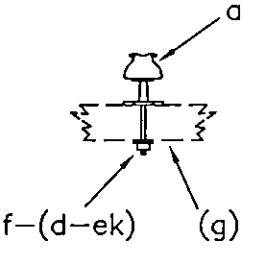


A1.011P





A1.01P



A1.011L

ASSEMBLY: A1.		01	01P	011	011P	011L
ITEM	MATERIAL	QTY	QTY	QTY	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	1		1		1
b	Pin, pole top, 20"	1				
c	Bolt, machine, 5/8" x req'd length	2	2			
d	Washer, square, 2 1/4"	2	2	1		
f	Pin, crossarm steel, 5/8" x 10 3/4"			1		
f	Pin, crossarm steel, clamp type					1
ea	Insulator, post type (12.47/7.2 kV)		1		1	
eb	Bracket, pole top		1			
ek	Locknuts	2	2			

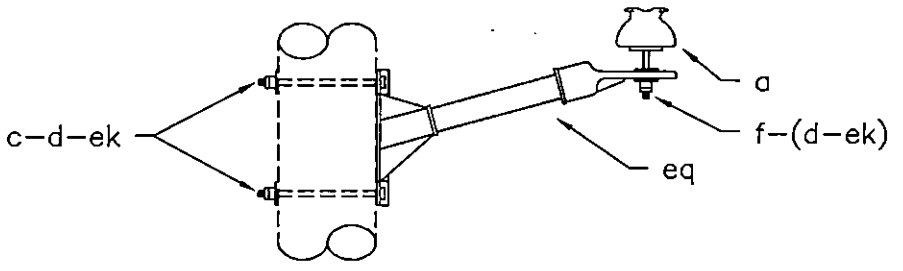
ASSEMBLY NUMBERS	
NEW	(OLD)
A1.01	(M5–2)
A1.01P	(M5–18)
A1.011	(M5–5)
A1.011P	(M5–7)
A1.011L	

DESIGN PARAMETERS:

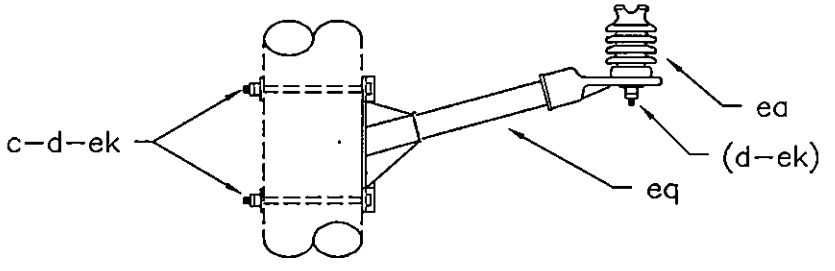
A1.01: See TABLE I
A1.01P: See TABLE II
A1.011: See TABLE II
A1.011P: See TABLE II
A1.011L: See TABLE III

SINGLE SUPPORT–PRIMARY

APRIL 2005 RUS	1 – PHASE PRIMARY 12.47/7.2 kV	A1.01,A1.01P A1.011,A1.011P A1.011L



A1.04N



A1.04NP

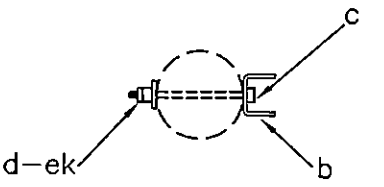
ASSEMBLY: A1.		04N	04NP	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	1		
c	Bolt, machine, 5/8" x req'd length	2	2	
d	Washer, square 2 1/4"	2	2	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)		(If req'd)
ea	Insulator, post type (12.47/7.2kV)		1	
ek	Locknuts	2	2	
eq	Bracket, insulator/equipment	1	1	

Design Parameters:

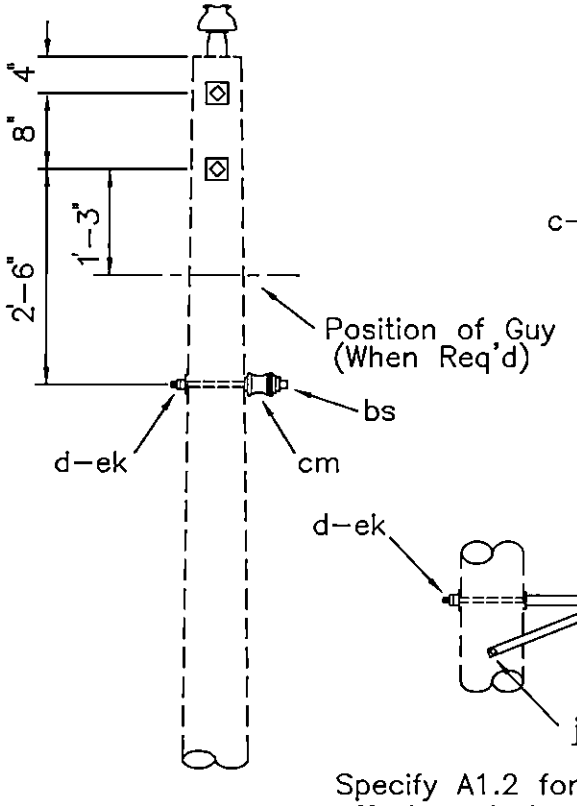
MAXIMUM LINE ANGLES:
See Table II

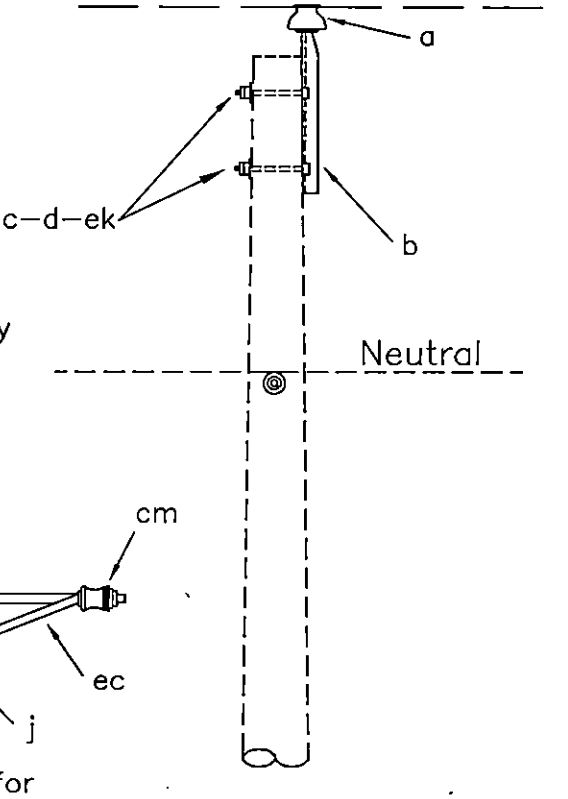
SINGLE SUPPORT–NARROW PROFILE

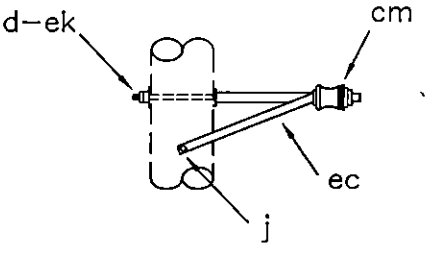
APRIL 2005	1 – PHASE PRIMARY	A1.04N
RUS	12.47/7.2 kV	A1.04NP



PLAN







Specify A1.2 for
offset neutral assembly

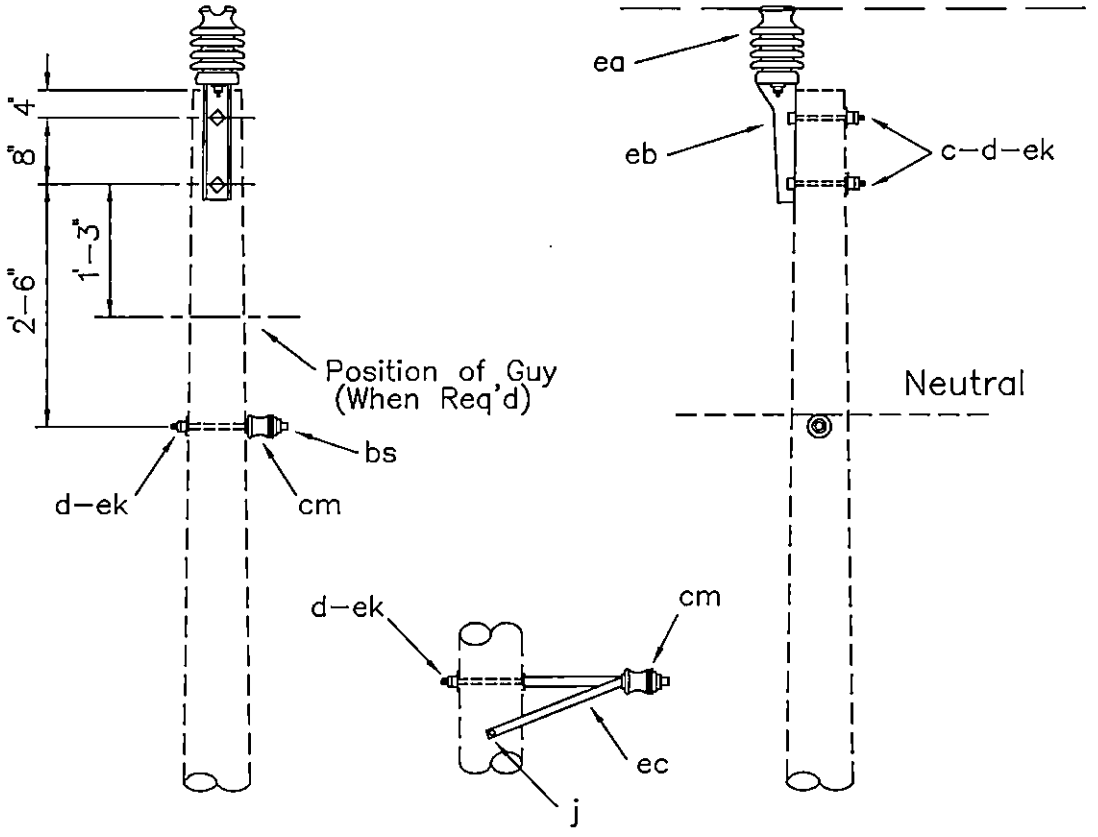
ASSEMBLY:		A1.1	A1.2
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	1	1
b	Pin, pole top, 20"	1	1
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	3	3

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT (TANGENT)

APRIL 2005	1 – PHASE PRIMARY	A1.1 (A1)
RUS	12.47/7.2 kV	A1.2 (A1A)



Specify A1.2P for
offset neutral assembly

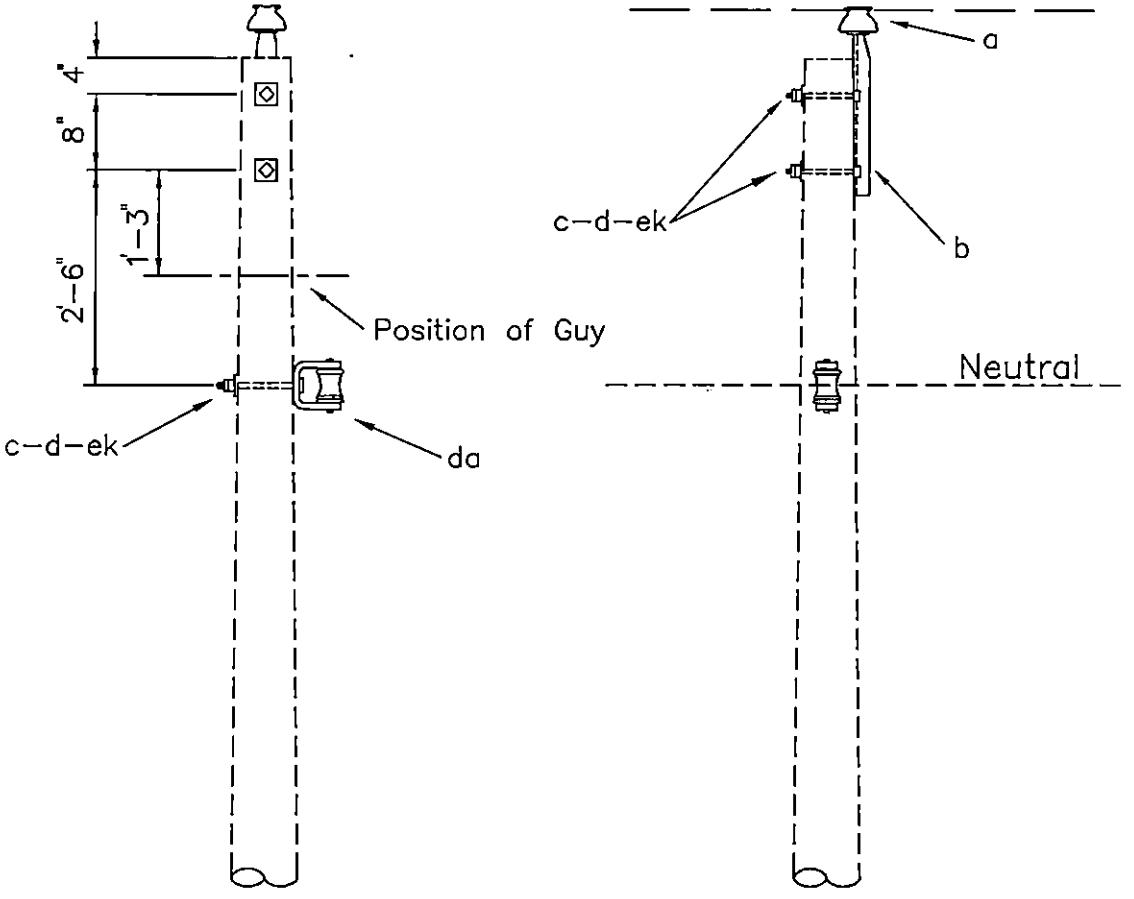
ASSEMBLY: A1		.1P	.2P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	1	1
eb	Bracket, pole top	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	3	3

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT (TANGENT)
(POST INSULATORS)

APRIL 2005 RUS	1 – PHASE PRIMARY 12.47/7.2 kV	A1.1P (A1P) A1.2P (A1AP)



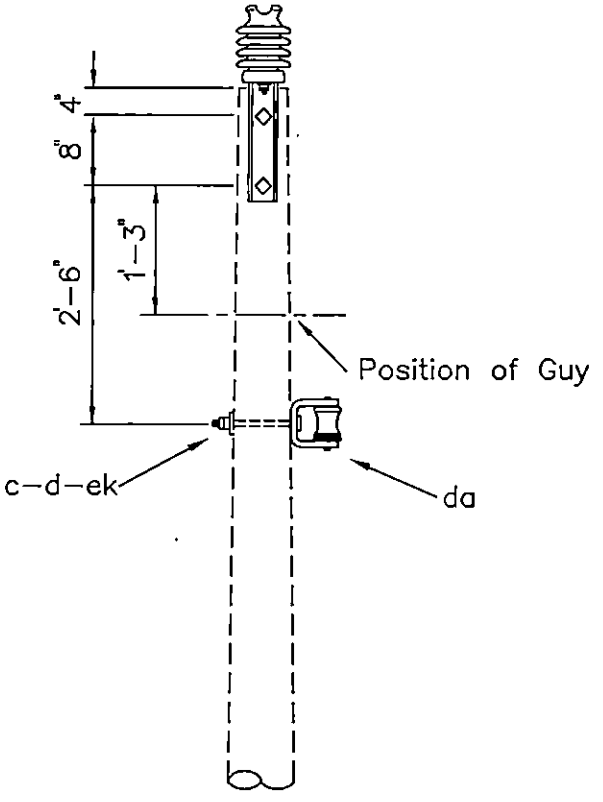
ITEM	QTY	MATERIAL
a	1	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20"
c	3	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	3	Locknuts

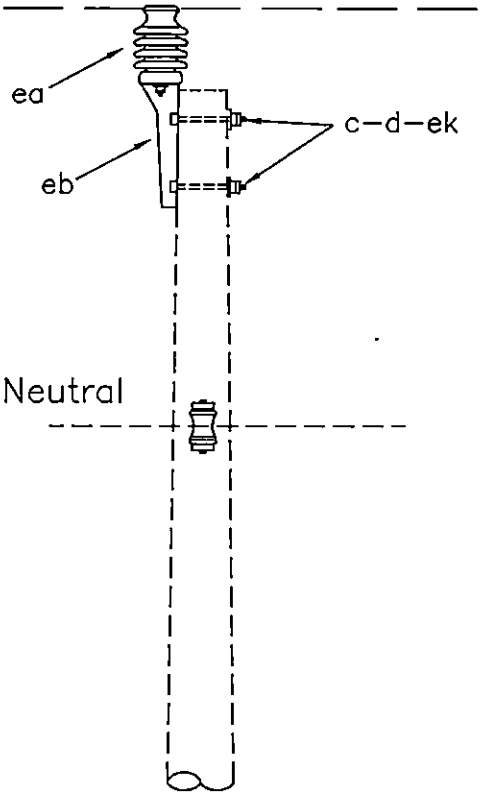
DESIGN PARAMETERS:

See TABLE I

SINGLE SUPPORT

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A1.3





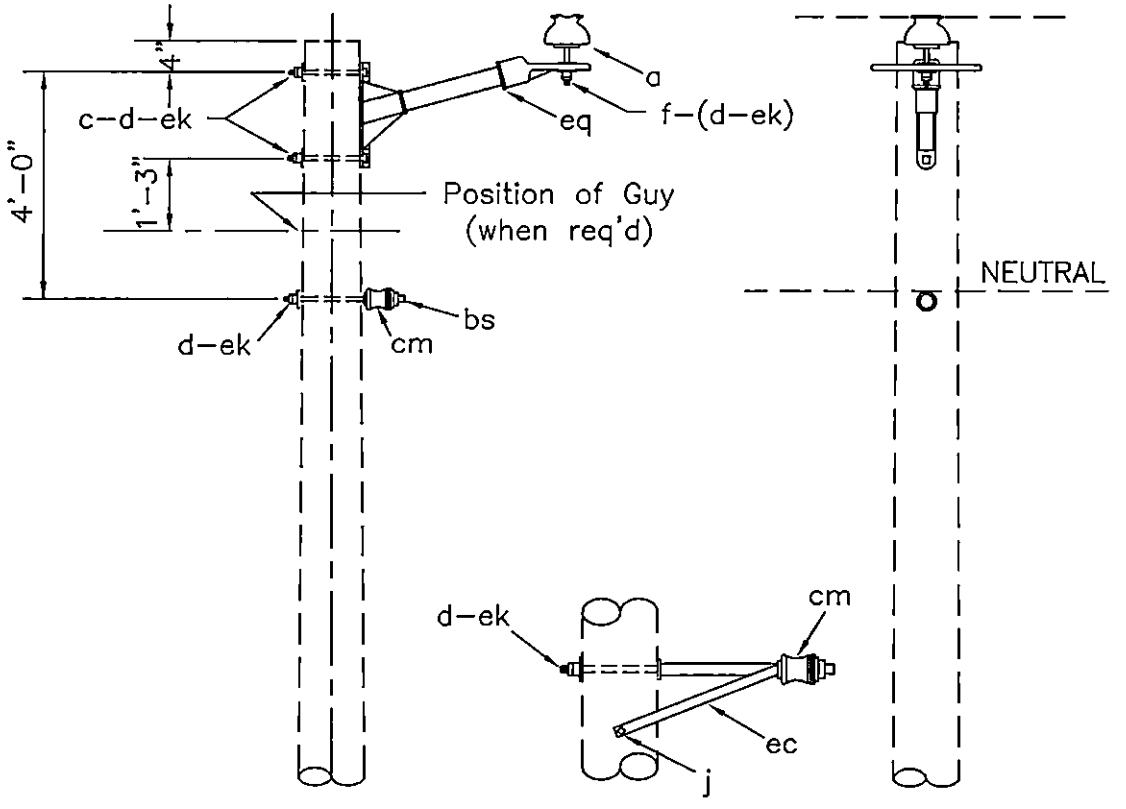
ITEM	QTY	MATERIAL
c	3	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ea	1	Insulator, post type (12.47/7.2 kV)
eb	1	Bracket, pole top
ek	3	Locknuts

DESIGN PARAMETERS:

See TABLE II

SINGLE SUPPORT
(POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A1.3P



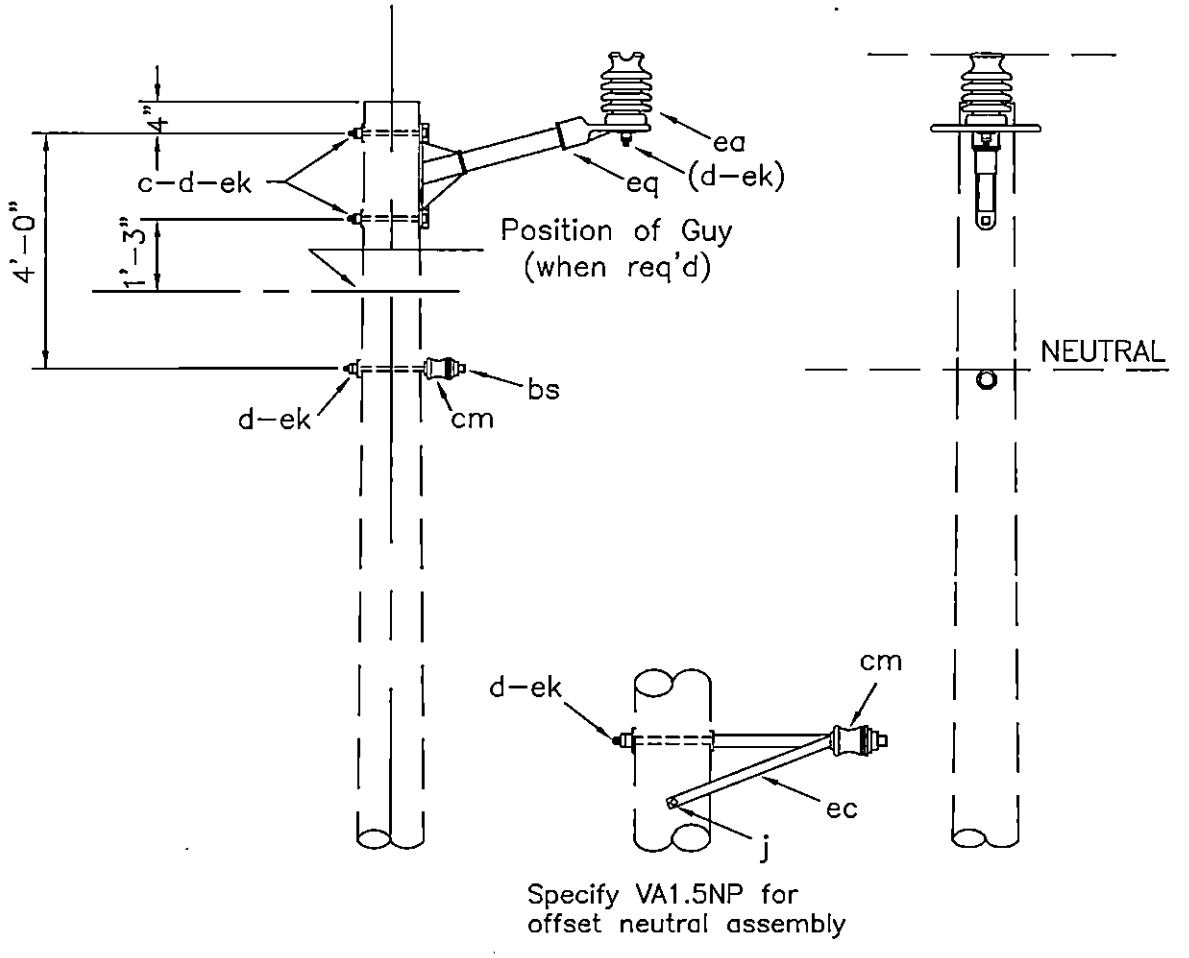
Specify A1.5N for
offset neutral assembly

ITEM	MATERIAL	Assembly: A1. 4N QTY	5N QTY	
a	Insulator, pin type (12.47/7.2 kV)	1	1	
c	Bolt, machine, 5/8" x req'd length	2	2	
d	Washer, square 2 1/4"	3	3	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)	(1)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	3	3	
eq	Bracket, insulator/equipment	1	1	

Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	1 – PHASE PRIMARY	A1.4N
RUS	12.47/7.2 kV	A1.5N



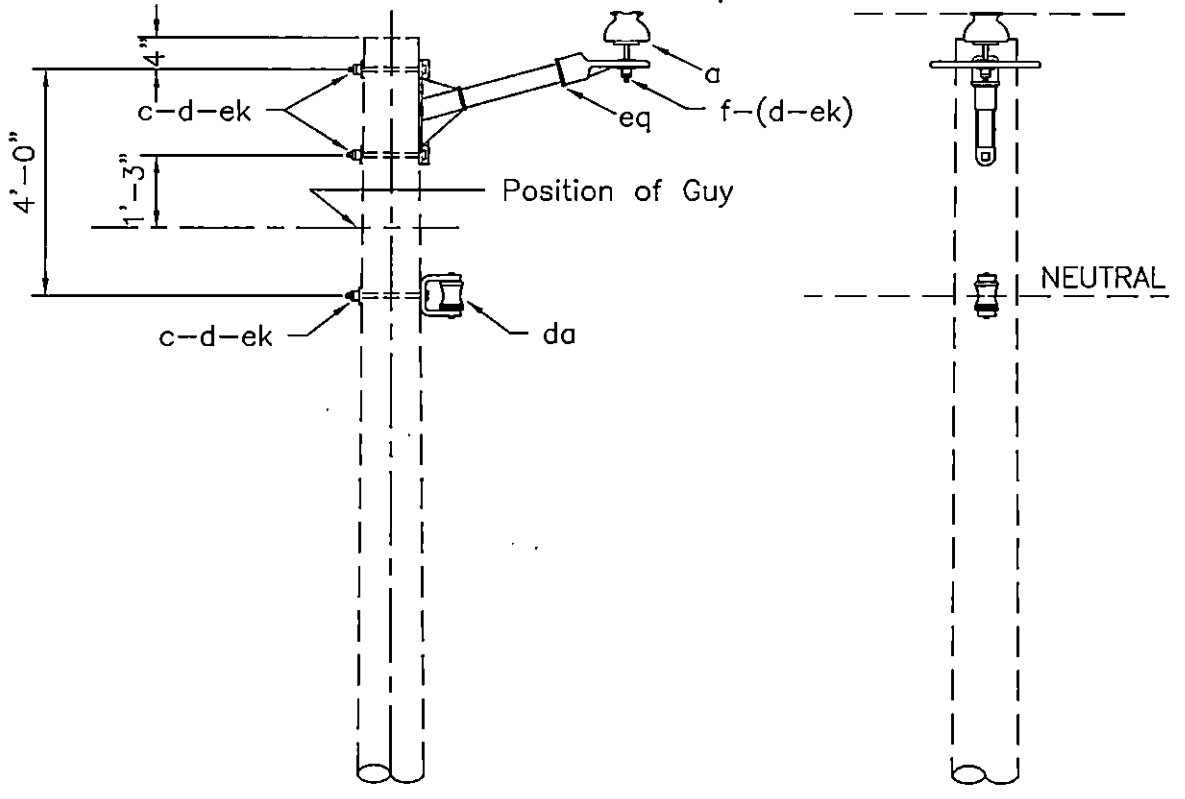
Specify VA1.5NP for offset neutral assembly

Assembly: VA1.		4NP	5NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	3	3
eq	Bracket, insulator/equipment	1	1

Design Parameters:
Maximum Line Angles
5° – Small conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	A1.4NP
RUS	12.47/7.2 kV	A1.5NP

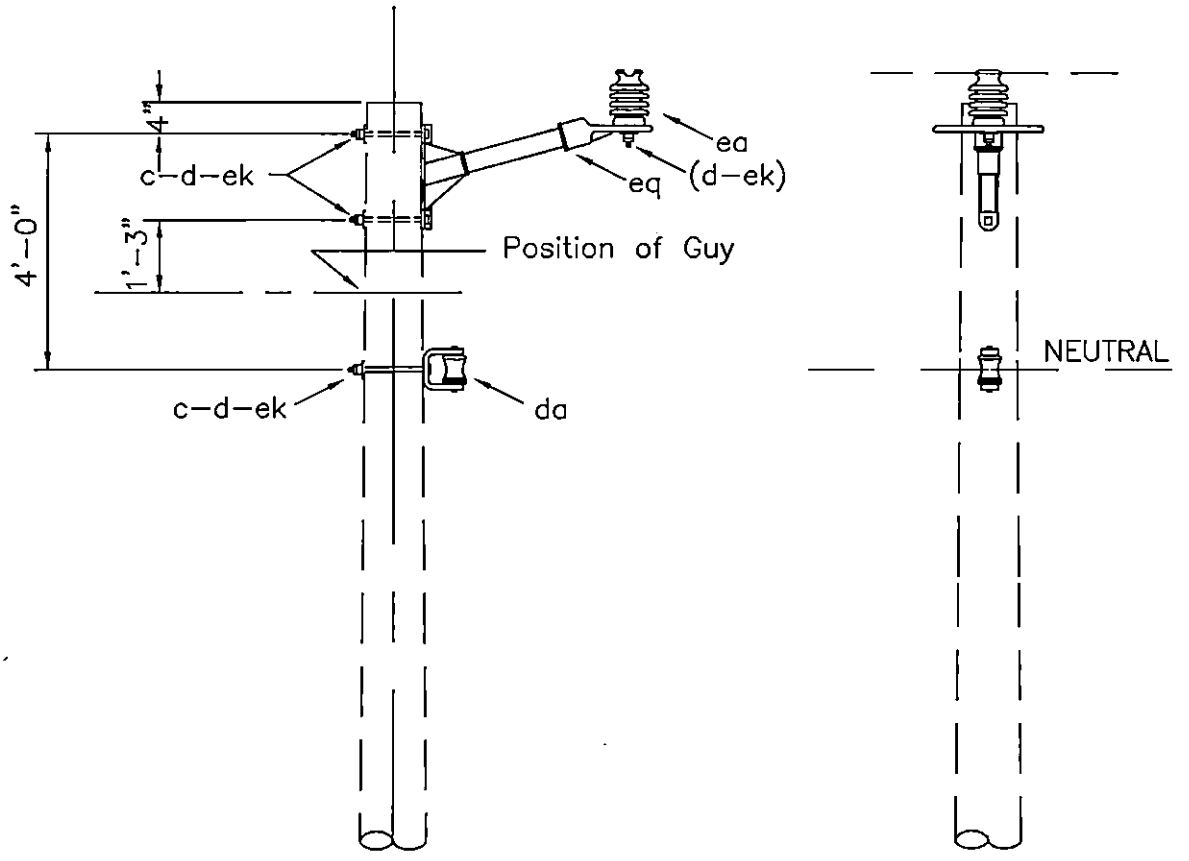


Assembly: A1.		6N	
ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	1	
c	Bolt, machine, 5/8" x req'd length	3	
d	Washer, square 2 1/4"	3	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	3	
eq	Bracket, insulator/equipment	1	

Design Parameters:
Maximum, Line Angles
See TABLE II

SINGLE SUPPORT–NARROW PROFILE

APRIL 2005	1 – PHASE PRIMARY	A1.6N
RUS	12.47/7.2 kV	



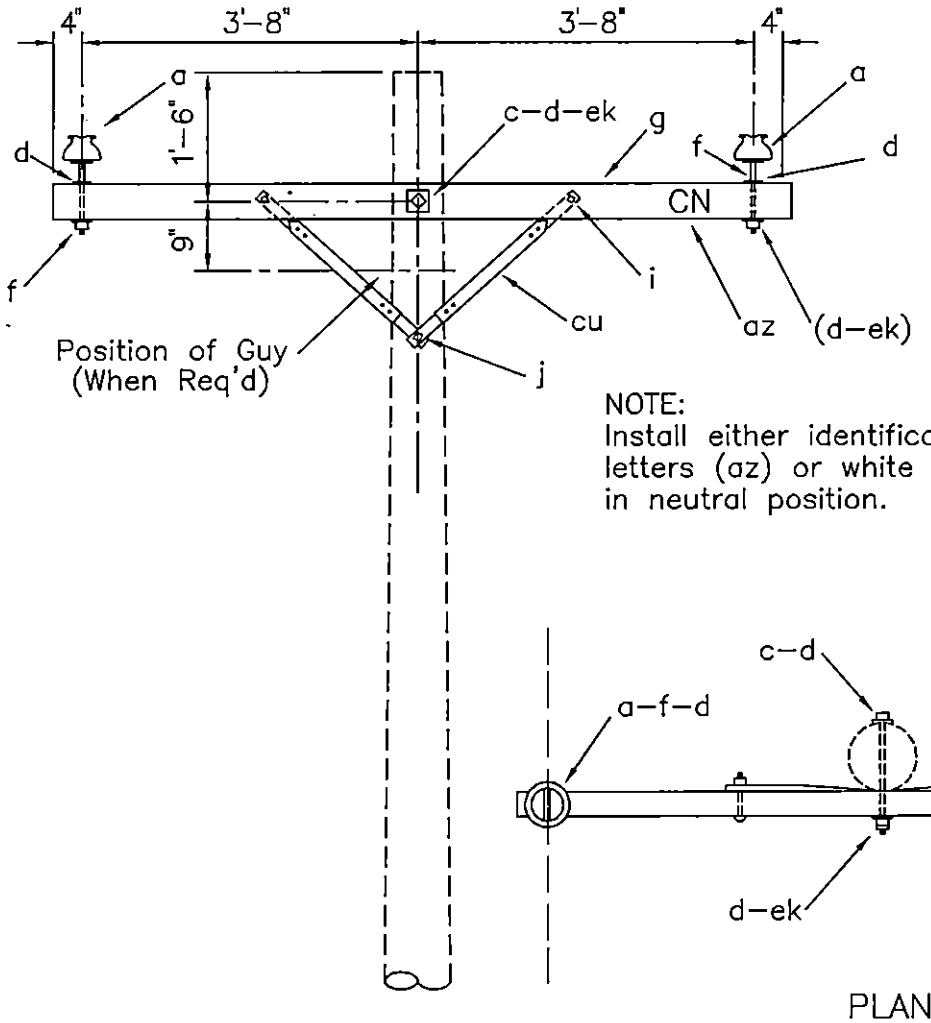
Assembly: A1.		6NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	3
d	Washer, square 2 1/4"	3
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	1
ek	Locknuts	3
eq	Bracket, insulator/equipment	1

Design Parameters:

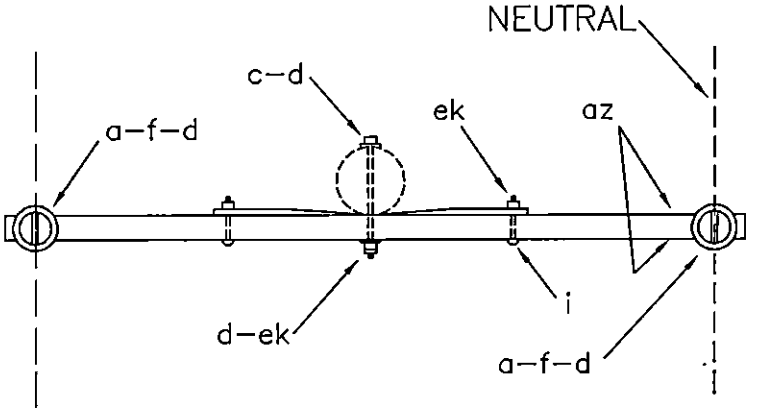
MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	A1.6NP
RUS	12.47/7.2 kV	



NOTE:
Install either identification letters (az) or white insulator in neutral position.



PLAN

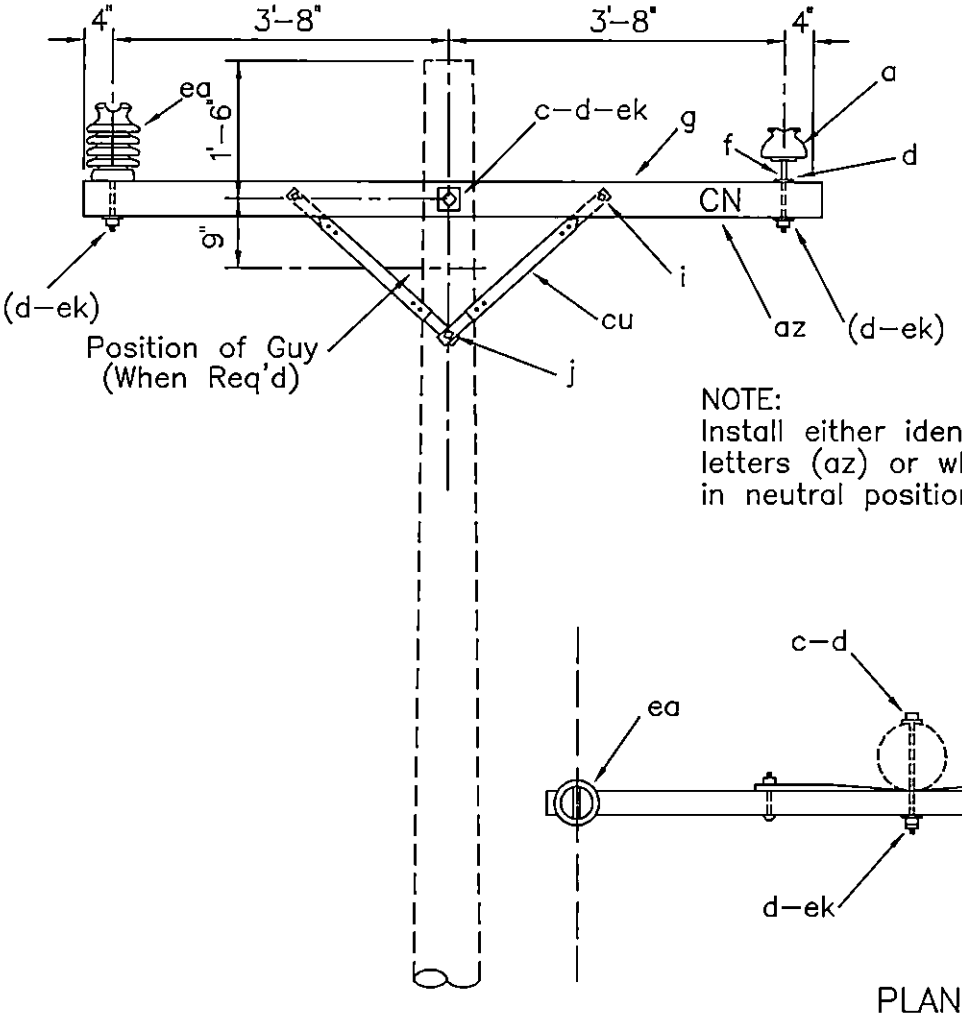
ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
a	1	Insulator, pin type (12.47/7.2 kV)
c	1	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
az	4	Letters, 2" C, 2" N, with 1" nails
cu	2	Brace, 28"
ek	3	Locknuts

DESIGN PARAMETERS:

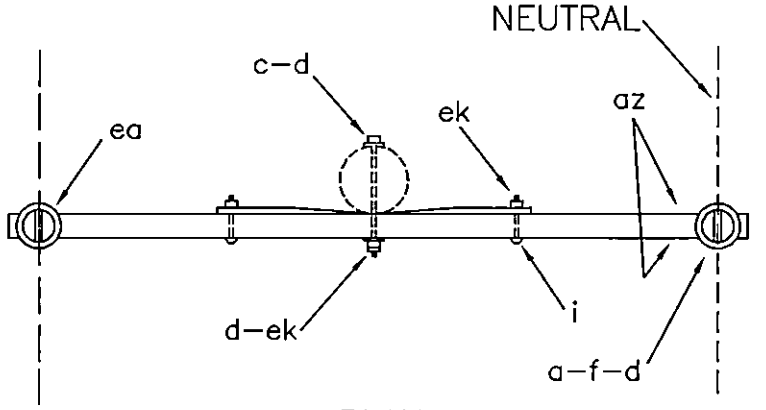
See TABLE II

SINGLE SUPPORT ON CROSSARM

APRIL 2005	1 - PHASE PRIMARY	
RUS	12.47/7.2 kV	A1.11 (A9-1)



NOTE:
Install either identification letters (az) or white insulator in neutral position.



PLAN

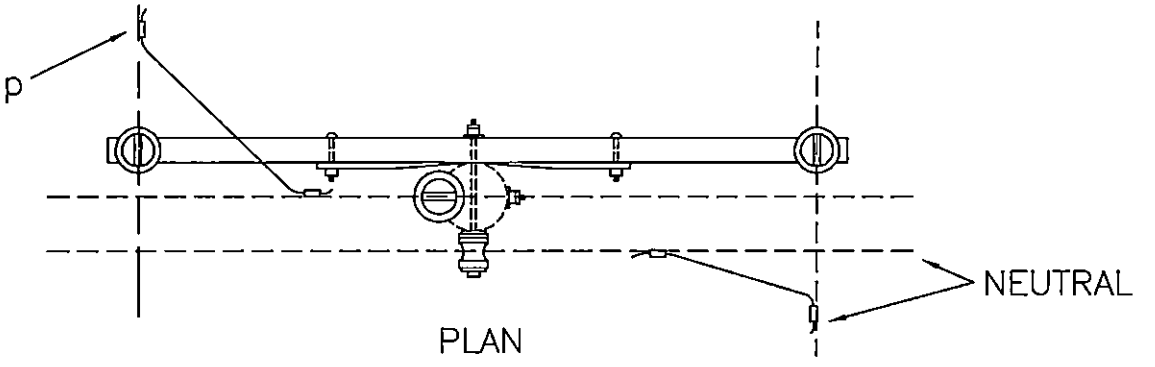
ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
c	1	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
f	1	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
az	4	Letters, 2" C, 2" N, with 1" nails
cu	2	Brace, 28"
ea	1	Insulator, post type (12.47/7.2 kV)
ek	3	Locknuts

DESIGN PARAMETERS:

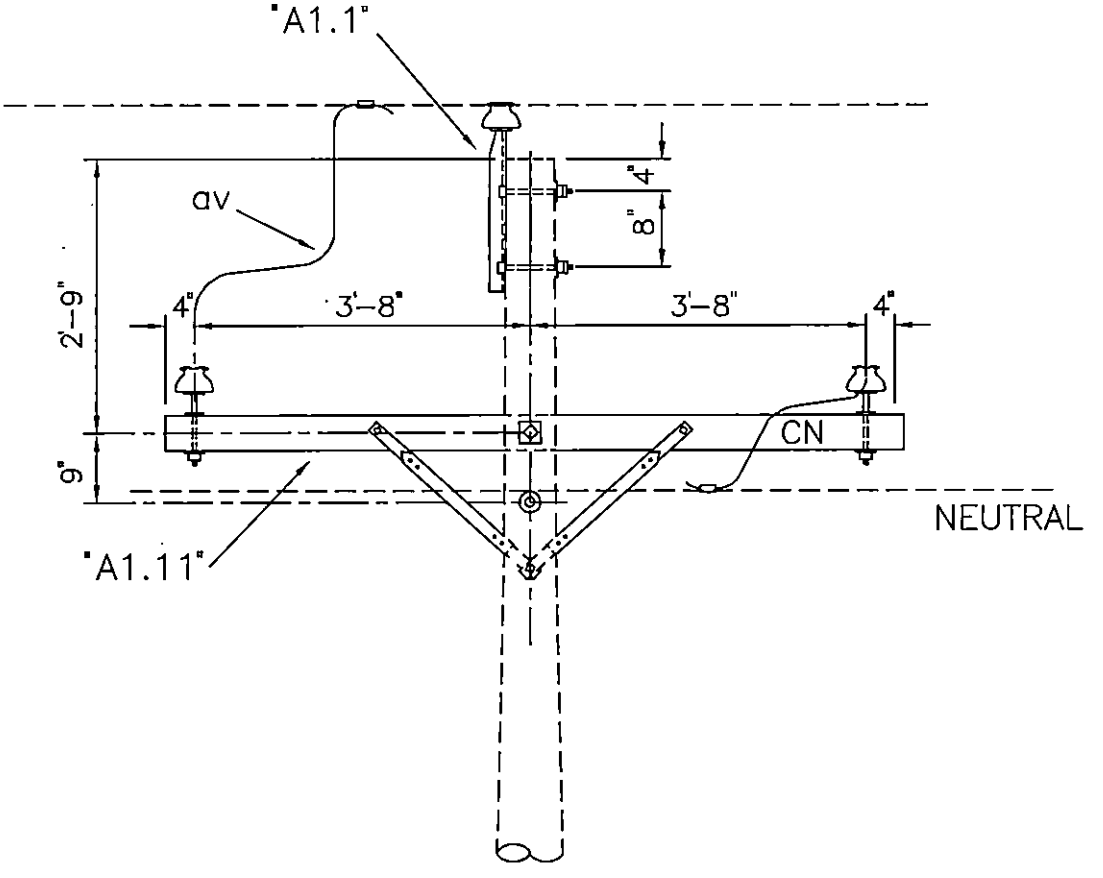
See TABLE II

SINGLE SUPPORT ON CROSSARM
(POST INSULATORS)

APRIL 2005	1 - PHASE PRIMARY	
RUS	12.47/7.2 kV	A1.11P (A9-1P)



PLAN



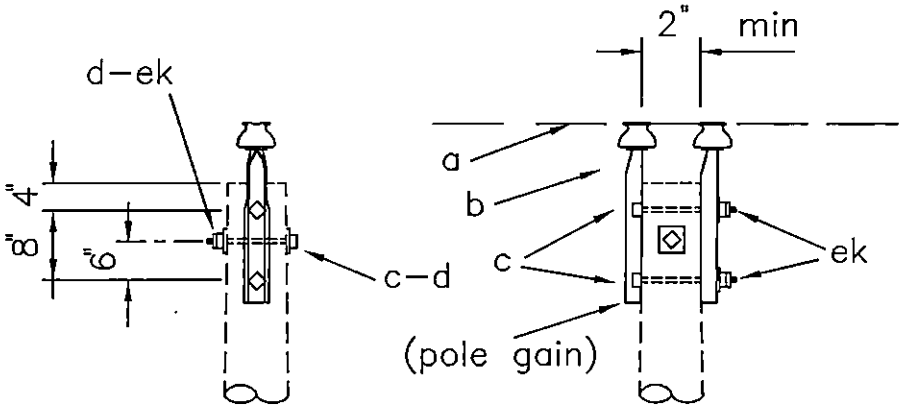
ITEM	QTY	MATERIAL
	1	A1.1 Primary Assembly
	1	A1.11 Primary Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

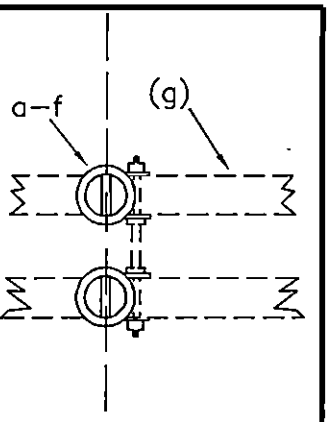
See: "A1.1"
"A1.11"

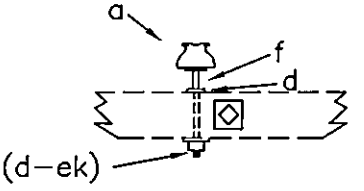
SINGLE PHASE JUNCTION GUIDE

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A1.12G

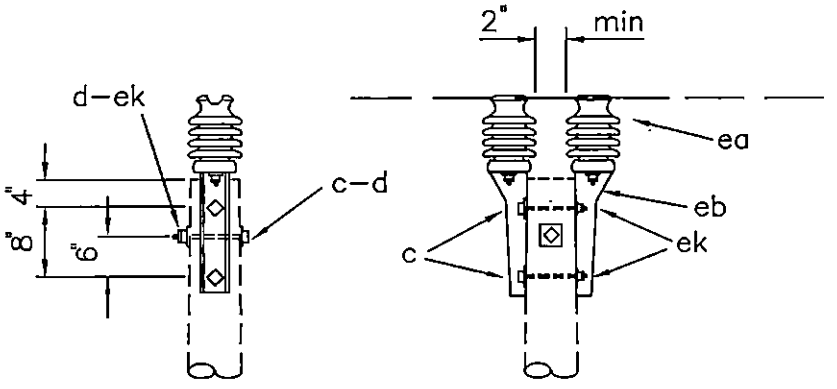


A2.01

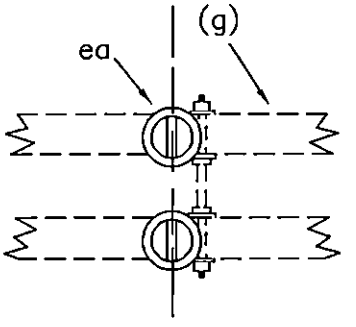


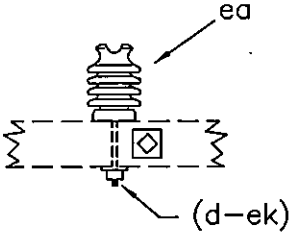


A2.021



A2.01P





A2.021P

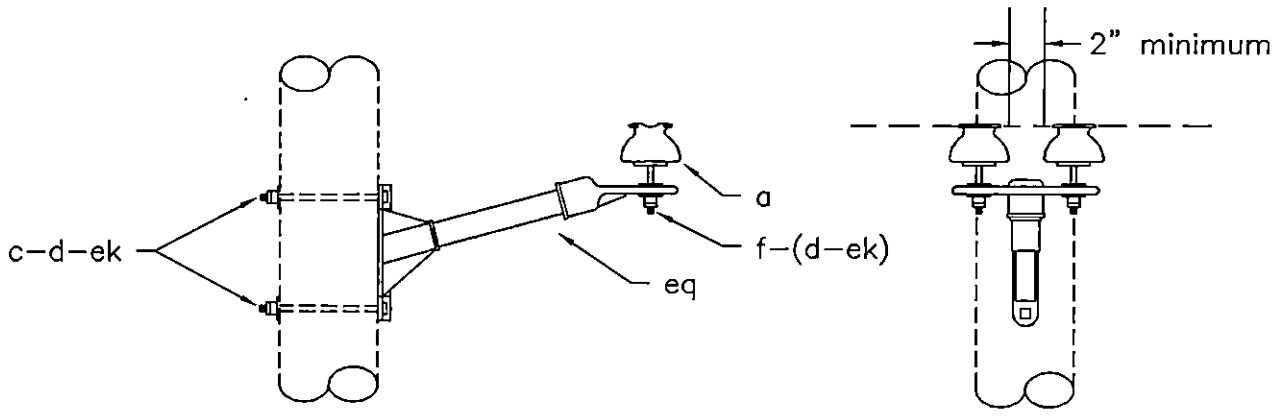
ASSEMBLY: A2.		01	01P	021	021P
ITEM	MATERIAL	QTY	QTY	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2		2	
b	Pin, pole top, 20	2			
c	Bolt, machine, 5/8" x req'd length	3	3		
d	Washer, square, 2 1/4"	2	2	2	
f	Pin, crossarm steel, 5/8" x 10 3/4"			2	
ea	Insulator, post type (12.47/7.2 kV)		2		2
eb	Bracket, pole top		2		
ek	Locknuts	3	3		

DESIGN PARAMETERS:

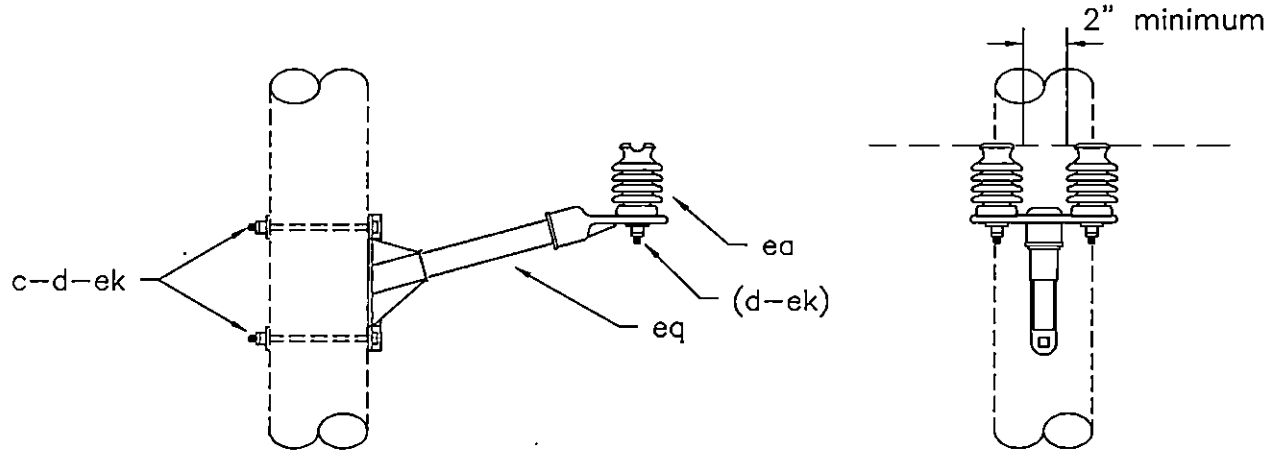
A2.01: See TABLE III
A2.01P: See TABLE IV
A2.021: See TABLE IV
A2.021P: See TABLE IV

DOUBLE SUPPORT–PRIMARY

APRIL 2005	1 – PHASE PRIMARY	A2.01,A2.01P
RUS	12.47/7.2 kV	A2.021,A2.021P



A2.04N



A2.04NP

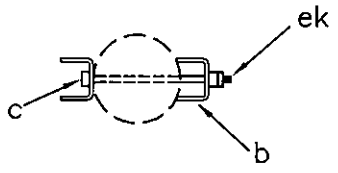
ASSEMBLY: A2.		04N	04NP
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2	
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	2	2
f	Pin, crossarm, 5/8" x 6 1/2"	2	
ea	Insulator, post type (12.47/7.2kV)		2
ek	Locknuts	2	2
eq	Bracket, insulator/equipment	1	1

Design Parameters:

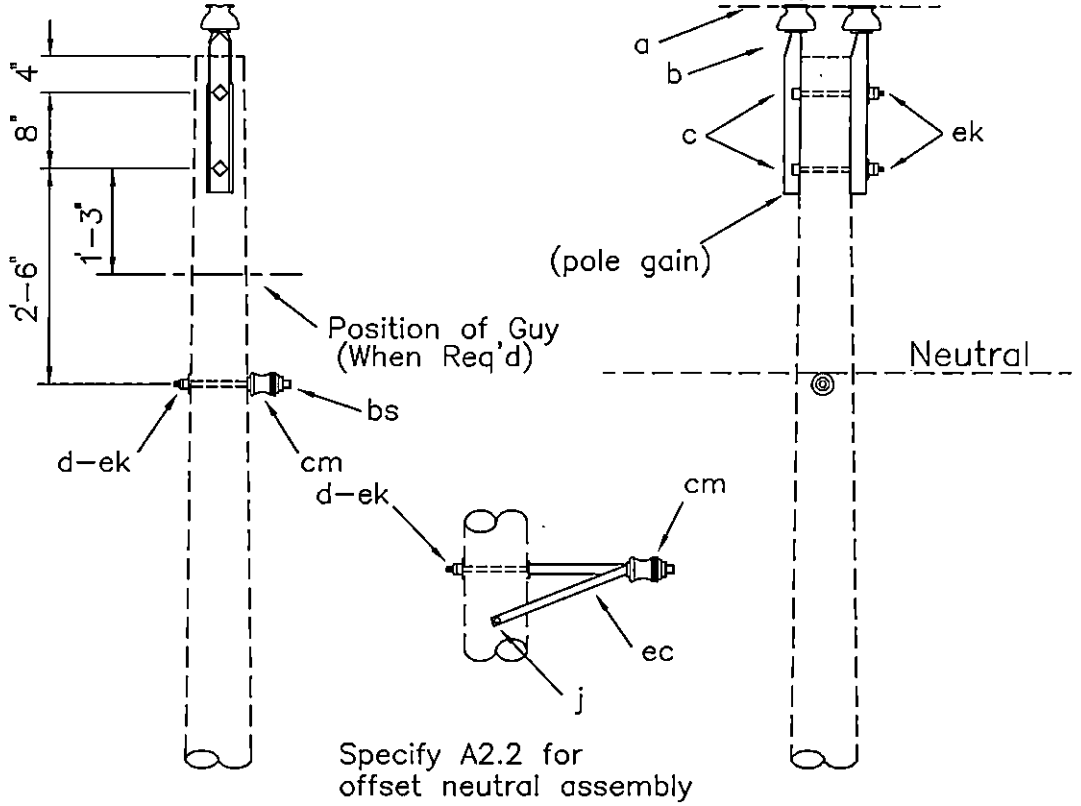
MAXIMUM LINE ANGLES:
See Table IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	1 – PHASE PRIMARY	A2.04N
RUS	12.47/7.2 kV	A2.04NP



PLAN



Specify A2.2 for offset neutral assembly

NOTE: These assemblies used for NESC Grade B construction.

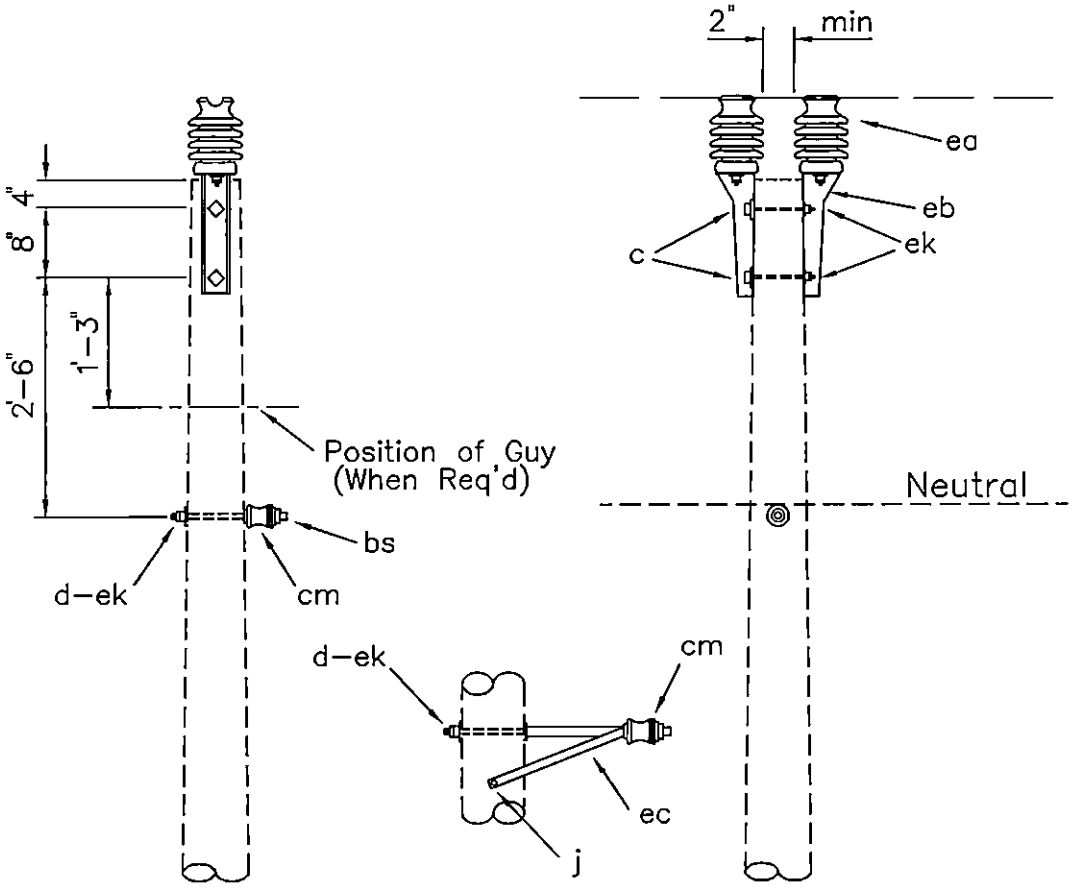
ASSEMBLY:		A2.1	A2.2
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2	2
b	Pin, pole top	2	2
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	1	1
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	3	3

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT (TANGENT)

APRIL 2005	1 – PHASE PRIMARY	A2.1 (A1–1)
RUS	12.47/7.2 kV	A2.2 (A1–1A)



Specify A2.2P for
offset neutral assembly

NOTE: These assemblies used for NESC Grade B construction.

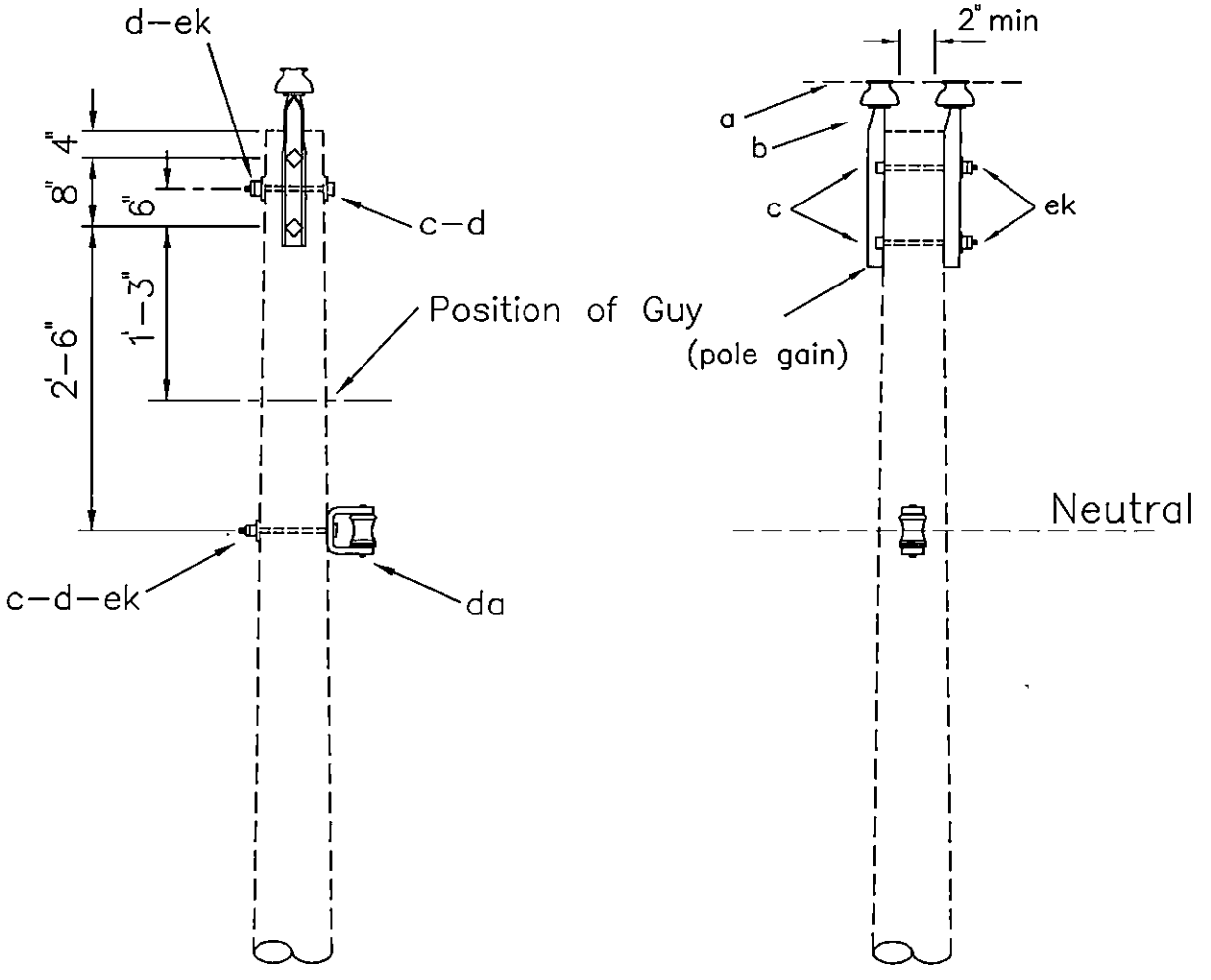
ASSEMBLY: A2		.1P	.2P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	1	1
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	2	2
eb	Bracket, pole top	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	3	3

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT – (TANGENT) (POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	A2.1P (A1–1P)
RUS	12.47/7.2 kV	A2.2P (A1–1AP)



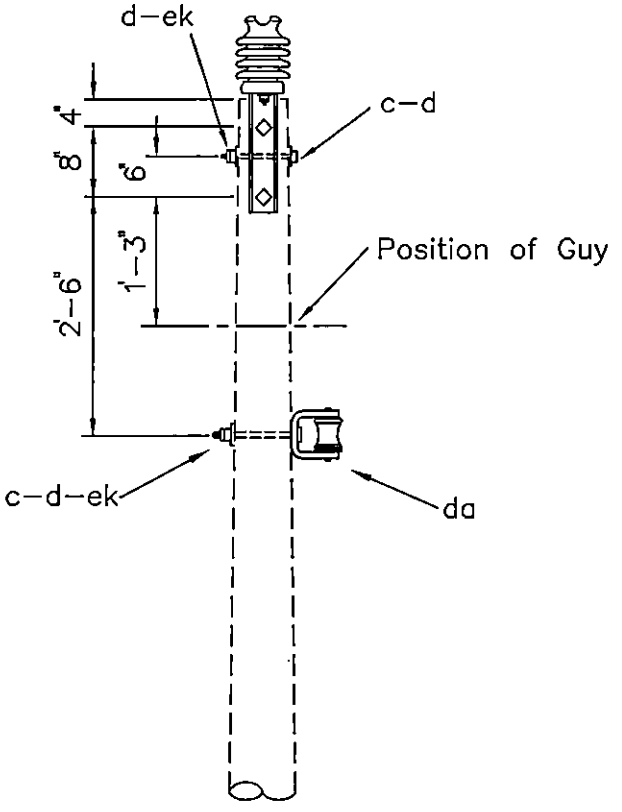
ITEM	QTY	MATERIAL
a	2	Insulator, pin type (12.47/7.2 kV)
b	2	Pin, pole top
c	4	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	4	Locknuts

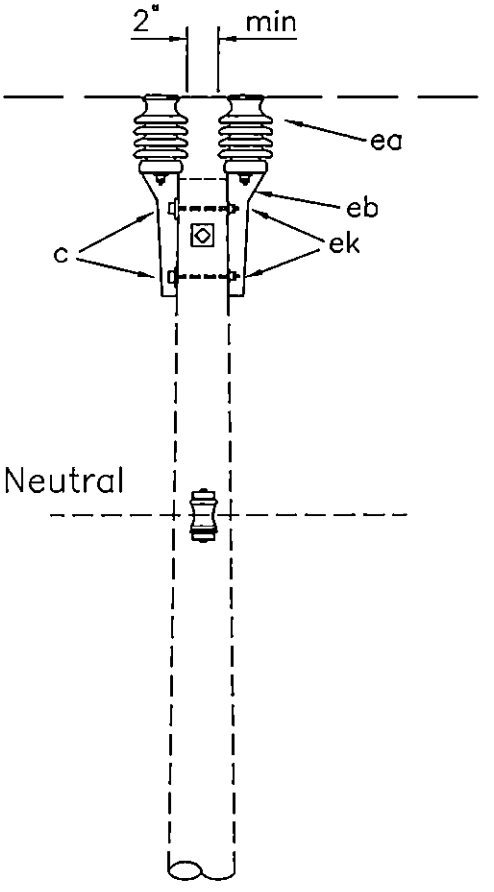
DESIGN PARAMETERS:

See TABLE III

DOUBLE SUPPORT

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A2.3 (A2)





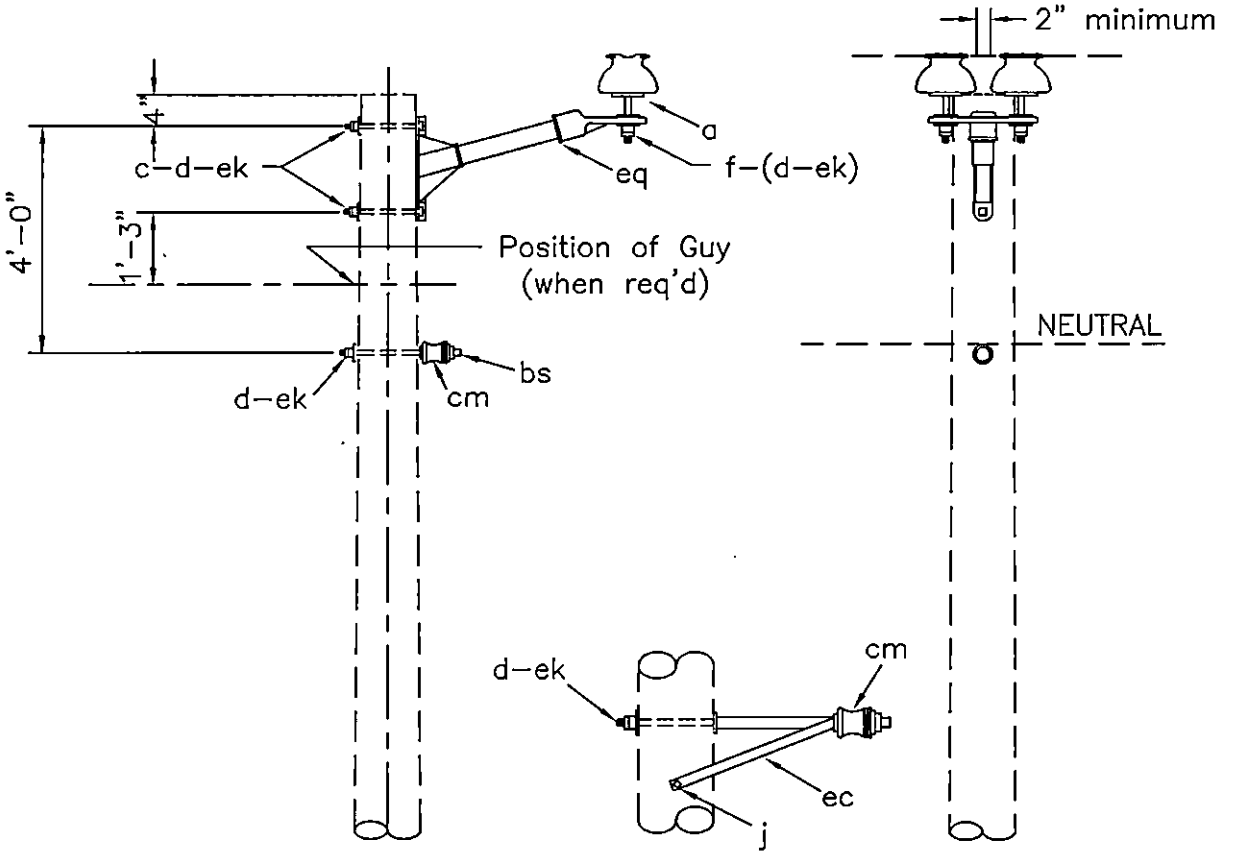
ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ea	2	Insulator, post type (12.47/7.2 kV)
eb	2	Bracket, pole top
ek	4	Locknuts

DESIGN PARAMETERS:

See TABLE IV

DOUBLE SUPPORT
(POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A2.3P (A2P)



Specify A2.5N for
offset neutral assembly

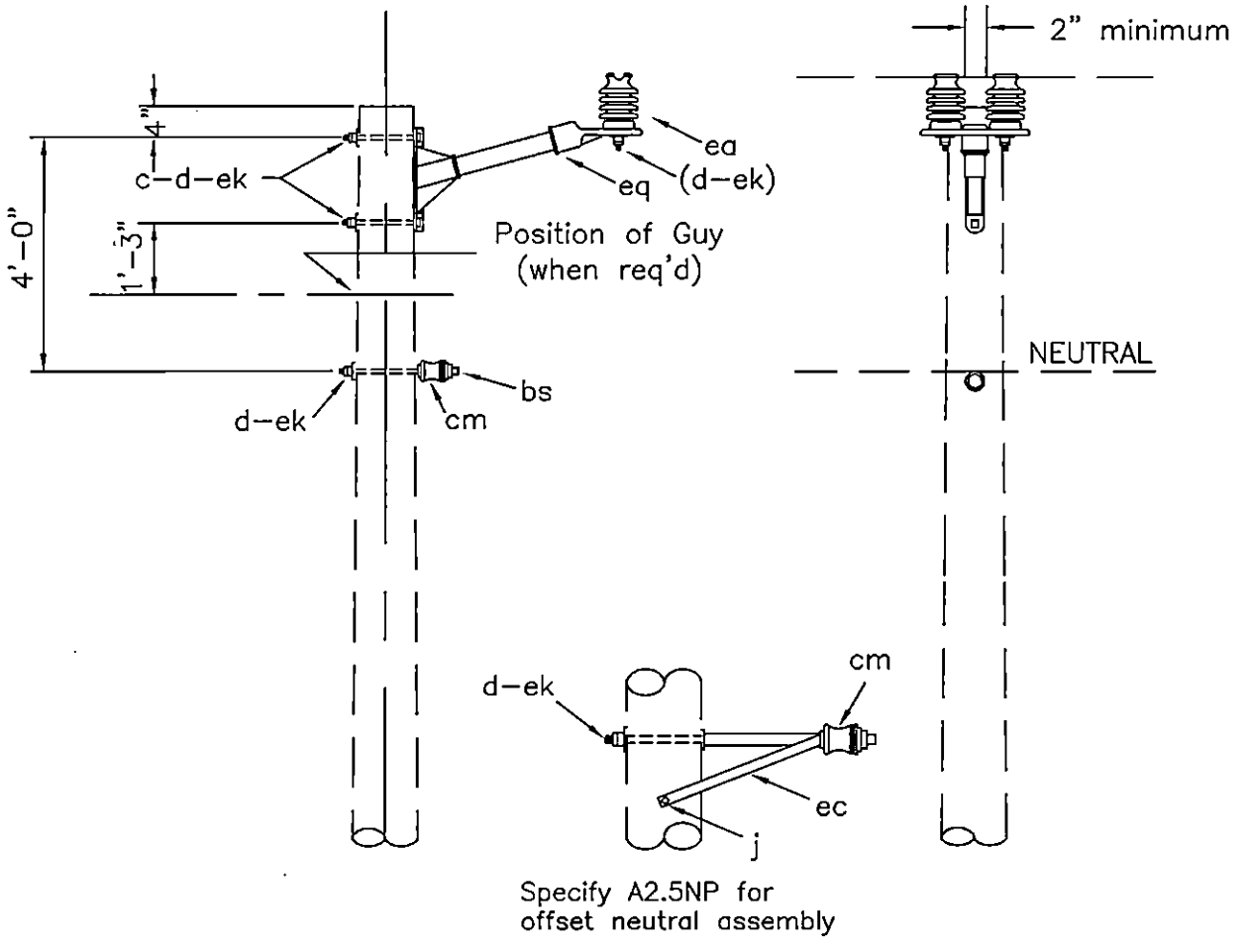
NOTE: These assemblies used for NESC Grade B construction.

	Assembly: A2.	4N	5N
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2	2
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
f	Pin, crossarm, 5/8" x 6 1/2"	2	2
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	3	3
eq	Bracket, insulator/equipment	1	1

Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	1 – PHASE PRIMARY	A2.4N
RUS	12.47/7.2 kV	A2.5N



Specify A2.5NP for
offset neutral assembly

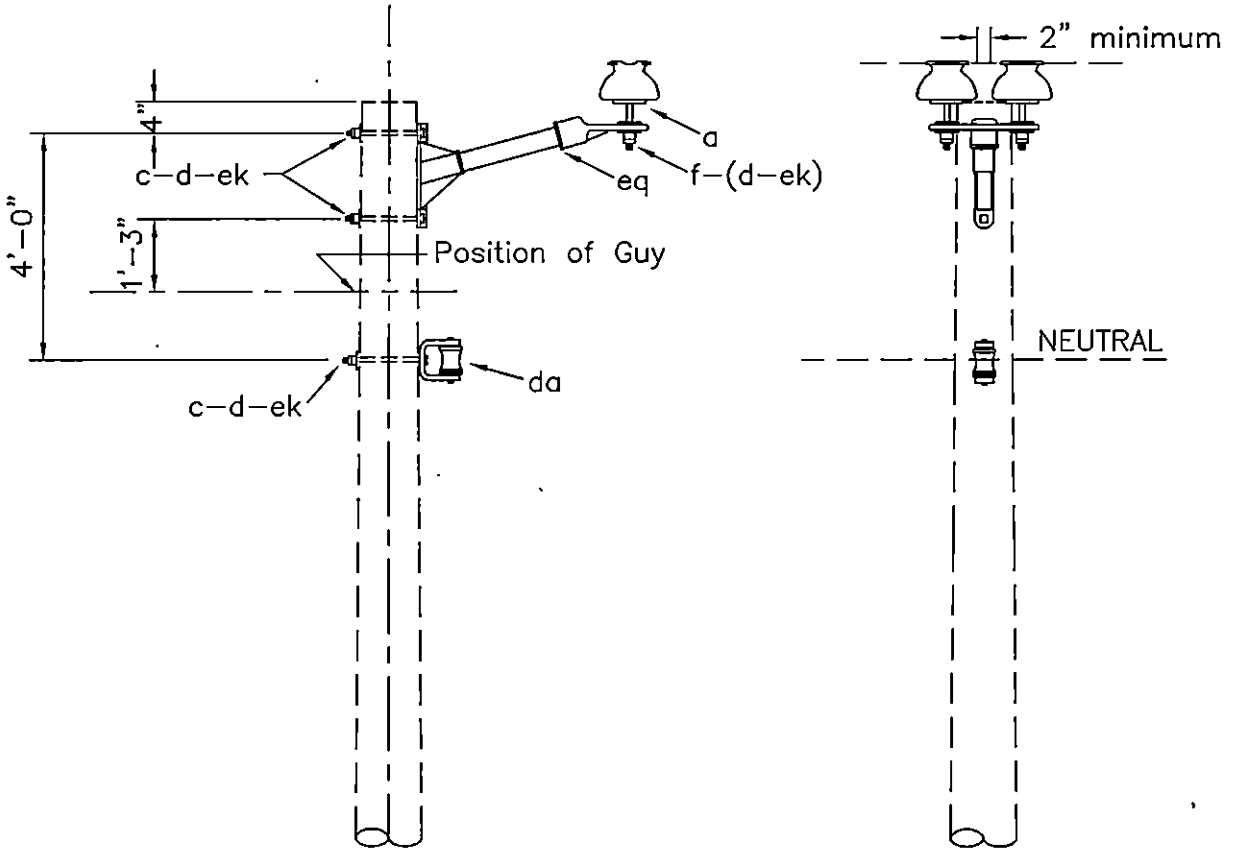
NOTE: These assemblies used for NESC Grade B construction.

ITEM	MATERIAL	Assembly: A2. 4NP QTY	5NP QTY
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	3	3
eq	Bracket, insulator/equipment	1	1

Design Parameters:
Maximum Line Angles
5° – Small conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	A2.4NP
RUS	12.47/7.2 kV	A2.5NP

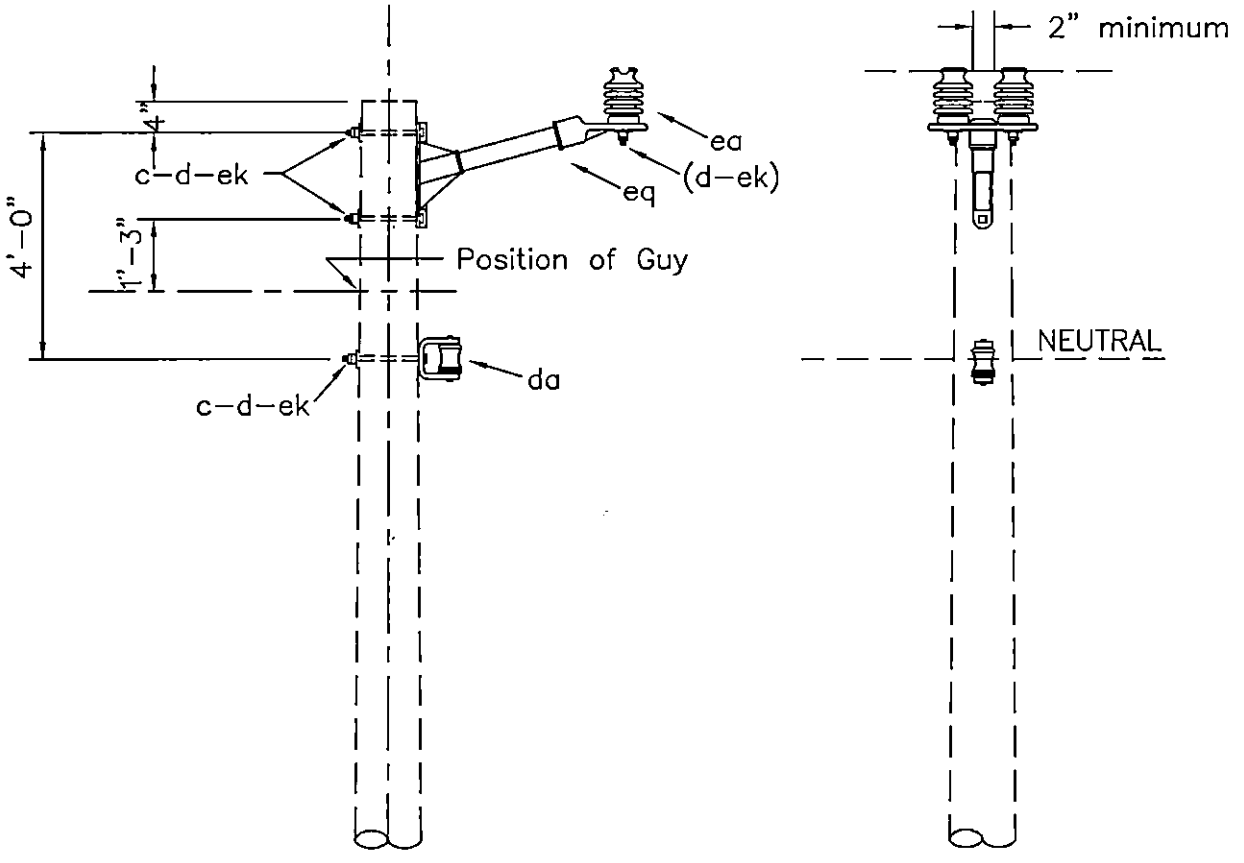


Assembly: A2.		6N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	2
c	Bolt, machine, 5/8" x req'd length	3
d	Washer, square 2 1/4"	3
f	Pin, crossarm, 5/8" x 6 1/2"	2
da	Bracket, insulated	1
ek	Locknuts	3
eq	Bracket, insulator/equipment	1

Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	1 – PHASE PRIMARY	A2.6N
RUS	12.47/7.2 kV	

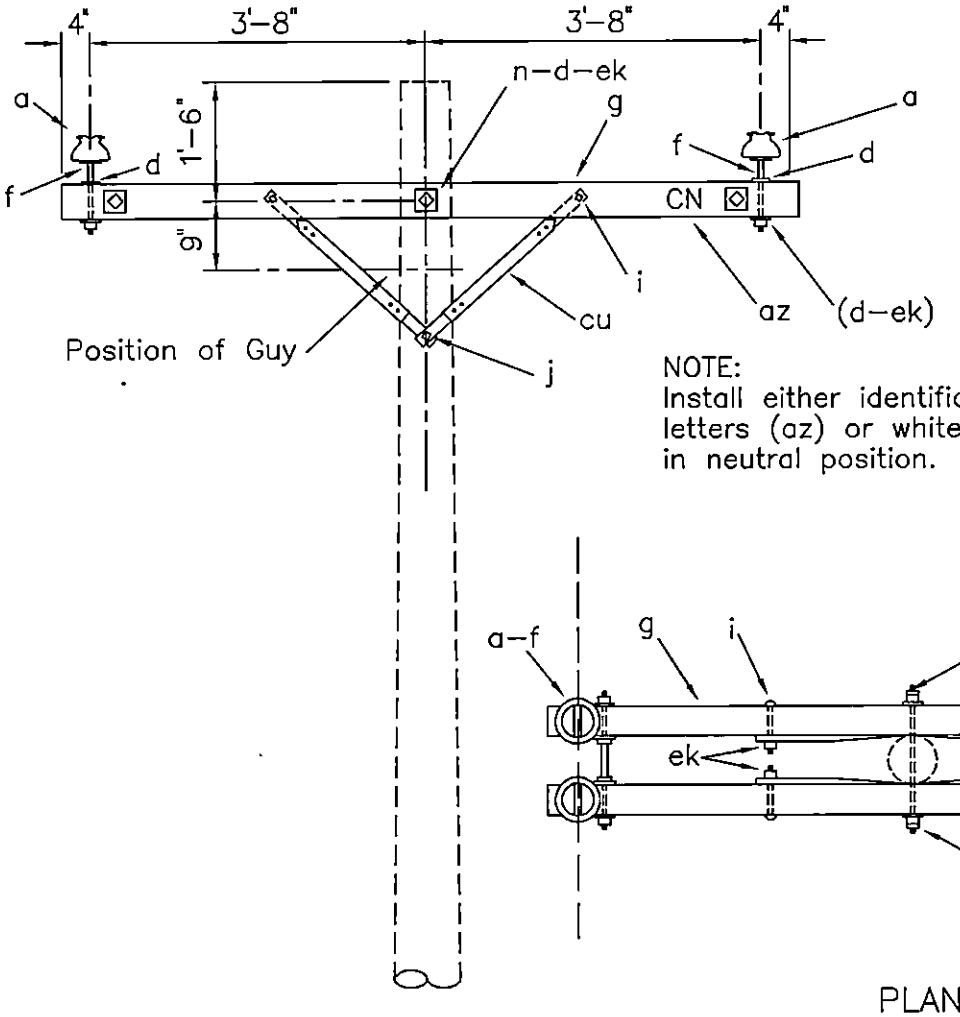


Assembly: A2.		6NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	3
d	Washer, square 2 1/4"	3
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2kV)	2
ek	Locknuts	3
eq	Bracket, insulator/equipment	1

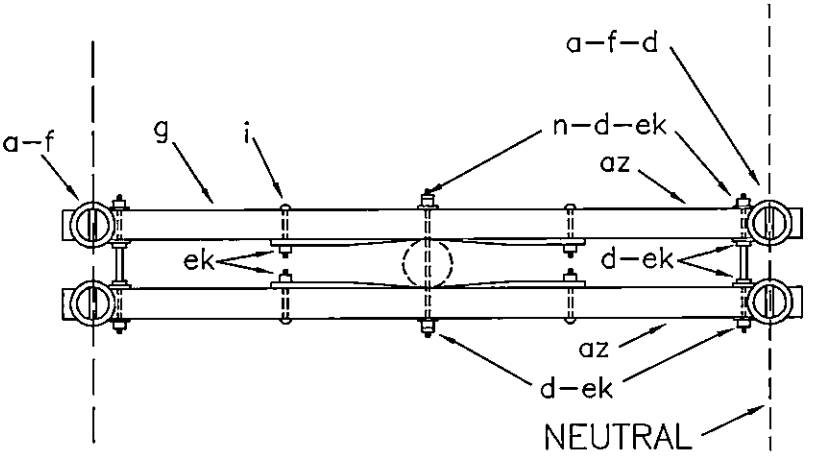
Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	1 – PHASE PRIMARY	A2.6NP
RUS	12.47/7.2 kV	



NOTE:
Install either identification letters (az) or white insulators in neutral position.



PLAN

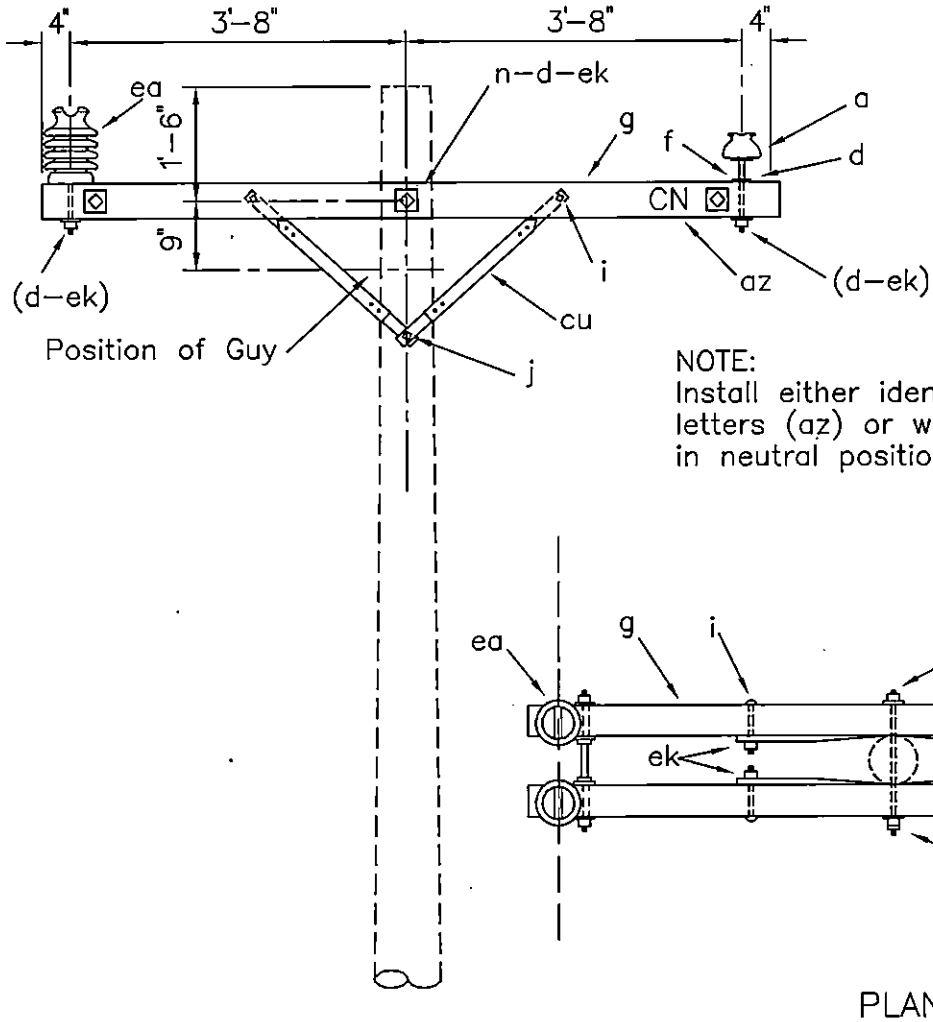
ITEM	QTY	MATERIAL
a	2	Insulator, pin type 15 kV white
a	2	Insulator, pin type (12.47/7.2 kV)
d	14	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arm, 5/8" x req'd length
az	4	Letters, 2" C, 2" N, with 1" nails
cu	4	Brace, 28"
ek	14	Locknuts

DESIGN PARAMETERS:

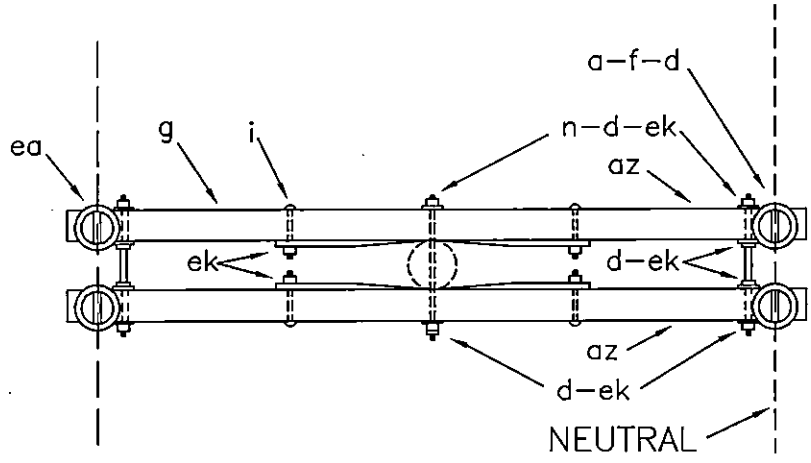
See TABLE IV

DOUBLE SUPPORT ON CROSSARMS

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A2.21 (A9)



NOTE:
Install either identification letters (az) or white insulator in neutral position.



PLAN

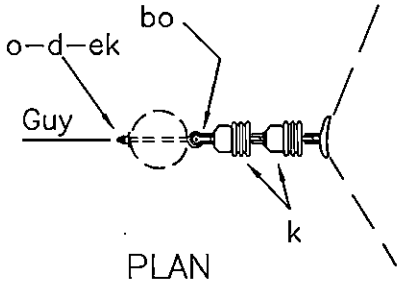
ITEM	QTY	MATERIAL
a	2	Insulator, pin type, 15 kV, white
d	12	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arm, 5/8" x req'd length
az	4	Letters, 2" C, 2" N, with 1" nails
cu	4	Brace, 28"
ea	2	Insulator, post type (12.47/7.2 kV)
ek	14	Locknuts

DESIGN PARAMETERS:

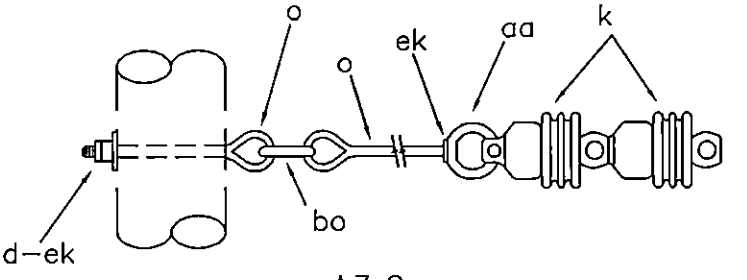
See TABLE IV

DOUBLE SUPPORT ON CROSSARMS
(POST INSULATORS)

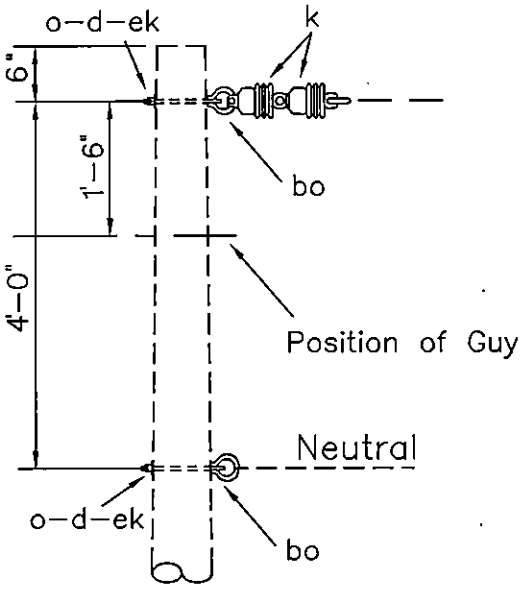
APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A2.21P (A9P)



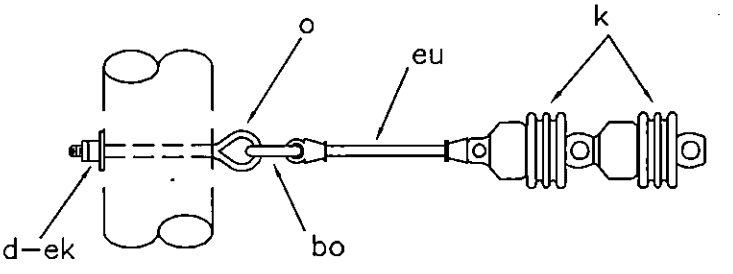
PLAN



A3.2



A3.1



A3.3

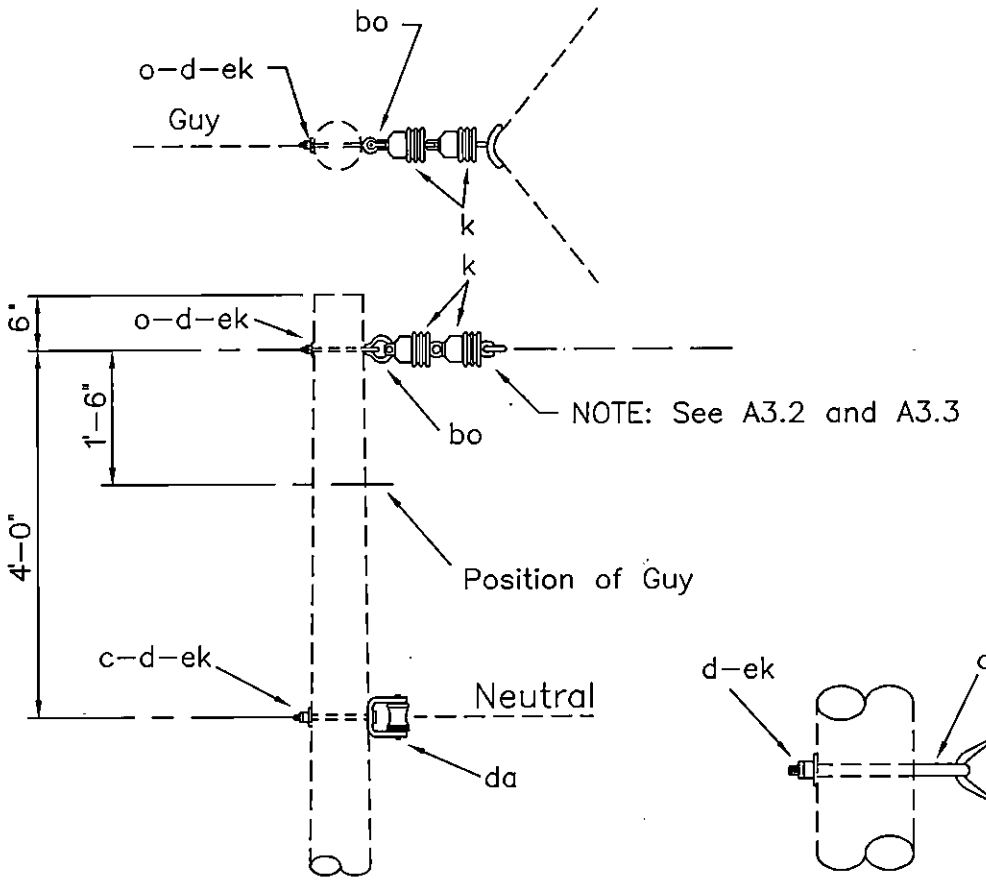
ASSEMBLY: A3		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	2	2	2
k	Insulator, suspension, 4 1/4"	2	2	2
o	Bolt, eye, 5/8"x req'd length	2	3	2
aa	Nut, eye		1	
bo	Shackle, anchor	2	2	2
ek	Locknuts	2	3	2
eu (du)	Link, extension, insulated (Link, extension) – (optional)			1 (1)

DESIGN PARAMETERS:

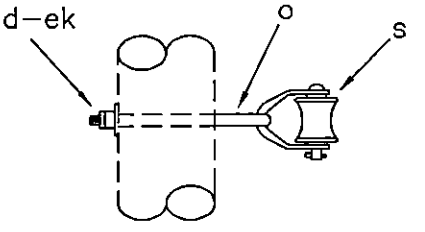
PERMITTED TRANSVERSE LOAD= 5000 lbs./Conductor
20° – 60°: #1/0 ACSR & Larger
30° – 60°: Smaller Conductors

SUSPENSION ANGLE

APRIL 2005	1 – PHASE PRIMARY	A3.1,A3.2,A3.3
RUS	12.47/7.2 kV	(A3)



A3.4



A3.7

A3.5 = A3.4 neutral subassembly + A3.2 primary subassembly
A3.6 = A3.4 neutral subassembly + A3.3 primary subassembly
A3.8 = A3.7 neutral subassembly + A3.2 primary subassembly
A3.9 = A3.7 neutral subassembly + A3.3 primary subassembly

ASSEMBLY: A3		.4	.5	.6	.7	.8	.9
ITEM	MATERIAL	QTY	QTY	QTY	QTY	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	1	1	1			
d	Washer, square, 3", curved	2	2	2	2	2	2
k	Insulator; suspension, 4 1/4"	2	2	2	2	2	2
o	Bolt, eye, 5/8"x req'd length	1	2	1	2	3	2
s	Clevis, secondary, swinging, insulated				1	1	1
aa	Nut, eye		1			1	
bo	Shackle, anchor	1	1	1	1	1	1
da	Braket, insulated	1	1	1			
ek	Locknuts	2	3	2	2	3	2
eu (du)	Link, extension, insulated (Link, extension) – (optional)			1 (1)			1 (1)

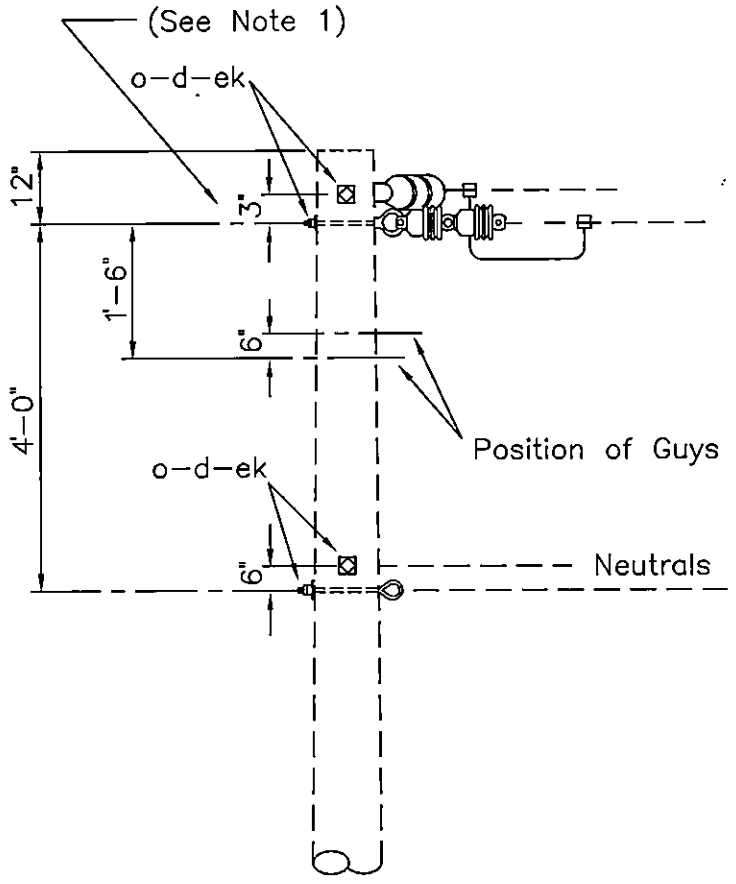
DESIGN PARAMETERS:

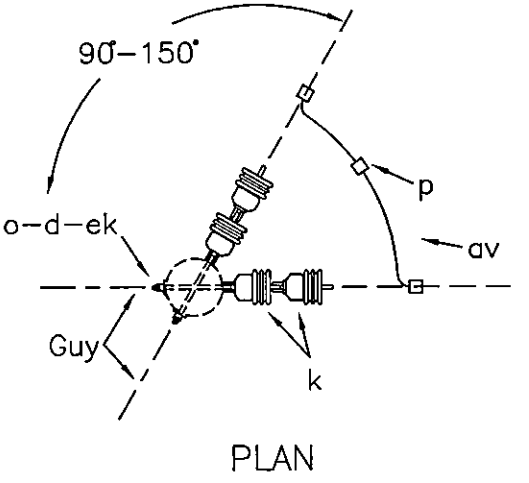
For ANSI Class 53–2 Spool Insulator (1 3/4") See Table VI

For ANSI Class 53–4 Spool Insulator (3") See Table VII

SUSPENSION ANGLE

APRIL 2005	1 – PHASE PRIMARY	A3.4 – A3.9
RUS	12.47/7.2 kV	





PLAN

NOTES:

1, Separate 6" (top position only) when angle equals 90°.
2. Other combinations of deadend assemblies (A5.1 through A5.9) may be used, (e.g., two A5.3's; or one A5.1 plus one A5.7). Record alternative assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

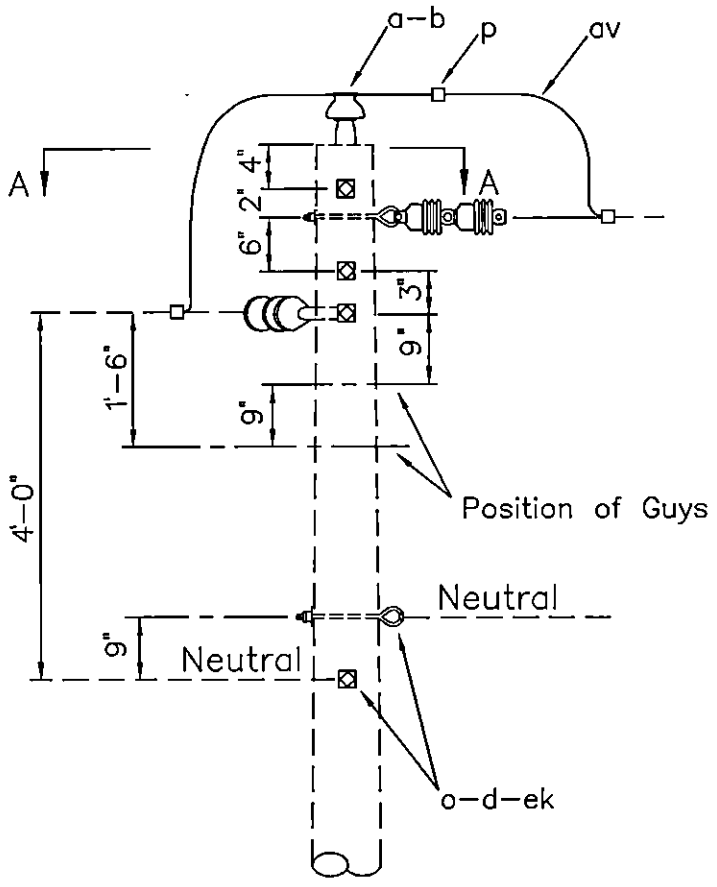
ITEM	QTY	MATERIAL
d	4	Washer, square, 3", curved
k	4	Insulator, suspension, 4 1/4"
o	4	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
av		Jumpers, as req'd
ek	4	Locknuts

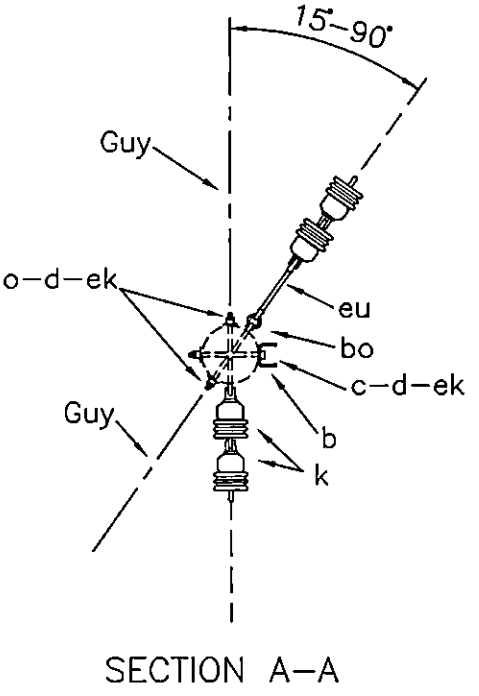
DESIGN PARAMETERS:

. PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE (90°–150°)

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A4.1 (A4)





SECTION A–A

NOTES:

1. Use 3" curved washers, "d", on eyebolts, "o".
2. Other combinations of deadend assemblies (A5.1 through A5.9) may be used, (e.g., one A1.01 plus two A5.3's; or one A1.01 plus one A5.1 plus one A5.7). Record alternative assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

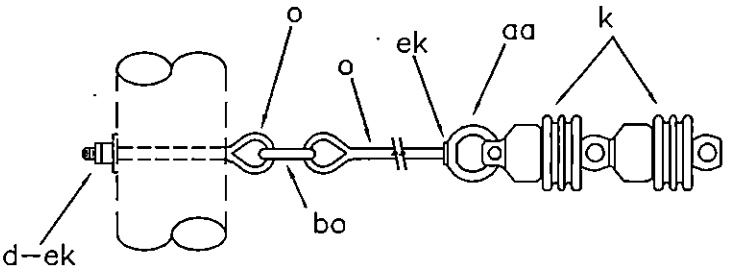
ITEM	QTY	MATERIAL
a	1	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20 "
c	2	Bolt, machine, 5/8 x req'd length
d	2	Washer, square, 2 1/4 "
d	4	Washer, square, 3, curved
k	4	Insulator, suspension, 4 1/4
o	4	Bolt, eye, 5/8 x req'd length
p		Connectors, as req'd
av		Jumpers, as req'd
bo	1	Shackle, anchor
ek	6	Locknuts
eu (du)	1 (1)	Link, extension, insulated (Link, Extension)(Optional)

DESIGN PARAMETERS:

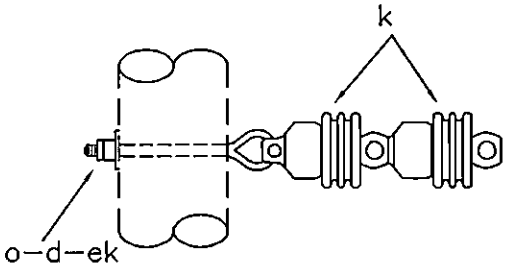
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE (15°–90°)

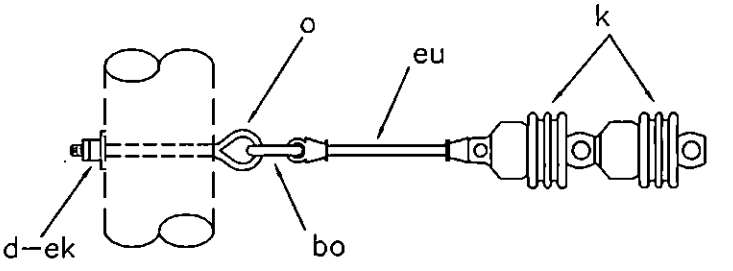
APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A4.2



A5.02



A5.01



A5.03

NOTE: When connecting to existing bolt end, use eyenut "aa" and locknut "ek" instead of eyebolt subassembly "o–d–ek".

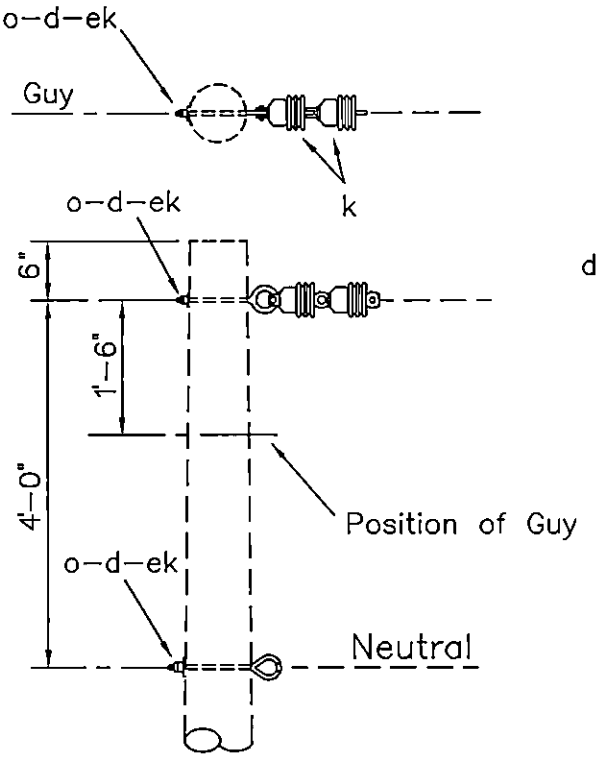
ITEM	MATERIAL	.01 QTY	.02 QTY	.03 QTY
d	Washer, square, 3", curved	1	1	1
k	Insulator, suspension, 4 1/4"	2	2	2
o	Bolt, eye, 5/8"x req'd length	1	2	1
aa	Nut, eye		1	
bo	Shackle, anchor		1	1
ek	Locknuts	1	2	1
eu (du)	Link, extension, insulated (Link, extension) – (optional)			1 (1)

DESIGN PARAMETERS:

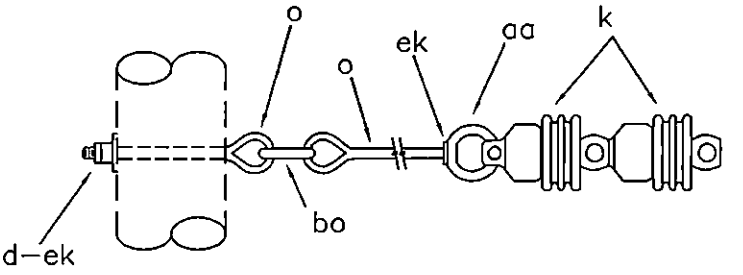
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

SINGLE DEADENDS

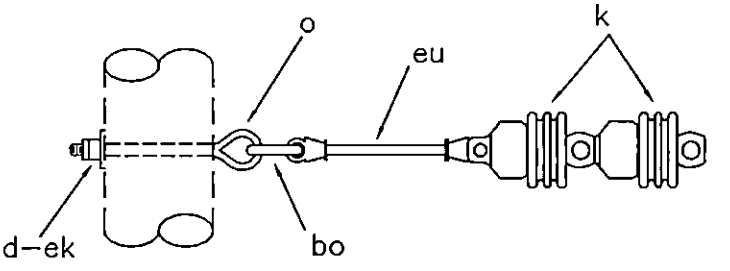
APRIL 2005	1 – PHASE PRIMARY	A5.01,A5.02,A5.03
RUS	12.47/7.2 kV	(M5–24),(M5–8)



A5.1



A5.2



A5.3

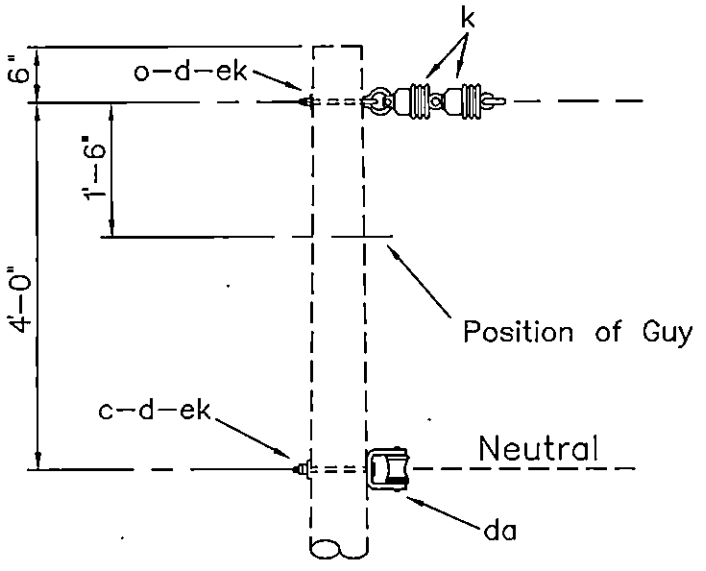
NOTE: When connecting to existing bolt end, use eyenut "aa" and locknut "ek" instead of eyebolt subassembly "o–d–ek".

ASSEMBLY: A5		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	2	2	2
k	Insulator, suspension, 4 1/4"	2	2	2
o	Bolt, eye, 5/8"x req'd length	2	3	2
p	Connectors, as req'd			
aa	Nut, eye		1	
av	Jumper's, as req'd			
bo	Shackle, anchor		1	1
ek	Locknuts	2	3	2
eu (du)	Link, extension, insulated (Link, extension) – (optional)			1 (1)

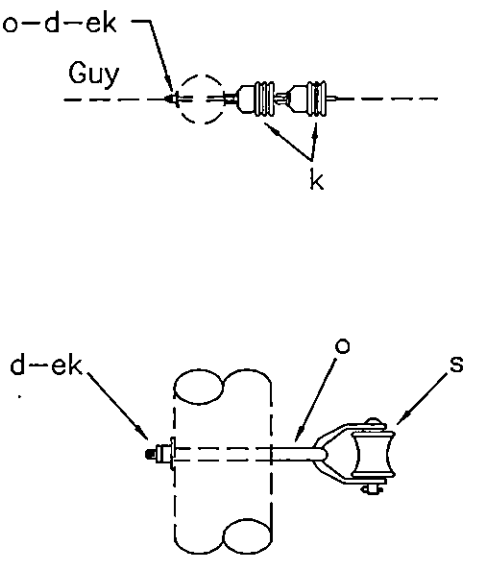
DESIGN PARAMETERS:
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

SINGLE DEADENDS

APRIL 2005	1 – PHASE PRIMARY	A5.1,A5.2,A5.3
RUS	12.47/7.2 kV	(A5),(A5–2)



A5.4



A5.7

A5:5 = A5.4 neutral assembly + A5.2 primary subassembly
A5.6 = A5.4 neutral assembly + A5.3 primary subassembly
A5.8 = A5.7 neutral assembly + A5.2 primary subassembly
A5.9 = A5.7 neutral assembly + A5.3 primary subassembly

NOTE: When connecting to existing bolt end, use eyenut "aa" and locknut "ek" instead of eyebolt subassembly "o–d–ek".

ASSEMBLY: A5		.4	.5	.6	.7	.8	.9
ITEM	MATERIAL	QTY	QTY	QTY	QTY	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	1	1	1			
d	Washer, square, 3", curved	2	2	2	2	2	2
k	Insulator, suspension, 4 1/4"	2	2	2	2	2	2
o	Bolt, eye, 5/8"x req'd length	1	2	1	2	3	2
p	Connectors, as req'd						
s	Clevis, secondary, swinging, insulated				1	1	1
aa	Nut, eye		1			1	
av	Jumpers, as req'd						
bo	Shackle, anchor		1	1		1	1
da	Bracket, insulated	1	1	1			
ek	Locknuts	2	3	2	2	3	2
eu (du)	Link, extension, insulated (Link, extension) – (optional)			1 (1)			1 (1)

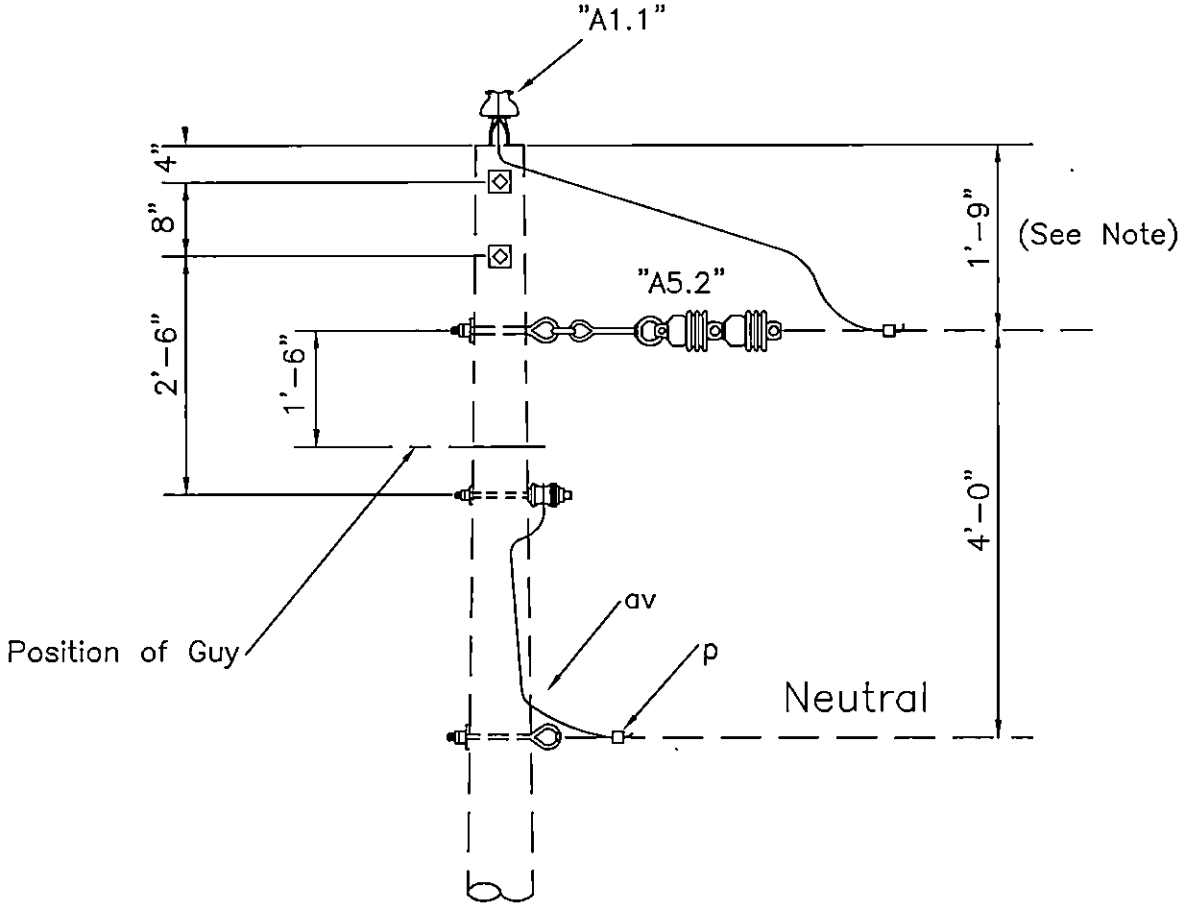
DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD
For ANSI Class 53–2 Spool Insulator (1 3/4"): 1,500 lbs

For ANSI Class 53–4 Spool Insulator (3"): 2,250 lbs

SINGLE DEADENDS

APRIL 2005	1 – PHASE PRIMARY	A5.4 – A5.9
RUS	12.47/7.2 kV	



NOTES:

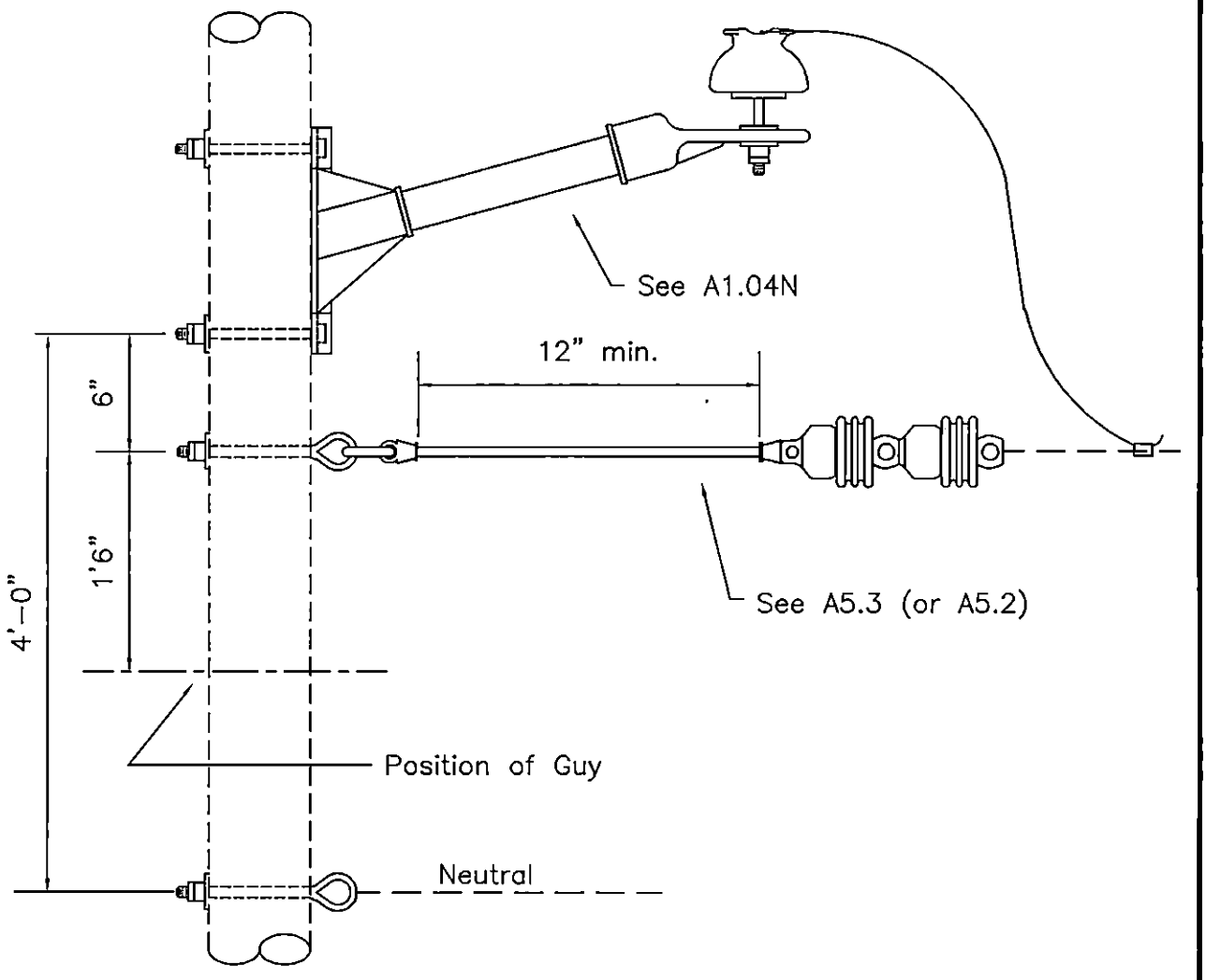
1. Tap assembly may be installed 6" from top of pole when perpendicular to line. Raise neutral and guy attachemnt 15" also.
2. Any deadend assembly, A5.1 through A5.9, may be used.

ITEM	QTY	MATERIAL
	(1)	(A1.1 Primary Assembly)
	1	A5.2 Primary Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:
PERMITTED LONGITUDINAL
LOAD = 5000 lbs./Conductor

SINGLE PHASE TAP GUIDE

APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A5.2G



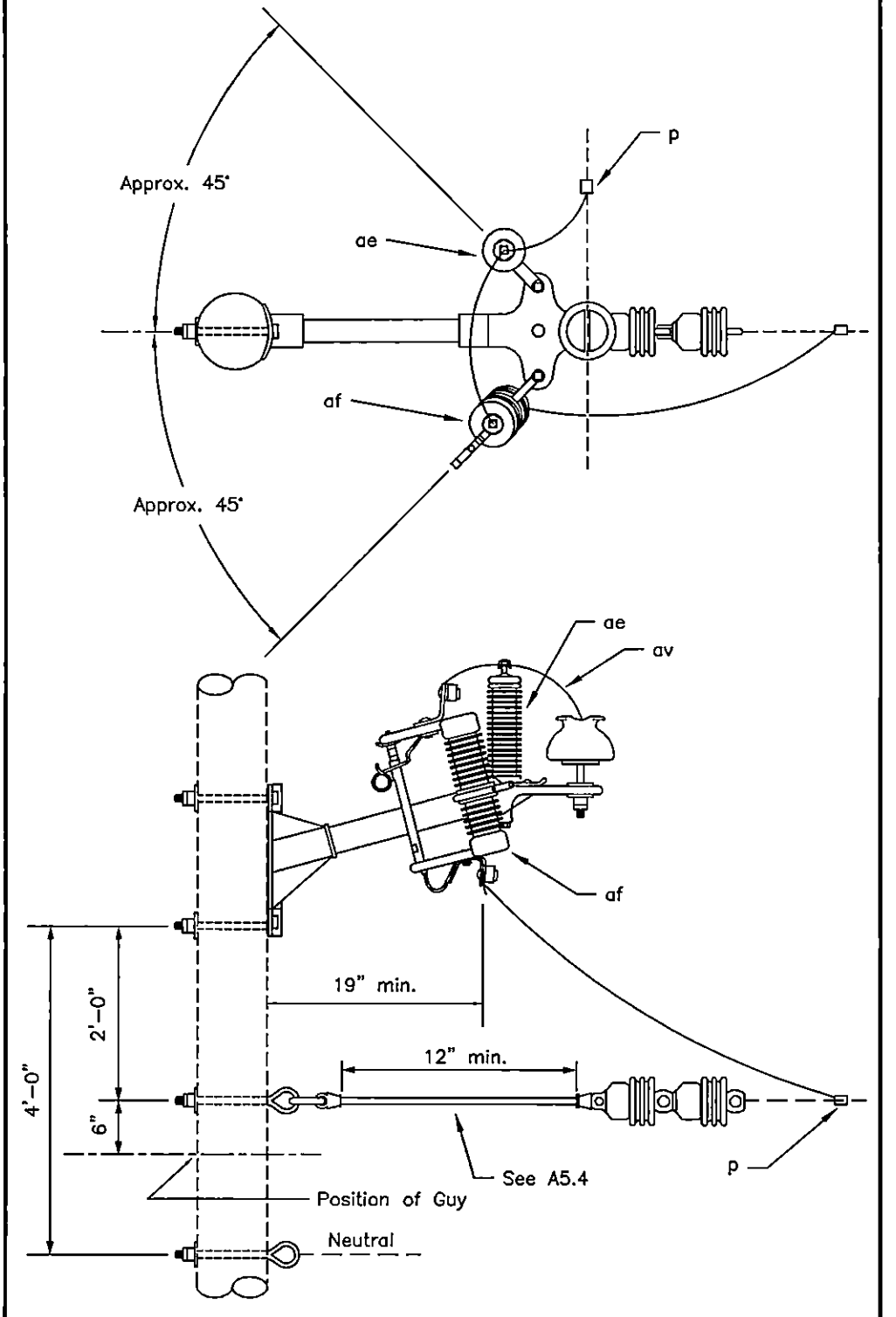
ITEM	MATERIAL	QTY
	A1.04N Primary Assembly (Narrow Profile)	1
	A5.3 Primary Assembly	1
P	Connectors, as req'd	
av	Jumpers, as req'd	

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

SINGLE PHASE TAP GUIDE

APRIL 2005 RUS	1 – PHASE PRIMARY 12.47/7.2 kV	A5.3NG



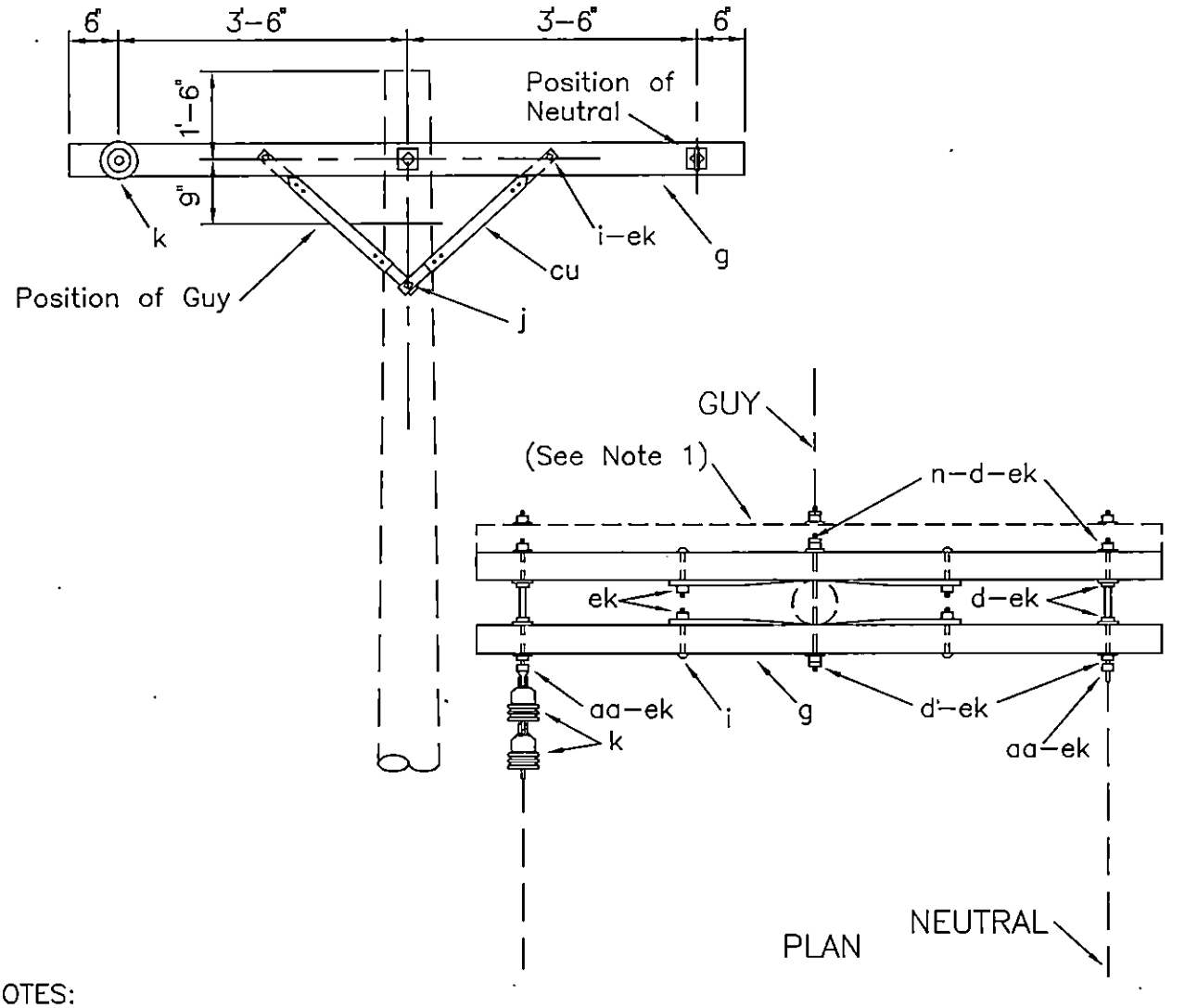
ITEM	MATERIAL	QTY
	A1.04N Primary Assembly (Narrow Profile)	1
	A5.4 Primary Assembly	1
p	Connectors, as req'd	
ae	Arrester, surge (9kV)	1
af	Cutout, dist. open (15kV)	1
av	Jumpers, as req'd	

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

SINGLE PHASE TAP GUIDE – NARROW PROFILE (WITH CUTOUT AND ARRESTER)

APRIL 2005	1 – PHASE PRIMARY	A5.4NG
RUS	12.47/7.2 kV	



NOTES:

1. Designate as A5.31 for assembly with three crossarms.
2. Double arming eye bolt, item "dy," may be used instead of double arming bolt, item "n," and eyenut, item "aa."

ITEM	QTY	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	2	Screw, lag, 1/2" x 4"
k	2	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
aa	2	Nut, eye, 5/8"
cu	4	Brace, 28"
ek	16	Locknuts

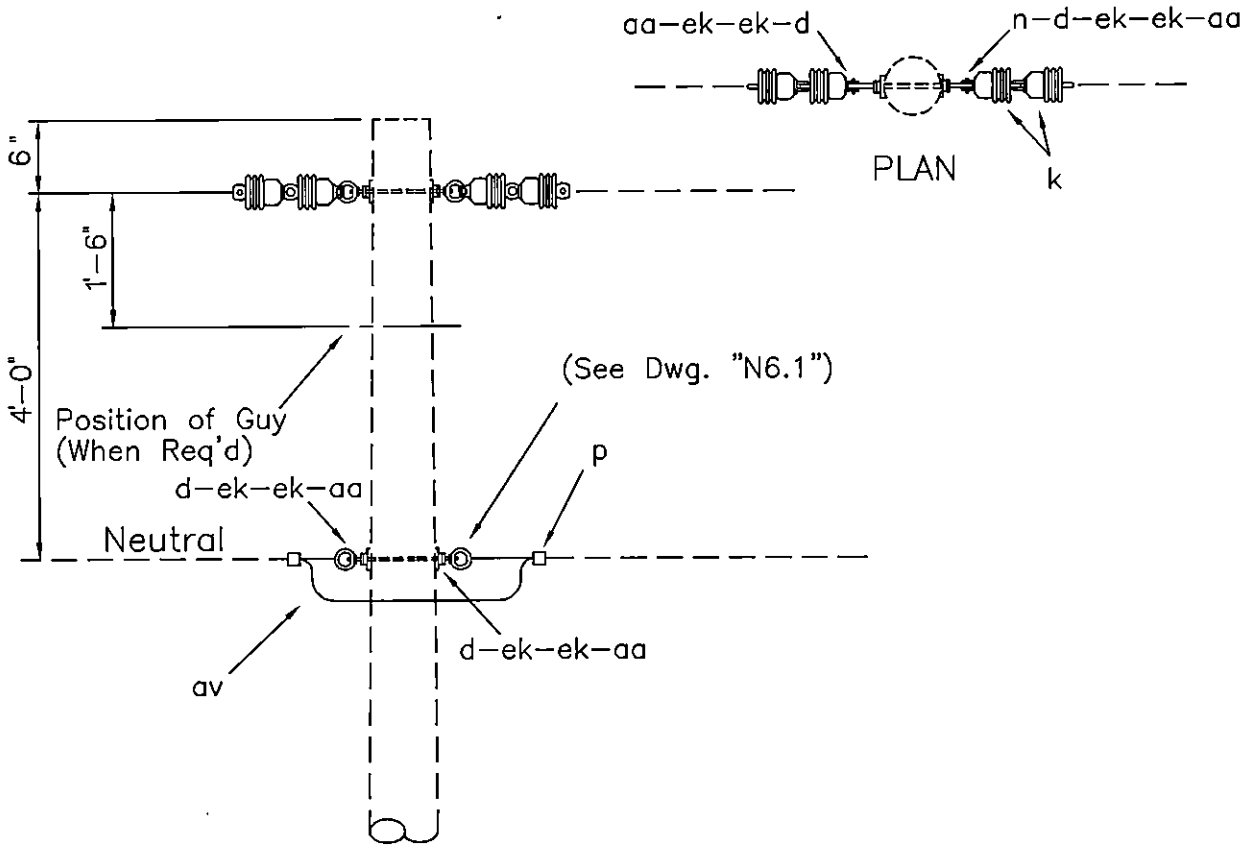
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

SINGLE DEADEND ON CROSSARMS

APRIL 2005 RUS	1 – PHASE PRIMARY 12.47/7.2 kV	A5.21 (A7) A5.31 (A7-1)



NOTES:

1. Single deadend assemblies A5.02 or A5.03 may optionally be installed
2. Maximum line angle may be increased to 15° by installing anchor shakles, item "bo", to (horizontal) eyenuts and installing side guy as req'd.

ITEM	QTY	MATERIAL
o	*	Bolt, eye, 5/8" x req'd length
bo	*	Shackle, anchor
eu	*	Link, extension, insulated
d	4	Washer, square, 3", curved
k	4	Insulator, suspension, 4 1/4"
n	2	Bolt,double arming,5/8" x req'd length
p		Connectors, as req'd
aa	4	Nut, eye, 5/8" (or as req'd)
av		Jumpers, as req'd
ek	8	Locknuts (or as req'd)

* Optional – Quantity as req'd

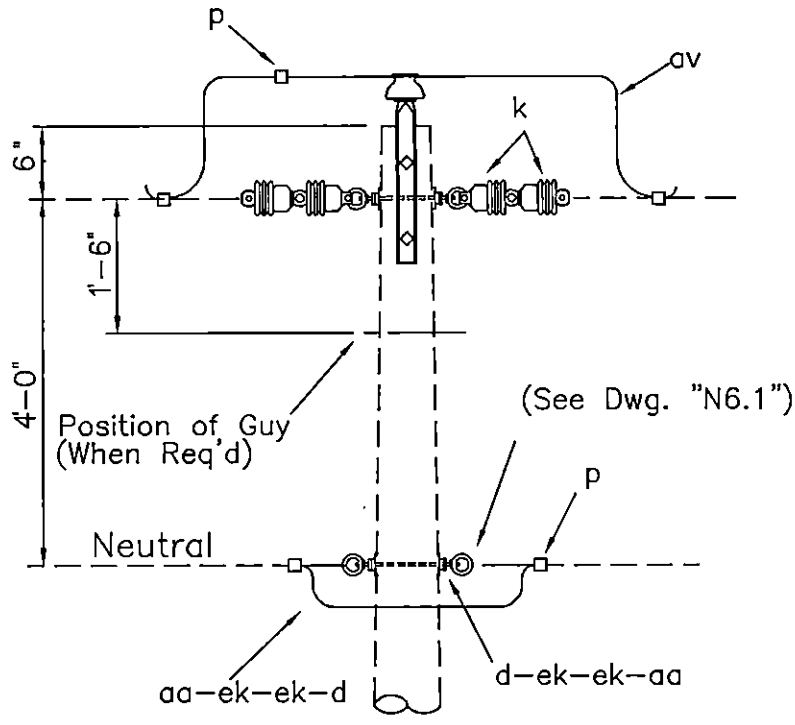
DESIGN PARAMETERS:

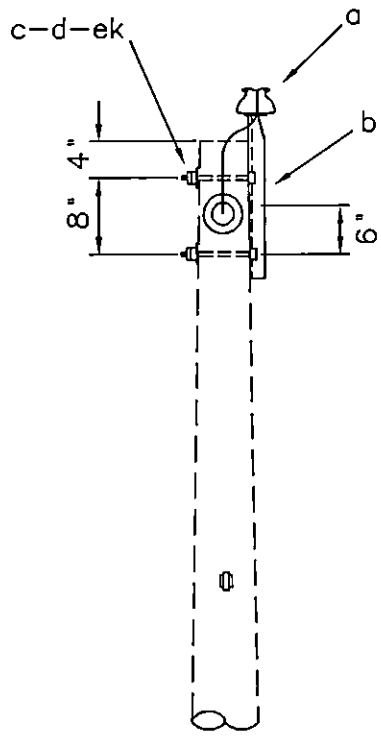
PERMITTED LONGITUDINAL LOAD= 5000 lbs./Conductor

MAXIMUM LINE ANGLE = 5° (See Note)

DOUBLE DEADEND (STRAIGHT)

APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A6.1 (A6)





NOTES:

1. Single deadend assemblies A5.02 or A5.03 may optionally be installed.
2. Maximum line angle may be increased to 15° by installing anchor shakles, item "bo", to (horizontal) eyenuts and installing side guy as req'd.

ITEM	QTY	MATERIAL
o	*	Bolt, eye, 5/8" x req'd length
bo	*	Shackle, anchor
eu	*	Link, extension, insulated
a	1	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20"
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
d	4	Washer, square, 3," curved
k	4	Insulator, suspension, 4 1/4"
n	2	Bolt,double arming,5/8" x req'd length
p		Connectors, as req'd
aa	4	Nut, eye, 5/8"
av		Jumpers, as req'd
ek	10	Locknuts

* Optional – Quantity as req'd

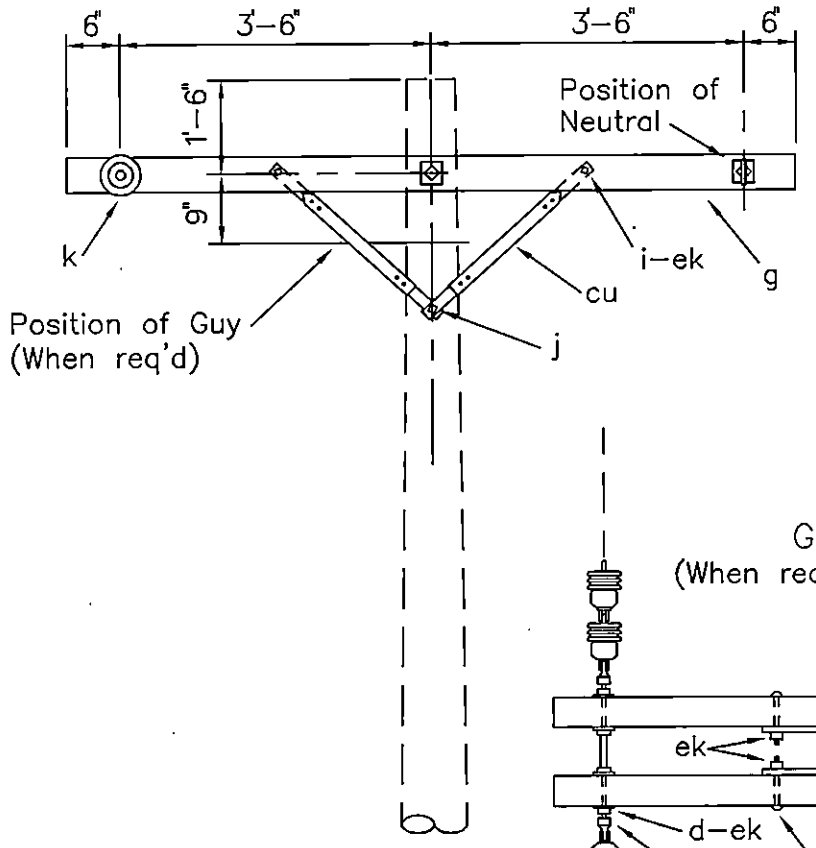
DESIGN PARAMETERS:

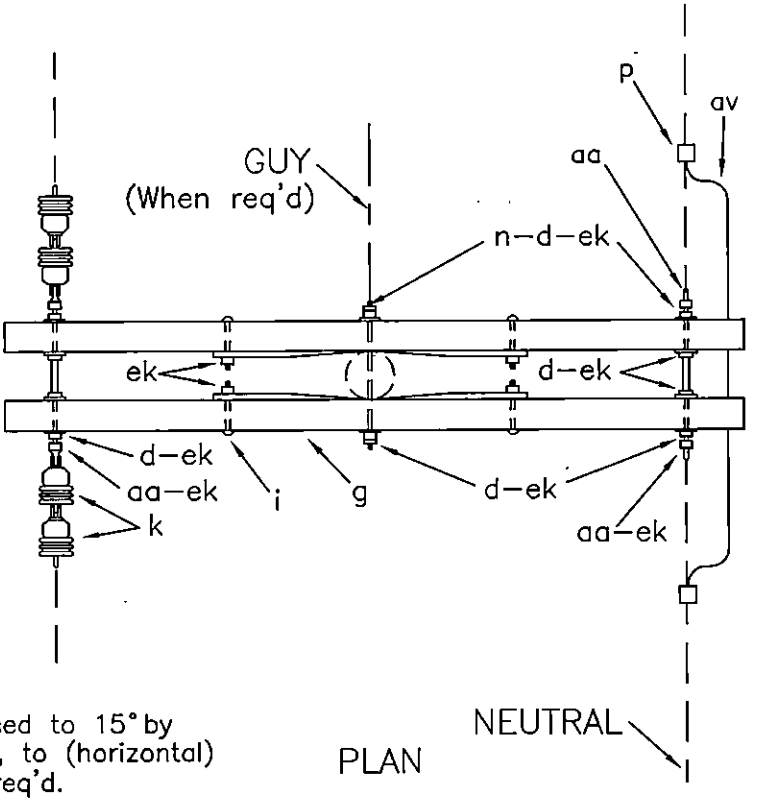
PERMITTED
LONGITUDINAL LOAD=
5000 lbs./Conductor

MAXIMUM LINE
ANGLE = 5° (See Note)

DOUBLE DEADEND (FEED THROUGH)

APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A6.2





PLAN

NOTES:

1. See drawing "N6.21" for additional details.
2. Maximum line angle may be increased to 15° by installing anchor shackles Item "bo", to (horizontal) eyenuts and installing side guy as req'd.

ITEM	QTY	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	2	Screw, lag, 1/2" x 4"
k	4	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
p		Connectors, as req'd
aa	4	Nut, eye, 5/8"
av		Jumpers, as req'd
cu	4	Brace, wood, 28"
ek	18	Locknuts

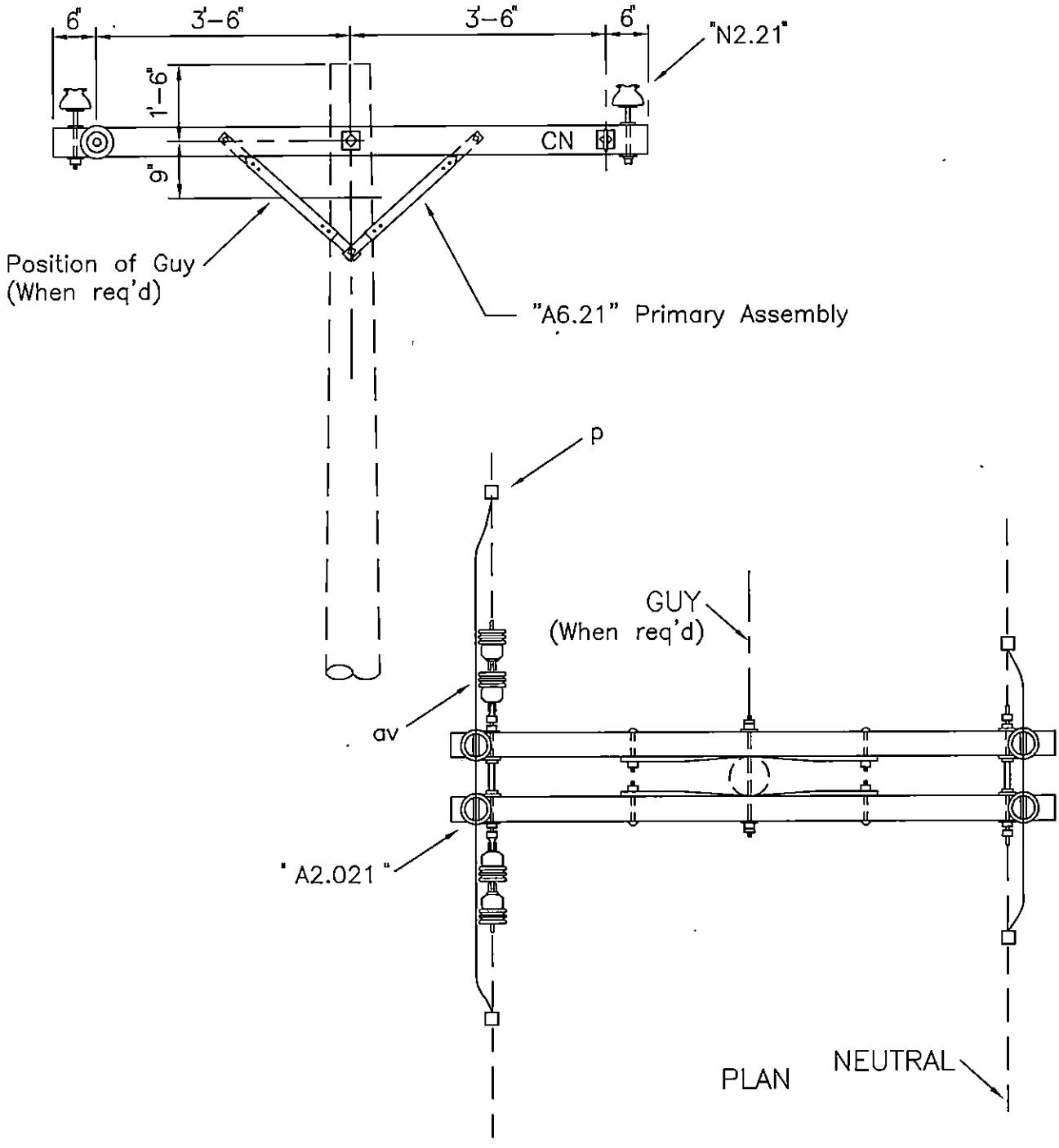
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:
See Table A (Exhibit 2)

MAXIMUM ALLOWABLE LINE ANGLE = 5° (See Note 2)

DOUBLE DEADEND ON CROSSARMS

APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A6.21 (A8)



ITEM	QTY	MATERIAL
	1	A6.21 Primary Assembly
	1	A2.021 Primary Assembly
	1	N2.21 Neutral Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:
See Table A (Exhibit 2)

MAXIMUM LINE ANGLE = 5° (See Dwg. A6-21)

DOUBLE DEADEND GUIDE (FEED THROUGH ON CROSSARMS)

APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A6.22G

INDEX B

TWO-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

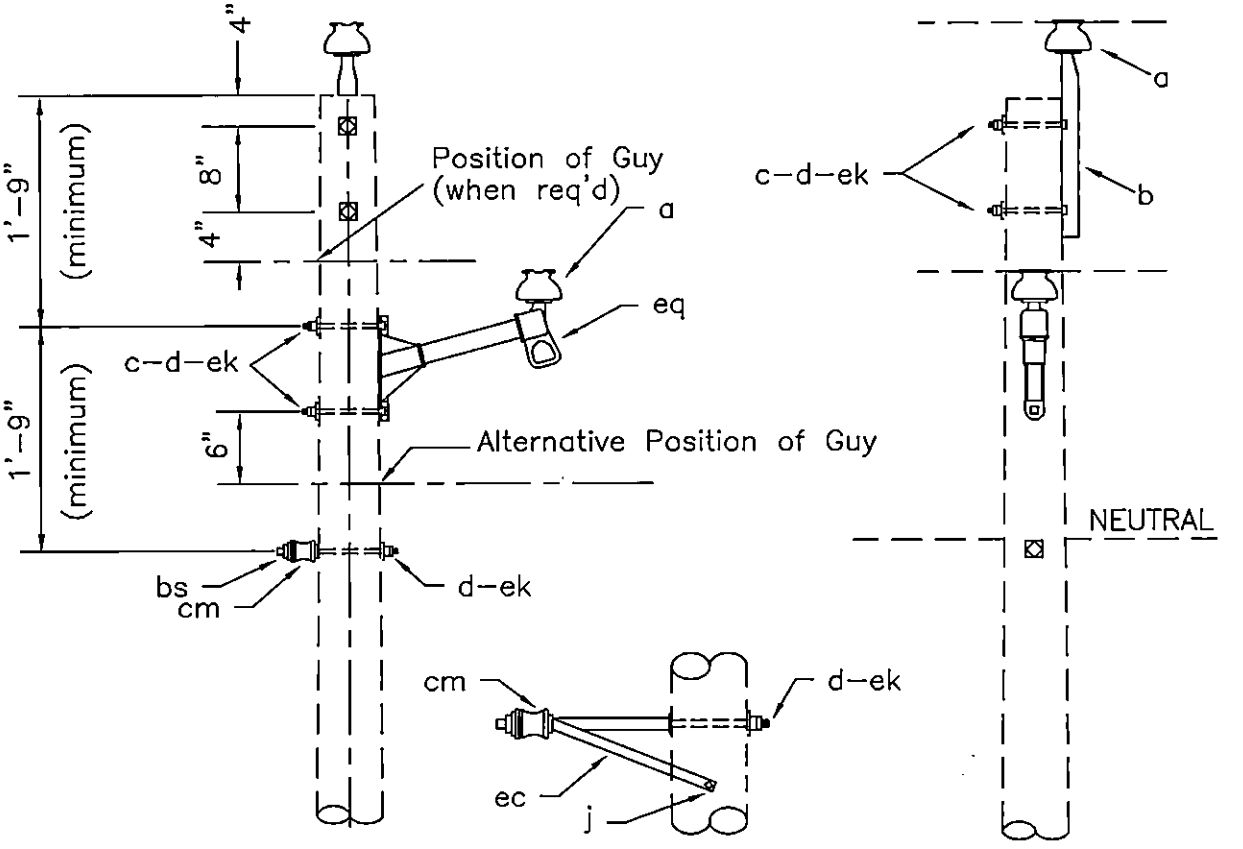
DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
B1.1N B1.2N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
B1.1NP B1.2NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.3N		SINGLE SUPPORT – NARROW PROFILE
B1.3NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B1.4N B1.5N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
B1.4NP B1.5NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.6N		SINGLE SUPPORT – NARROW PROFILE
B1.6NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B1.7N B1.8N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
B1.7NP B1.8NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.9N		SINGLE SUPPORT – NARROW PROFILE
B1.9NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B1.11 B1.12	(B1) (B1A)	SINGLE SUPPORT ON CROSSARM (TANGENT)
B1.11P B1.12P	(B1P) (B1AP)	SINGLE SUPPORT ON CROSSARM (TANGENT) (POST INSULATORS)
B1.13		SINGLE SUPPORT ON CROSSARM
B1.13P		SINGLE SUPPORT ON CROSSARM (POST INSULATORS)

TWO-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
B1.14	(B9-1)	SINGLE SUPPORT, NEUTRAL ON CROSSARM
B1.14P	(B9-1P)	SINGLE SUPPORT, NEUTRAL ON CROSSARM (POST INSULATORS)
B2.1N B2.2N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
B2.1NP B2.2NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B2.3N		DOUBLE SUPPORT – NARROW PROFILE
B2.3NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B2.4N B2.5N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
B2.4NP B2.5NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B2.6N		DOUBLE SUPPORT – NARROW PROFILE
B2.6NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B2.7N B2.8N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
B2.7NP B2.8NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B2.9N		DOUBLE SUPPORT – NARROW PROFILE
B2.9NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B2.21	(B2)	DOUBLE SUPPORT ON CROSSARMS
B2.21P	(B2P)	DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)
B2.22	(B9)	DOUBLE SUPPORT, NEUTRAL ON CROSSARMS
B2.22P	(B9P)	DOUBLE SUPPORT, NEUTRAL ON CROSSARMS (POST INSULATORS)

TWO-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
B2.24	(B1-1)	DOUBLE SUPPORT ON CROSSARMS - TANGENT
B2.25	(B1-1A)	
B2.24P	(B1-1P)	DOUBLE SUPPORT ON CROSSARMS - TANGENT
B2.25P	(B1-1AP)	(POST INSULATORS)
B3.1	(B3)	SUSPENSION ANGLE
B3.2		
B3.3		
B3.4		SUSPENSION ANGLE
B3.5		
B3.6		
B3.7		
B3.8		
B3.9		
B4.1G	((B4-1))	DEADEND ANGLE GUIDE (90° – 150°)
B4.2G		DEADEND ANGLE GUIDE (15° – 90°)
B5.1	(B5-1)	SINGLE DEADENDS
B5.2		
B5.3		
B5.4		SINGLE DEADENDS
B5.5		
B5.6		
B5.7		
B5.8		
B5.9		
B5.21	(B7)	SINGLE DEADEND ON CROSSARMS
B5.31	(B7-1)	
B6.21	(B8)	DOUBLE DEADEND CROSSARMS



Specify B1.2N for offset neutral assembly

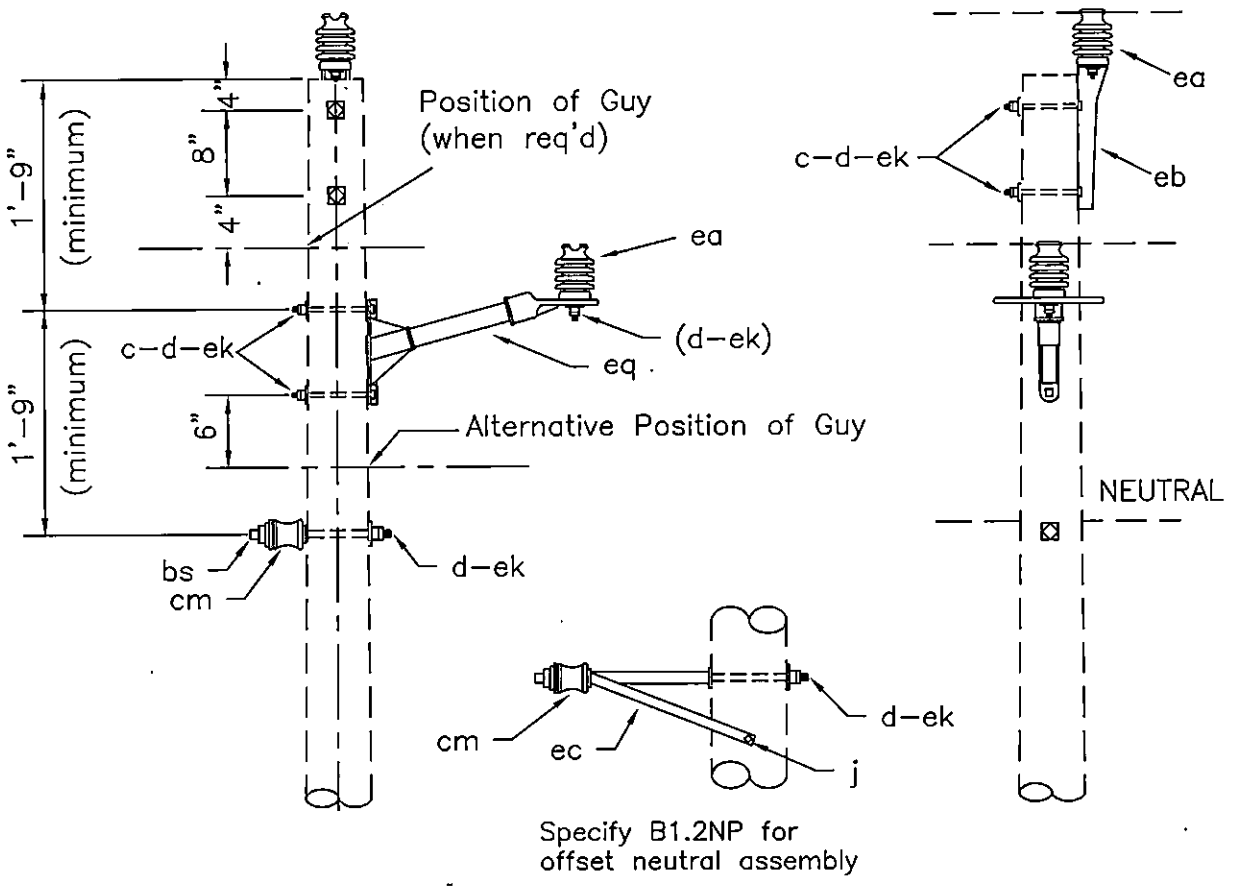
ITEM	MATERIAL	ASSEMBLY: B1. 1N QTY	2N QTY	
a	Insulator, pin type (12.47/7.2 kV)	2	2	
b	Pin, pole top, 20"	1	1	
c	Bolt, machine, 5/8" x req'd length	4	4	
d	Washer, square 2 1/4"	5	5	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)	(1)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	5	5	
eq	Bracket, insulator/equipment	1.	1	

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	2 – PHASE PRIMARY	B1.1N
RUS	12.47/7.2 kV	B1.2N



Specify B1.2NP for offset neutral assembly

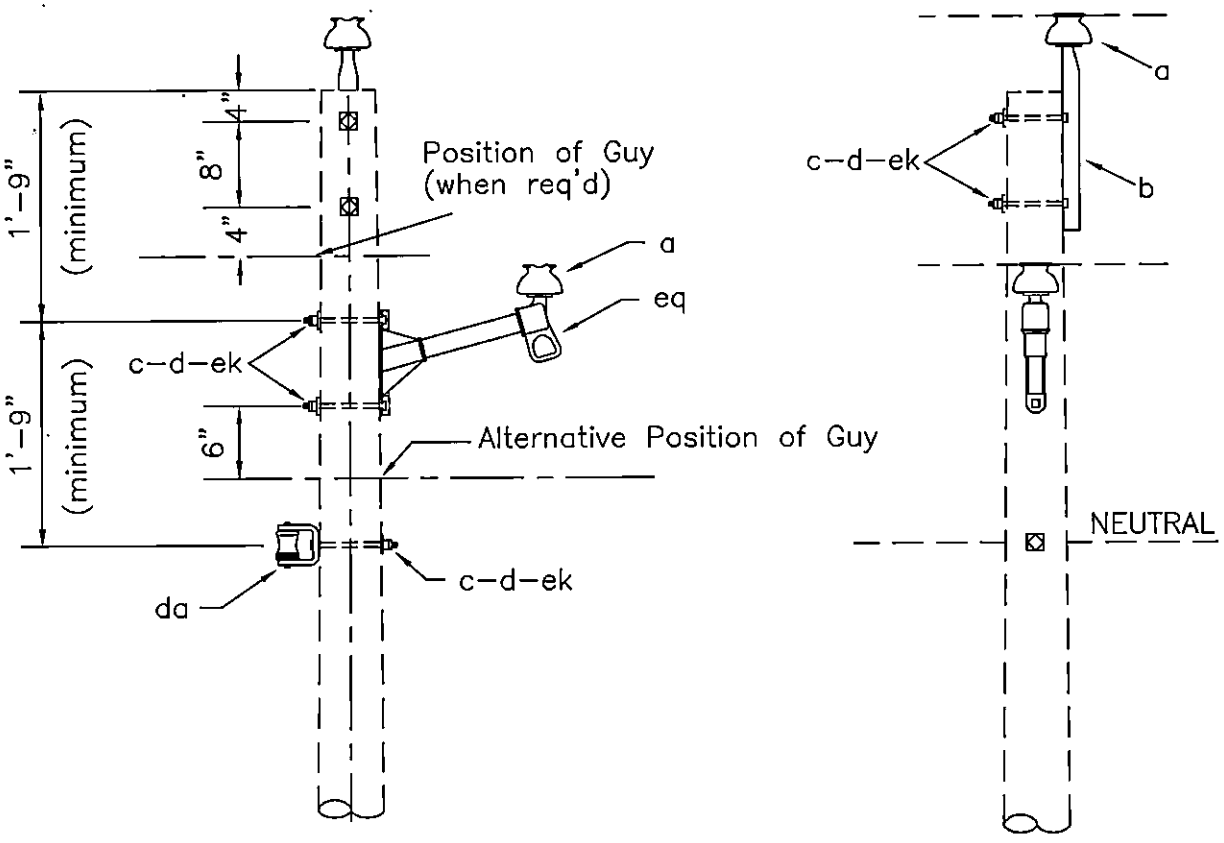
ASSEMBLY: B1.		1NP	2NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	2	2
eb	Bracket, pole top	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	1	1

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.1NP
RUS	12.47/7.2 kV	B1.2NP



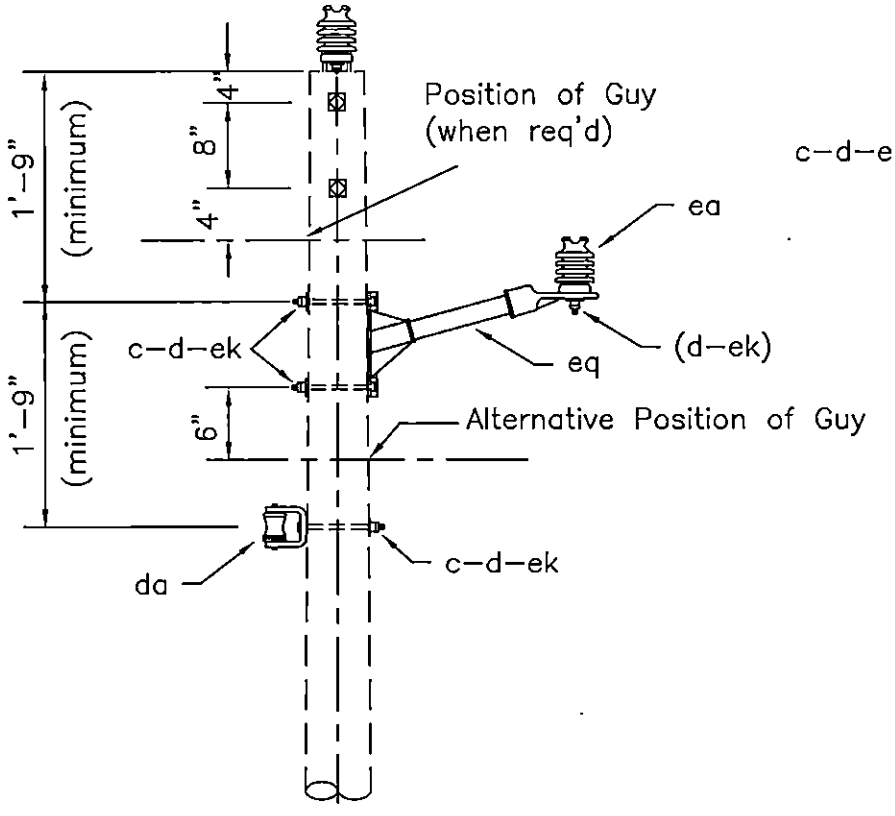
ASSEMBLY: B1.		3N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	2
b	Pin, pole top, 20"	1
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1) (If req'd)
da	Bracket, insulated	1
ek	Locknuts	5
eq	Bracket, insulator/equipment	1

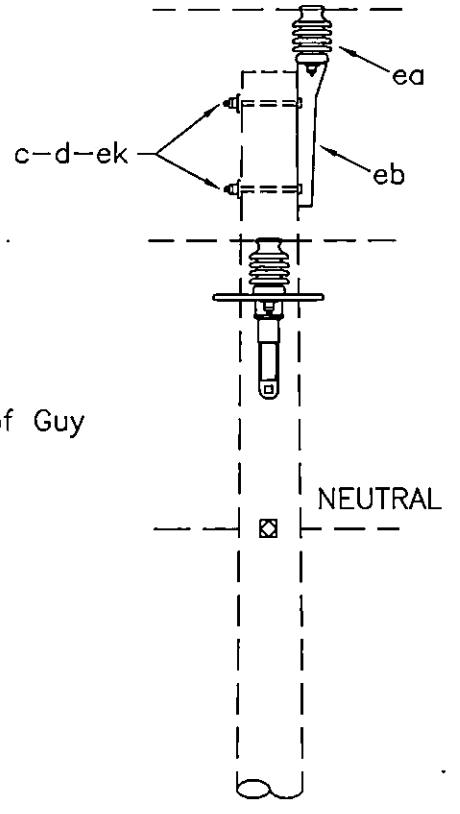
Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE I

SINGLE SUPPORT–NARROW PROFILE

APRIL 2005	2 – PHASE PRIMARY	B1.3N
RUS	12.47/7.2 kV	





ASSEMBLY: B1. 3NP

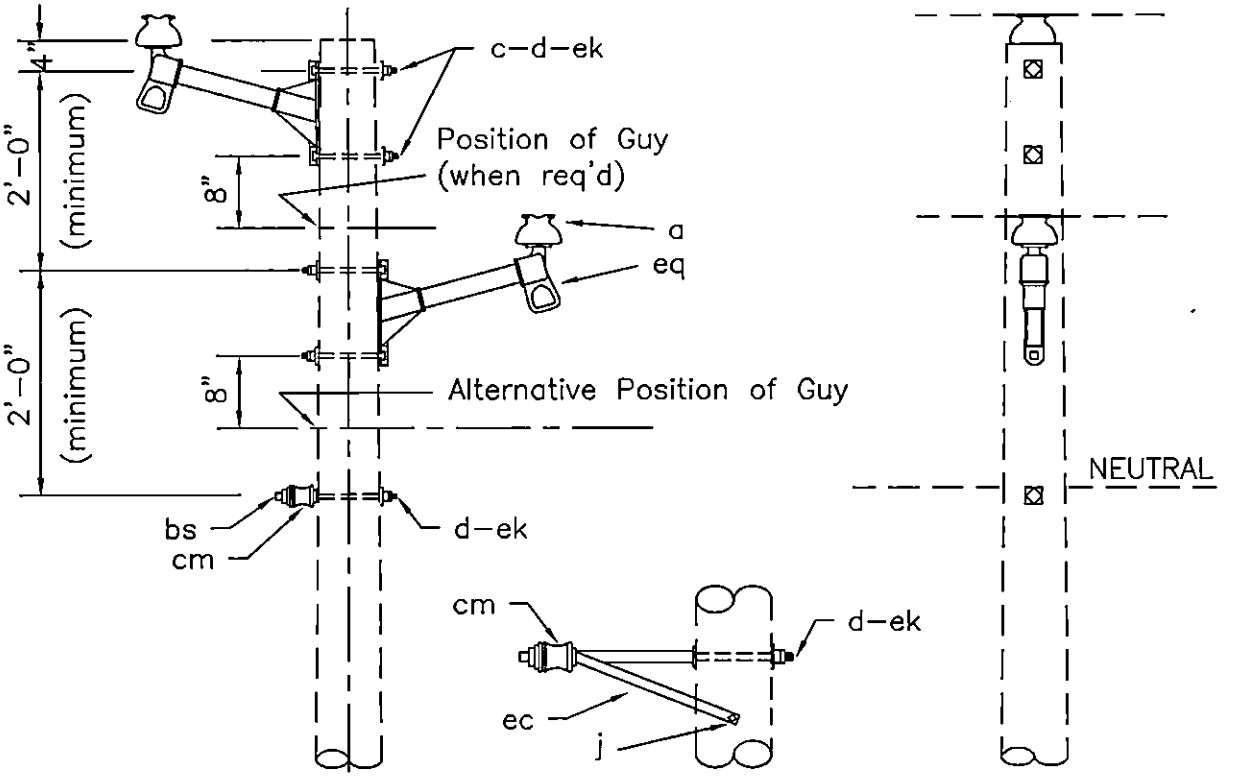
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	2
eb	Bracket, pole top	1
ek	Locknuts	5
eq	Bracket, insulator/equipment	1

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.3NP
RUS	12.47/7.2 kV	



Specify B1.5N for
offset neutral assembly

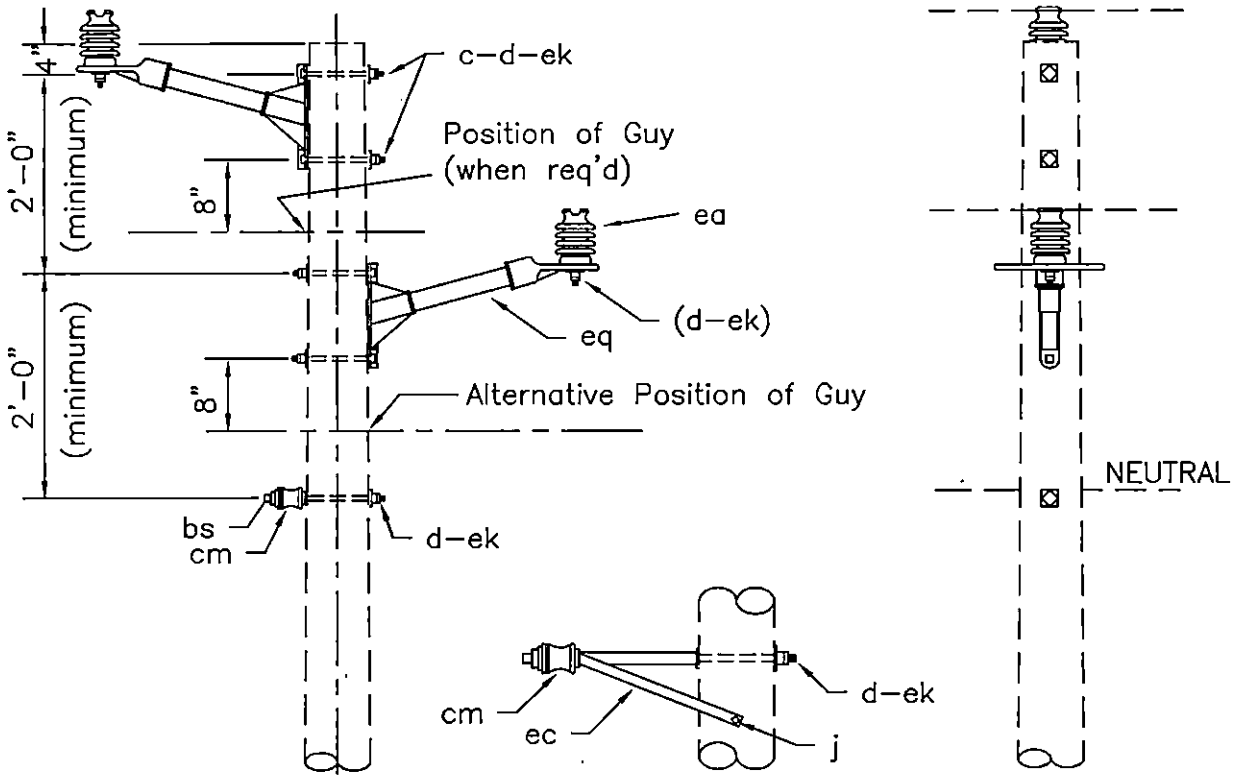
ASSEMBLY: B1.		4N	5N	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	2	2	
c	Bolt, machine, 5/8" x req'd length	4	4	
d	Washer, square 2 1/4"	5	5	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(2)	(2)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	5	5	
eq	Bracket, insulator/equipment	2	2	

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	2 – PHASE PRIMARY	B1.4N
RUS	12.47/7.2 kV	B1.5N



Specify B1.5NP for offset neutral assembly

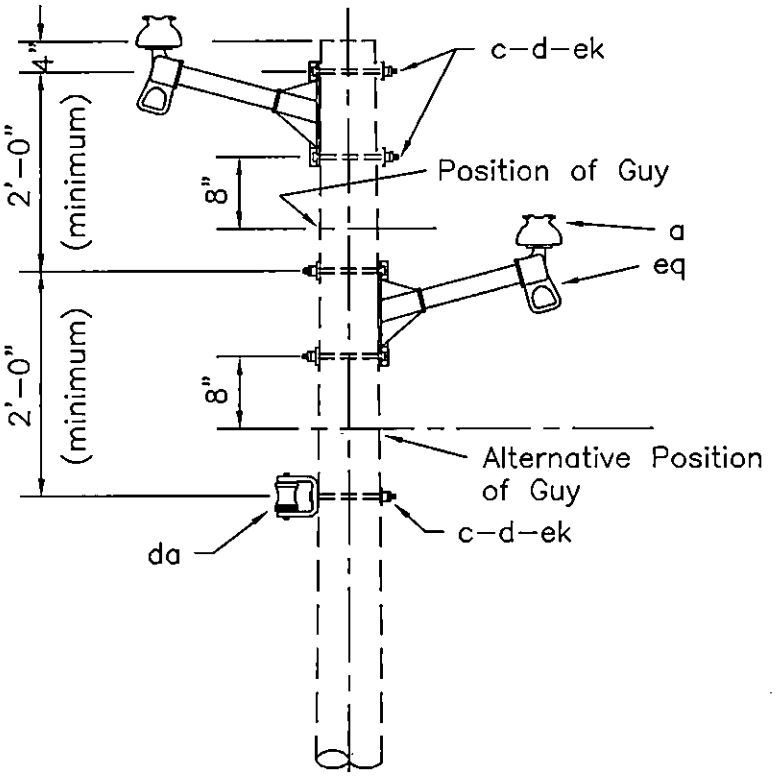
ASSEMBLY: B1.		4NP	5NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	2	2

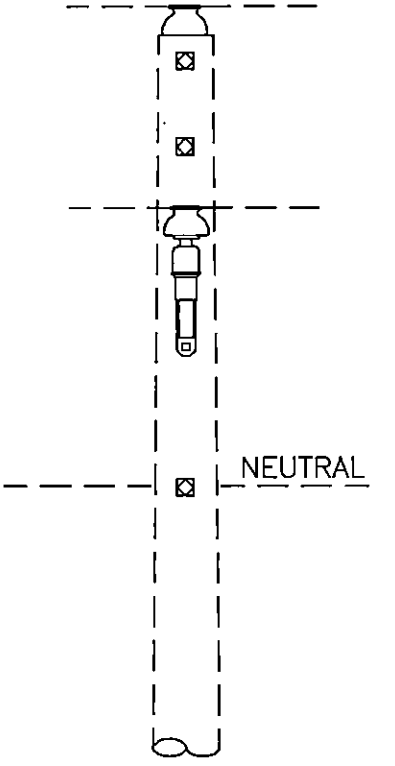
Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.4NP
RUS	12.47/7.2 kV	B1.5NP





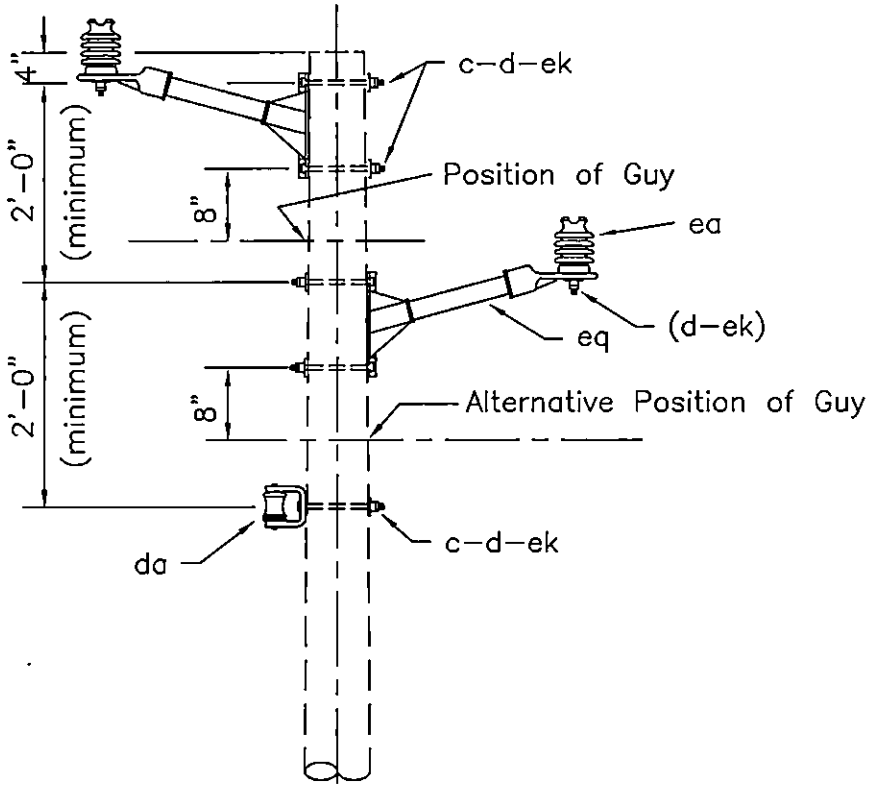
ASSEMBLY: B1.		6N	
ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	2	
c	Bolt, machine, 5/8" x req'd length	5	
d	Washer, square 2 1/4"	5	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(2)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	5	
eq	Bracket, insulator/equipment	2	

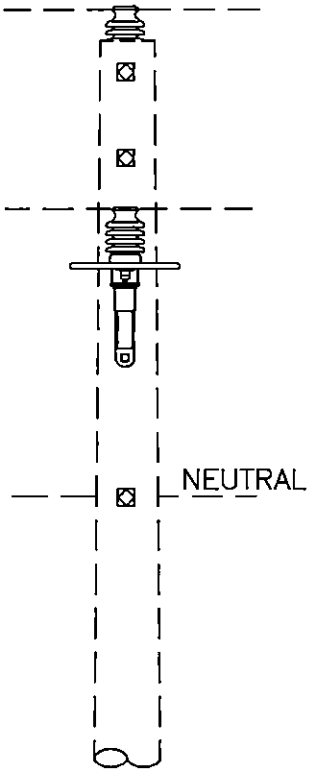
Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT–NARROW PROFILE

APRIL 2005	2 – PHASE PRIMARY	B1.6N
RUS	12.47/7.2 kV	





ASSEMBLY: B1. 6NP

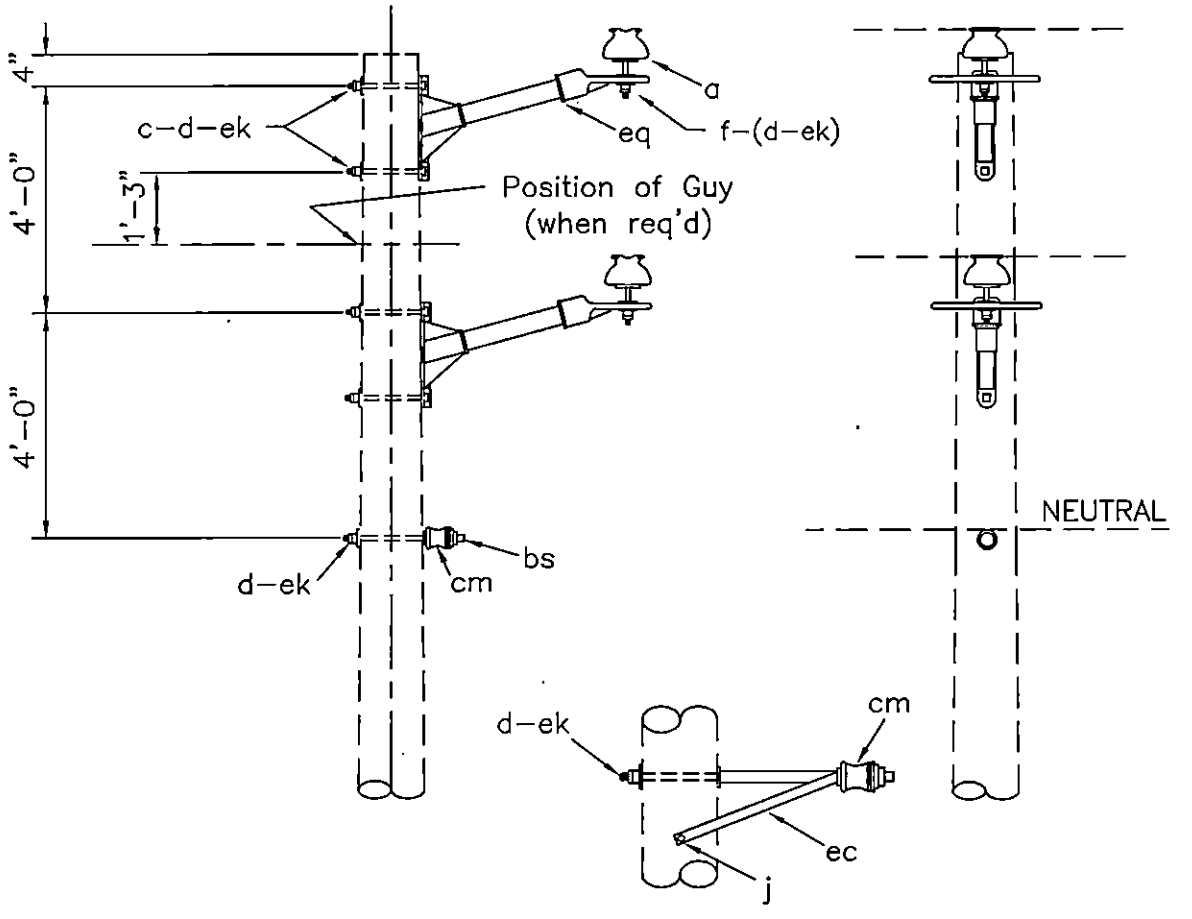
ITEM	MATERIAL	QTY
c	Bolt, machine 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	2
ek	Locknuts	5
eq	Bracket, insulator/equipment	2

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT—NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.6NP
RUS	12.47/7.2 kV	



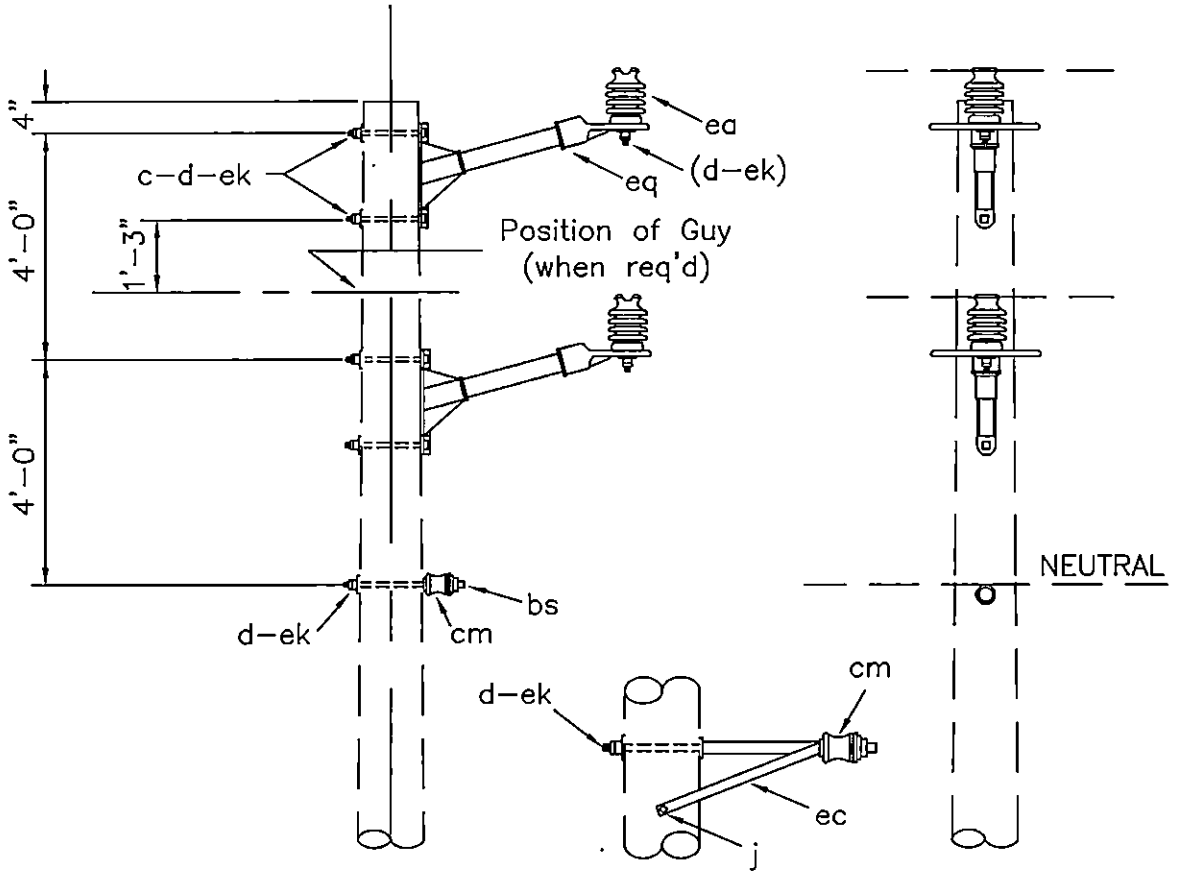
Specify B1.8N for
offset neutral assembly

ITEM	MATERIAL	Assembly: B1. 7N QTY	8N QTY	
a	Insulator, pin type (12.47/7.2 kV)	2	2	
c	Bolt, machine, 5/8" x req'd length	4	4	
d	Washer, square 2 1/4"	5	5	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(2)	(2)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	5	5	
eq	Bracket, insulator/equipment	2	2	

Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	2 – PHASE PRIMARY	B1.7N
RUS	12.47/7.2 kV	B1.8N



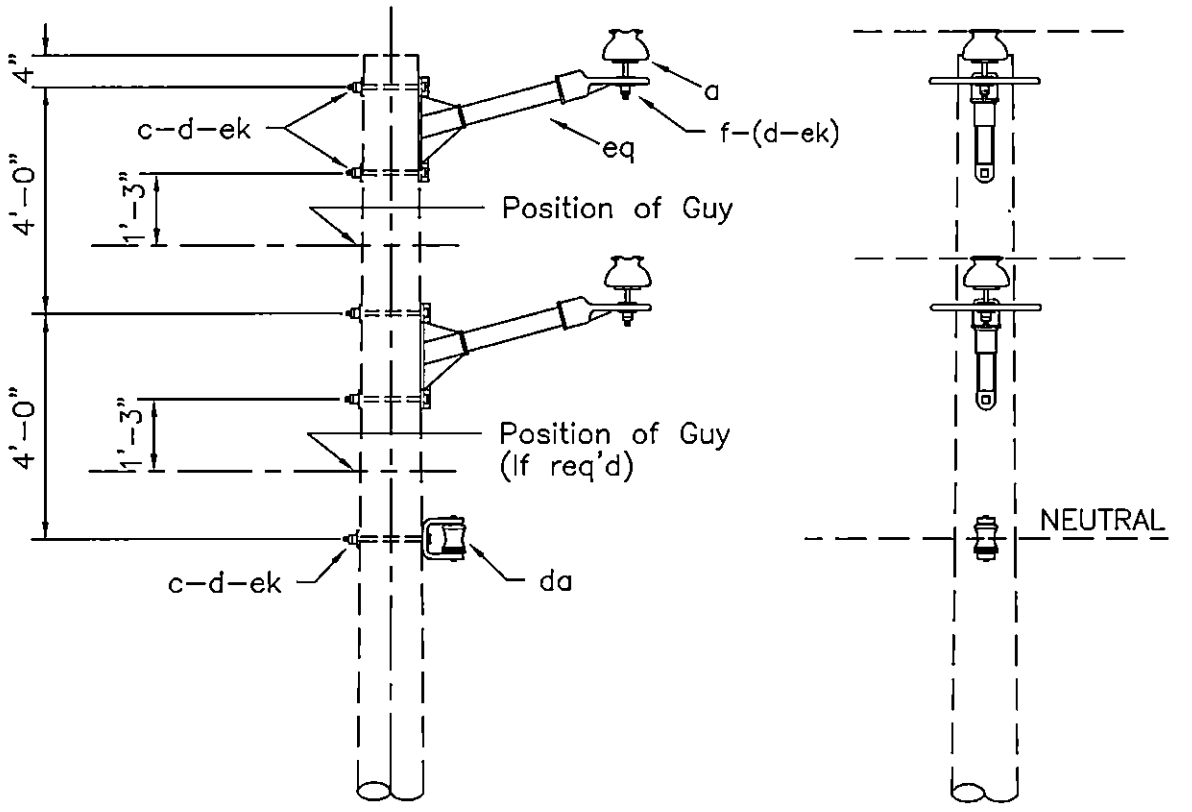
Specify B1.8NP for
offset neutral assembly

Assembly: B1.		7NP	8NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.5 kV)	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	2	2

Design Parameters:
Maximum Line Angles
5° – Small conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.7NP
RUS	12.47/7.2 kV	B1.8NP

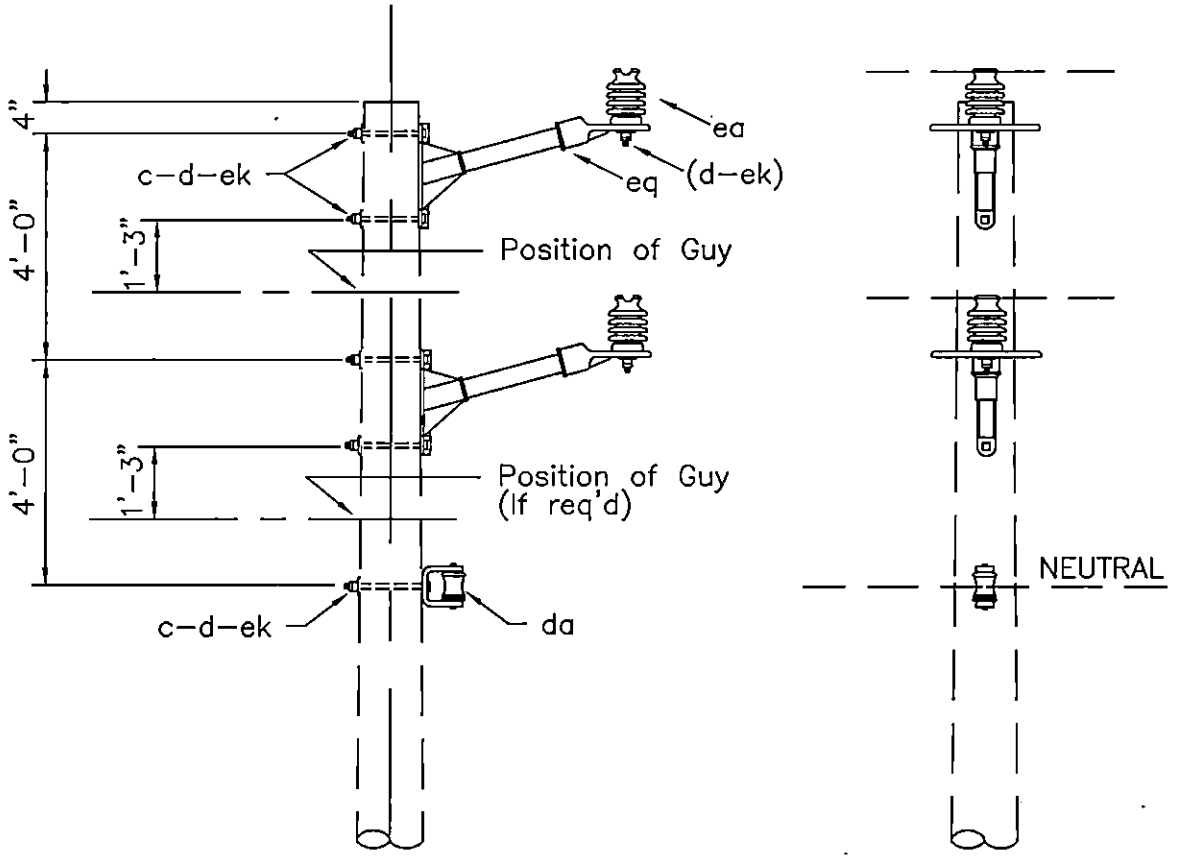


Assembly: B1.		9N	
ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	2	
c	Bolt, machine, 5/8" x req'd length	5	
d	Washer, square 2 1/4"	5	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(2)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	5	
eq	Bracket, insulator/equipment	2	

Design Parameters:
Maximum Line Angles
See TABLE II

SINGLE SUPPORT–NARROW PROFILE

APRIL 2005	2 – PHASE PRIMARY	B1.9N
RUS	12.47/7.2 kV	



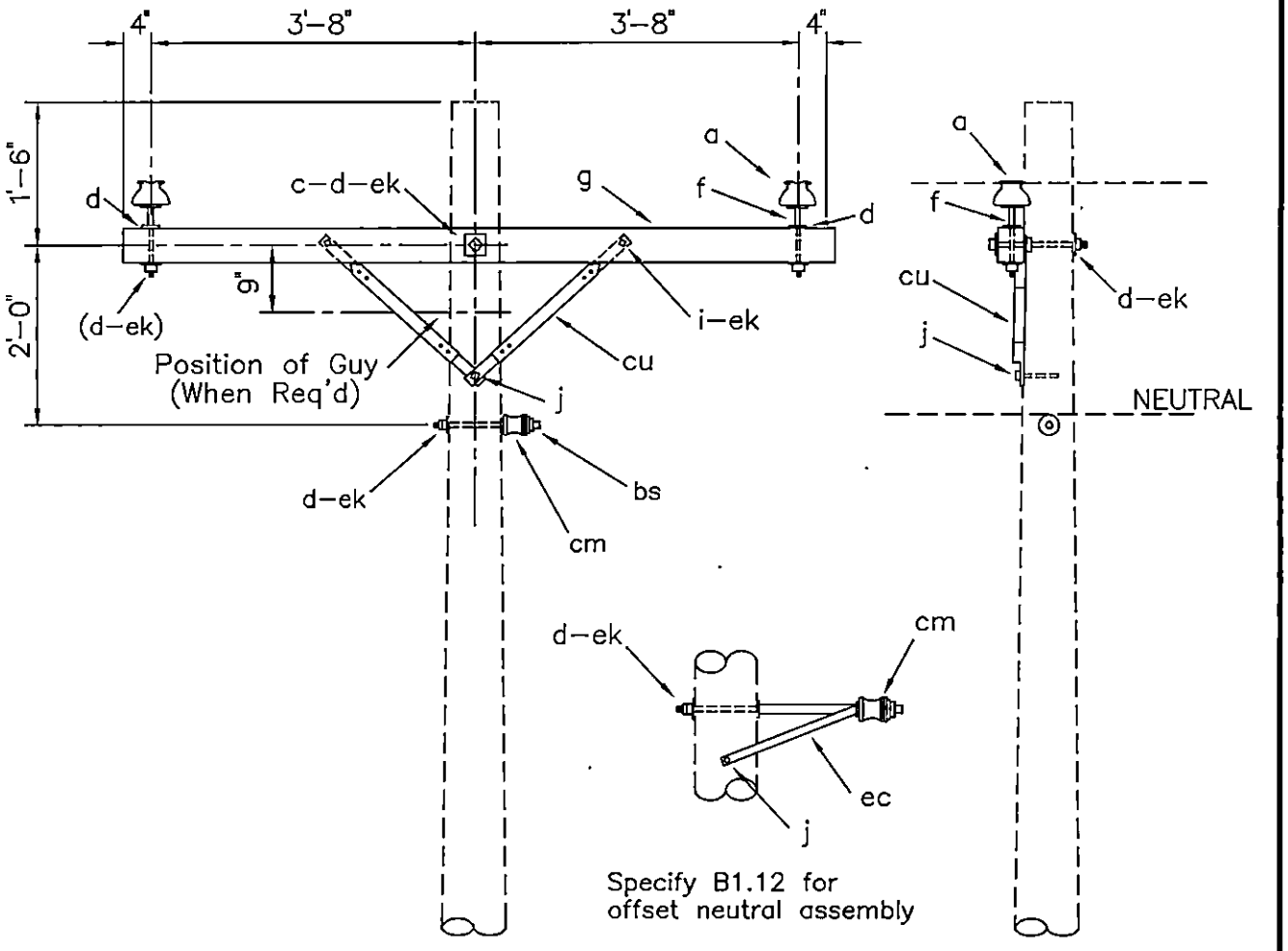
Assembly: B1.		9NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.5 kV)	2
ek	Locknuts	5
eq	Bracket, insulator/equipment	2

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.9NP
RUS	12.47/7.2 kV	



Specify B1.12 for offset neutral assembly

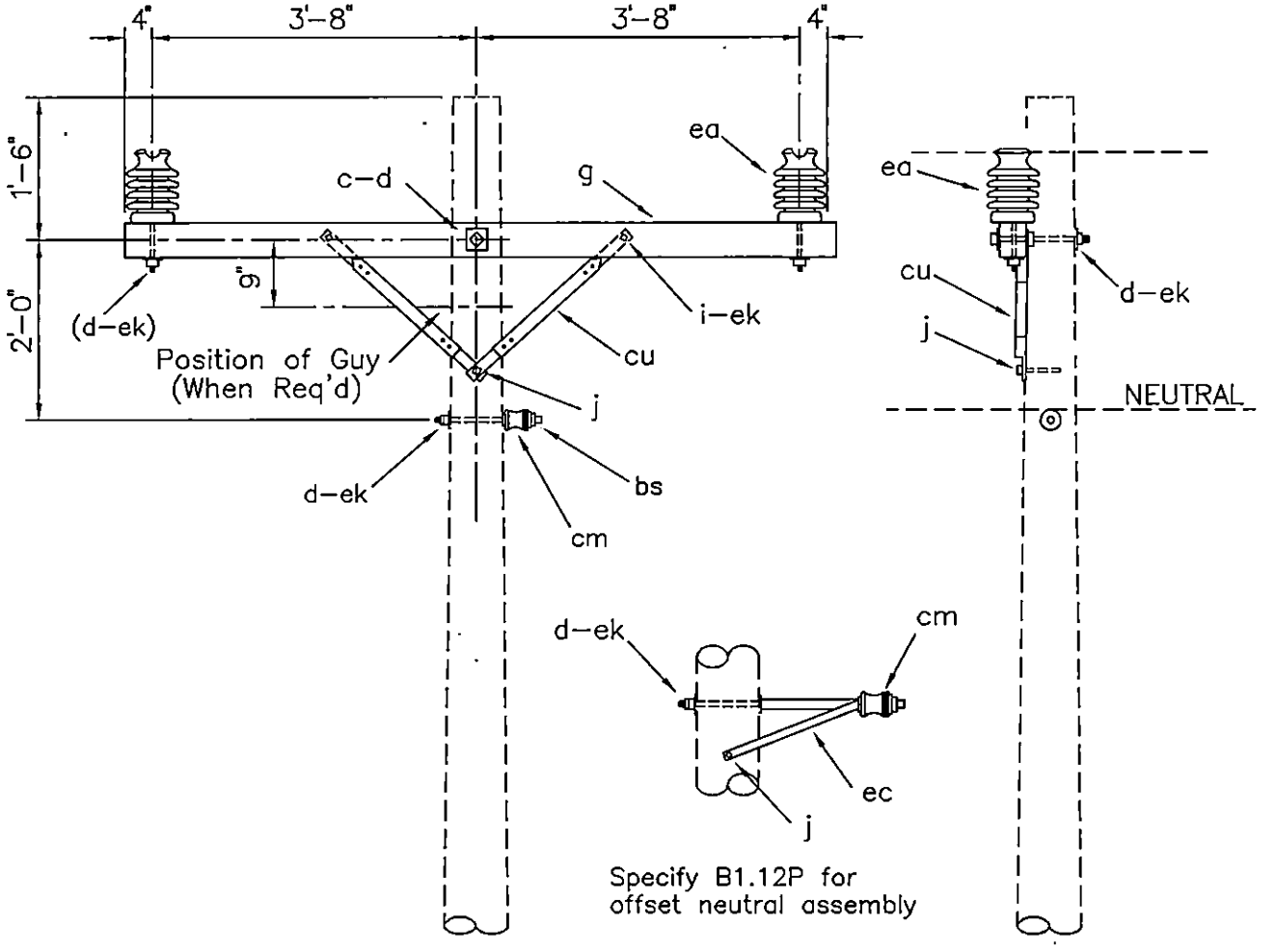
ASSEMBLY: B1.		11	12
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2	2
c	Bolt, machine, 5/8" x req'd length	1	1
d	Washer, square, 2 1/4"	5	5
f	Pin, crossarm steel, 5/8" x 10 3/4"	2	2
g	Crossarm, 3 5/8" x 4 5/8" x 8'–0"	1	1
i	Bolt, carriage, 3/8" x 4 1/2"	2	2
j	Screw, lag, 1/2" x 4"	1	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	2	2
ec	Bracket, offset, neutral		1
ek	Locknuts	4	4

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
- 5° – Small Conductors
- 2° – Larger than #1/0

SINGLE SUPPORT ON CROSSARM (TANGENT)

APRIL 2005 RUS	2 – PHASE PRIMARY 12.47/7.2 kV	B1.11 (B1) B1.12 (B1A)



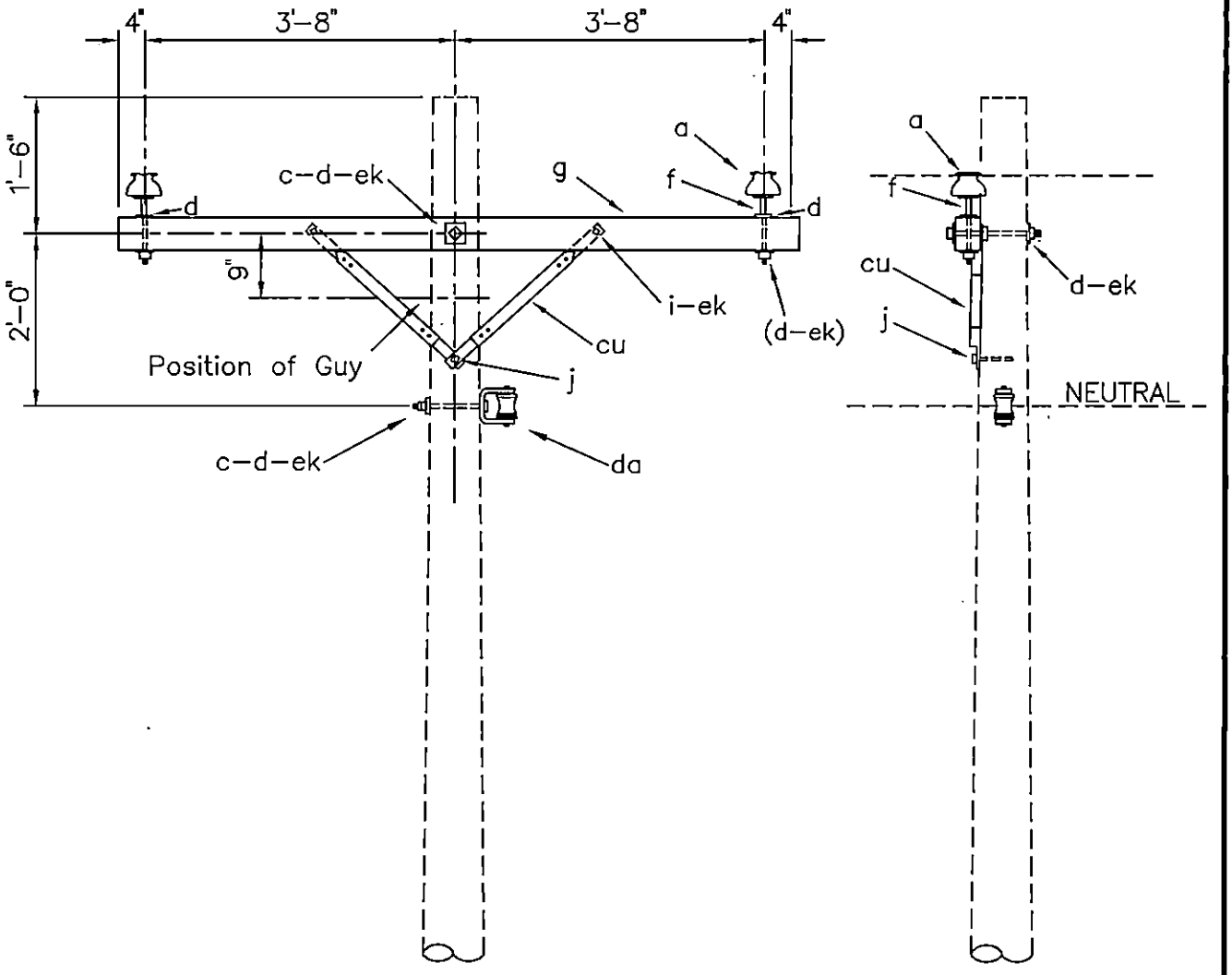
ASSEMBLY: B1.		11P	12P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	1	1
d	Washer, square, 2 1/4"	3	3
g	Crossarm, 3 5/8" x 4 5/8" x 8'-0"	1	1
i	Bolt, carriage, 3/8" x 4 1/2"	2	2
j	Screw, lag, 1/2" x 4"	1	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	2	2
ea	Insulator, post type, (12.47/7.2 kV)	2	2
ec	Bracket, offset, neutral		1
ek	Locknuts	4	4

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT ON CROSSARM (TANGENT) (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B1.11P (B1P)
RUS	12.47/7.2 kV	B1.12P (B1AP)



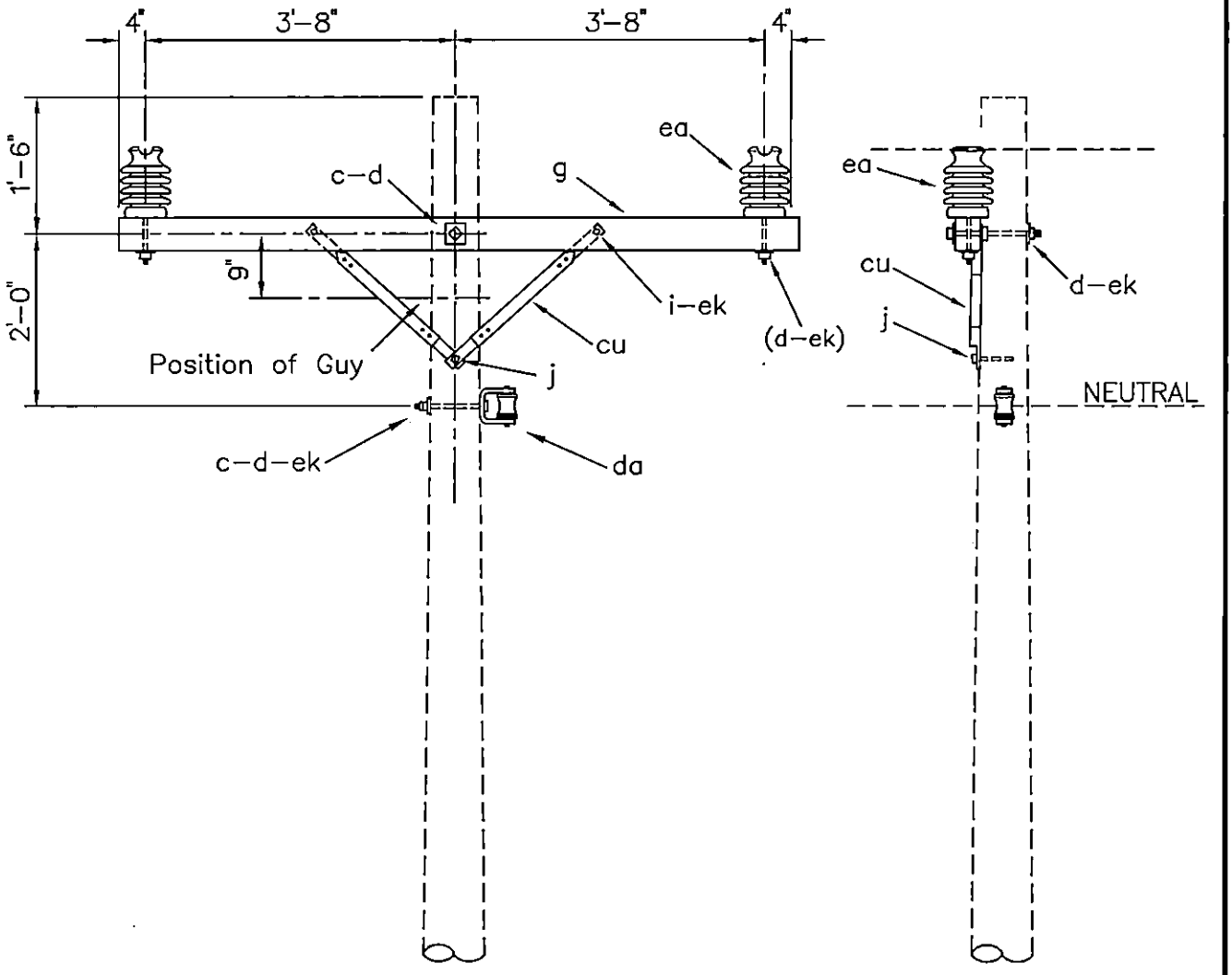
ITEM	QTY	MATERIAL
a	2	Insulator, pin type (12.47/7.2 kV)
c	2	Bolt, machine, 5/8" x req'd length
d	5	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
cu	2	Brace, 28"
da	1	Bracket, insulated
ek	4	Locknuts

DESIGN PARAMETERS:

See TABLE II

SINGLE SUPPORT ON CROSSARM

APRIL 2005	2 - PHASE PRIMARY	
RUS	12.47/7.2 kV	B1.13



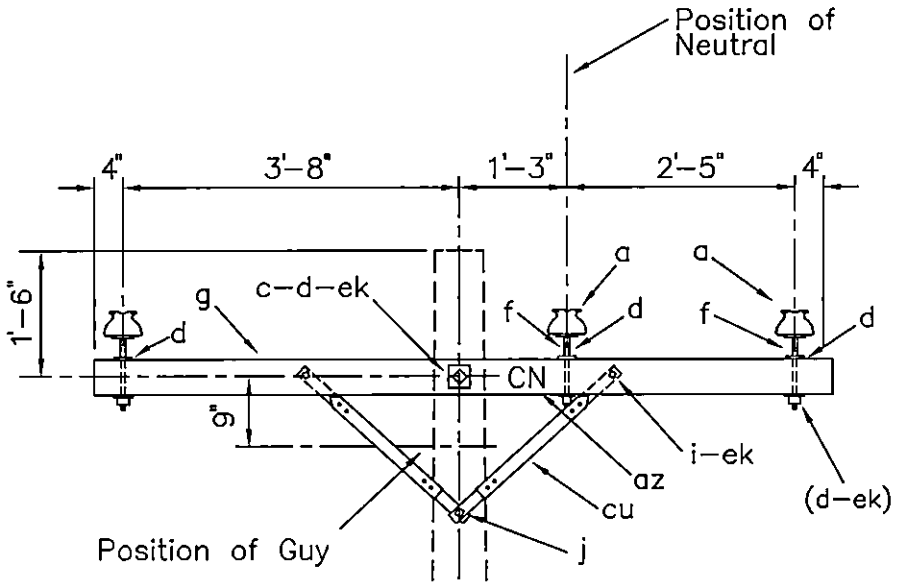
ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
cu	2	Brace, 28"
da	1	Bracket, insulated
ea	2	Insulator, post type (12.47/7.2 kV)
ek	4	Locknuts

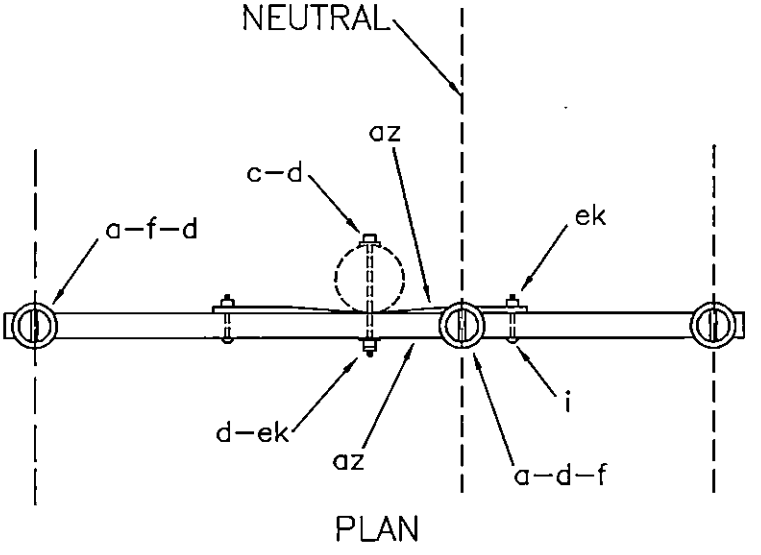
DESIGN PARAMETERS:

See TABLE II

SINGLE SUPPORT ON CROSSARM (POST INSULATORS)

APRIL 2005	2 - PHASE PRIMARY	
RUS	12.47/7.2 kV	B1.13P





PLAN

ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
a	2	Insulator, pin type (12.47/7.2 kV)
c	1	Bolt, machine, 5/8" x req'd length
d	5	Washer, square, 2 1/4"
f	3	Pin, crossarm, steel, 5/8" x 10 3/4"
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"
az	4	Letters, 2" C, 2" N, with nails
cu	2	Brace, 28"
ek	3	Locknuts

NOTE:

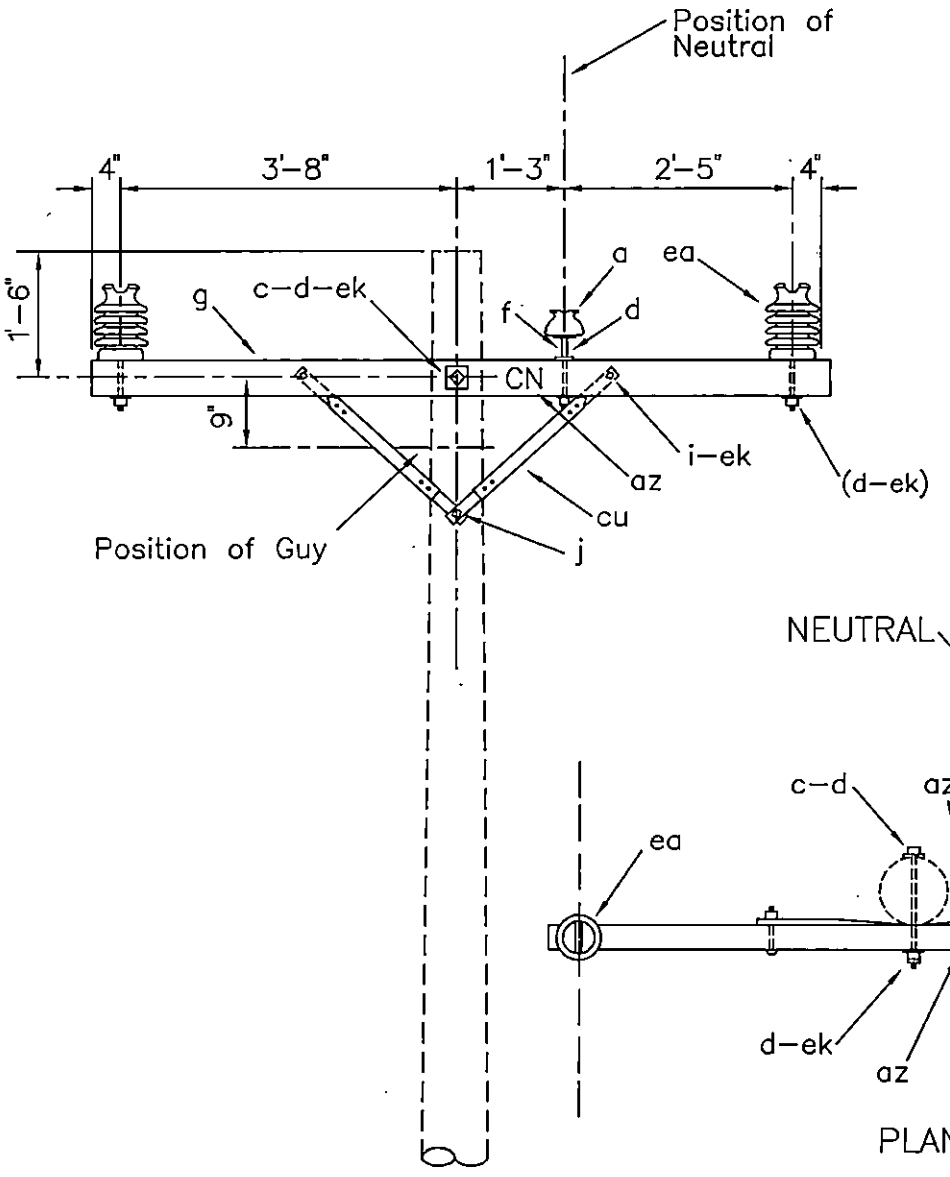
Install either identification letters (az) or white insulator in neutral position.

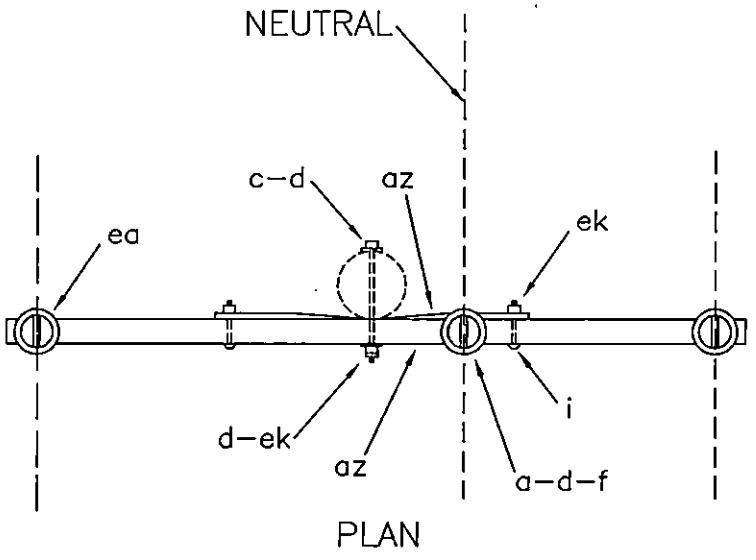
DESIGN PARAMETERS:

See TABLE II

SINGLE SUPPORT, NEUTRAL ON CROSSARM

APRIL 2005	2 – PHASE PRIMARY	B1.14
RUS	12.47/7.2 kV	(B9–1)





PLAN

ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
c	1	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
f	1	Pin, crossarm, steel, 5/8" x 10 3/4"
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"
az	4	Letters, 2" C, 2" N, with nails
cu	2	Brace, 28"
ea	2	Insulator, post type (12.47/7.2 kV)
ek	3	Locknuts

NOTE:

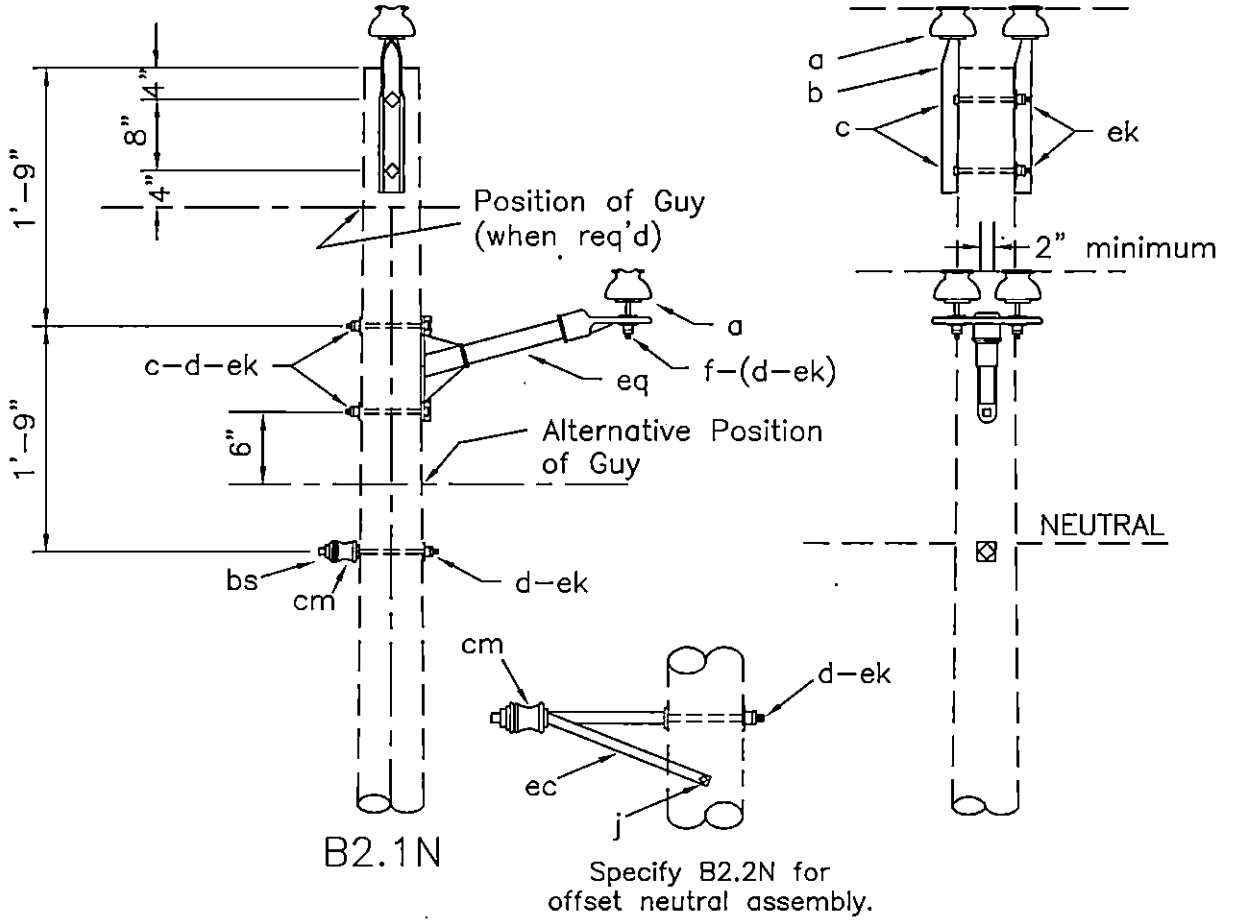
Install either identification letters (az) or white insulator in neutral position.

DESIGN PARAMETERS:

See TABLE II

SINGLE SUPPORT, NEUTRAL ON CROSSARM (POST INSULATORS)

APRIL 2005 RUS	2 - PHASE PRIMARY 12.47/7.2 kV	B1.14P (B9-1P)



NOTE: These assemblies used for NESC Grade B construction.

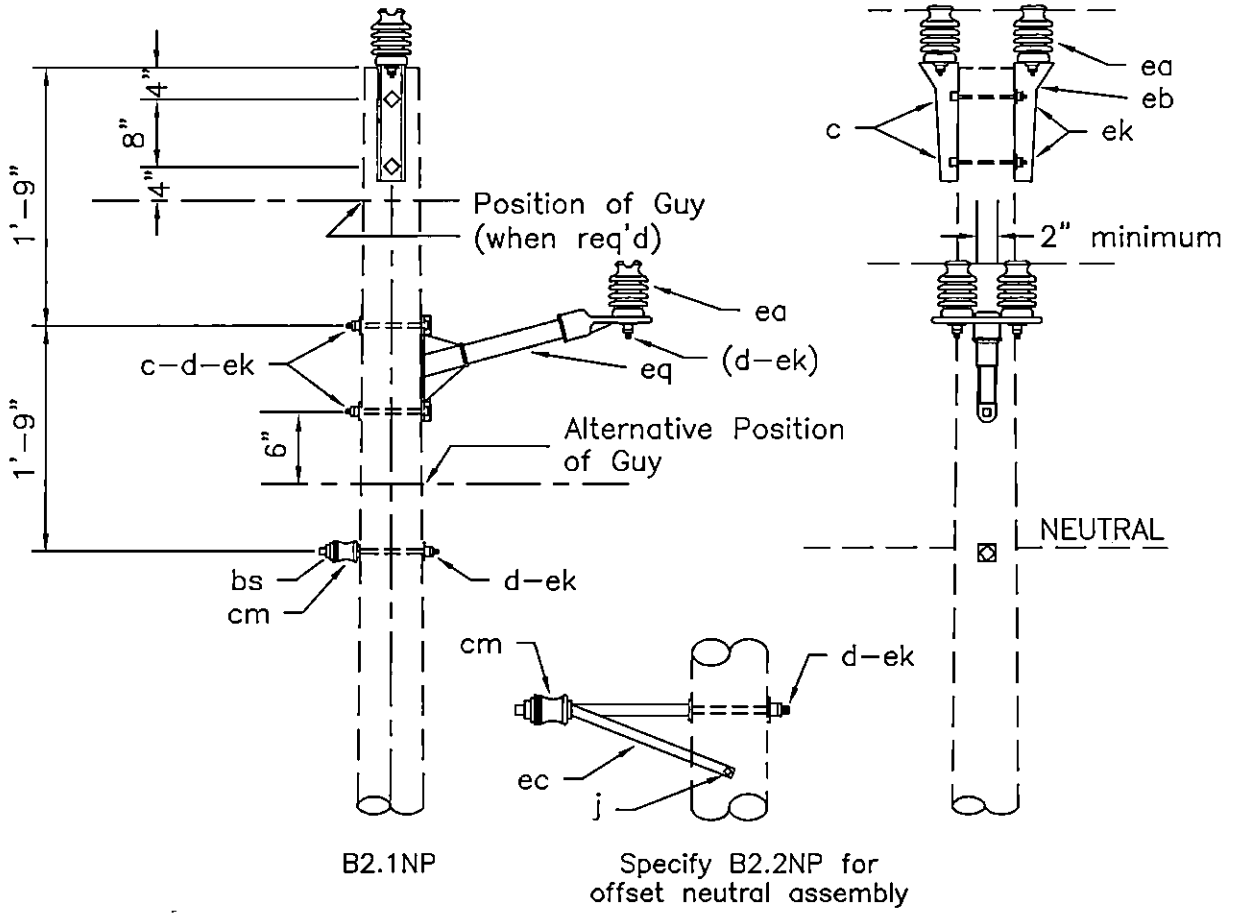
ITEM	MATERIAL	ASSEMBLY: B2. 1N QTY	2N QTY
a	Insulator, pin type (12.47/7.2 kV)	4	4
b	Pin, pole top, 20"	2	2
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	3	3
f	Pin, crossarm, 5/8" x 6 1/2"	2	2
j	Screw, lag 1/2" x 4"		2
bs	Bolt, single upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	1	1

Design Parameters:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	2 – PHASE PRIMARY	B2.1N
RUS	12.47/7.2 kV	B2.2N



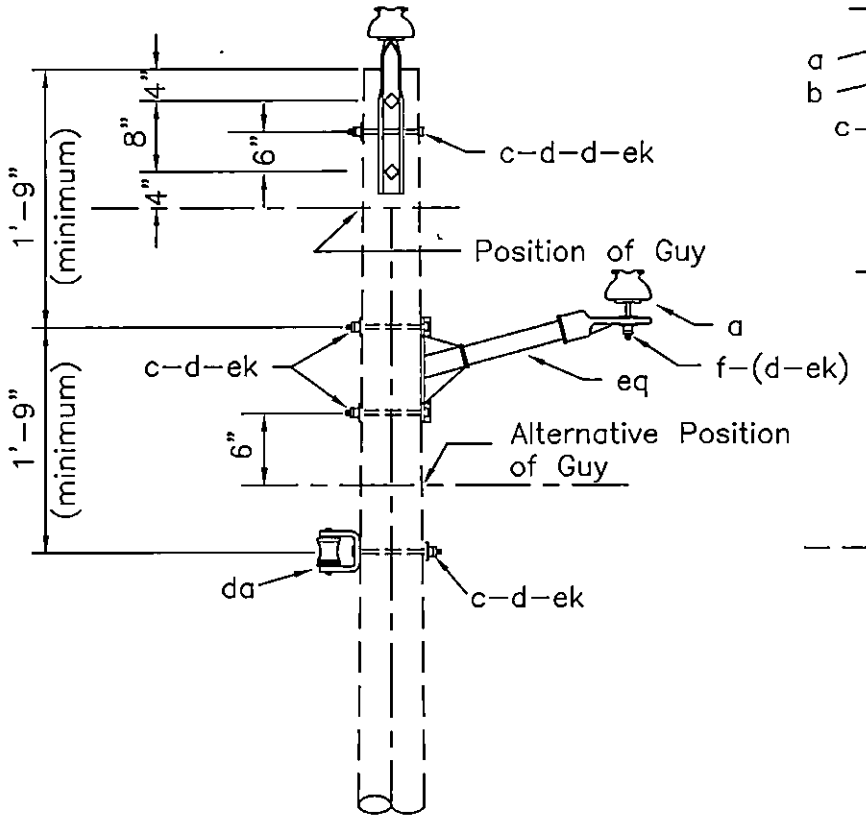
NOTE: These assemblies used for NESC Grade B construction.

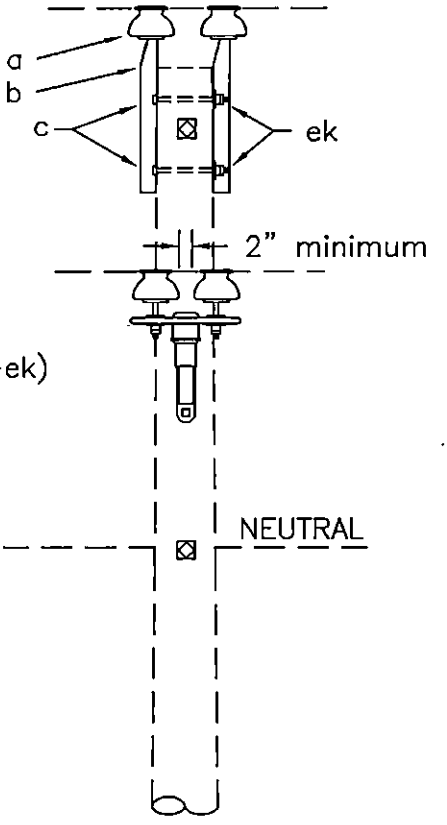
ITEM	MATERIAL	ASSEMBLY: B2. 1NP QTY	2NP QTY
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	3	3
j	Screw, lag 1/2" x 4"		2
bs	Bolt, single upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.5 kV)	4	4
eb	Bracket, pole top	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	1	1

Design Parameters:
Maximum Line Angles:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.1NP
RUS	12.47/7.2 kV	B2.2NP





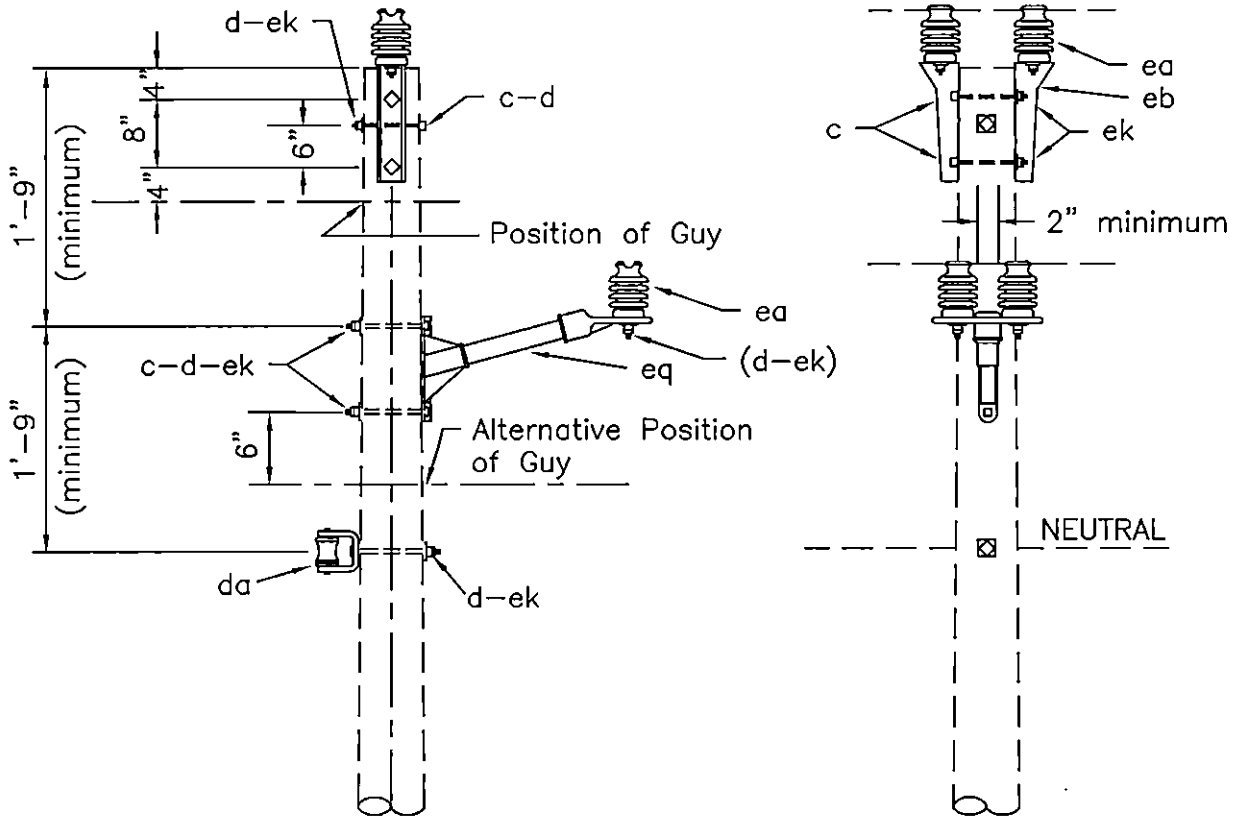
ASSEMBLY: B2.		3N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	4
b	Pin, pole top, 20"	2
c	Bolt, machine, 5/8" x req'd length	6
d	Washer, square 2 1/4"	5
f	Pin, crossarm, 5/8" x 6 1/2"	2
da	Bracket, insulated	1
ek	Locknuts	6
eq	Bracket, insulator/equipment	1

Design Parameters:

MAXIMUM LINE ANGLES:
See Table III

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	2 – PHASE PRIMARY	B2.3N
RUS	12.47/7.2 kV	

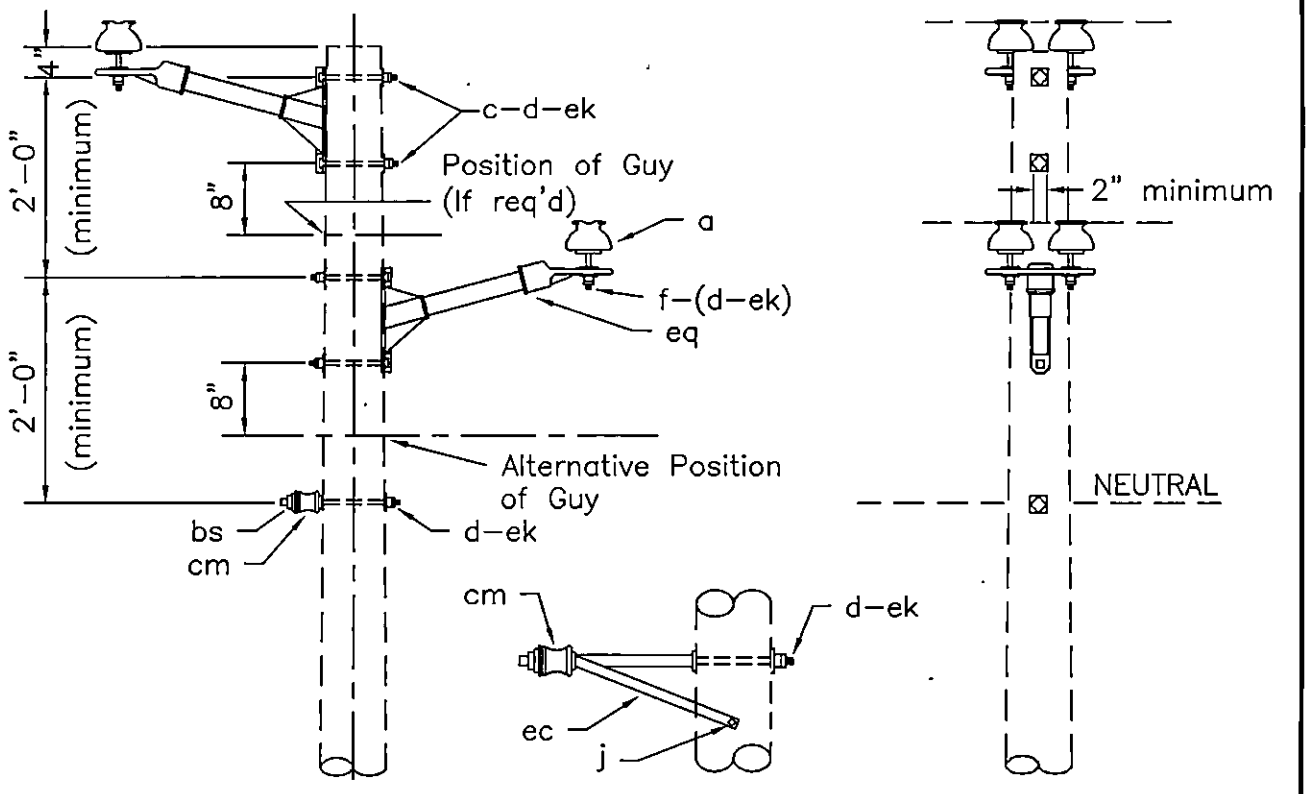


ASSEMBLY: B2.		3NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	6
d	Washer, square 2 1/4"	5
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	4
eb	Bracket, pole top	2
ek	Locknuts	6
eq	Bracket, insulator/equipment	1

Design Parameters:
Maximum Line Angles:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.3NP
RUS	12.47/7.2 kV	



Specify B2.5N for offset neutral assembly

NOTE: Use these assemblies for NESC Grade B construction.

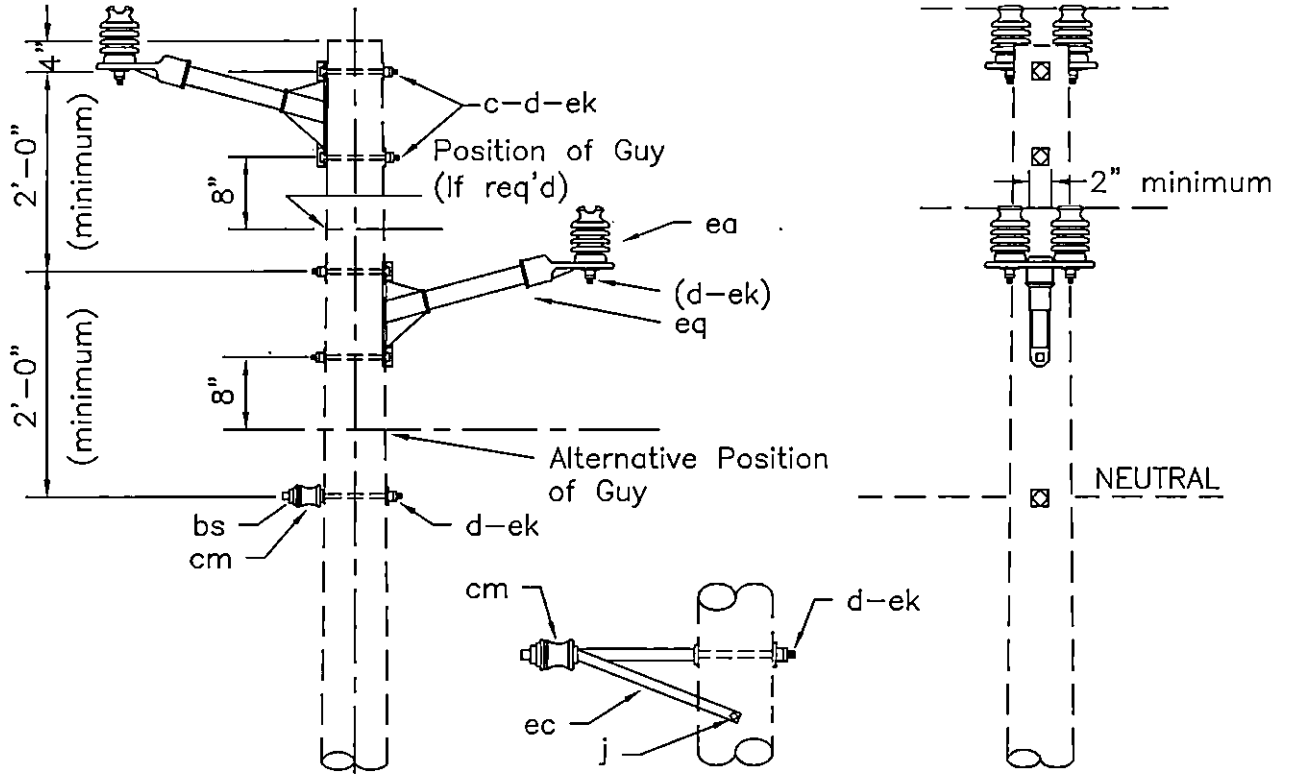
ITEM	MATERIAL	ASSEMBLY: B2. 4N QTY	5N QTY
a	Insulator, pin type (12.47/7.2 kV)	4	4
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
f	Pin, crossarm, 5/8" x 6 1/2"	4	4
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	2	2

Design Parameters:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	2 – PHASE PRIMARY	B2.4N
RUS	12.47/7.2 kV	B2.5N



Specify B2.5NP for
offset neutral assembly

NOTE: Use these assemblies for NESC Grade B construction.

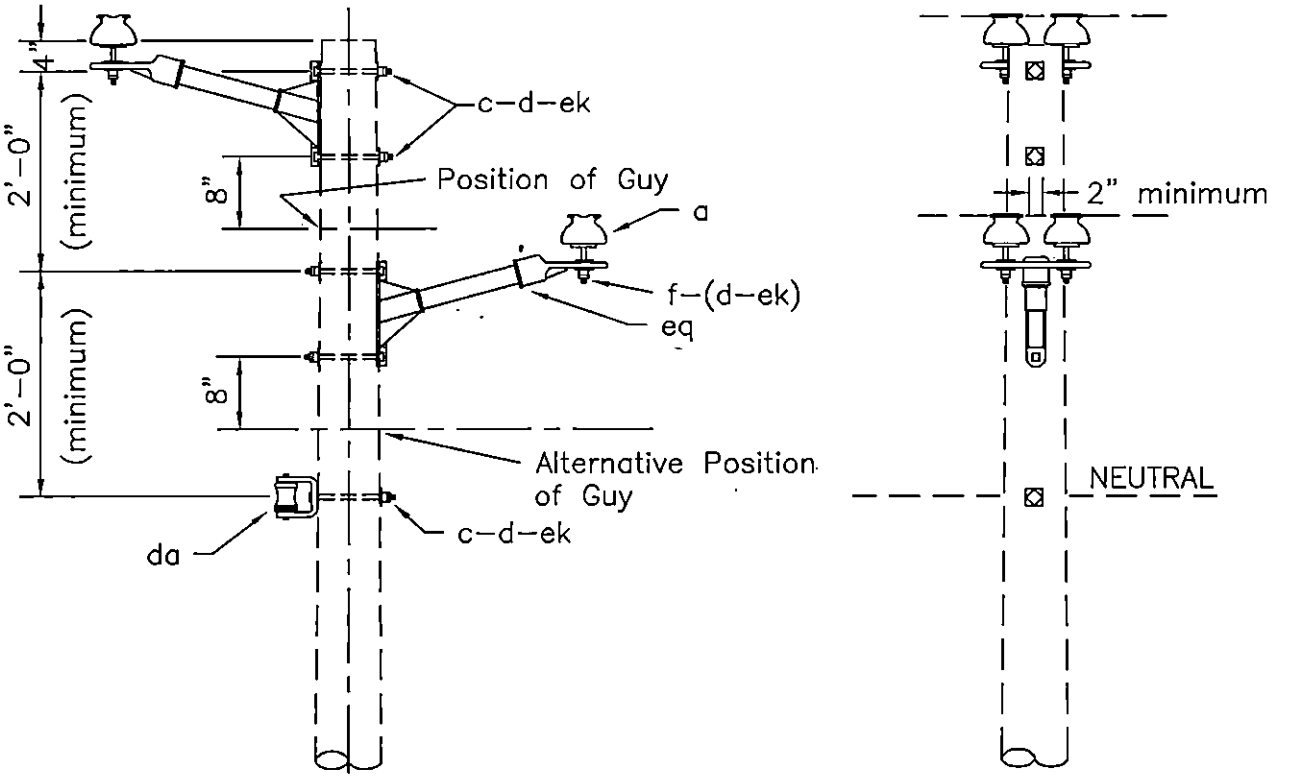
ASSEMBLY: B2.		4NP	5NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kv)	4	4
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	2	2

Design Parameters:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)(POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.4NP
RUS	12.47/7.2 kV	B2.5NP



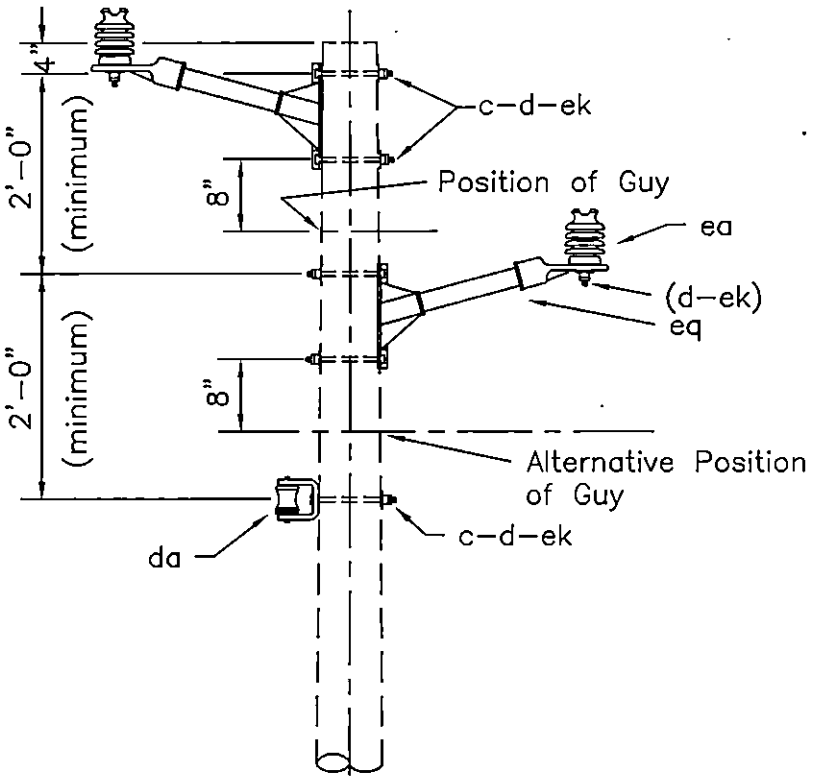
ASSEMBLY: B2.		6N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	4
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
f	Pin, crossarm, 5/8" x 6 1/2"	4
da	Bracket, insulated	1
ek	Locknuts	5
eq	Bracket, insulator/equipment	2

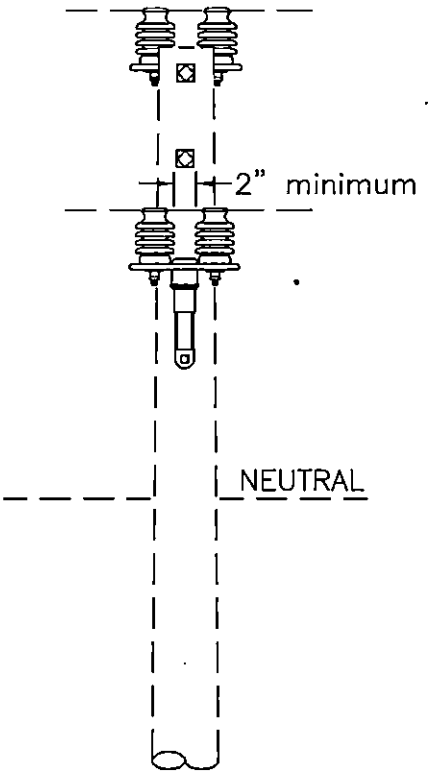
Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	2 – PHASE PRIMARY	B2.6N
RUS	12.47/7.2 kV	





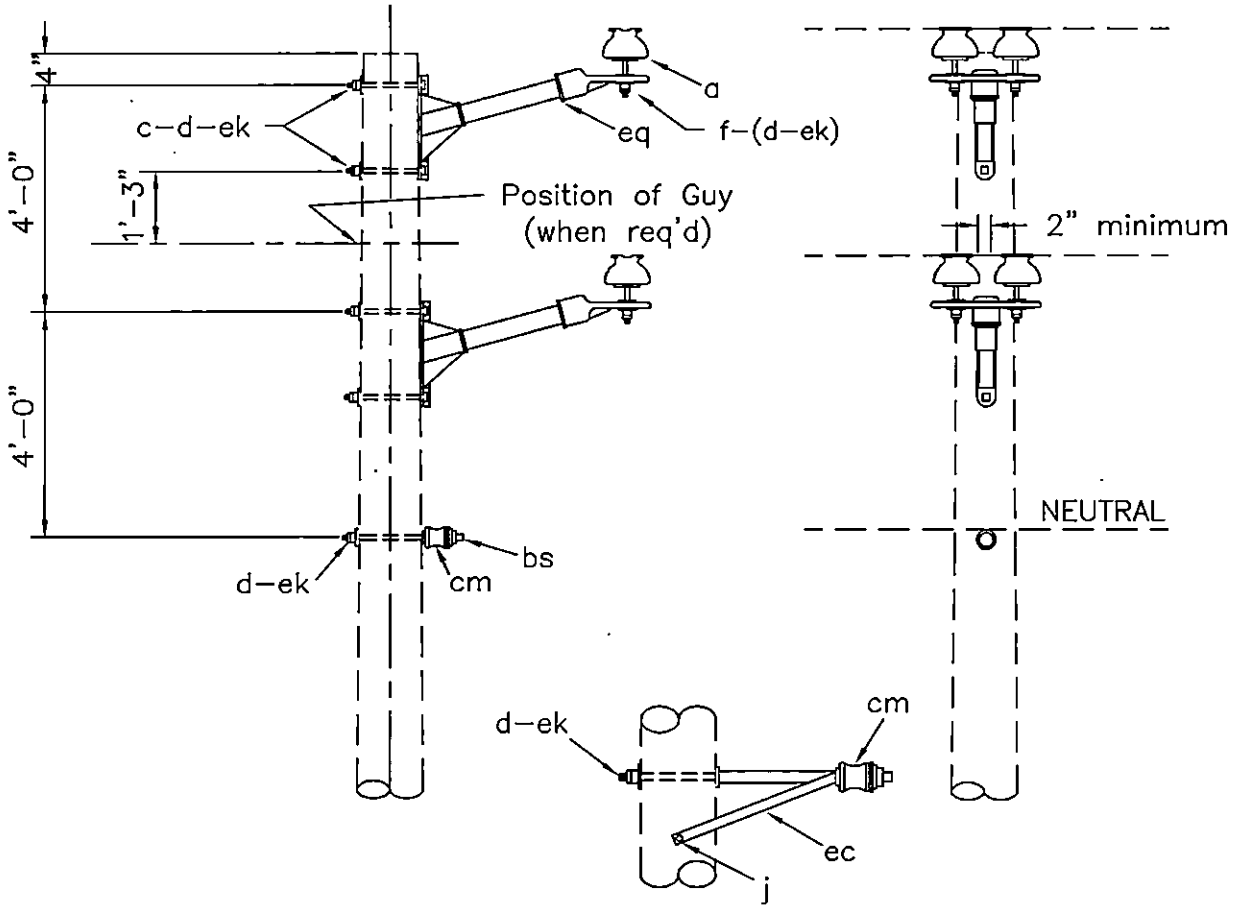
ASSEMBLY: B2.		6NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2kV)	4
ek	Locknuts	5
eq	Bracket, insulator/equipment	2

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.6NP
RUS	12.47/7.2 kV	



Specify B2.8N for
offset neutral assembly

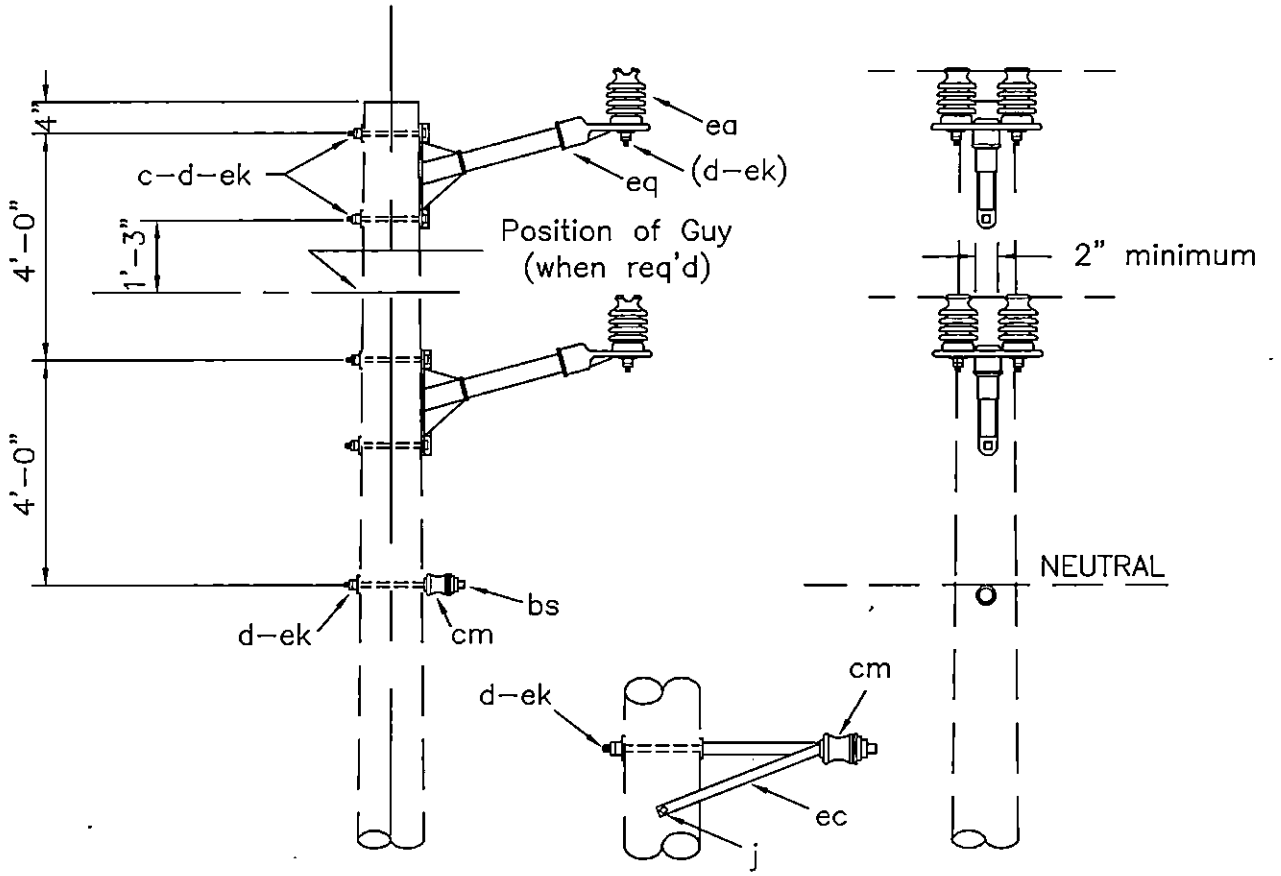
NOTE: These assemblies used for NESC Grade B construction.

	Assembly: B2.	7N	8N
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	4	4
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
f	Pin, crossarm, 5/8" x 6 1/2"	4	4
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	2	2

Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	2 – PHASE PRIMARY	B2.7N
RUS	12.47/7.2 kV	B2.8N



Specify B2.8NP for
offset neutral assembly

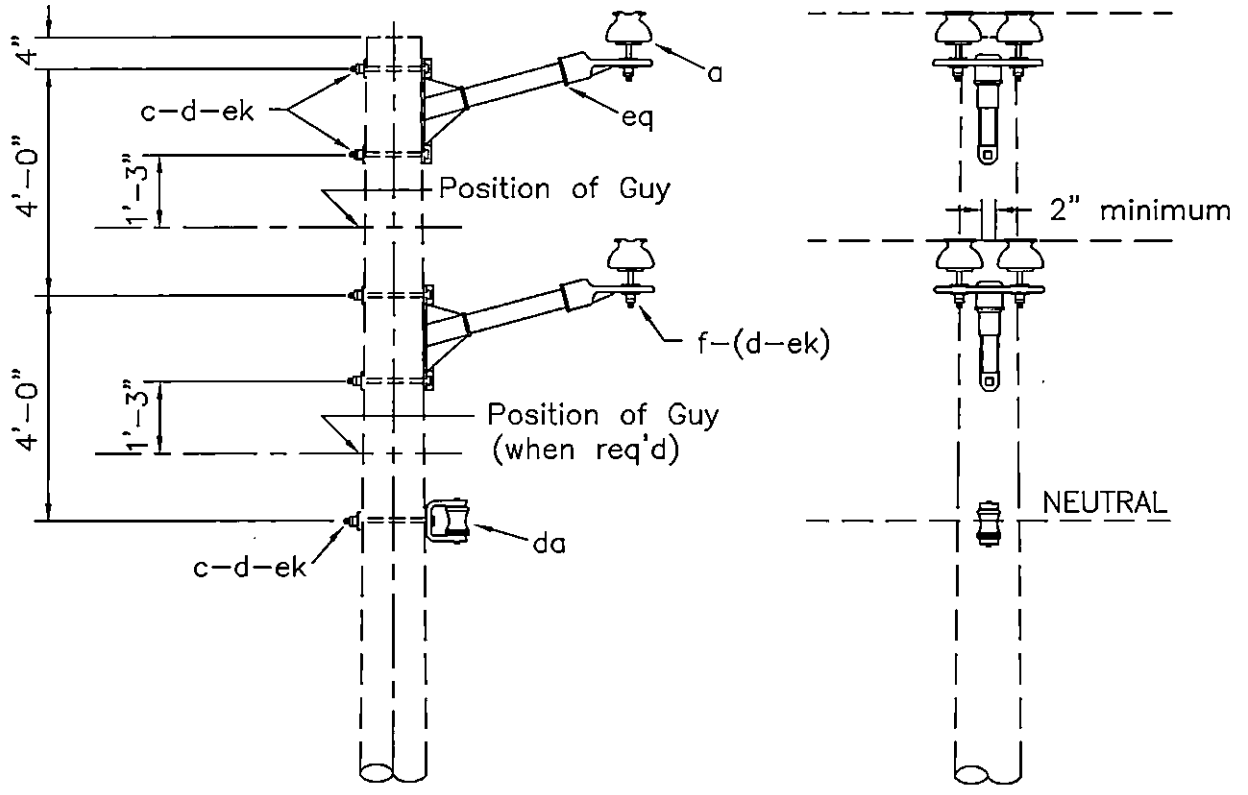
NOTE: These assemblies used for NESC Grade B construction.

ITEM	MATERIAL	Assembly: B2. 7NP QTY	8NP QTY
c	Bolt, machine, 5/8" x req'd length	4	4
d	Washer, square 2 1/4"	5	5
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	4	4
ec	Bracket, offset neutral		1
ek	Locknuts	5	5
eq	Bracket, insulator/equipment	2	2

Design Parameters:
Maximum Line Angles
5° – Small conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.7NP
RUS	12.47/7.2 kV	B2.8NP

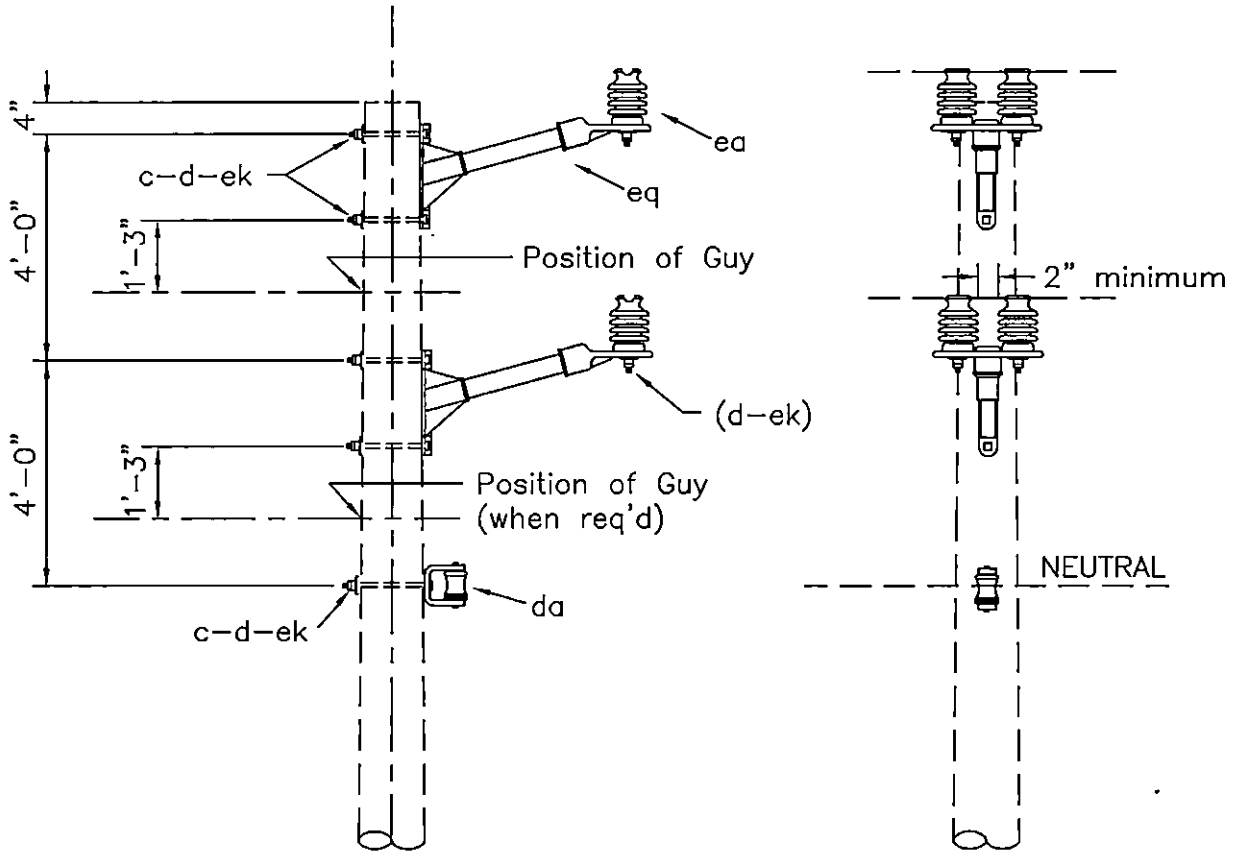


Assembly: B2.		9N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	4
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
f	Pin, crossarm, 5/8" x 6 1/2"	4
da	Bracket, insulated	1
ek	Locknuts	5
eq	Bracket, insulator/equipment	2

Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	2 – PHASE PRIMARY	B2.9N
RUS	12.47/7.2 kV	

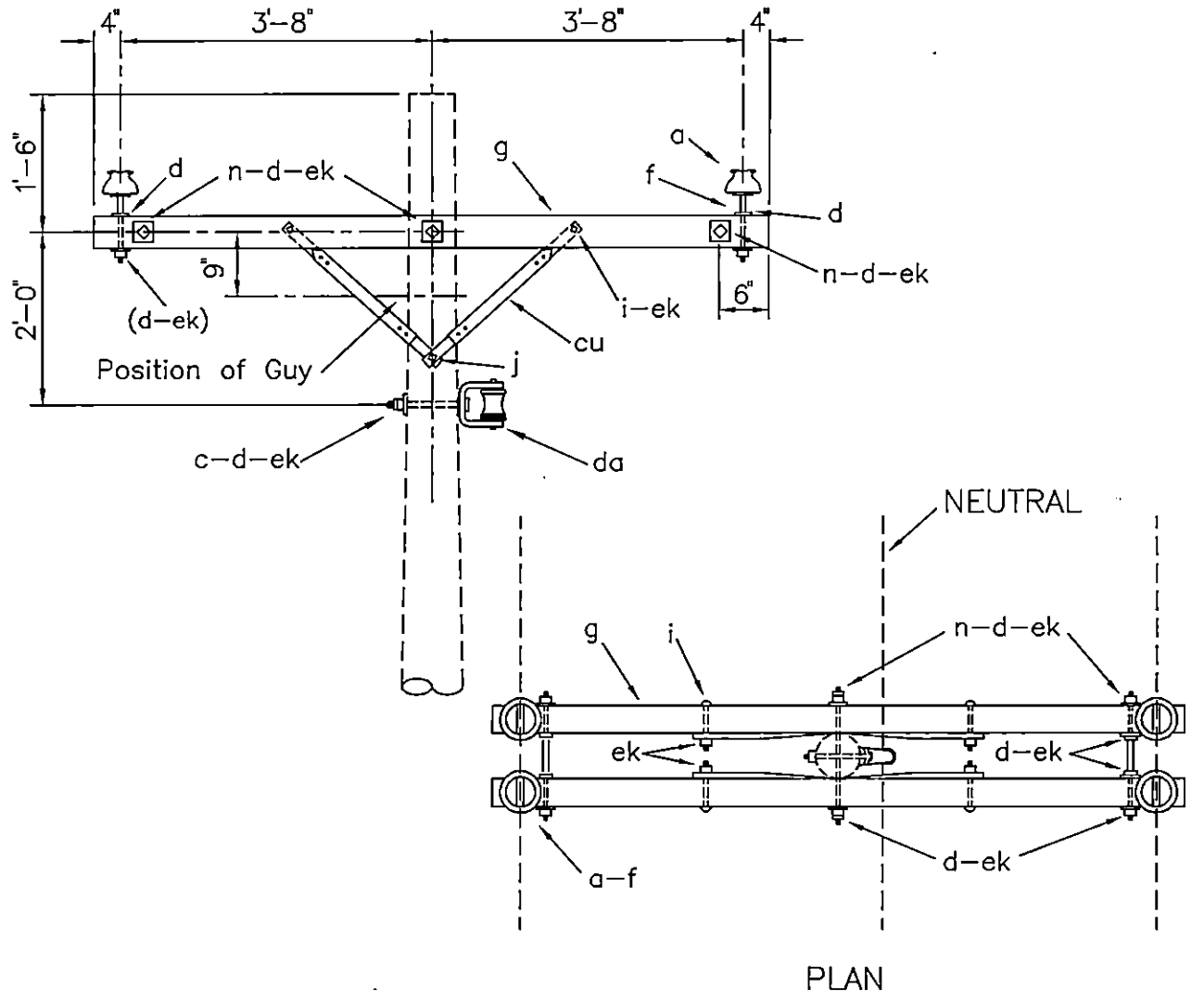


Assembly: B2.		9NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	5
d	Washer, square 2 1/4"	5
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	4
ek	Locknuts	5
eq	Bracket, insulator/equipment	2

Design Parameters:
Maximum Line Angles:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.9NP
RUS	12.47/7.2 kV	



PLAN

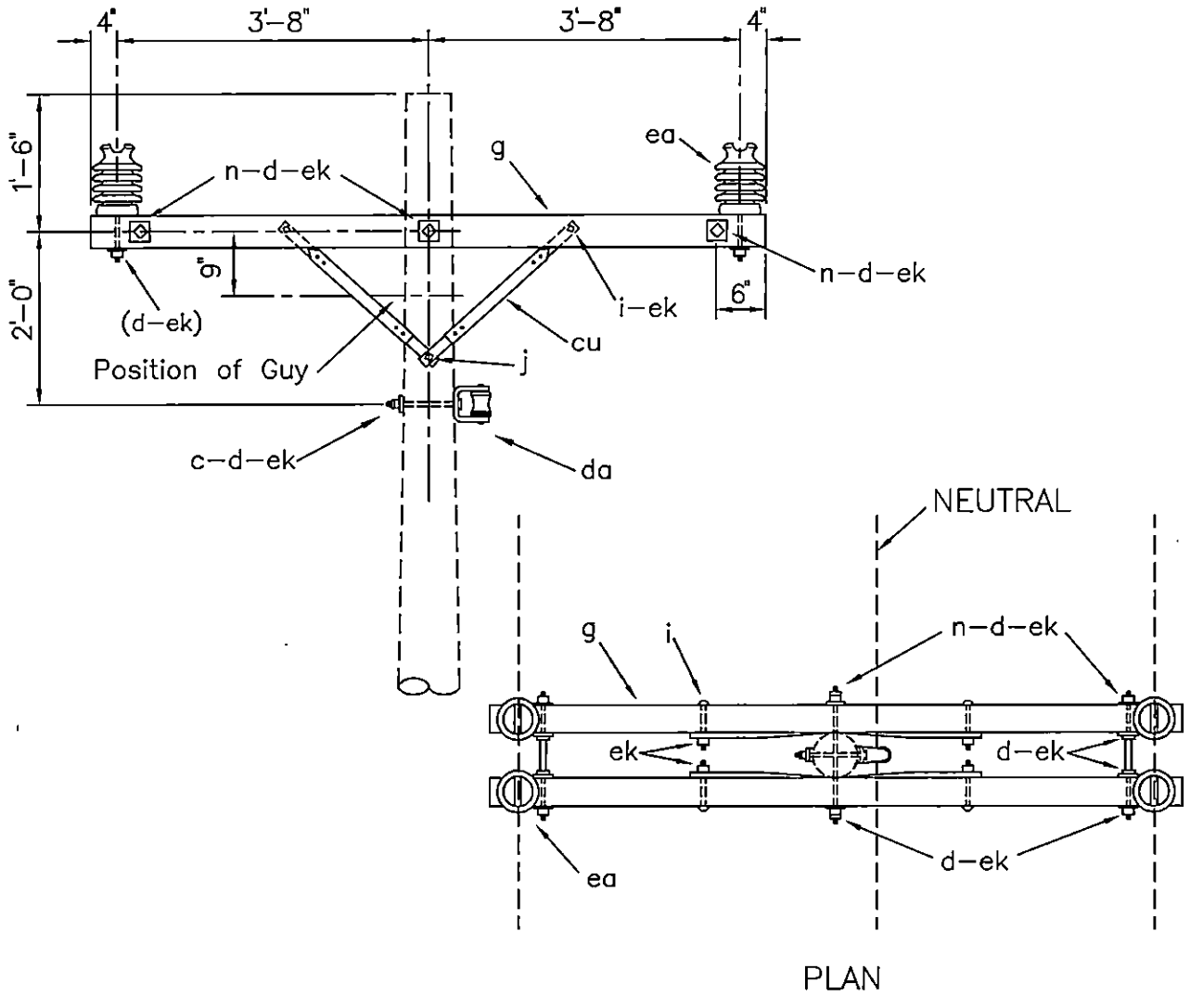
ITEM	QTY	MATERIAL
a	4	Insulator, pin type (12.47/7.2 kV)
c	1	Bolt, machine, 5/8" x req'd length
d	15	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arm, 5/8" x req'd length
cu	4	Brace, 28"
da	1	Bracket, insulated
ek	15	Locknuts

DESIGN PARAMETERS:

See TABLE IV

DOUBLE SUPPORT ON CROSSARMS

APRIL 2005	2 – PHASE PRIMARY	B2.21
RUS	12.47/7.2 kV	(B2)



PLAN

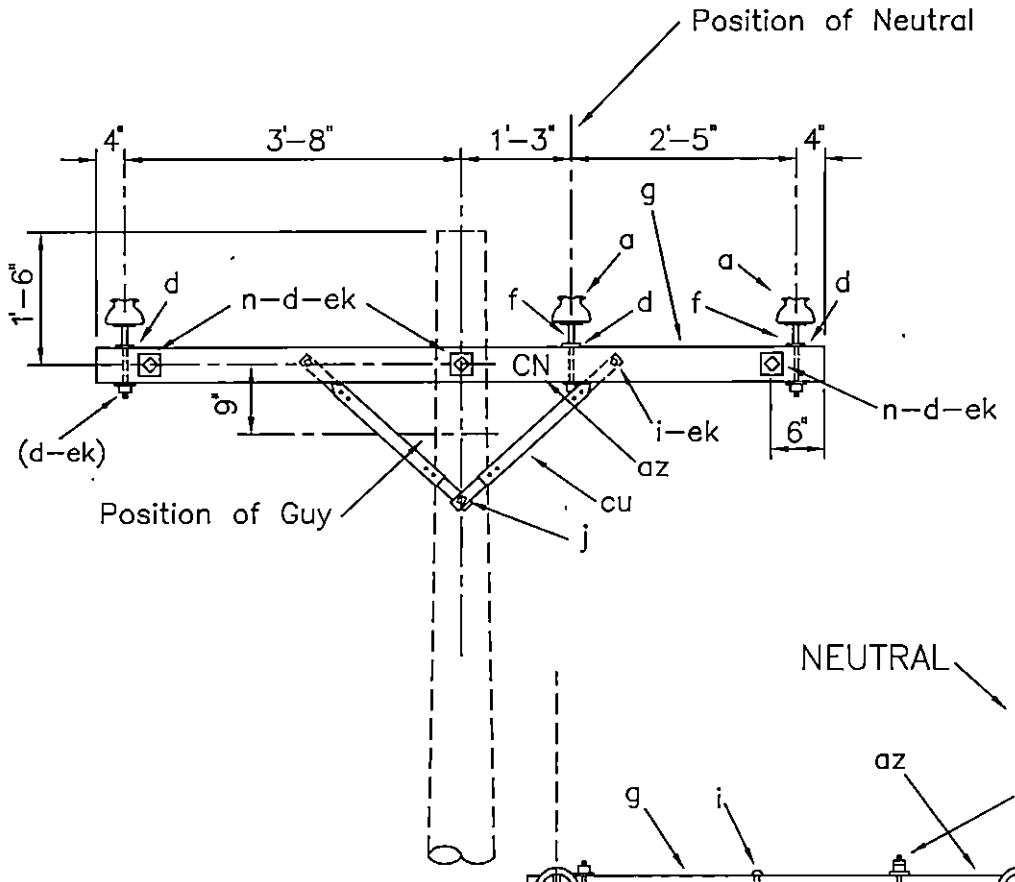
ITEM	QTY	MATERIAL
c	1	Bolt, machine, 5/8" x req'd length
d	11	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arm, 5/8" x req'd length
cu	4	Brace, 28"
da	1	Bracket, insulated
ea	4	Insulator, post type (12.47/7.2 kV)
ek	15	Locknuts

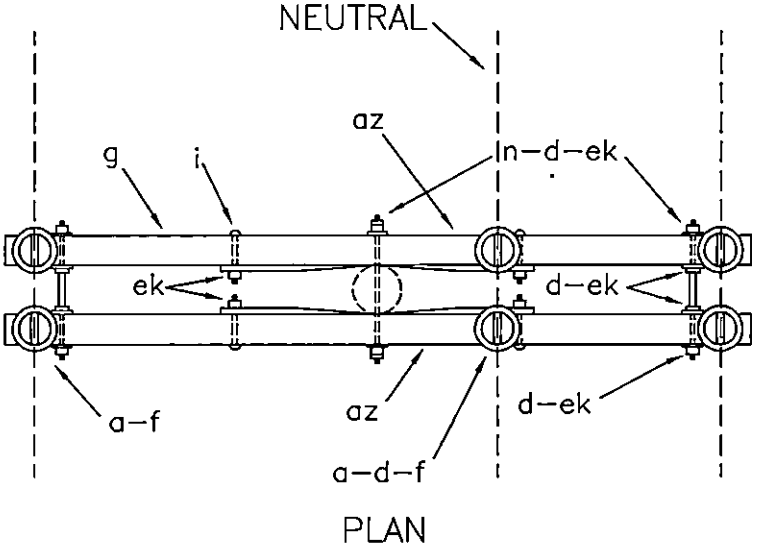
DESIGN PARAMETERS:

See TABLE IV

DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)

APRIL 2005 RUS	2 – PHASE PRIMARY 12.47/7.2 kV	B2.21P (B2P)





PLAN

ITEM	QTY	MATERIAL
a	2	Insulator, pin type, white, (15 kV)
a	4	Insulator, pin type (12.47/7.2 kV)
d	16	Washer, square, 2 1/4"
f	6	Pin, crossarm, steel, 5/8" x 10 3/4"
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"
n	3	Bolt, double arm, 5/8" x req'd length
az	4	Letters, 2" C, 2" N, with nails
cu	4	Brace, 28"
ek	14	Locknuts

NOTE:

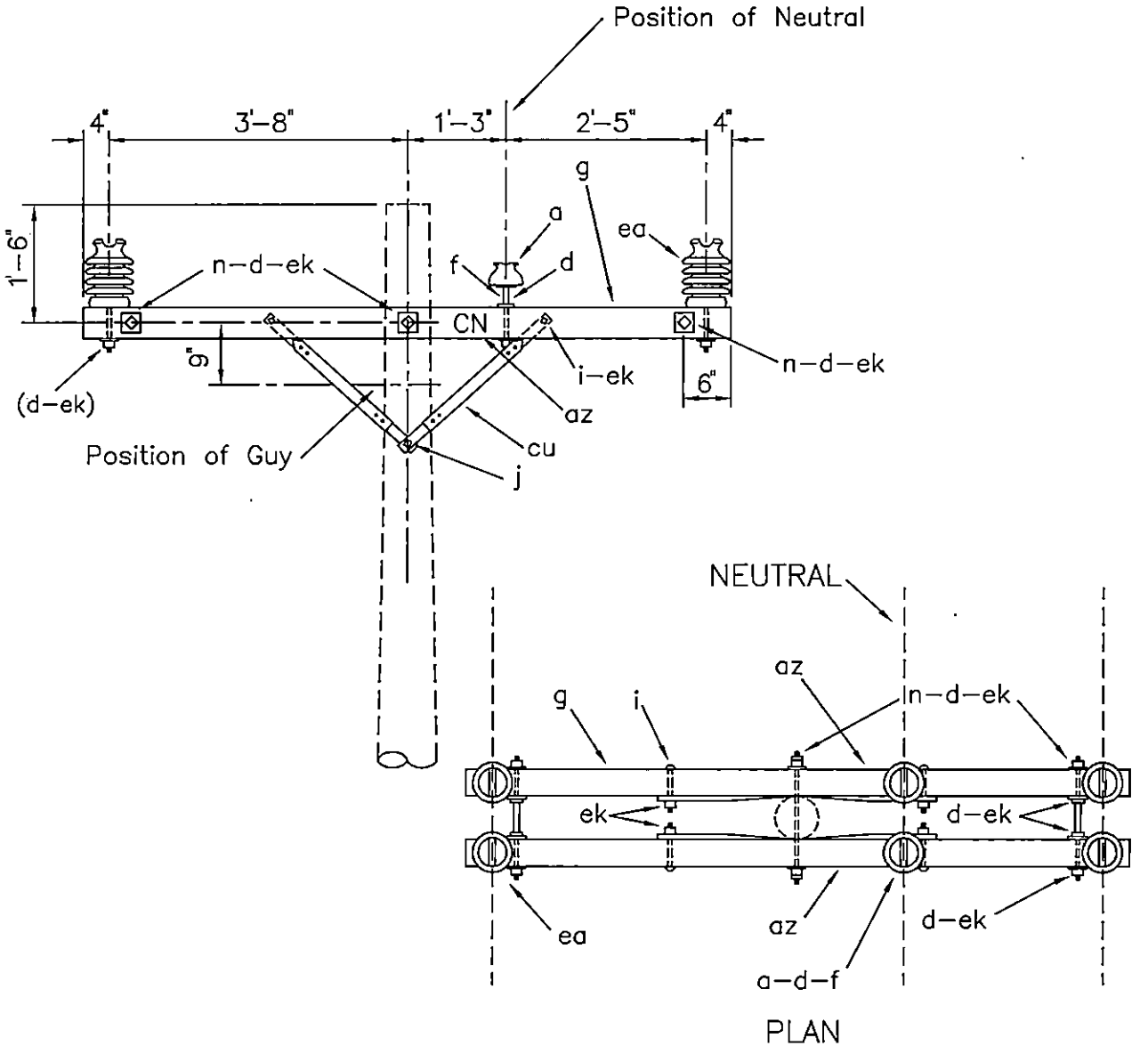
Install either identification letters (az) or white insulators in neutral position.

DESIGN PARAMETERS:

See TABLE IV

DOUBLE SUPPORT, NEUTRAL ON CROSSARMS

APRIL 2005	2 – PHASE PRIMARY	B2.22
RUS	12.47/7.2 kV	(B9)



PLAN

ITEM	QTY	MATERIAL
a	2	Insulator, pin type, white, (15 kV)
d	12	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
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"
n	3	Bolt, double arm, 5/8" x req'd length
az	4	Letters, 2" C, 2" N, with nails
cu	4	Brace, 28"
ea	4	Insulator, post type (12.47/7.2 kV)
ek	14	Locknuts

NOTE:

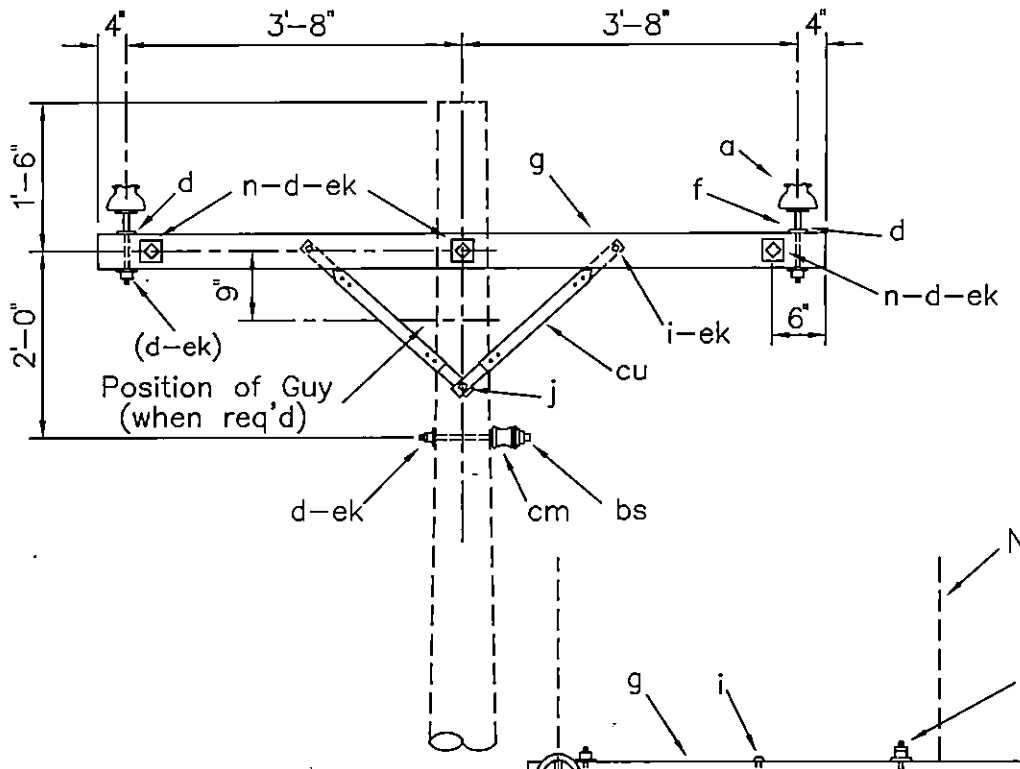
Install either identification letters (az) or white insulators in neutral position.

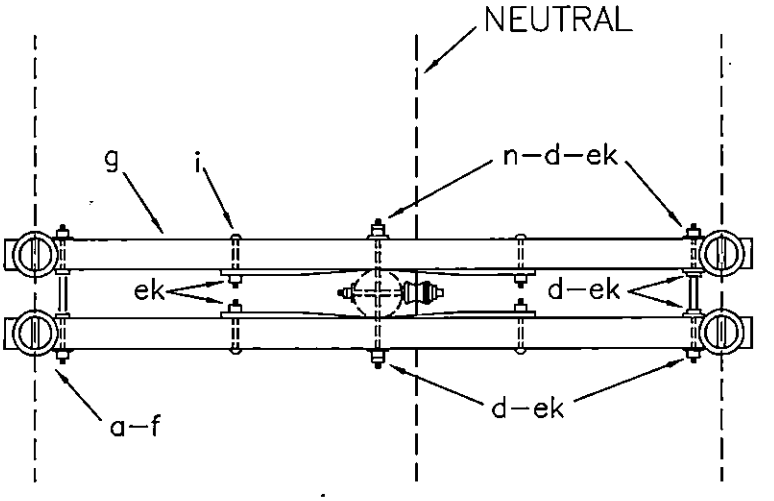
DESIGN PARAMETERS:

See TABLE IV

DOUBLE SUPPORT, NEUTRAL ON CROSSARMS (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	B2.22P
RUS	12.47/7.2 kV	(B9P)

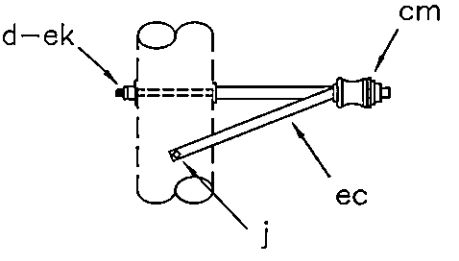




PLAN

NOTE: These assemblies used for NESC Grade B construction.

ASSEMBLY: B2.		24	25
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2kV)	4	4
d	Washer, square 2 1/4"	15	15
f	Pin, crossarm, steel, 5/8" x 10 3/4"	4	4
g	Crossarm, 3 5/8" x 4 5/8" x 8'-0"	2	2
i	Bolt, carriage, 3/8" x 4 1/2"	4	4
j	Screw, lag, 1/2" x 4"	2	4
n	Bolt, double arm, 5/8" x req'd length	3	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	4	4
ec	Bracket, offset neutral		1
ek	Locknuts	15	15



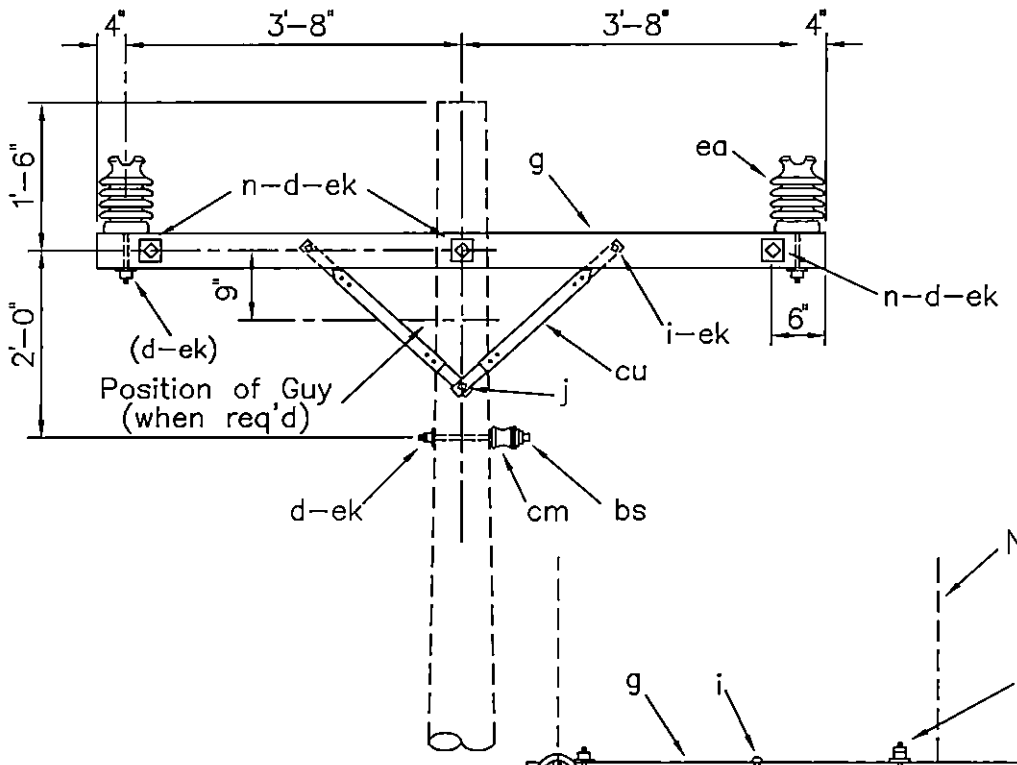
Specify B2.25 for offset neutral assembly

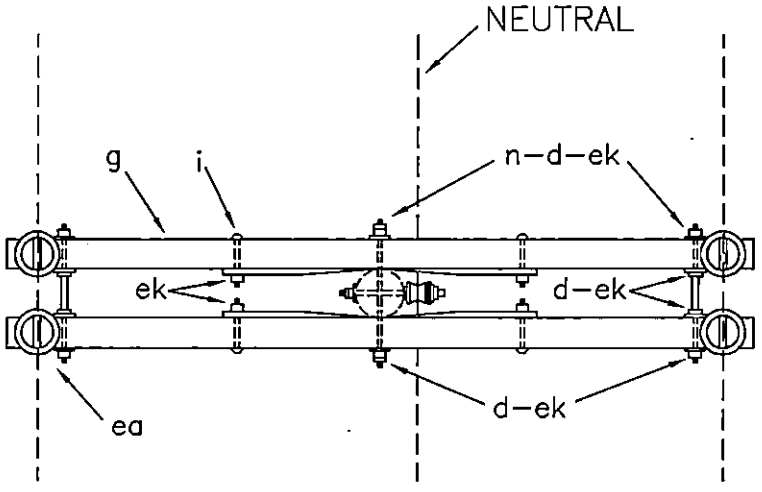
DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5°-Small Conductors
2°-Larger than #1/0

DOUBLE SUPPORT ON CROSSARMS-TANGENT

APRIL 2005	2 - PHASE PRIMARY	B2.24,B2.25
RUS	12.47/7.2 kV	(B1-1,B1-1A)

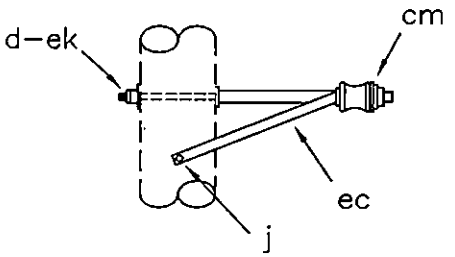




PLAN

NOTE: These assemblies used for NESC Grade B construction.

ASSEMBLY: B2.		24P	25P
ITEM	MATERIAL	QTY	QTY
d	Washer, square 2 1/4"	11	11
g	Crossarm, 3 5/8" x 4 5/8" x 8'-0"	2	2
i	Bolt, carriage, 3/8" x 4 1/2"	4	4
j	Screw, lag, 1/2" x 4"	2	4
n	Bolt, double arm, 5/8" x req'd length	3	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	4	4
ea	Insulator, post type (12.47/7.2kV)	4	4
ec	Bracket, offset neutral		1
ek	Locknuts	11	11



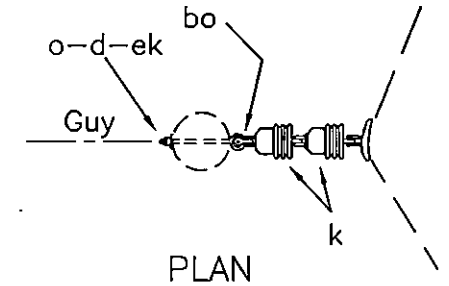
Specify B2.25P for offset neutral assembly

DESIGN PARAMETERS:

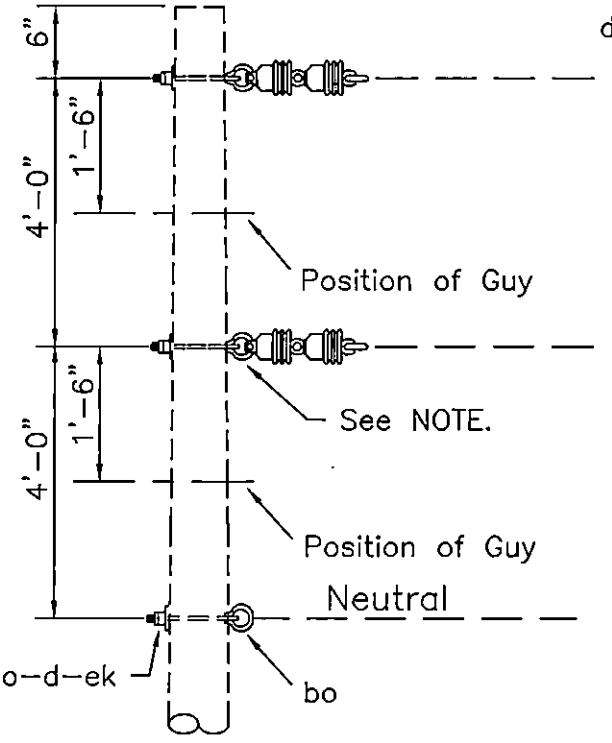
MAXIMUM LINE ANGLES:
5°-Small Conductors
2°-Larger than #1/0

DOUBLE SUPPORT ON CROSSARMS-TANGENT (POST INSULATORS)

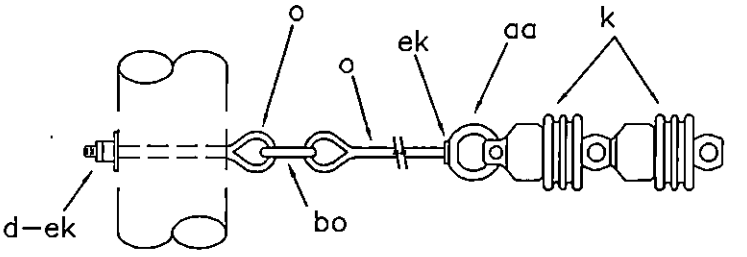
APRIL 2005	2 - PHASE PRIMARY	B2.24P,B2.25P
RUS	12.47/7.2 kV	(B1-1P,B1-1AP)



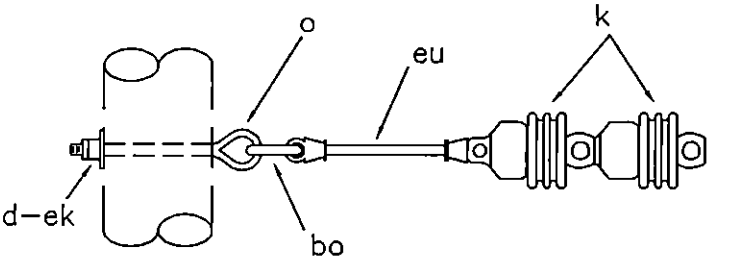
PLAN



B3.1



B3.2



B3.3

NOTE: Extension link (item "eu" or "du") or eye bolt (item "o"), eye nut (item "aa") and locknut (item "ek") may be installed in lower primary position. Adjust material as required.

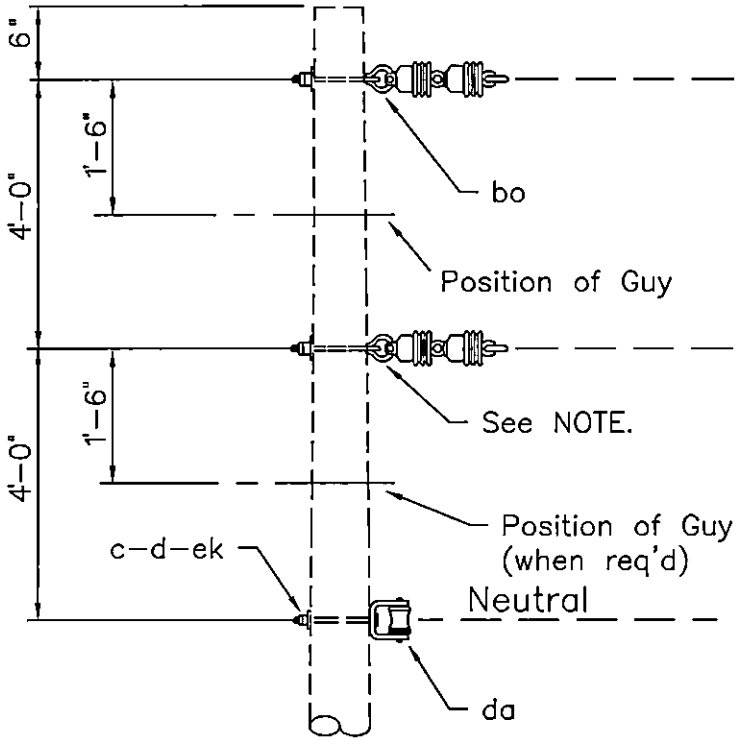
ASSEMBLY: B3		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	3	3	3
k	Insulator, suspension, 4 1/4"	4	4	4
o	Bolt, eye, 5/8"x req'd length	3	5	3
aa	Nut, eye		2	
bo	Shackle, anchor	3	3	3
ek	Locknuts	3	5	3
eu (du)	Link, extension, insulated (Link, extension) – (optional)			2 (2)

DESIGN PARAMETERS:

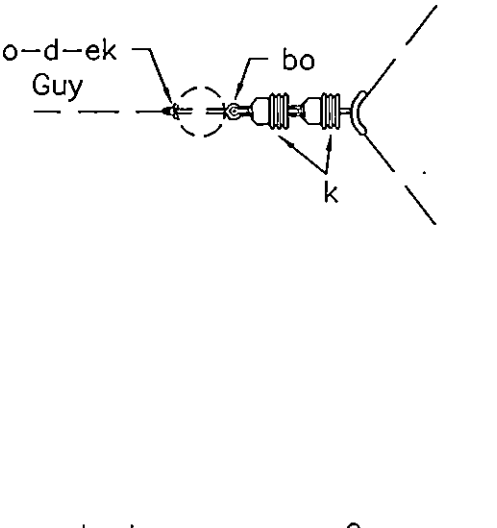
PERMITTED TRANSVERSE
LOAD= 5000 lbs./Conductor
20° – 60°: #1/0 ACSR & Larger
30° – 60°: Smaller Conductors

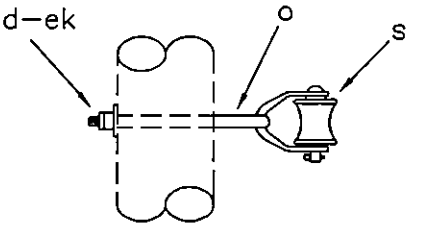
SUSPENSION ANGLE

APRIL 2005	2 – PHASE PRIMARY	B3.1,B3.2,B3.3
RUS	12.47/7.2 kV	(B3)



B3.4





B3.7

B3.5 = B3.4 neutral assembly + B3.2 primary subassembly
B3.6 = B3.4 neutral assembly + B3.3 primary subassembly
B3.8 = B3.7 neutral assembly + B3.2 primary subassembly
B3.9 = B3.7 neutral assembly + B3.3 primary subassembly

NOTE: Extension link (item "eu" or "du") or eye bolt (item "o"), eye nut (item "aa") and locknut (item "ek") may be installed in lower primary position. Adjust material as required.

ASSEMBLY: B3		.4	.5	.6	.7	.8	.9
ITEM	MATERIAL	QTY	QTY	QTY	QTY	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	1	1	1			
d	Washer, square, 3", curved	3	3	3	3	3	3
k	Insulator, suspension, 4 1/4"	4	4	4	4	4	4
o	Bolt, eye, 5/8"x req'd length	1	2	1	2	3	2
s	Clevis, secondary, swinging, insulated				1	1	1
aa	Nut, eye		2			2	
bo	Shackle, anchor	2	2	2	2	2	2
da	Bracket, insulated	1	1	1			
ek	Locknuts	3	5	3	3	5	3
eu (du)	Link, extension, insulated (Link, extension) – (optional)			2 (2)			2 (2)

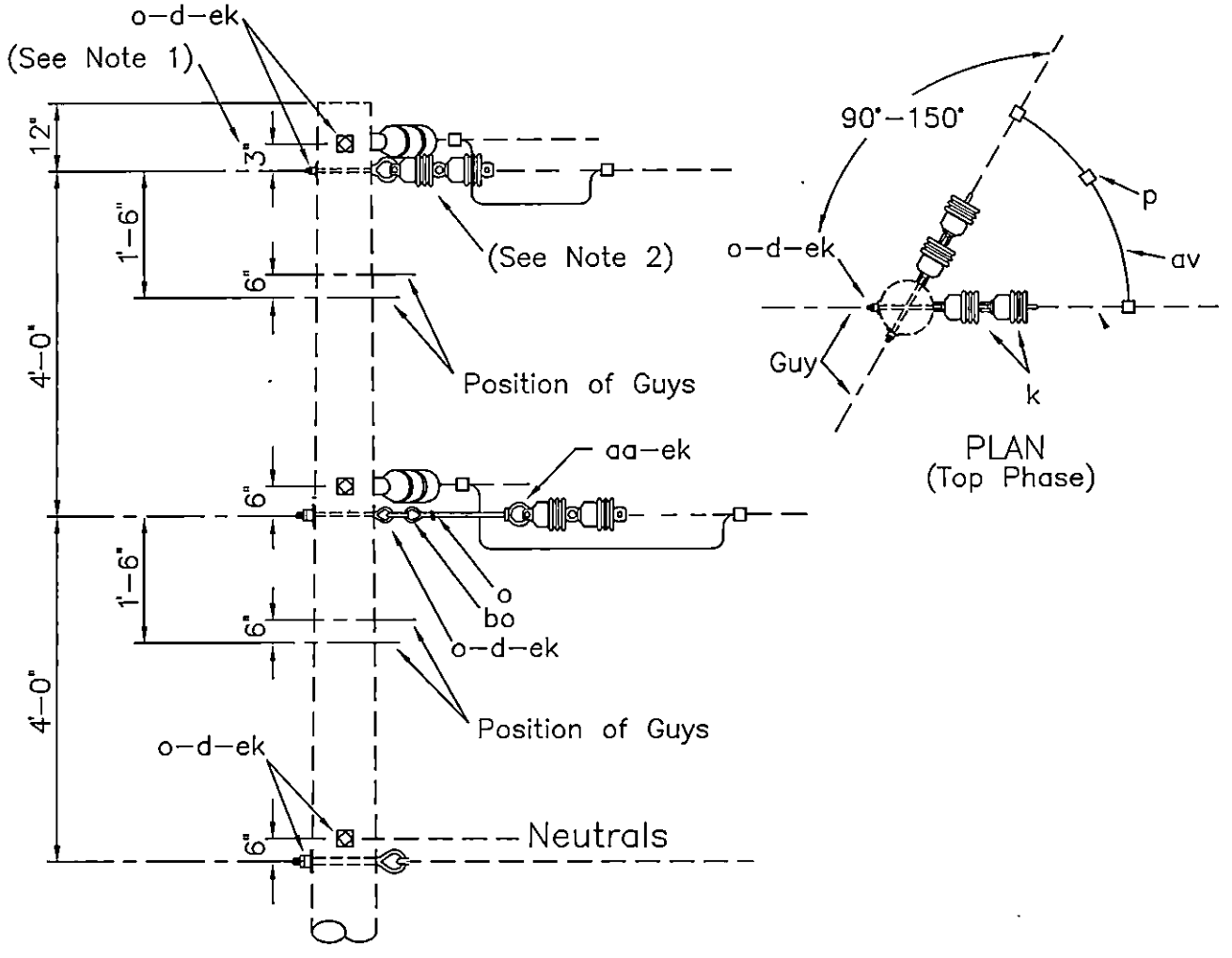
DESIGN PARAMETERS:

For ANSI Class 53-2 Spool Insulator (1 3/4") See Table VI

For ANSI Class 53-4 Spool Insulator (3") See Table VII

SUSPENSION ANGLE

APRIL 2005	2 – PHASE PRIMARY	B3.4 – B3.9
RUS	12.47/7.2 kV	



NOTES:

1. Separate 6" (top position only) when angle equals 90°.
2. This drawing shows two A5.1 plus two A5.02 assemblies and their material as an example. Any combination of B5.1 – B5.9, A4.1 – A5.9 and A5.03 assemblies may be installed. Record assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

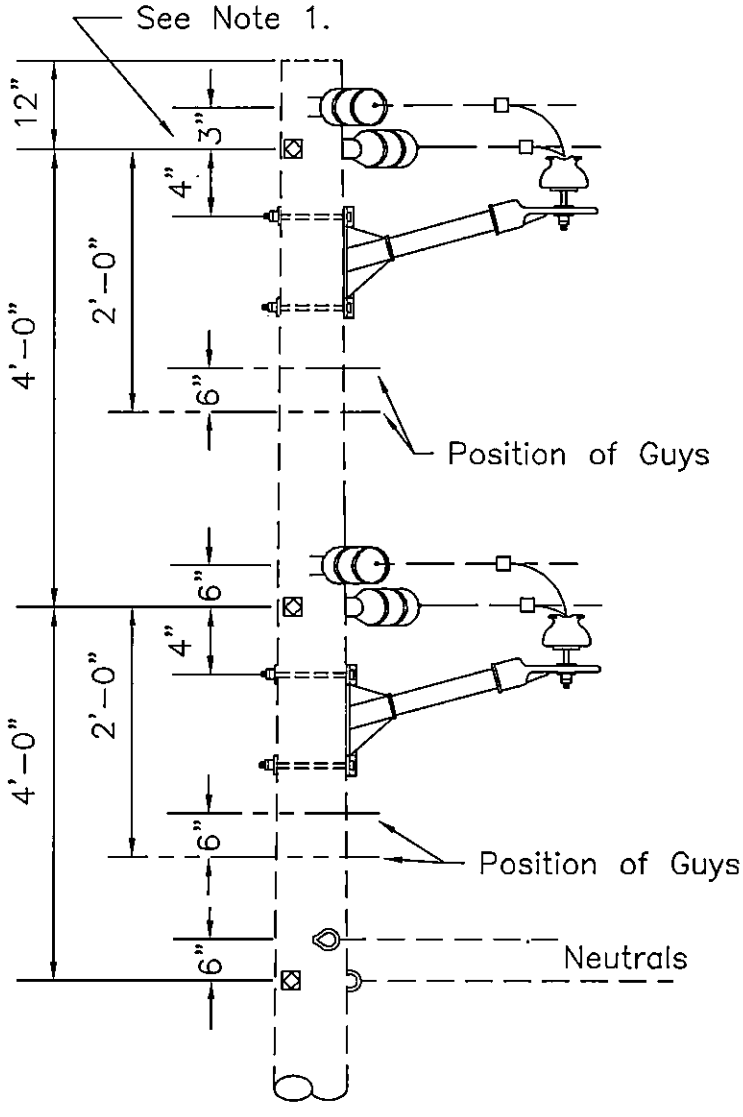
ITEM	QTY	MATERIAL
		Primary Assemblies, as req'd (See Note 2)
p		Connectors, as req'd
av		Jumpers, as req'd

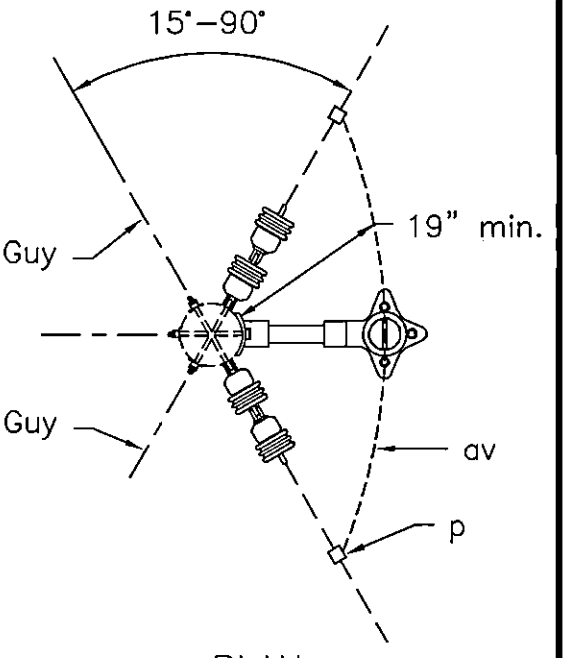
DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE GUIDE (90°–150°)

APRIL 2005	2 – PHASE PRIMARY	B4.1G
RUS	12.47/7.2 kV	(B4–1)





PLAN
(Top Phase)

NOTES:

1. Separate 6" (top position only) when angle equals 90°.
2. This drawing shows two B5.1 and two A1.04N assemblies as an example. Any combination of two A1.04N plus B5.1 – B5.9, A5.1 – A5.9 and A5.01 – A5.03 assemblies may be installed. Record assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

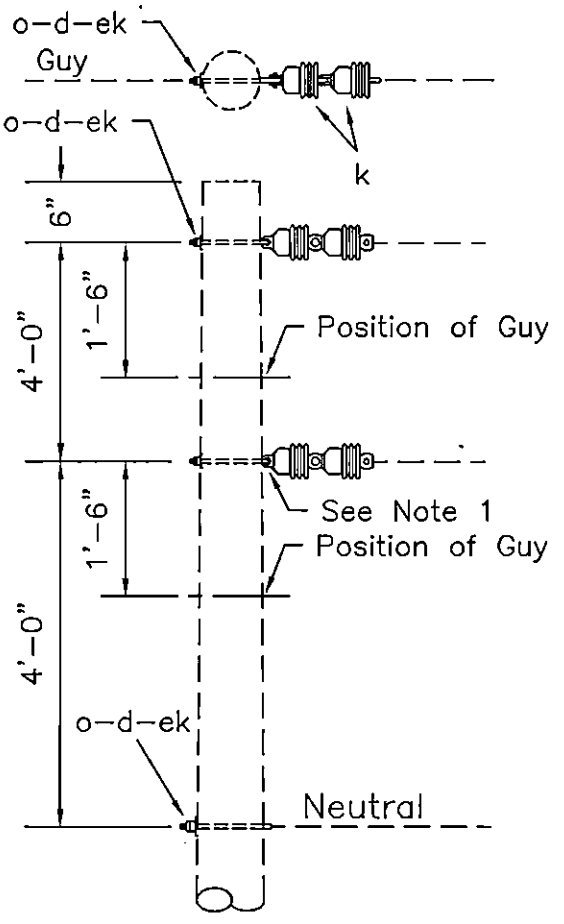
ITEM	QTY	MATERIAL
		Primary Assemblies, as req'd (See Note 2)
	2	A1.04N primary assemblies
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

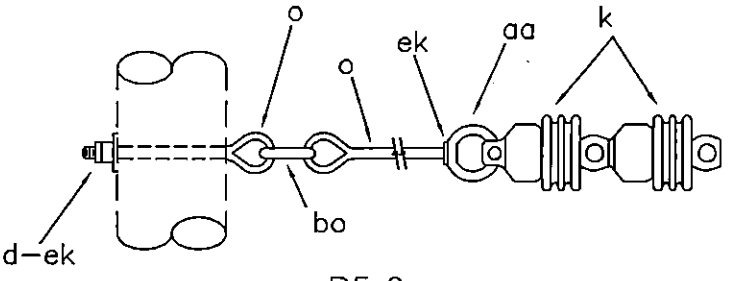
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE GUIDE (15°–90°)

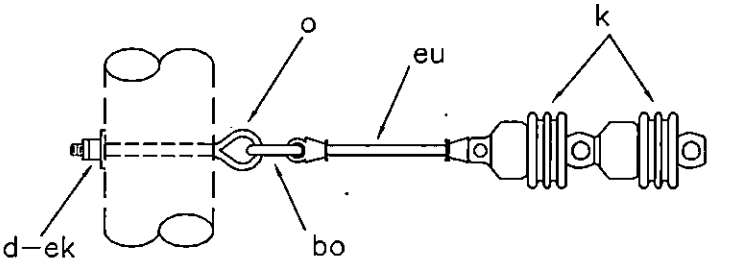
APRIL 2005	2 – PHASE PRIMARY	B4.2G
RUS	12.47/7.2 kV	



B5.1



B5.2



B5.3

NOTES: 1. Extension link (item "eu" or "du") or eye bolt (item "o"), eye nut (item "aa") and locknut (item "ek") may be installed in lower primary position. Adjust material as required.

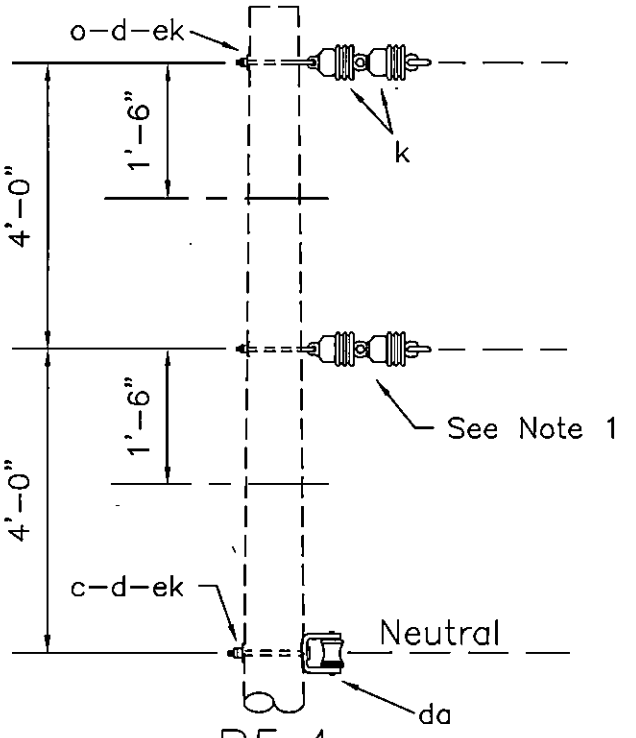
2. When connecting to existing bolt end, use eye nut "aa" and lock nut "ek" instead of eye bolt subassembly "o–d–ek".

ASSEMBLY: B5		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	3	3	3
k	Insulator, suspension, 4 1/4"	4	4	4
o	Bolt, eye, 5/8"x req'd length	3	4	3
p	Connectors, as req'd			
aa	Nut, eye		1	
av	Jumper's, as req'd			
bo	Shackle, anchor		1	1
ek	Locknuts	3	4	3
eu (du)	Link, extension, insulated (Link, extension) – (optional)			2 (2)

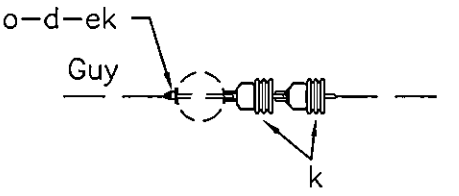
DESIGN PARAMETERS:
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

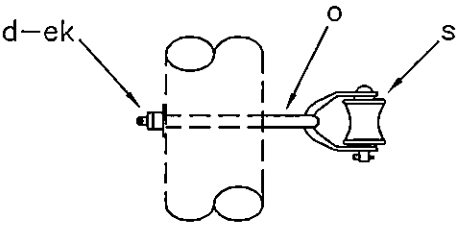
SINGLE DEADENDS

APRIL 2005	2 – PHASE PRIMARY	B5.1,B5.2,B5.3
RUS	12.47/7.2 kV	(B5–1)



B5.4





B5.7

B5.5 = B5.4 neutral assembly + B5.2 primary subassembly
B5.6 = B5.4 neutral assembly + B5.3 primary subassembly
B5.8 = B5.7 neutral assembly + B5.2 primary subassembly
B5.9 = B5.7 neutral assembly + B5.3 primary subassembly

NOTES: 1. Extension link (item "eu" or "du") or eyebolt (item "o"), eyenut (item "aa") and locknut (item "ek") may be installed in lower primary position. Adjust material as required.
2. When connecting to existing bolt end, use eyenut "aa" and locknut "ek" instead of eyebolt subassemly "o–d–ek".

ASSEMBLY: B5		.4	.5	.6	.7	.8	.9
ITEM	MATERIAL	QTY	QTY	QTY	QTY	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	1	1	1			
d	Washer, square, 3", curved	3	3	3	3	3	3
k	Insulator, suspension, 4 1/4"	4	4	4	4	4	4
o	Bolt, eye, 5/8"x req'd length	2	3	2	3	4	3
p	Connectors, as req'd						
s	Clevis, secondary, swinging, insulated				1	1	1
aa	Nut, eye		1			1	
av	Jumpers, as req'd						
bo	Shackle, anchor		2	2		2	2
da	Bracket, insulated	1	1	1			
ek	Locknuts	3	4	3	3	4	3
eu (du)	Link, extension, insulated (Link, extension) – (optional)			2 (2)			2 (2)

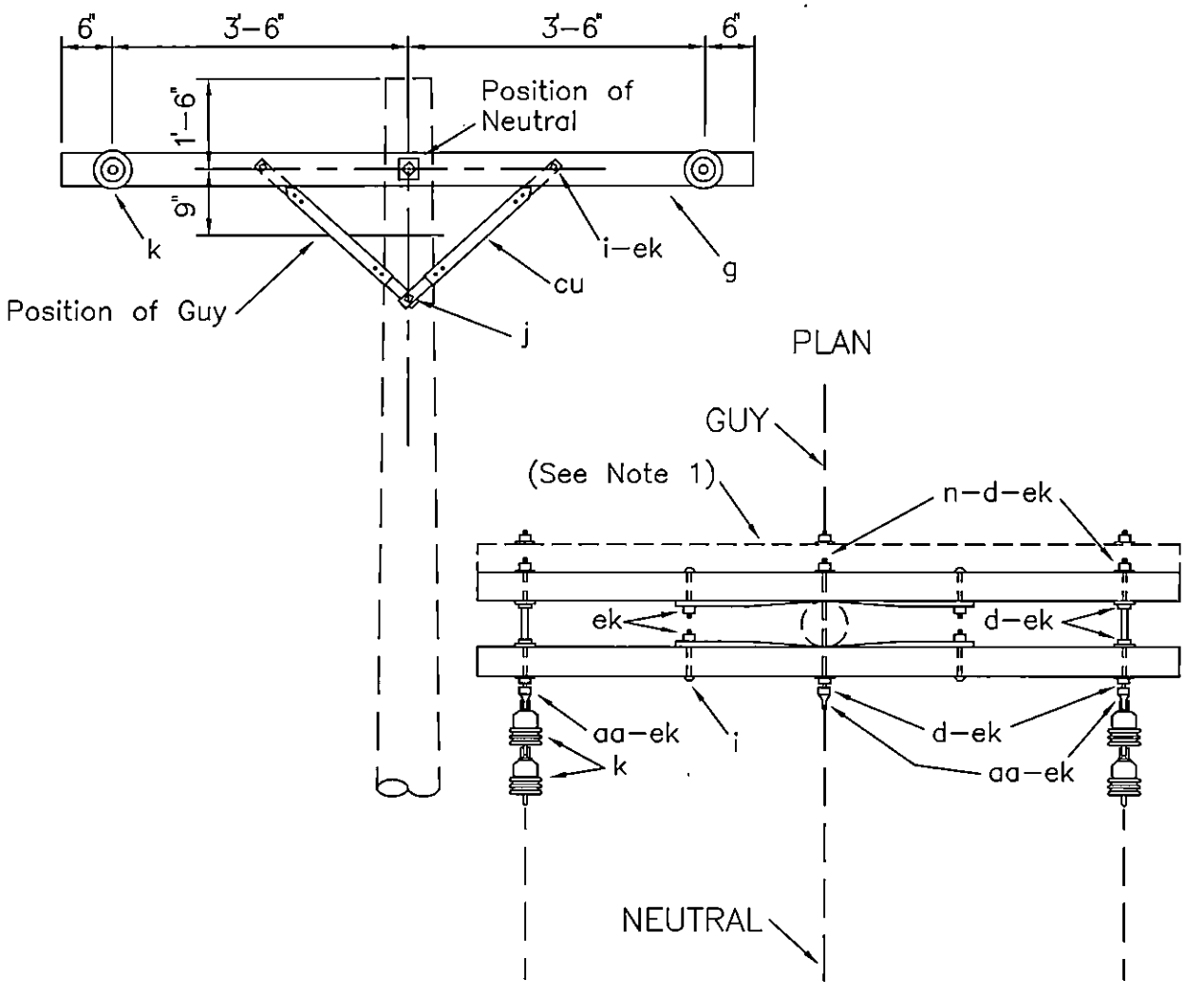
DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD
For ANSI Class 53–2 Spool Insulator (1 3/4"): 1,500 lbs

For ANSI Class 53–4 Spool Insulator (3"): 2,250 lbs

SINGLE DEADENDS

APRIL 2005	2 – PHASE PRIMARY	B5.4 – B5.9
RUS	12.47/7.2 kV	



NOTES:

1. Designate as B5.31 for assembly with three crossarms.
2. Double arming eye bolt, item "dy", may be used instead of double arming bolt, item "n", and eyenut, item "aa".
3. See assembly B6.21 for alternative neutral position and materials.

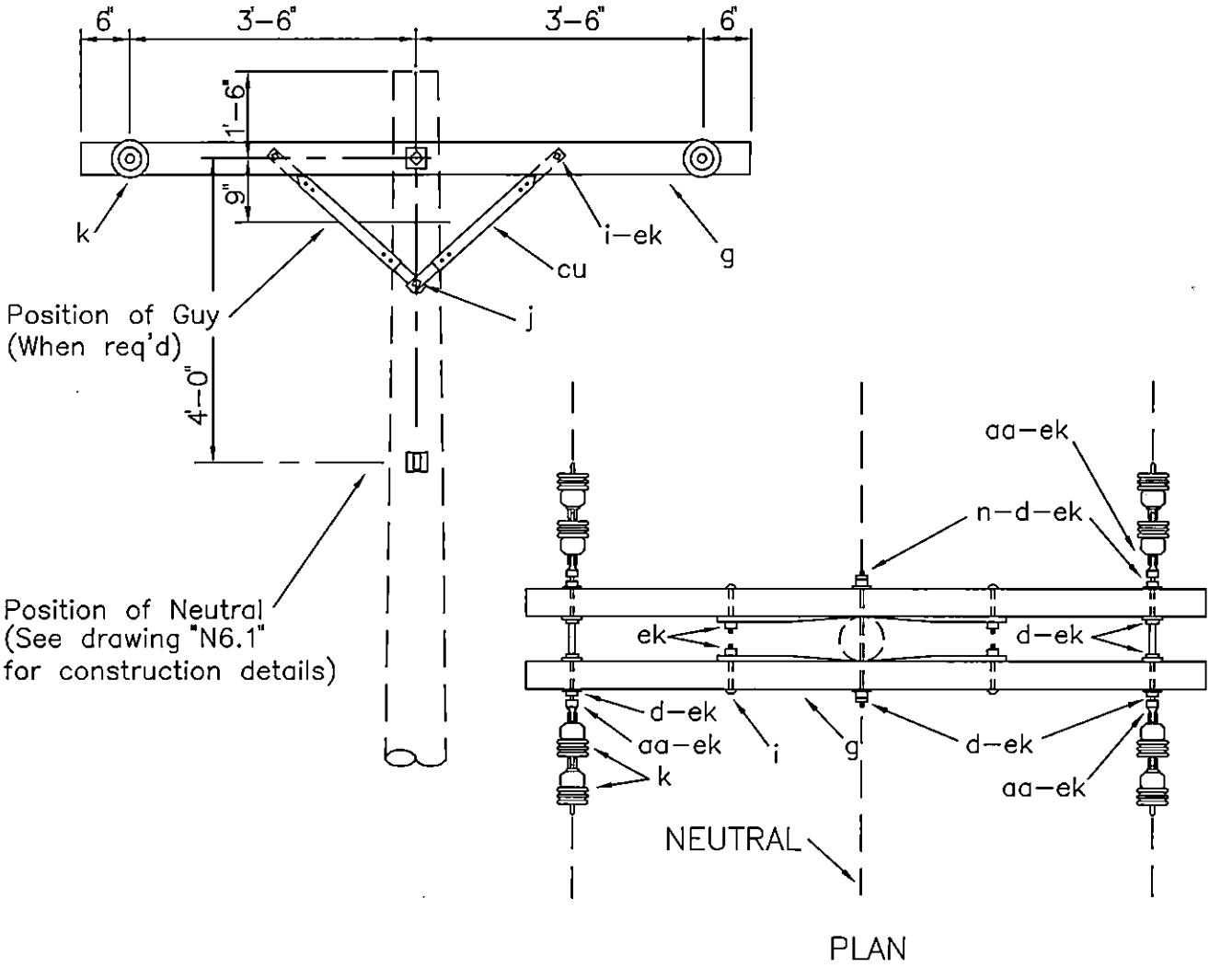
ITEM	QTY	MATERIAL
d	10	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
k	4	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
aa	3	Nut, eye, 5/8"
cu	4	Brace, 28"
ek	17	Locknuts

DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:
See Table A (Exhibit 2)

SINGLE DEADEND ON CROSSARMS

APRIL 2005 RUS	2 – PHASE PRIMARY 12.47/7.2 kV	B5.21 (B7) B5.31 (B7-1)



PLAN

NOTES:

1. Double arming bolt, item "n", and eye nut, item "aa" may be replaced with double arming eye bolt, item "dy".
2. Maximum line angle may be increased to 15° by installing anchor shackles, item "bo", to (horizontal) eyenuts and installing side guy as req'd.
3. See assembly B5.21 for alternative neutral position and materials.

ITEM	QTY	MATERIAL
d	10	Washer, square, 2 1/4"
d	2	Washer, square, 3", curved
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"
k	8	Insulator, suspension, 4 1/4"
n	4	Bolt,double arming,5/8" x req'd length
aa	6	Nut, eye, 5/8"
cu	4	Brace, 28"
ek	22	Locknuts

DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

DOUBLE DEADEND ON CROSSARMS

APRIL 2005	2 – PHASE PRIMARY	
RUS	12.47/7.2 kV	B6.21 (B8)

INDEX C

THREE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
C1.1N C1.2N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
C1.1NP C1.2NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C1.3N		SINGLE SUPPORT – NARROW PROFILE
C1.3NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
C1.4N C1.5N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
C1.4NP C1.5NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C1.6N		SINGLE SUPPORT – NARROW PROFILE
C1.6NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
C1.7N C1.8N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
C1.7NP C1.8NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C1.9N		SINGLE SUPPORT – NARROW PROFILE
C1.9NP		SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
C1.11 C1.12	(C1) (C1A)	SINGLE SUPPORT ON CROSSARM (TANGENT)
C1.11L C1.12L	(C1-2)	SINGLE SUPPORT ON CROSSARM (TANGENT) (LARGE CONDUCTORS)
C1.11P C1.12P	(C1P) (C1AP)	SINGLE SUPPORT ON CROSSARM (TANGENT) (POST INSULATORS)
C1.13		SINGLE SUPPORT ON CROSSARM
C1.13L	(C1-4)	SINGLE SUPPORT ON CROSSARM (LARGE CONDUCTORS)
C1.13P		SINGLE SUPPORT ON CROSSARM (POST INSULATORS)

THREE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

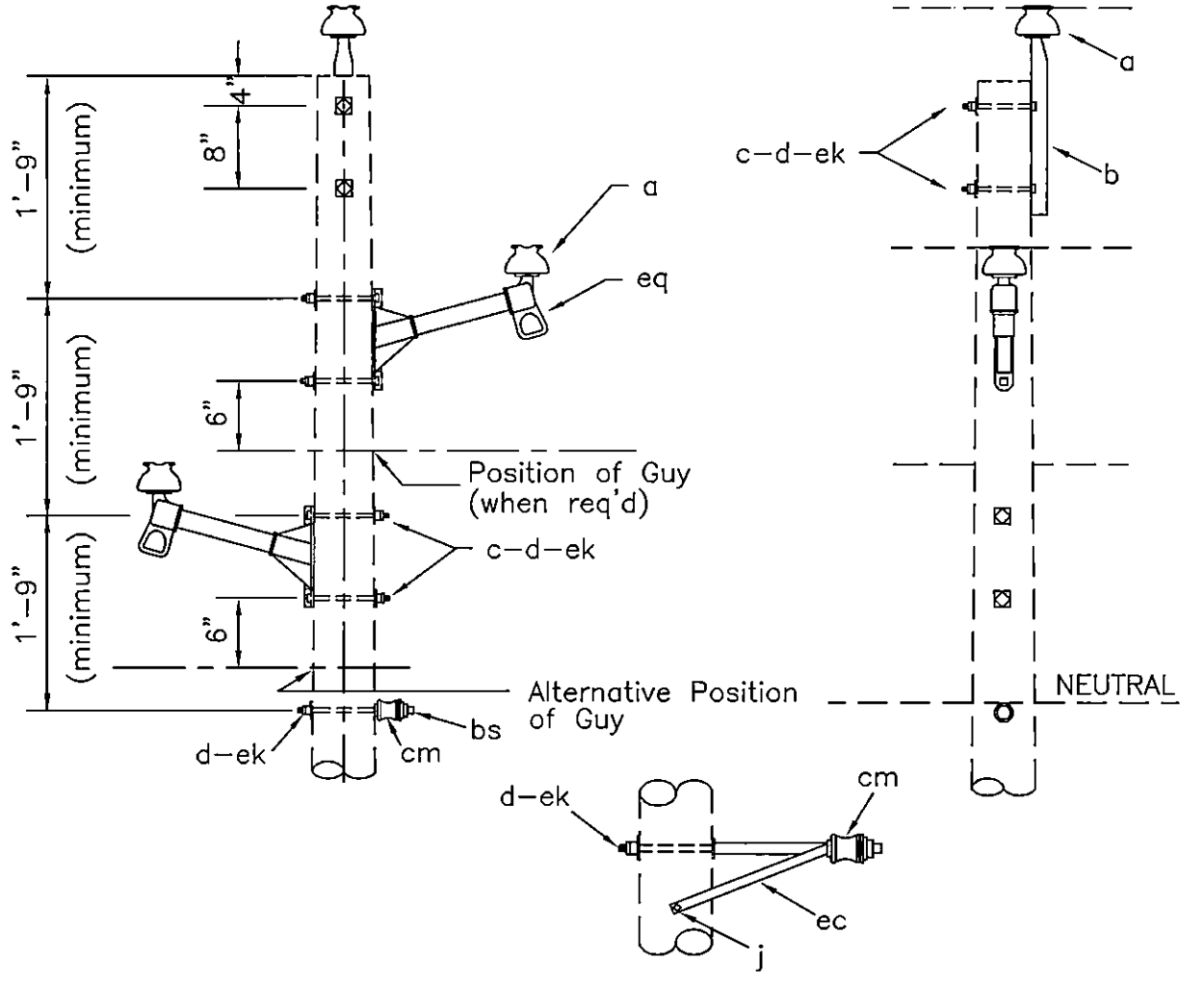
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
C1.41	(C9-1)	SINGLE SUPPORT, NEUTRAL ON CROSSARM
C1.41L	(C9-3)	SINGLE SUPPORT, NEUTRAL ON CROSSARM (LARGE CONDUCTORS)
C1.41P	(C9-1P)	SINGLE SUPPORT, NEUTRAL ON CROSSARM (POST INSULATORS)
C1.81G		THREE-PHASE JUNCTION GUIDE
C2.1N C2.2N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
C2.1NP C2.2NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C2.3N		DOUBLE SUPPORT – NARROW PROFILE
C2.3NG		DOUBLE SUPPORT – NARROW PROFILE (ALTERNATIVE GUYING GUIDE)
C2.3NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
C2.4N C2.5N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
C2.4NP C2.5NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C2.6N		DOUBLE SUPPORT – NARROW PROFILE
C2.6NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
C2.7N C2.8N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
C2.7NP C2.8NP		DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C2.9N		DOUBLE SUPPORT – NARROW PROFILE
C2.9NP		DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)

THREE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
C2.21	(C2)	DOUBLE SUPPORT ON CROSSARMS
C2.21L	(C1-3)	DOUBLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)
C2.21P	(C1-3P)	DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)
C2.24 C2.25	(C1-1) (C1-1A)	DOUBLE SUPPORT ON CROSSARMS - TANGENT
C2.24P C2.25P	(C1-1P) (C1-1AP)	DOUBLE SUPPORT ON CROSSARMS - TANGENT (POST INSULATORS)
C2.51	(C9)	DOUBLE SUPPORT, NEUTRAL ON CROSSARMS
C2.51L	(C9-2)	DOUBLE SUPPORT, NEUTRAL ON CROSSARMS (LARGE CONDUCTORS)
C2.51P	(C9-2PL)	DOUBLE SUPPORT, NEUTRAL ON CROSSARMS (POST INSULATORS)
C2.52	(C2-1)	DOUBLE SUPPORT ON 10-FOOT CROSSARMS
C2.52L	(C2-2)	DOUBLE SUPPORT ON 10-FOOT CROSSARMS (LARGE CONDUCTORS)
C2.52P	(C2-2PL)	DOUBLE SUPPORT ON 10-FOOT CROSSARMS (POST INSULATORS)
C3.1 C3.2 C3.3	(C3)	SUSPENSION ANGLE
C3.4 C3.5 C3.6 C3.7 C3.8 C3.9		SUSPENSION ANGLE
C3.1L	(C3-1)	SUSPENSION ANGLE (LARGE CONDUCTORS)

THREE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
C4.1G	((C4-1))	DEADEND GUIDE ($90^{O} - 150^{O}$)
C4.2G		DEADEND GUIDE ($15^{O} - 90^{O}$)
C5.1 C5.2 C5.3	(C5-1)	SINGLE DEADENDS - VERTICAL
C5.4 C5.5 C5.6 C5.7 C5.8 C5.9		SINGLE DEADENDS - VERTICAL
C5.11G		SINGLE PHASE TAP GUIDE
C5.21 C5.31	(C7) (C7-1)	SINGLE DEADEND ON CROSSARMS
C5.21L C5.32L		SINGLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)
C5.22 C5.32	(C7-2)	SINGLE DEADEND ON CROSSARMS - ALTERNATIVE
C5.71L	(C7A)	SINGLE DEADEND ON CROSSARM ASSEMBLY
C5.82G		THREE PHASE HORIZONTAL TAP GUIDE
C6.21 C6.31	(C8)	DOUBLE DEADEND ON CROSSARMS
C6.21L C6.311	(C8-3)	DOUBLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)
C6.52 C6.53		DOUBLE DEADEND ON 10-FOOT CROSSARMS
C6.52G		DOUBLE DEADEND ON 10-FOOT CROSSARMS (FEEDTHROUGH GUIDE)
C6.91G		DOUBLE DEADENDS (BUCKARMS) GUIDE



Specify C1.2N for offset neutral assembly

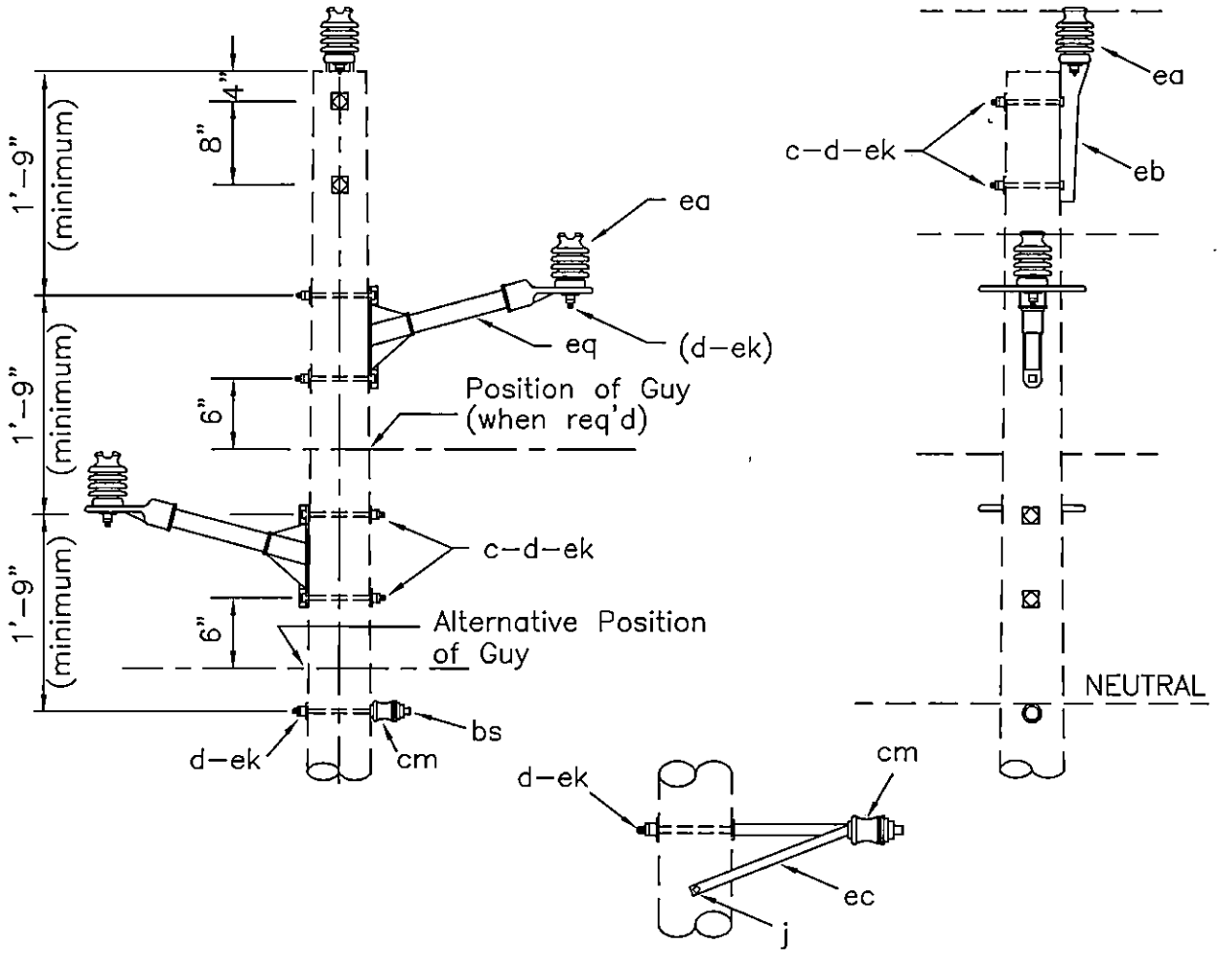
ASSEMBLY: C1.		1N	2N	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	3	3	
b	Pin, pole top, 20"	1	1	
c	Bolt, machine, 5/8" x req'd length	6	6	
d	Washer, square 2 1/4"	7	7	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(2)	(2)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	7	7	
eq	Bracket, insulator/equipment	2	2	

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	3 – PHASE PRIMARY	C1.1N
RUS	12.47/7.2 kV	C1.2N



Specify C1.2NP for offset neutral assembly

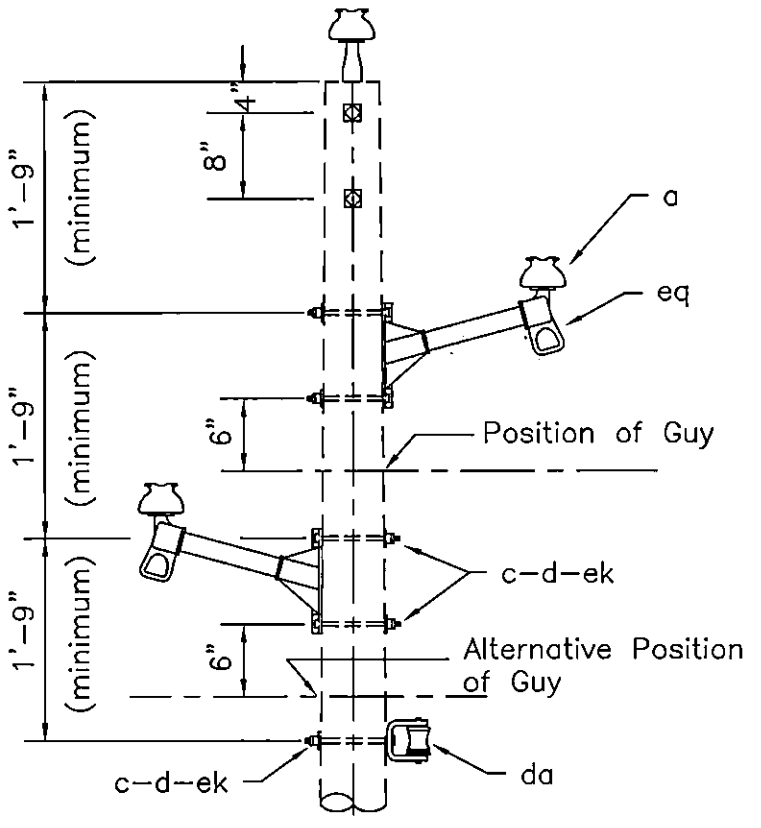
ASSEMBLY: C1.		1NP	2NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	3	3
eb	Bracket, pole top	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	2	2

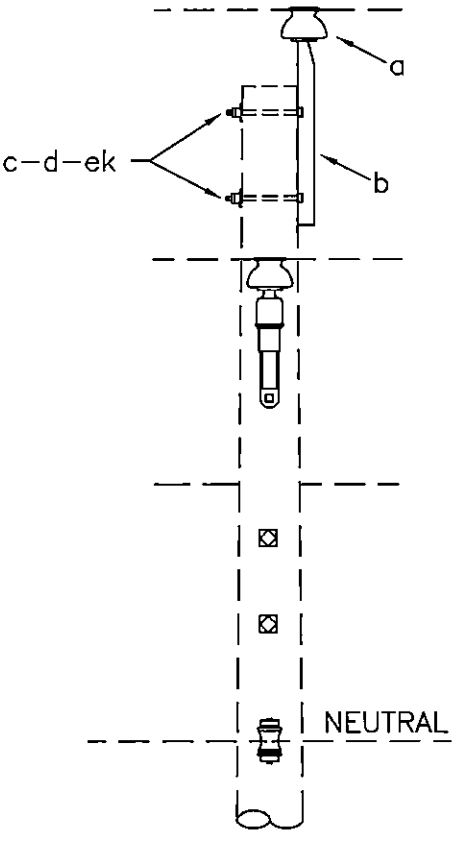
Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C1.1NP
RUS	12.47/7.2 kV	C1.2NP





NOTE: If additional or alternative guying is required, frame pole according to C2.3NG.

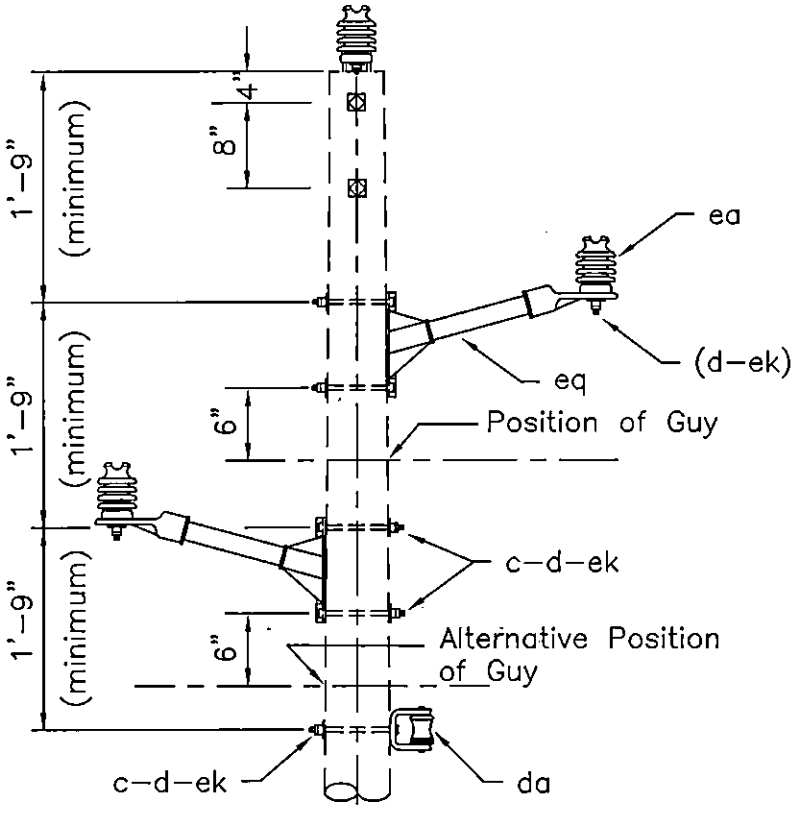
ASSEMBLY: C1.		3N	
ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	3	
b	Pin, pole top, 20"	1	
c	Bolt, machine, 5/8" x req'd length	7	
d	Washer, square 2 1/4"	7	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(2)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	7	
eq	Bracket, insulator/equipment	2	

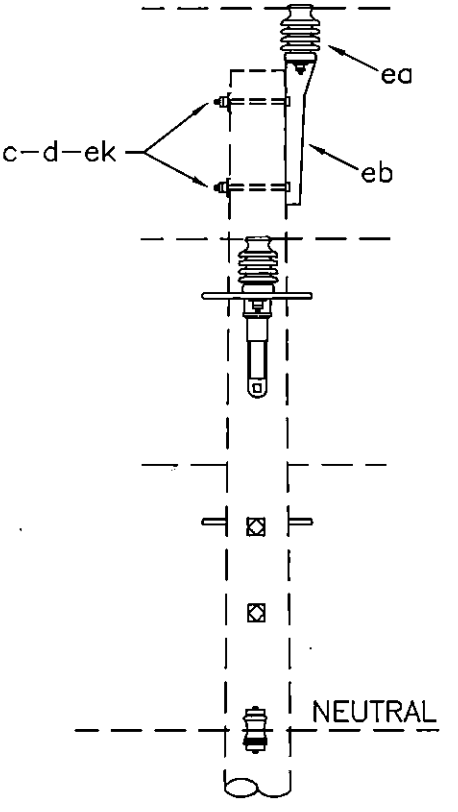
Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE I

SINGLE SUPPORT–NARROW PROFILE

APRIL 2005	3 – PHASE PRIMARY	C1.3N
RUS	12.47/7.2 kV	





ASSEMBLY: C1. 3NP

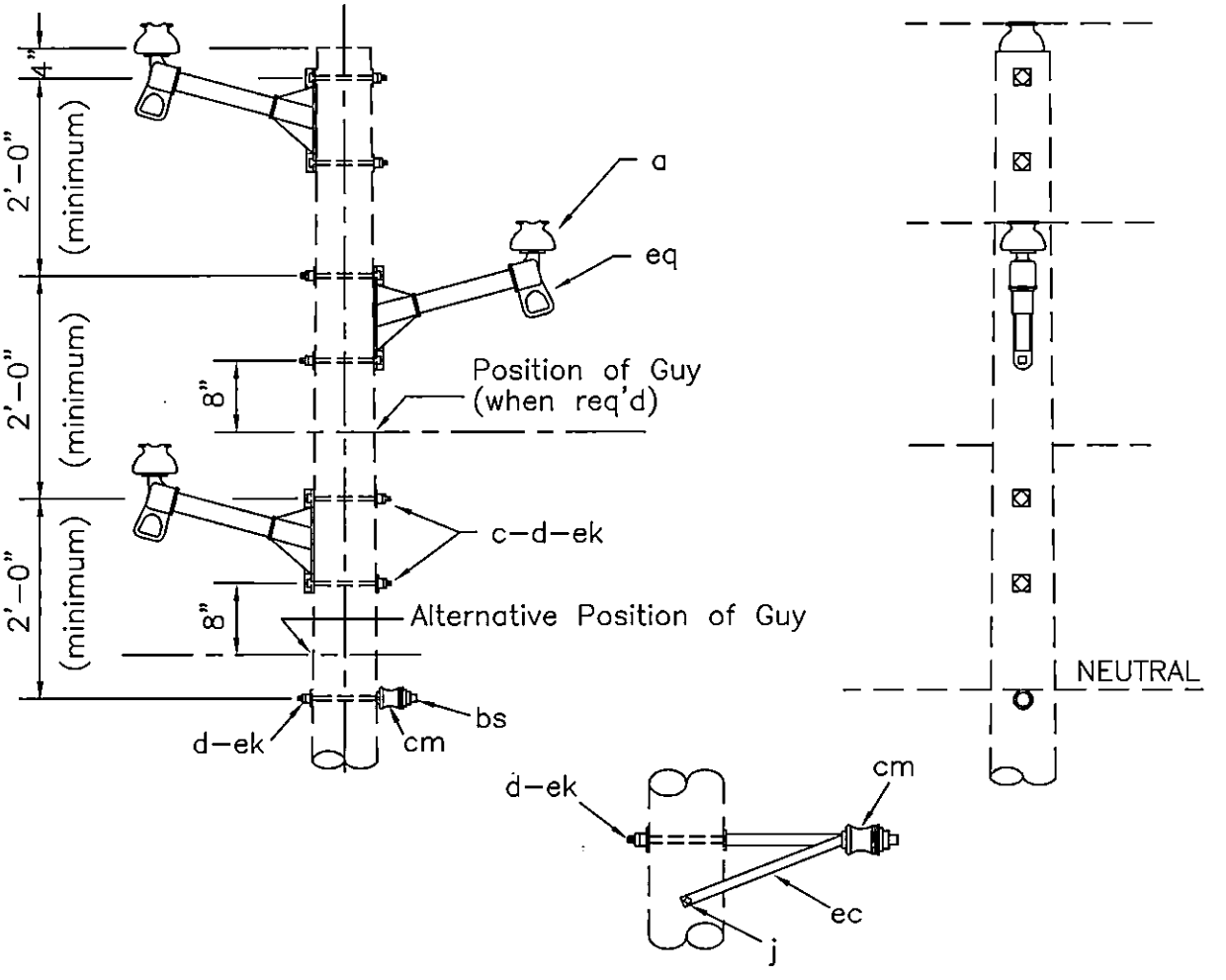
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	3
eb	Bracket, pole top	1
ek	Locknuts	7
eq	Bracket, insulator/equipment	2

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT—NARROW PROFILE
'(POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C1.3NP
RUS	12.47/7.2 kV	



Specify C1.5N for offset neutral assembly

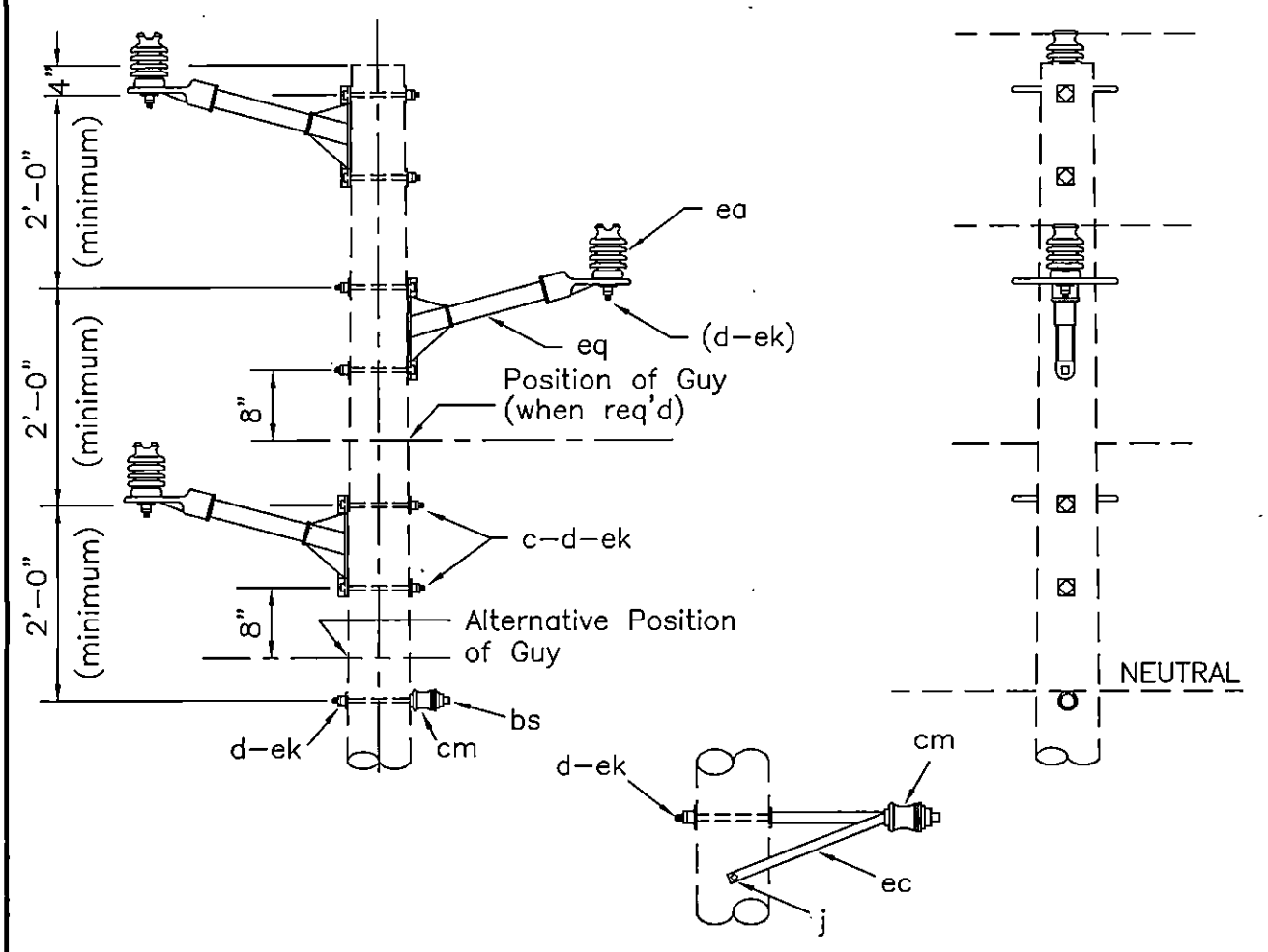
ASSEMBLY: C1.		4N	5N	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	3	3	
c	Bolt, machine, 5/8" x req'd length	6	6	
d	Washer, square 2 1/4"	7	7	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(3)	(3)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	7	7	
eq	Bracket,insulator/equipment	3	3	

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	3 – PHASE PRIMARY	C1.4N
RUS	12.47/7.2 kV	C1.5N



Specify C1.5NP for offset neutral assembly

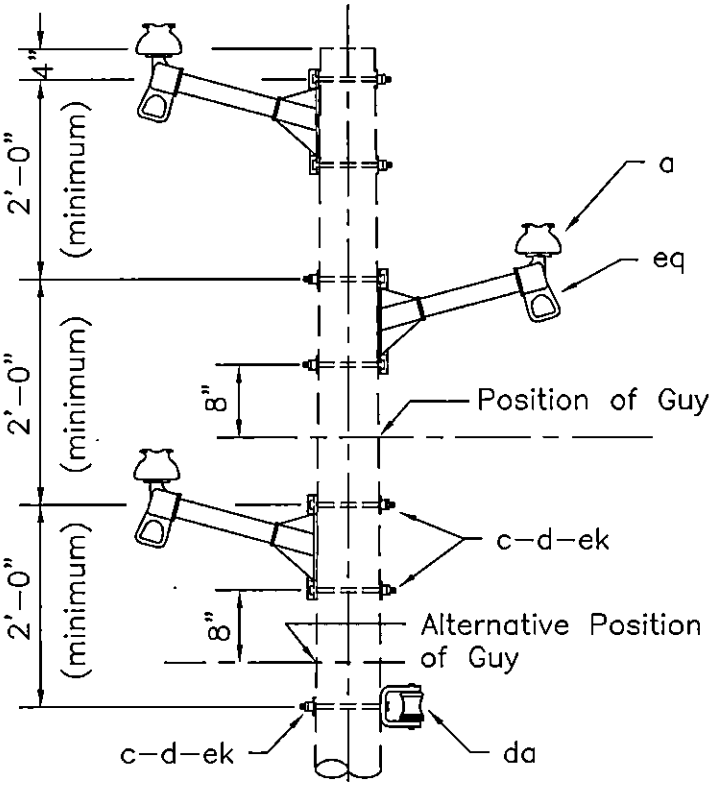
ASSEMBLY: C1.		4NP	5NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	3	3
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	3	3

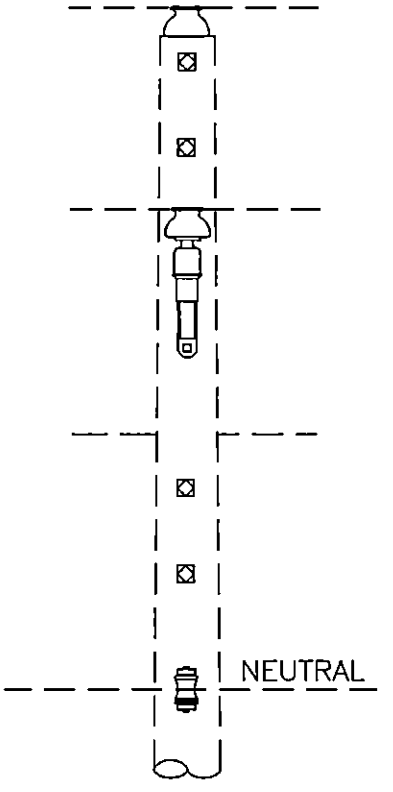
Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C1.4NP
RUS	12.47/7.2 kV	C1.5NP



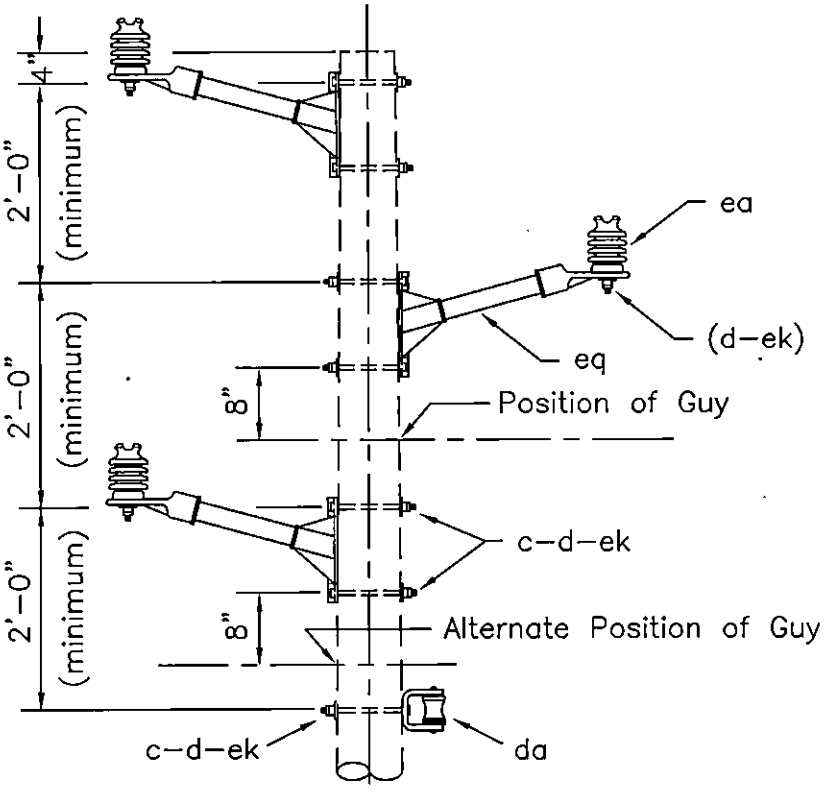


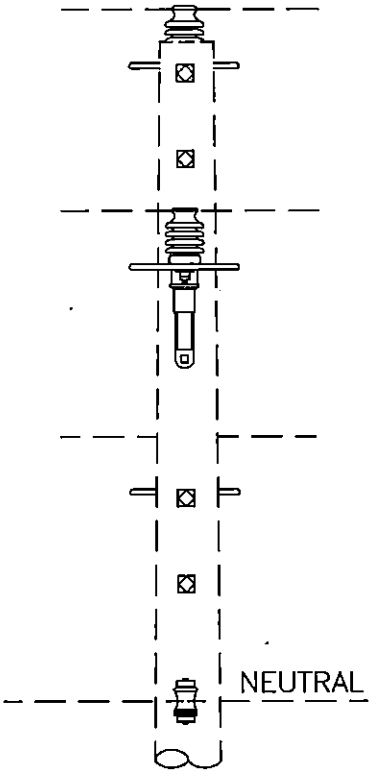
ASSEMBLY: C1.		6N	
ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	3	
c	Bolt, machine, 5/8" x req'd length	7	
d	Washer, square 2 1/4"	7	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(3)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	7	
eq	Bracket, insulator/equipment	3	

Design Parameters:
Maximum Line Angles
See TABLE II

SINGLE SUPPORT–NARROW PROFILE

APRIL 2005	3 – PHASE PRIMARY	C1.6N
RUS	12.47/7.2 kV	





ASSEMBLY: C1. 6NP

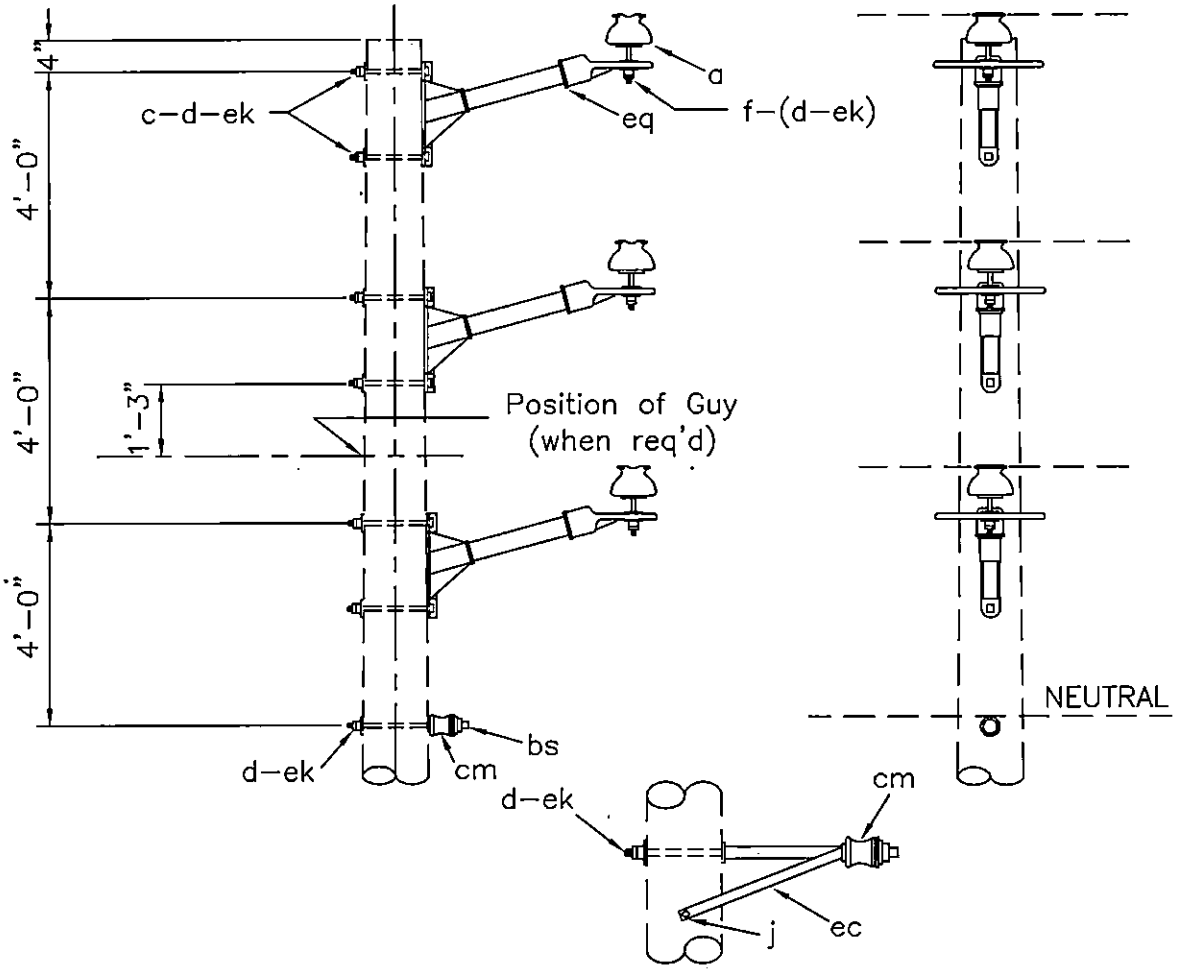
ITEM	MATERIAL	QTY
c	Bolt, machine 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	3
ek	Locknuts	7
eq	Bracket, insulator/equipment	3

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C1.6NP
RUS	12.47/7.2 kV	



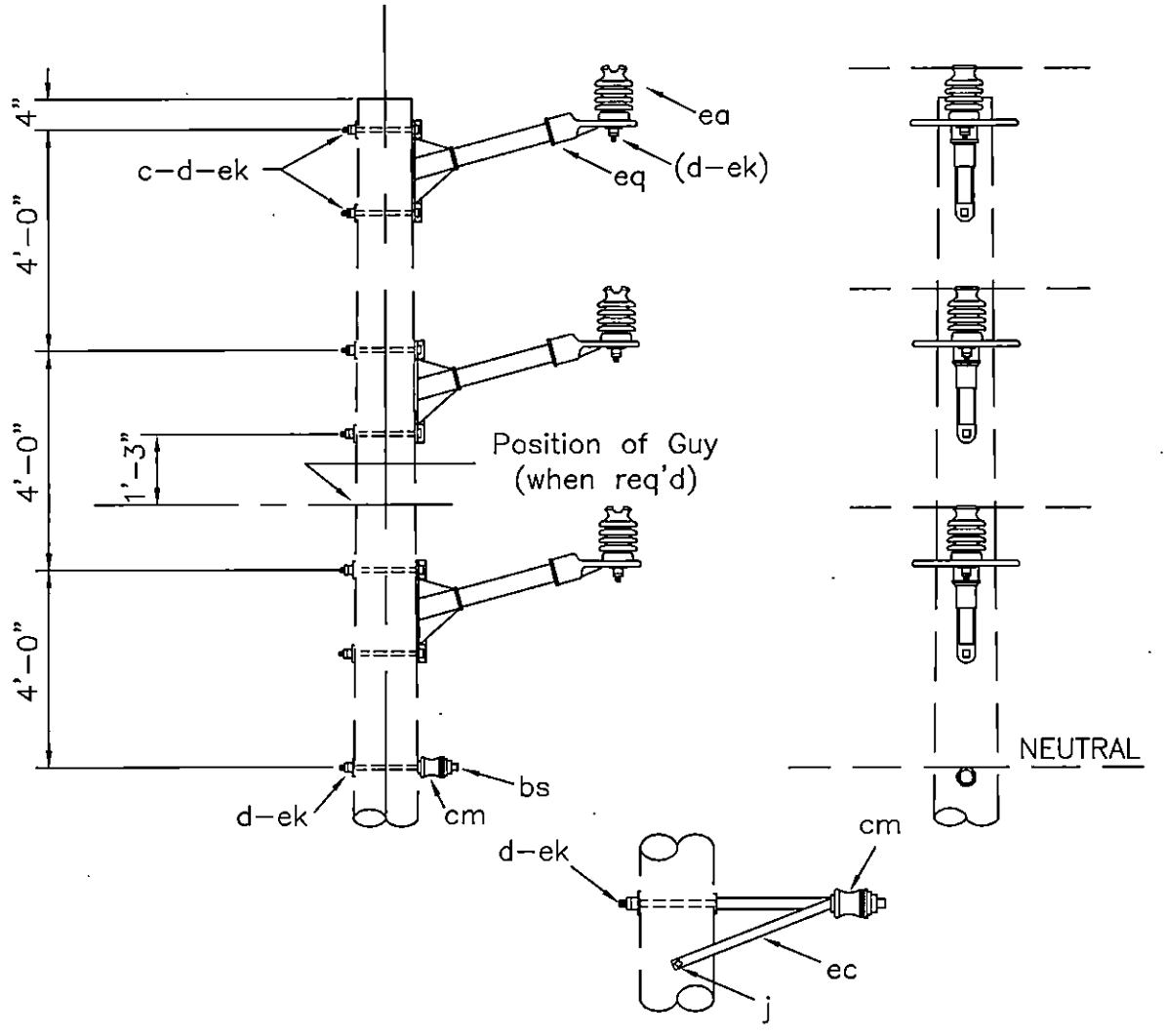
Specify C1.8N for offset neutral assembly

Assembly: C1.		7N	8N	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	3	3	
c	Bolt, machine, 5/8" x req'd length	6	6	
d	Washer, square 2 1/4"	7	7	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(3)	(3)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket, offset neutral		1	
ek	Locknuts	7	7	
eq	Bracket, insulator/equipment	3	3	

Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	3 – PHASE PRIMARY	C1.7N
RUS	12.47/7.2 kV	C1.8N



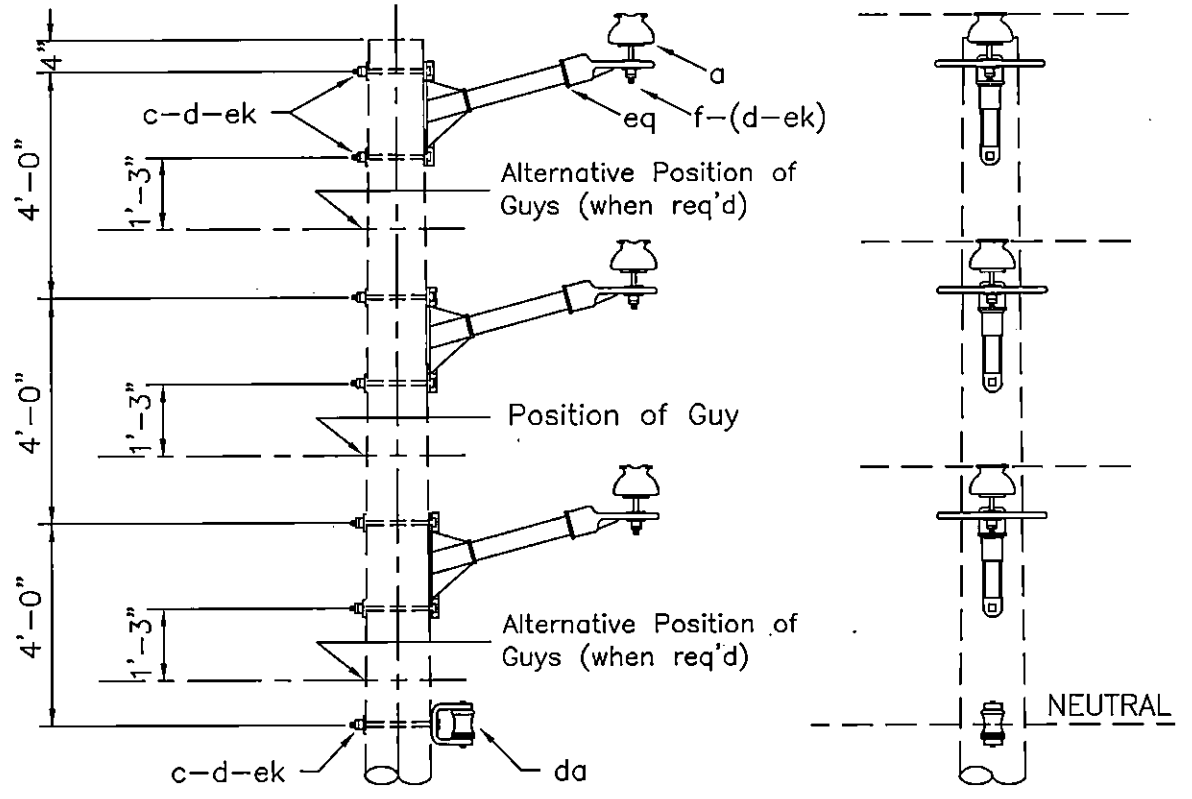
Specify C1.8NP for offset neutral assembly

Assembly: C1.		7NP	8NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.5 kV)	3	3
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	3	3

Design Parameters:
Maximum Line Angles
5° – Small conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C1.7NP
RUS	12.47/7.2 kV	C1.8NP



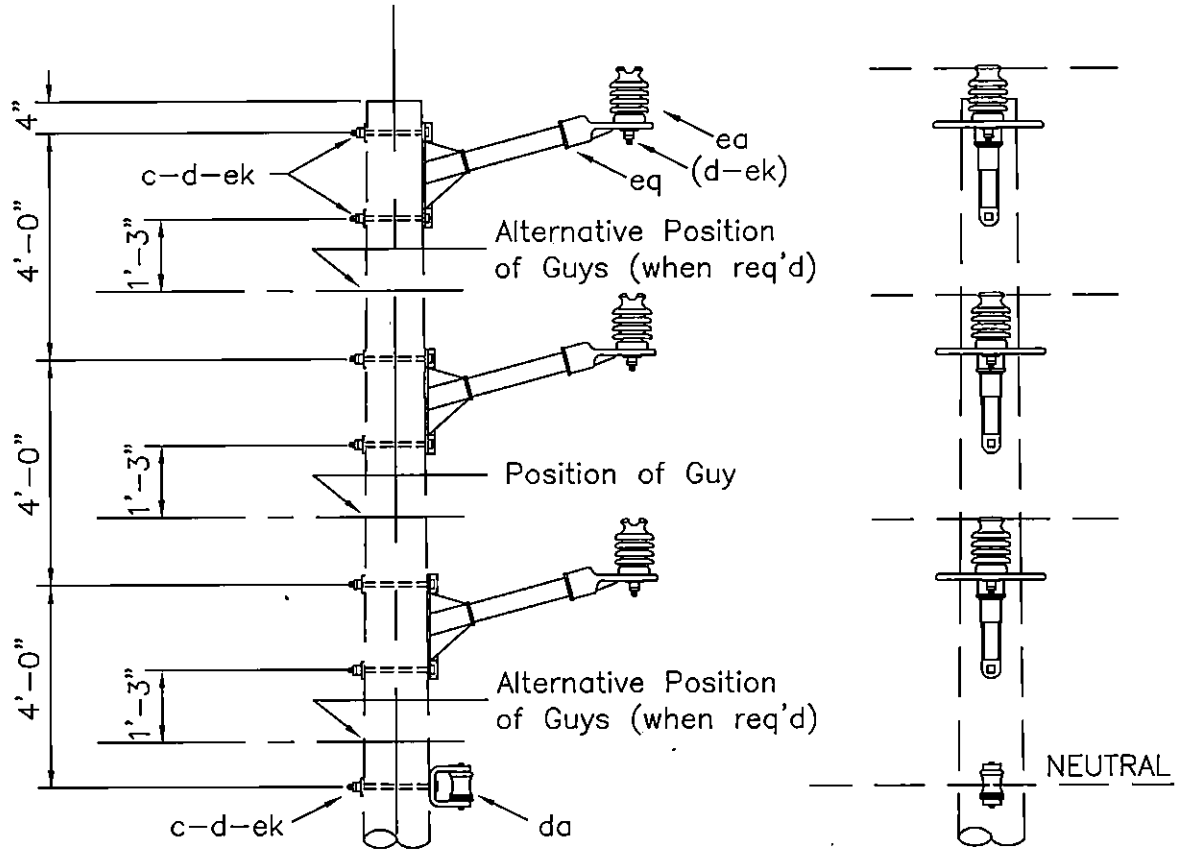
Assembly: C1. 9N

ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	3	
c	Bolt, machine, 5/8" x req'd length	7	
d	Washer, square 2 1/4"	7	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(3)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	7	
eq	Bracket, insulator/equipment	3	

Design Parameters:
Maximum Line Angles
See TABLE II

SINGLE SUPPORT—NARROW PROFILE

APRIL 2005	3 – PHASE PRIMARY	C1.9N
RUS	12.47/7.2 kV	



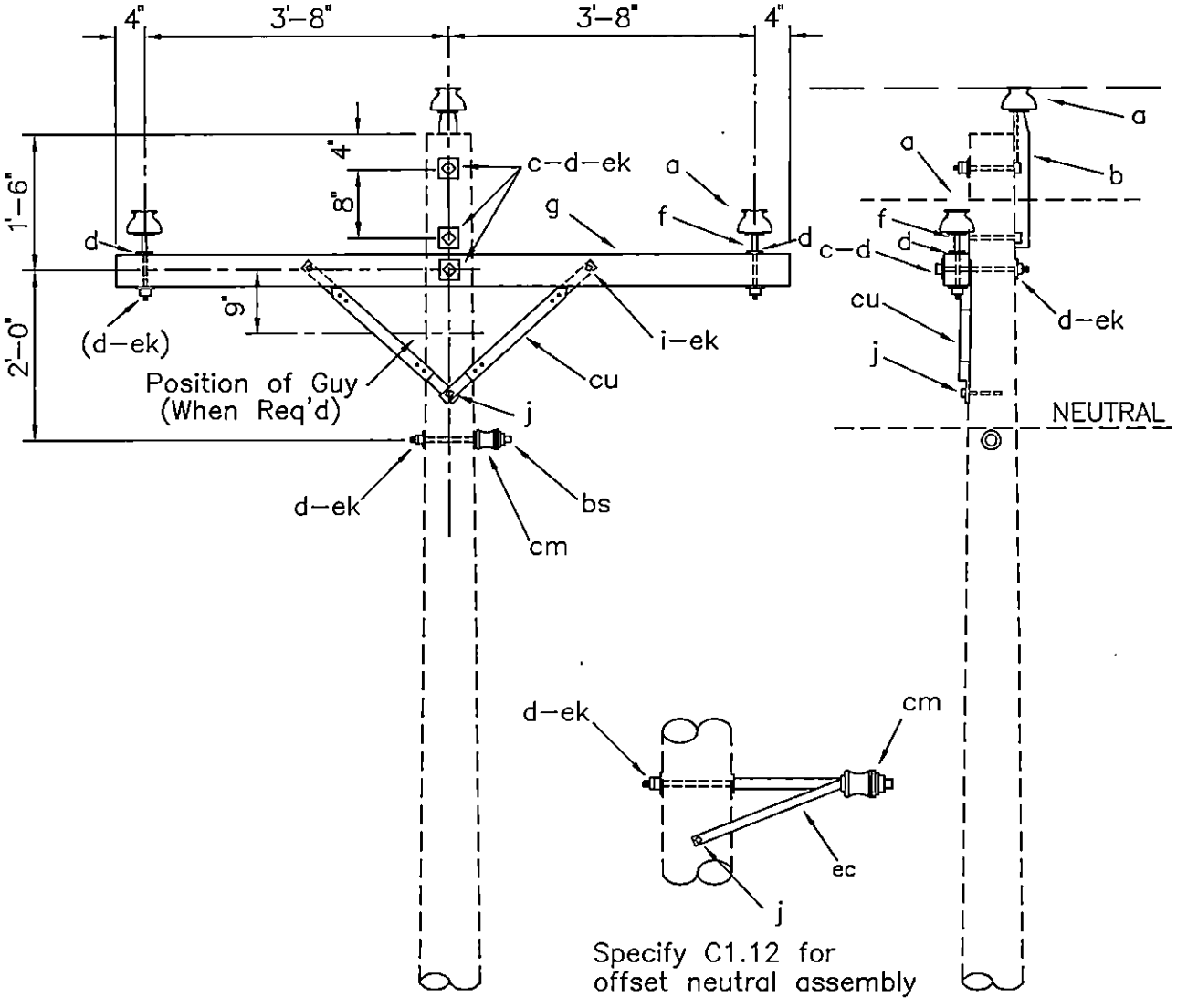
Assembly: C1.		9NP
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	3
ek	Locknuts	7
eq	Bracket, insulator/equipment	3

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT—NARROW PROFILE (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C1.9NP
RUS	12.47/7.2 kV	



Specify C1.12 for offset neutral assembly

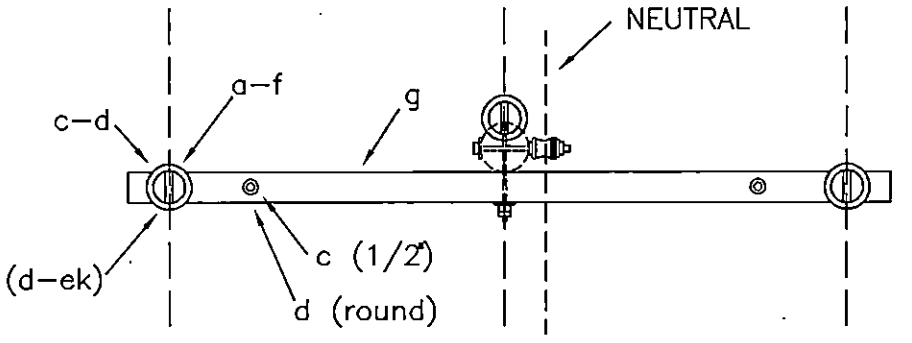
ASSEMBLY: C1.		11	12
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type, (12.47/7.2 kV)	3	3
b	Pin, pole top, 20"	1	1
c	Bolt, machine, 5/8 x req'd length	3	3
d	Washer, square, 2 1/4"	7	7
f	Pin, crossarm, steel, 5/8" x 10 3/4"	2	2
g	Crossarm, 3 5/8" x 4 5/8" x 8'-0"	1	1
i	Bolt, carriage, 3/8" x 4"	2	2
j	Screw, lag, 1/2" x 4"	1	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	6	6

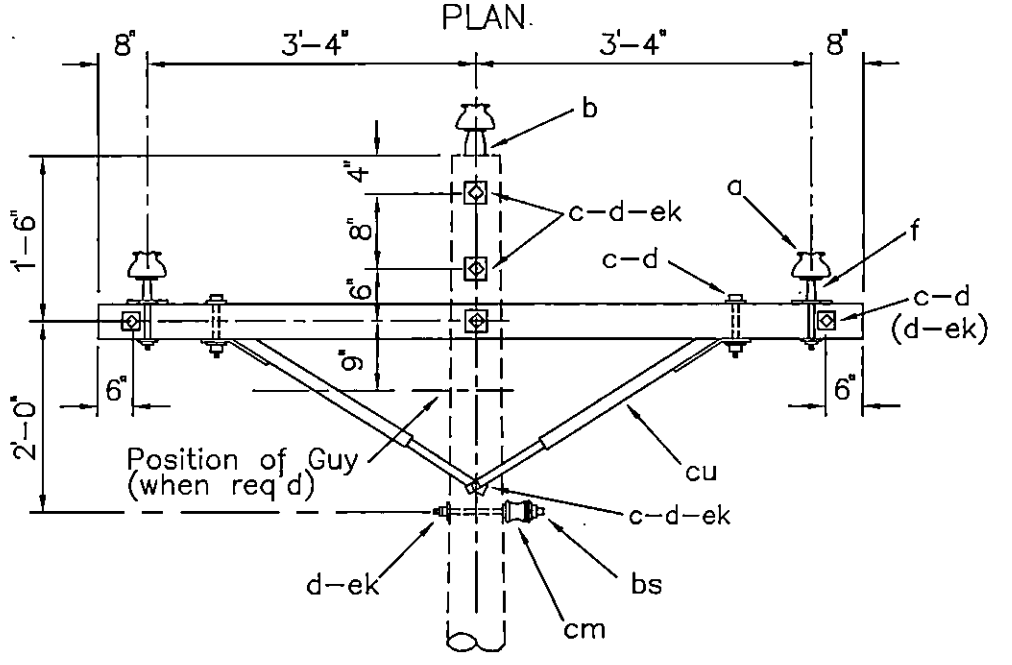
DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

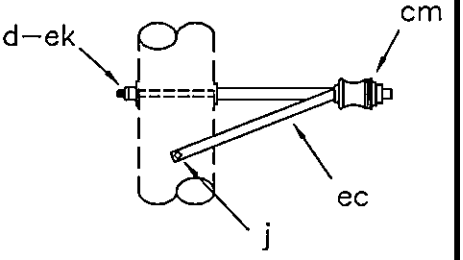
SINGLE SUPPORT ON CROSSARM (TANGENT)

APRIL 2005	3 – PHASE PRIMARY	C1.11 (C1)
RUS	12.47/7.2 kV	C1.12 (C1A)





ITEM	MATERIAL	ASSEMBLY: C1. 11L QTY	12L QTY
a	Insulator, pin type, (12.47/7.2 kV)	3	3
b	Pin, pole top, 20"	1	1
c	Bolt, machine, 1/2" x req'd length	2	2
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, round, 1 3/8"	2	2
d	Washer, square, 2 1/4"	10	10
f	Pin, crossarm, clamp type	2	2
g	Crossarm, 3 5/8" x 4 5/8" x 8'–0"	1	1
j	Screw, lag, 1/2" x 4" .		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, wood, 60" span	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	9	9



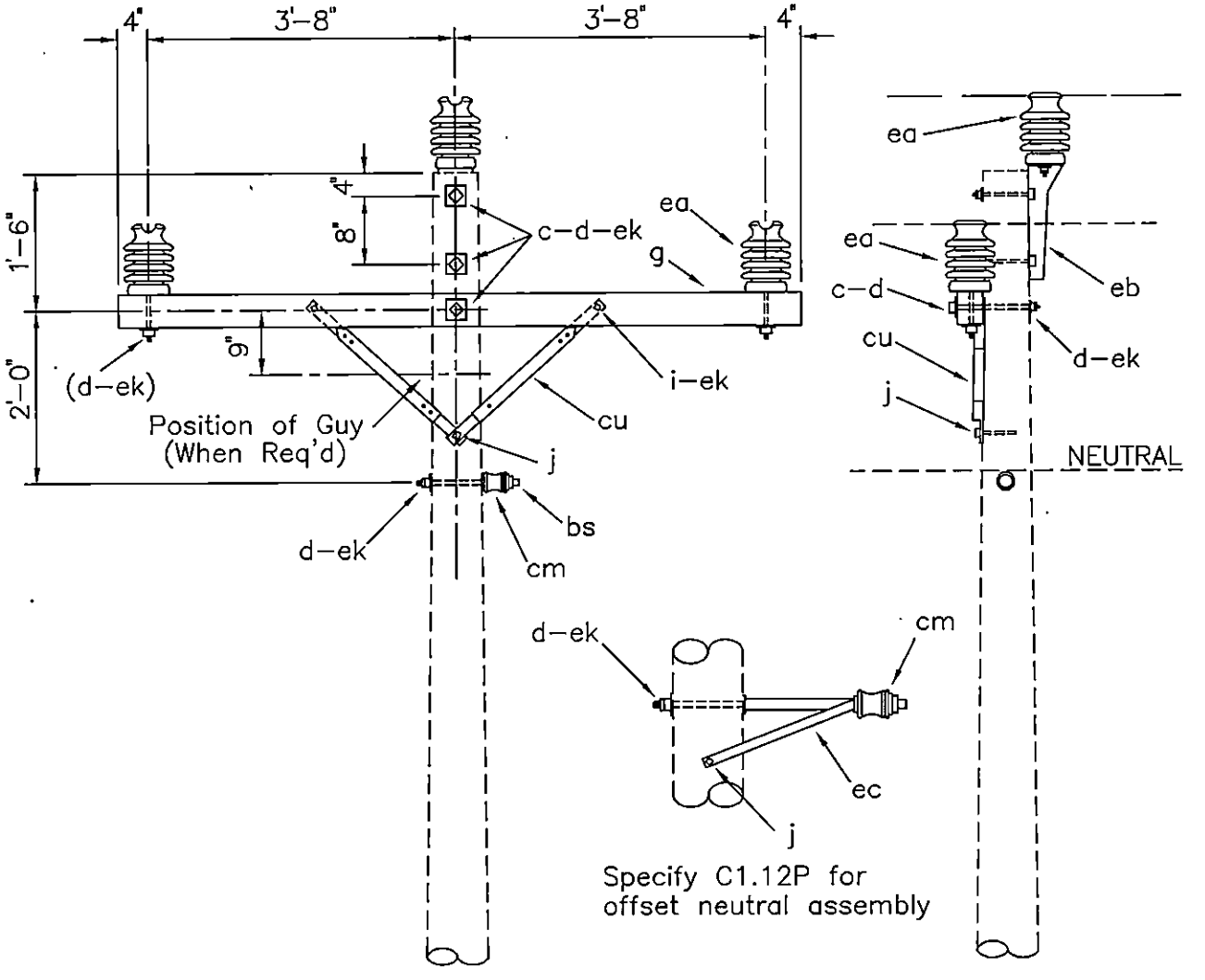
Specify C1.12L for offset neutral assembly

DESIGN PARAMETERS:

MAXIMUM LINE ANGLE:
2° – (Large Conductors)

SINGLE SUPPORT ON CROSSARM (TANGENT) (LARGE CONDUCTORS)

APRIL 2005	3 – PHASE PRIMARY	C1.11L (C1–2)
RUS	12.47/7.2 kV	C1.12L



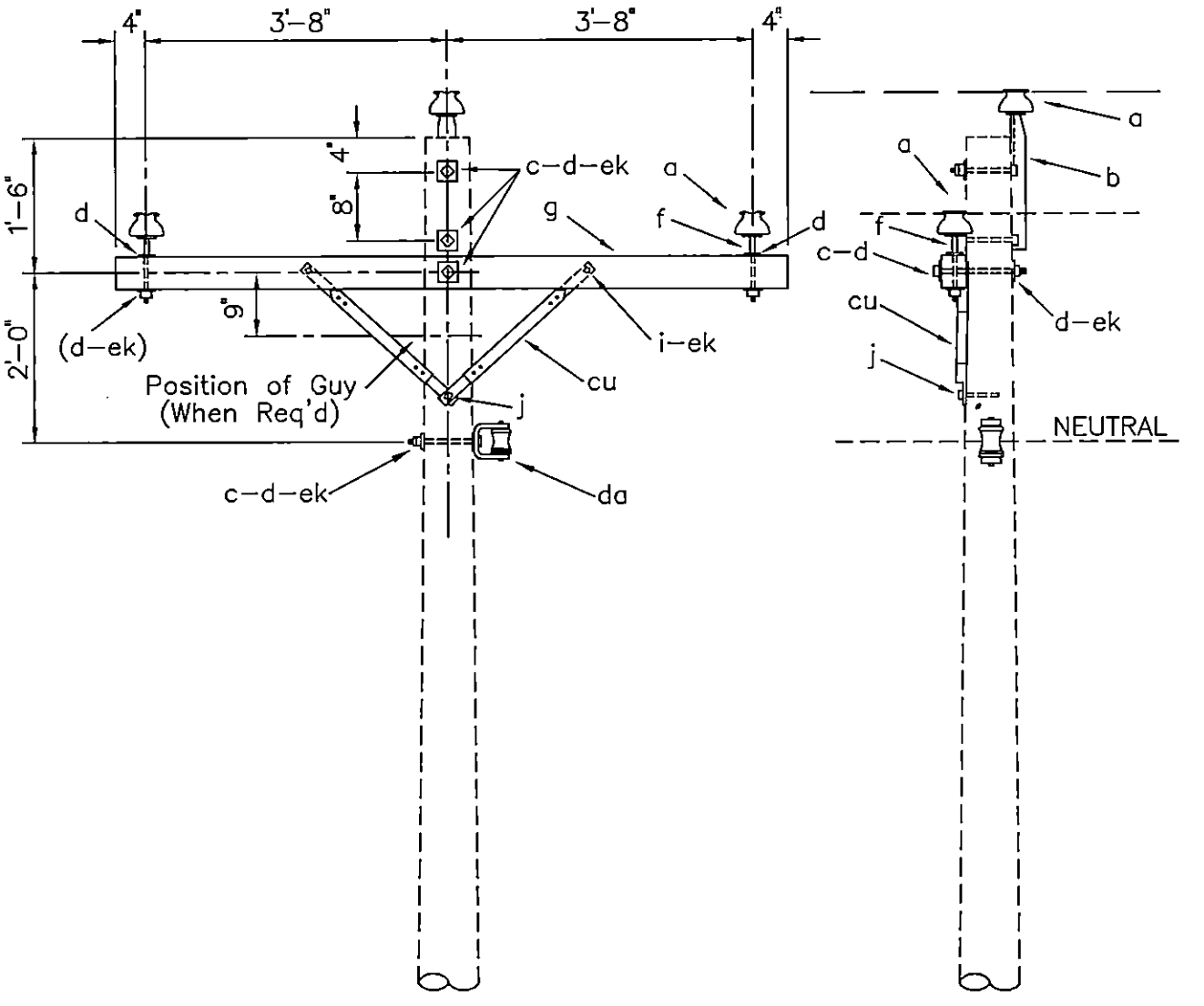
ASSEMBLY: C1.		11P	12P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	3	3
d	Washer, square, 2 1/4"	5	5
g	Crossarm, 3 5/8" x 4 5/8" x 8'–0"	1	1
i	Bolt, carriage, 3/8" x 4"	2	2
j	Screw, lag, 1/2" x 4"	1	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	2	2
ea	Insulator, post type (12.47/7.2 kV)	3	3
eb	Bracket, pole top	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	6	6

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT ON CROSSARM (TANGENT) (POST INSULATORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C1.11P (C1P) C1.12P (C1AP)



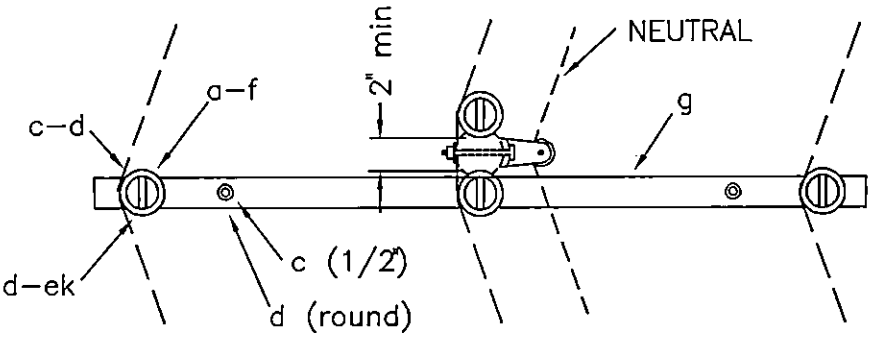
ITEM	QTY	MATERIAL
a	3	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20"
c	4	Bolt, machine, 5/8" x req'd length
d	7	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
cu	2	Brace, 28"
da	1	Bracket, insulated
ek	6	Locknuts

DESIGN PARAMETERS:

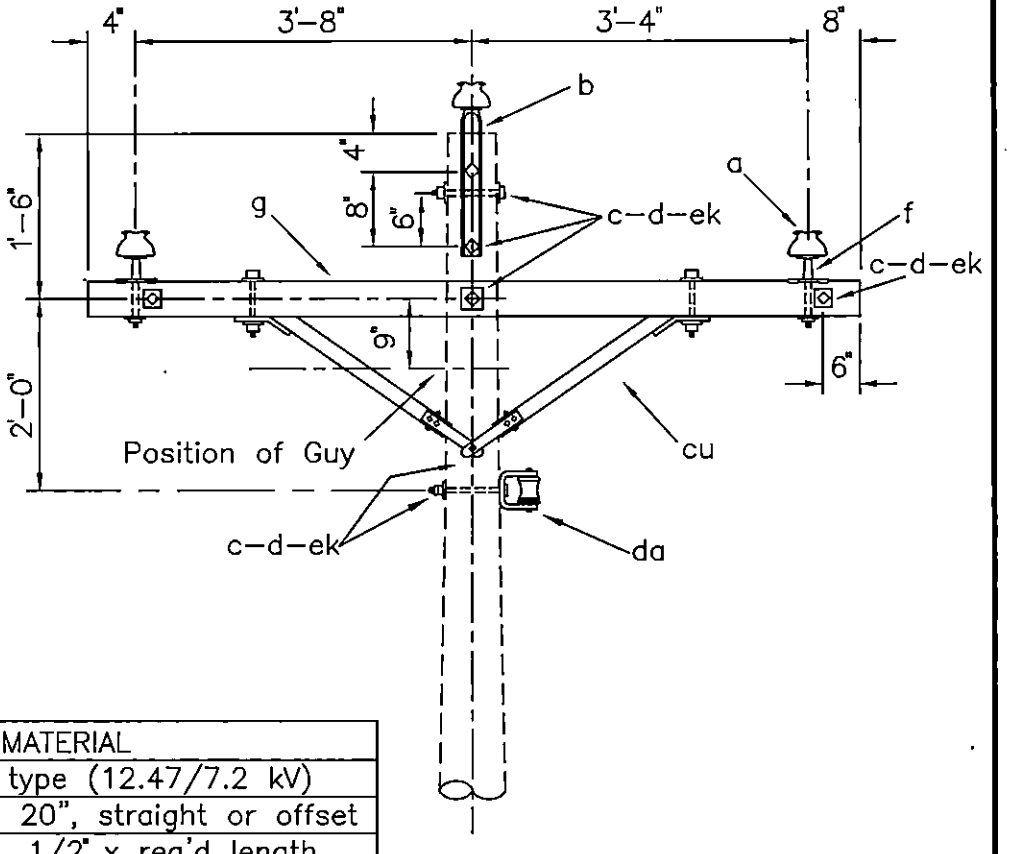
See TABLE I

SINGLE SUPPORT ON CROSSARM

APRIL 2005	3 - PHASE PRIMARY	
RUS	12.47/7.2 kV	C1.13



PLAN



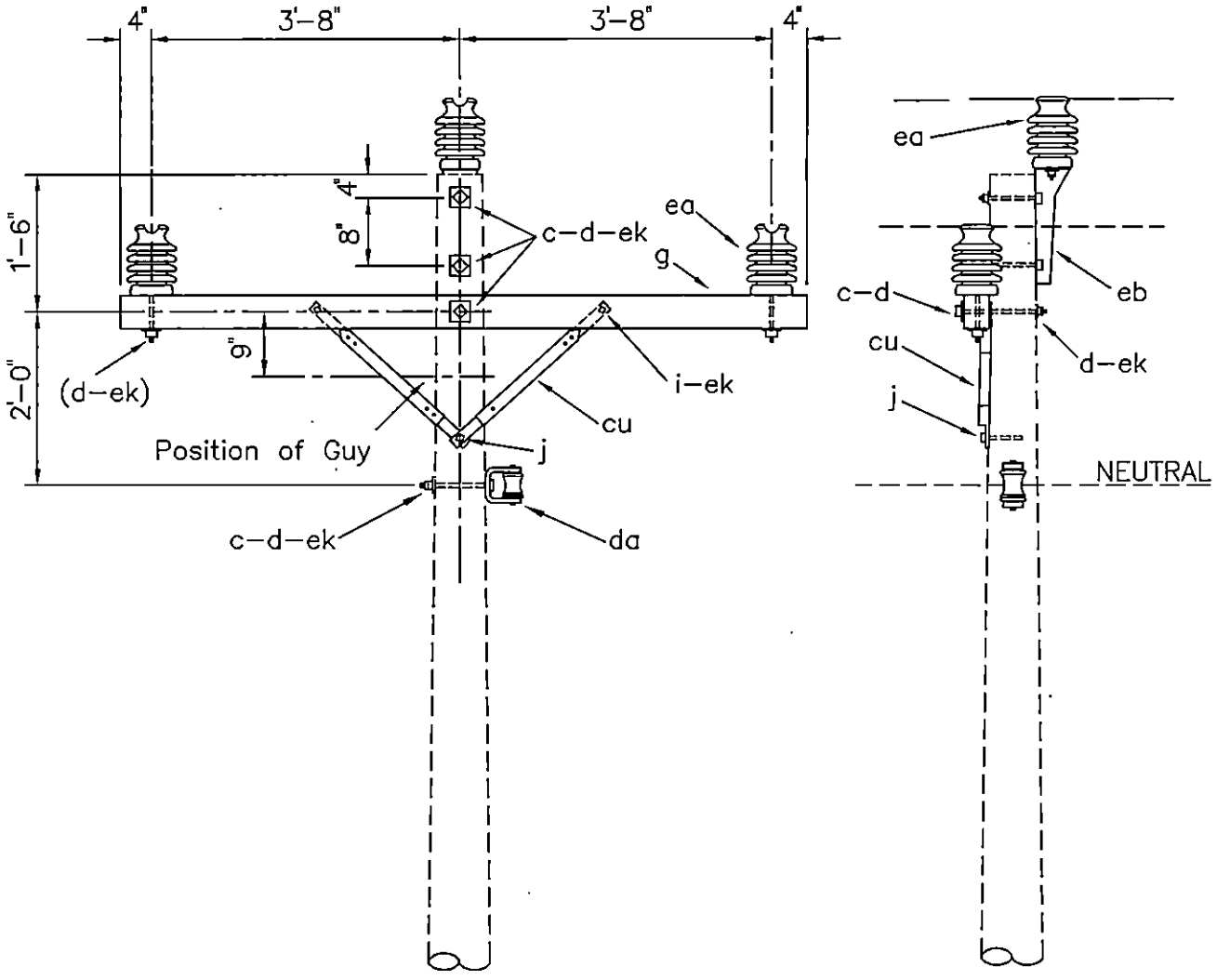
ITEM	QTY	MATERIAL
a	4	Insulator, pin type (12.47/7.2 kV)
b	2	Pin, pole top, 20", straight or offset
c	2	Bolt, machine, 1/2" x req'd length
c	8	Bolt, machine, 5/8" x req'd length
d	2	Washer, round, 1 3/8"
d	12	Washer, square, 2 1/4"
f	2	Pin, crossarm, clamp type
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
cu	1	Brace, wood, 60" span
da	1	Bracket, insulated
ek	10	Locknuts

DESIGN PARAMETERS:

See TABLE III

SINGLE SUPPORT ON CROSSARM (LARGE CONDUCTORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C1.13L (C1–4)



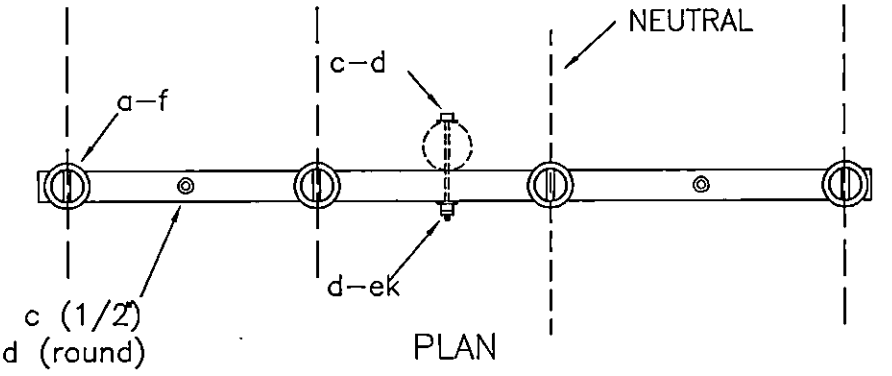
ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	5	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
cu	2	Brace, 28"
da	1	Bracket, insulated
ea	3	Insulator, post type (12.47/7.2 kV)
eb	1	Bracket, pole top
ek	6	Locknuts

DESIGN PARAMETERS:

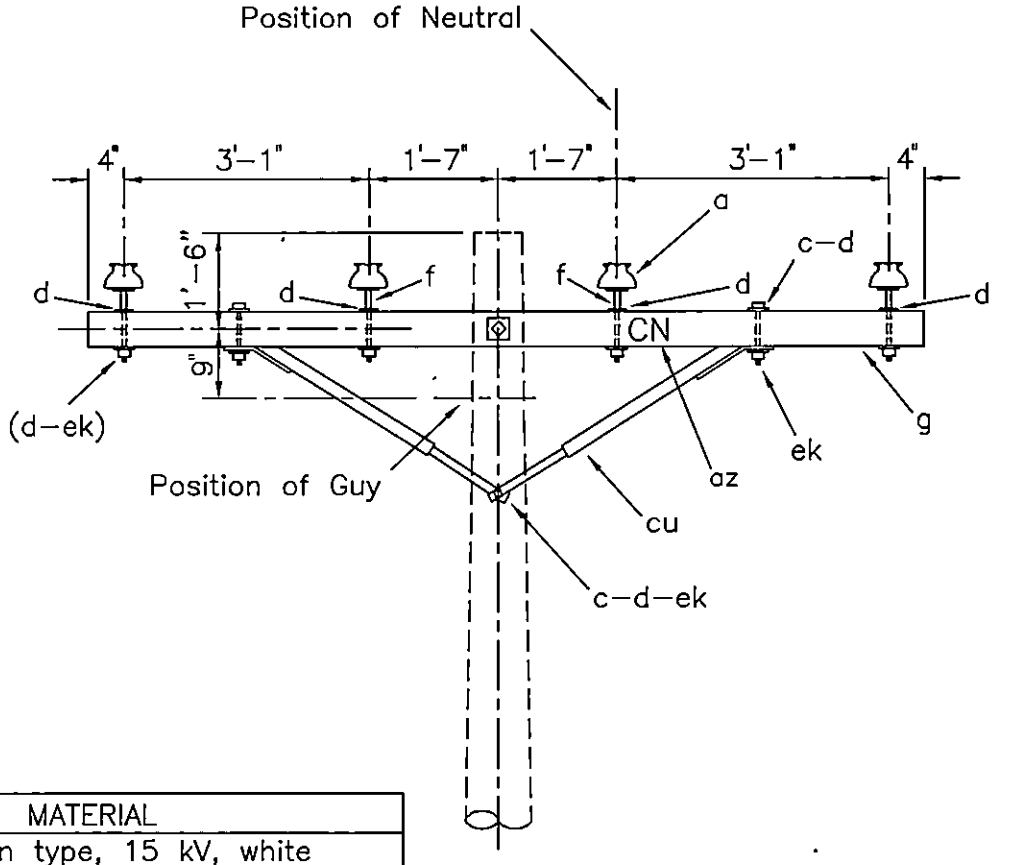
See TABLE II

SINGLE SUPPORT ON CROSSARM (POST INSULATORS)

APRIL 2005	3 - PHASE PRIMARY	
RUS	12.47/7.2 kV	C1.13P



PLAN



ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
a	3	Insulator, pin type (12.47/7.2 kV)
c	2	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, round, 1 3/8"
d	7	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
az	4	Letters, 2" C, 2" N, with 1" nails
cu	1	Brace, wood, 60° span
ek	4	Locknuts

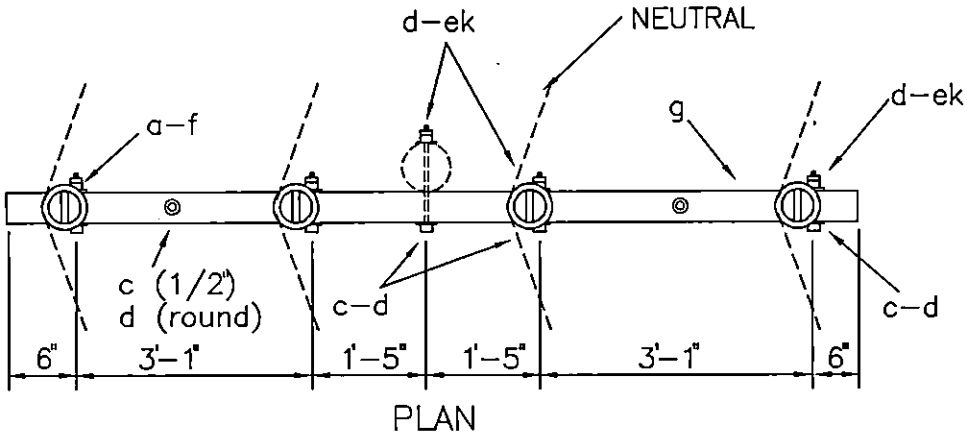
NOTE: Install either identification letters (az) or white insulator in neutral position.

DESIGN PARAMETERS:

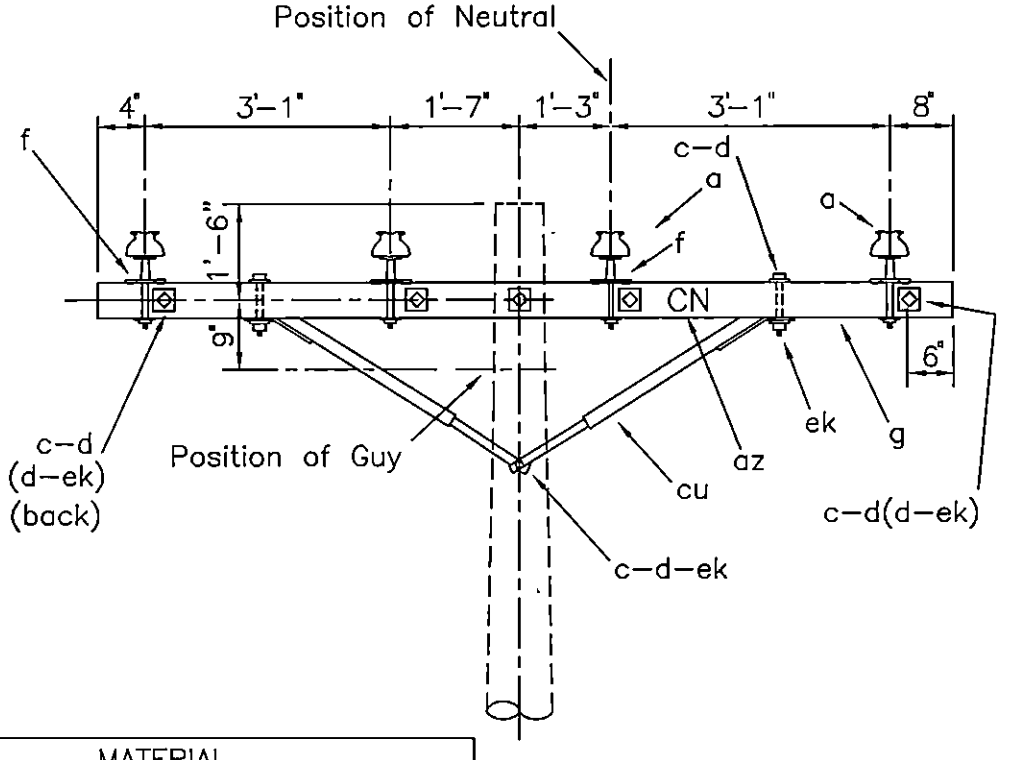
See TABLE II

SINGLE SUPPORT, NEUTRAL ON CROSSARM

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C1.41 (C9–1)



PLAN



ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kv, white
a	3	Insulator, pin type (12.47/7.2 kV)
c	2	Bolt, machine, 1/2" x req'd length
c	6	Bolt, machine, 5/8" x req'd length
d	2	Washer, round, 1 3/8"
d	11	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel clamp type
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
az	4	Letters, 2" C, 2" N, with 1" nails
cu	1	Brace, wood, 60" span
ek	8	Locknuts

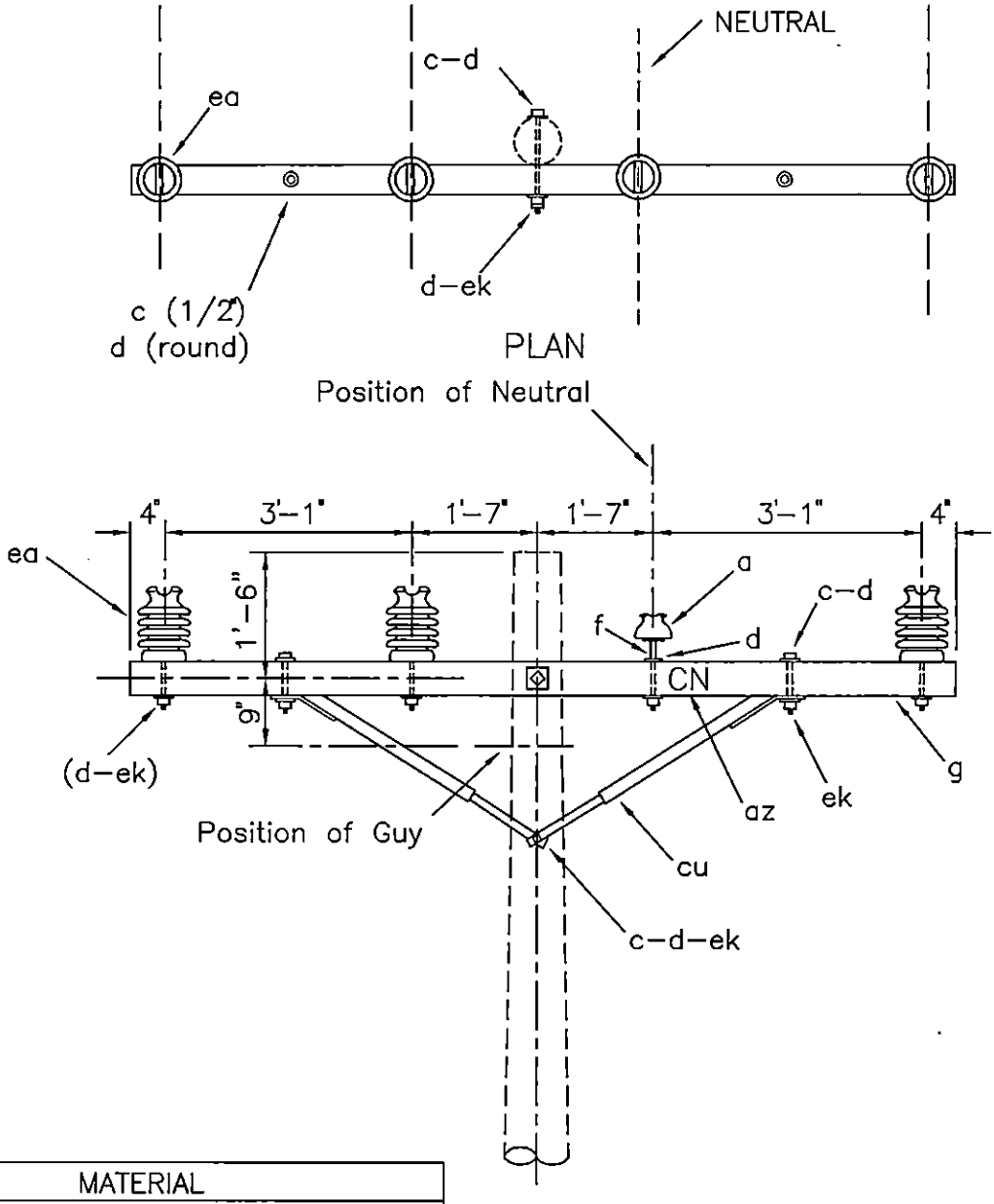
NOTE: Install either identification letters (az) or white insulator in neutral position.

DESIGN PARAMETERS:

See TABLE III

SINGLE SUPPORT, NEUTRAL ON CROSSARM (LARGE CONDUCTORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C1.41L (C9–3)



ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
c	2	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, round, 1 3/8"
d	4	Washer, square, 2 1/4"
f	1	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
az	4	Letters, 2" C, 2" N, with 1" nails
cu	1	Brace, wood, 60" span
ea	3	Insulator, post type (12.47/7.2 kV)
ek	4	Locknuts

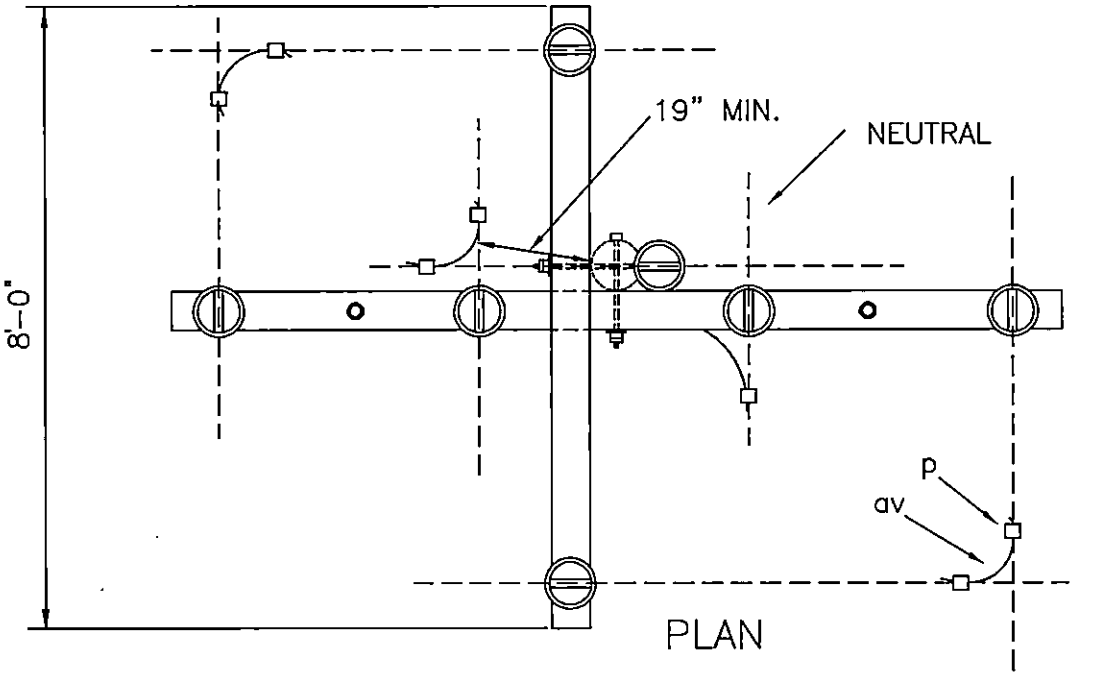
NOTE: Install identification letters (az) in neutral position. (optional)

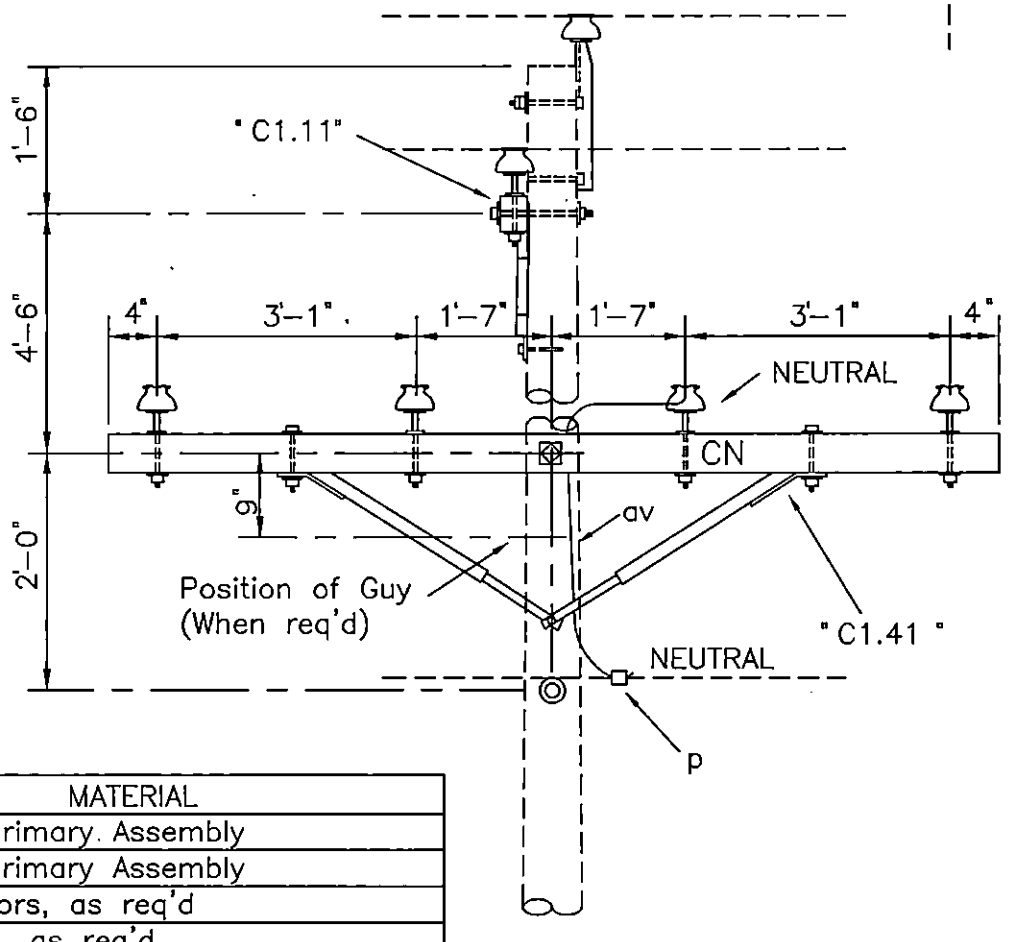
DESIGN PARAMETERS:

See TABLE II

SINGLE SUPPORT, NEUTRAL ON CROSSARM (POST INSULATORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C1.41P (C9–1P)





ITEM	QTY	MATERIAL
	1	C1.11 Primary Assembly
	1	C1.41 Primary Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

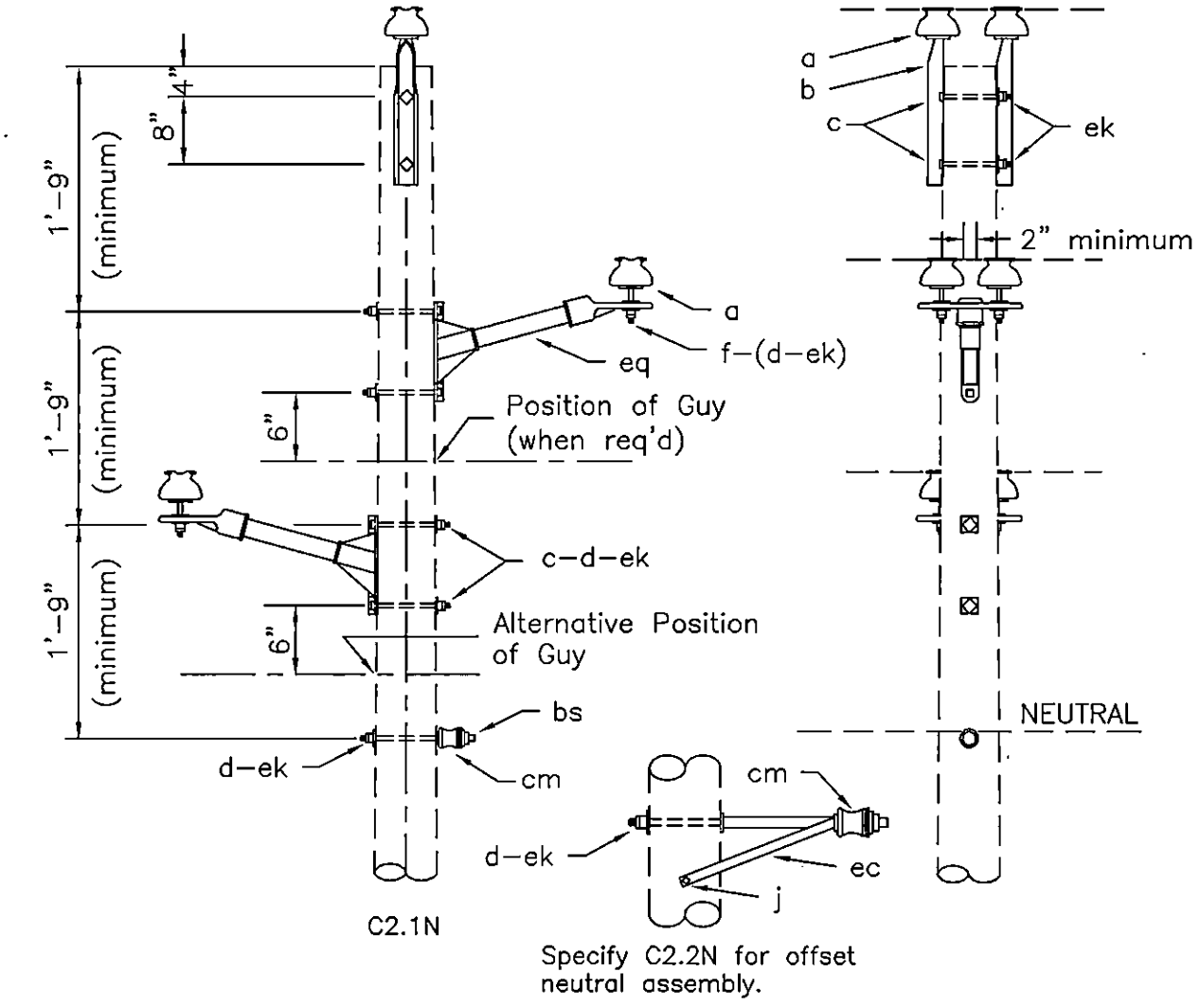
DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:

5° – Small Conductors
2° – Larger than #1/0

THREE PHASE JUNCTION GUIDE

APRIL 2005	3 – PHASE PRIMARY	C1.81G
RUS	12.47/7.2 kV	



NOTES: These assemblies used for NESC Grade B construction.

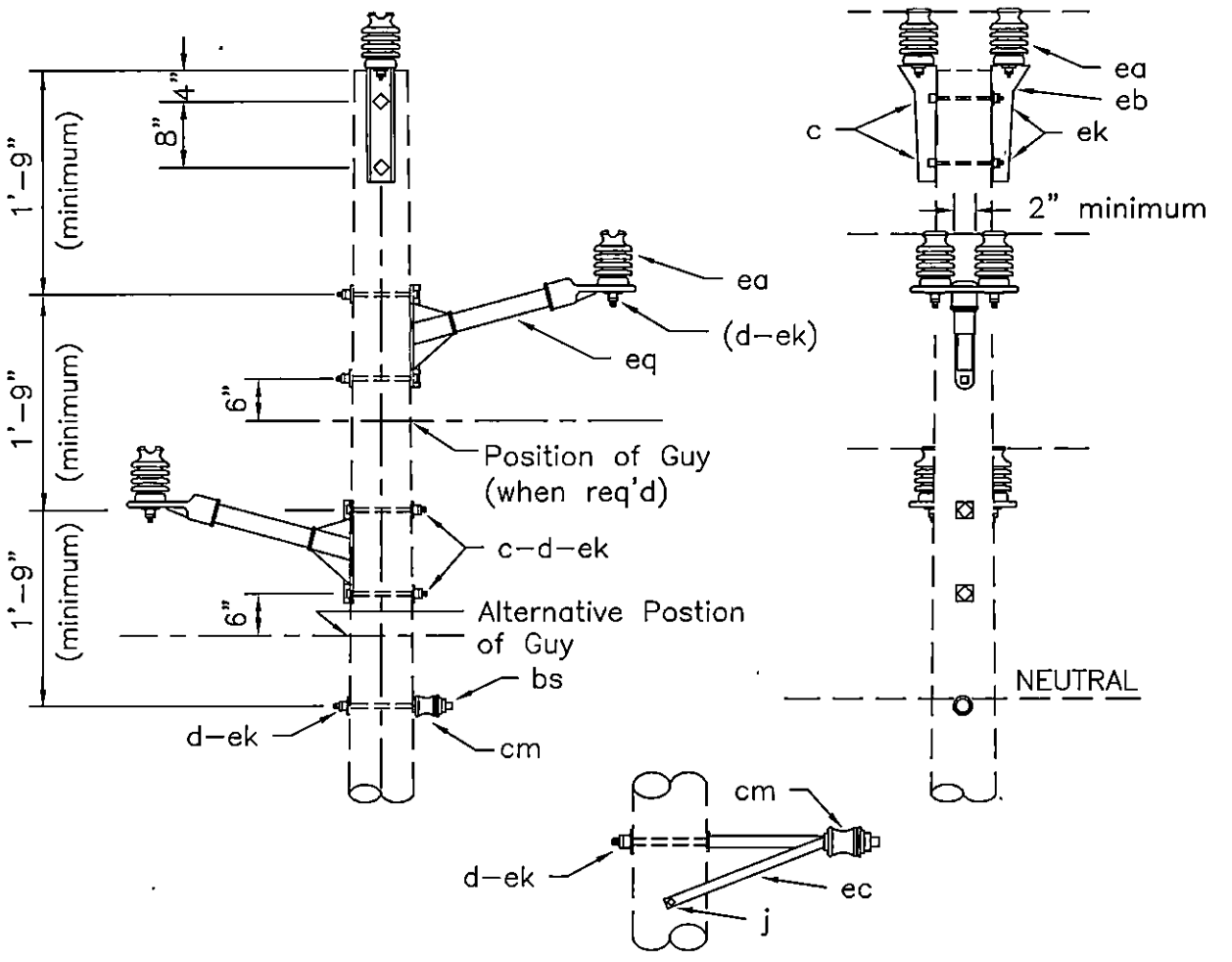
ITEM	MATERIAL	ASSEMBLY: C2. 1N QTY	2N QTY
a	Insulator, pin type (12.47/7.2 kV)	6	6
b	Pin, pole top, 20"	2	2
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	5	5
f	Pin, crossarm, 5/8" x 6 1/2"	4	4
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	2	2

Design Parameters:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	3 – PHASE PRIMARY · 12.47/7.2 kV	C2.1N C2.2N
RUS		



Specify C2.2NP for offset neutral assembly.

NOTES: These assemblies used for NESC Grade B construction.

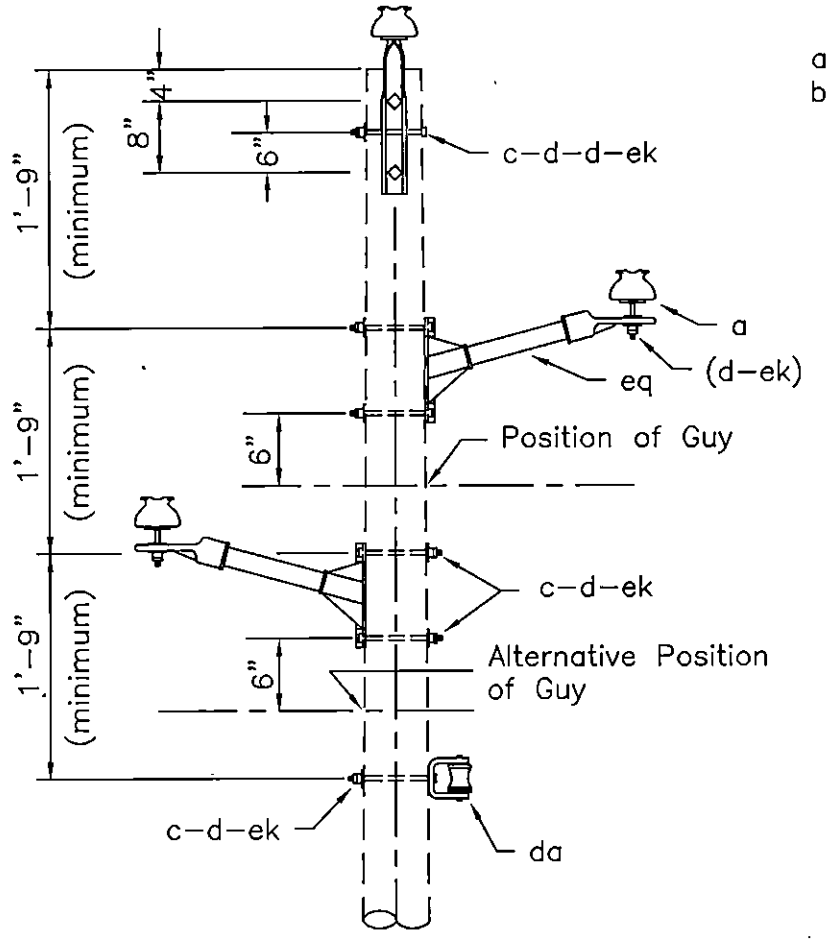
ITEM	MATERIAL	ASSEMBLY: C2. 1NP QTY	2NP QTY
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	5	5
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	6	6
eb	Bracket, pole top	2	
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	2	2

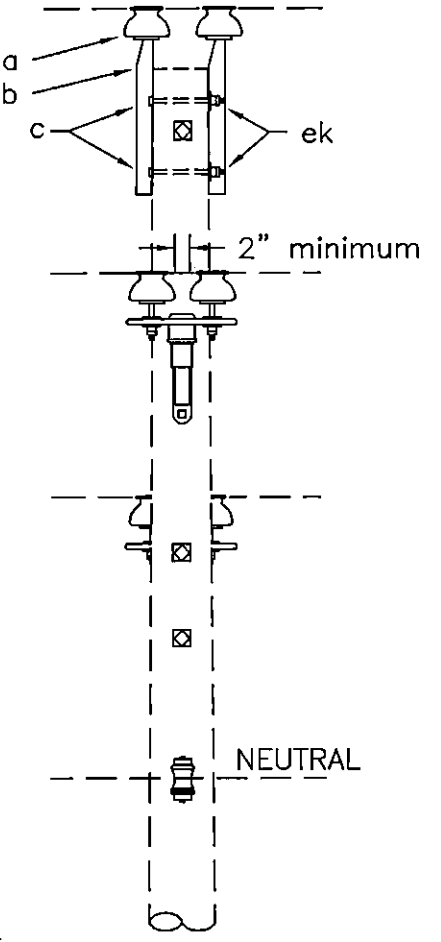
Design Parameters:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.1NP
RUS	12.47/7.2 kV	C2.2NP





NOTES: If additional or alternative guying is required frame pole according to C2.3NG.

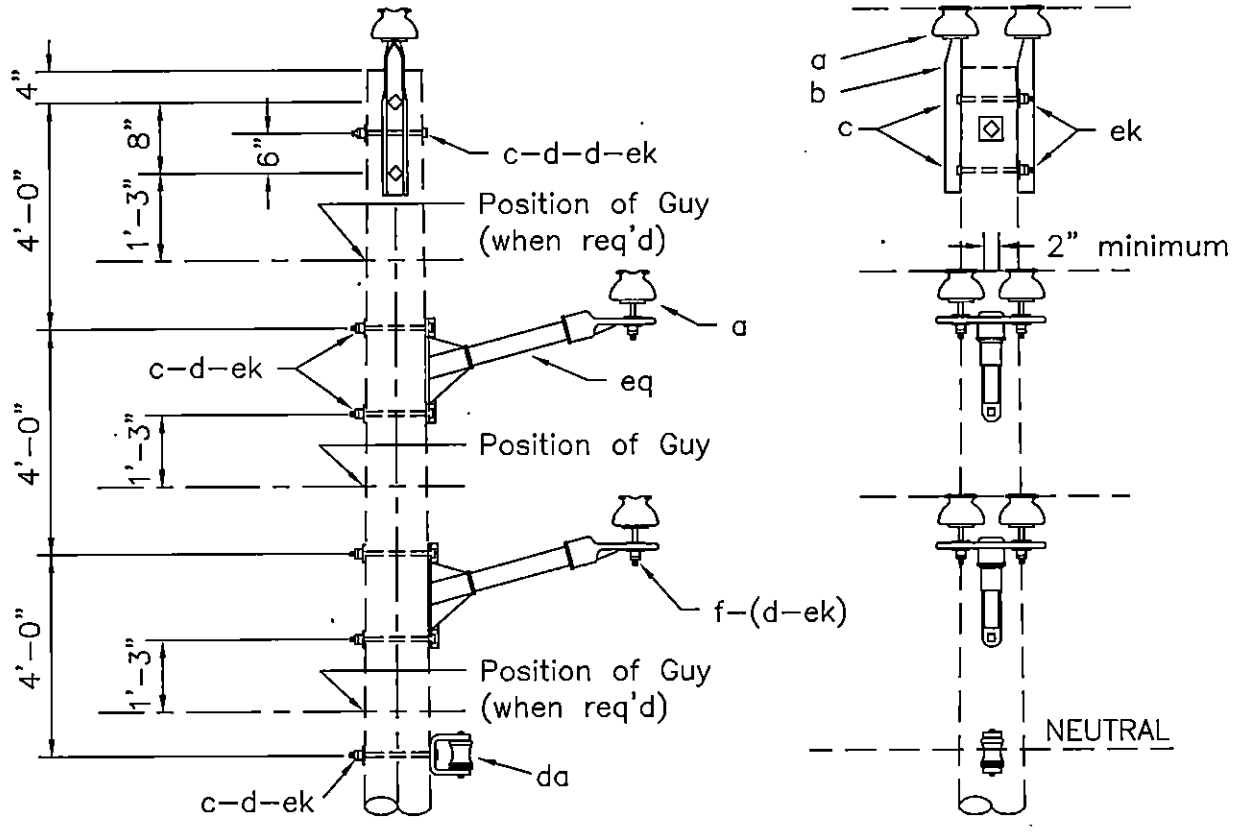
ASSEMBLY: C2.		3N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	6
b	Pin, pole top, 20"	2
c	Bolt, machine, 5/8" x req'd length	8
d	Washer, square 2 1/4"	7
f	Pin, crossarm, 5/8" x 6 1/2"	4
da	Bracket, insulated	1
ek	Locknuts	8
eq	Bracket, insulator/equipment	2

Design Parameters:

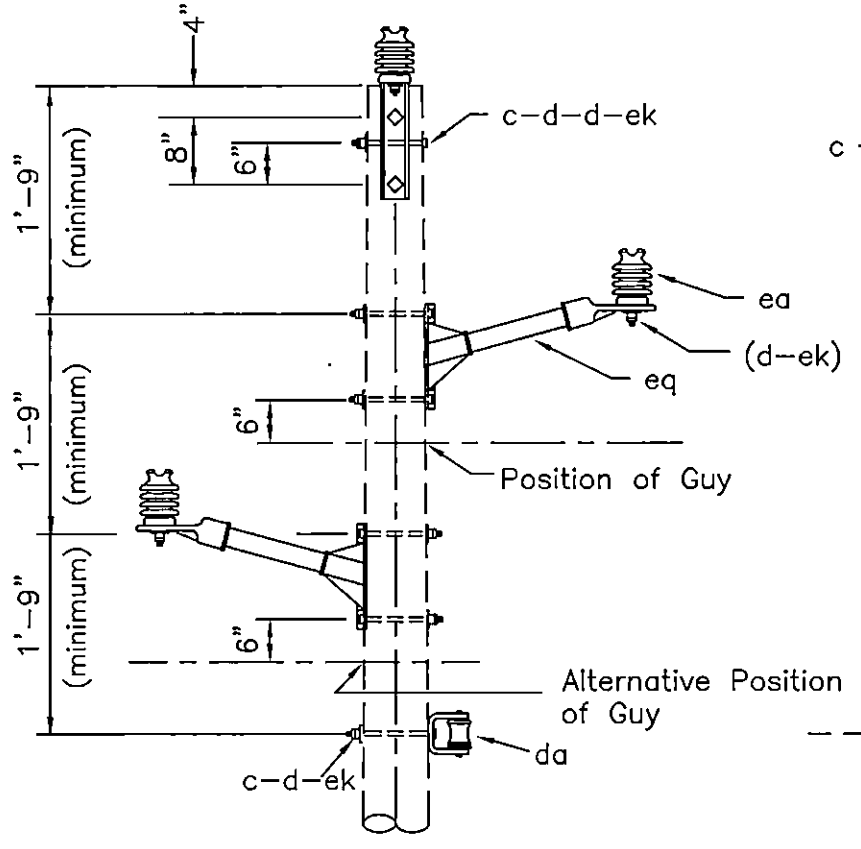
MAXIMUM LINE ANGLES:
See Table III

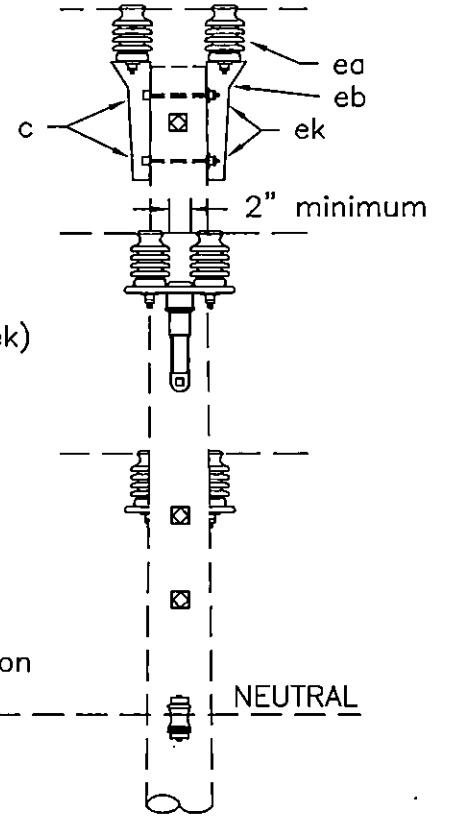
DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	3 – PHASE PRIMARY	C2.3N
RUS	12.47/7.2 kV	



Design Parameters: MAXIMUM LINE ANGLES: See Table III	DOUBLE SUPPORT–NARROW PROFILE (ALTERNATIVE GUYING GUIDE)		
	APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C2.3NG





NOTES: If additional or alternative guying is required, frame pole according to C2.3NG

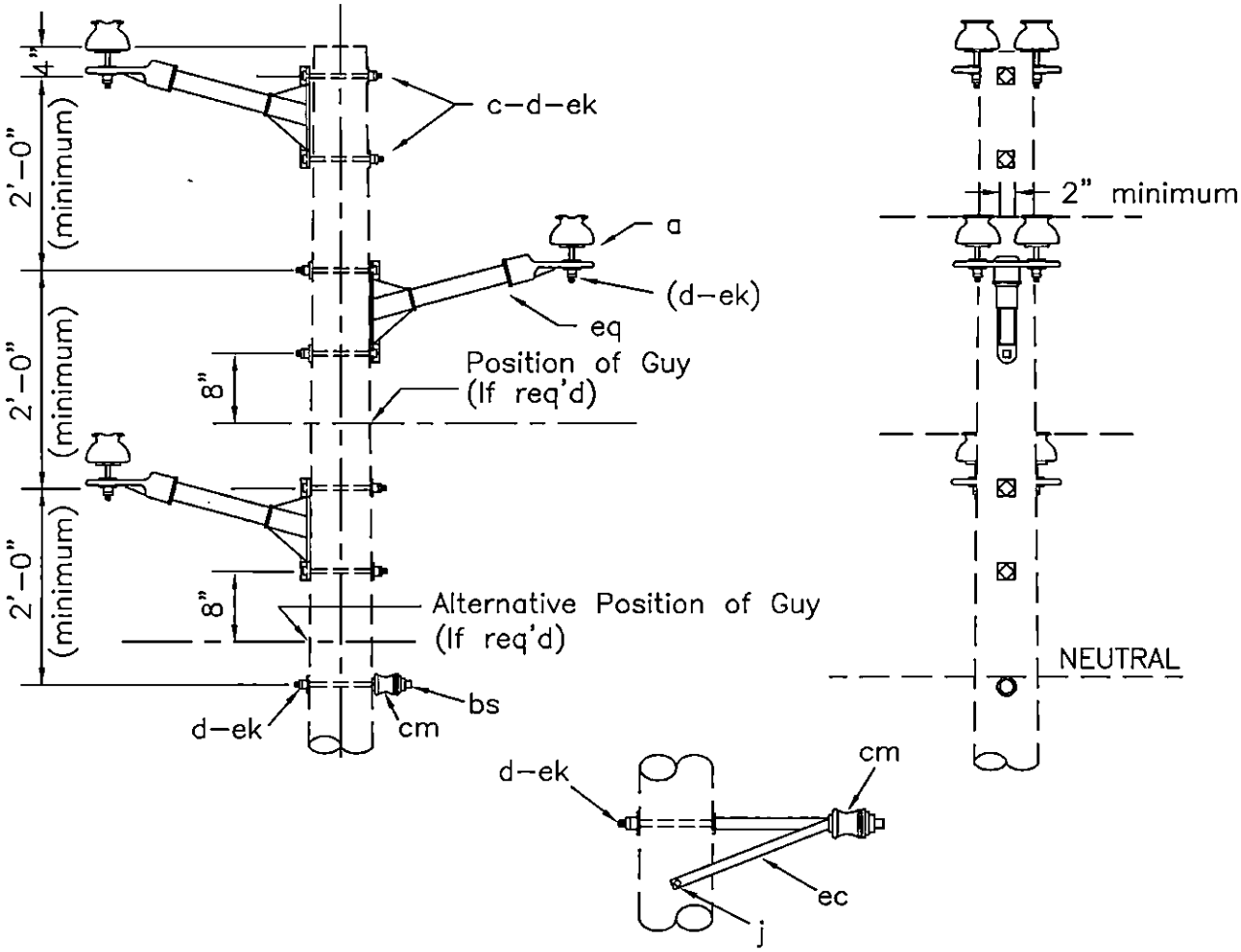
ASSEMBLY: C2.3NP

ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	8
d	Washer, square 2 1/4"	7
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.5 kV)	6
eb	Bracket, pole top	2
ek	Locknuts	8
eq	Bracket, insulator/equipment	2

Design Parameters:
Maximum Line Angles:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	2 – PHASE PRIMARY	C2.3NP
RUS	12.47/7.2 kV	



Specify C2.5N for offset neutral assembly

NOTE: These assemblies used for NESC Grade B construction.

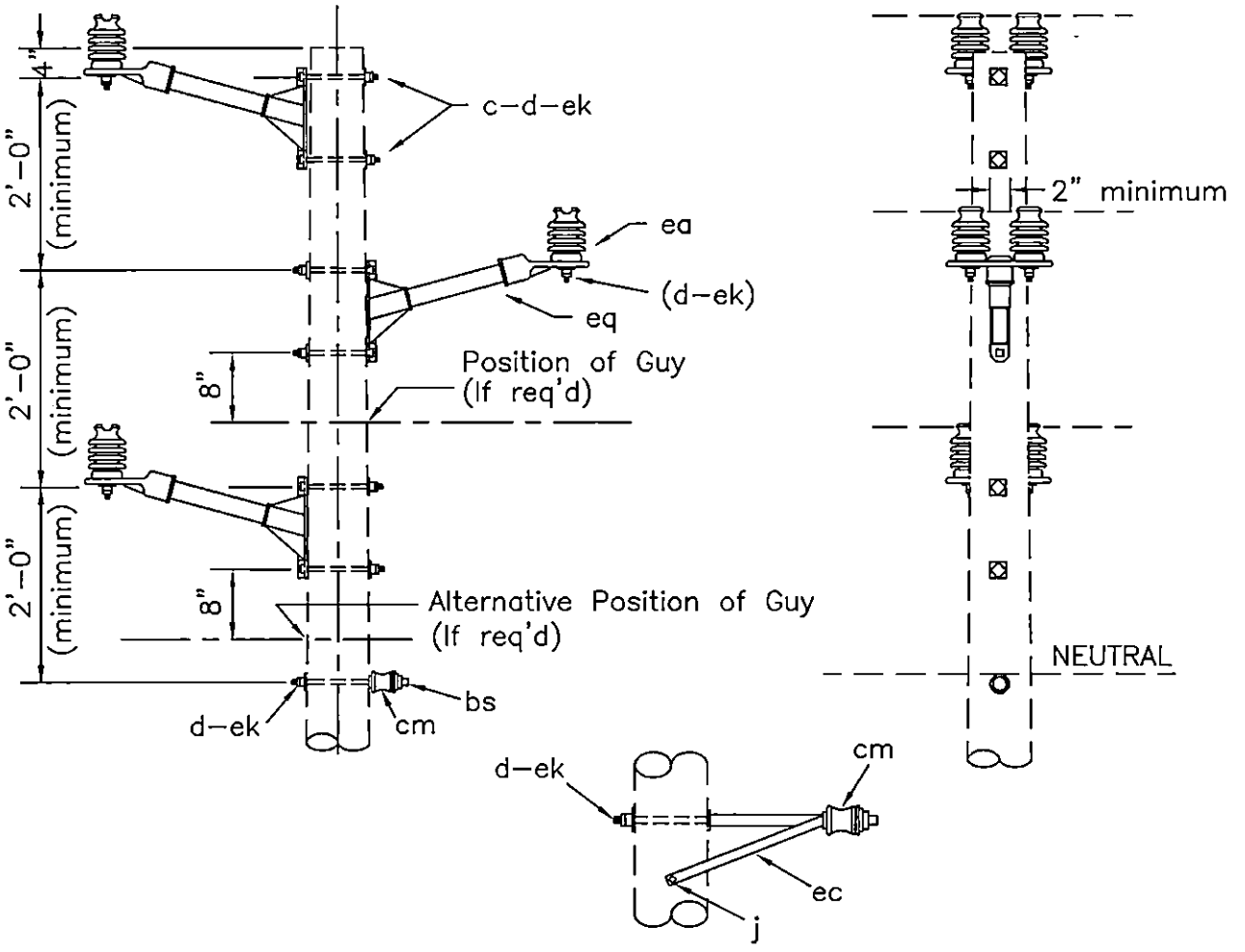
ASSEMBLY: C2.		4N	5N
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	6	6
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
f	Pin, crossarm, 5/8" x 6 1/2"	6	6
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	3	3

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	3 – PHASE PRIMARY	C2.4N
RUS	12.47/7.2 kV	C2.5N



Specify C2.5NP for offset neutral assembly

NOTE: These assemblies used for NESC Grade B construction.

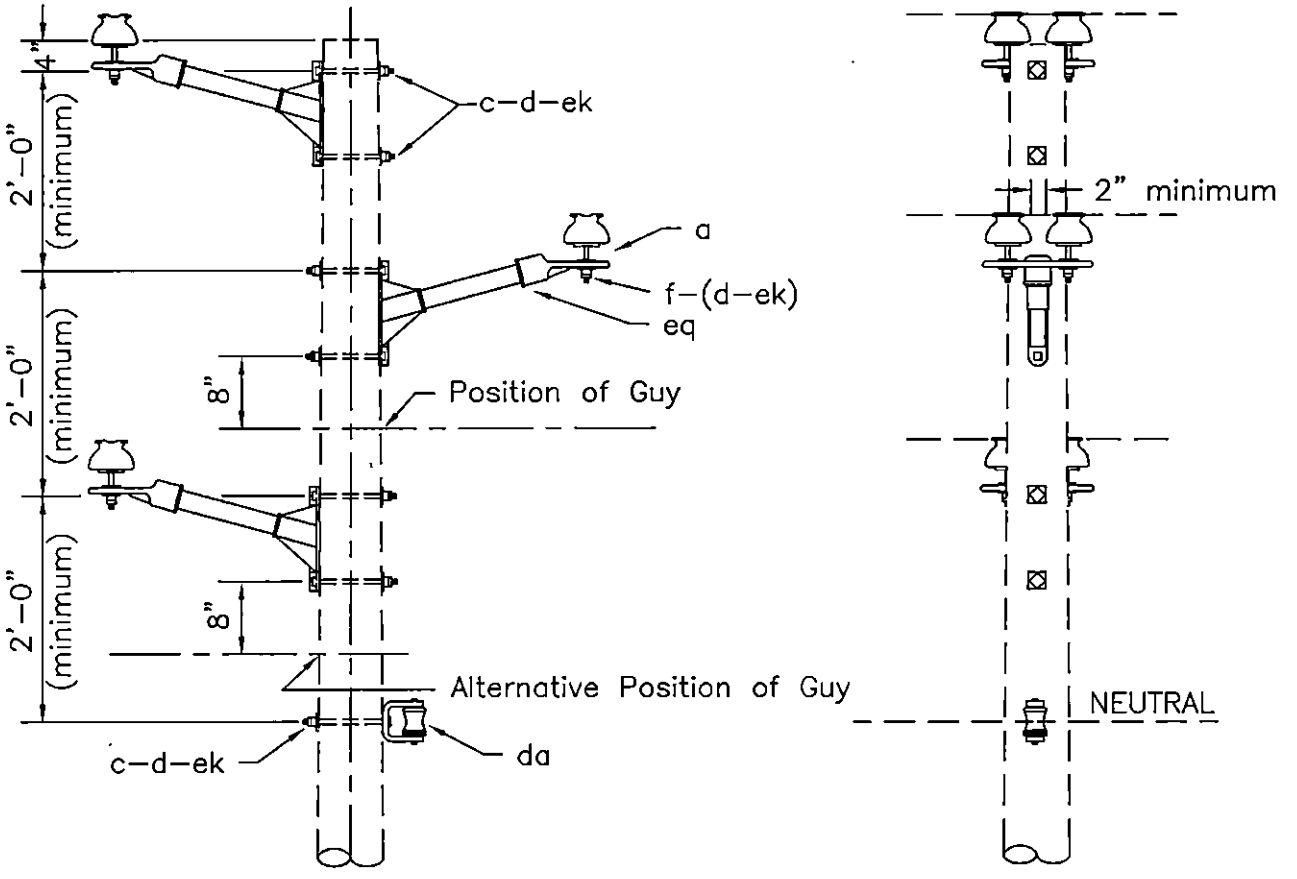
ASSEMBLY: C2.		4NP	5NP
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type, (12.47/7.2kV)	6	6
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	3	3

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)(POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.4NP
RUS	12.47/7.2 kV	C2.5NP



NOTE: If additional guying is required, use assembly C2.9N.

ASSEMBLY: C2. 6N

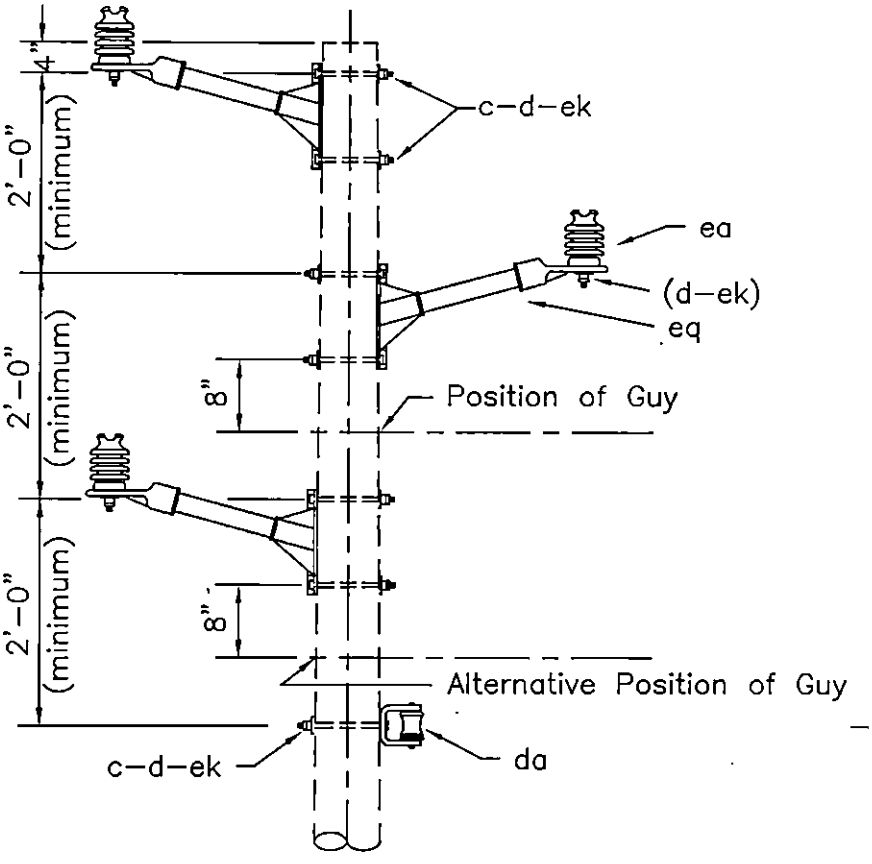
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	6
c	Bolt, machine, 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
f	Pin, crossarm, 5/8" x 6 1/2"	6
da	Bracket, insulated	1
ek	Locknuts	7
eq	Bracket, insulator/equipment	3

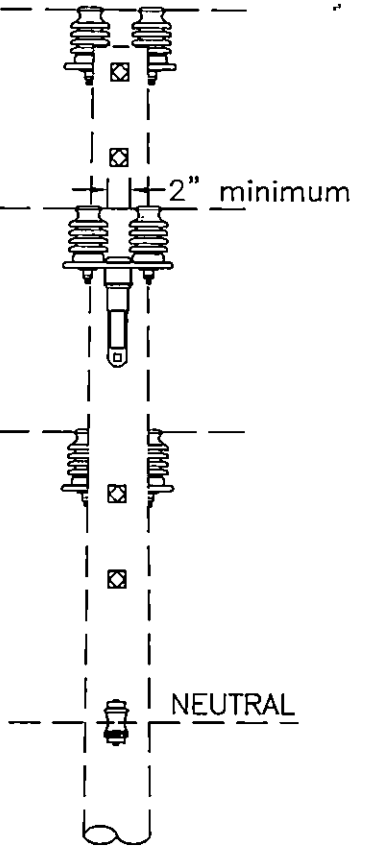
Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	3 – PHASE PRIMARY	C2.6N
RUS	12.47/7.2 kV	





NOTE: If additional guying is required, use assembly C2.9NP.

ASSEMBLY: C2.6NP

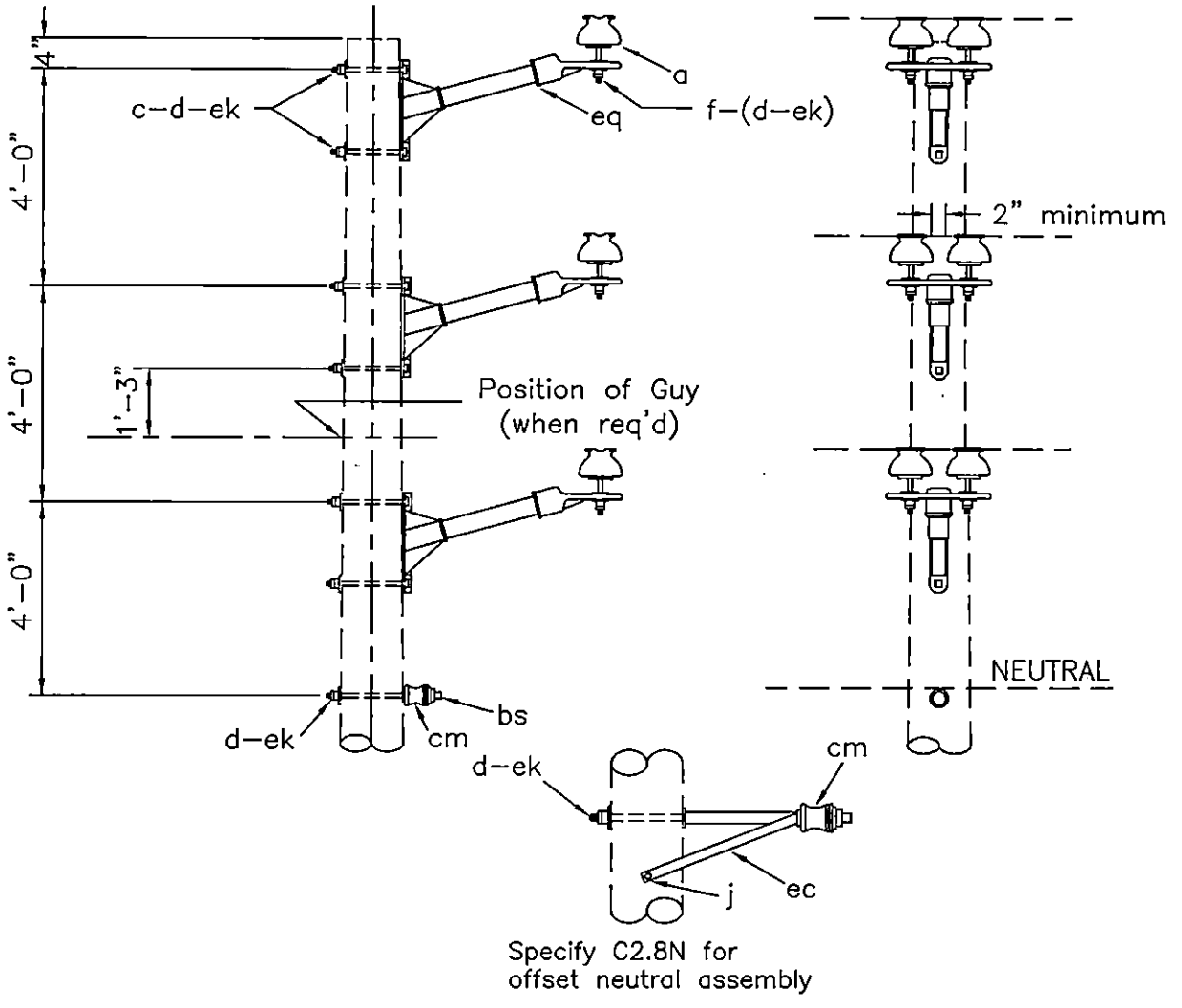
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2kV)	6
ek	Locknuts	7
eq	Bracket, insulator/equipment	3

Design Parameters:

MAXIMUM LINE ANGLES:
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.6NP
RUS	12.47/7.2 kV	



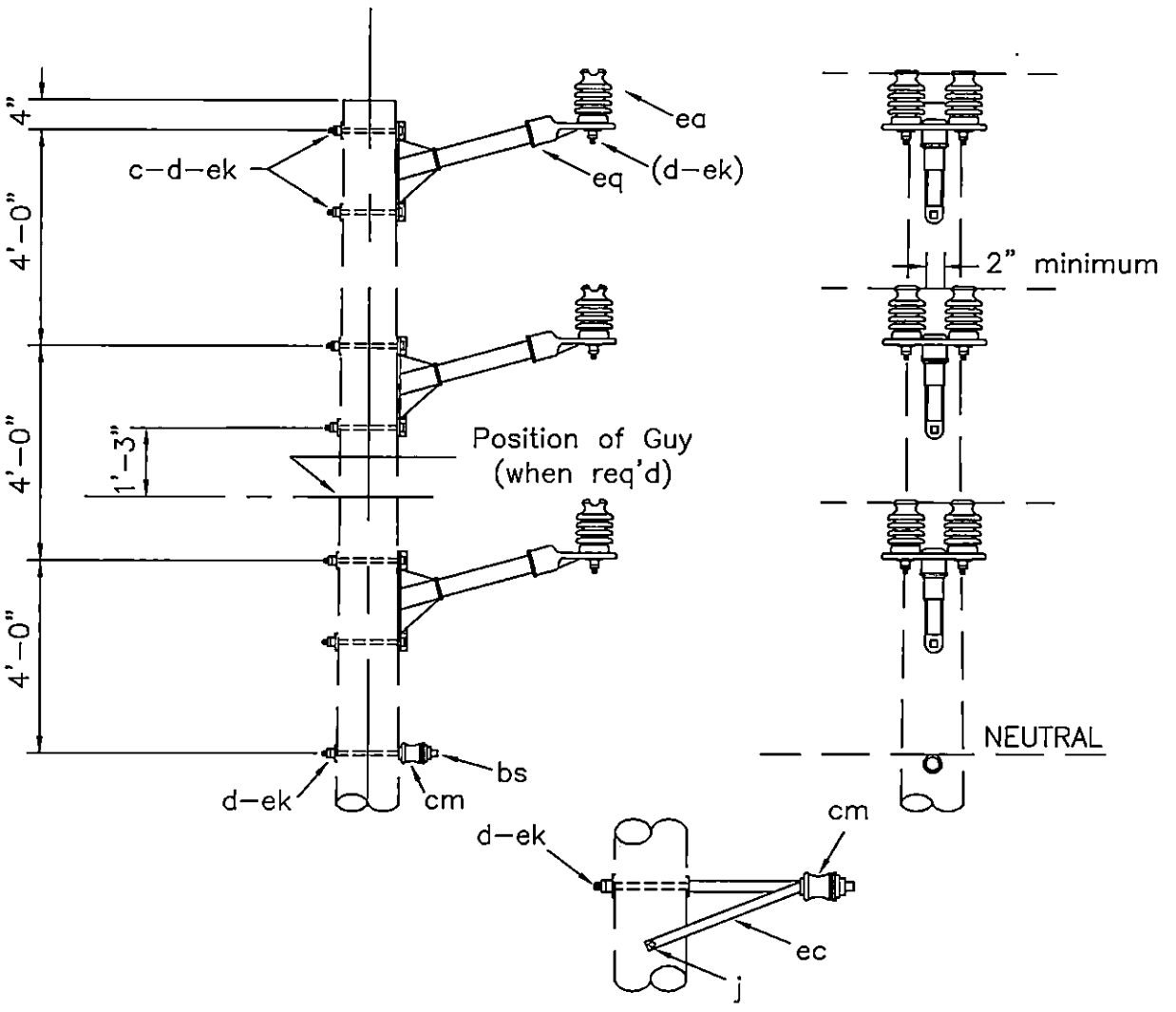
NOTE: These assemblies used for NESC Grade B construction.

Assembly: C2.		7N	8N
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	6	6
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
f	Pin, crossarm, 5/8" x 6 1/2"	6	6
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	3	3

Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	3 – PHASE PRIMARY	C2.7N
RUS	12.47/7.2 kV	C2.8N



Specify C2.8NP for offset neutral assembly

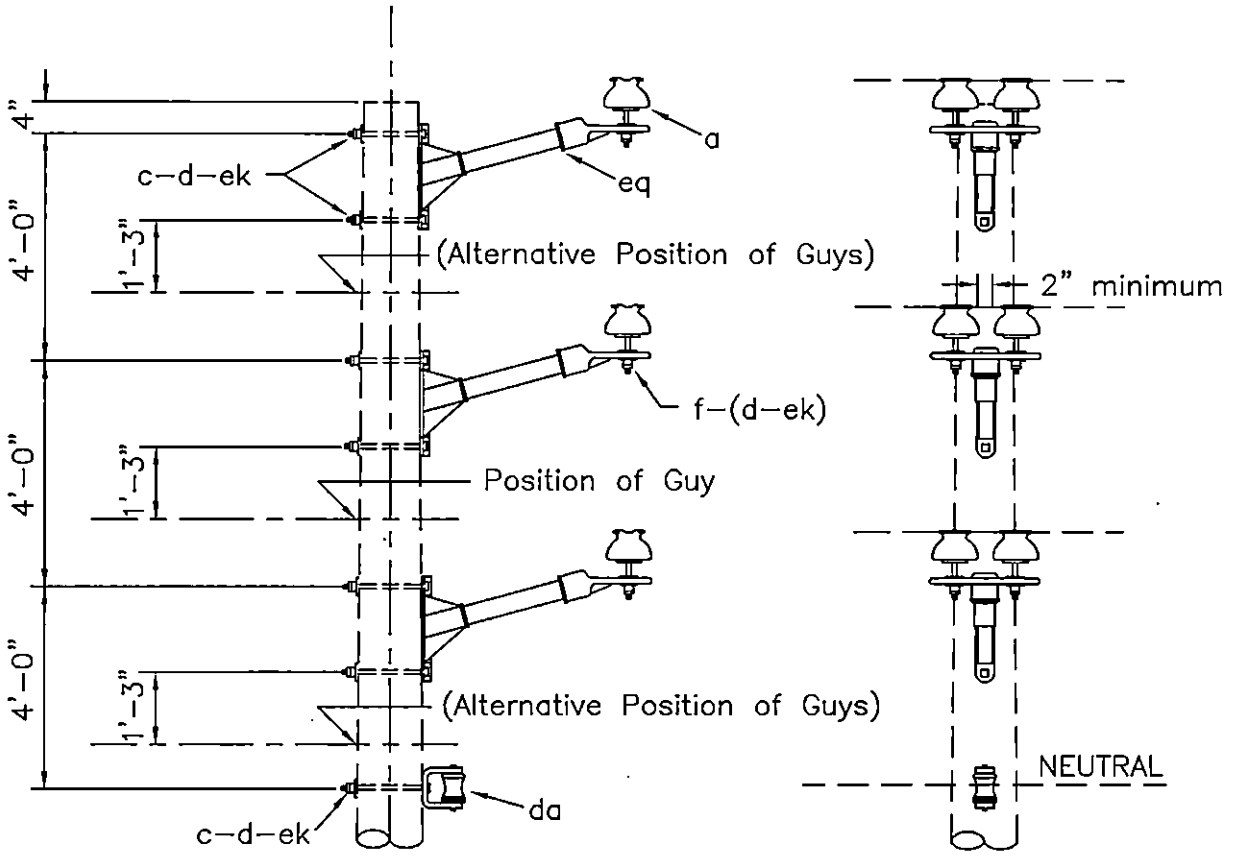
NOTE: These assemblies used for NESC Grade B construction.

ITEM	MATERIAL	Assembly: C2. 7NP QTY	8NP QTY
c	Bolt, machine, 5/8" x req'd length	6	6
d	Washer, square 2 1/4"	7	7
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.5 kV)	6	6
ec	Bracket, offset neutral		1
ek	Locknuts	7	7
eq	Bracket, insulator/equipment	3	3

Design Parameters:
Maximum Line Angles
5° – Small conductors
2° – Larger than #1/0

DOUBLE SUPPORT–NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.7NP
RUS	12.47/7.2 kV	C2.8NP

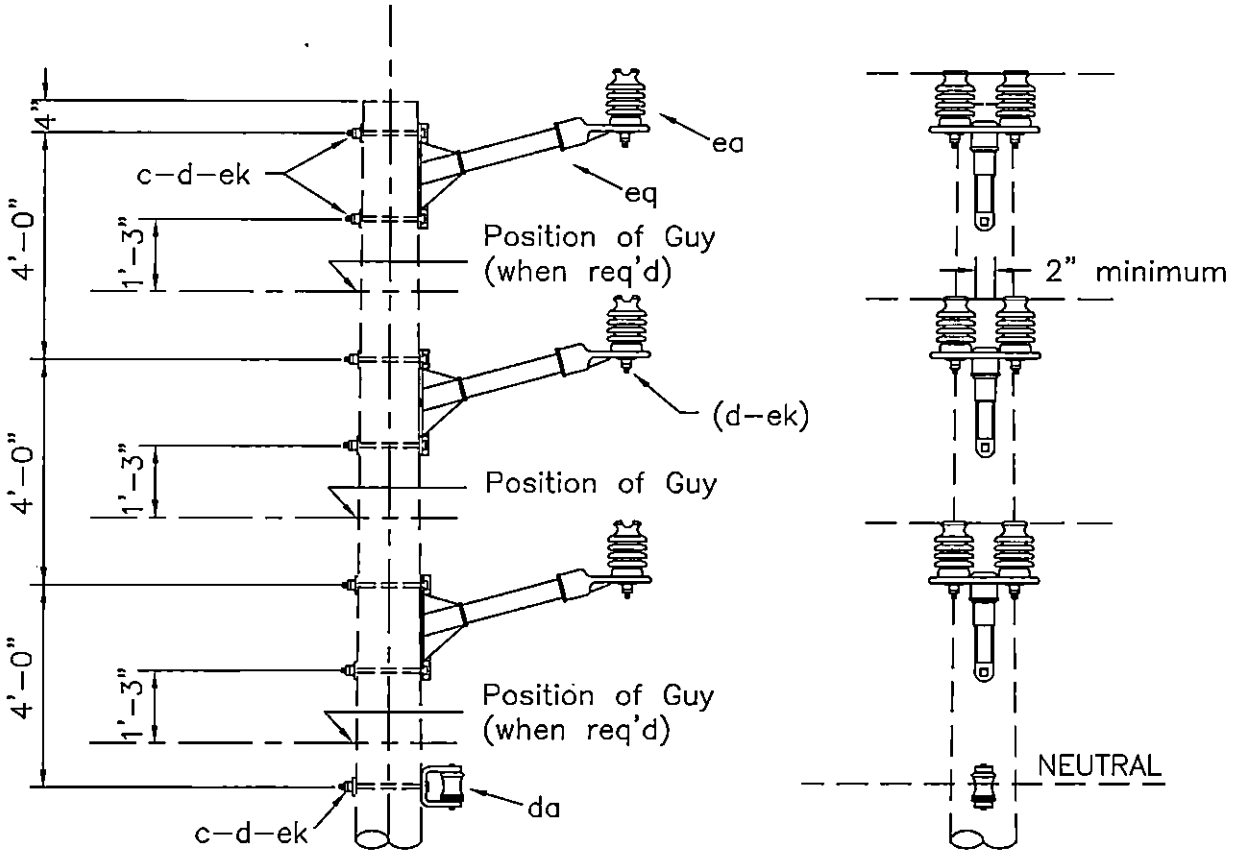


Assembly: C2.		9N
ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	6
c	Bolt, machine, 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
f	Pin, crossarm, 5/8" x 6 1/2"	6
da	Bracket, insulated	1
ek	Locknuts	7
eq	Bracket, insulator/equipment	3

Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	3 – PHASE PRIMARY	C2.9N
RUS	12.47/7.2 kV	



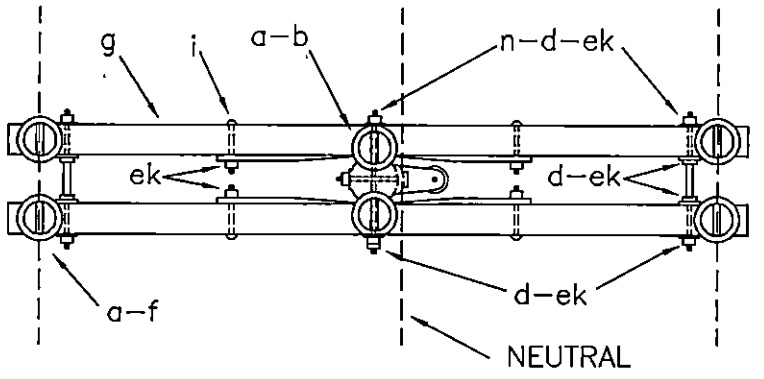
Assembly: C2. 9NP

ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	7
d	Washer, square 2 1/4"	7
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	6
ek	Locknuts	7
eq	Bracket, insulator/equipment	3

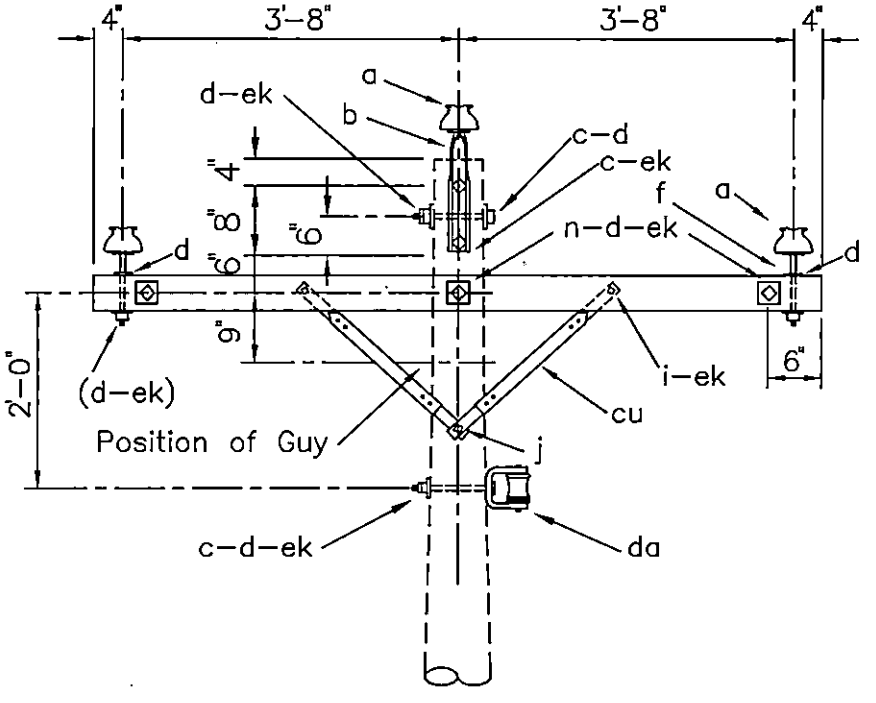
Design Parameters:
Maximum Line Angles
See TABLE IV

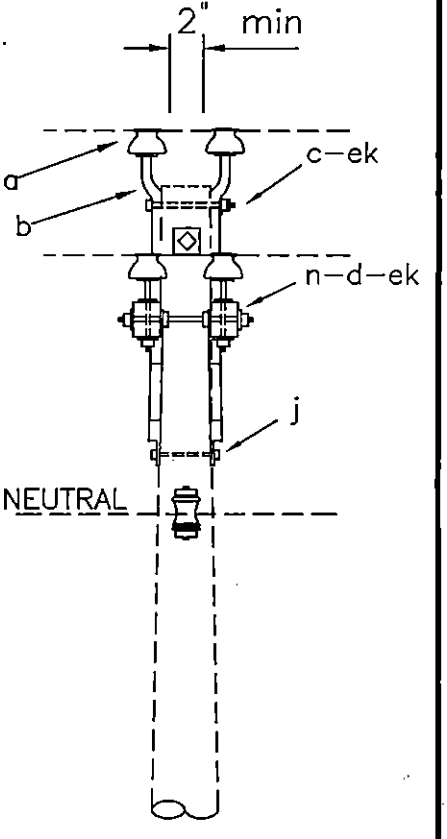
DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.9NP
RUS	12.47/7.2 kV	



PLAN





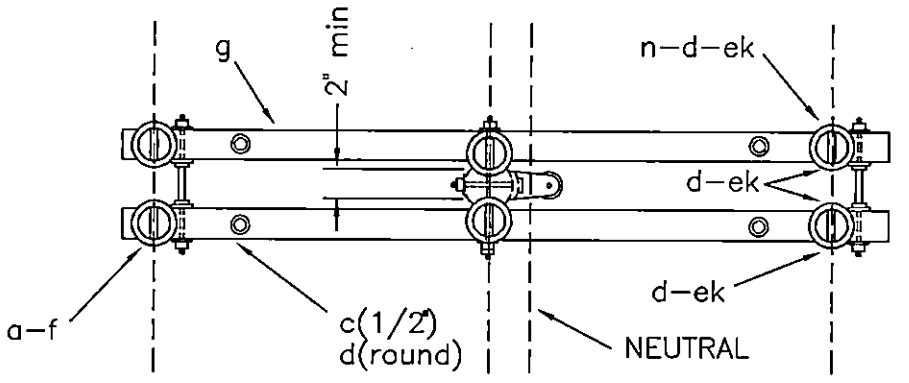
ITEM	QTY	MATERIAL
a	6	Insulator, pin type (12.47/7.2 kV)
b	2	Pin, pole top, 20", straight or offset
c	4	Bolt, machine, 5/8" x req'd length
d	17	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arming, 5/8"xreq'd length
cu	4	Brace, 28"
da	1	Bracket, insulated
ek	18	Locknuts

DESIGN PARAMETERS:

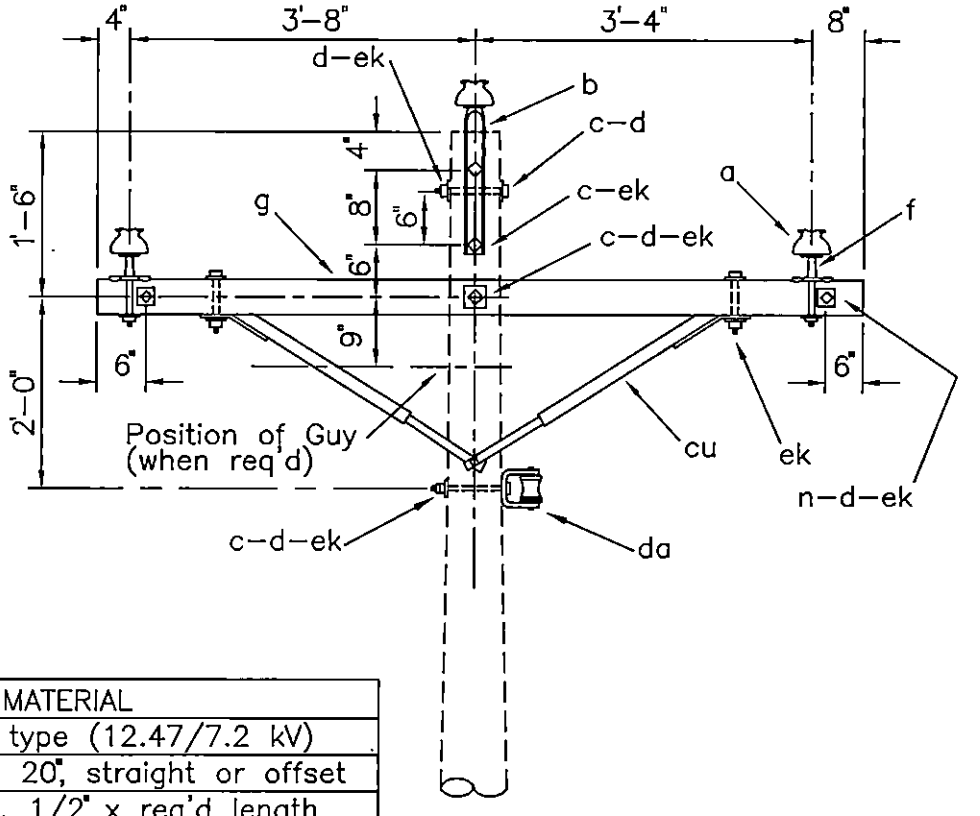
See TABLE III

DOUBLE SUPPORT ON CROSSARMS

APRIL 2005	3 – PHASE PRIMARY	C2.21
RUS	12.47/7.2 kV	(C2)



PLAN



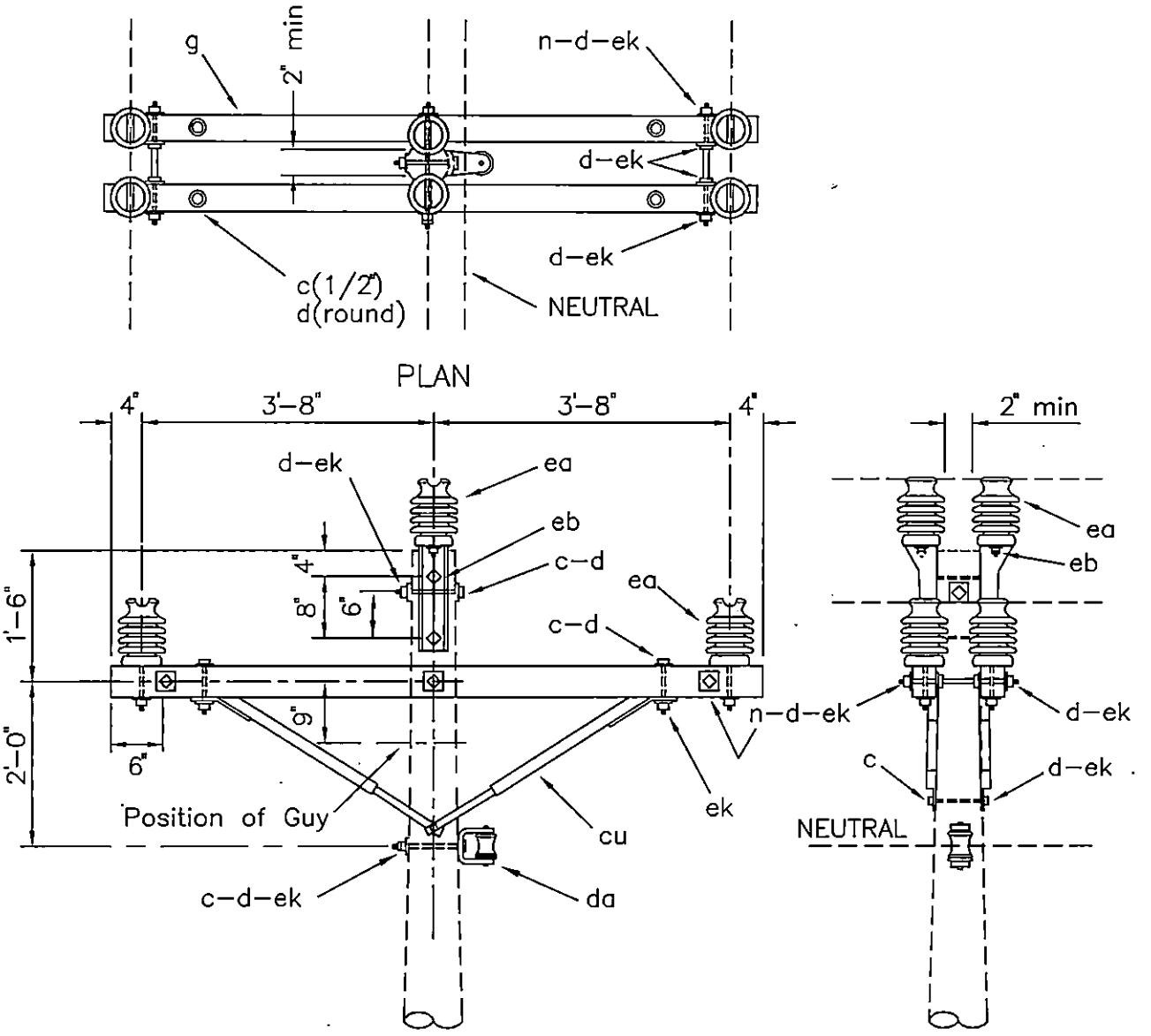
ITEM	QTY	MATERIAL
a	6	Insulator, pin type (12.47/7.2 kV)
b	2	Pin, pole top, 20", straight or offset
c	4	Bolt, machine, 1/2" x req'd length
c	5	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	14	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel, clamp type
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
n	3	Bolt, double arming,5/8"x req'd length
cu	2	Brace, wood, 60" span
da	1	Bracket, insulated
ek	19	Locknuts

DESIGN PARAMETERS:

See TABLE III

DOUBLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C2.21L (C1–3)



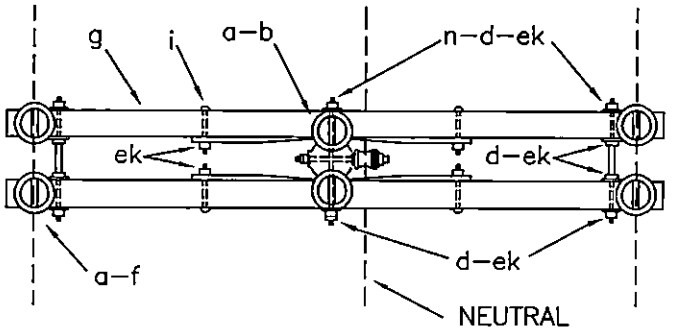
ITEM	QTY	MATERIAL
c	5	Bolt, machine, 5/8" x req'd length
c	4	Bolt, machine, 1/2" x req'd length
d	14	Washer, square, 2 1/4"
d	4	Washer, round, 1 3/8"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
n	3	Bolt, double arming,5/8"xreq'd length
cu	2	Brace, wood, 60" span
da	1	Bracket, insulated
ea	6	Insulator, post type (12.47/7.2 kV)
eb	2	Bracket, pole top
ek	19	Locknuts

DESIGN PARAMETERS:

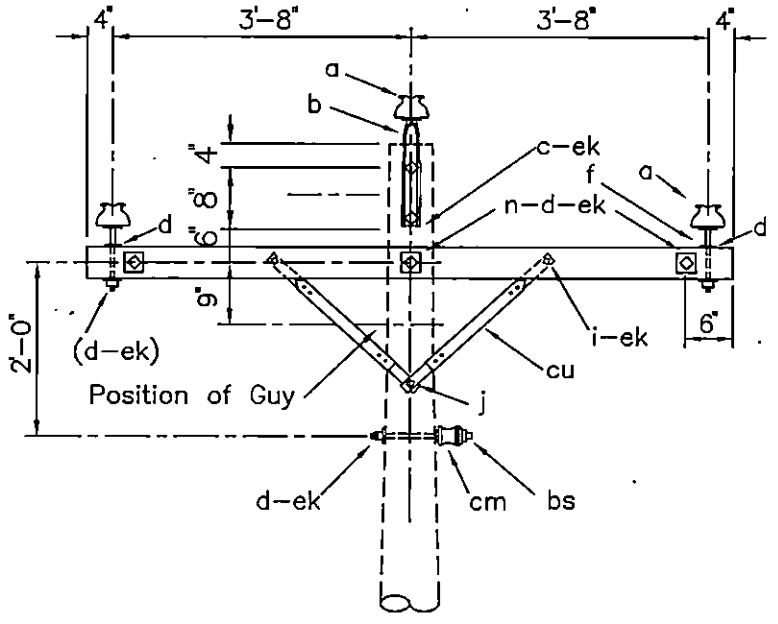
See TABLE IV

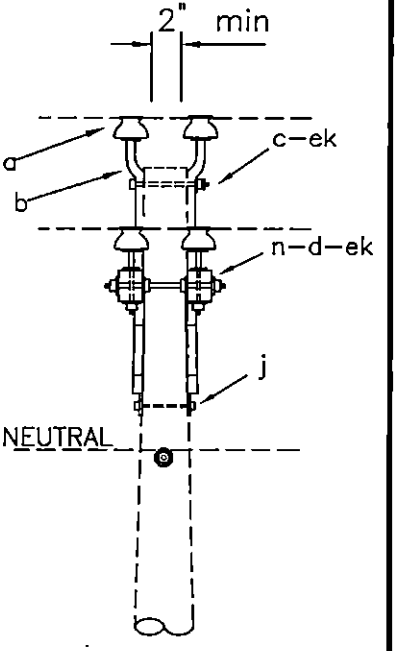
DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C2.21P (C1–3P)



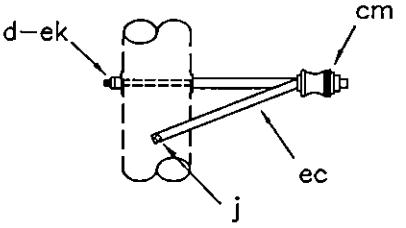
PLAN





NOTE: These assemblies used for NESC Grade B construction.

ASSEMBLY: C2.		24	25
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2kV)	6	6
b	Pin, pole top, 20", straight or offset	2	2
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	15	15
f	Pin, crossarm, steel, 5/8" x 10 3/4"	4	4
g	Crossarm, 3 5/8" x 4 5/8" x 8'–0"	2	2
i	Bolt, carriage, 3/8" x 4 1/2"	4	4
j	Screw, lag, 1/2" x 4"	2	4
n	Bolt, double arm, 5/8" x req'd length	3	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	4	4
ec	Bracket, offset neutral		1
ek	Locknuts	17	17



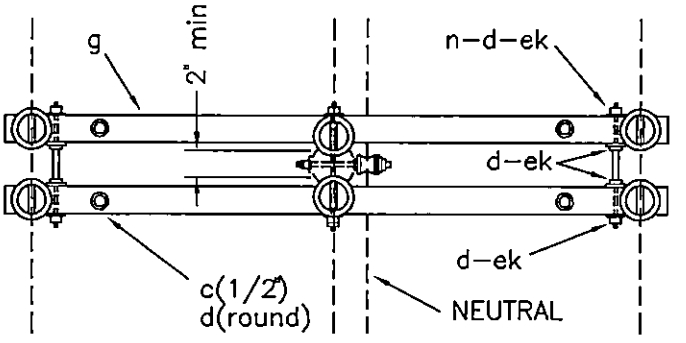
Specify C2.25 for offset neutral assembly

DESIGN PARAMETERS:

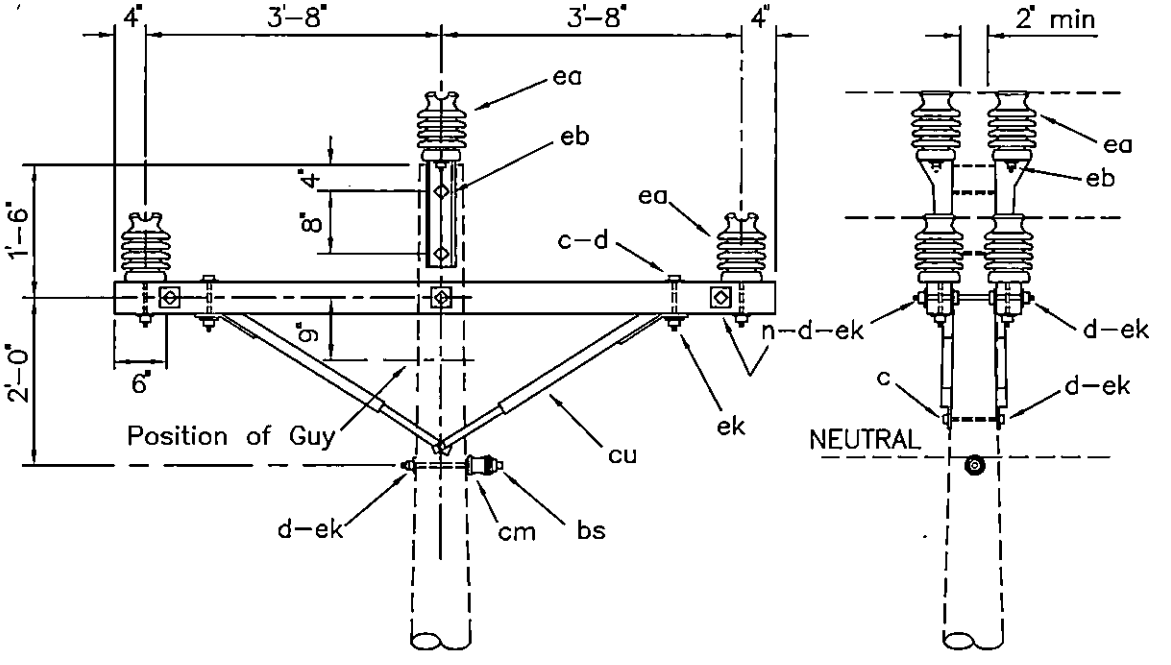
MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

DOUBLE SUPPORT ON CROSSARMS–TANGENT

APRIL 2005	3 – PHASE PRIMARY	C2.24,C2.25
RUS	12.47/7.2 kV	(C1–1,C1–1A)

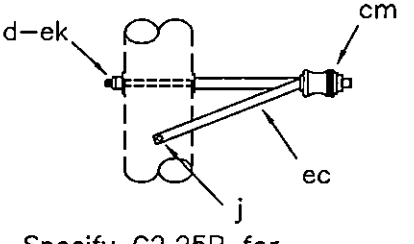


PLAN



NOTE: These assemblies used for NESC Grade B construction.

ITEM	MATERIAL	24P QTY	25P QTY
	ASSEMBLY: C2.		
c	Bolt, machine, 5/8" x req'd length	3	3
c	Bolt, machine, 1/2" x req'd length	4	4
d	Washer, square, 2 1/4"	12	12
d	Washer, round, 1 3/8"	4	4
g	Crossarm, 3 5/8" x 4 5/8" x 8'–0"	2	2
n	Bolt,double arming,5/8" x req'd length	3	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, wood, 60" span	2	2
ea	Insulator, post type (12.47/7.2kV)	6	6
eb	Bracket, pole top	2	2
ec	Bracket, offset neutral		1
ek	Locknuts	18	18



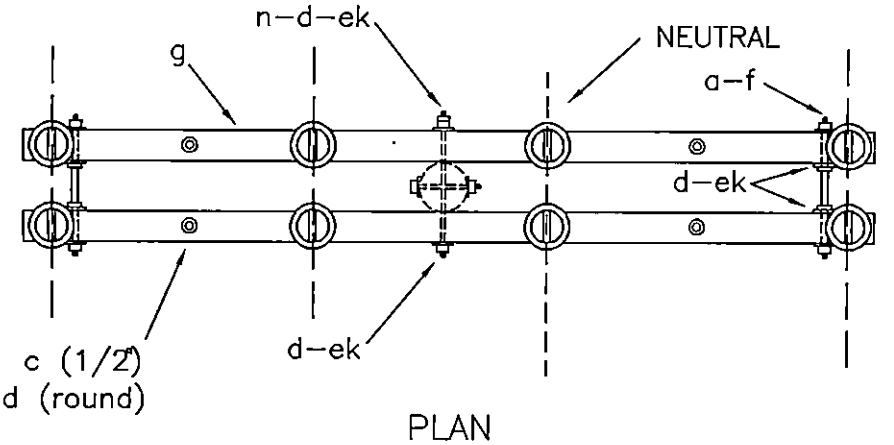
Specify C2.25P for offset neutral assembly

DESIGN PARAMETERS:

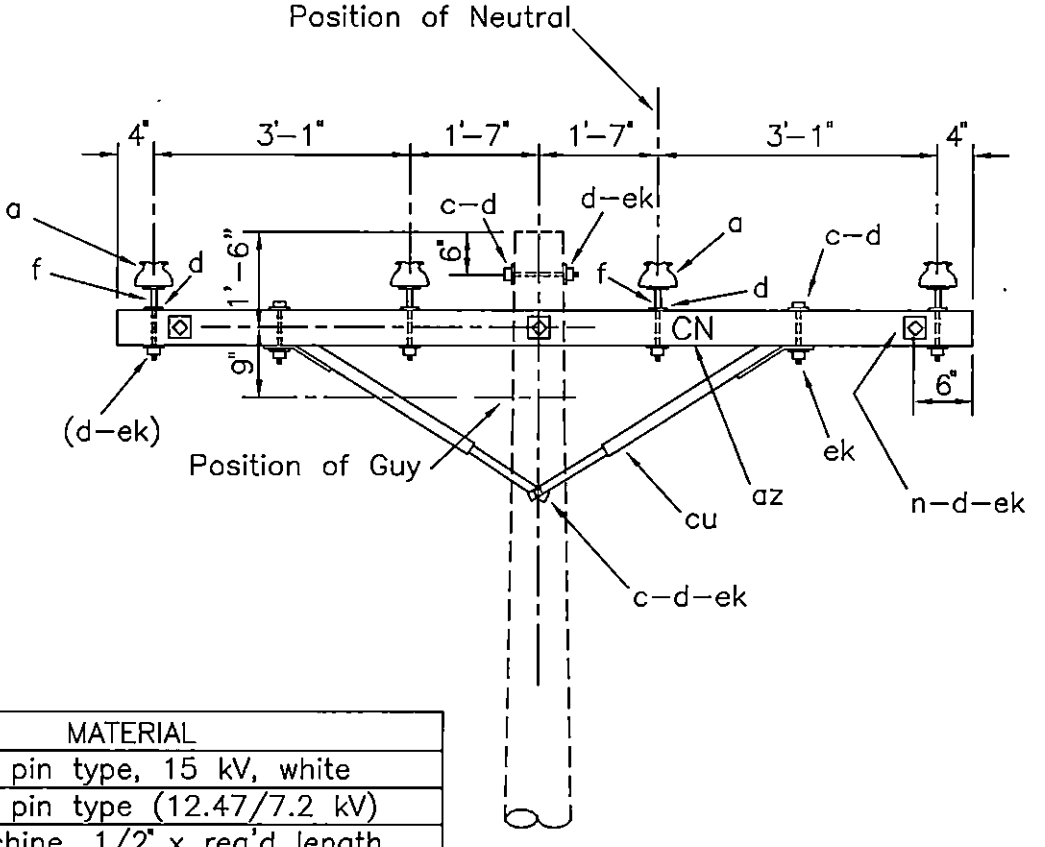
MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

DOUBLE SUPPORT ON CROSSARMS–TANGENT (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.24P,C2.25P
RUS	12.47/7.2 kV	(C1–1P,C1–1AP)



PLAN



ITEM	QTY	MATERIAL
a	2	Insulator, pin type, 15 kV, white
a	6	Insulator, pin type (12.47/7.2 kV)
c	4	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	21	Washer, square, 2 1/4"
f	8	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	3	Bolt double arming,5/8"x req'd length
az	4	Letters, 2" C, 2" N, with 1" nails
cu	2	Brace, wood, 60" span
ek	16	Locknuts

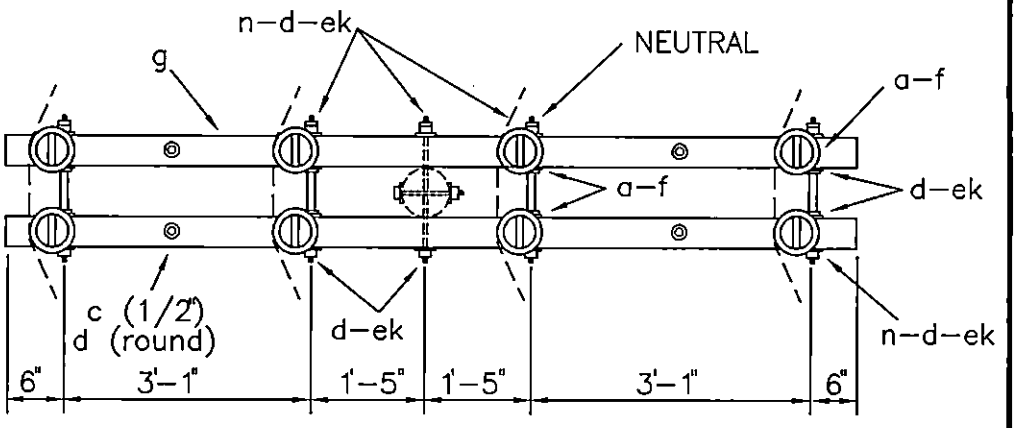
NOTE: Install either identification letters or white insulators in neutral position.

DESIGN PARAMETERS:

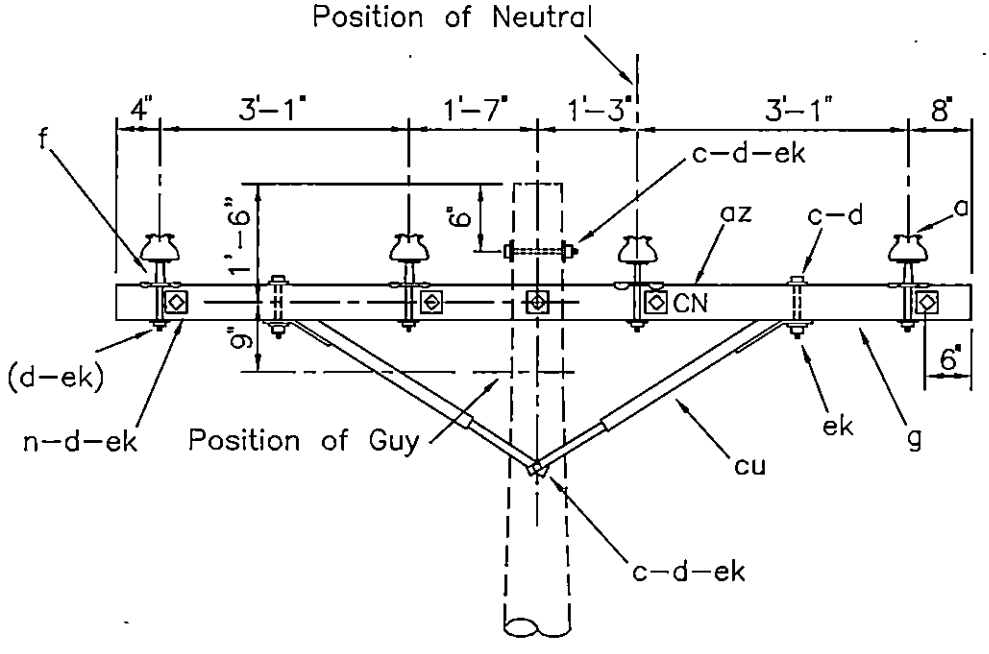
See TABLE IV

DOUBLE SUPPORT, NEUTRAL ON CROSSARMS

APRIL 2005	3 – PHASE PRIMARY	C2.51
RUS	12.47/7.2 kV	(C9)



PLAN



ITEM	QTY	MATERIAL
a	2	Insulator, pin type, 15 kV, white
a	6	Insulator, pin type (12.47/7.2 kV)
c	4	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	21	Washer, square, 2 1/4"
f	8	Pin, crossarm, steel clamp type
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	5	Bolt, double arming, 5/8"xreq'd length
az	4	Letters, 2" C, 2" N, with 1" nails
cu	2	Brace, wood, 60" span
ek	24	Locknuts

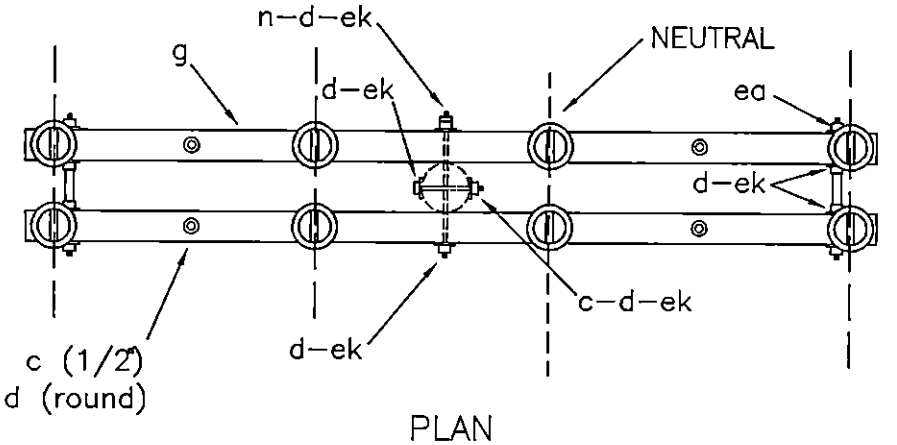
NOTE: Install either identification letters (az) or white insulators in neutral position.

DESIGN PARAMETERS:

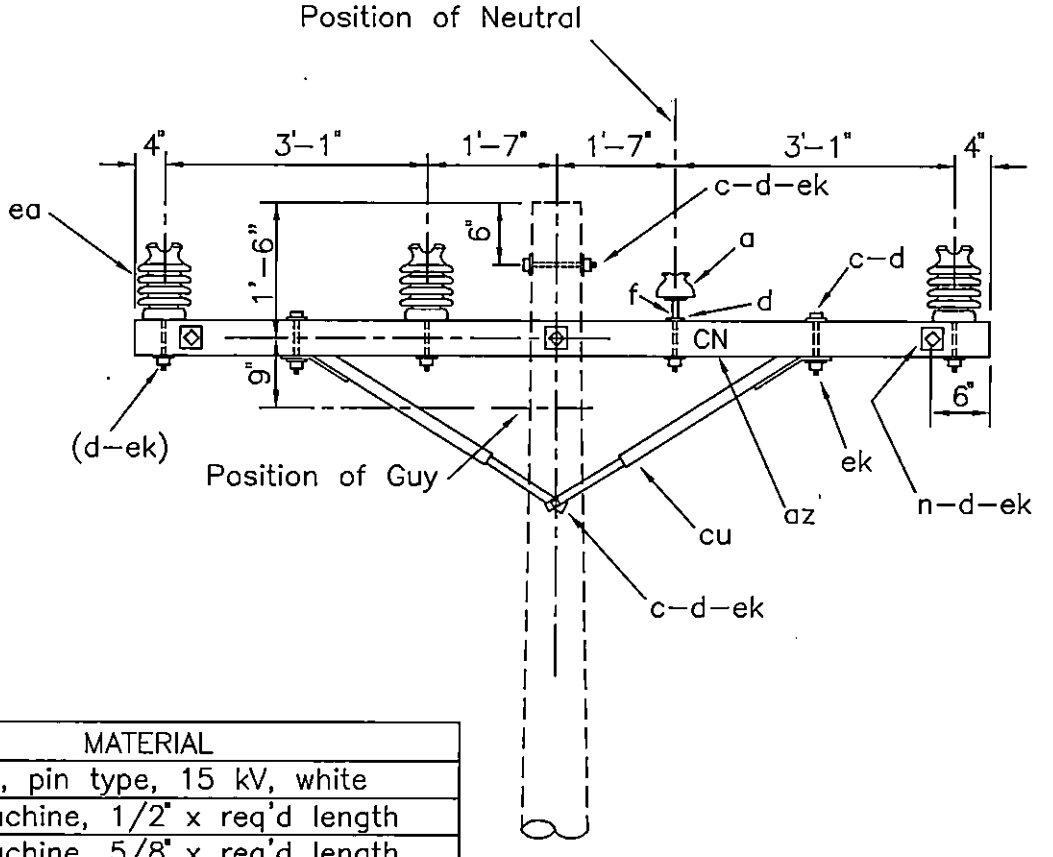
See TABLE V

DOUBLE SUPPORT, NEUTRAL ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005	3 – PHASE PRIMARY	C2.51L
RUS	12.47/7.2 kV	(C9–2)



PLAN



ITEM	QTY	MATERIAL
a	2	Insulator, pin type, 15 kV, white
c	4	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	15	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	3	Bolt double arming,5/8"x req'd length
az	4	Letters, 2" C, 2" N, with 1" nails
cu	2	Brace, wood, 60" span
ea	6	Insulator, post type (12.47/7.2 kV)
ek	16	Locknuts

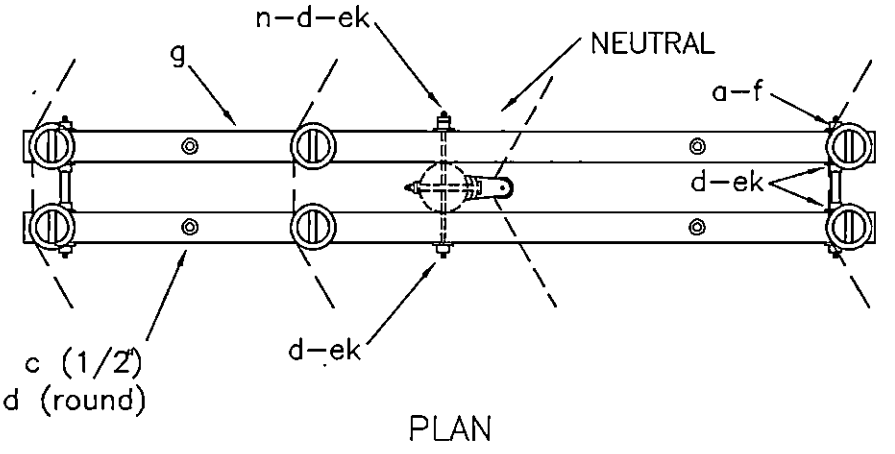
NOTE: Install identification letters (az) (optional) in neutral position.

DESIGN PARAMETERS:

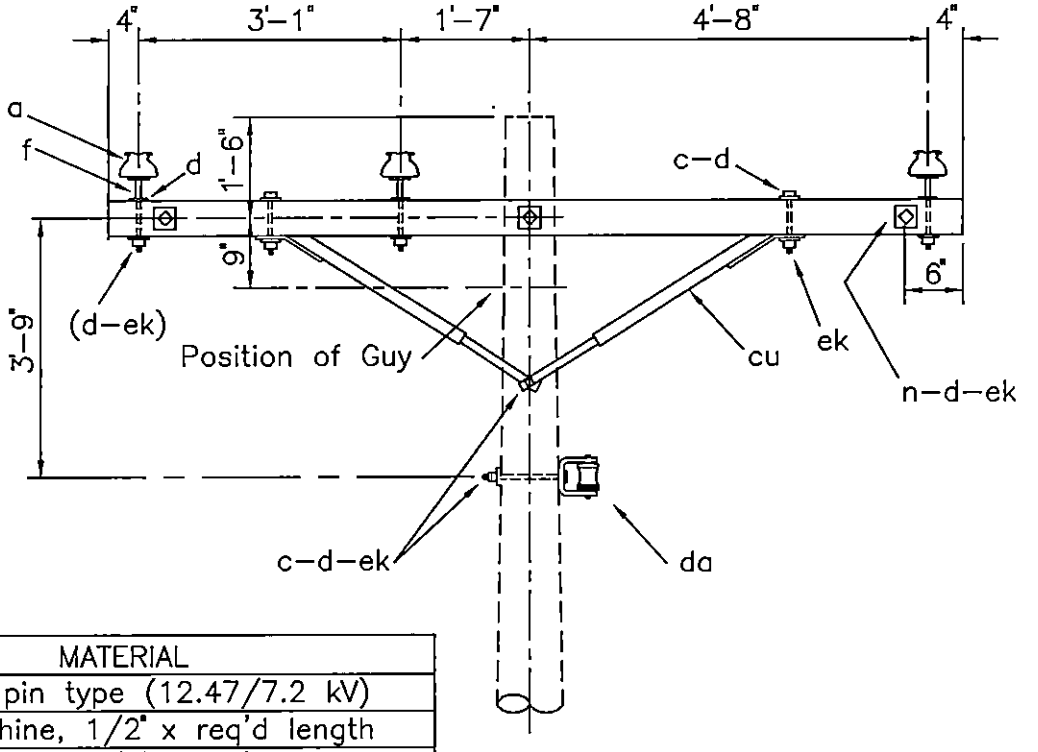
See TABLE IV

DOUBLE SUPPORT, NEUTRAL ON CROSSARMS (POST INSULATORS)

APRIL 2005	3 – PHASE PRIMARY	C2.51P
RUS	12.47/7.2 kV	(C9–2PL)



PLAN



ITEM	QTY	MATERIAL
a	6	Insulator, pin type (12.47/7.2 kV)
c	4	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	18	Washer, square, 2 1/4"
f	6	Pin, crossarm, steel, 5/8" X 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	3	Bolt, double arm, 5/8" x req'd length
cu	2	Brace, wood, 60" span
da	1	Bracket, insulated
ek	16	Locknuts

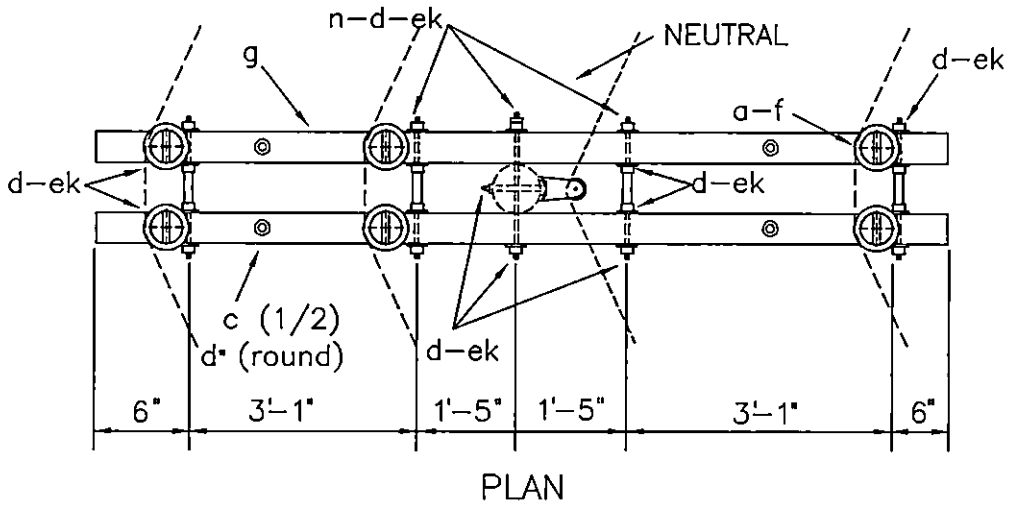
NOTE:
Neutral assembly may be installed on opposite side of pole when necessary to increase midspan conductor clearance.

DESIGN PARAMETERS:

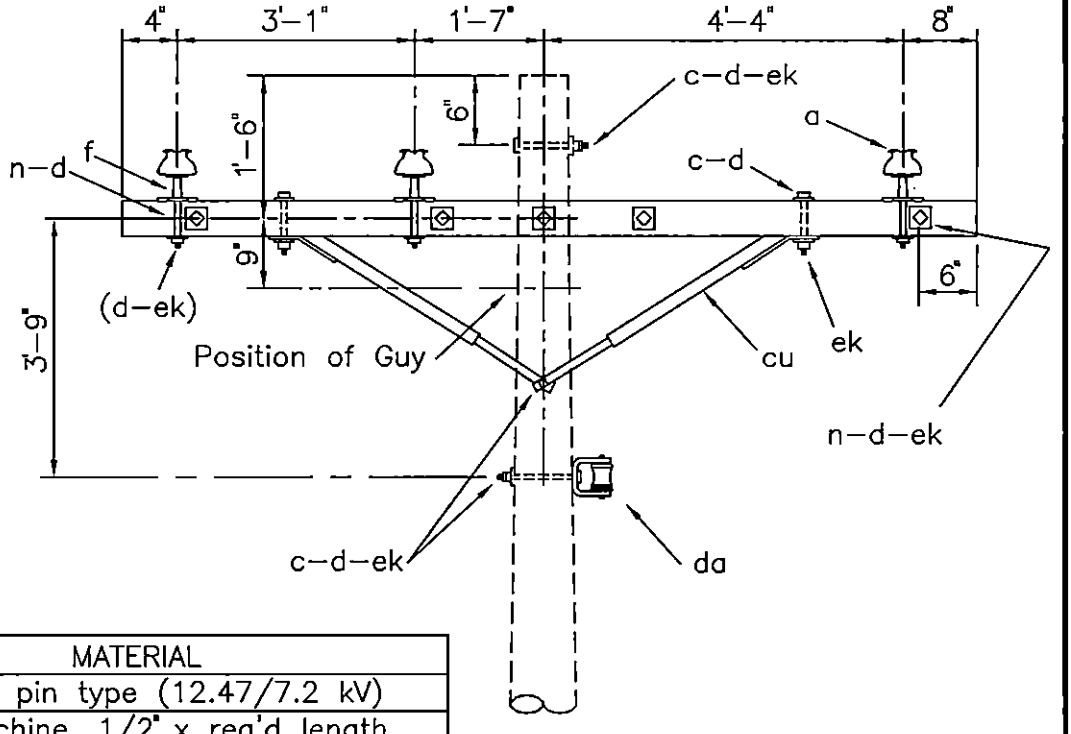
See TABLE IV

DOUBLE SUPPORT ON 10 FOOT CROSSARMS

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C2.52 (C2–1)



PLAN



ITEM	QTY	MATERIAL
a	6	Insulator, pin type (12.47/7.2 kV)
c	4	Bolt, machine, 1/2" x req'd length
c	3	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	22	Washer, square, 2 1/4"
f	6	Pin, crossarm, steel, clamp type
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	5	Bolt, double arm, 5/8" x req'd length
cu	2	Brace, wood, 60" span
da	1	Bracket, w/ 3" x 3" spool insulator
ek	25	Locknuts

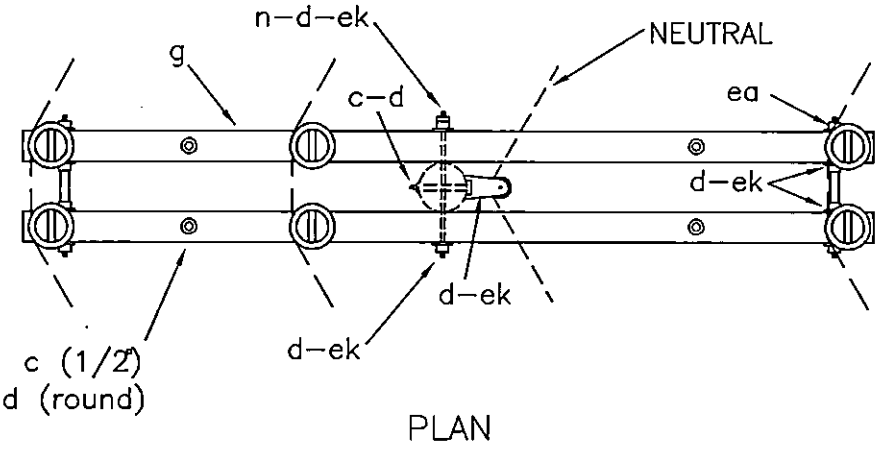
NOTE:
Neutral assembly may be installed on opposite side of pole when necessary to increase midspan conductor clearance.

DESIGN PARAMETERS:

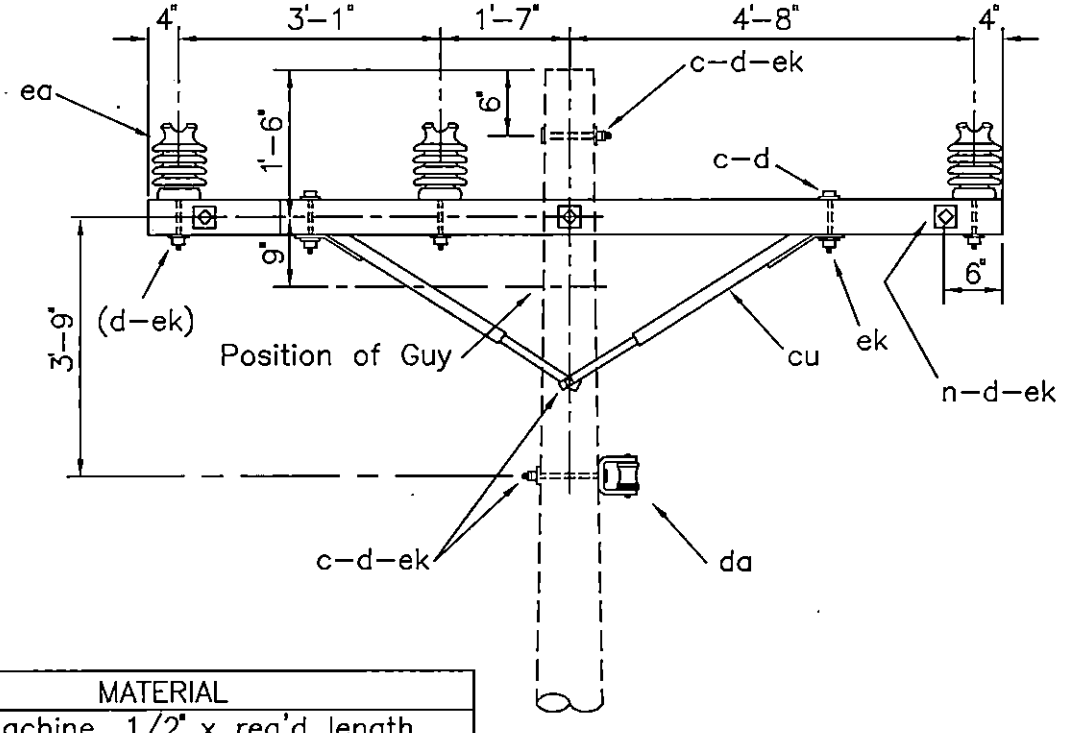
See TABLE V

DOUBLE SUPPORT ON 10 FOOT CROSSARMS (LARGE CONDUCTORS)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C2.52L (C2–2)



PLAN



ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	3	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	14	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	3	Bolt, double arm, 5/8" x req'd length
cu	2	Brace, wood, 60° span
da	1	Bracket, Insulated
ea	6	Insulator, post type (12.47/7.2 kV)
ek	17	Locknuts

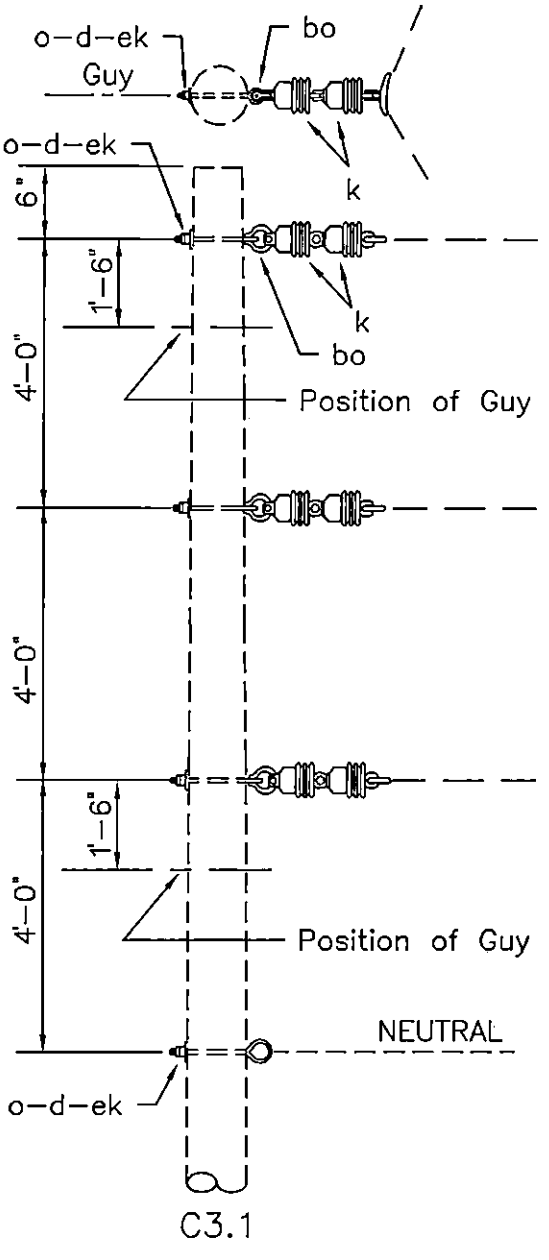
NOTE:
Neutral assembly may be installed on opposite side of pole when necessary to increase midspan conductor clearance.

DESIGN PARAMETERS:

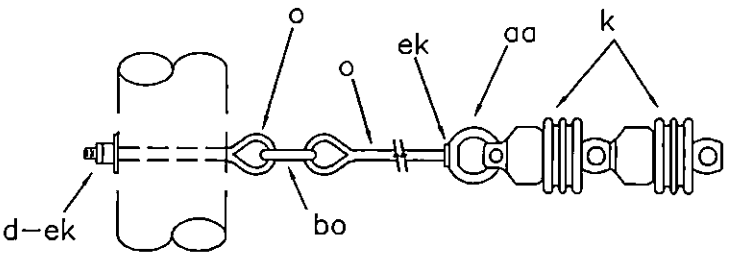
See TABLE IV

DOUBLE SUPPORT ON 10 FOOT CROSSARMS (POST INSULATORS)

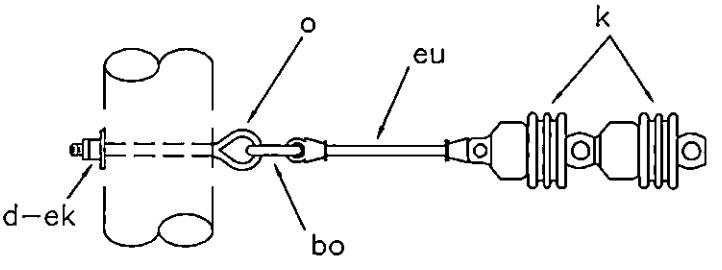
APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C2.52P (C2–2PL)



C3.1



C3.2



C3.3

NOTE: Extension link (item "eu" or "du") or eyebolt (item "o"), eyenut (item "aa") and locknut (item "ek") may be installed in 2 lower primary positions. Adjust material as required.

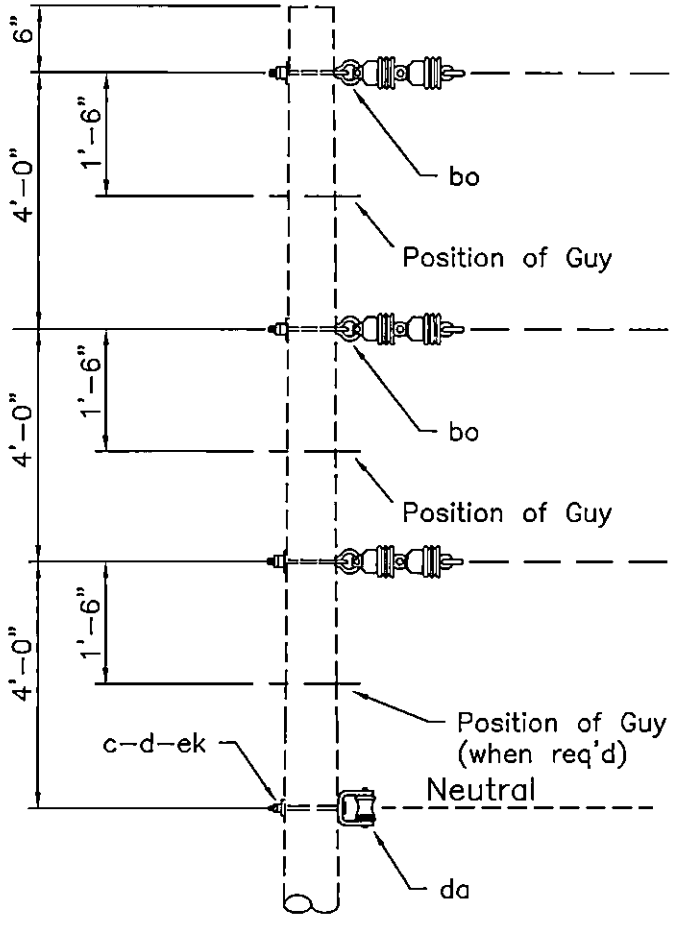
ASSEMBLY: C3		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	4	4	4
k	Insulator, suspension, 4 1/4"	6	6	6
o	Bolt, eye, 5/8"x req'd length	4	7	4
aa	Nut, eye		3	
bo	Shackle, anchor	4	4	4
ek	Locknuts	4	7	4
eu (du)	Link, extension, insulated (Link, extension) – (optional)			3 (3)

DESIGN PARAMETERS:

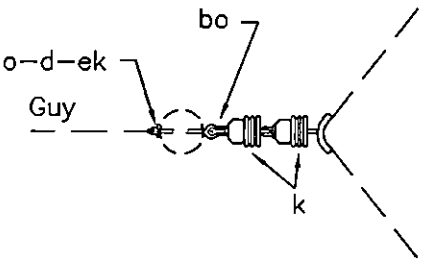
PERMITTED TRANSVERSE LOAD= 5000 lbs./Conductor
20° – 60°: #1/0 ACSR & Larger
30° – 60°: Smaller Conductors

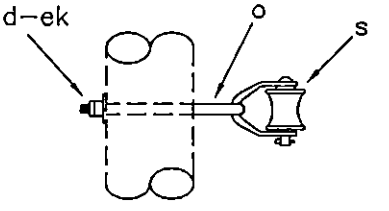
SUSPENSION ANGLE

APRIL 2005	3 – PHASE PRIMARY	C3.1,C3.2,C3.3
RUS	12.47/7.2 kV	(C3)



C3.4





C3.7

C3.5 = C3.4 neutral assembly + C3.2 primary subassembly
C3.6 = C3.4 neutral assembly + C3.3 primary subassembly
C3.8 = C3.7 neutral assembly + C3.2 primary subassembly
C3.9 = C3.7 neutral assembly + C3.3 primary subassembly

NOTE: Extension link (item "eu" or "du") or eyebolt (item "o"), eyenut (item "aa") and locknut (item "ek") may be installed in lower primary positions. Adjust material as required.

ITEM	MATERIAL (ASSEMBLY: C3)	.4 QTY	.5 QTY	.6 QTY	.7 QTY	.8 QTY	.9 QTY
c	Bolt, machine, 5/8" x req'd length	1	1	1			
d	Washer, square, 3", curved	4	4	4	4	4	4
k	Insulator, suspension, 4 1/4"	6	6	6	6	6	6
o	Bolt, eye, 5/8"x req'd length	3	6	3	4	7	4
s	Clevis, secondary, swinging, insulated				1	1	1
aa	Nut, eye		3			3	
bo	Shackle, anchor	3	3	3	3	3	3
da	Bracket, insulated	1	1	1			
ek	Locknuts	4	7	4	4	7	4
eu (du)	Link, extension, insulated (Link, extension) – (optional)			3 (3)			3 (3)

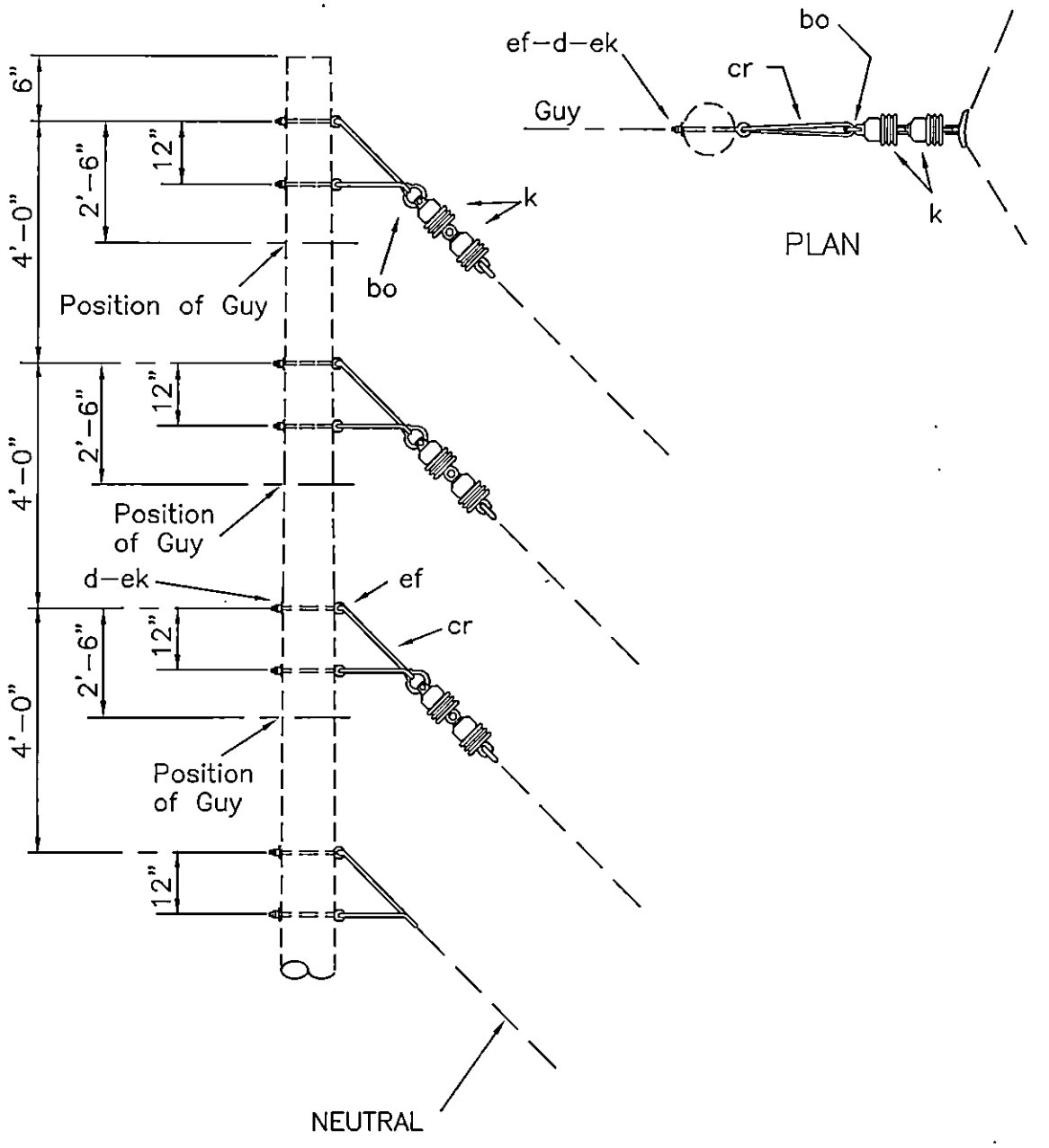
DESIGN PARAMETERS:

For ANSI Class 53-2 Spool Insulator (1 3/4") See Table VI

For ANSI Class 53-4 Spool Insulator (3") See Table VII

SUSPENSION ANGLE

APRIL 2005	3 – PHASE PRIMARY	C3.4 – C3.9
RUS	12.47/7.2 kV	



ITEM	QTY	MATERIAL
d	8	Washer, square, 3", curved
k	6	Insulator, suspension, 4 1/4"
bo	3	Shackle, anchor
cr	4	Bracket, angle, 5/8"
ef	8	Bolt, clevis, 5/8" x req'd length
ek	8	Locknuts

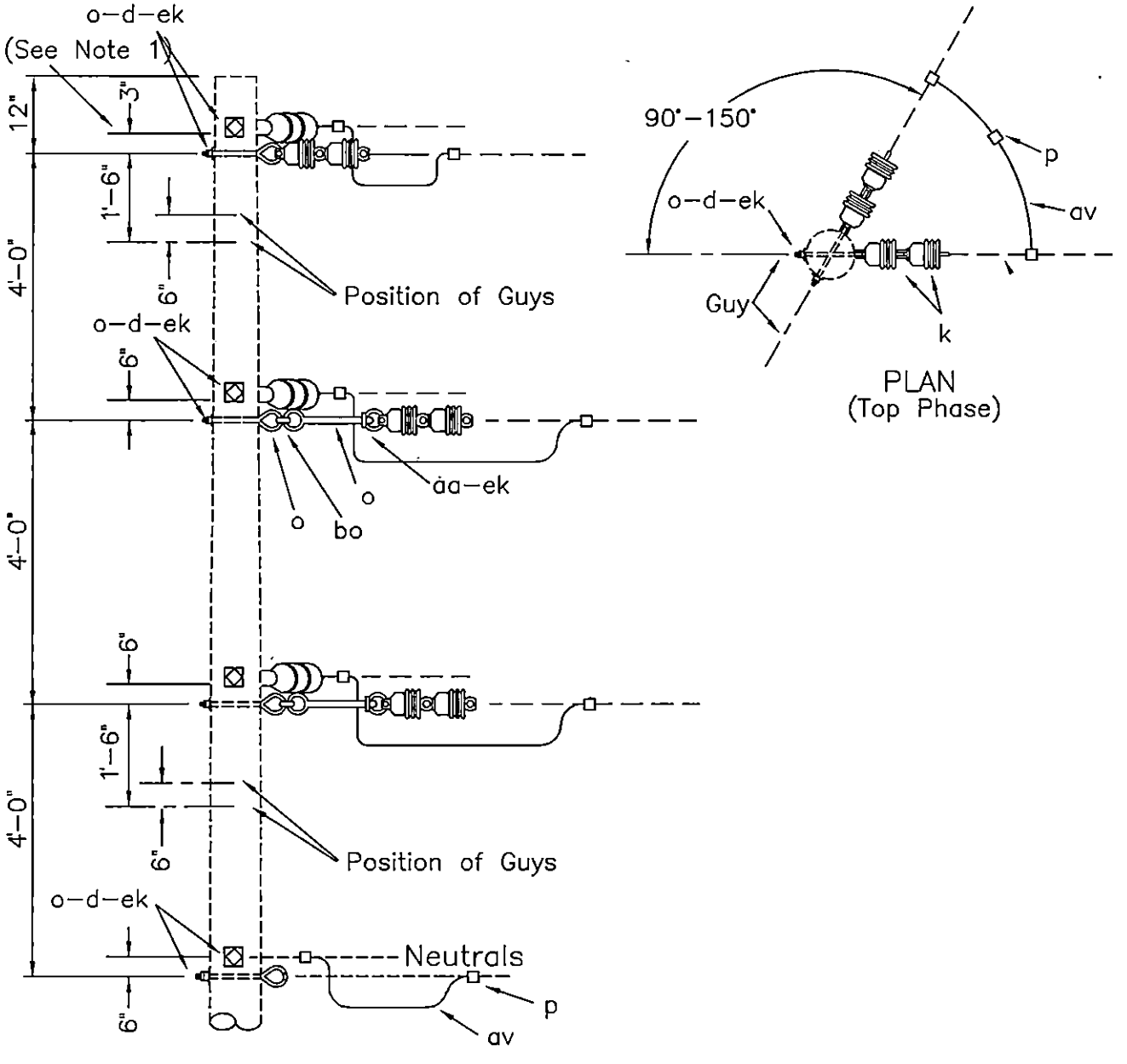
DESIGN PARAMETERS:

PERMITTED TRANSVERSE LOAD= 5000 lbs./Conductor

10° -30° Angles

SUSPENSION ANGLE (LARGE CONDUCTORS)

APRIL 2005	3 - PHASE PRIMARY	C3.1L
RUS	12.47/7.2 kV	(C3-1)



NOTES:

1. Separate 6" (top position only) when angle equals 90°.
2. This drawing shows two B5.1 plus two A5.02 assemblies and their material as an example. Any combination of B5.1 – B5.9, A4.1 – A5.9 and A5.01 – A5.03 assemblies may be installed. Record assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

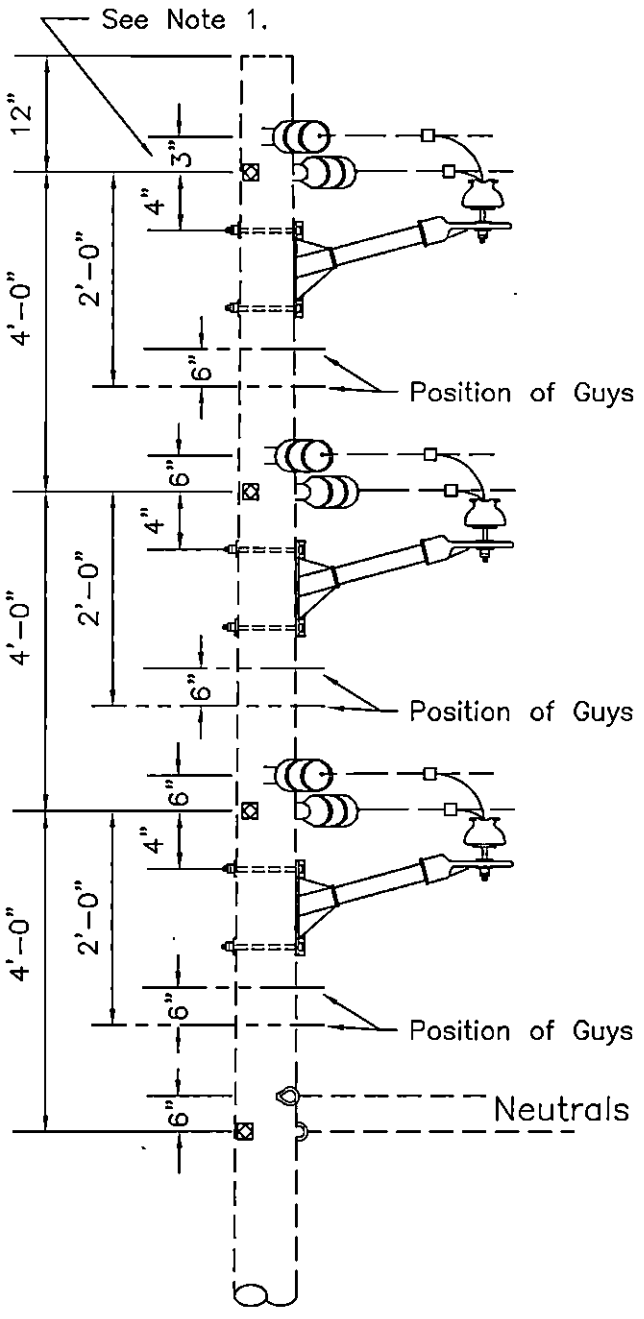
ITEM	QTY	MATERIAL
		Primary Assemblies, as req'd (See Note 2)
p		Connectors, as req'd
av		Jumpers, as req'd

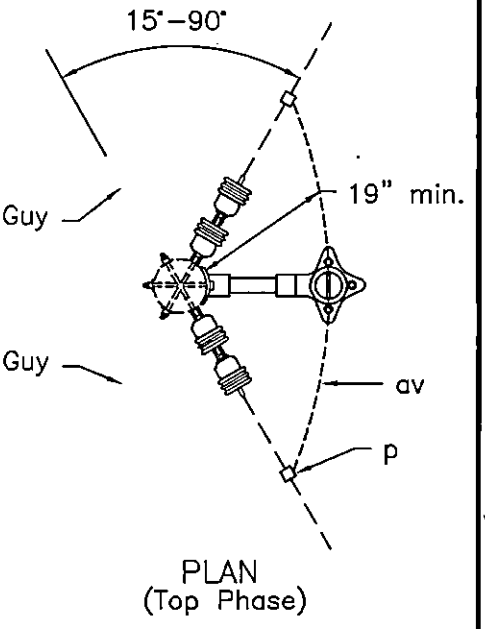
DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE GUIDE (90°–150°)

APRIL 2005	3 – PHASE PRIMARY	C4.1G
RUS	12.47/7.2 kV	(C4–1)





NOTES:

1. Separate 6" (top position only) when angle equals 90°.
2. This drawing shows three C5.1 and three A1.04N assemblies as an example. Any combination of three A1.04N plus C5.1 – C5.9, or A5.1 – A5.9 and A5.01 – A5.03 assemblies may be installed. Record assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

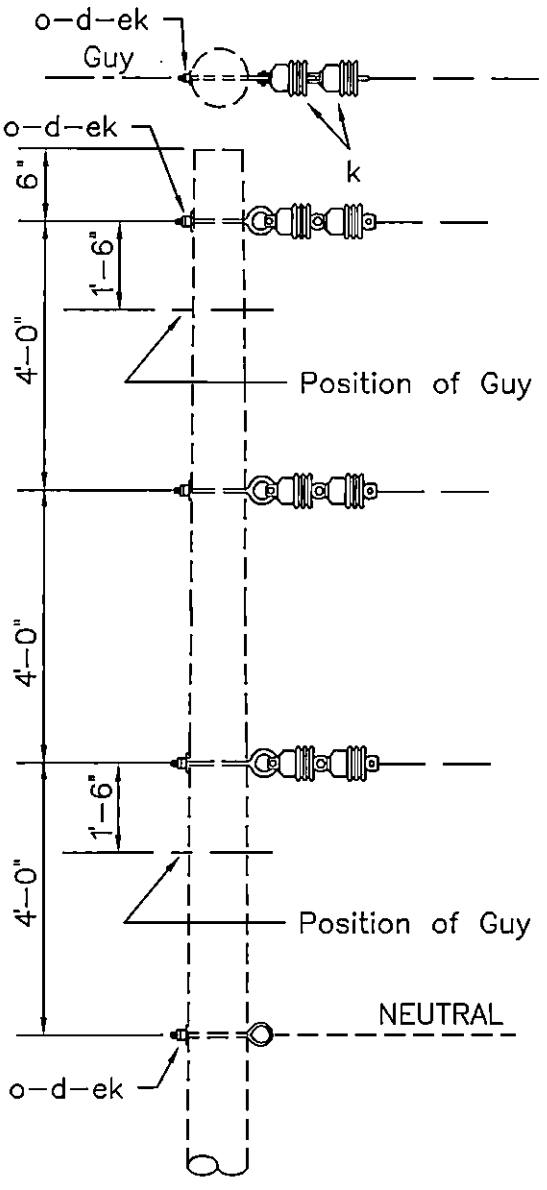
ITEM	QTY	MATERIAL
		Primary Assemblies, as req'd (See Note 2)
	3	A1.04N primary assemblies
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

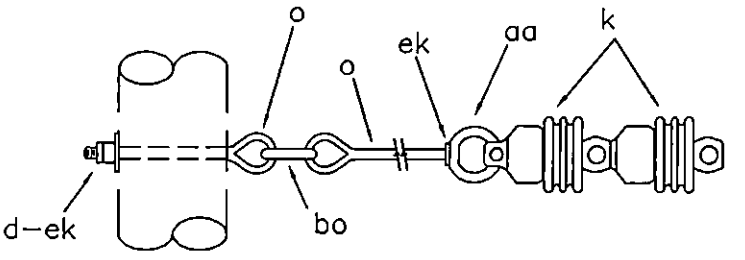
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE GUIDE (15°–90°)

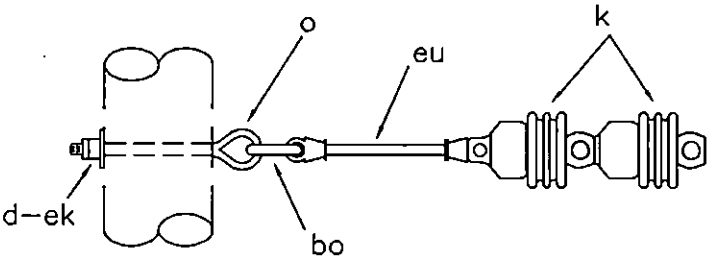
APRIL 2005	3 – PHASE PRIMARY	C4.2G
RUS	12.47/7.2 kV	



C5.1



C5.2



C5.3

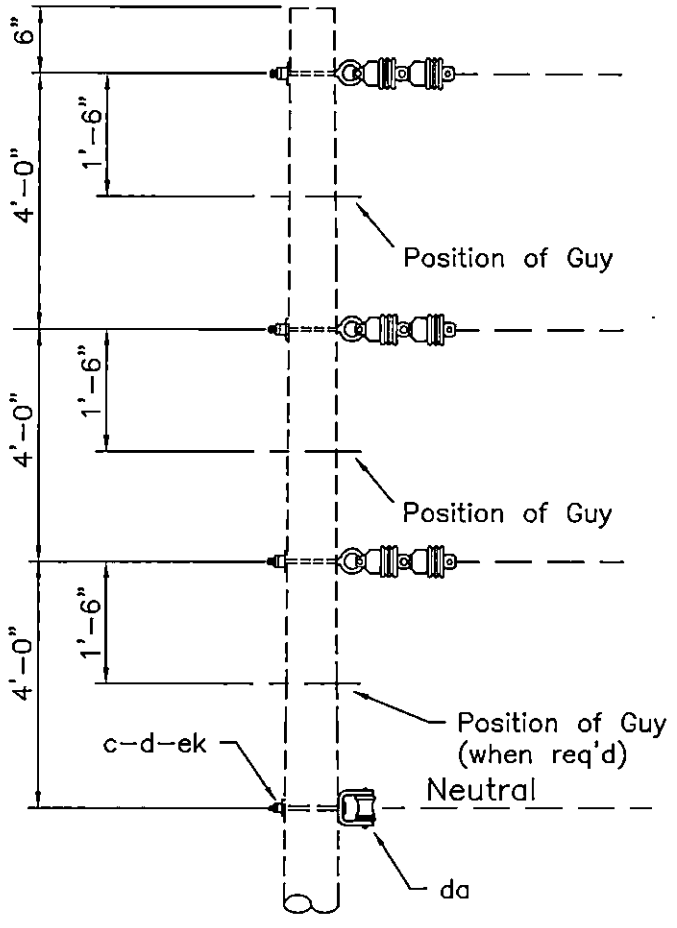
NOTE: Extension link (item "eu" or "du") or eyebolt (item "o"), eyenut (item "aa") and locknut (item "ek") may be installed in 2 lower primary positions on assembly C5.1. Adjust material as required.

ASSEMBLY: C5		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	4	4	4
k	Insulator, suspension, 4 1/4"	6	6	6
o	Bolt, eye, 5/8"x req'd length	4	7	4
aa	Nut, eye		3	
bo	Shackle, anchor		3	3
ek	Locknuts	4	7	4
eu (du)	Link, extension, insulated (Link, extension) – (optional)			3 (3)

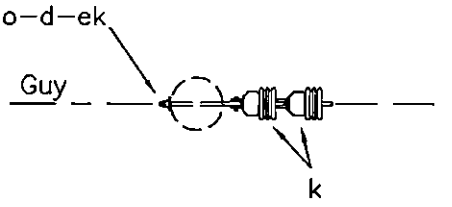
DESIGN PARAMETERS:
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

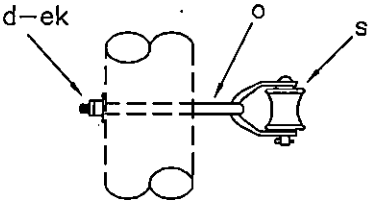
SINGLE DEADENDS

APRIL 2005	3 – PHASE PRIMARY	C5.1,C5.2,C5.3
RUS	12.47/7.2 kV	(C5.1)



C5.4





C5.7

C5.5 = C5.4 neutral assembly + C5.2 primary subassembly
C5.6 = C5.4 neutral assembly + C5.3 primary subassembly
C5.8 = C5.7 neutral assembly + C5.2 primary subassembly
C5.9 = C5.7 neutral assembly + C5.3 primary subassembly

NOTE: Extension link (item "eu" or "du") or eyebolt (item "o"), eyenut (item "aa") and locknut (item "ek") may be installed in 2 lower primary positions in assembly C5.4. Adjust material as required.

ASSEMBLY: C5		.4	.5	.6	.7	.8	.9
ITEM	MATERIAL	QTY	QTY	QTY	QTY	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	1	1	1			
d	Washer, square, 3", curved	4	4	4	4	4	4
k	Insulator, suspension, 4 1/4"	6	6	6	6	6	6
o	Bolt, eye, 5/8"x req'd length	3	6	3	4	7	4
s	Clevis, secondary, swinging, insulated				1	1	1
aa	Nut, eye		3			3	
bo	Shackle, anchor		3	3		3	3
da	Bracket, insulated	1	1	1			
ek	Locknuts	4	7	4	4	7	4
eu (du)	Link, extension, insulated (Link, extension) – (optional)			3 (3)			3 (3)

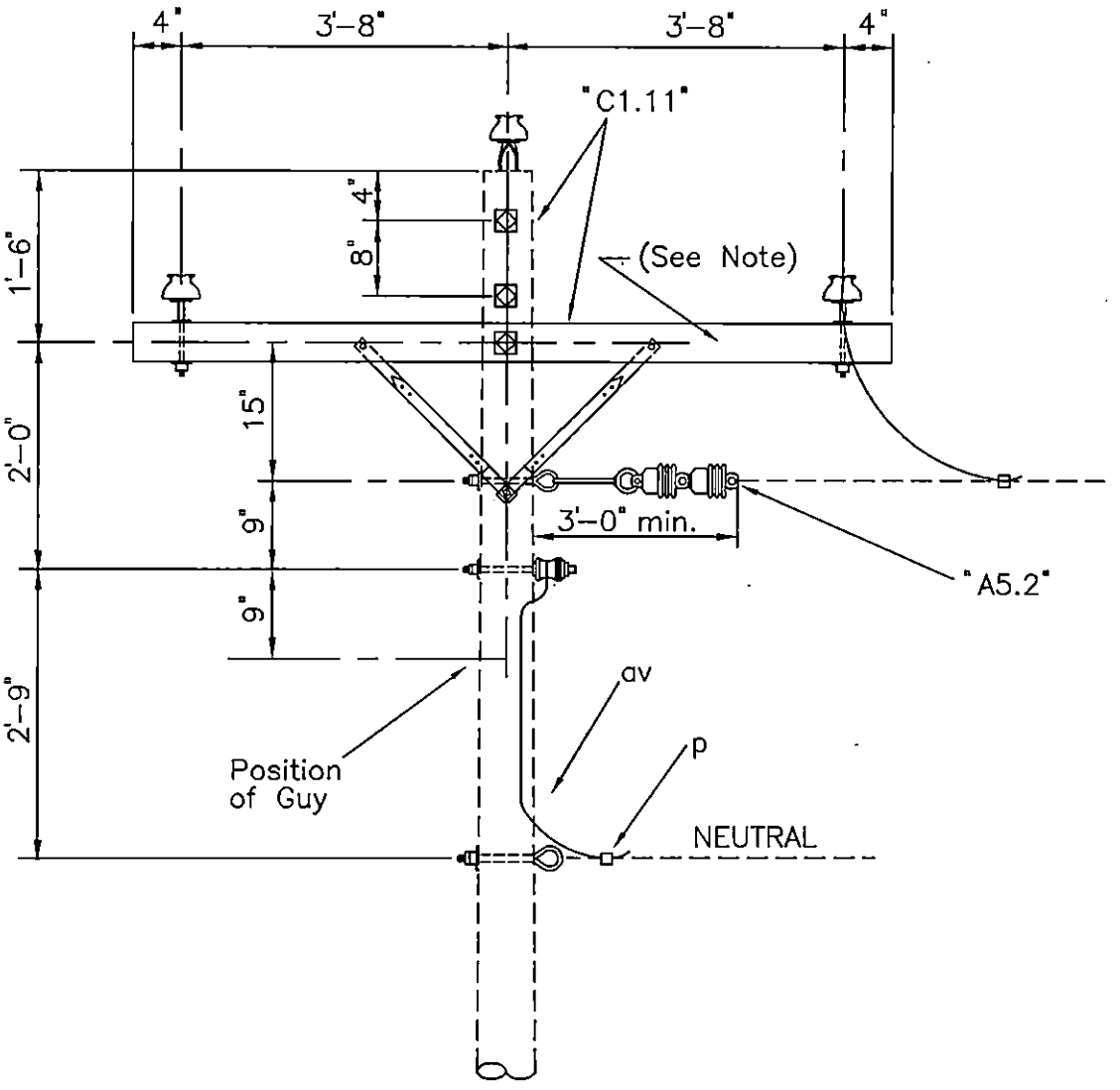
DESIGN PARAMETERS:

For ANSI Class 53-2 Spool Insulator (1 3/4") See Table VI

For ANSI Class 53-4 Spool Insulator (3") See Table VII

SINGLE DEADENDS

APRIL 2005	3 – PHASE PRIMARY	C5.4 – C5.9
RUS	12.47/7.2 kV	



NOTE:

When tapping center phase, install post type insulator, "A1.011P", horizontally on crossarm, 19 inches (minimum) from surface of pole and fasten jumper to insulator.

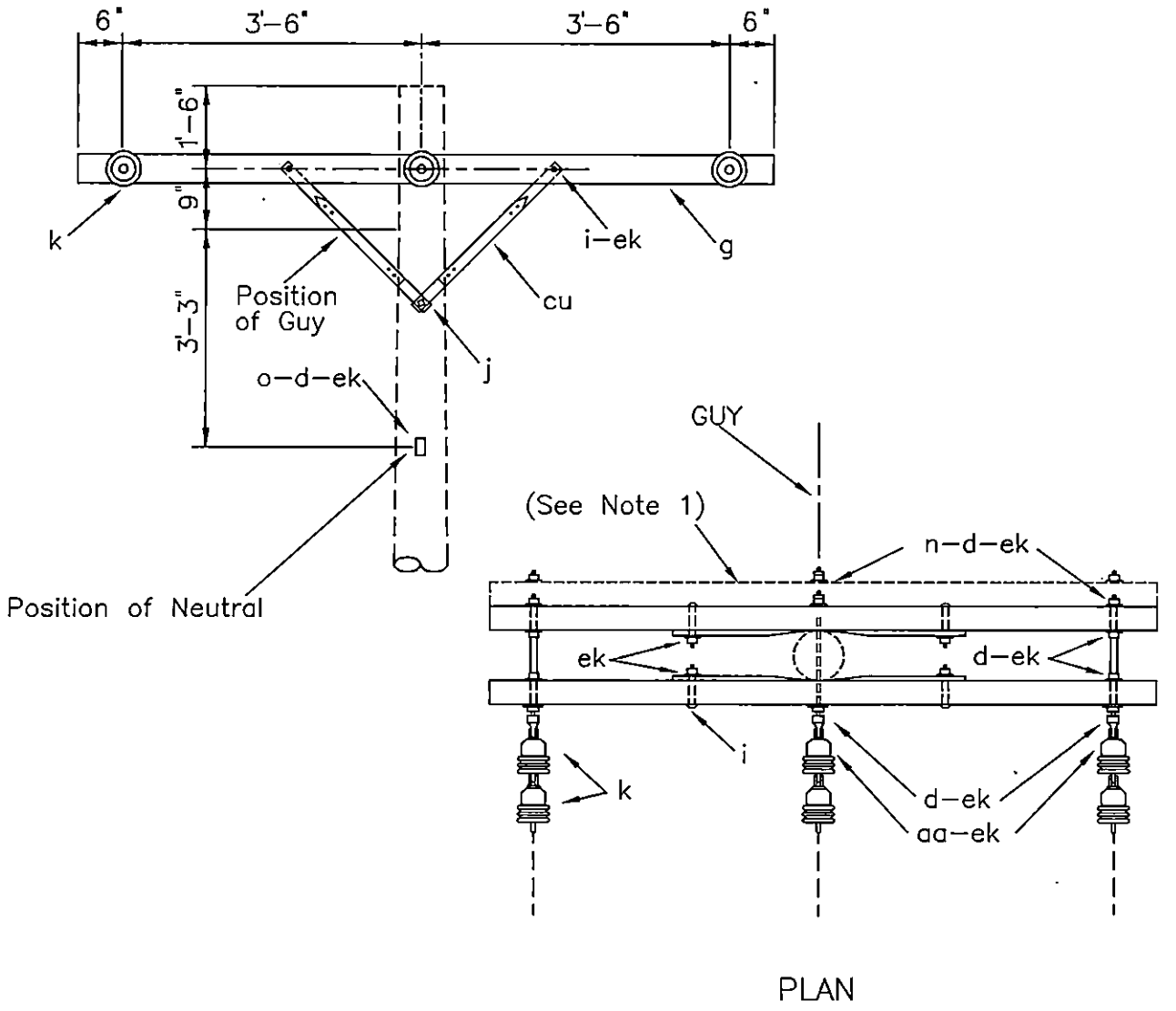
ITEM	QTY	MATERIAL
	1	"C1.11" Primary Assembly
	1	"A5.2" Primary Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD = 5,000 lbs./Conductor

SINGLE PHASE TAP GUIDE

APRIL 2005	3 – PHASE PRIMARY	C5.11G
RUS	12.47/7.2 kV	



PLAN

ITEM	QTY	MATERIAL
d	1	Washer, square, 3", curved
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	2	Screw, lag, 1/2" x 4"
k	6	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
o	1	Bolt, eye, 5/8" x req'd length
aa	3	Nut, eye, 5/8"
cu	4	Brace, 28"
ek	18	Locknuts

NOTES:

1. Designate as "C5.31" for assembly with three crossarms.
2. Double arming eye bolt, item "dy," may be used instead of double arming bolt, item "n," and eye nut, item "aa."
3. Other neutral assemblies may be used. See Section N. Adjust material as needed.

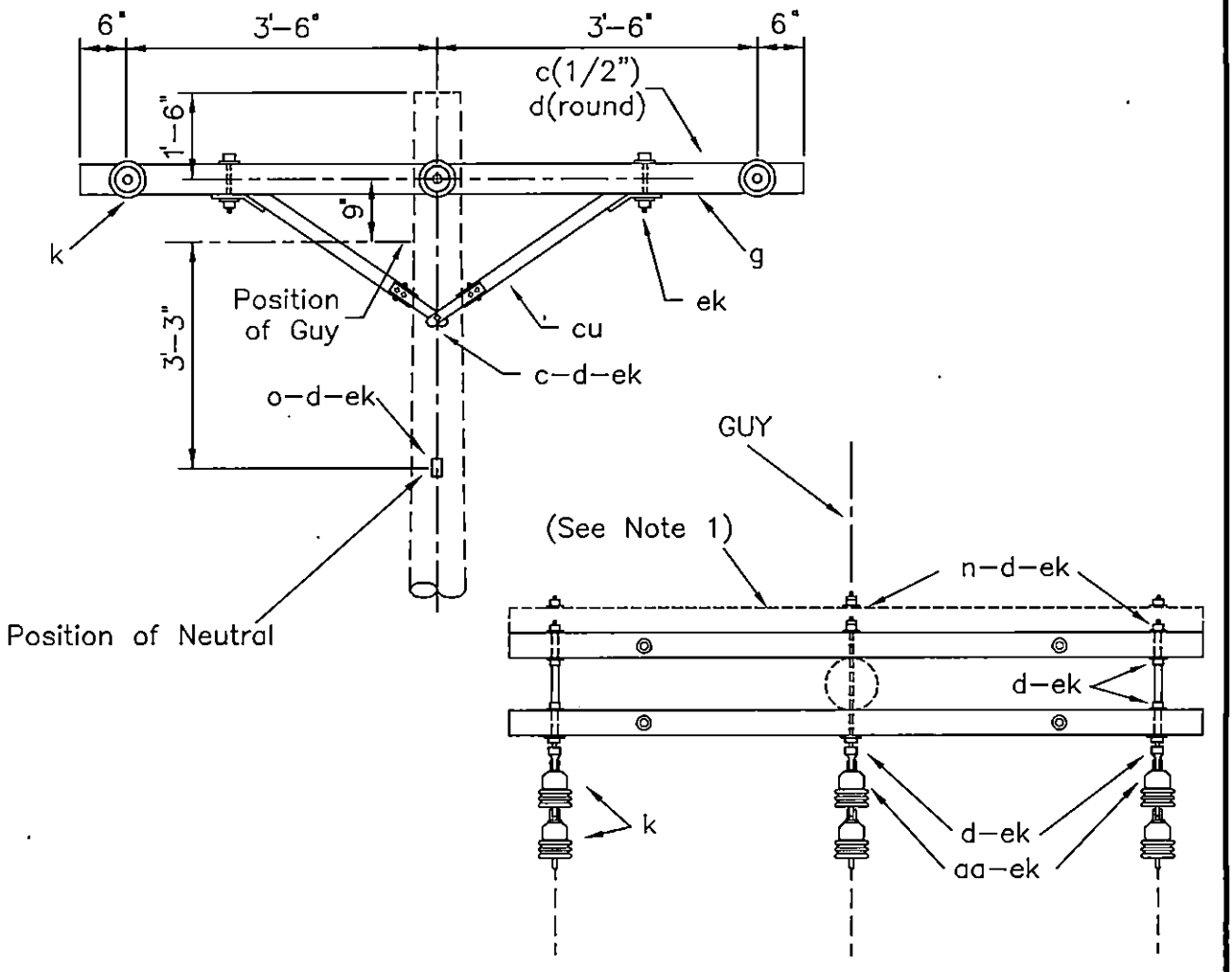
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

SINGLE DEADEND ON CROSSARMS

APRIL 2005	3 – PHASE PRIMARY	C5.21,C5.31
RUS	12.47/7.2 kV	(C7),(C7–1)



PLAN

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
d	4	Washer, round, 1 3/8"
d	1	Washer, square, 3", curved
d	11	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
k	6	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
o	1	Bolt, eye, 5/8" x req'd length
aa	3	Nut, eye, 5/8"
cu	2	Brace, wood, 60" span
ek	18	Locknuts

NOTES:

1. Designate as "C5.31L" for assembly with three crossarms.
2. Double arming eye bolt, item "dy," may be used instead of double arming bolt, item "n", and eye nut, item "aa."

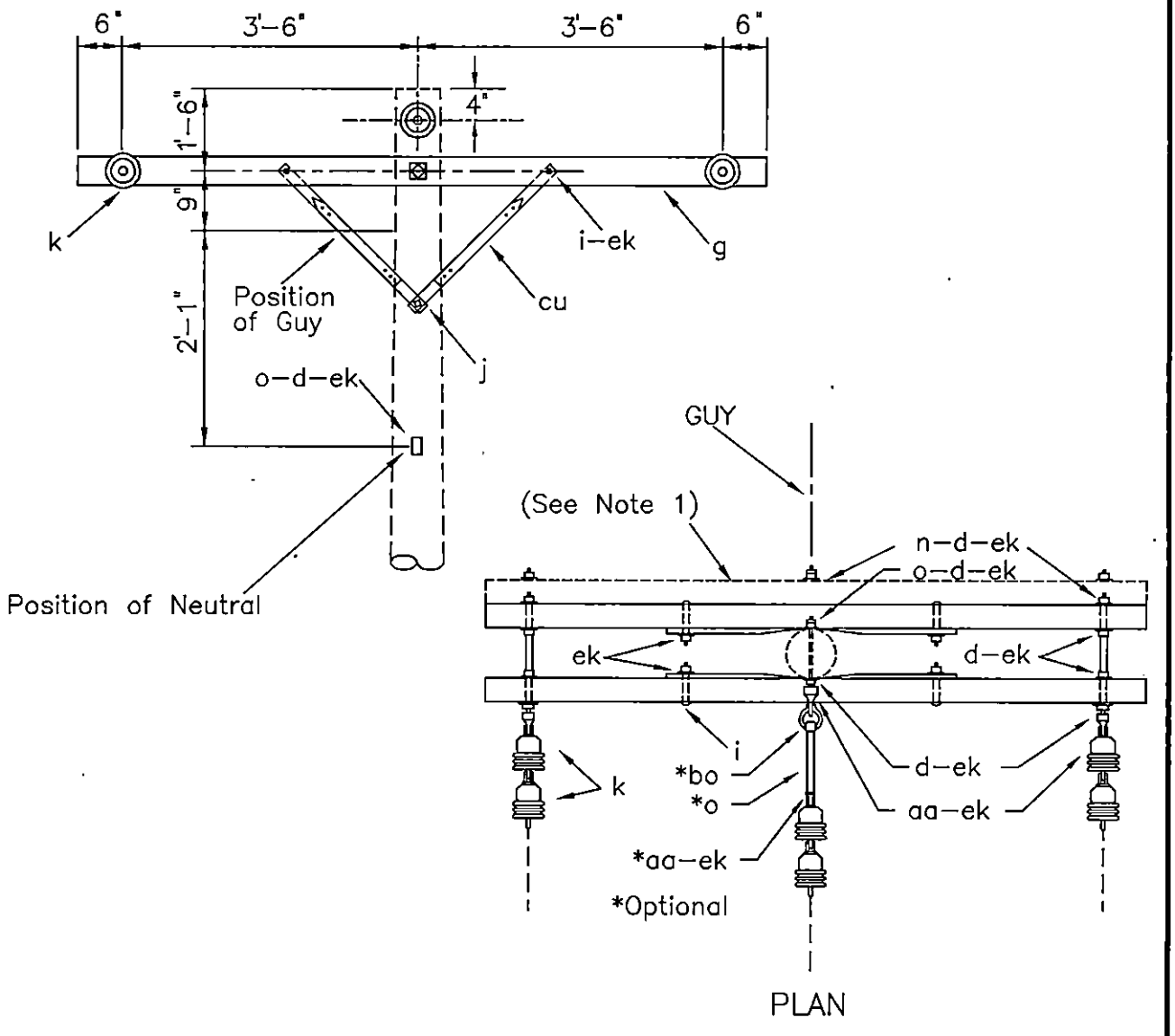
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

SINGLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005	3 – PHASE PRIMARY	C5.21L,C5.31L
RUS	12.47/7.2 kV	



ITEM	QTY	MATERIAL
d	2	Washer, square, 3", curved
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	2	Screw, lag, 1/2" x 4"
k	6	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
o	3	Bolt, eye, 5/8" x req'd length
aa	3	Nut, eye, 5/8"
bo	1	Shackle, anchor
cu	4	Brace, 28"
ek	19	Locknuts

NOTES:

1. Designate as "C5.32" for assembly with three crossarms.
2. Double arming eye bolt, item "dy," may be used instead of double arming bolt, item "n", and eye nut, item "aa."
3. Other neutral assemblies may be used. See Section N. Adjust material as needed.

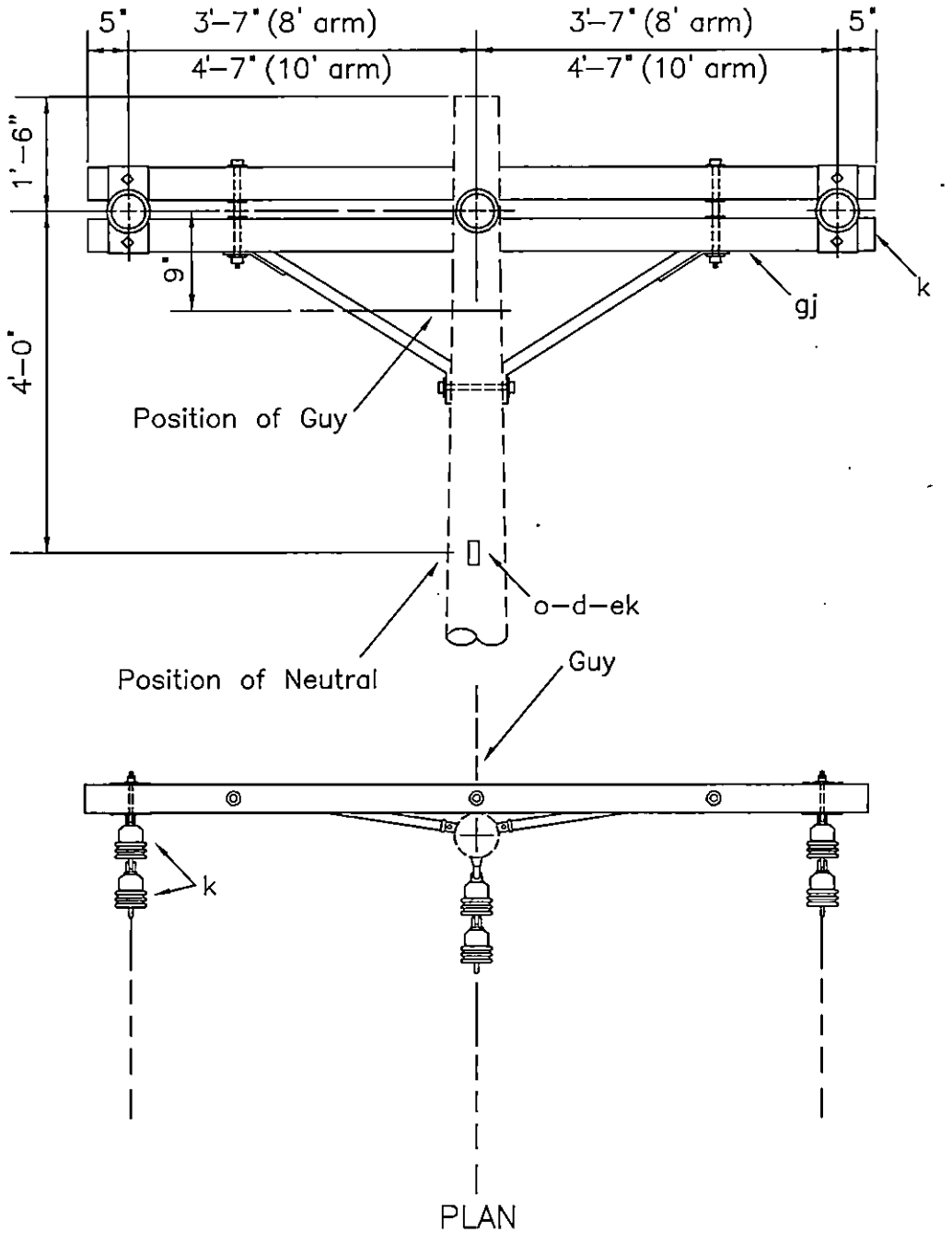
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

SINGLE DEADEND ON CROSSARMS–ALTERNATIVE

APRIL 2005	3 – PHASE PRIMARY	C5.22,C5.32
RUS	12.47/7.2 kV	(C7–2)



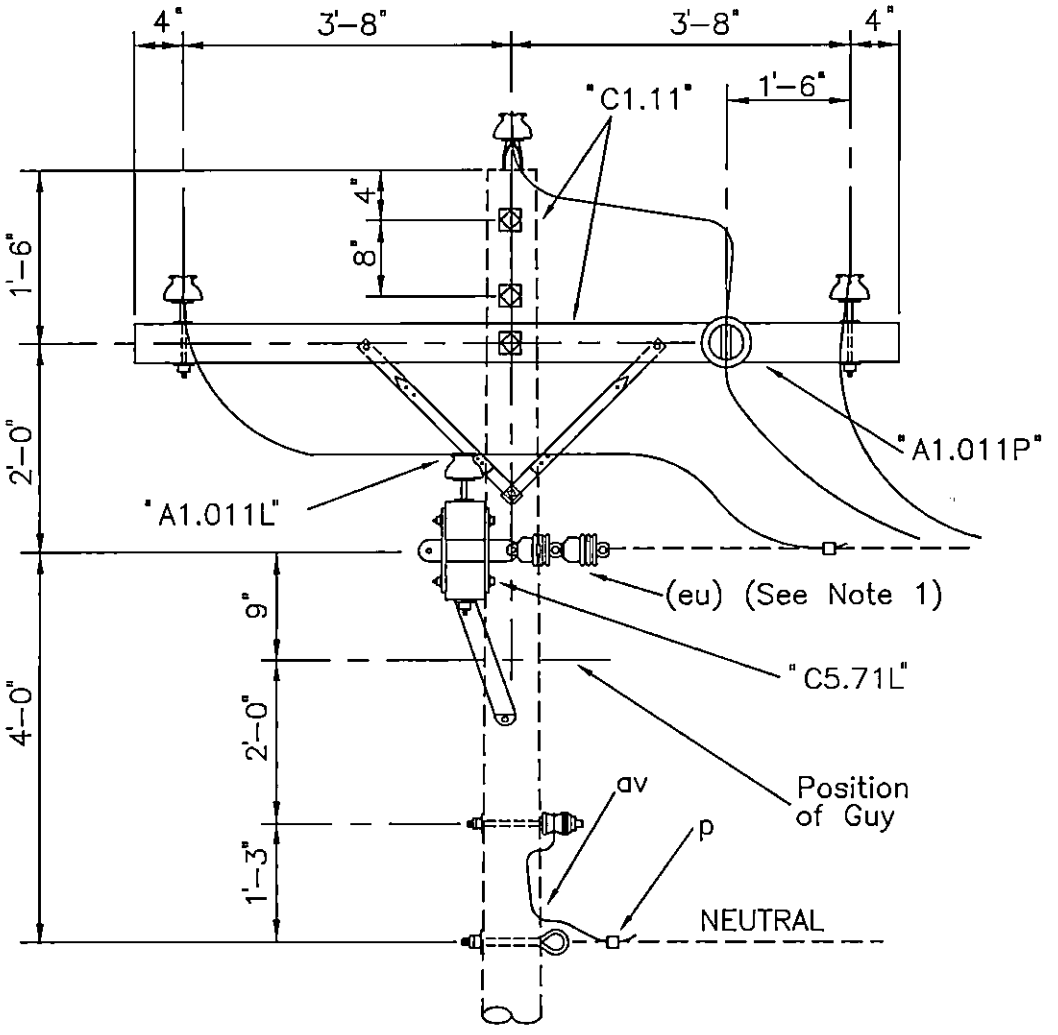
ITEM	QTY	MATERIAL
d	1	Washer, square, 3", curved
k	6	Insulator, suspension, 4 1/4"
o	1	Bolt, eye, 5/8" x req'd length
ek	1	Locknuts
gj	1	Crossarm Assembly

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD EQUALS LESSER OF:
5,000 lbs/Conductor, or
Manufacturer's specifications times NESC strength factor.

SINGLE DEADEND ON CROSSARM ASSEMBLY

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	C5.71L (C7A)



NOTES:

1. Install insulated extension link, item "eu", in center phase of tap.
2. Jumper wires to be a minum of 19 inches to surface of pole.

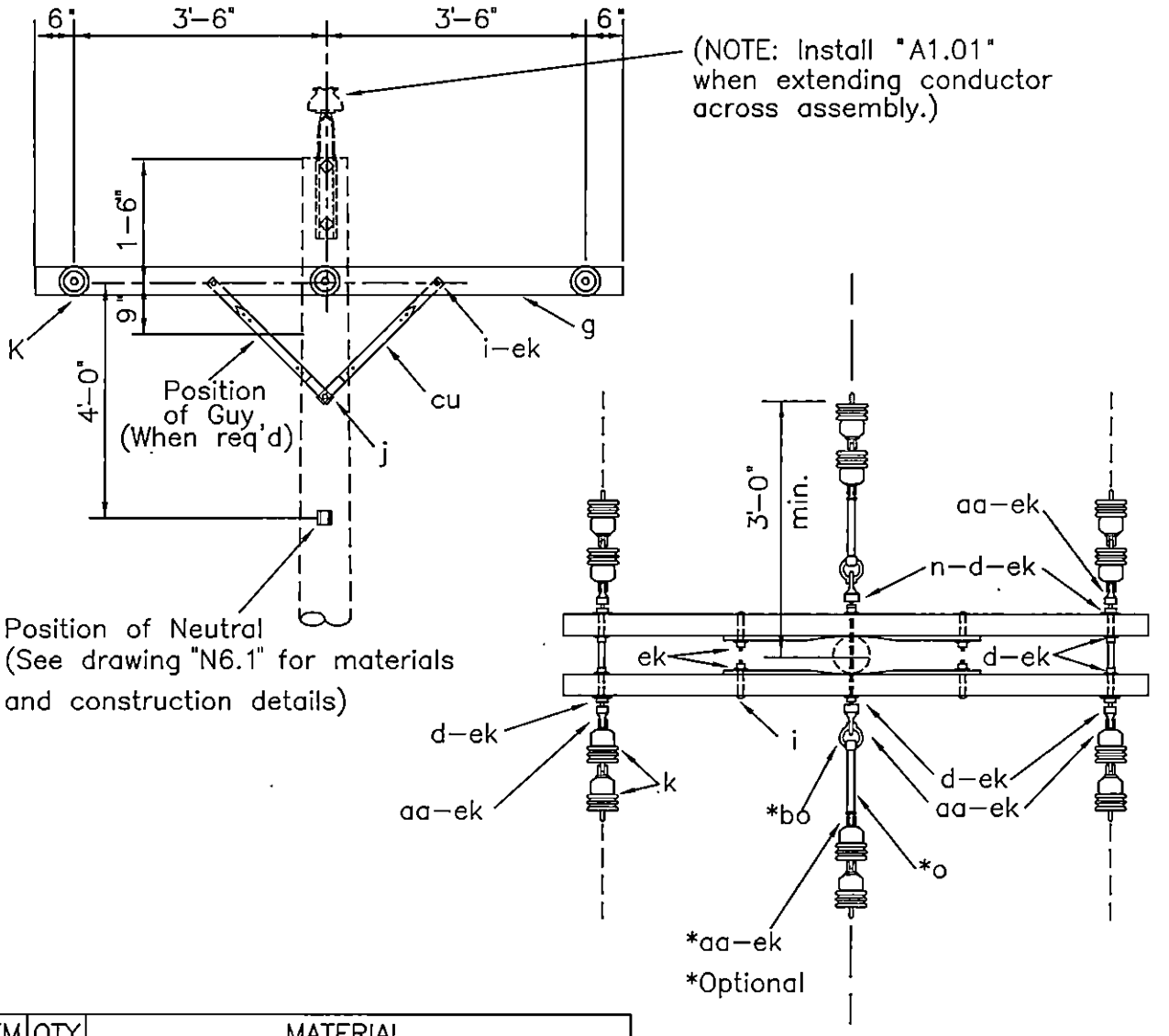
ITEM	QTY	MATERIAL
	1	C1.11 Primary Assembly
	1	C5.71L Primary Assembly
	(1)	(C5.21 or C5.31 Primary Assembly)
		(Use Table A – Exhibit 2)
	1	A1.011L Misc. Single Support
	1	A1.011P Misc. Single Support
p		Connectors, as req'd
av		Jumpers, as req'd
bo	1	Shackle, anchor
eu	1	Link, extension, insulated (18" min.)

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD EQUALS LESSER OF:
5,000 lbs./Conductor, or
Manufacturer's specifications times NESC strength factor.

THREE PHASE HORIZONTAL TAP GUIDE

APRIL 2005	3 – PHASE PRIMARY	C5.82G
RUS	12.47/7.2 kV	



ITEM	QTY	MATERIAL
d	2	Washer, square, 3", curved
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	2	Screw, lag, 1/2" x 4"
k	12	Insulator, suspension, 4 1/4"
n	4	Bolt,double arming,5/8" x req'd length
o	2	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
aa	8	Nut, eye, 5/8"
av		Jumpers, as req'd
bo	2	Shackle, anchor
cu	4	Brace, 28"
ek	26	Locknuts

NOTES:

1. Double arming bolt, item "n," and eye nut, item "aa," may be replaced with double arming eye bolt, item "dy."
2. Maximum line angle may be increased to 15° by installing anchor shackles, item "bo," to (horizontal) eye nuts and installing side guys as req'd.
3. Designate as C6.31 for assembly with three crossarms.

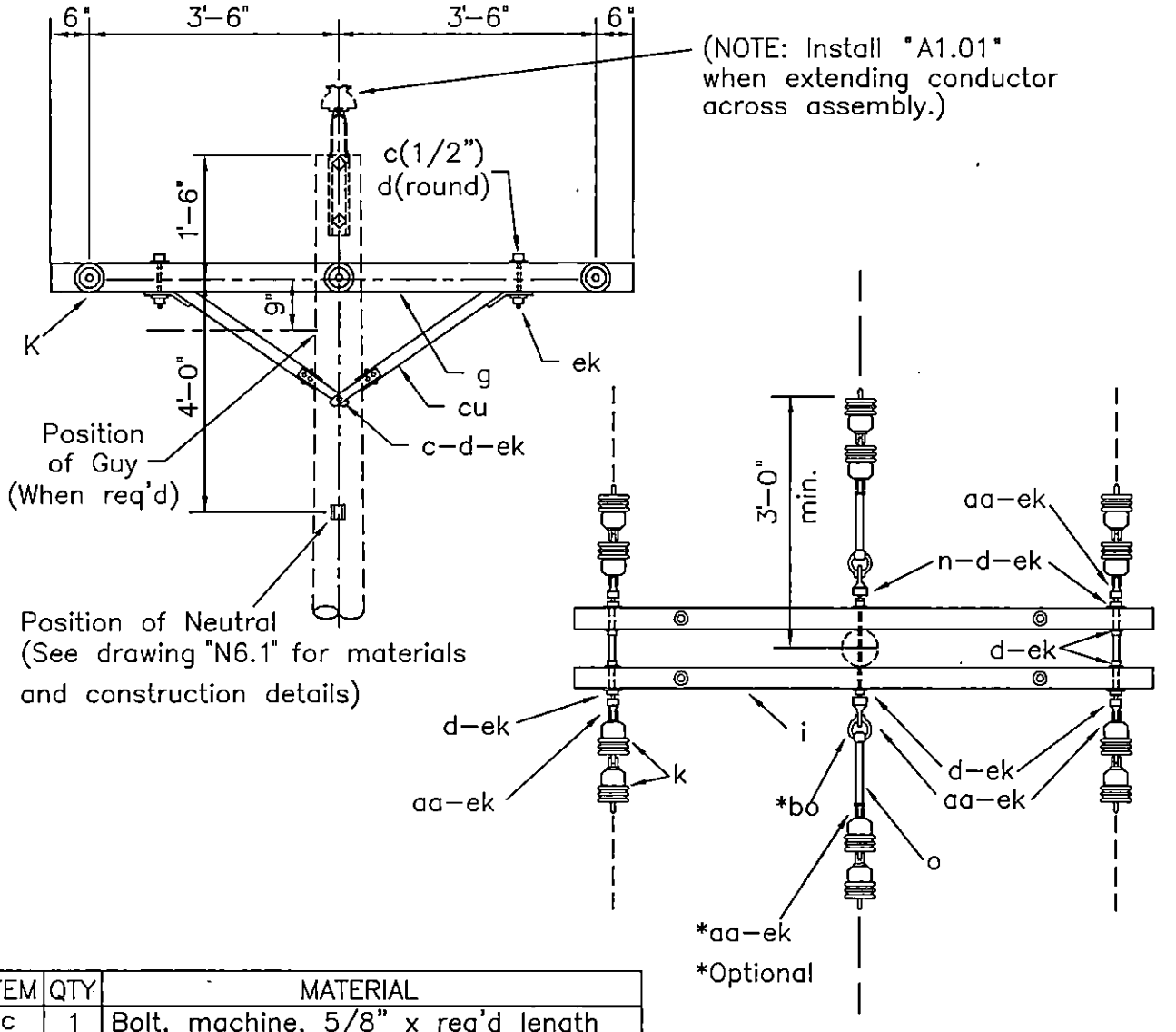
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:
See Table A (Exhibit 2)

MAXIMUM LINE ANGLE = 5°
(See Note 2)

DOUBLE DEADEND ON CROSSARMS

APRIL 2005	3 – PHASE PRIMARY	C6.21 (C8)
RUS	12.47/7.2 kV	C6.31



ITEM	QTY	MATERIAL
c	1	Bolt, machine, 5/8" x req'd length
c	4	Bolt, machine, 1/2" x req'd length
d	4	Washer, round, 1 3/8"
d	2	Washer, square, 3", curved
d	11	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0
k	12	Insulator, suspension, 4 1/4"
n	4	Bolt,double arming,5/8" x req'd length
o	2	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
aa	8	Nut, eye, 5/8"
av		Jumpers, as req'd
bo	2	Shackle, anchor
cu	2	Brace, wood, 60" span
ek	27	Locknuts

NOTES:

1. Double arming bolt, item "n," and eye nut, item "aa," may be replaced with double arming eye bolt, item "dy."
2. Maximum line angle may be increased to 15° by installing anchor shackles, item "bo," to (horizontal) eye nuts and installing side guys as req'd.
3. Designate as C6.31L for assembly with three crossarms.

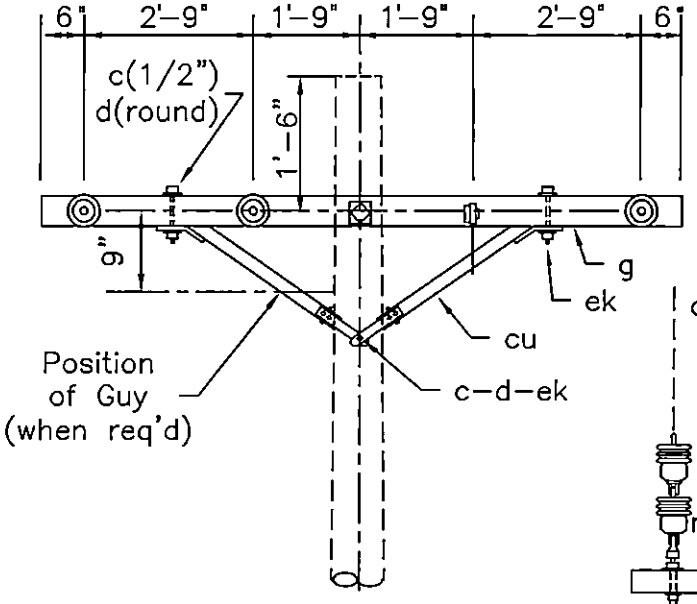
DESIGN PARAMETERS:

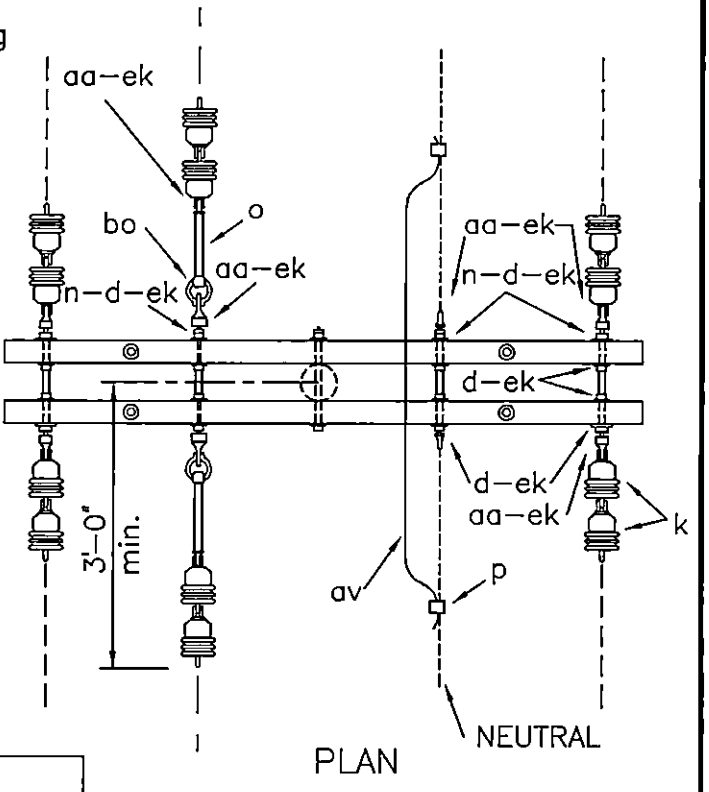
PERMITTED UNBALANCED CONDUCTOR TENSION:
See Table A (Exhibit 2)

MAXIMUM LINE ANGLE = 5°
(See Note 2)

DOUBLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005	3 – PHASE PRIMARY	C6.21L
RUS	12.47/7.2 kV	C6.31L (C8–3)





PLAN

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	2	Bolt, machine, 5/8" x req'd length
d	4	washer, round, 1 3/8"
d	19	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
k	12	Insulator, suspension, 4 1/4"
n	4	Bolt, double arm, 5/8" x req'd length
o	2	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
aa	10	Nut, eye, 5/8"
av		Jumpers, as req'd
bo	2	Shackle, anchor
cu	2	Brace, wood, 60" span
ek	29	Locknuts

NOTES:

1. Double arming bolt, item "n" and eye nut, item "aa", may be replaced with double arming eye bolt, item "dy."
2. Maximum line angle may be increased to 15° by installing anchor shackles, item "bo", to (horizontal) eye nuts and installing side guys as req'd.
3. See drawing "N6.21" for additional details.
4. Designate as "C6.53" for assembly with 3 crossarms.

DESIGN PARAMETERS:

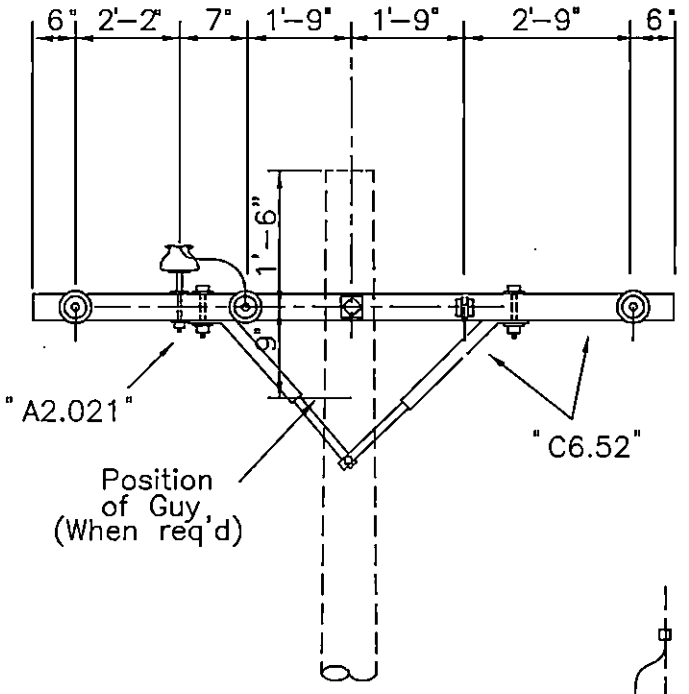
PERMITTED UNBALANCED CONDUCTOR TENSION:

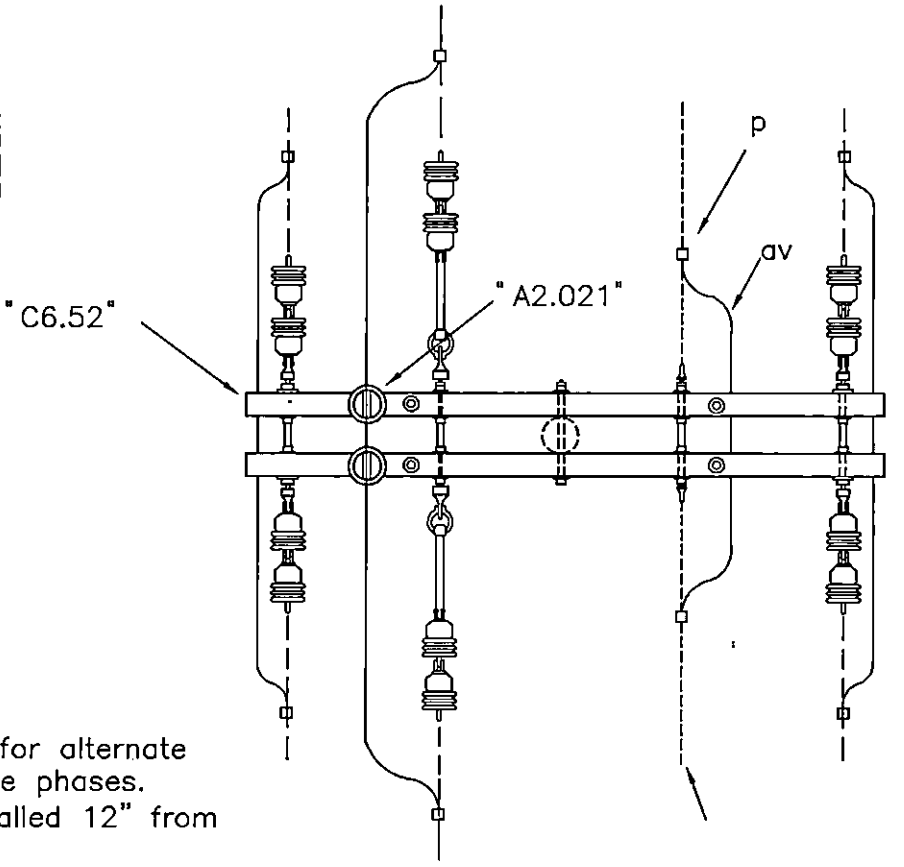
See Table B (Exhibit 2)

MAXIMUM LINE ANGLE = 5°
(See Note 2)

DOUBLE DEADEND ON 10 FOOT CROSSARMS

APRIL 2005	3 – PHASE PRIMARY	
RUS	12.47/7.2 kV	C6.52,C6.53





PLAN

NOTES:

1. See drawing "A6.22G" for alternate feed through of outside phases.
2. Crossarm may be installed 12" from top of pole.

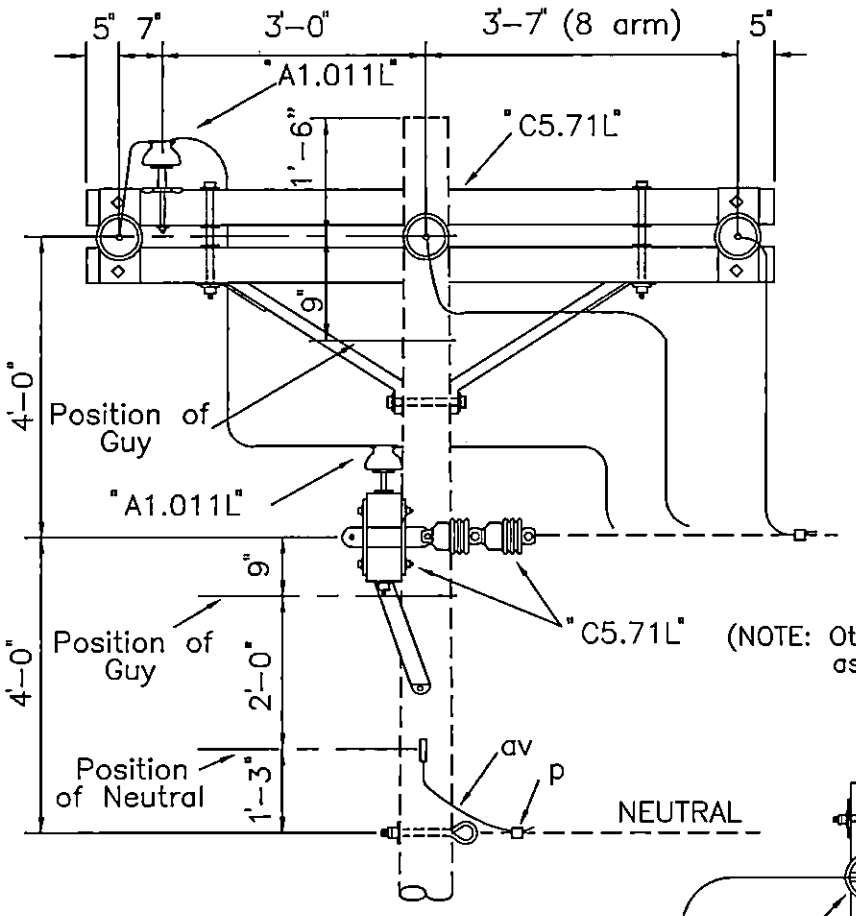
ITEM	QTY	MATERIAL
	1	C6.51 Primary Assembly
	1	A2.021 Primary Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

See: Table B (Exhibit 2)

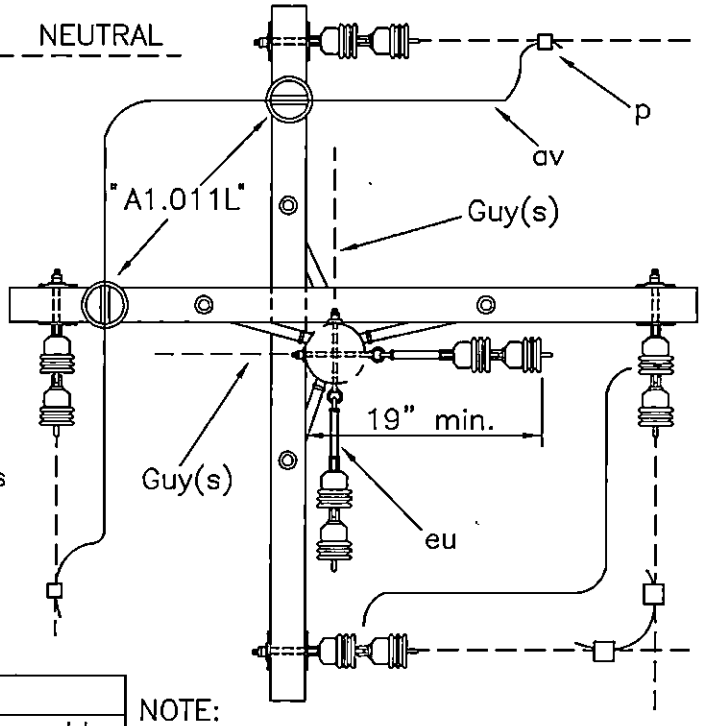
DOUBLE DEADEND ON 10 FOOT CROSSARMS (FEEDTHROUGH GUIDE)

APRIL 2005	3 – PHASE PRIMARY	
RUS	12.47/7.2 kV	C6.52G



(NOTE: Other double or triple crossarm assemblies may be used.)

PLAN



NOTE: Guy angle of top down guy needs to be less than 39° (4:5 guy lead to height ratio). A 1:1 guy ratio is permitted if 10 foot crossarm assembly is used in bottom position. Install guy strain insulator, "w" 60" minimum, in top down guy. (See "E1.5")

ITEM	QTY	MATERIAL
	2	C5.71L Primary (Crossarm) Assembly
	2	A1.011L Misc. Single Support
p		Connectors, as req'd
av		Jumpers, as req'd
eu	2	Link, extension, insulated, 12" min.

NOTE:
Vertical deadends, Dwg. "C4.1," is preferred construction.

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD EQUALS LESSER OF: 5,000 lbs./Conductor, or Manufacturer's specifications times NESC strength factor.

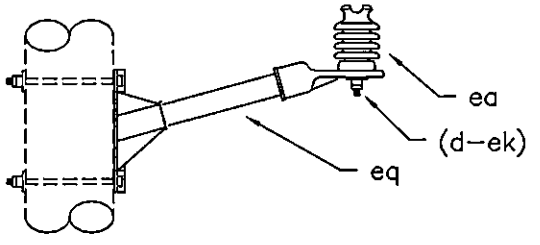
DOUBLE DEADENDS (BUCKARMS) GUIDE

APRIL 2005	3 – PHASE PRIMARY 12.47/7.2 kV	C6.91G
RUS		

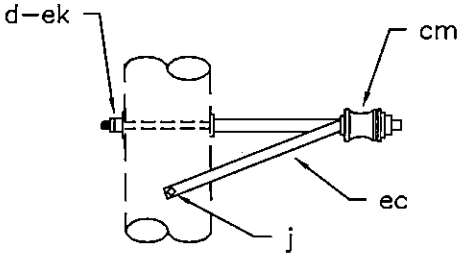
INDEX D

DOUBLE CIRCUIT PRIMARY POLE TOP ASSEMBLY UNITS

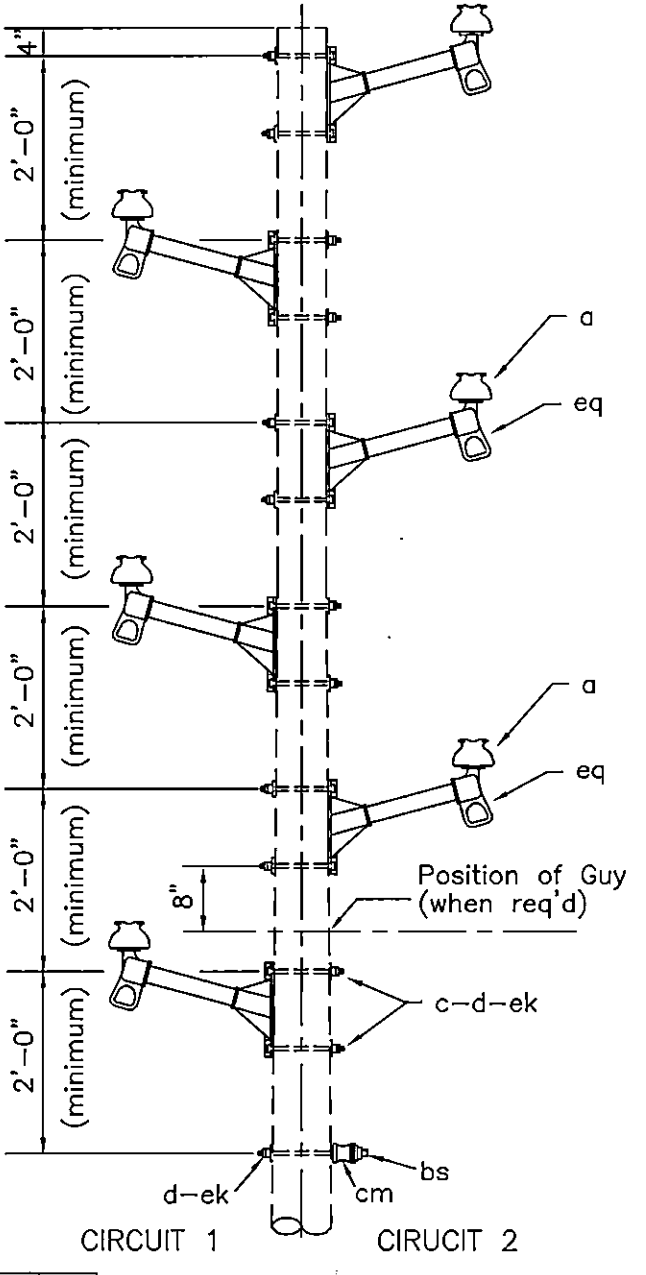
DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
D1.4N D1.4NP D1.5N D1.5NP		SINGLE SUPPORT - NARROW PROFILE (TANGENT) (and POST INSULATORS)
D1.81 D1.82	(DC-C1)	SINGLE SUPPORT ON CROSSARMS (TANGENT)
D1.81L D1.82L		SINGLE SUPPORT ON CROSSARMS (TANGENT) (LARGE CONDUCTORS)
D1.81P D1.82P		SINGLE SUPPORT ON CROSSARMS (TANGENT) (POST INSULATORS)
D1.83		SINGLE SUPPORT ON CROSSARMS
D1.83L		SINGLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)
D1.83P		SINGLE SUPPORT ON CROSSARMS (POST INSULATORS)
D2.9N D2.9NP		DOUBLE SUPPORT - NARROW PROFILE (and POST INSULATORS)
D2.91	(DC-C2-1)	DOUBLE SUPPORT ON CROSSARMS
D2.91L		DOUBLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)
D2.91P		DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)
D3.1G		SUSPENSION ANGLE GUIDE
D4.1G		DEADEND ANGLE GUIDE
D5.91G		THREE PHASE TAP GUIDE
D6.91	(DC-C8)	DOUBLE DEADENDS ON CROSSARMS (FEEDTHROUGH)



Specify D1.4NP or D1.5NP for post type insulators.



Specify D1.5N or D1.5NP for offset neutral assembly.



NOTE: If additional guying is required, use assembly D2.9N or D2.9NP.

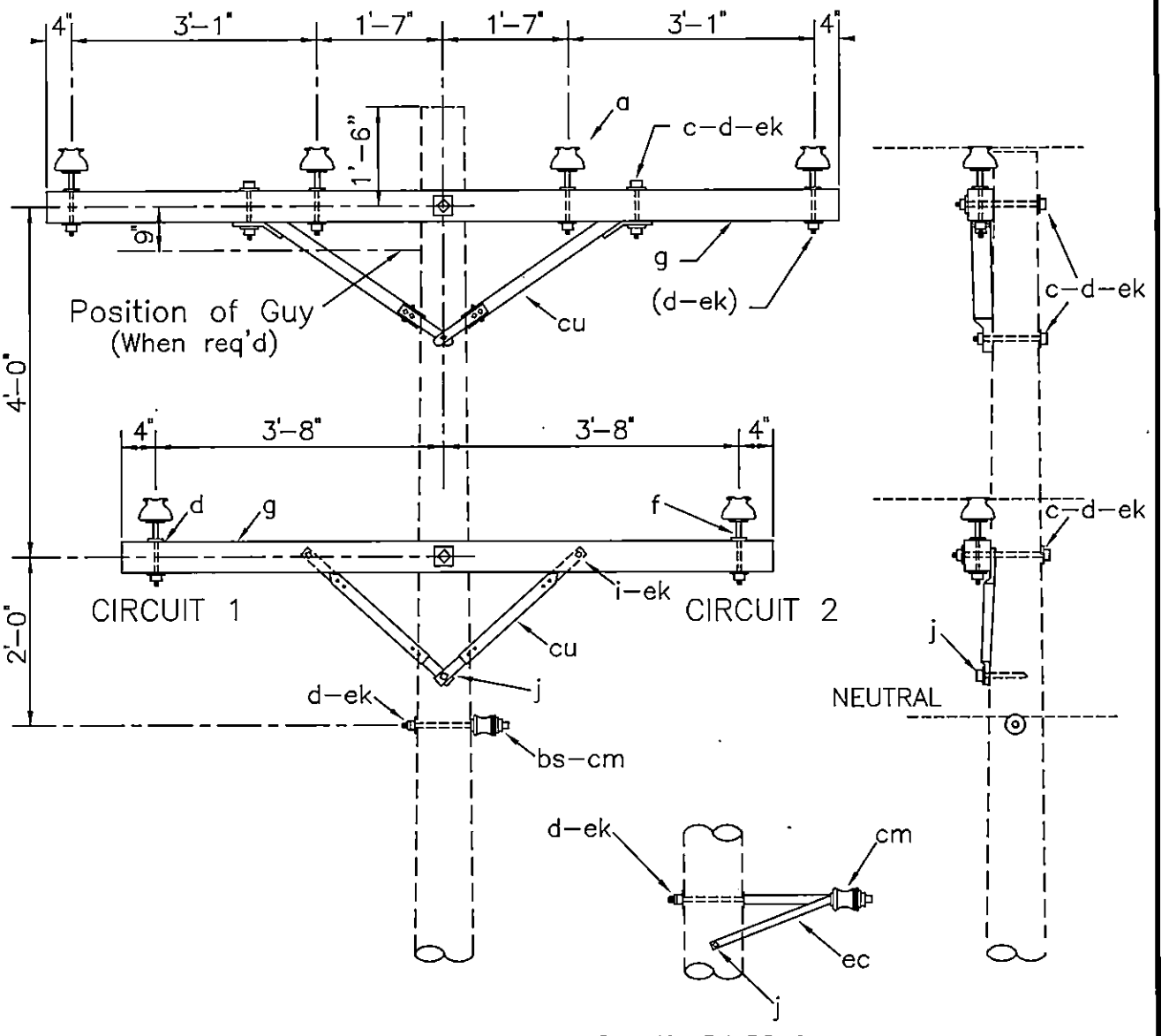
ASSEMBLY: D1.		4N	4NP	5N	5NP	
ITEM	MATERIAL	QTY	QTY	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	6		6		
c	Bolt, machine, 5/8" x req'd length	12	12	12	12	
d	Washer, square 2 1/4"	13	13	13	13	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(6)		(6)		(if req'd)
j	Screw, lag, 1/2" x 4"			2	2	
bs	Bolt, single, upset	1	1			
cm	Insulator, spool, 3"	1	1	1	1	
ea	Insulator, post type (12.47/7.2kV)		6		6	
ec	Bracket, offset, neutral			1	1	
ek	Locknuts	13	13	13	13	
eq	Bracket, insulator/equipment	6	6	6	6	

Design Parameters:

MAXIMUM LINE ANGLES:
5°–Small Conductors
2°–Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D1.4N,D1.4NP
RUS	12.47/7.2 kV	D1.5N,D1.5NP



Specify D1.82 for offset neutral assembly

ASSEMBLY: D1.		81	82
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type, (12.47/7.2 kV)	6	6
c	Bolt, machine, 1/2" x req'd length	2	2
c	Bolt, machine, 5/8 x req'd length	3	3
d	Washer, round, 1 3/8"	2	2
d	Washer, square, 2 1/4"	12	12
f	Pin, crossarm, steel, 5/8" x 10 3/4"	6	6
g	Crossarm, 3 5/8" x 4 5/8" x 8' – 0"	1	1
g	Crossarm, 3 5/8" x 4 5/8" x 10'– 0"	1	1

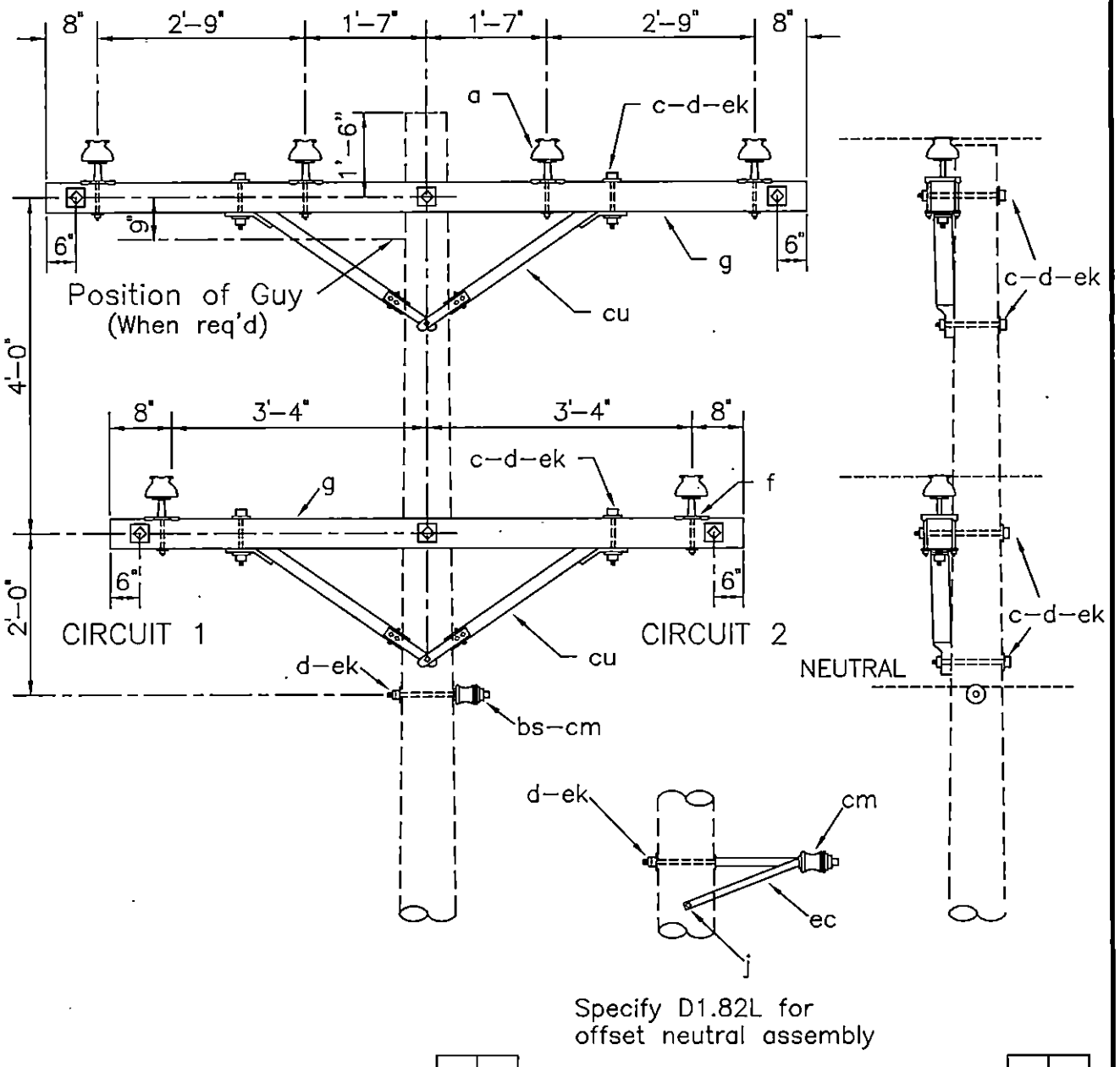
ASSEMBLY: D1.		81	82
ITEM	MATERIAL	QTY	QTY
i	Bolt, carriage, 3/8" x 4 1/2"	2	2
j	Screw, lag, 1/2" x 4"	1	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	2	2
cu	Brace, wood, 60" span	1	1
ec	Bracket, offset, neutral		1
ek	Locknuts	8	8

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0.

SINGLE SUPPORT ON CROSSARMS (TANGENT)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D1.81 (DC–C1)
RUS	12.47/7.2 kV	D1.82



Specify D1.82L for offset neutral assembly

ASSEMBLY: D1.		81L	82L
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type, (12.47/7.2 kV)	6	6
c	Bolt, machine, 1/2" x req'd length	4	4
c	Bolt, machine, 5/8 x req'd length	8	8
d	Washer, round, 1 3/8"	4	4
d	Washer, square, 2 1/4"	15	15
f	Pin, crossarm, steel, clamp type	6	6
g	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"	1	1
g	Crossarm, 3 5/8" x 4 5/8" x 10'- 0"	1	1

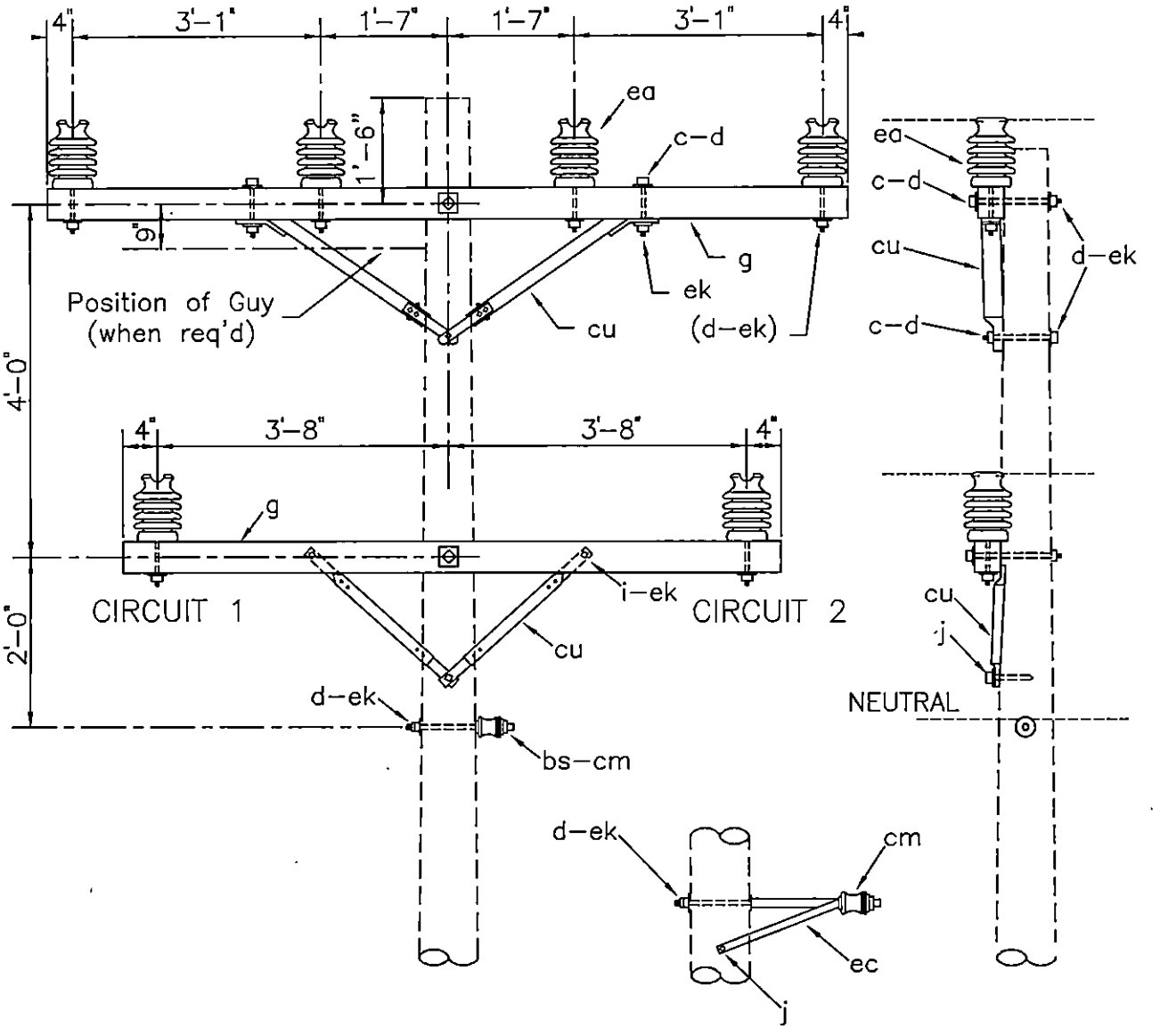
ASSEMBLY: D1.		81L	82L
ITEM	MATERIAL	QTY	QTY
j	Screw, lag, 1/2" x 4"	0	3
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	brace, wood, 60" span	2	2
ec	Bracket, offset, neutral		1
ek	Locknuts	13	13

DESIGN PARAMETERS:

MAXIMUM LINE ANGLE = 2°

SINGLE SUPPORT ON CROSSARMS (TANGENT) (LARGE CONDUCTORS)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D1.81L
RUS	12.47/7.2 kV	D1.82L



Specify D1.82P for offset neutral assembly

ASSEMBLY: D1.		81P	82P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 1/2" x req'd length	2	2
c	Bolt, machine, 5/8 x req'd length	3	3
d	Washer, round, 1 3/8"	2	2
d	Washer, square, 2 1/4"	6	6
g	Crossarm, 3 5/8" x 4 5/8" x 8' - 0"	1	1
g	Crossarm, 3 5/8" x 4 5/8" x 10'- 0"	1	1
i	Bolt, carriage, 3/8" x 4 1/2"	2	2
j	Screw, lag, 1/2" x 4	1	3

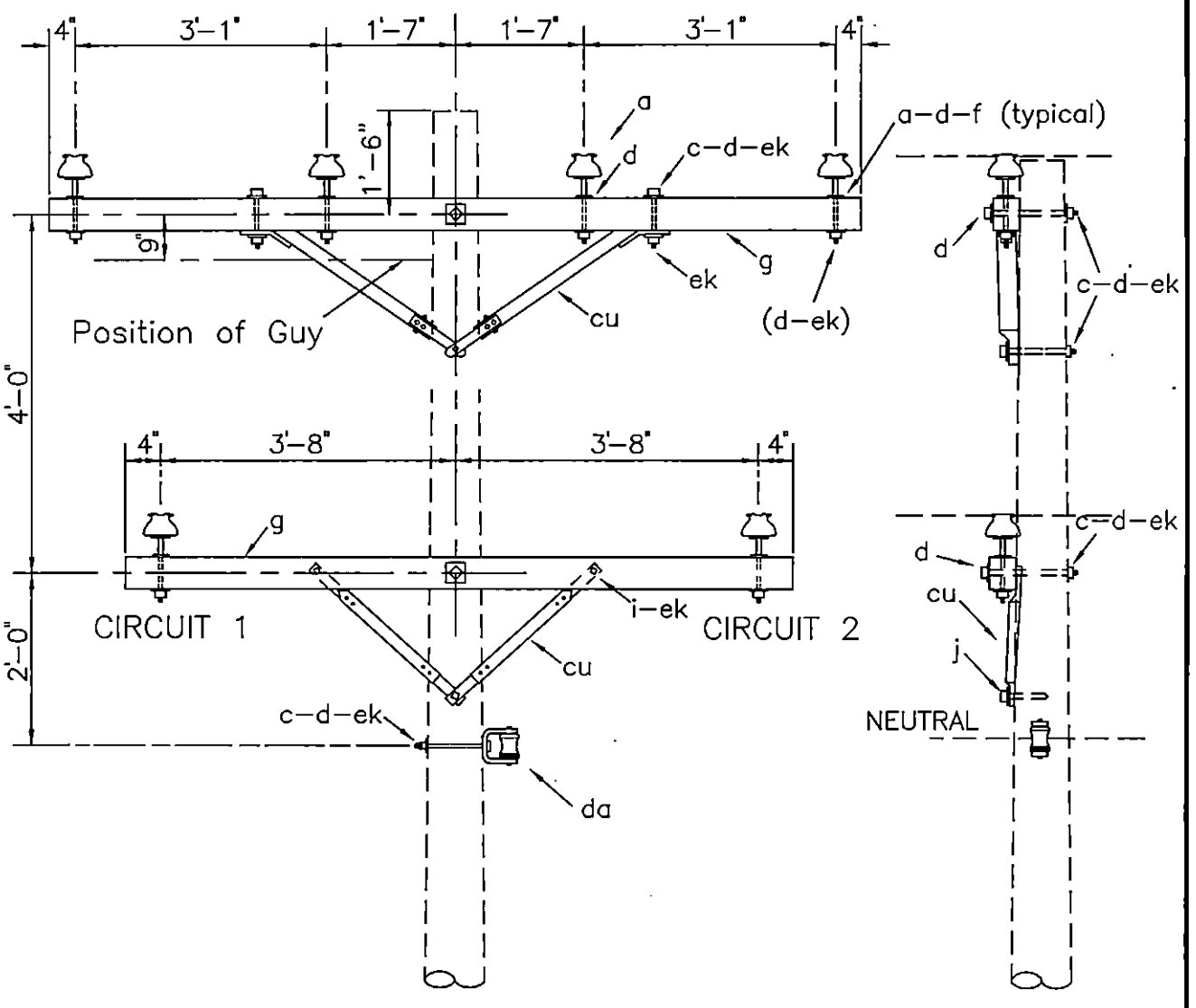
ASSEMBLY: D1.		81P	82P
ITEM	MATERIAL	QTY	QTY
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
cu	Brace, 28"	2	2
cu	Brace, wood, 60" span	1	1
ea	Insulator, post type, (12.47/7.2 kV)	6	6
ec	Bracket, offset, neutral		1
ek	Locknuts	8	8

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT ON CROSSARMS (TANGENT) (POST INSULATORS)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D1.81P
RUS	12.47/7.2 kV	D1.82P



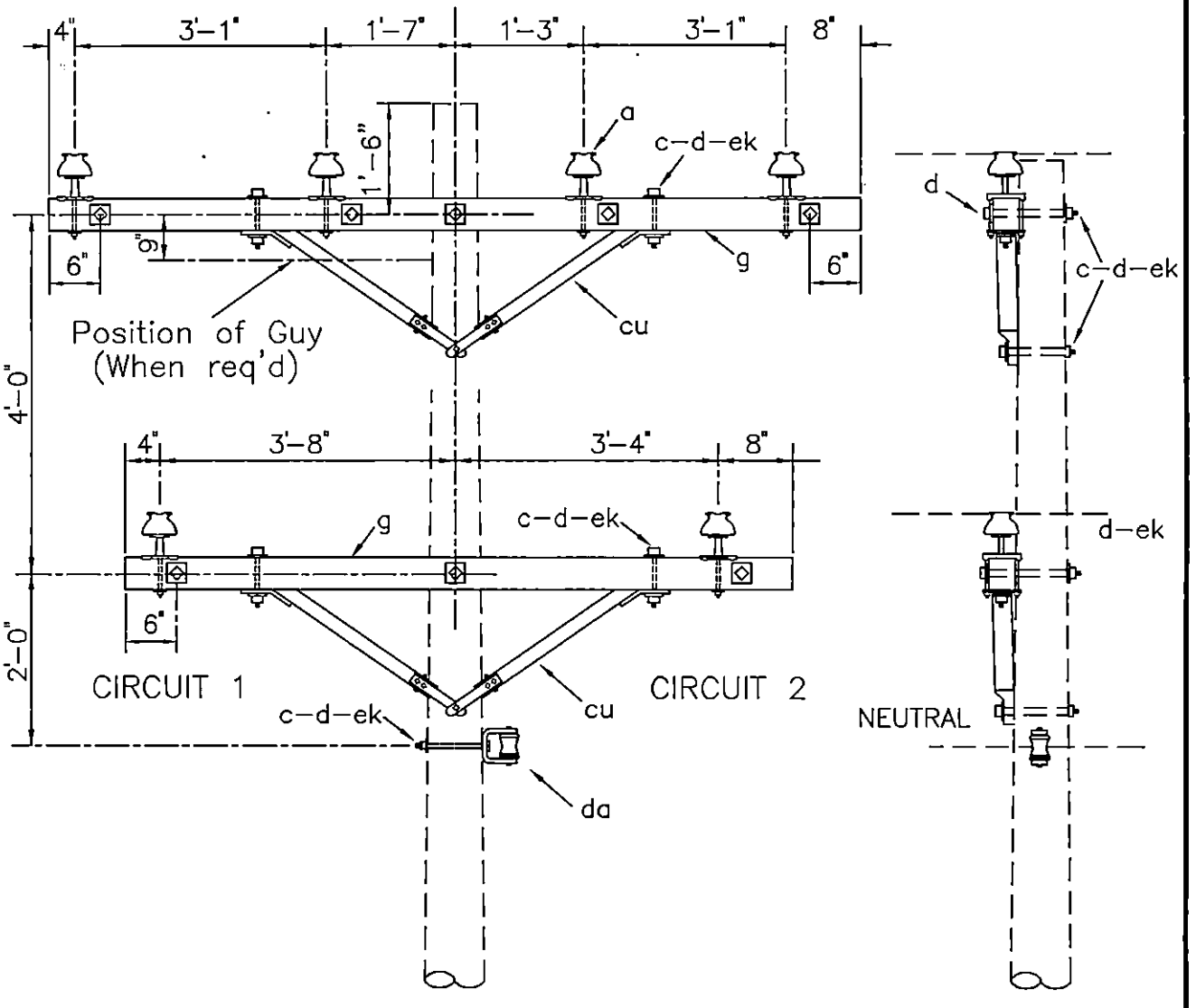
ITEM	QTY	MATERIAL
a	6	Insulator, pin type, (12.47/7.2 kV)
c	2	Bolt, machine, 1/2" x req'd length
c	4	Bolt, machine, 5/8" x length
d	2	Washer, round, 1 3/8"
d	12	Washer, square, 2 1/4"
f	6	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'–0"

ITEM	QTY	MATERIAL
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
cu	2	Brace, 28"
cu	1	Brace, wood, 60" span
da	1	Bracket, insulated
ek	8	Locknuts

DESIGN PARAMETERS:
See Table II

SINGLE SUPPORT ON CROSSARMS

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D1.83



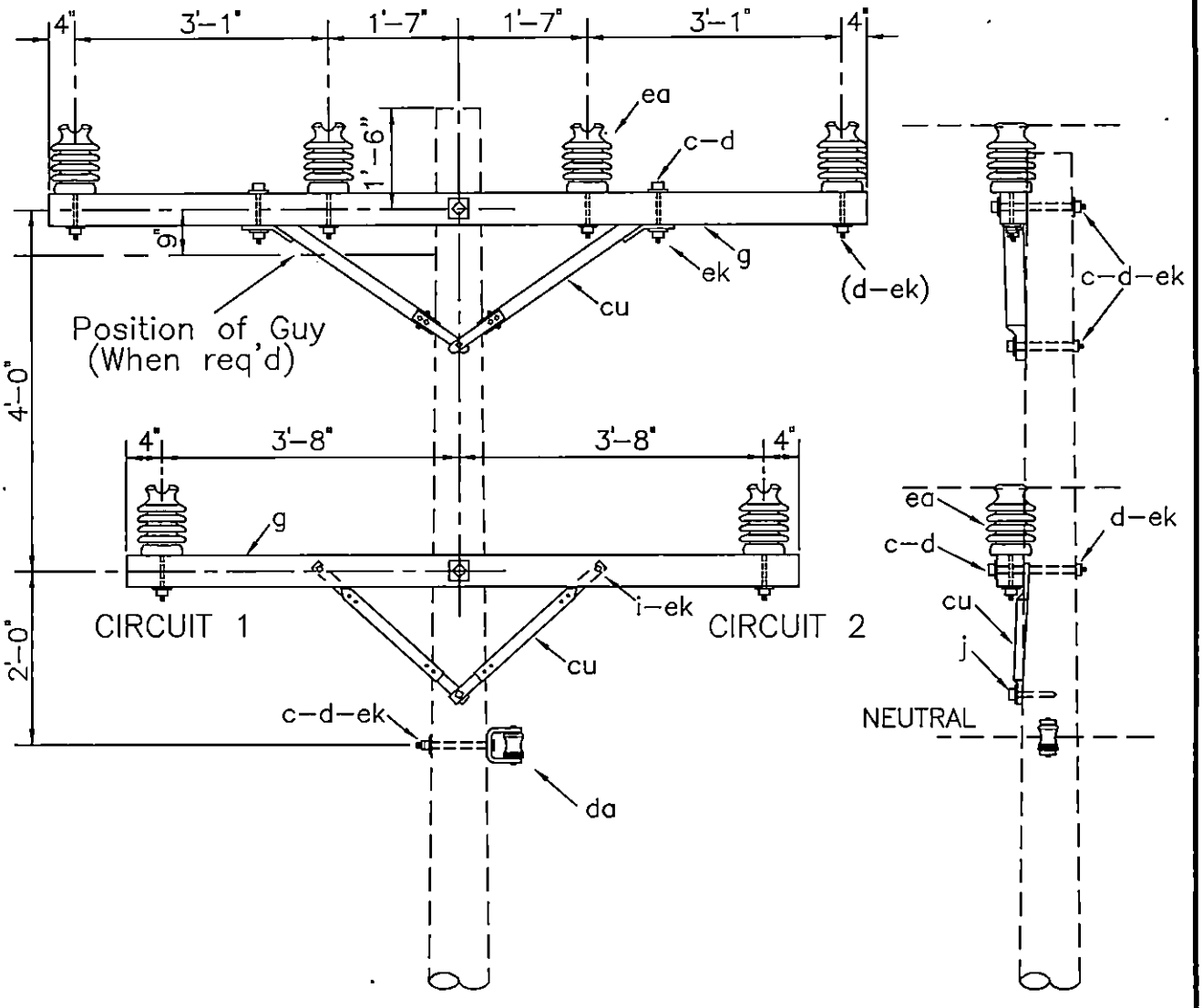
ITEM	QTY	MATERIAL
a	6	Insulator, pin type, (12.47/7.2 kV)
c	4	Bolt, machine, 1/2" x req'd length
c	11	Bolt, machine, 5/8" x length
d	4	Washer, round, 1 3/8"
d	19	Washer, square, 2 1/4"
f	6	Pin, crossarm, steel, clamp type
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'–0"

ITEM	QTY	MATERIAL
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
cu	2	Brace, wood, 60" span
da	1	Bracket, insulator
ek	15	Locknuts

DESIGN PARAMETERS:
See Table III

SINGLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D1.83L



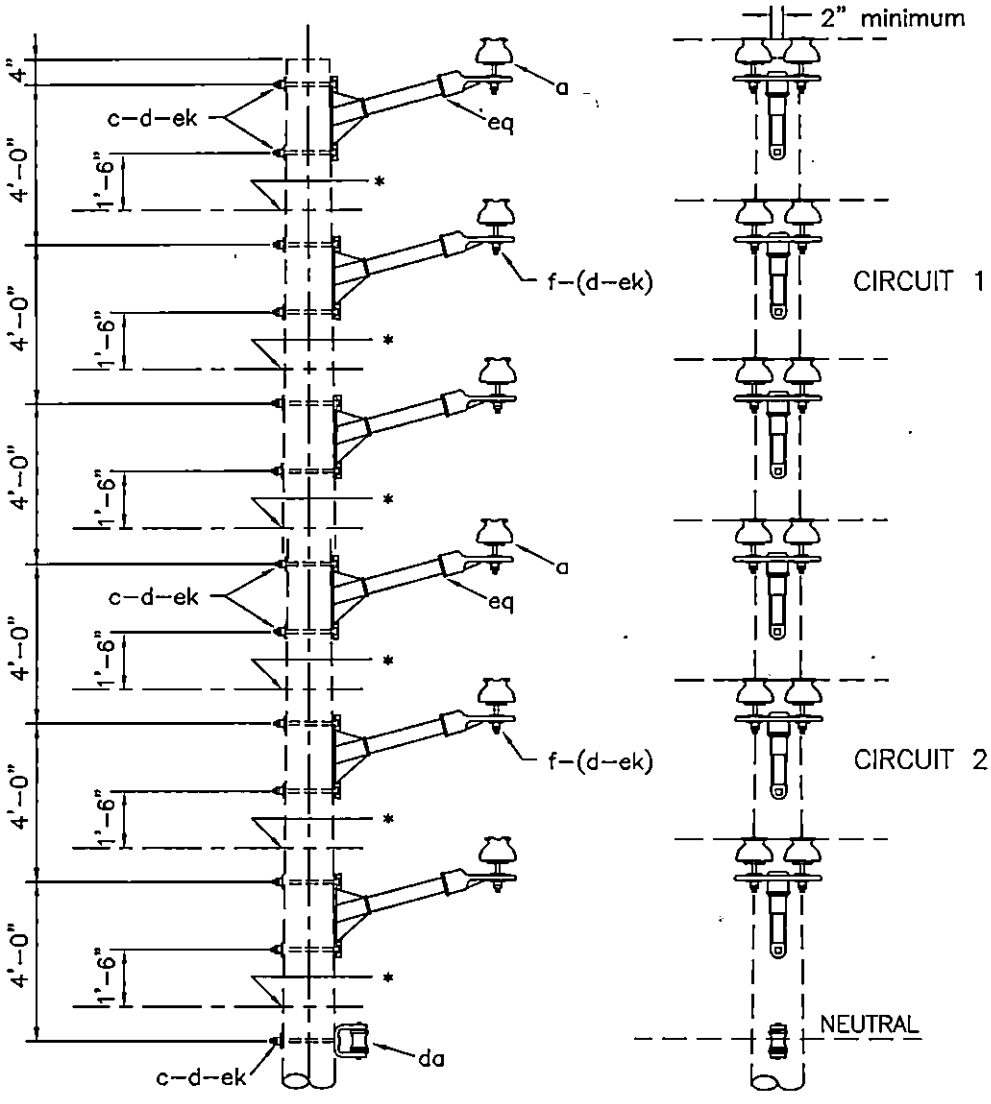
ITEM	QTY	MATERIAL
c	2	Bolt, machine, 1/2" x req'd length
c	4	Bolt, machine, 5/8" x req'd length
d	2	Washer, round, 1 3/8"
d	6	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
g	1	Crossarm, 3 5/8" x 4 5/8" x 10'-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"

ITEM	QTY	MATERIAL
j	1	Screw, lag, 1/2" x 4"
cu	2	Brace, 28"
cu	1	Brace, wood, 60" span
da	1	Bracket, insulated
ea	6	Insulator, post type, (12.47/7.2 kV)
ek	8	Locknuts

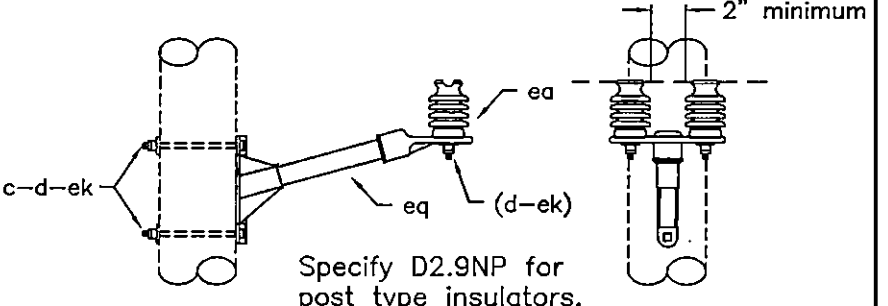
DESIGN PARAMETERS:
See Table II

SINGLE SUPPORT ON CROSSARMS (POST INSULATORS)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D1.83P



* Position of guys as required.



Specify D2.9NP for post type insulators.

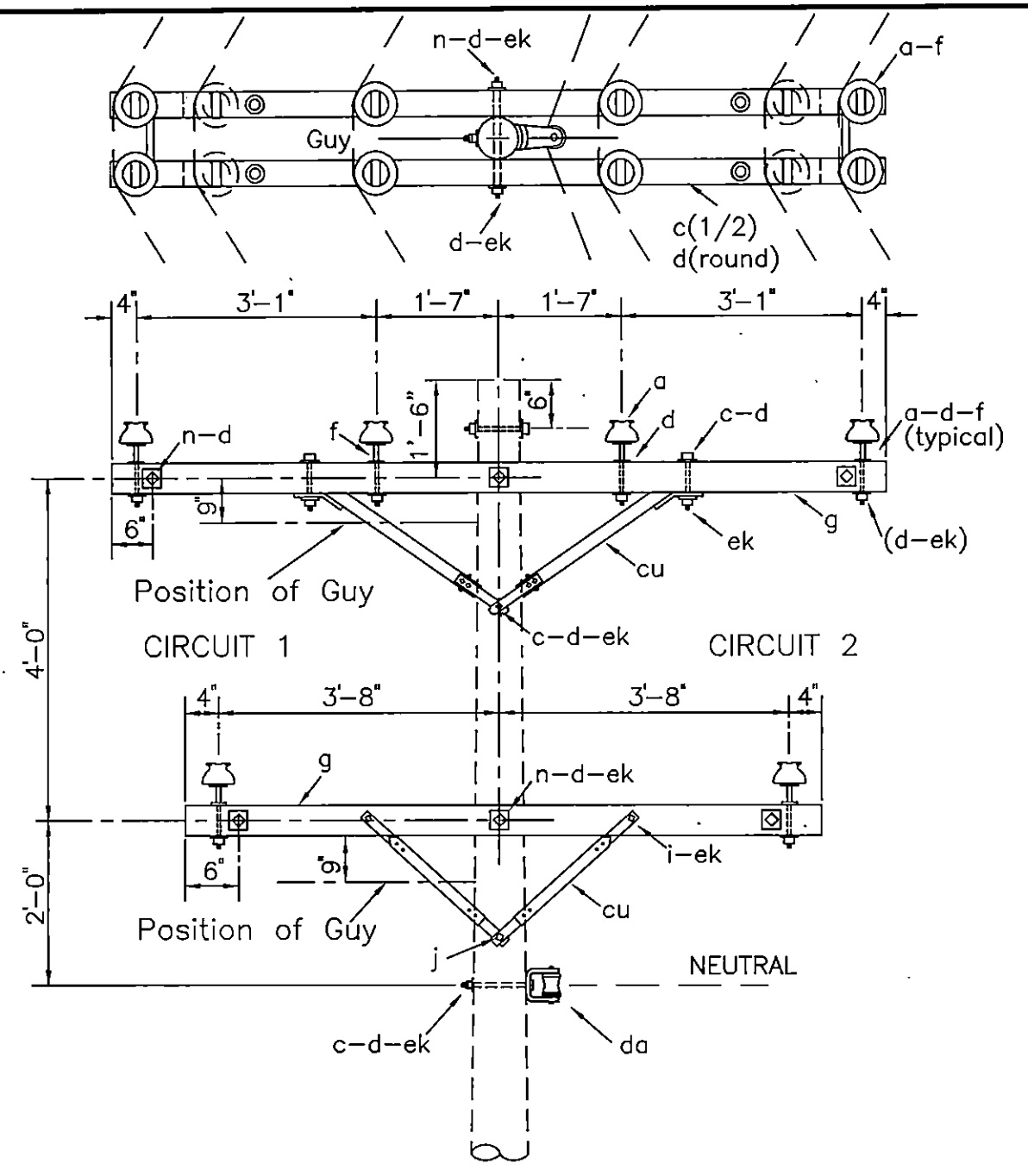
NOTE: See D3.1G or D4.1G for alternative construction.

Assembly: D2.		9N	9NP
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	12	
c	Bolt, machine, 5/8" x req'd length	13	13
d	Washer, square 2 1/4"	13	13
f	Pin, crossarm, 5/8" x 6 1/2"	12	
da	Bracket, insulated	1	1
ea	Insulator, post type (12.47/7.2kV)		12
ek	Locknuts	13	13
eq	Bracket, insulator/equipment	6	6

Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D2.9N
RUS	12.47/7.2 kV	D2.9NP



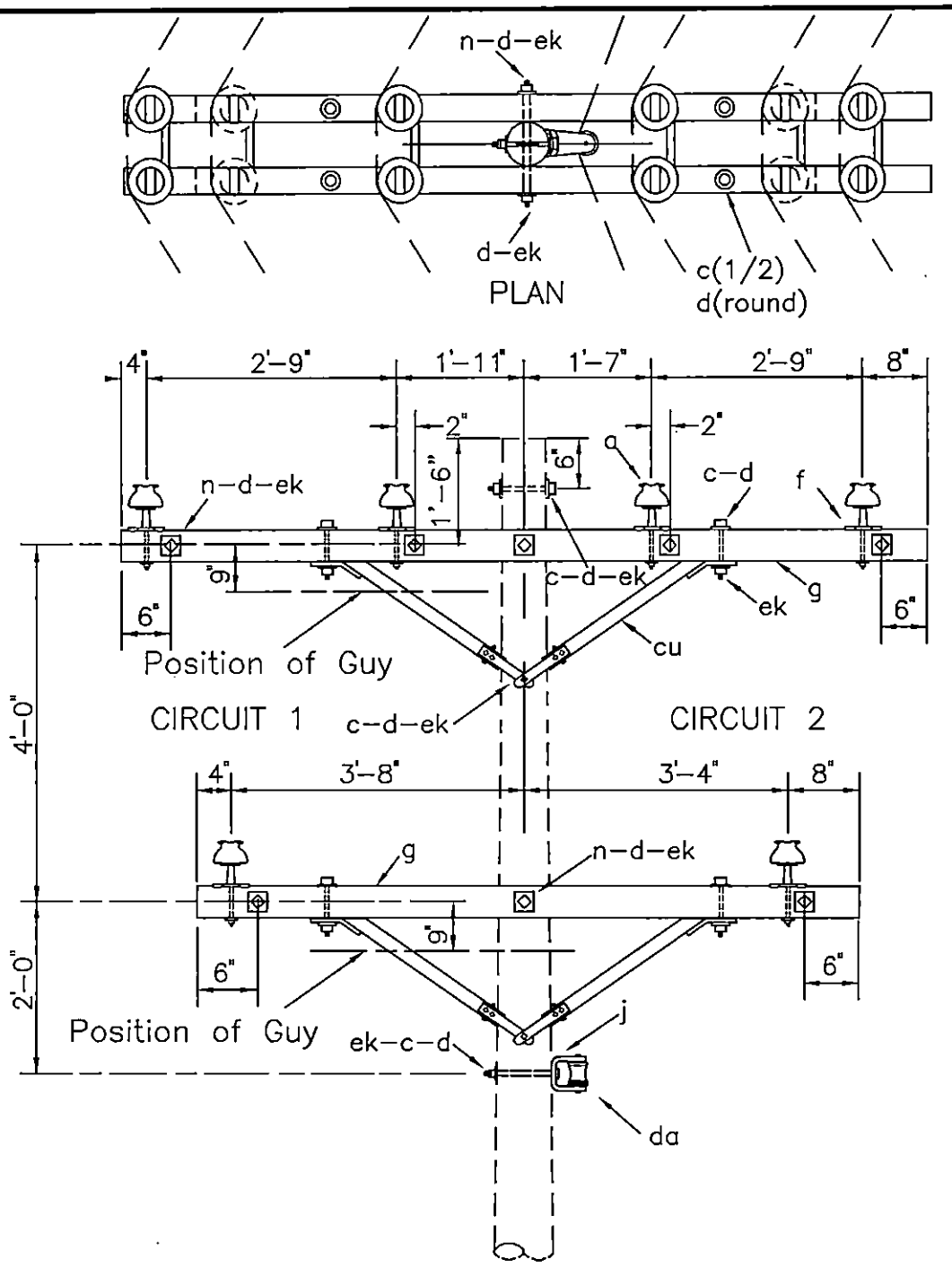
ITEM	QTY	MATERIAL
a	12	Insulator, pin type (12.47/7.2 kV)
c	4	Bolt, machine, 1/2" x req'd length
c	3	Bolt, machine, 5/8" x length
d	4	Washer, round, 1 3/8"
d	36	Washer, square, 2 1/4"
f	12	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0"

ITEM	QTY	MATERIAL
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	6	Bolt,double arming, 5/8"xreq'd length
cu	4	Brace, 28"
cu	2	Brace, wood, 60" span
da	1	Bracket, insulated
ek	27	Locknuts

DESIGN PARAMETERS:
See Table IV

DOUBLE SUPPORT ON CROSSARMS

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D2.91
RUS	12.47/7.2 kV	(DC–C2–1)



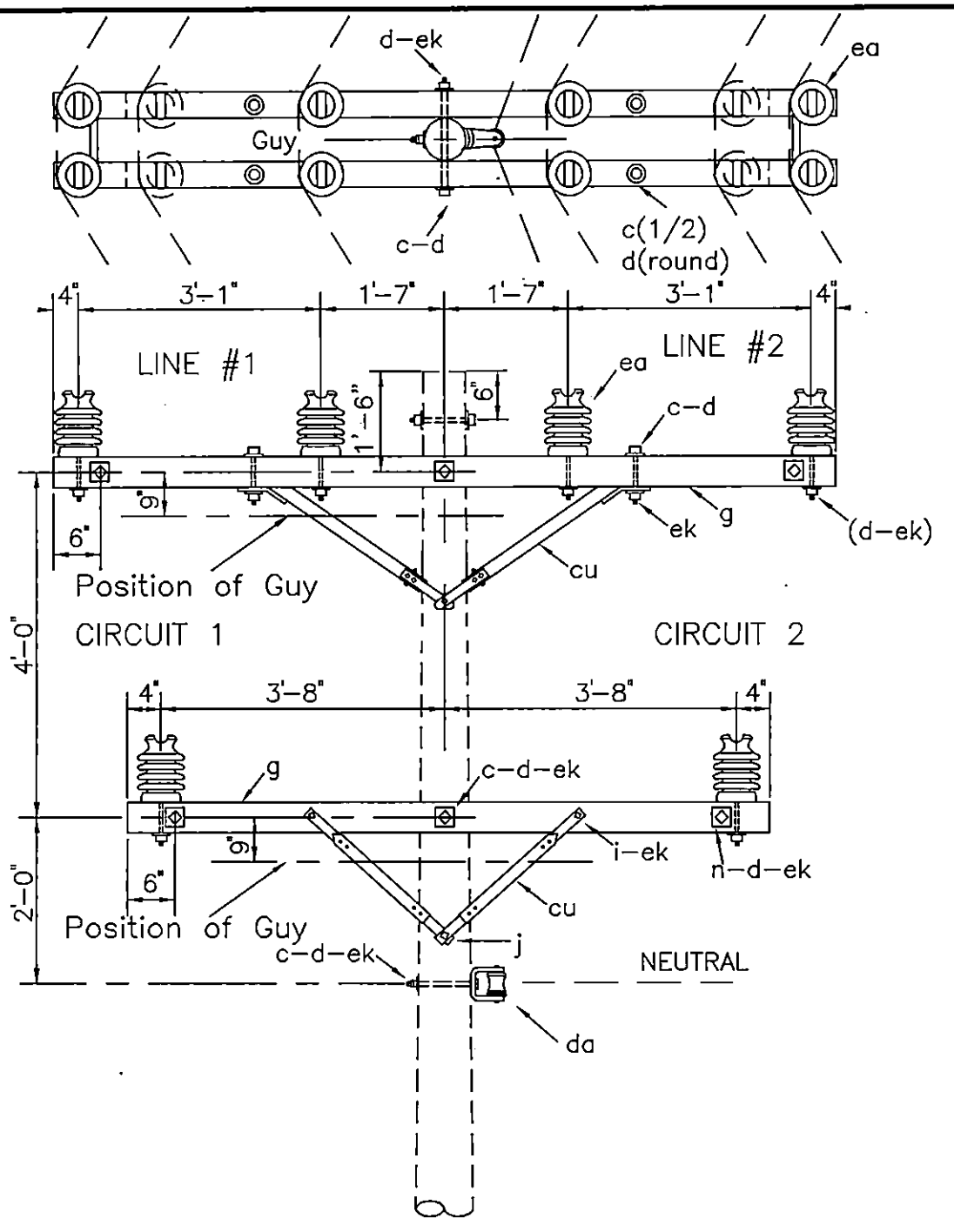
ITEM	QTY	MATERIAL
a	12	Insulator, pin type (12.47/7.2 kV)
c	8	Bolt, machine, 1/2" x req'd length
c	4	Bolt, machine, 5/8" x req'd length
d	8	Washer, round, 1 3/8" diam.
d	33	Washer, square, 2 1/4"
f	12	Pin, .crossarm, steel, clamp type
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0"

ITEM	QTY	MATERIAL
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
n	8	Bolt,double arming,5/8" x req'd length
cu	4	Brace, wood, 60" span
da	1	Bracket, insulated
ek	40	Locknuts

DESIGN PARAMETERS:
See Table V

DOUBLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D2.91L



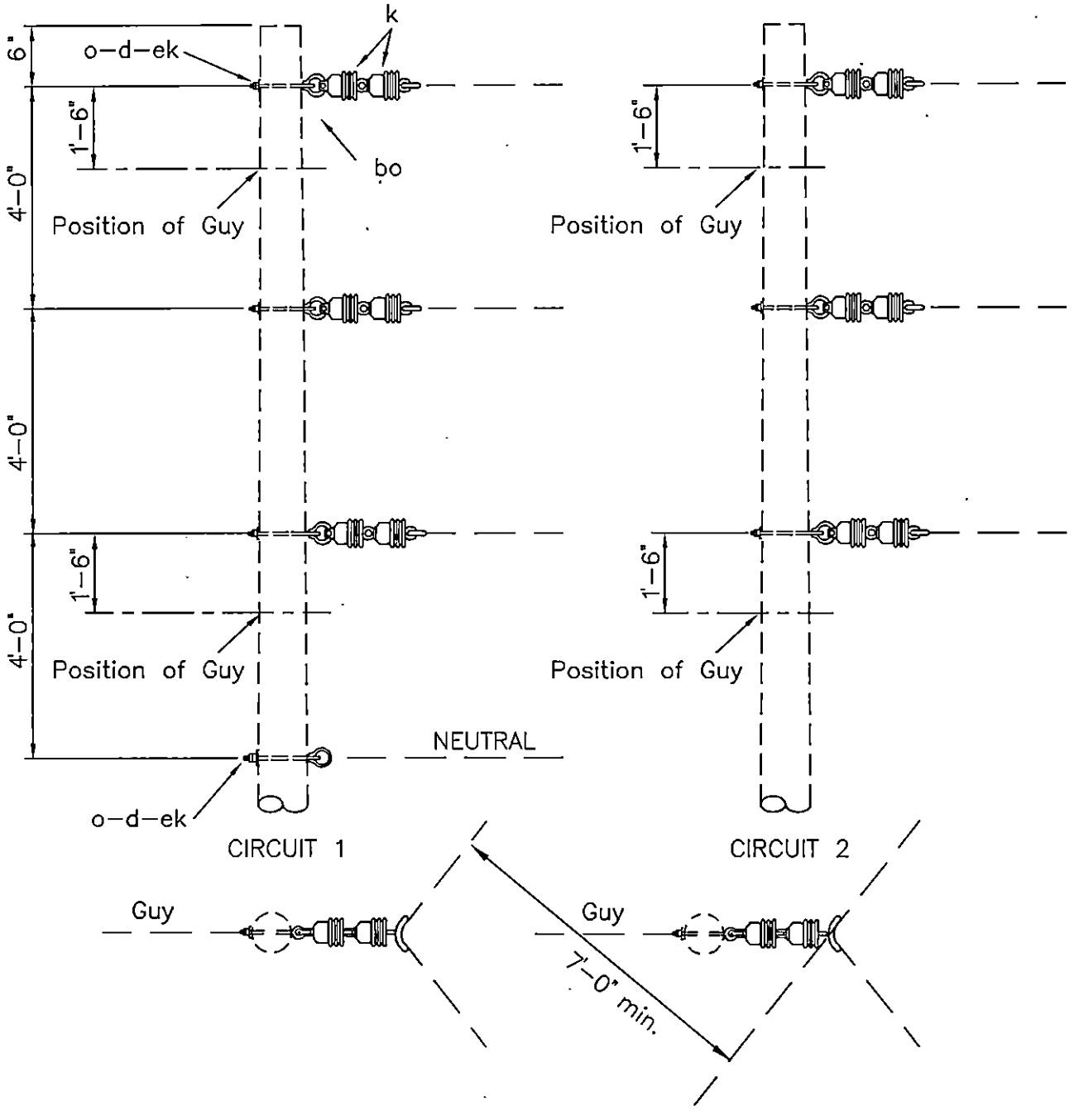
ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	5	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	24	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
i	4	Bolt, carriage, 3/8" x 4 1/2"

ITEM	QTY	MATERIAL
j	2	Screw, lag, 1/2" x 4"
n	4	Bolt,double arming, 5/8"x req'd length
cu	4	Brace, 28"
cu	2	Brace, wood, 60" span
da	1	Bracket, insulated
ea	12	Insulator, post type, (12.47/7.2 kV)
ek	25	Locknuts

DESIGN PARAMETERS:
See Table IV

DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D2.91P



NOTE: 1. The NESC requires a minimum separation of 5 feet between any energized conductor and any guy wire.
2. See guy assembly "E2.1G", "E3.1LG", "E4.3LG".

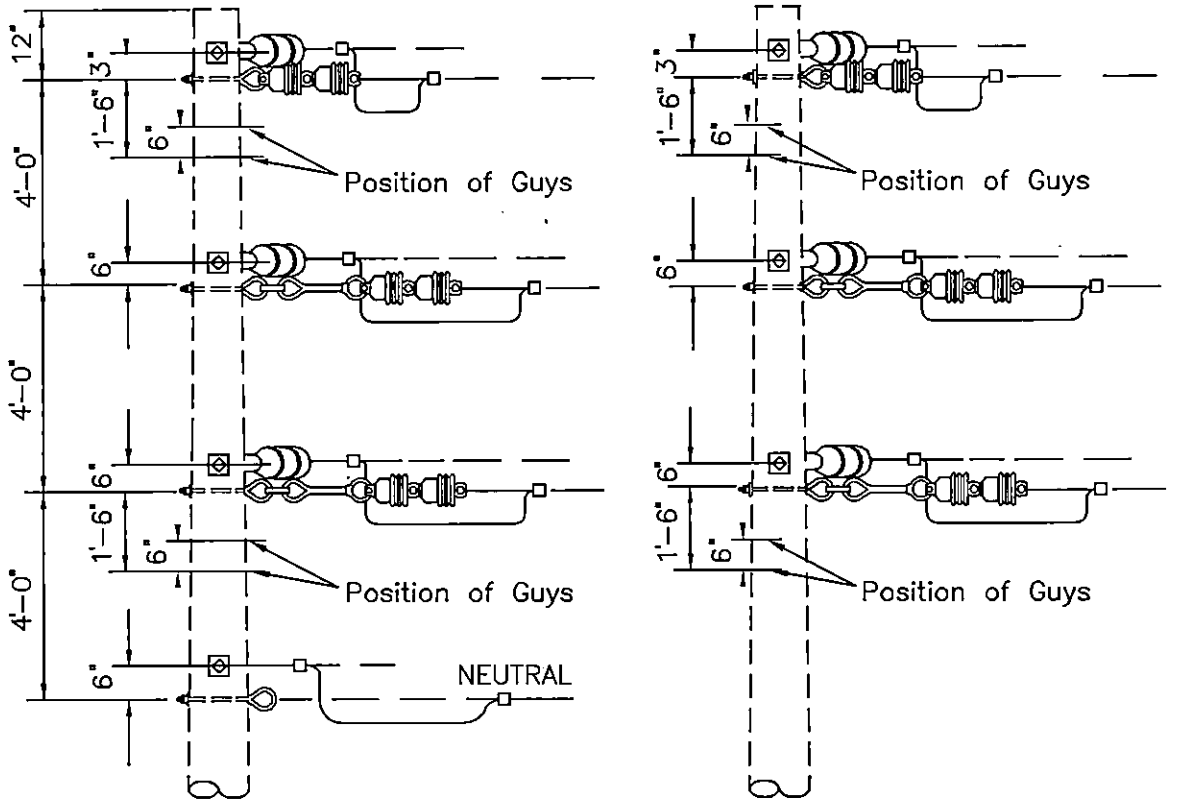
ITEM	QTY	MATERIAL
	2	"C3.1" through "C3.9" Primary Assemblies (Delete material for one neutral subassembly: "o–d–ek")
	(2)	(Use "C3.1L" Primary Assembly for large conductors.) (Delete material for one neutral subassembly)

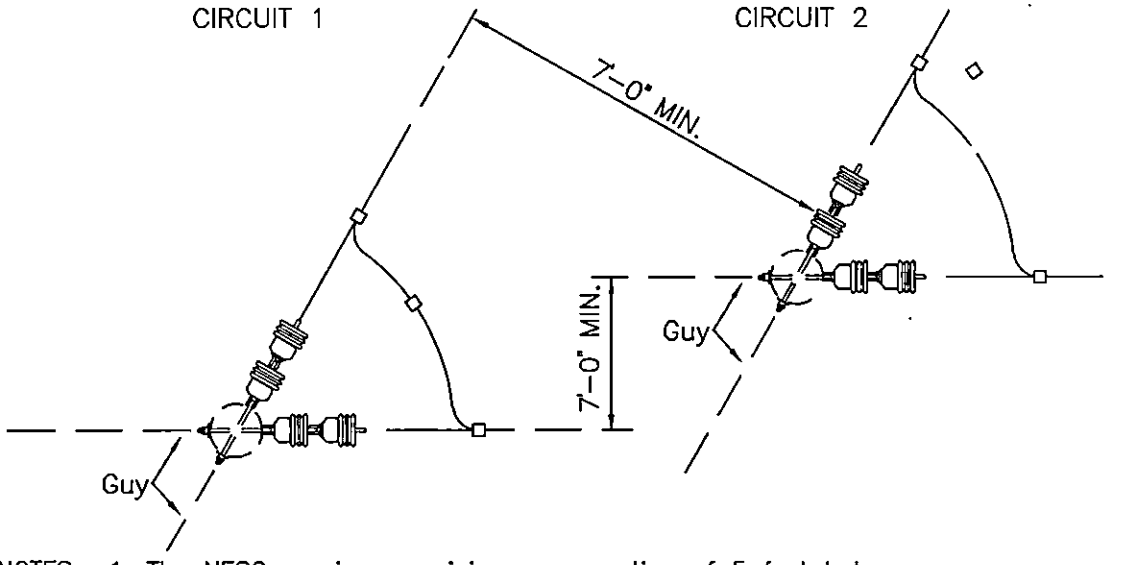
DESIGN PARAMETERS:

See "C3.1 through "C3.9"

SUSPENSION ANGLE GUIDE

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D3.1G





NOTES:
1. The NESC requires a minimum separation of 5 feet between any energized conductor and any guy wire.
2. See guy assembly "E2.G", "E3.1LG" or "E4.3LG".

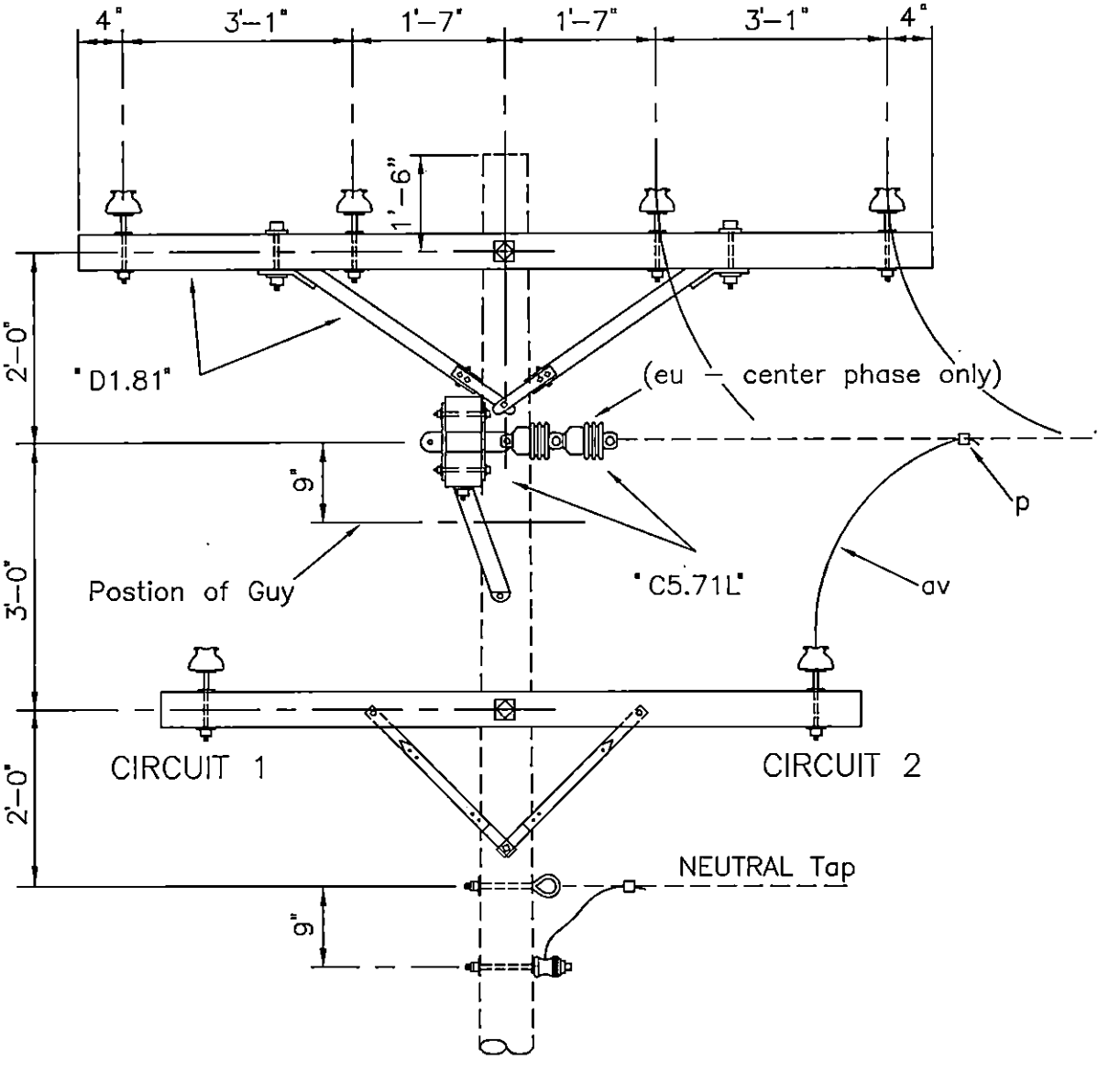
ITEM	QTY	MATERIAL
	4	"C3.1" through "C3.9" Primary Assemblies (Delete material for two neutral subassemblies: "o-d-ek")
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

See: "C4.1G"
"C4.2G"

DEADEND ANGLE GUIDE

APRIL 2005	DOUBLE CIRCUIT PRIMARY	
RUS	12.47/7.2 kV	D4.1G



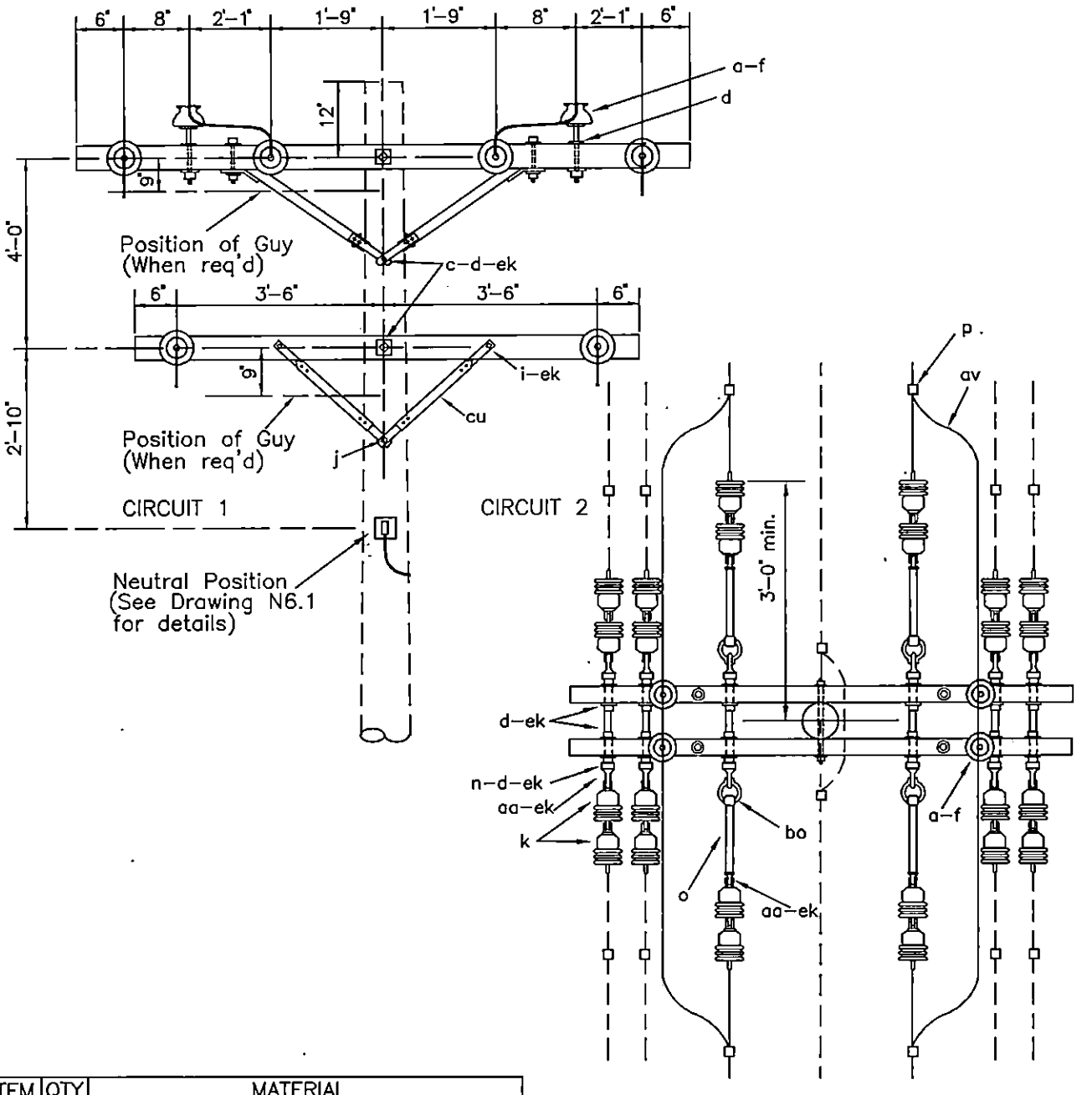
ITEM	QTY	MATERIAL
	1	C5.71L Primary Assembly
	1	D1.81 Primary Assembly
p		Connectors, as required
av		Jumpers, as required
eu		Link, extension, insulated, 12" min.

DESIGN PARAMETERS:

SEE: "C5.71L"
"D1.81"

THREE PHASE TAP GUIDE

APRIL 2005 RUS	DOUBLE CIRCUIT PRIMARY 12.47/7.2 kV	D5.91G



ITEM	QTY	MATERIAL
a	4	Insulator, pin type (12.47/7.2 kV)
c	4	Bolt, machine, 1/2 x req'd length
c	3	Bolt, machine, 5/8" x length
d	4	Washer, round, 1 3/8
d	33	Washer, square, 2 1/4
d	2	Washer, square, 3", curved
f	4	Pin, crossarm, steel, 5/8" x 10 3/4"
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"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"

ITEM	QTY	MATERIAL
k	24	Insulator, suspension, 4 1/2"
n	7	Bolt, double arm, 5/8 x req'd length
o	4	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
aa	18	Nut, eye
av		Jumpers, as req'd
bo	4	Shackle, anchor
cu	2	Brace, wood, 60" span
cu	4	Brace, 28"
ek	47	Locknuts

DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table B (Exhibit 2)

(See Notes on Drawing "C6.52")

DOUBLE DEADENDS ON CROSSARMS (FEEDTHROUGH)

APRIL 2005	DOUBLE CIRCUIT PRIMARY	D6.91
RUS	12.47/7.2 kV	(DC-C8)

INDEX E

GUYING ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
E1.1	(E1-2)	SINGLE DOWN GUY (THROUGH BOLT TYPE)
E1.1L	(E1-3)	SINGLE DOWN GUY - HEAVY DUTY (THROUGH BOLT TYPE)
E1.2	(E3-3)	SINGLE DOWN GUY (WRAPPED TYPE)
E1.3L		SINGLE DOWN GUY - LARGE CONDUCTORS (POLE BAND TYPE)
E1.4	(E2-2)	SINGLE OVERHEAD GUY - (THROUGH BOLT TYPE)
E1.4L	(E2-3)	SINGLE OVERHEAD GUY - HEAVY DUTY (THROUGH BOLT TYPE)
E1.5		GUY STRAIN INSULATOR
E2.1G		DOUBLE DOWN GUY GUIDE - (THROUGH BOLT TYPE)
E3.1LG		THREE DOWN GUY GUIDE - HEAVY DUTY (THROUGH BOLT TYPE)
E4.3LG		FOUR DOWN GUY GUIDE - LARGE CONDUCTORS (POLE BAND TYPES)

CONSTRUCTION SPECIFICATIONS FOR GUYS

The design engineer shall determine the number and type of guys needed to be installed.

Guys shall be attached to the pole as shown in the construction drawings and shall be installed before conductors are strung. Deadend structure guys shall be installed, as nearly as practicable, in line with the pull of conductors. Guys that bisect line angles (bisector guys) at line angle structures shall be installed as nearly as practicable to the true bisector of the line angle.

The distance from the pole to the anchor rod (the guy lead) is recommended to be the same distance as from the ground to the guy attachment on the pole. This 1:1 guy slope is especially recommended on deadend structures.

Written permission from RUS is required prior to the installation of sidewalk guys and push poles. RUS will consider the use of sidewalk guys and push poles on a case-by-case basis.

The NESC requires that the grade of construction of guys be the same or higher as the grade of construction of: (1) the pole or structure to which they are attached, or (2) the highest grade required for any conductors supported by the pole or structure.

The permitted loads shown in the design parameters for guying assemblies have already been calculated by RUS by multiplying a strength factor of 0.85 to the RUS designated loading (or strength) of the guying assemblies. The strength factor of 0.85 was used by RUS as an additional safety factor and is based on the spirit of the rules of NESC Section 261 and NESC Table 261-1A.

The permitted loads shown on the guy assembly drawings shall be reduced by 25 percent for NESC Grade B construction.

The permitted loads on guy wires shall be determined by multiplying the rated breaking strength of the guy wire by the strength factor of 0.90 given in NESC Table261-1A.

Guy strength that must be provided is determined by totaling all loads expected to be exerting tension on the guy assembly and guy wire(s) and multiplying this total load by the appropriate overload factors according to NESC Rule 253 and as shown in NESC Table 253-1.

CONSTRUCTION SPECIFICATIONS FOR GUYS *(cont.)*

If the separation on the pole between any guy attachment bolt or hardware and any phase conductor attachment bolt is less than 15 inches, then a guy strain insulator assembly (E5.1) shall be installed at the top of the guy and the guy wire shall be effectively grounded below the insulator by bonding the guy wire to the system neutral and the pole ground if present. Alternatively, an insulated extension link (item "eu") shall be installed in the primary conductor tap, deadend, or suspension angle subassembly where it attaches to the pole.

The purpose of this specification is to maintain minimum basic insulation impulse levels (BIL) and to increase clearances for line workers.

Down guy and overhead guy wires shall be effectively grounded in accordance with Rule 215C2 of the NESC and in accordance with the RUS assembly drawings. Effectively grounded guy wires provide a direct path to ground and thus decrease the chances of electric shock, serious injury and even death to a person standing on the ground and making contact with a guy wire that has accidentally become energized by means of contact with a primary, secondary, service or neutral conductor. Furthermore, effectively grounded guy wires bonded to anchor rods decrease the overall system impedance to ground and improve the chances of primary overcurrent protection devices to operate as designed.

Down guy and overhead guy wires may be insulated in portions of a borrower's service area if all 5 of the following conditions are met:

(1) The borrower: (1) has records documenting that anchors or anchor rods have failed due to corrosion after less than 20 years of service, or (2) has performed and documented a study that has determined that insulating down guy wires is an adequate and economical method to mitigate predicted premature corrosion of anchors and anchor rods in the service area covered by the study. Such studies or records shall be made available for RUS review upon request;

(2) Insulated down guys and their component parts shall be in compliance with all of the applicable rules of the NESC;

(3) Only fiberglass guy strain insulators (item "w") shall be used to insulate guy wires and the insulators shall be installed at the top of the guy wire as depicted in assembly drawing E1.5;

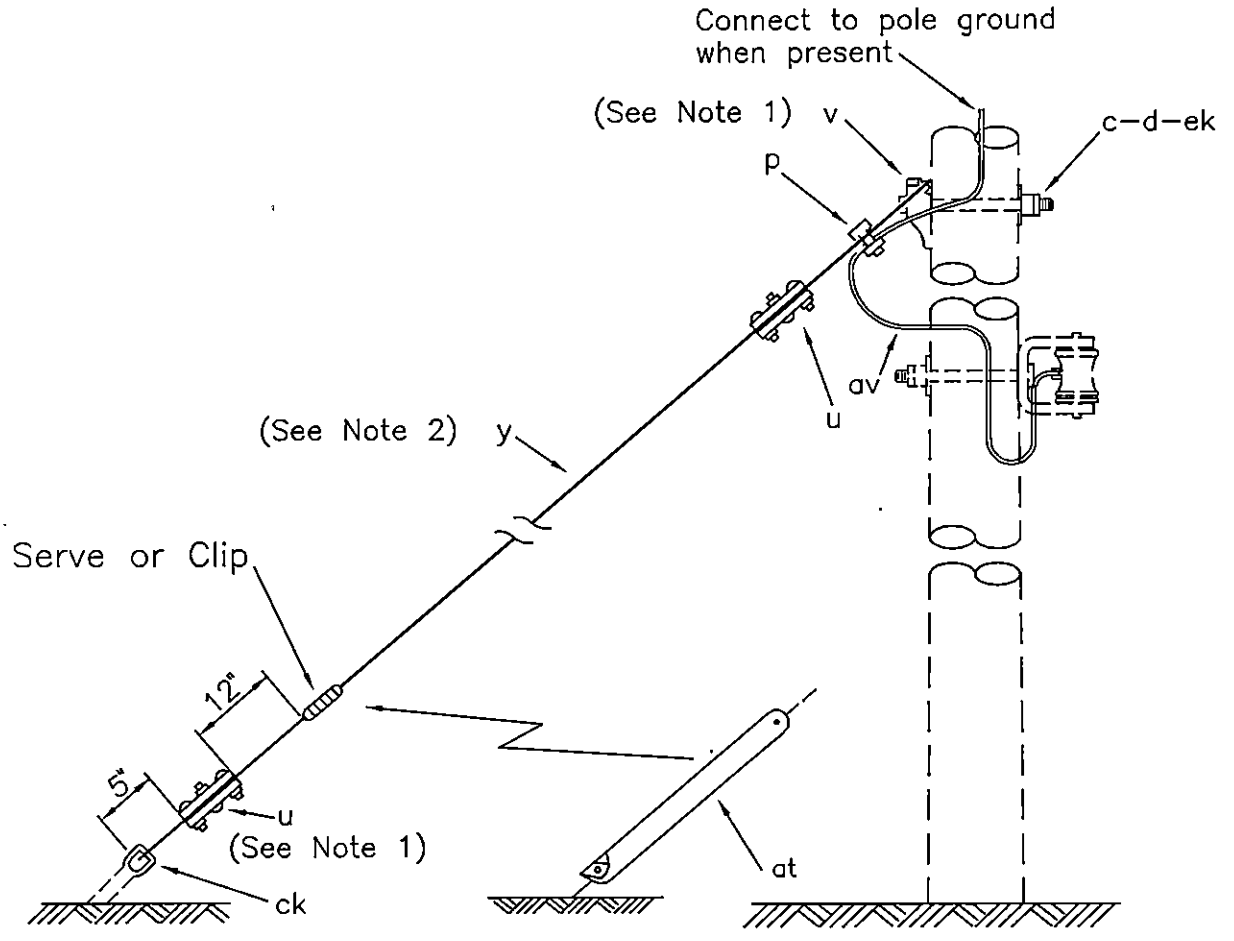
(4) RUS required bonding clamps are securely installed between the anchor rod and the guy wire attached to the anchor rod; and

(5) The borrower has a special regimented maintenance program in place that periodically (as experience indicates) checks the insulation integrity of installed guy insulators.

CONSTRUCTION SPECIFICATIONS FOR GUYS *(cont.)*

Down guys installed on tangent, double deadend assemblies (e.g., A6.1) shall have a minimum clearance to the neutral conductor of 6 inches and shall have a guy strain insulator(s) installed at the top of the guy that extends from the pole attachment to at least 12 inches past the neutral conductor.[1] Alternatively, two down guys without guy strain insulators may be installed, one on each side of the neutral, such that clearance between each down guy wire and the neutral conductor is a minimum of 12 inches. For either of the above designs, the down guy wire shall be effectively bonded to ground in accordance with RUS specifications and the rules of the NESC.

[1] For example, the 6-inch clearance can be met for a down guy with a 30-foot guy lead that is attached to the pole 30 feet above the ground and 2.5 feet above the neutral by installing (offsetting) the guy anchor 6 feet perpendicular to the line of the neutral conductor.



NOTES:

1. Other accepted and equivalent guy deadend (item "u") and attachment (item "v") material may be substituted for the ones shown.
2. Some types of guy attachments use 2 bolts and washer or lag screw (item"j"), change materials accordingly.
3. Specify guy wire size, type and required length.

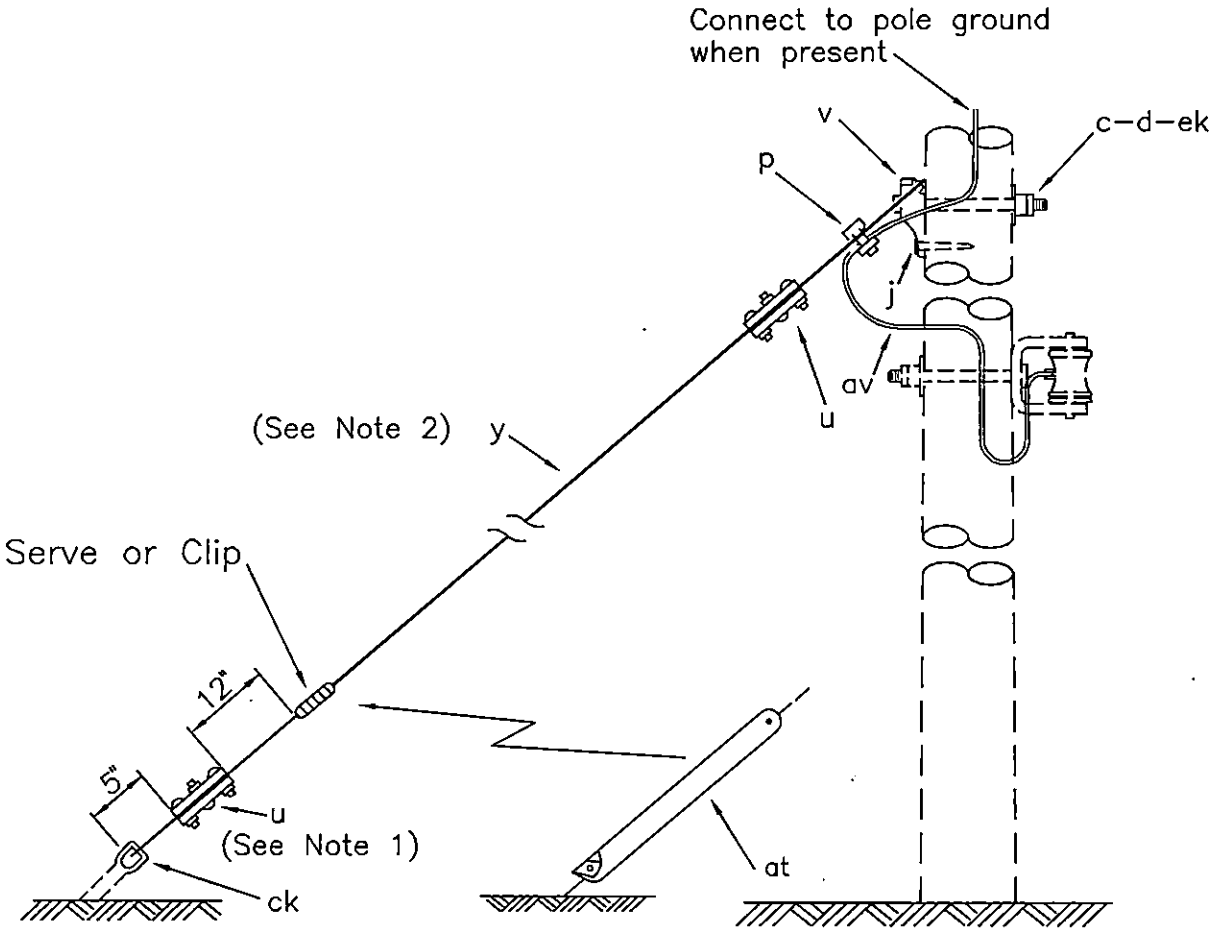
ITEM	QTY	MATERIAL
c	1	Bolt, machine, 5/8" x req'd length
d	1	Washer, 3" square, curved
p		Connectors, guy bond and as req'd
u	2	Deadend for guy strand (See Note 1)
v	1	Guy attachment (See Note 1)
y		Guy wire, as req'd (See Note 3)
at	1	Guy marker
av		Jumpers, as req'd
ck	1	Clamp, anchor bonding
ek	1	Locknuts

DESIGN PARAMETERS:

PERMITTED LOAD IS LESSER OF:
6,600 lbs (in any direction)
or 90% of RATED BREAKING STRENGTH OF GUY WIRE

SINGLE DOWN GUY (THROUGH BOLT TYPE)

APRIL 2005		E1.1
RUS		(E1–2)



NOTES:

1. Other accepted and equivalent, heavy duty, guy deadend material (item "u") may be substituted for the ones shown.
2. Pole eye plate guy attachment and anchor shakle (item "bo") may be used.

ITEM	QTY	MATERIAL
c	1	Bolt, machine, 3/4" x req'd length
d	1	Washer, square, 4", curved
p		Connectors, guy bond and as req'd
j	1	Screw, lag, 1/2" x 4"
u	2	Deadend for guy strand, heavy duty
v	1	Guy attachment, guy hook type
y		Guy wire, as req'd (See Note 4)
at	1	Guy marker
av		Jumpers, as req'd
ck	1	Clamp, anchor bonding
ek	1	Locknuts

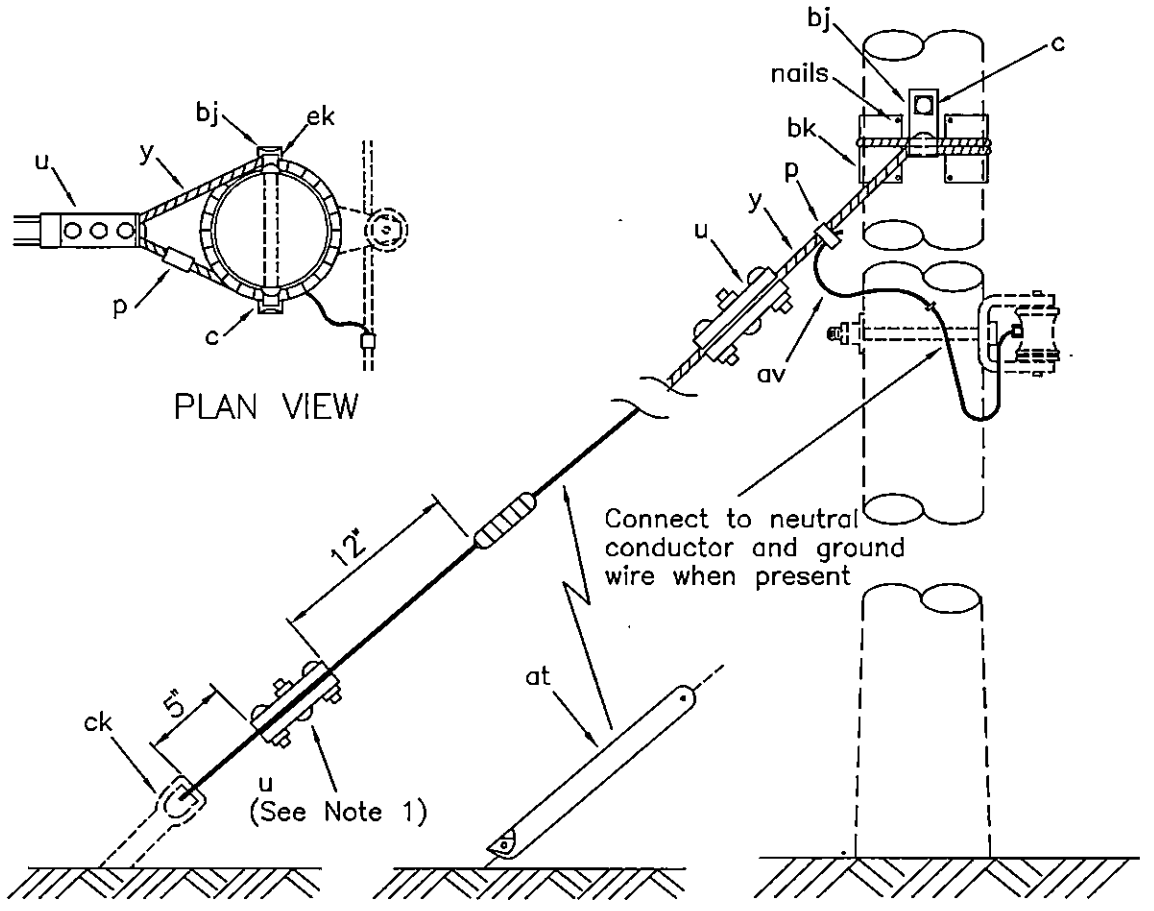
3. 2–5/8 machine bolts and 2–3 square curved washers may be used to install guy attachment.
4. Specify guy wire size, type and required length.

DESIGN PARAMETERS:

PERMITTED LOAD IS LEAST OF:
8,500 lbs (in any direction)
or 90% of RATED BREAKING STRENGTH OF GUY WIRE

SINGLE DOWN GUY – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005		E1.1L
RUS		(E1–3)



NOTES:

1. Other accepted and equivalent, heavy duty, guy clamps, (item "u"), may be substituted for the 3–bolt clamps shown
2. Specify guy wire size, type and required length.

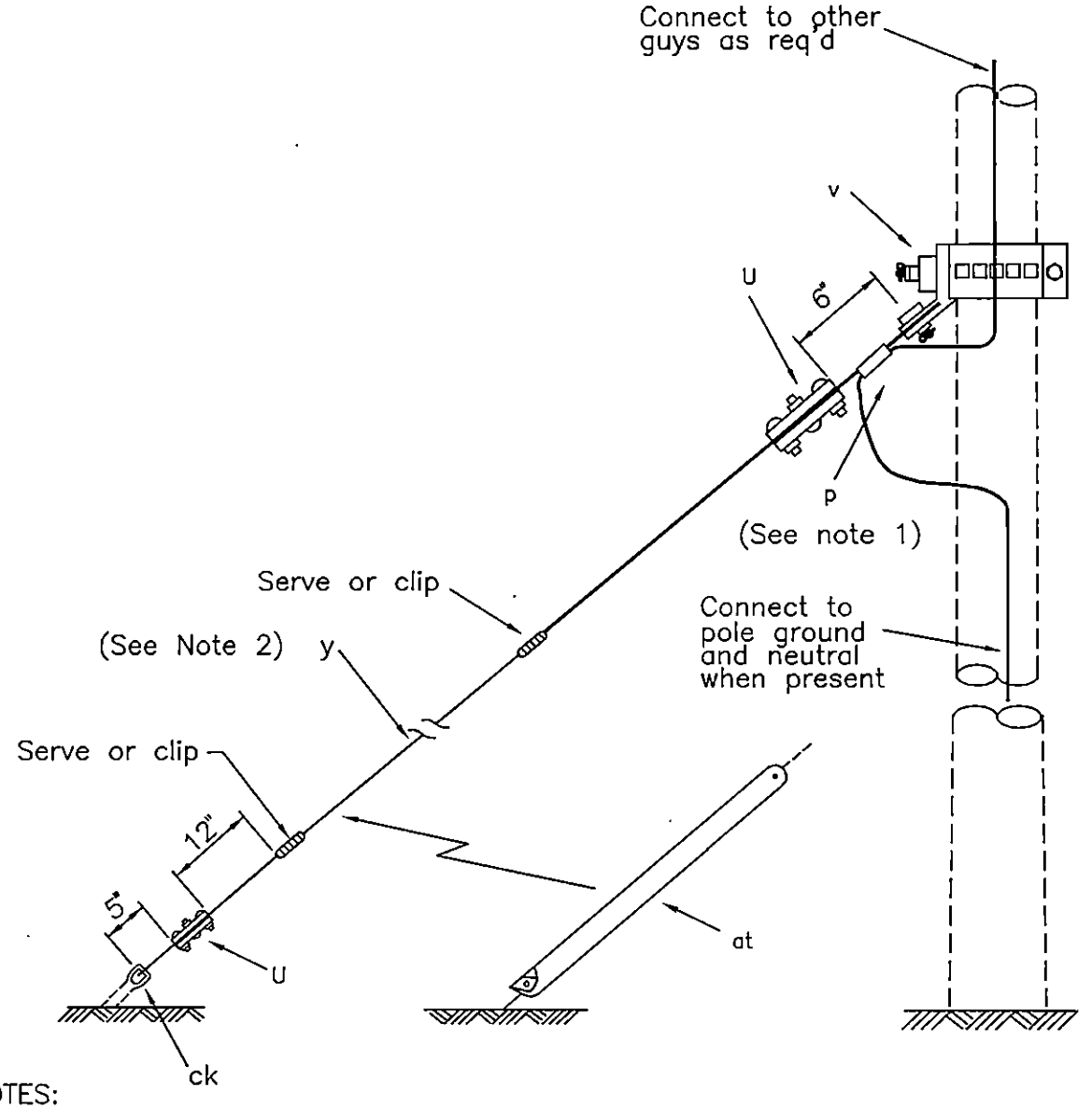
ITEM	QTY	MATERIAL
c	1	Bolt, machine, 5/8" x req'd length
p		Connectors, guy bond and as req'd
u	2	Deadend for guy strand, heavy duty
y		Guy wire, as req'd (See Note 2)
at	1	Guy marker
av		Jumpers, as req'd
bj	2	Guy hook
bk	2	Guy Plate, 4" x 8", 14 gauge
ck	1	Clamp, anchor rod bonding
ek	1	Locknuts
	8	Nails, 8 penny galv.

DESIGN PARAMETERS:

PERMITTED LOAD =
90% of RATED BREAKING
STRENGTH OF GUY WIRE

SINGLE DOWN GUY (WRAPPED TYPE)

APRIL 2005		E1.2
RUS		(E3–3)



NOTES:

1. Other accepted and equivalent, heavy duty, guy deadend material (item "u") may be substituted for the ones shown.
2. Specify guy wire size, type and required length.

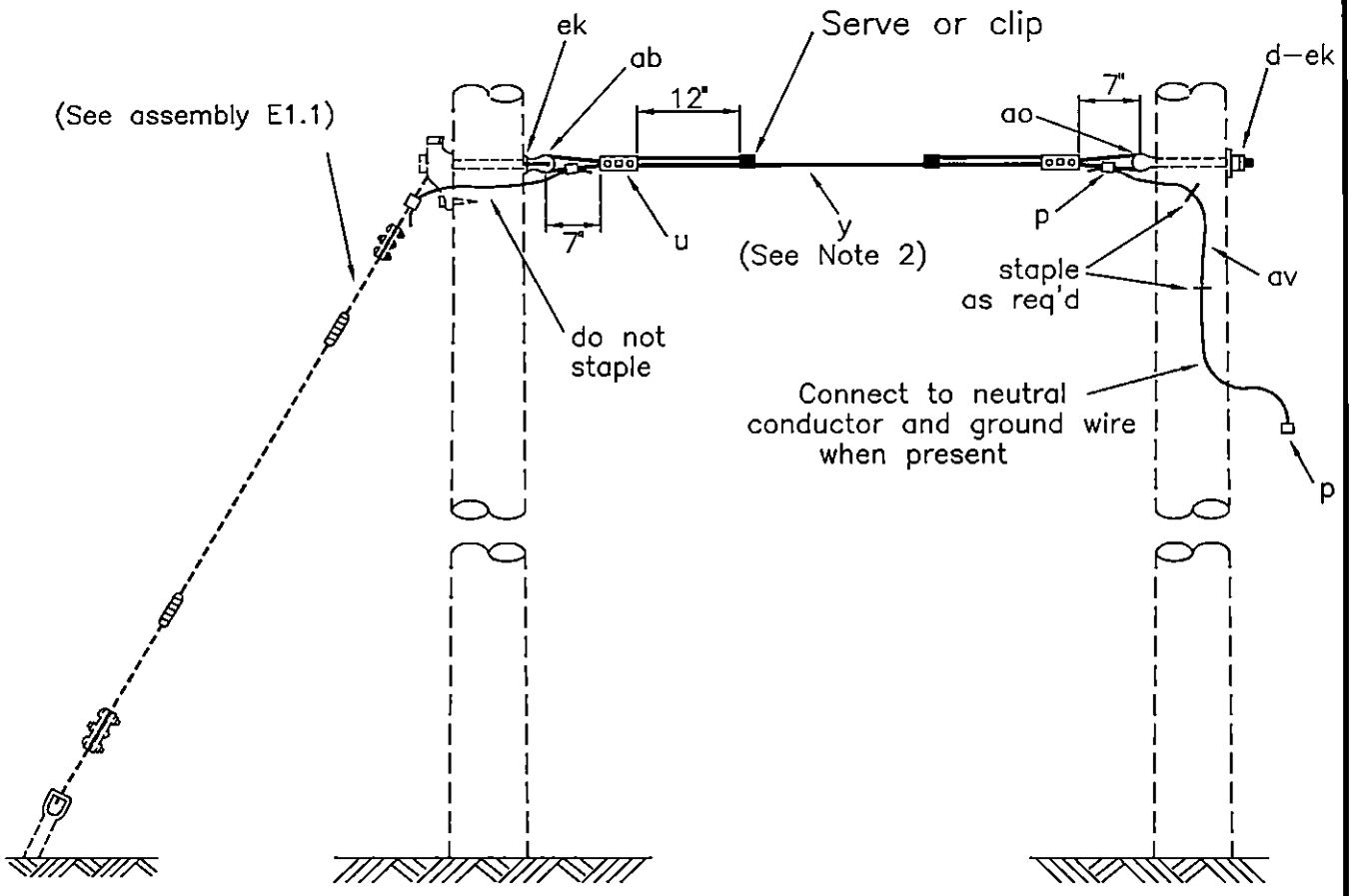
ITEM	QTY	MATERIAL
p		Connectors, guy bond as req'd
u	2	Deadend for guy strand, heavy duty
v	1	Guy attachment, pole band type
y		Guy wire, as req'd (See Note 2)
at	1	Guy marker
av		Jumpers, as req'd
ck	1	Clamp, anchor bonding

DESIGN PARAMETERS:

PERMITTED LOAD IS LESSER OF:
8,500 lbs. (in any direction)
or 90% of RATED BREAKING STRENGTH OF GUY WIRE

SINGLE DOWN GUY – LARGE CONDUCTORS (POLE BAND TYPE)

APRIL 2005		
RUS		E1.3L



NOTES:

1. Other accepted and equivalent, guy deadends (item "u"), may be substituted for the 3–bolt clamps shown.
2. Specify guy wire size, type and required length.
3. Wrapped type overhead guys may be used. (See drawing E1.2 as guide)

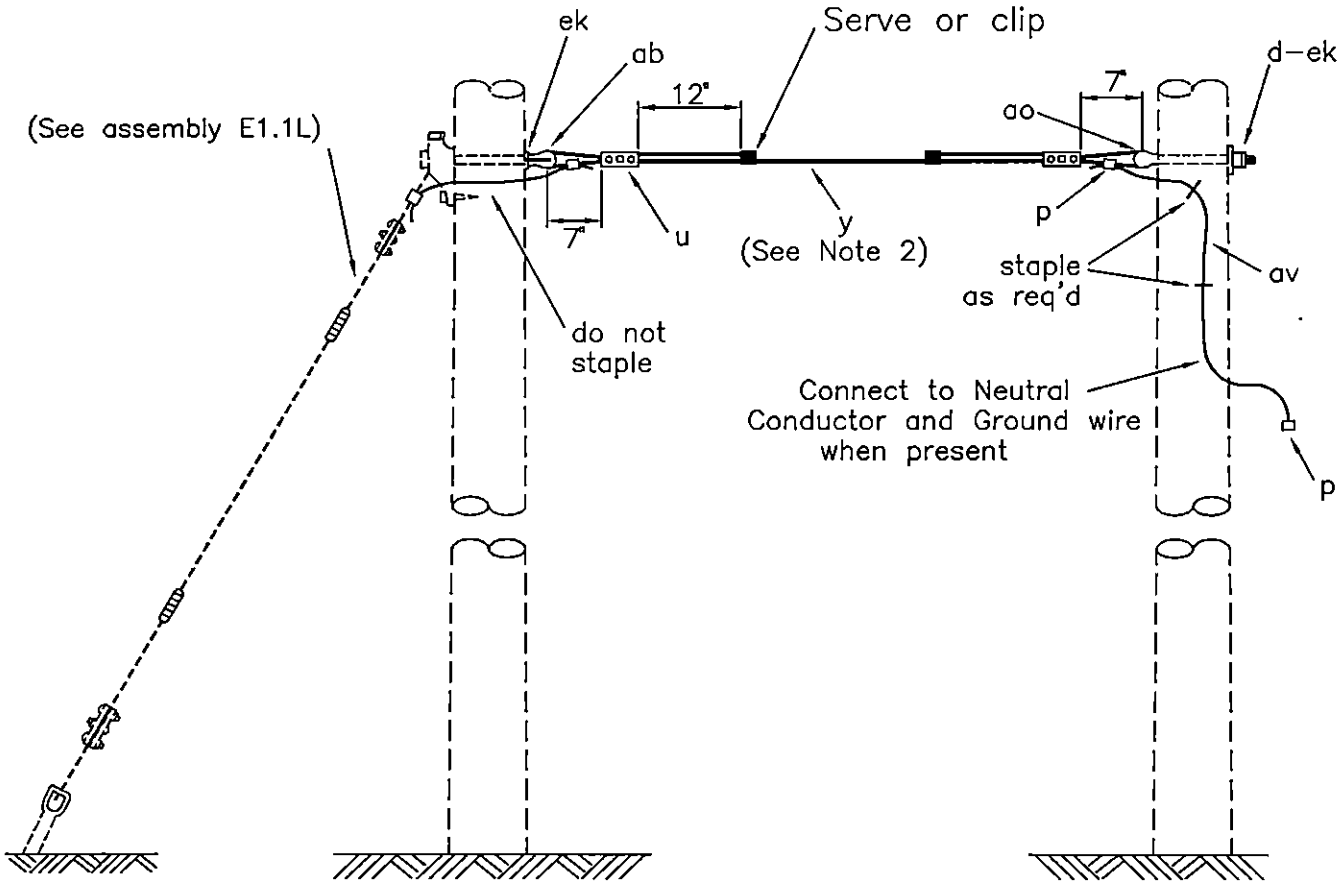
ITEM	QTY	MATERIAL
d	1	Washer, 3" square, curved
p		Connectors, guy bond and as req'd
u	2	Deadend for guy strand, heavy duty
y		Guy wire, as req'd (See Note 2)
ab	1	Nut, thimble eye type, 5/8"
ao	1	Bolt, thimble eye, 5/8"x req'd length
av		Jumpers, as req'd
ek	2	Locknuts

DESIGN PARAMETERS:

PERMITTED LOAD IS LESSER OF:
6,600 lbs. (HORIZONTAL)
or 90 % of RATED BREAKING STRENGTH OF GUY WIRE

SINGLE OVERHEAD GUY (THROUGH BOLT TYPE)

APRIL 2005		E1.4
RUS		(E2–2)



NOTES:

1. Other accepted and equivalent, guy deadends (item "u"), may be substituted for the 3–bolt clamps shown.
2. Specify guy wire size, type and required length.
3. Wrapped type overhead guys may be used. (See drawing E1.2 as guide)
4. Assembly requires 3/4" bolt on down guy assembly attachment.

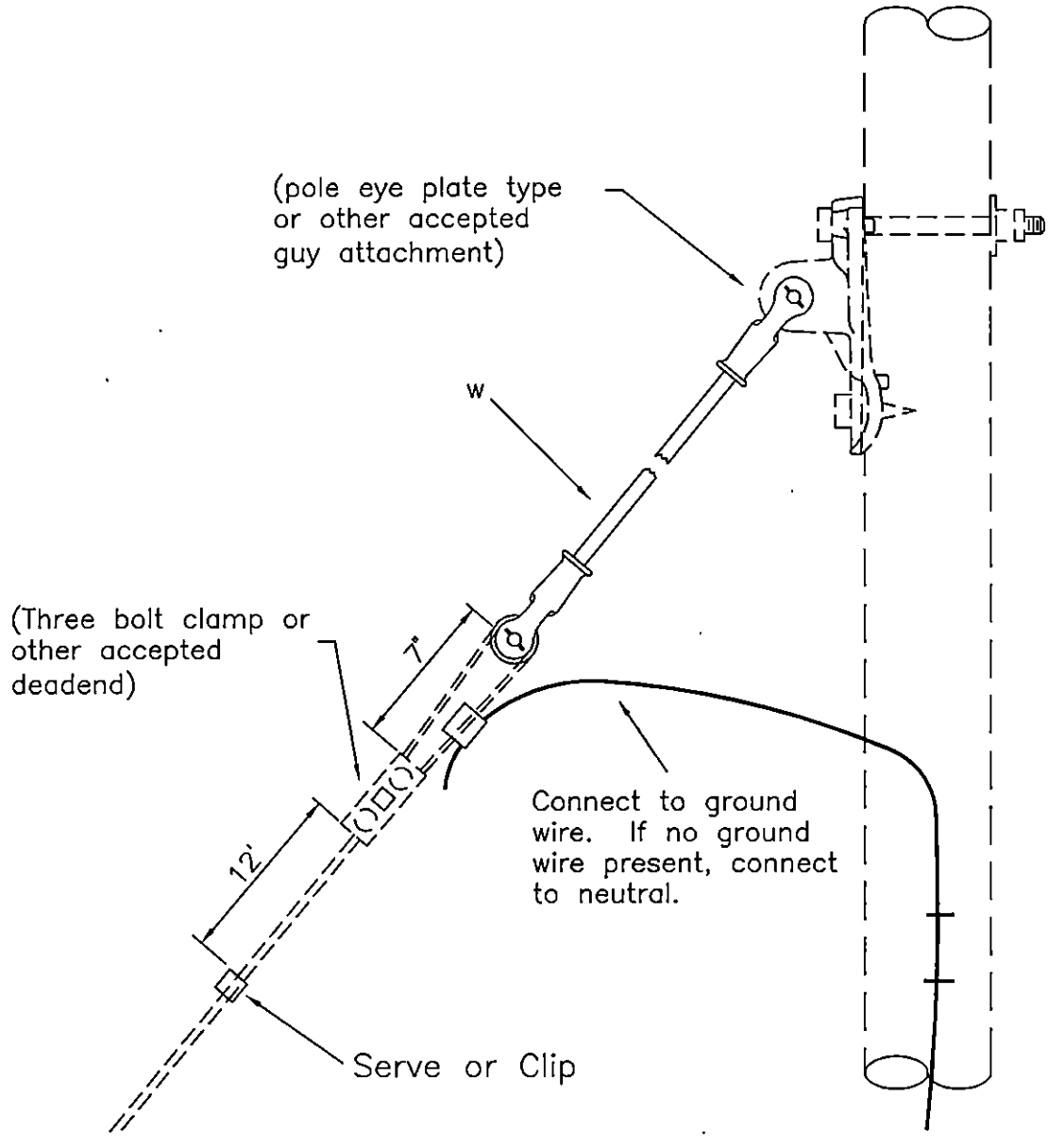
ITEM	QTY	MATERIAL
d	1	Washer, 4" square, curved
p		Connectors, guy bond and as req'd
u	2	Deadend for guy strand, heavy duty
y		Guy wire, as req'd (See Note 2)
ab	1	Nut, thimble eye type, 3/4"
ao	1	Bolt, thimble eye, 3/4"x req'd length
av		Jumpers, as req'd
ek	2	Locknuts

DESIGN PARAMETERS:

PERMITTED LOAD IS LESSER OF:
8,500 lbs. (HORIZONTAL)
or 90 % of RATED BREAKING STRENGTH OF GUY WIRE

SINGLE OVERHEAD GUY – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005		E1.4L (E2–3)
RUS		



NOTE: Ground wire jumper may be attached to down guy wire below guy deadend connector.

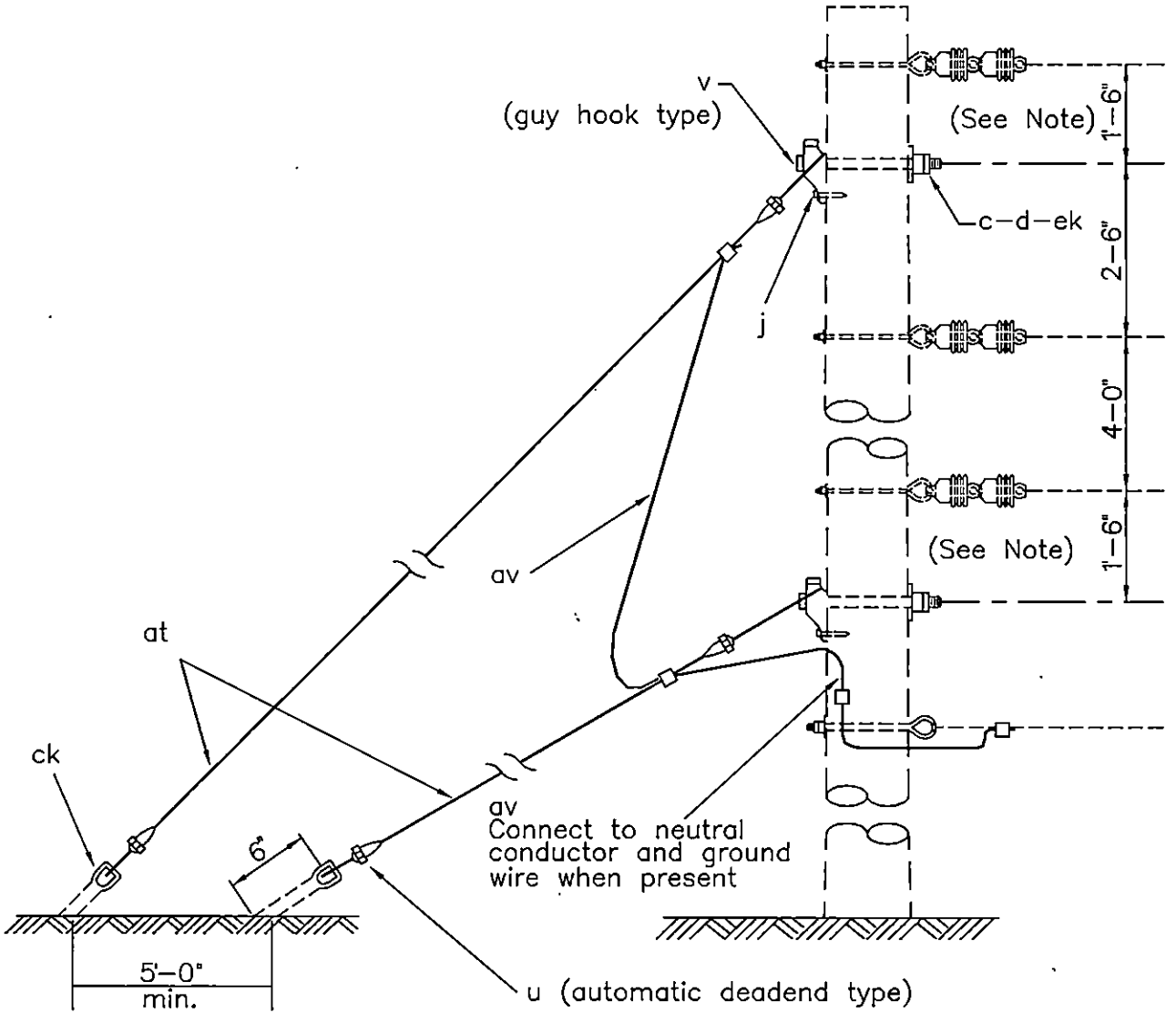
ITEM	MATERIAL
W	Insulator, guy strain

DESIGN PARAMETERS:

PERMITTED LOAD = 8,500 lbs.

GUY STRAIN INSULATOR

APRIL 2005		
RUS		E1.5



NOTES:
Position guys as shown on applicable pole top assembly unit if different than shown here. If distance between primary assembly and down guy is less than 12", install (minimum 12") guy strain insulator,(item "w"), or insulated extension link, (item "eu"), (mininum 12"), in primary assembly.

The following single down guy assemblies may be used, (multiply material quantities by 2):

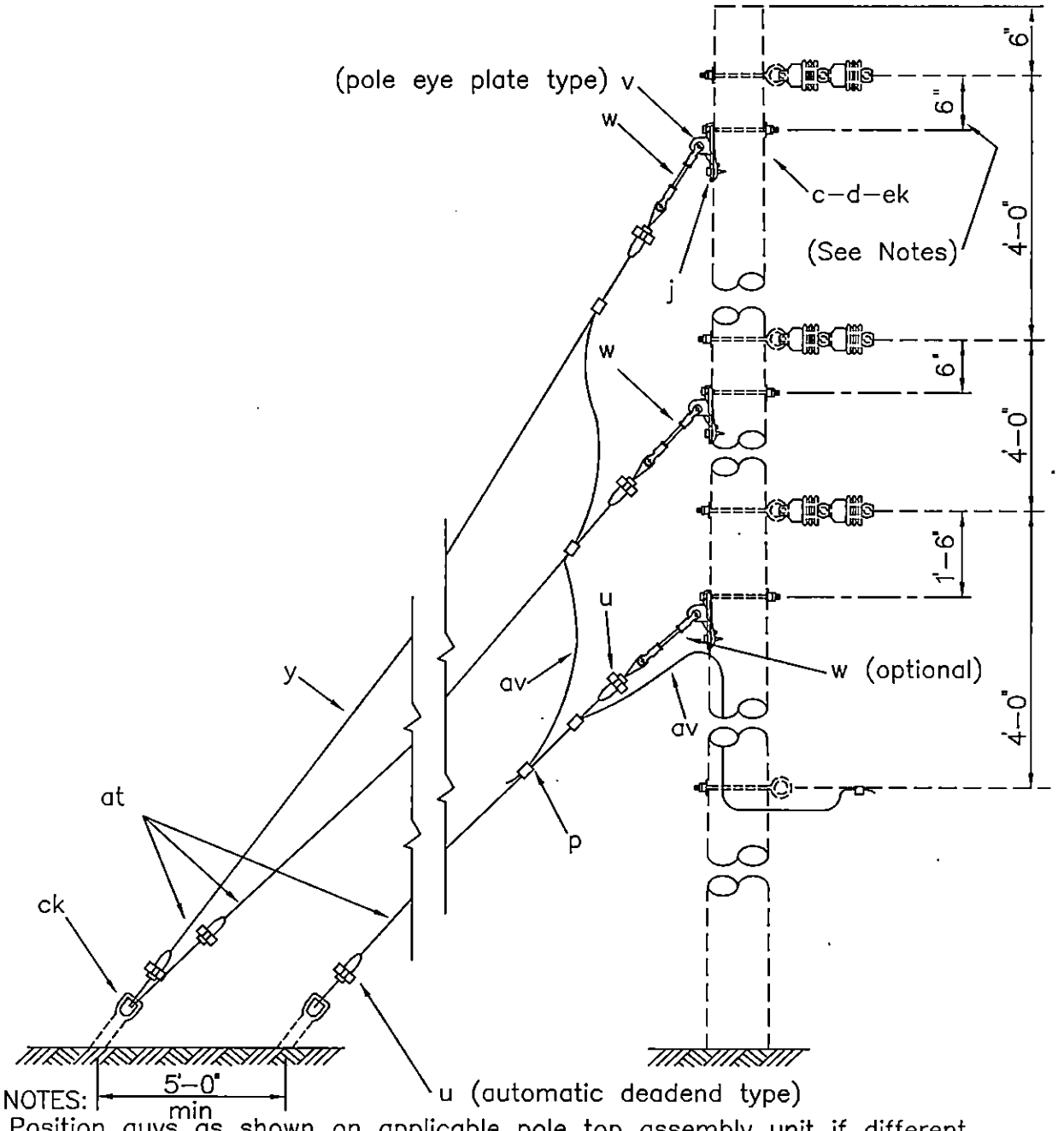
E1.1:	Through Bolt Type (shown above)
E1.1L:	Through Bolt Type, Heavy Duty
E1.2:	Wrapped Type
E1.3L:	Pole Band Type

DESIGN PARAMETERS:

(See Single Down Guy drawings)

DOUBLE DOWN GUY GUIDE (THROUGH BOLT TYPE)

APRIL 2005		
RUS		E2.1G



NOTES:

Position guys as shown on applicable pole top assembly unit if different than shown here. If distance between primary assembly and down guy is less than 12", install (minimum 12") guy strain insulator, (item "w"), or insulated extension link, (item "eu"), (mininum 12"), in primary assembly. The following single down guy assemblies may be used, (multiply material quantities by 3):

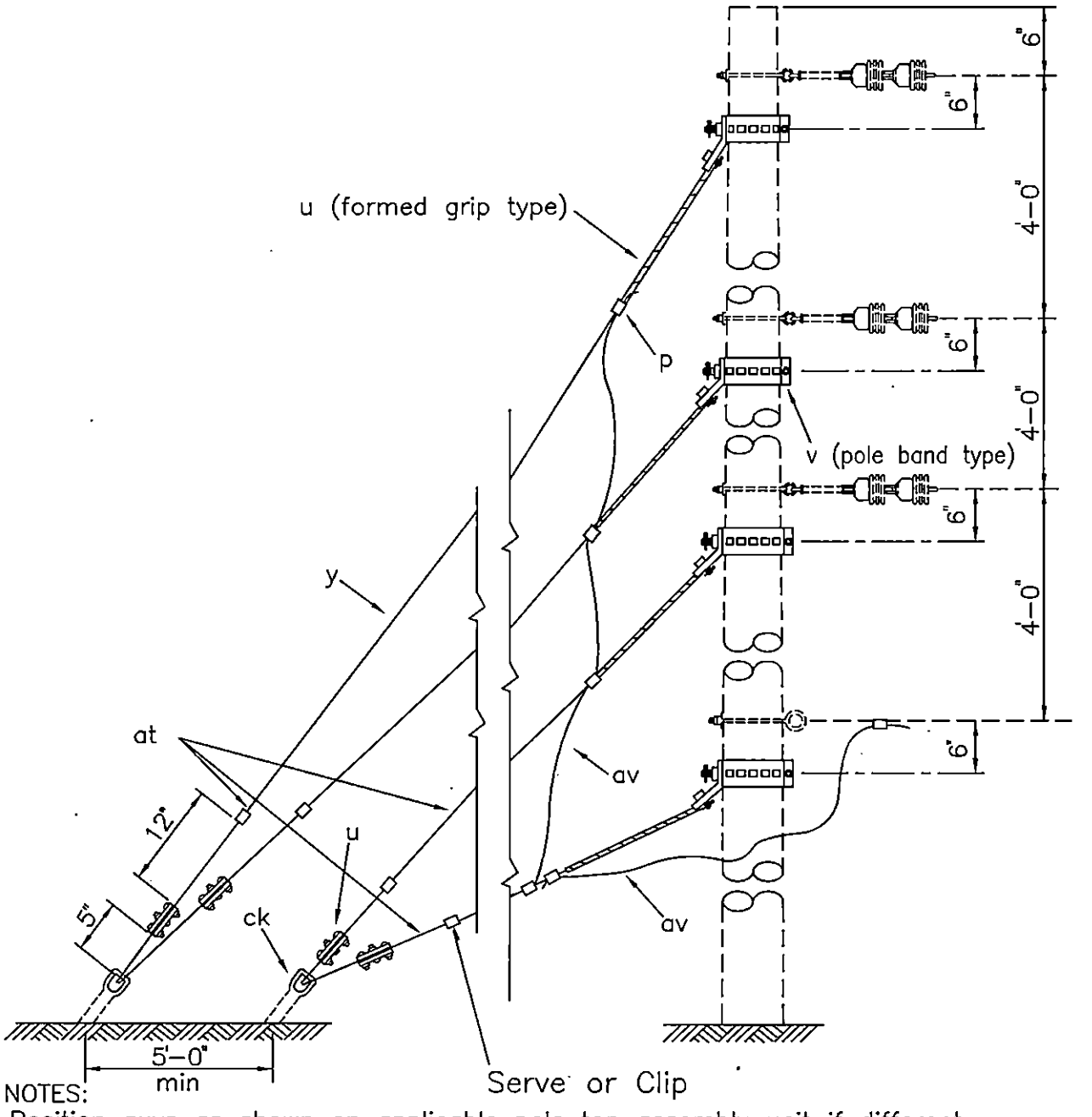
E1.1:	Through Bolt Type
E1.1L:	Through Bolt Type, Heavy Duty (shown above)
E1.2:	Wrapped Type
E1.3L:	Pole Band Type

DESIGN PARAMETERS:

(See Single Down Guy drawings)

THREE DOWN GUY GUIDE – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005		
RUS		E3.1LG



NOTES:

Position guys as shown on applicable pole top assembly unit if different than shown here. If distance between primary assembly and down guy is less than 12", install (minimum 12") guy strain insulator, (item "w"), or insulated extension link, (item "eu"), (mininum 12"), in primary assembly.

The following single down guy assemblies may be used, (multiply material quantities by 4):

- E1.1 : Through Bolt Type
- E1.1L: Through Bolt Type, Heavy Duty
- E1.2 : Wrapped Type
- E1.3L: Pole Band Type (Shown Above)

DESIGN PARAMETERS:

(See Single Down Guy drawings)

FOUR DOWN GUY GUIDE – LARGE CONDUCTORS (POLE BAND TYPE)

APRIL 2005		
RUS		E4.3LG

INDEX F

ANCHOR ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
F1.6	(F1-1)	EXPANDING TYPE ANCHORS
F1.8	(F1-2)	
F1.10	(F1-3)	
F1.12	(F1-4)	
F2.6	(F1-1S)	SCREW ANCHORS (POWER INSTALLED)
F2.8	(F1-2S)	
F2.10	(F1-3S)	
F2.12	(F1-4S)	
F3.6	(F1-1P)	PLATE TYPE ANCHORS
F3.8	(F1-2P)	
F3.10	(F1-3P)	
F3.12	(F1-4P)	
F4.1	(F4-1E)	SERVICE ANCHORS
F4.2	(F4.1S)	
F5.1	(F5-1)	ROCK ANCHORS
F5.2	(F5-2)	
F5.3	(F5-3)	
F6.6	(F6-1)	SWAMP ANCHORS (POWER INSTALLED)
F6.8	(F6-2)	
F6.10	(F6-3)	

CONSTRUCTION SPECIFICATIONS FOR ANCHORING

As much as practicable, anchors and rods shall be installed in line with, and in the opposite direction of, the resultant strain of the conductors. Anchor assemblies shall be installed so that approximately 6 inches of the rod remains 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 to prevent burial of the rod eye.

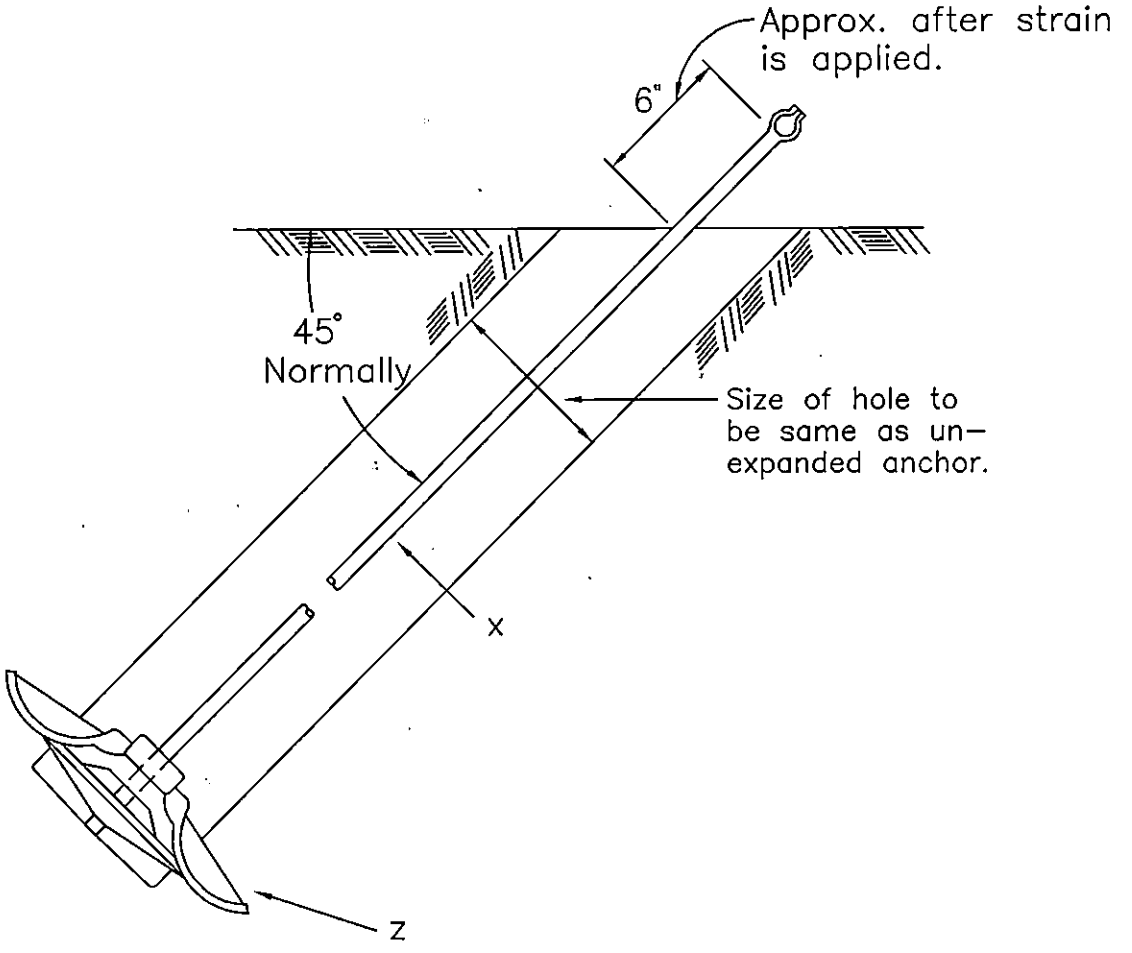
The backfill of all anchor holes must be thoroughly tamped the full depth. After a cone anchor has been set in place, the hole shall be backfilled with coarse crushed rock for 2 feet above the anchor and tamped during the filling. The remainder of the hole shall be backfilled and tamped with dirt.

The designated holding powers shown on the anchor assembly drawings are based on the maximum holding power of average, Class 5 soil. When the anchor is installed in poorer soils, the holding power of the anchor shall be derated. A suggested guide is to derate by 25 percent in Class 6 soil and by 50 percent in Class 7 soil. For Class 8 soil it is usually necessary to use swamp anchors or power driven screw anchors which can penetrate the poor soil into firmer soil. See the "Soil Classifications" table on the following page for soil classes.

Log type anchors are acceptable for use on distribution systems. Refer to the appropriate drawings in RUS Bulletin 1728F-811,"Electric Transmission Specifications and Drawings, 115 kV through 230 kV" for assembly units and construction details.

SOIL CLASSIFICATIONS

Class	Engineering Description
0	Sound hard rock, unweatherd
1	Very dense and/or cemented sands; coarse gravel and cobbles
2	Dense fine sand; very hard silts and clays (may be preloaded)
3	Dense clayed sand and gravel; very stiff to hard silts and clays
4	Medium dense sandy gravel; very stiff to hard silts and clays
5	Medium dense coarse sand and sandy gravels; stiff to very stiff silts and clays
6	Loose to medium dense fine to coarse sand; firm to stiff clays and silts
7	Loose fine sand; alluvium; loess; soft-firm clays; varved clays; fill
8	Peat; organic silts; inundated silts; fly ash



NOTE: Designated maximum holding power rating assumes proper installation in class 5 soil.

	ASSEMBLY: F1	.6	.8	.10	.12
	Minimum Area (sq. in.)	90	100	120	135
ITEM	MATERIAL	QTY	QTY	QTY	QTY
x	Rod, anchor, thimble eye, 5/8" x 7'0"	1	1		
x	Rod, anchor, twin eye, 3/4" X 8'0"			1	1
z	Anchor, expanding type	1	1	1	1

ASSEMBLY NUMBERS	
NEW	(OLD)
F1.6	(F1-1)
F1.8	(F1-2)
F1.10	(F1-3)
F1.12	(F1-4)

DESIGN PARAMETERS:
DESIGNATED MAXIMUM HOLDING POWER (lbs.)

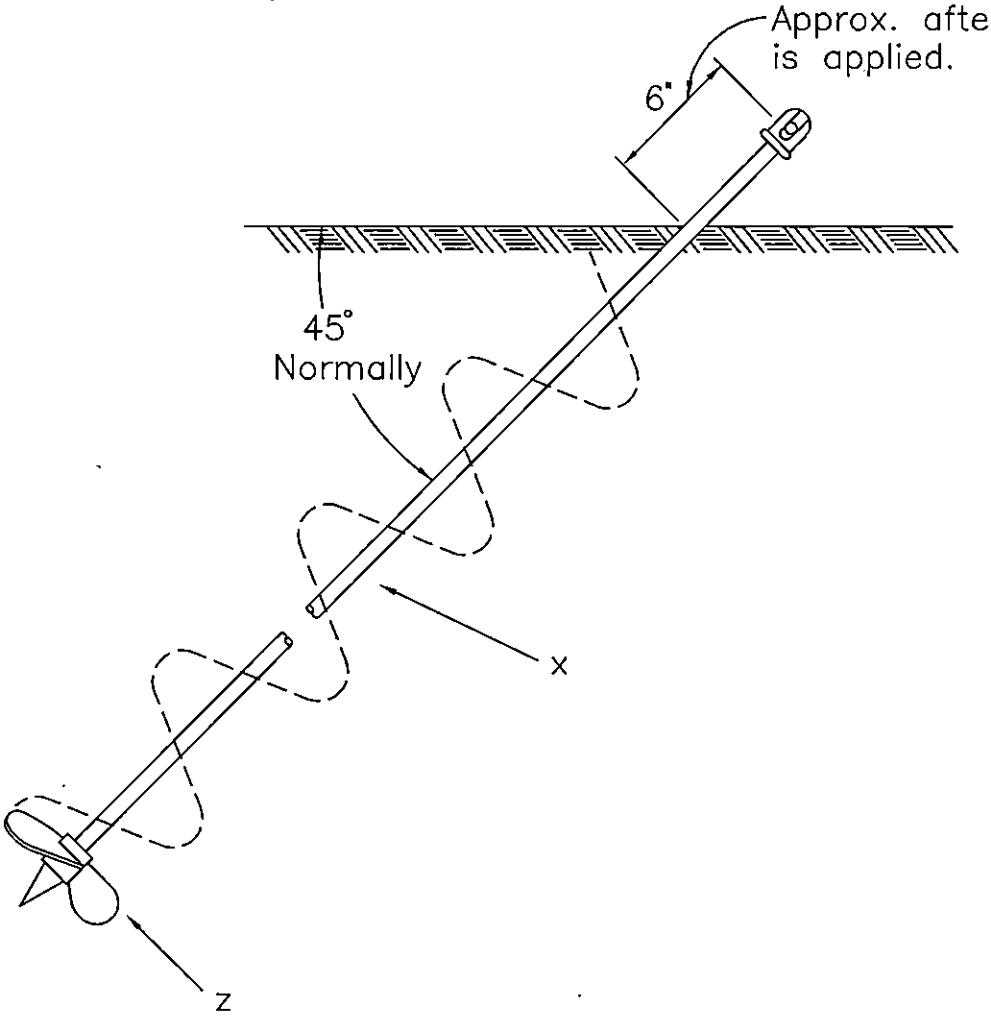
F1.6:	6,000
F1.8:	8,000
F1.10:	10,000
F1.12:	12,000

EXPANDING TYPE ANCHORS

APRIL 2005

RUS

F1.6, F1.8, F1.10, F1.12



NOTE: Designated maximum holding power rating assumes proper installation in class 5 soil.

	ASSEMBLY: F2	.6	.8	.10	.12
	Minimum Area (sq. in.)	90	100	120	135
ITEM	MATERIAL	QTY	QTY	QTY	QTY
x	Rod, anchor, thimble eye, 5/8" x 7'0"	1	1		
x	Rod, anchor, twin eye, 3/4 X 8'0			1	1
z	Anchor, screw type, power installed	1	1	1	1

ASSEMBLY NUMBERS	
NEW	(OLD)
F2.6	(F1-1S)
F2.8	(F1-2S)
F2.10	(F1-3S)
F2.12	(F1-4S)

DESIGN PARAMETERS:
DESIGNATED MAXIMUM HOLDING POWER (lbs.)

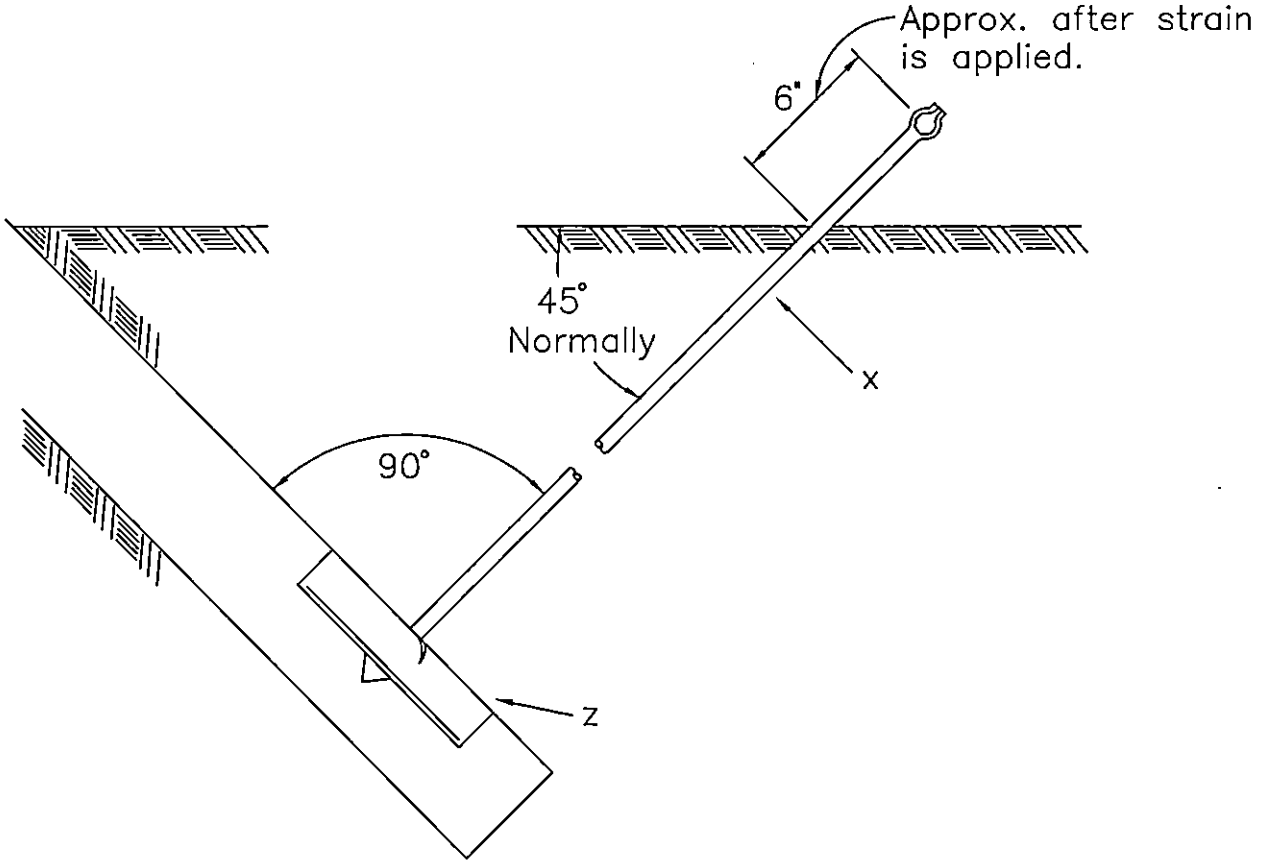
F2.6:	6,000
F2.8:	8,000
F2.10:	10,000
F2.12:	12,000

SCREW ANCHORS, (POWER INSTALLED)

APRIL 2005

RUS

F2.6, F2.8, F2.10, F2.12



NOTE: Designated maximum holding power rating assumes proper installation in class 5 soil.

	ASSEMBLY: F3	.6	.8	.10	.12
	Minimum Area (sq. in.)	90	100	120	135
ITEM	MATERIAL	QTY	QTY	QTY	QTY
x	Rod, anchor, thimble eye, 5/8" x 7'0"	1	1		
x	Rod, anchor, twin eye, 3/4" X 8'0"			1	1
z	Anchor, plate type	1	1	1	1

ASSEMBLY NUMBERS	
NEW	(OLD)
F3.6	(F1–1P)
F3.8	(F1–2P)
F3.10	(F1–3P)
F3.12	(F1–4P)

DESIGN PARAMETERS:
DESIGNATED MAXIMUM HOLDING POWER (lbs.)

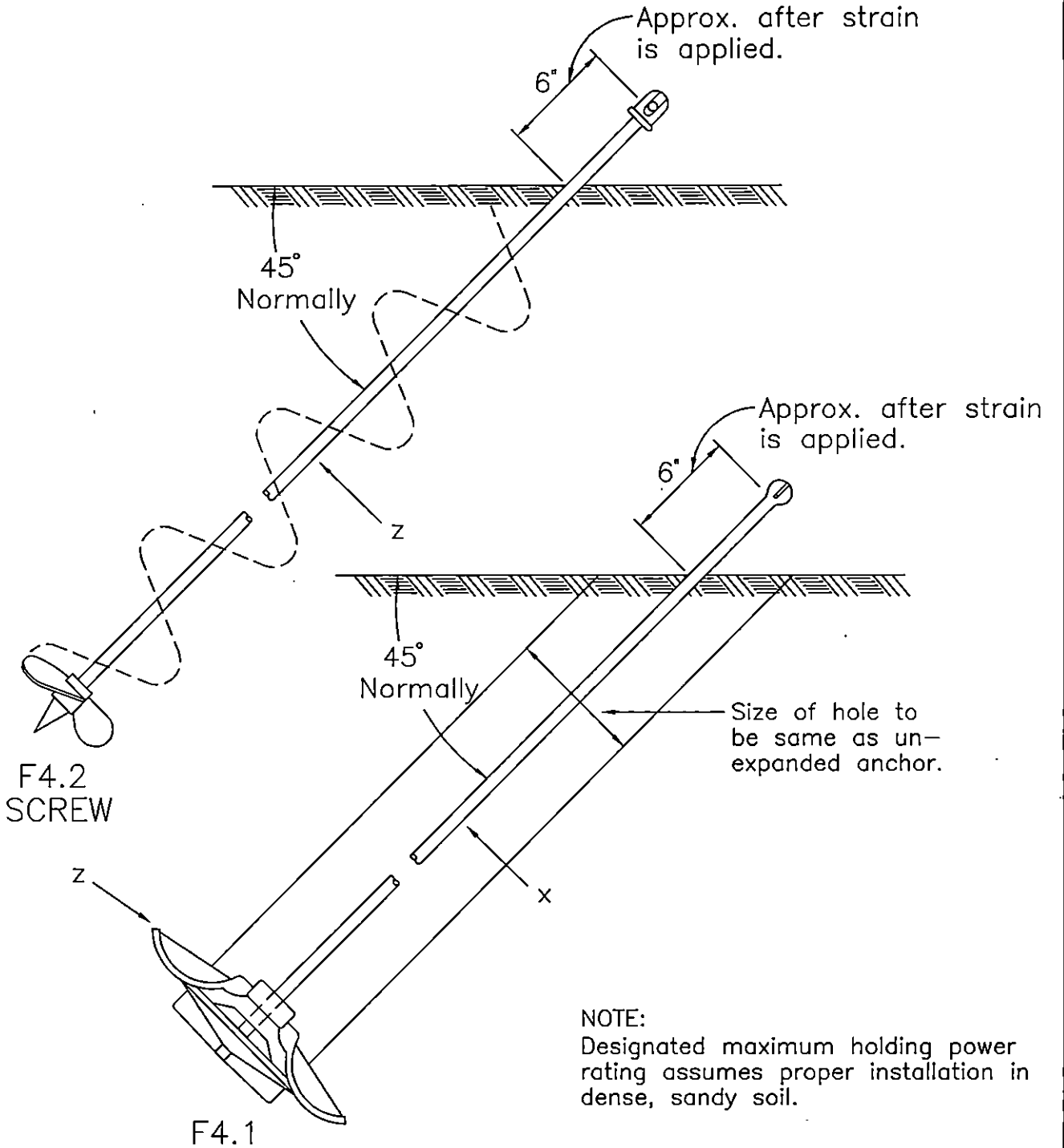
F3.6:	6,000
F3.8:	8,000
F3.10:	10,000
F3.12:	12,000

PLATE TYPE ANCHORS

APRIL 2005

RUS

F3.6, F3.8, F3.10, F3.12



NOTE:
Designated maximum holding power rating assumes proper installation in dense, sandy soil.

ASSEMBLY:		F4.1	F4.2
ITEM	MATERIAL	QTY	QTY
x	Rod, anchor, thimble eye type	1	
z	Anchor, service, expanding type	1	
z	Anchor, service, screw type		1

ASSEMBLY NUMBERS	
NEW	(OLD)
F4.1	(F4-1E)
F4.2	(F4-1S)

DESIGN PARAMETERS:

DESIGNATED MAXIMUM HOLDING POWER (lbs.)

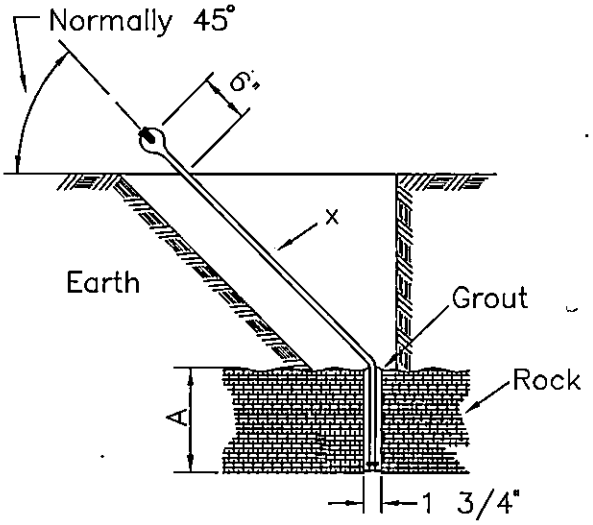
F4.1: 2,500
F4.2: 2,500

SERVICE ANCHORS

APRIL 2005

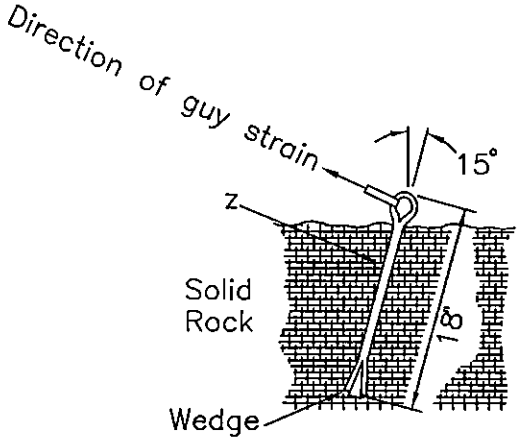
RUS

F4.1, F4.2



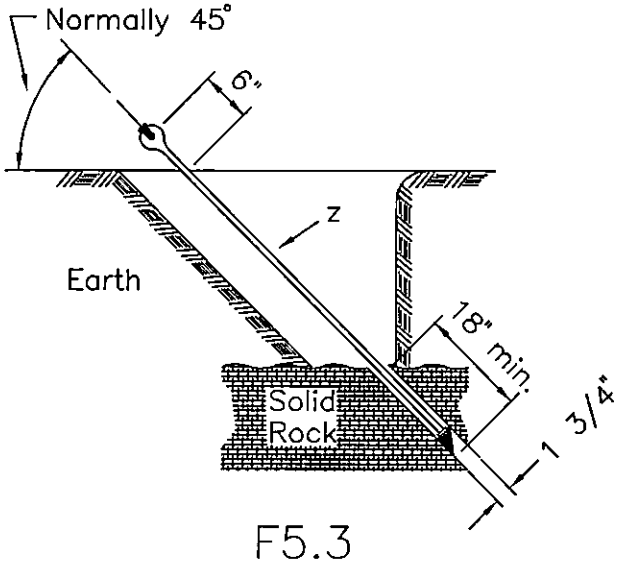
A = 18" min. for solid rock
= 30" min. for stratified rock

F5.1



NOTE: 15" expanding type rock anchor may be used

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 minimum apart and, where practical, install in direct line with pole.
2. Do not anchor to any boulder measuring less than 4 feet in diameter.

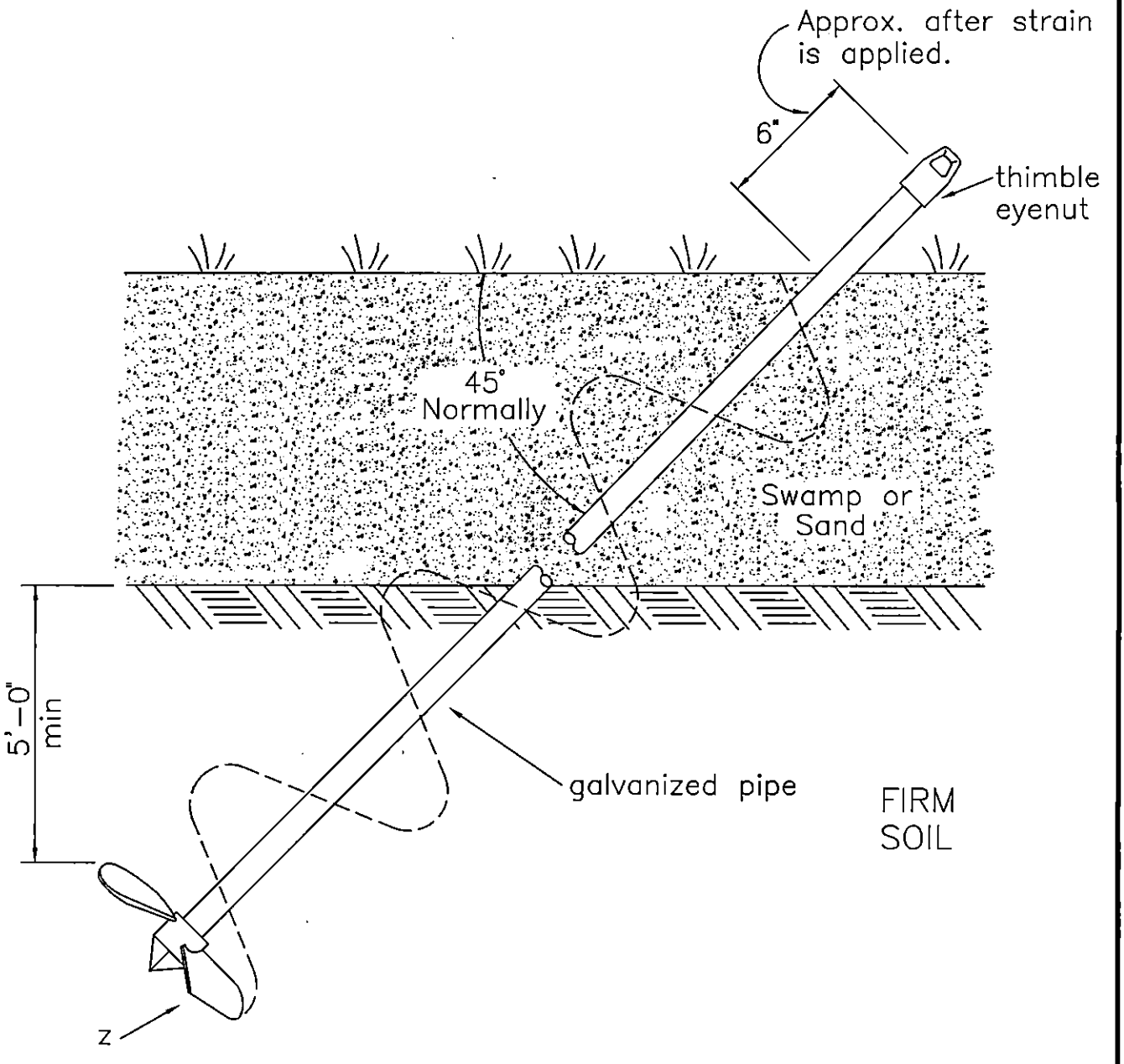
		(* See Note)		
	ASSEMBLY:	F5.1	F5.2	F5.3
ITEM	MATERIAL	QTY	QTY	QTY
x	Rod, anchor or thimble eye type	1		
z	Anchor, expanding rock type		*	1
z	Anchor, rock, guy bolt type		1	

ASSEMBLY NUMBERS	
NEW	(OLD)
F5.1	(F5–1)
F5.2	(F5–2)
F5.3	(F5–3)

DESIGN PARAMETERS:

ROCK ANCHORS

APRIL 2005		F5.1, F5.2, F5.3
RUS		



NOTE: Designated maximum holding power rating assumes proper installation. See anchor specifications for additional information.

ITEM	MATERIAL	F6.6 QTY	F6.8 QTY	F6.10 QTY
Z	Anchor, swamp type (diameter)	1-10"	1-12"	1-15"
	Nut, thimble eye type	1	1	1
	Pipe, galvanized, as req'd			

ASSEMBLY NUMBERS	
NEW	(OLD)
F6.6	(F6-1)
F6.8	(F6-2)
F6.10	(F6-3)

DESIGN PARAMETERS:
DESIGNATED MAXIMUM HOLDING POWER (lbs.)

F6.6:	6,000
F6.8:	8,000
F6.10:	10,000

SWAMP ANCHORS (POWER INSTALLED)

APRIL 2005

RUS

F6.6, F6.8, F6.10

TRANSFORMER ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
G1.1G	(M27-1A)	TRANSFORMER INSTALLATION GUIDE SINGLE -PHASE, POLE-TYPE TRANSFORMER
G1.2G		POLE TYPE TRANSFORMER LOCATION GUIDE
G1.2	(G105-) (G136-)	SINGLE-PHASE, CSP TRANSFORMER (TANGENT POLE)
G1.3	(G106-)	SINGLE-PHASE, CSP TRANSFORMER (DEADEND POLE)
G1.4 G1.5		SINGLE-PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)
G1.6		SINGLE-PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)
G1.7	(G9-) (G39-)	SINGLE-PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)
G1.8	(G10-)	SINGLE-PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)
G2.1	(G210-)	TWO-PHASE TRANSFORMER BANK OPEN-WYE PRIMARY OPEN-DELTA, 4 WIRE SECONDARY
G2.1G		TRANSFORMER / METER CONNECTION GUIDE THREE-PHASE, OPEN-WYE - OPEN DELTA FOR 120/240 VOLT POWER LOADS
G3.1	(G310-)	THREE-PHASE TRANSFORMER BANK UNGROUNDED-WYE PRIMARY CENTER-TAP GROUNDED DELTA, 4 WIRE SECONDARY
G3.1G		TRANSFORMER / METER CONNECTION GUIDE UNGROUNDED WYE - CENTER TAP GROUNDED DELTA FOR 120/240 VOLT POWER LOADS

TRANSFORMER ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
G3.2	(G311-)	THREE-PHASE TRANSFORMER BANK UNGROUNDED WYE - PRIMARY CORNER GROUNDED DELTA, 3 WIRE SECONDARY
G3.2G		TRANSFORMER / METER CONNECTION GUIDE UNGROUNDED WYE - CORNER GROUNDED DELTA FOR 240 OR 480 VOLT POWER LOADS
G3.3	(G312-)	THREE-PHASE TRANSFORMER BANK GROUNDED-WYE PRIMARY GROUNDED WYE, 4 WIRE SECONDARY
G3.3G		TRANSFORMER / METER CONNECTION GUIDE GROUNDED WYE - GROUNDED WYE FOR 120/208 VOLT POWER LOADS

CONSTRUCTION SPECIFICATIONS FOR TRANSFORMERS

It may be necessary, and it is permissible, to lower the neutral attachment on standard single-phase conventional type transformer assemblies an additional distance not exceeding 2 feet to provide adequate clearances for cutouts.

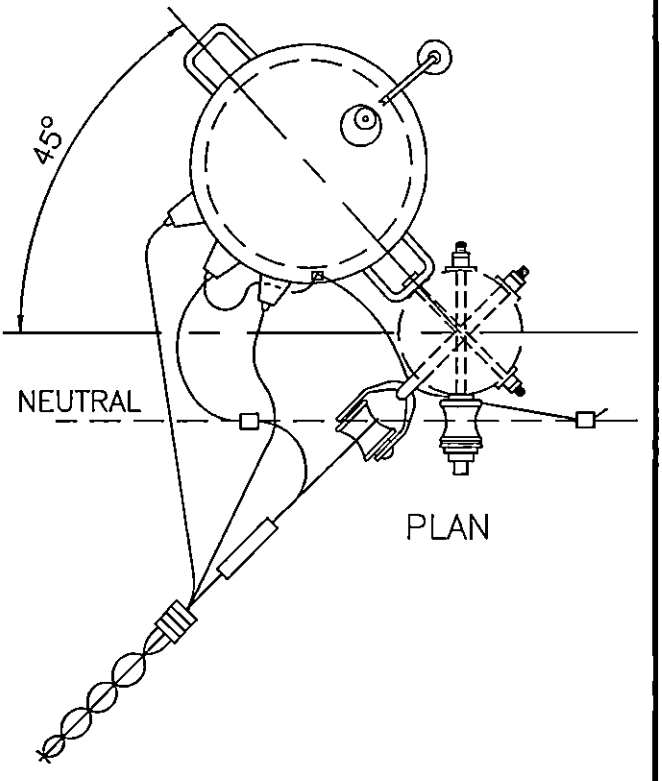
Where applicable, the external gap on surge arresters shall be set according to the manufacturer's recommended spacing.

The construction drawings for three-phase transformer banks (e.g., "G3.1") show cutouts (items "af") and arresters (items "ae) mounted adjacent to one another on the crossarm. However, a cutout and arrester, as shown, may be replaced with a combination cutout/arrester (item "ax"). This change will require a change in the assembly's material shown on the construction drawings. Moreover, the arresters may be mounted directly on the transformer tank. (The cutouts remain on the arm.) Any of the above mounting arrangements for three-phase transformer banks are acceptable; the choice is left to the design engineer.

The construction drawings for single-phase conventional transformer assemblies show surge arresters mounted directly on the transformer tank which maximizes transformer surge protection. Except for single-phase conventional transformers with open link fused cutouts (assemblies "G1.7" and "G1.8"), the arrester may be mounted on a crossarm, on a bracket (item "fn") adjacent to the cutout, or a combination cutout/arrester (item "ax") may be used. The choice of using any of these acceptable mounting arrangements is left to the design engineer.

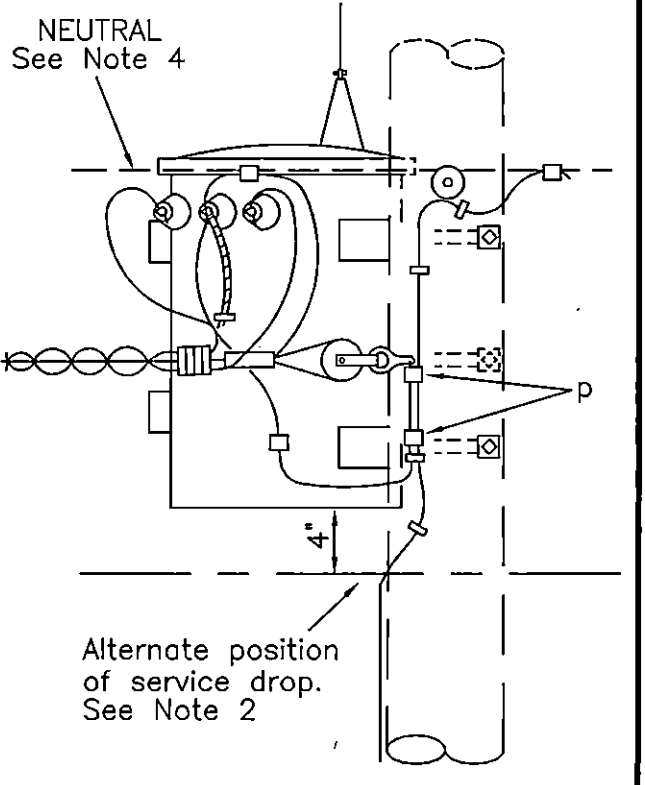
Tank-mounted arresters provide maximum surge protection to transformers because of the arresters' minimum lead lengths. However, when arresters are mounted directly on transformer tanks, the fused cutouts have less surge protection and are subject to more frequent operations. Nuisance operations on fused cutouts with minimal surge protection can be lessened with the use of dual-element fuses.

The wiring schematics on the three-phase transformer/meter connection guide drawings (e.g., "G3.1G") are based on single-phase transformers with additive polarity. ANSI Standard C57-12.20 specifies that all single-phase transformers larger than 200 kVA have subtractive polarity. If the transformer/meter connection guides are used for single-phase transformers larger than 200 kVA, the schematic diagrams will need to be modified accordingly.



NOTES:

1. Install transformer on tangent poles on a quadrant on the opposite side of pole from primary neutral.
2. When it is necessary to install transformer in the same quadrant as a service drop, attach the service drops 4 inches below the transformer.
3. Install transformer so that primary neutral is at same height as bottom of transformer lid on tangent poles, or 3 inches above transformer lid on deadend poles.
4. Use compression type connectors (item "p").
5. Standard aluminum alloy or standard soft-drawn copper is recommended for the grounding loop conductor.
6. Transformer secondary bushings are not to be used for bi-metal connections.
7. Cover secondary terminals with moisture seal and/or dress conductor ends downward to prevent entry of moisture. (Mininum bending radius is six times the overall cable diameter).

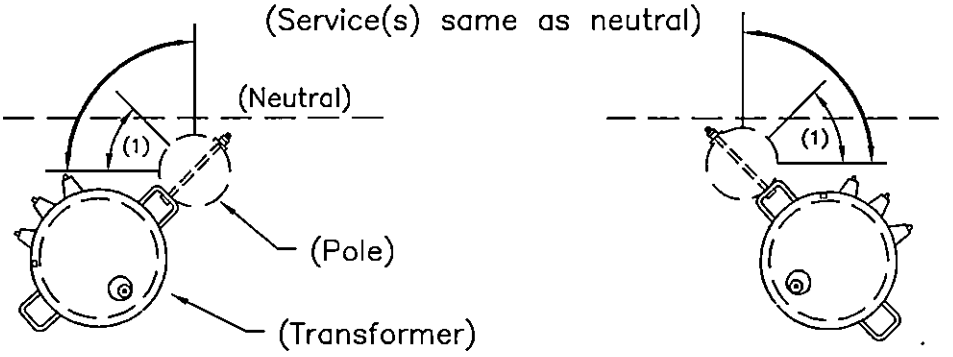


TRANSFORMER INSTALLATION GUIDE
SINGLE-PHASE, POLE-TYPE TRANSFORMER

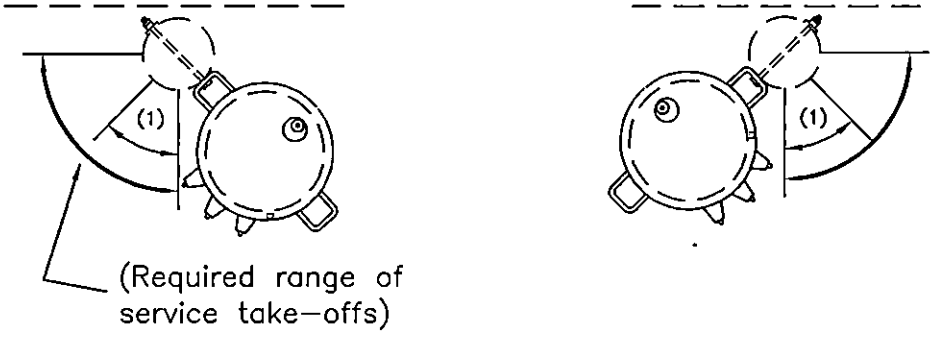
APRIL 2005		G1.1G
RUS		(M27-1A)

TANGENT POLES

(Service(s) same as neutral)

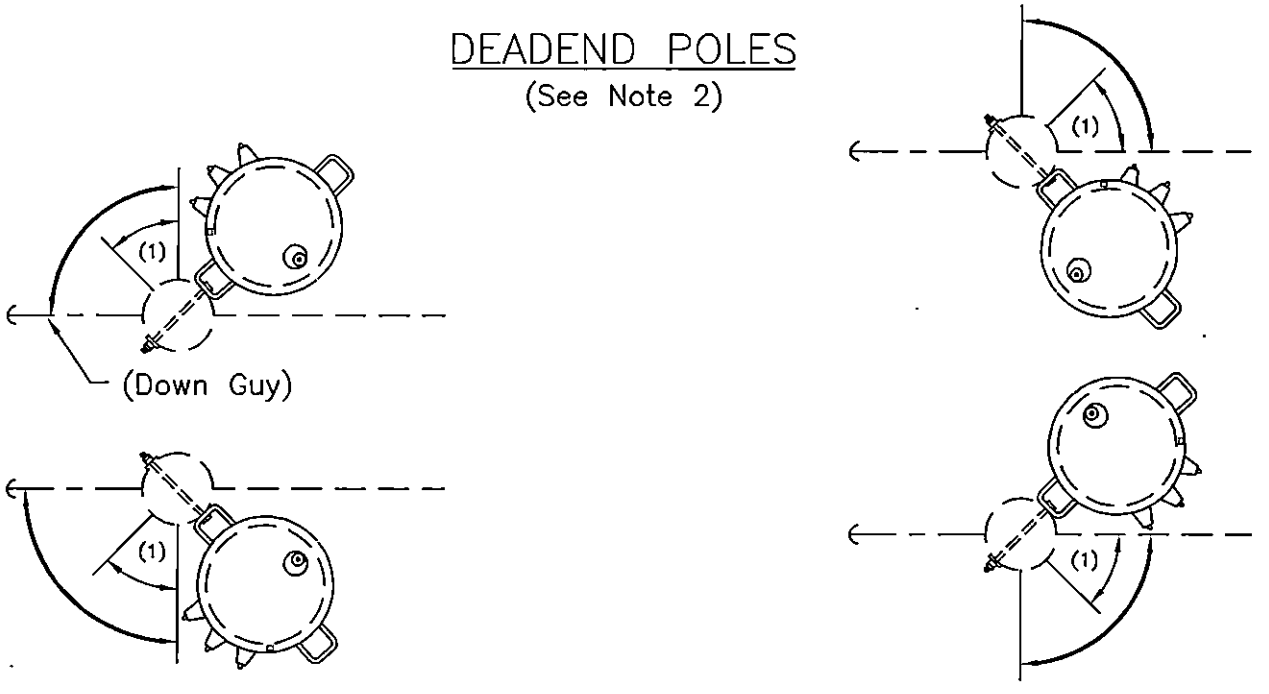


(Service(s) opposite side of neutral)



DEADEND POLES

(See Note 2)

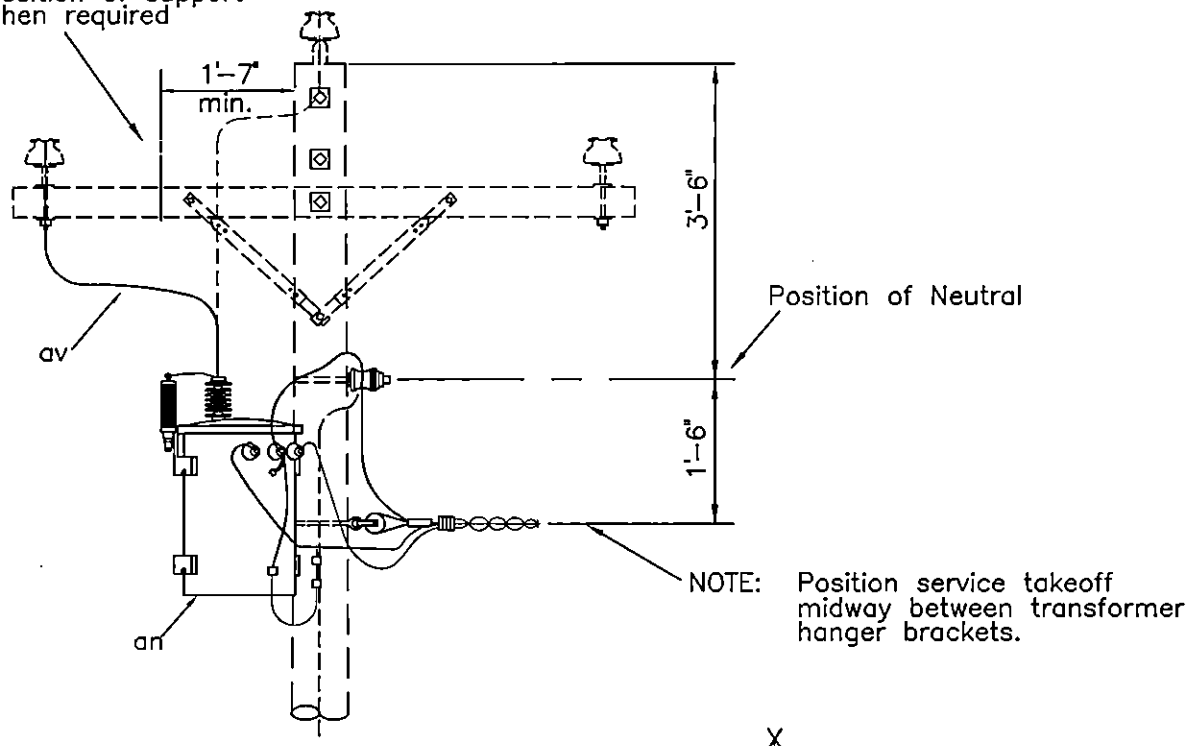


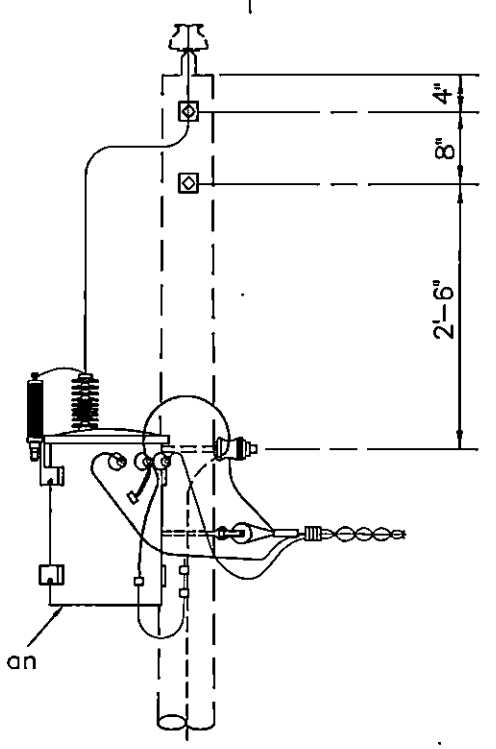
NOTES:

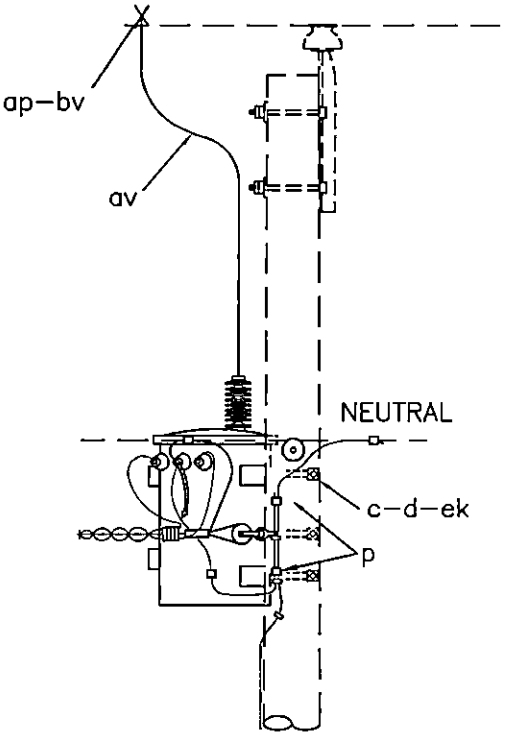
1. Lower service(s) to 4 inches below transformer if necessary for adequate clearances.
2. Lower transformer so that neutral is 3 inches above transformer lid.

POLE TYPE TRANSFORMER LOCATION GUIDE

APRIL 2005		G1.2G
RUS		







ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
p		Connectors,compression type,as req'd
an	1	Transformer, 12.47 kV, self-protected

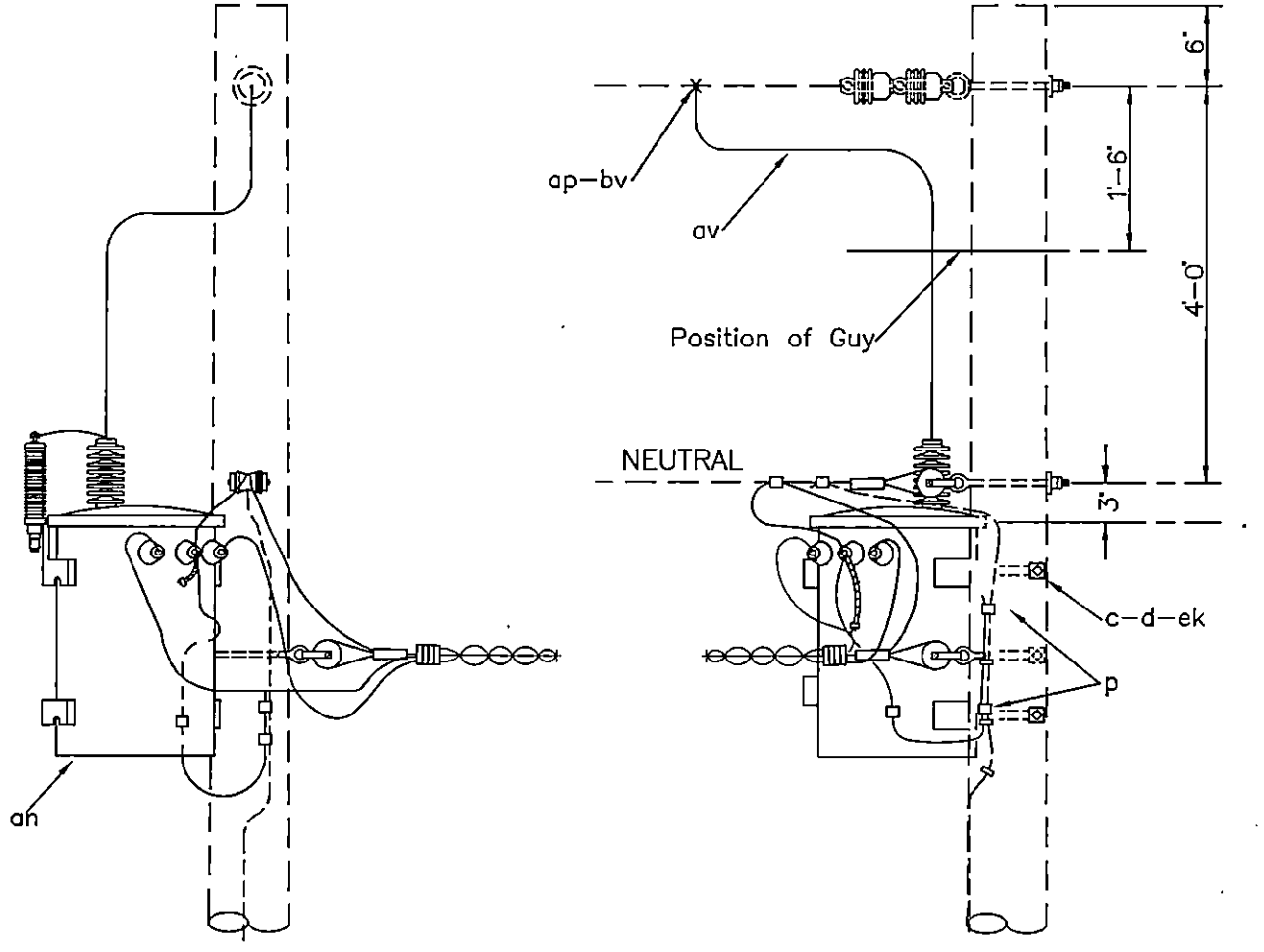
ITEM	QTY	MATERIAL
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE-PHASE, CSP TRANSFORMER (TANGENT POLE)

APRIL 2005 RUS	12.47/7.2 kV	G1.2 (G105-),(G136-)



NOTE: Install transformer so that primary neutral is 3 inches above bottom of transformer lid on both single-phase and three-phase primary assemblies. See drawing "C5.21" for three-phase deadend.

ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
p		Connectors,compression type as req'd
an	1	Transformer, 12.47 kV, self protected

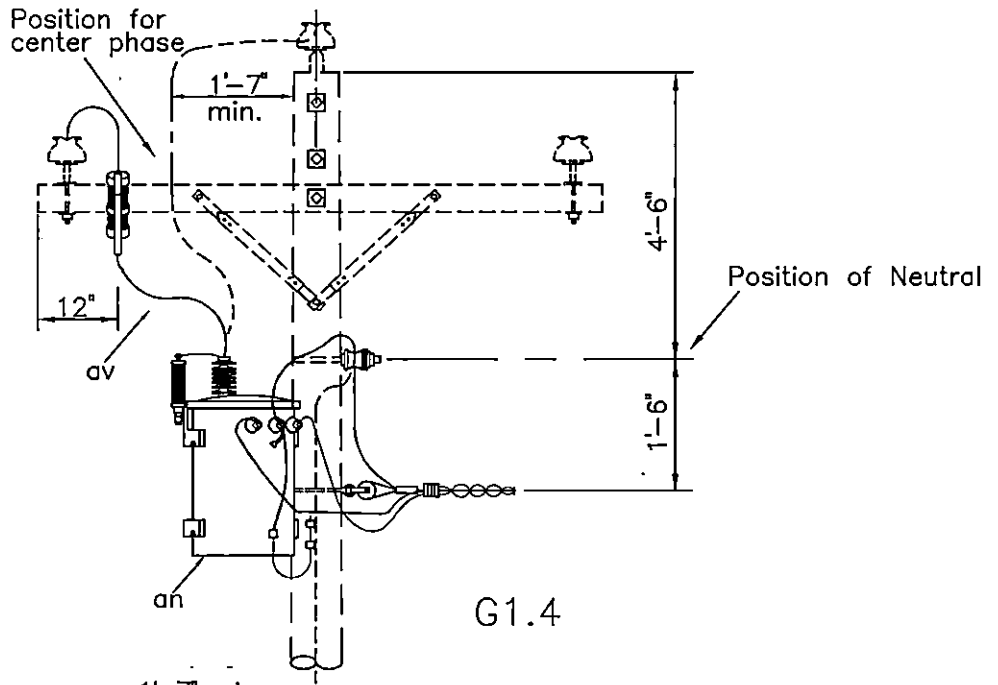
ITEM	QTY	MATERIAL
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

DESIGN PARAMETERS:

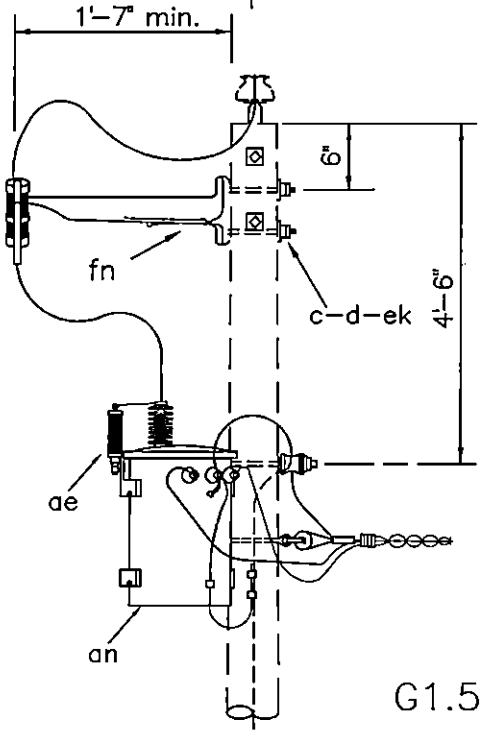
See Guide Drawing "G1.1G"

SINGLE-PHASE, CSP TRANSFORMER (DEADEND POLE)

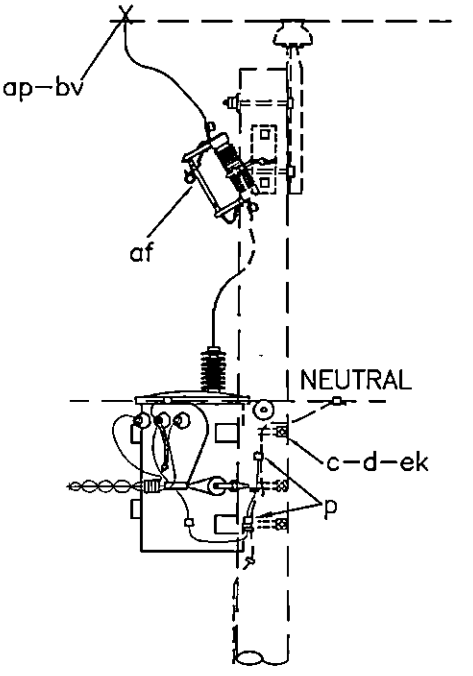
APRIL 2005		G1.3
RUS	12.47/7.2 kV	(G106-)



G1.4



G1.5



NOTE: Rotate cutout so the blade faces climbing face of pole.

ITEM	MATERIAL	ASSEMBLY: G1 .4 QTY	.5 QTY
c	Bolt, machine, 5/8" x req'd length	2	4
d	Washer, square, 2 1/4"	2	4
p	Connectors, as req'd		
ae	Arrester, surge (9 kV)	1	1
af	Cutout, dist., open (15 kV)	1	1
an	Transformer, 12.47 kV, conventional	1	1

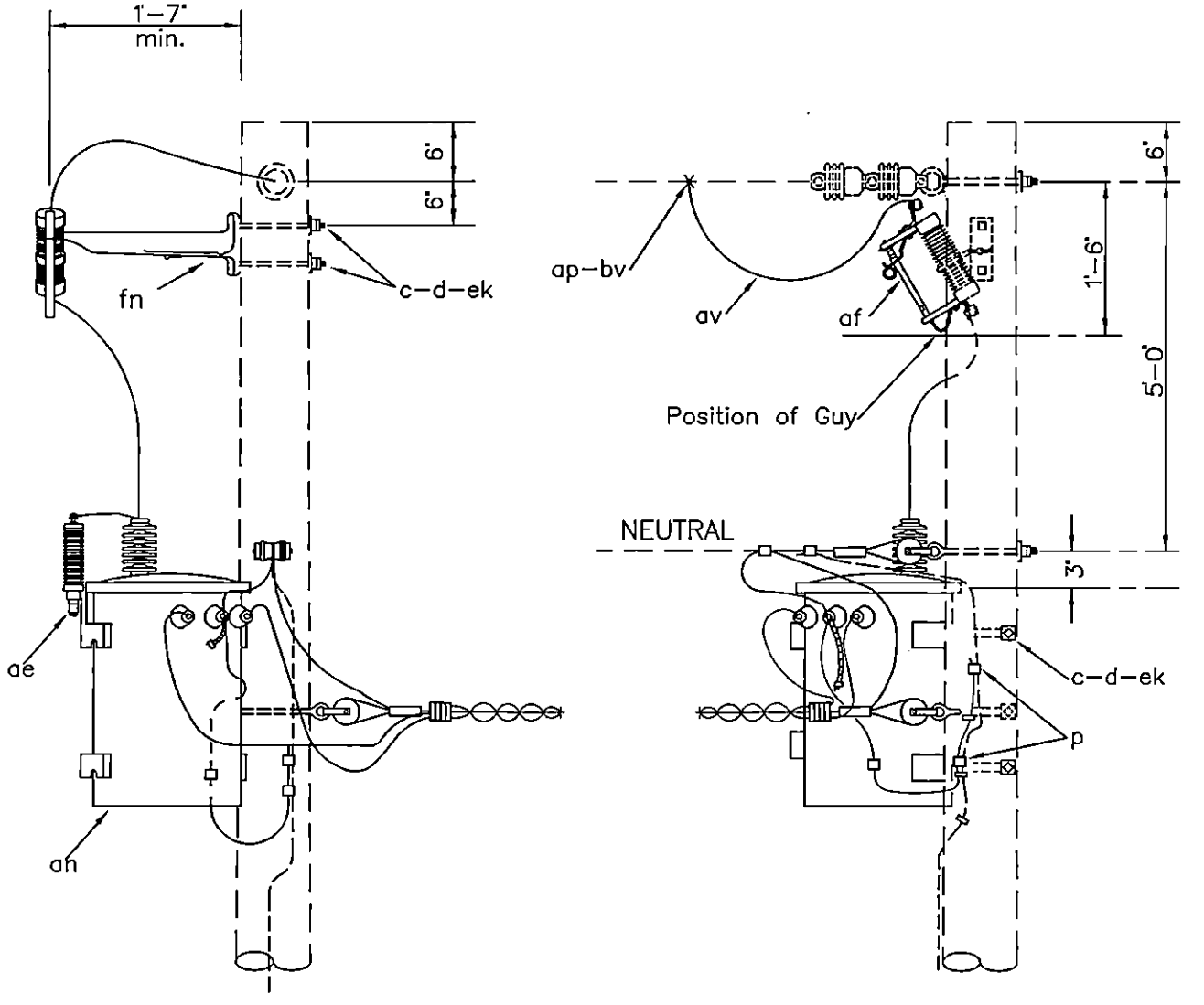
ITEM	MATERIAL	ASSEMBLY: G1 .4 QTY	.5 QTY
ap	Clamp, hot line	1	1
av	Jumpers, stranded, as req'd		
bv	Rod, armor, as req'd		
ek	Locknuts,	2	4
fn	Bracket, extension		1

DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)

APRIL 2005		G1.4 G1.5
RUS	12.47/7.2 kV	



NOTE: Rotate cutout so that the blade faces climbing face of pole.

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
p		Connectors, as req'd
ae	1	Arrester, surge (9 kV)
af	1	Cutout, dist. open (15 kV)
an	1	Transformer, 12.47 kV, conventional

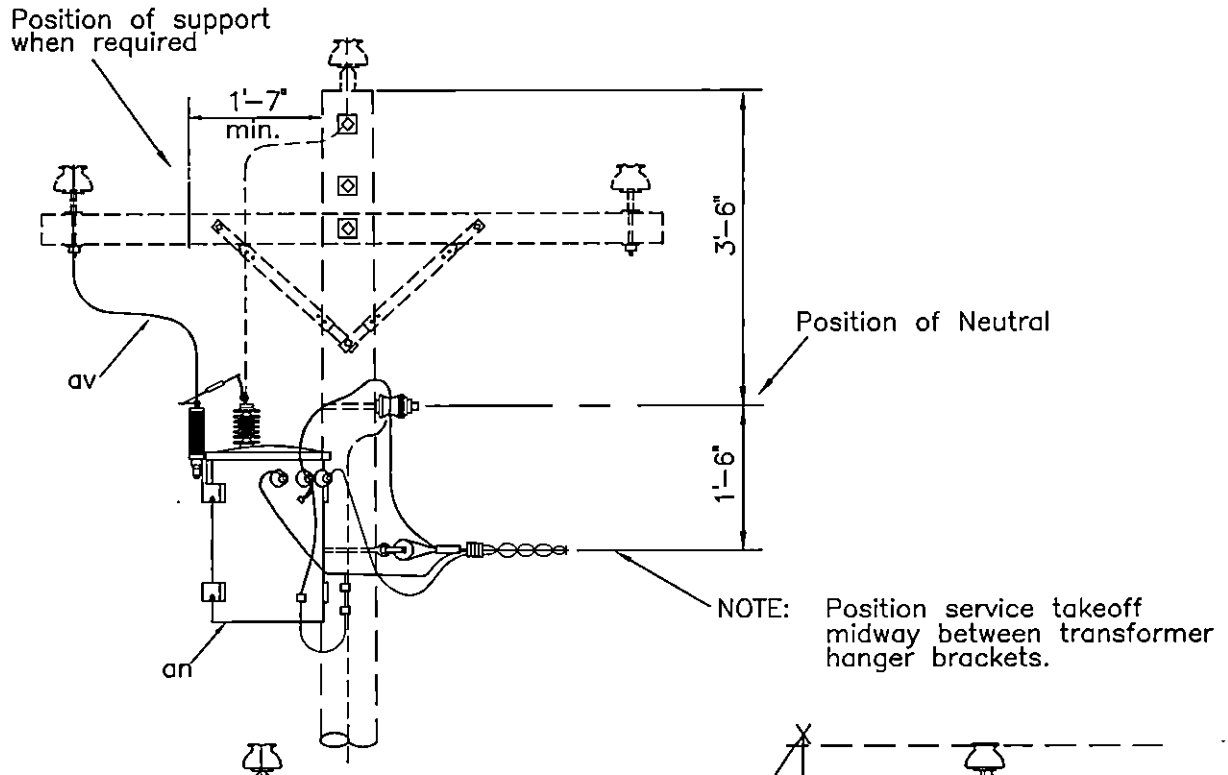
ITEM	QTY	MATERIAL
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor as req'd
ek	4	Locknuts
fn	1	Bracket, extension

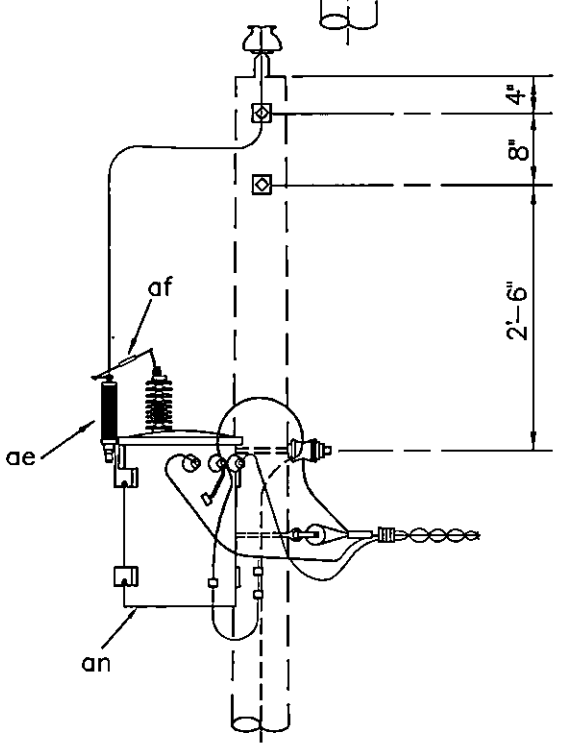
DESIGN PARAMETERS:

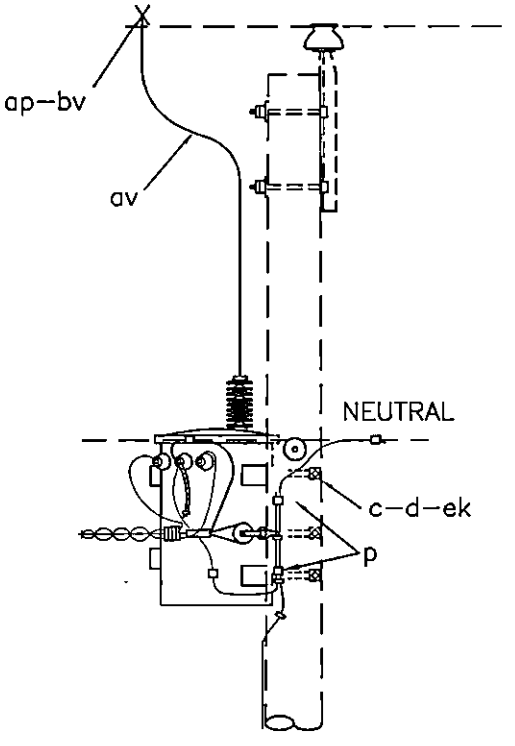
See Guide Drawing "G1.1G"

SINGLE-PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)

APRIL 2005		
RUS	12.47/7.2 kV	G1.6







ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
p		Connectors,compression type,as req'd
an	1	Transformer, 12.47 kV, conventional
ae	1	Arrester, surge (9 kV)

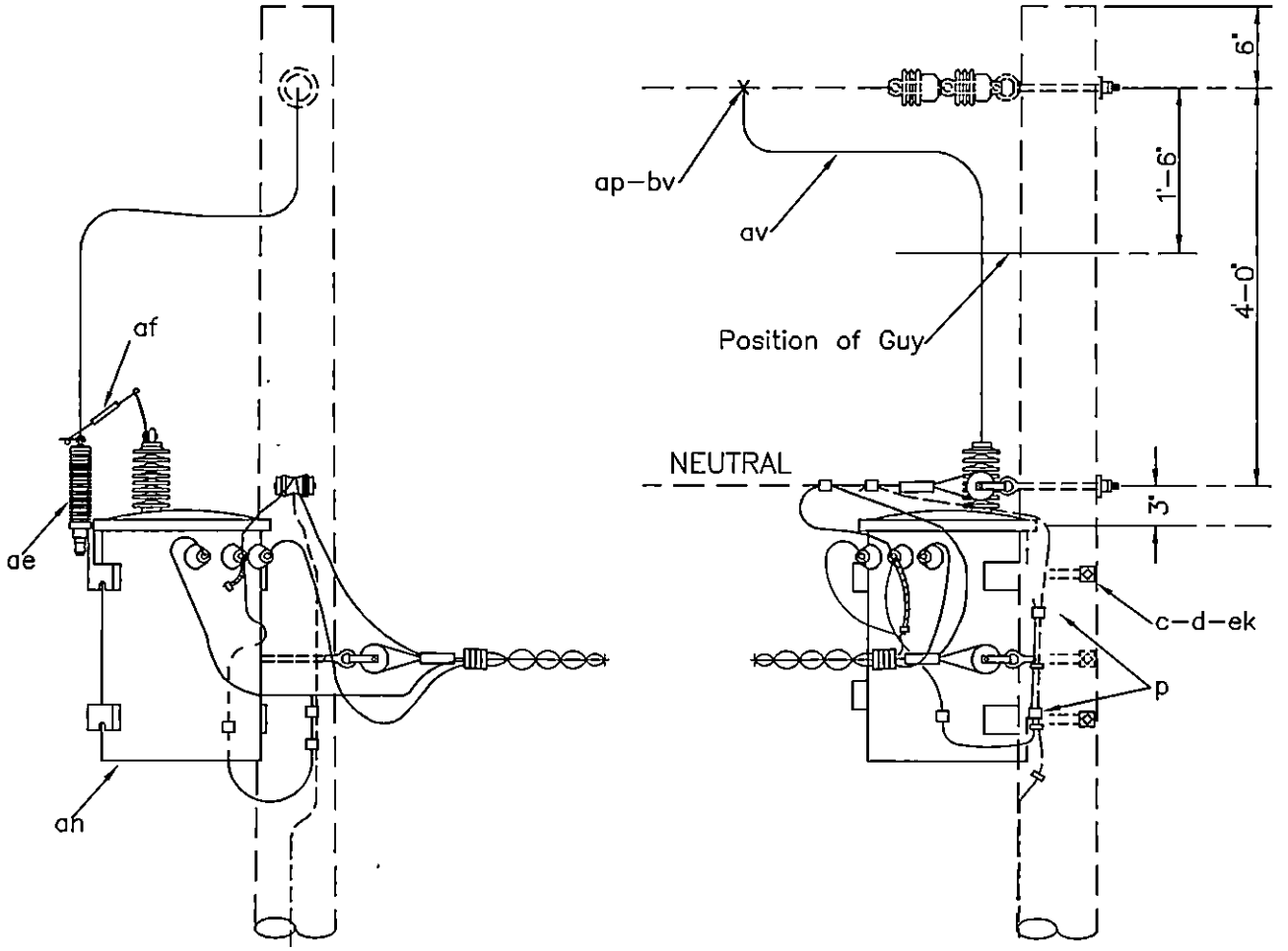
ITEM	QTY	MATERIAL
af	1	Cutout, fuse, open link
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE-PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)

APRIL 2005		G1.7
RUS	12.47/7.2 kV	(G9-),(G39-)



NOTE: Install transformer so that primary neutral is 3 inches above bottom of transformer lid on both single–phase and three–phase primary assemblies. See drawing "C5.21" for three–phase deadend.

ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
p		Connectors,compression type as req'd
an	1	Transformer, 12.47 kV, conventional
ae	1	Arrester, surge (9 kV)

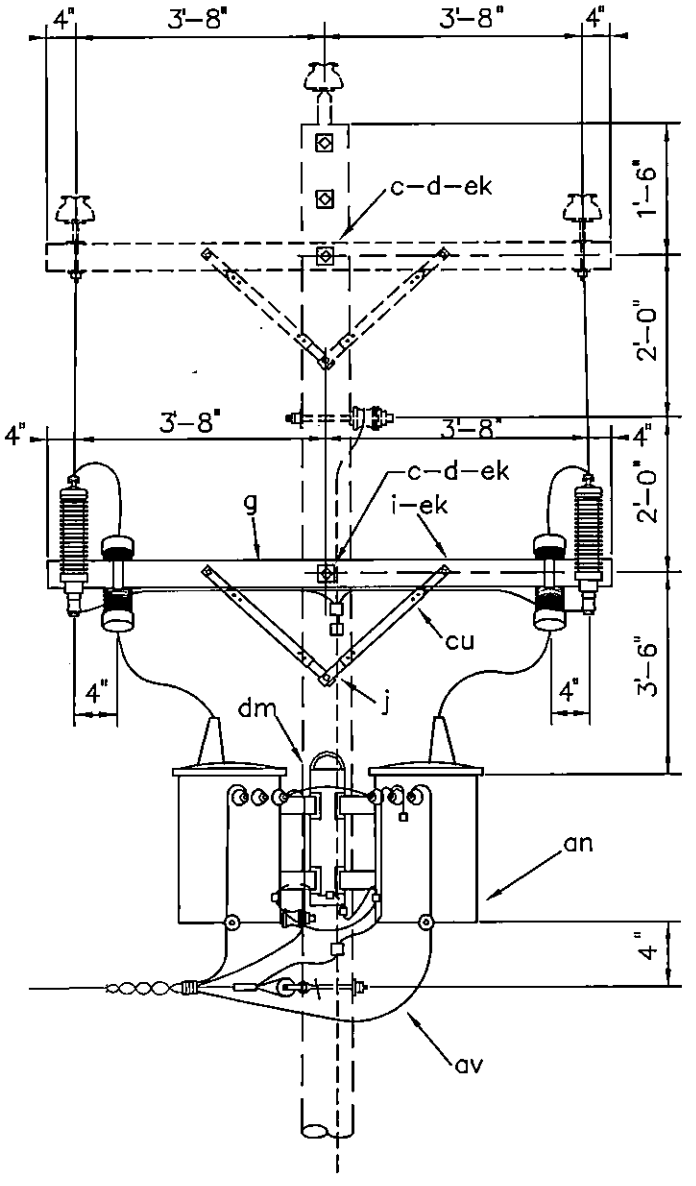
ITEM	QTY	MATERIAL
af	1	Cutout, fuse, open link
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

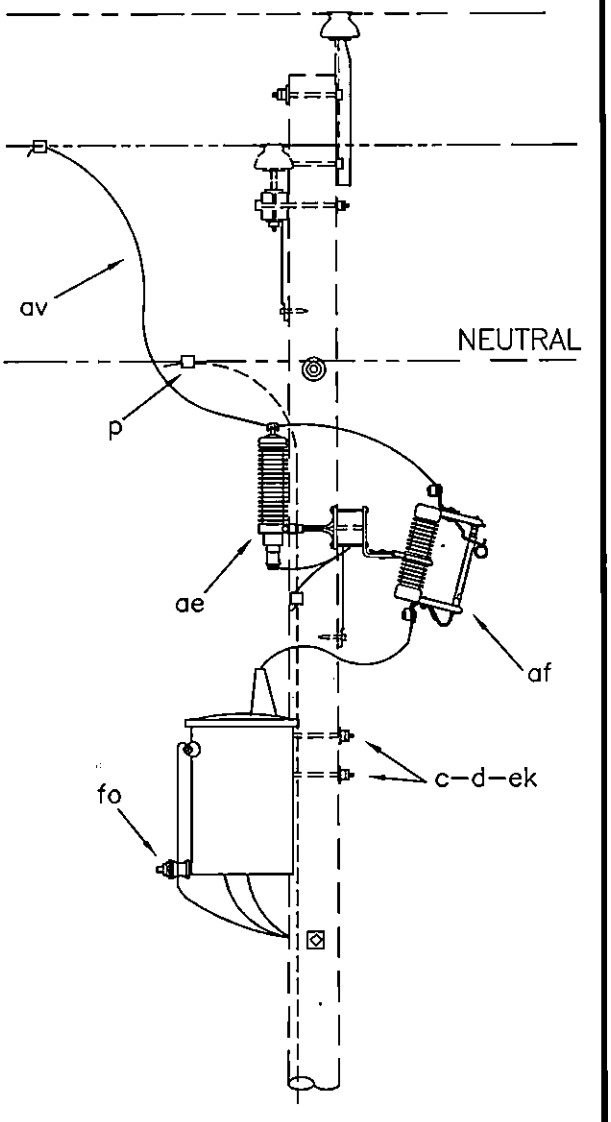
DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)

APRIL 2005		G1.8
RUS	12.47/7.2 kV	(G10–)





ITEM	QTY	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 5/8" x 8'-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	2	Arrester, surge, (9 kV)

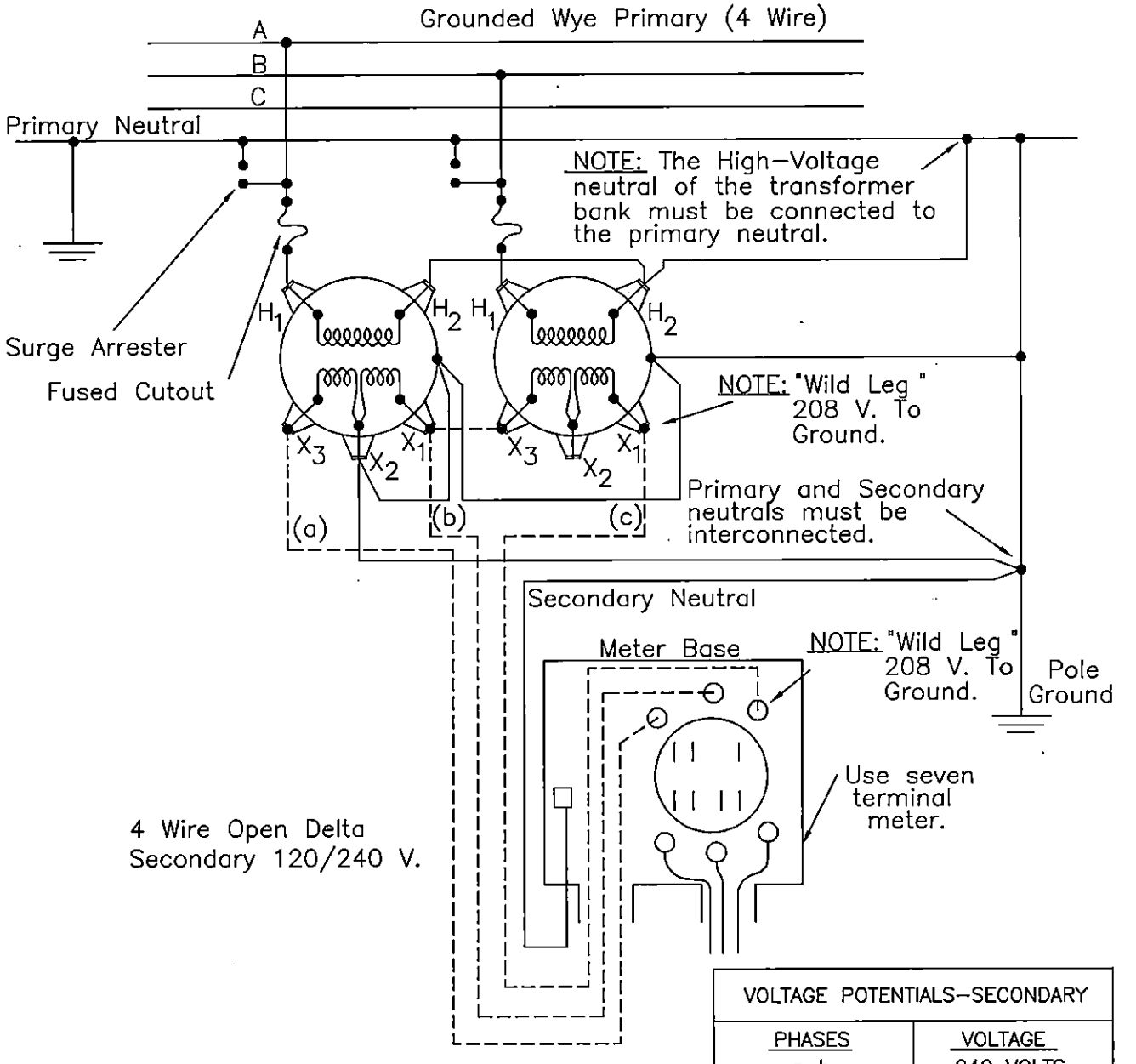
ITEM	QTY	MATERIAL
af	2	Cutout, dist. open (15 kV)
an	2	Transformer, 12.47 kV, conv.
av		Jumpers, bare, stranded, as req'd
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer
ek	5	Locknuts
fo	2	Bracket, transformer, insul.

DESIGN PARAMETERS:

See Guide Drawing "G2.1G"

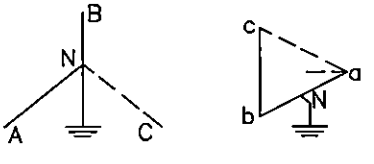
TWO-PHASE TRANSFORMER BANK
OPEN-WYE PRIMARY
OPEN-DELTA, 4 WIRE SECONDARY

APRIL 2005		G2.1
RUS	12.47/7.2 kV	(G210-)



VOLTAGE POTENTIALS–SECONDARY	
PHASES	VOLTAGE
a–b	240 VOLTS
b–c	240 VOLTS
a–c	240 VOLTS
a–N	120 VOLTS
b–N	120 VOLTS
c–N	208 VOLTS

210° ANGULAR DISPLACEMENT



(Additive Polarity–See TRANSFORMER SPECIFICATIONS)

APPLICATION: Used to supply large single–phase, 120/240 volt loads with small amount of three phase loads. Also used when only two phases of primary are available or during emergencies when one unit of a four–wire, wye–delta bank is disabled.

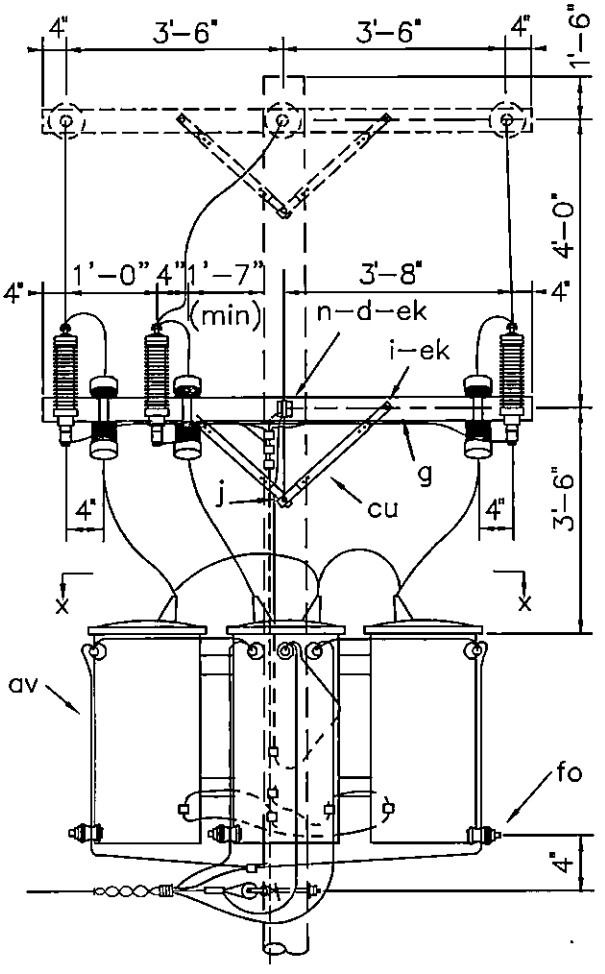
See drawing "G2.1" or "VG2.1" for construction details. One–bushing or two–bushing transformers may be used. Usually transformers of different KVA sizes are used.

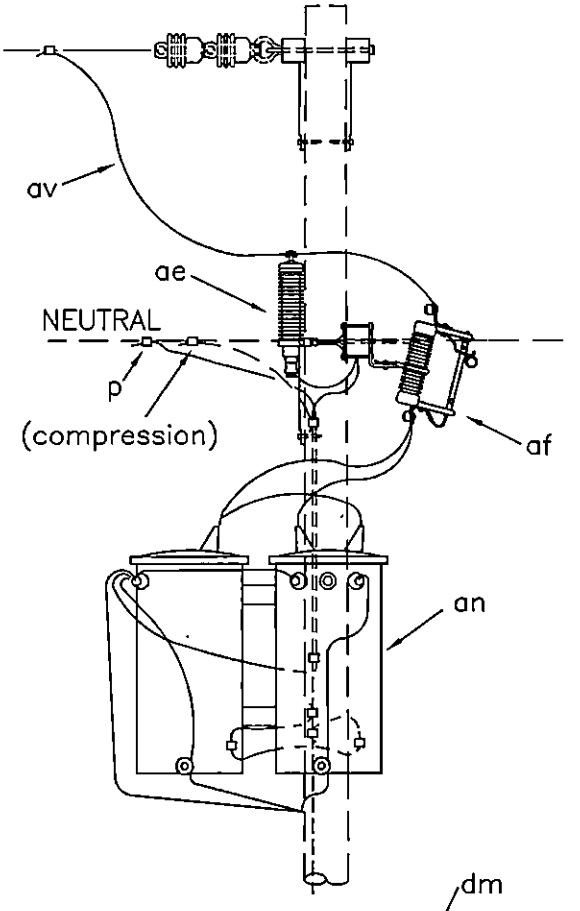
BANK RATING: This bank has only 86.6% of the rating of the two units making up the three–phase bank and only 57.7% of the three–phase rating of a closed delta–delta bank of three transformers. Thus, it is relatively inefficient where three–phase loads predominate.

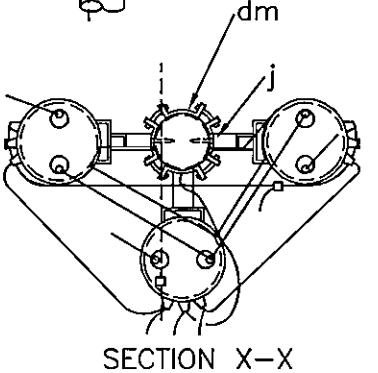
TRANSFORMER/METER CONNECTION GUIDE

THREE–PHASE, OPEN–WYE – OPEN DELTA
FOR 120/240 VOLT POWER LOADS

APRIL 2005		
RUS		G2.1G







SECTION X–X

NOTES:

1. See Drawing "Q3.1" for additional connection and metering details.
2. All transformer tanks must be grounded.

ITEM	QTY	MATERIAL
d	2	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		Screw, lag, 1/2" x 4" as req'd
n	1	Bolt, dble arm, 5/8 x req'd length
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge, (9 kV)

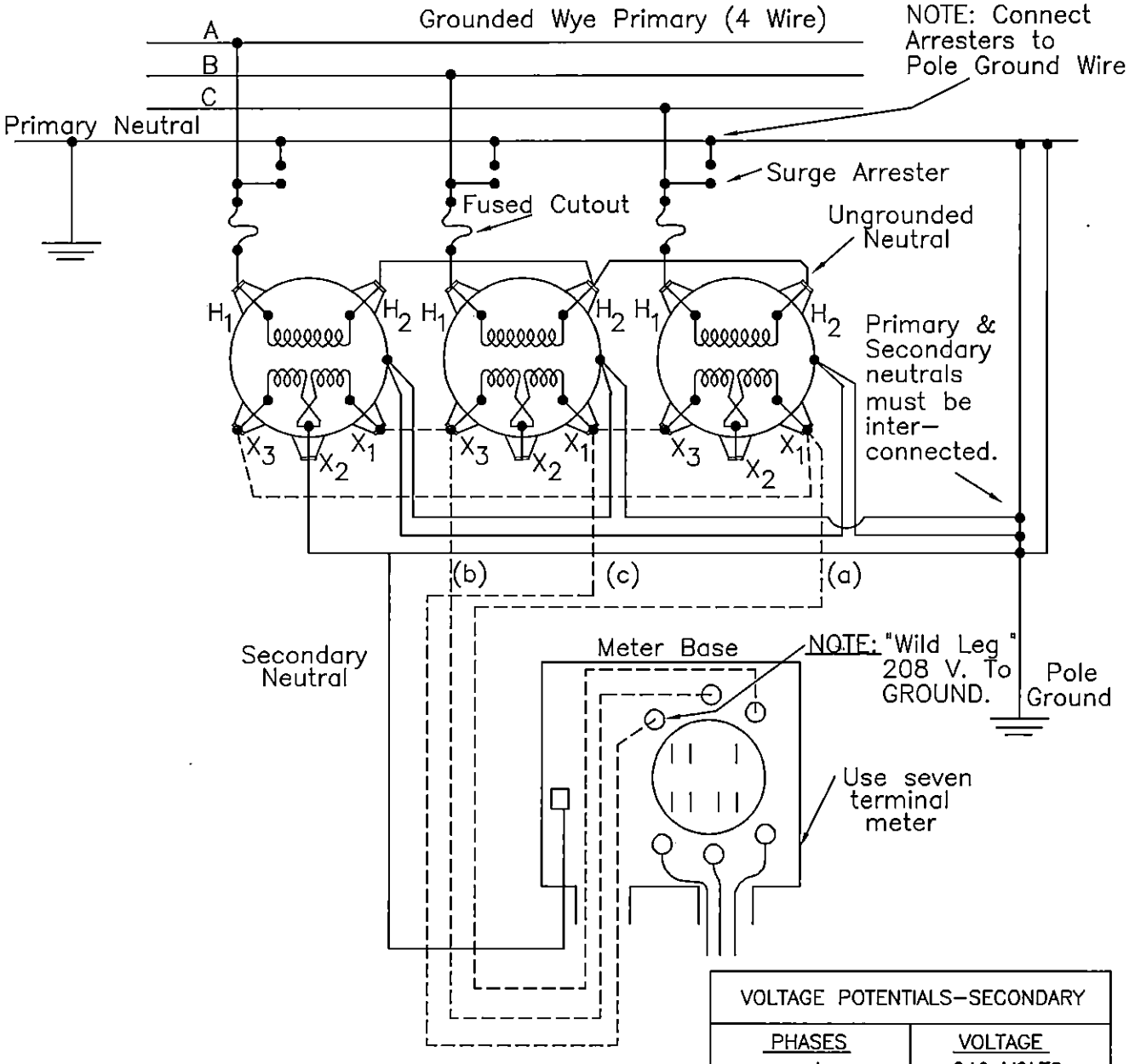
ITEM	QTY	MATERIAL
af	3	Cutout, dist. open (15 kV)
an	3	Transformer, 12.47 kV, conventional
av		Jumpers, bare, stranded
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer, cluster with
		adapter plates as req'd
ek	5	Locknuts
fo	3	Bracket, transformer, insulated

DESIGN PARAMETERS:

See Guide Drawing "G3.1G"

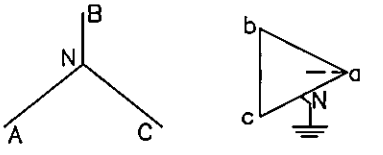
THREE–PHASE TRANSFORMER BANK
UNGROUNDED–WYE PRIMARY
CENTER–TAP GROUNDED DELTA, 4 WIRE SECONDARY

APRIL 2005	3 – PHASE PRIMARY	G3.1
RUS	12.47/7.2 kV	(G310–)



VOLTAGE POTENTIALS–SECONDARY	
PHASES	VOLTAGE
a–b	240 VOLTS
b–c	240 VOLTS
a–c	240 VOLTS
a–N	120 VOLTS
b–N	120 VOLTS
c–N	208 VOLTS

210° ANGULAR DISPLACEMENT



APPLICATION: Used to supply three–phase, 240 volt loads with small amounts of 120/240 volt single–phase loads.

See drawing "G3.1" or "VG3.1" for construction details.

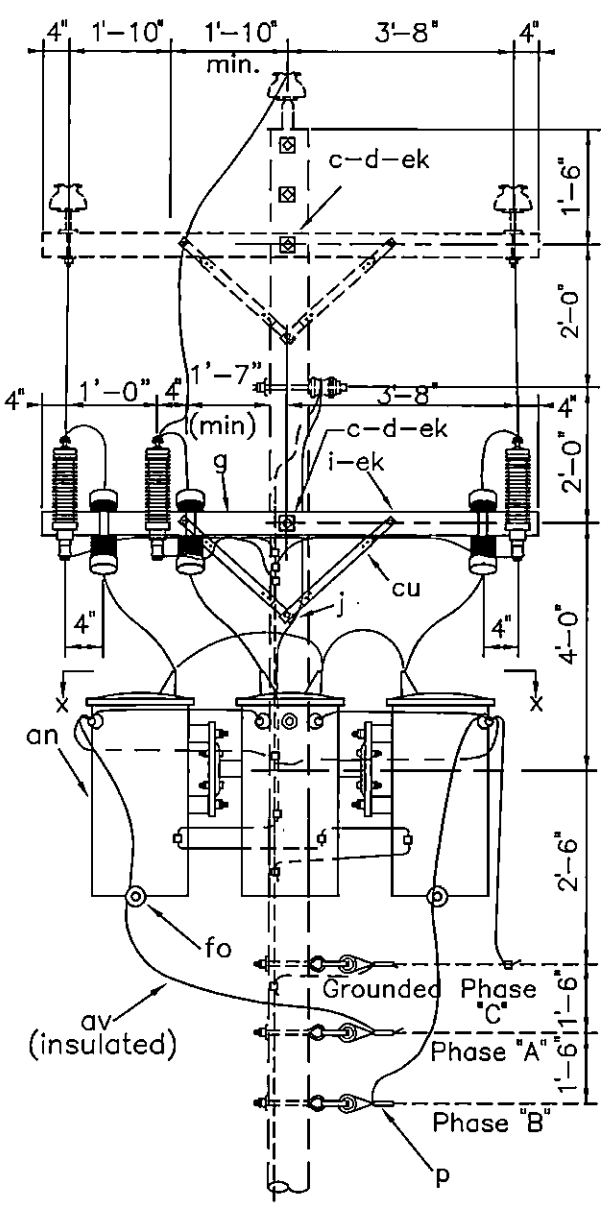
CAUTION: Only ground one secondary neutral bushing of the three transformers.
Connecting the high–voltage neutral to the system neutral may cause the transformer bank to burn out.
Largest transformer capacity should not be more than 2 times the smallest transformer kVA.

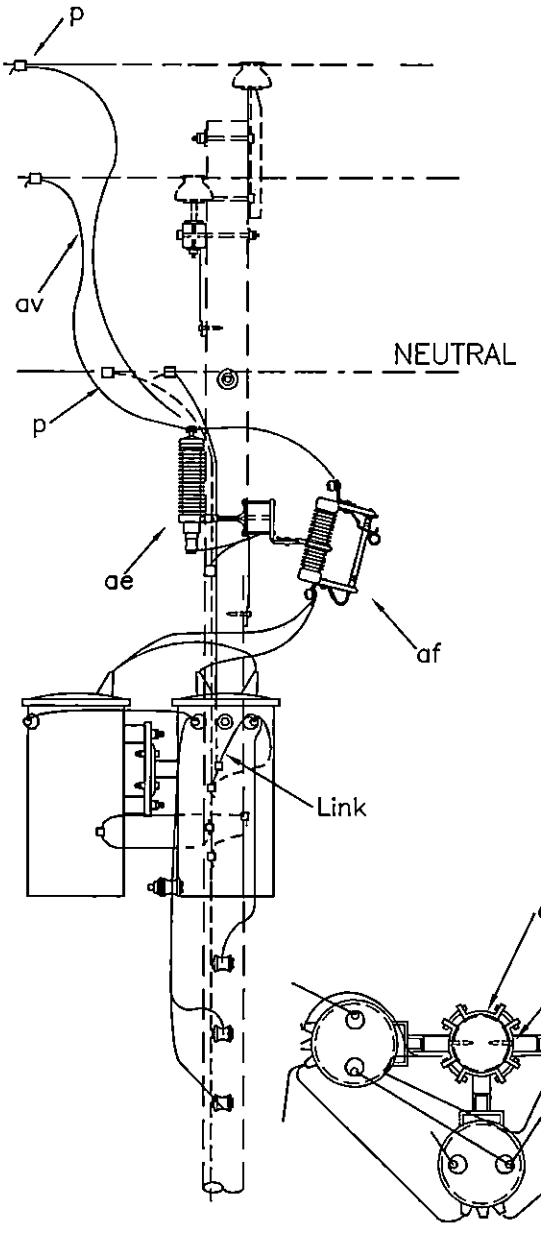
BANK RATING: The center tapped transformer carries 2/3 of the 120/240 volt single–phase load; each of the three units carry 1/3 of the 240 volt three–phase load.

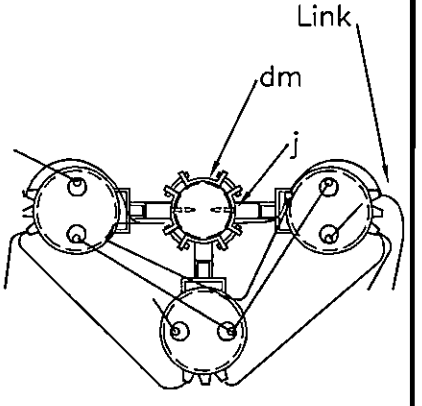
(Additive Polarity–See TRANSFORMER SPECIFICATIONS)

TRANSFORMER/METER CONNECTION GUIDE
UNGROUNDED WYE – CENTER TAP GROUNDED DELTA FOR 120/240 VOLT POWER LOADS

APRIL 2005	3 – PHASE PRIMARY	
RUS		G3.1G







SECTION X–X

NOTES:

1. See Drawing "Q3.2" for additional connection and metering details.
2. This transformer connection not recommended for new services.

ITEM	QTY	MATERIAL
d	2	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		Screw, lag, 1/2" x 4", as req'd
n	1	Bolt, dble arm, 5/8" x req'd length
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge, (9 kV)

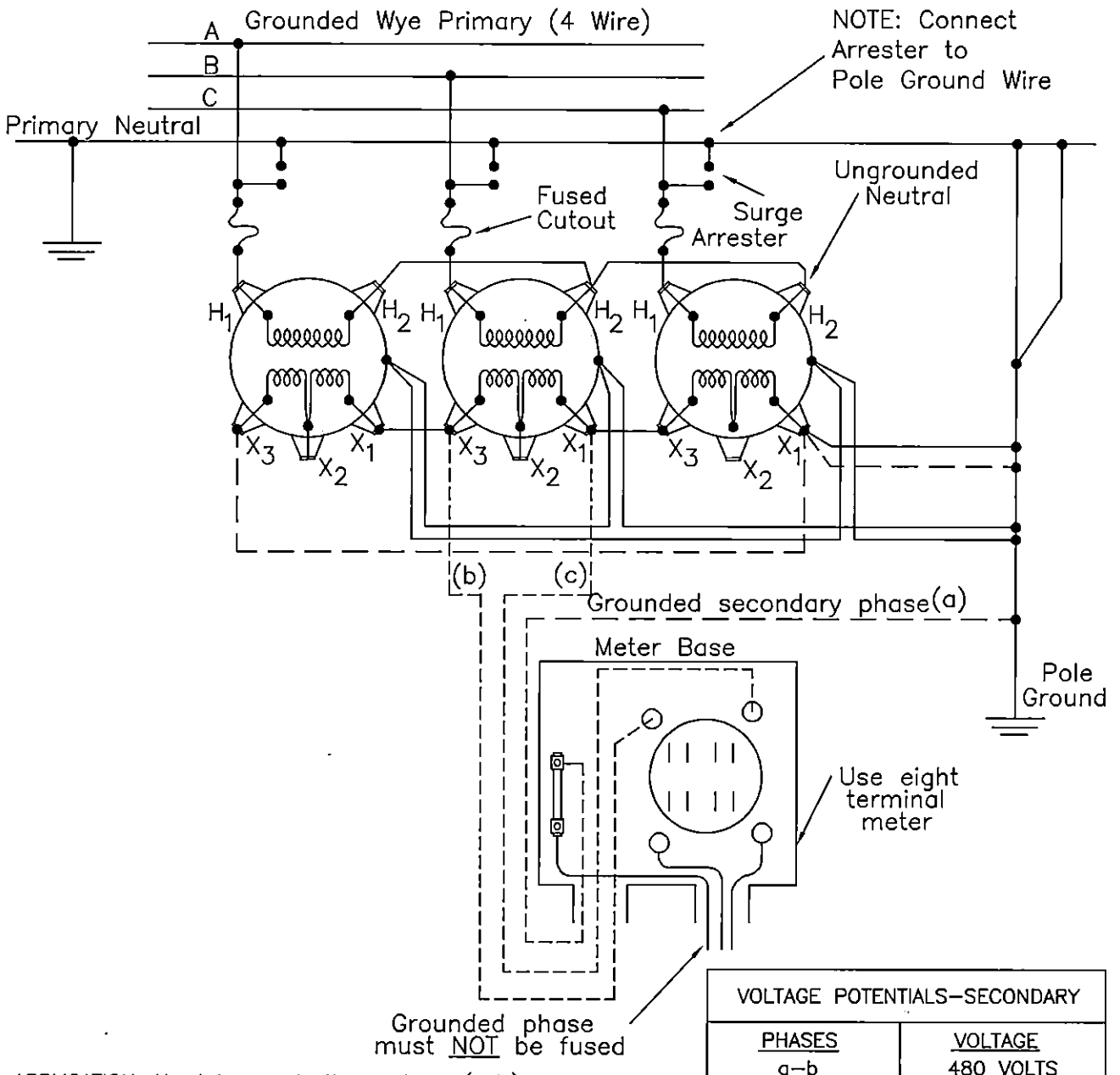
ITEM	QTY	MATERIAL
af	3	Cutout, dist. open (15 kV)
an	3	Transformer, 12.47 kV, conventional
av		Jumpers, bare, stranded
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer, cluster with
		adapter plates as req'd
ek	5	Locknuts
fo	3	Bracket, transformer, insulated

DESIGN PARAMETERS:

See Guide Drawing "G3.2G"

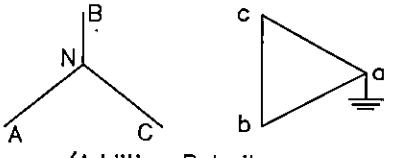
THREE–PHASE TRANSFORMER BANK
UNGROUNDED–WYE PRIMARY
CORNER GROUNDED DELTA, 3 WIRE SECONDARY

APRIL 2005	3 – PHASE PRIMARY	G3.2
RUS	12.47/7.2 kV	(G311–)



VOLTAGE POTENTIALS–SECONDARY	
PHASES	VOLTAGE
a–b	480 VOLTS
b–c	480 VOLTS
a–c	480 VOLTS
a–GRD	0 VOLTS
b–GRD	480 VOLTS
c–GRD	480 VOLTS

210° ANGULAR DISPLACEMENT



(Additive Polarity–
See TRANSFORMER SPECIFICATIONS)

APPLICATION: Used to supply three–phase (only), 240 or 480 volt power loads.

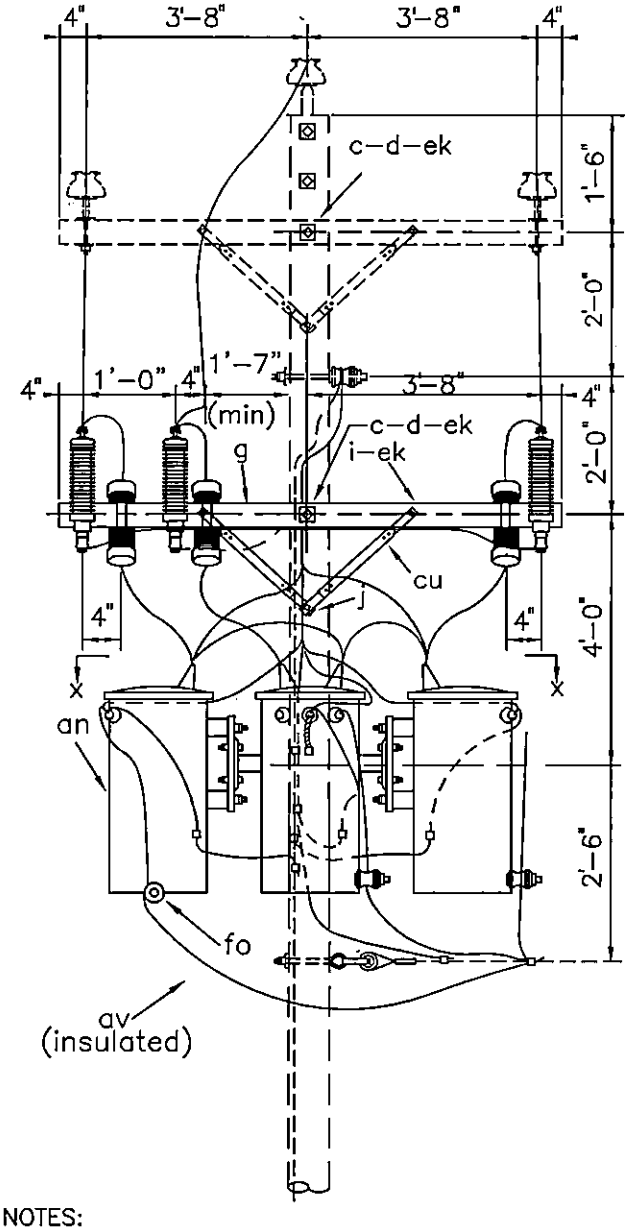
See drawing "G3.2" or "VG3.2" for construction details.

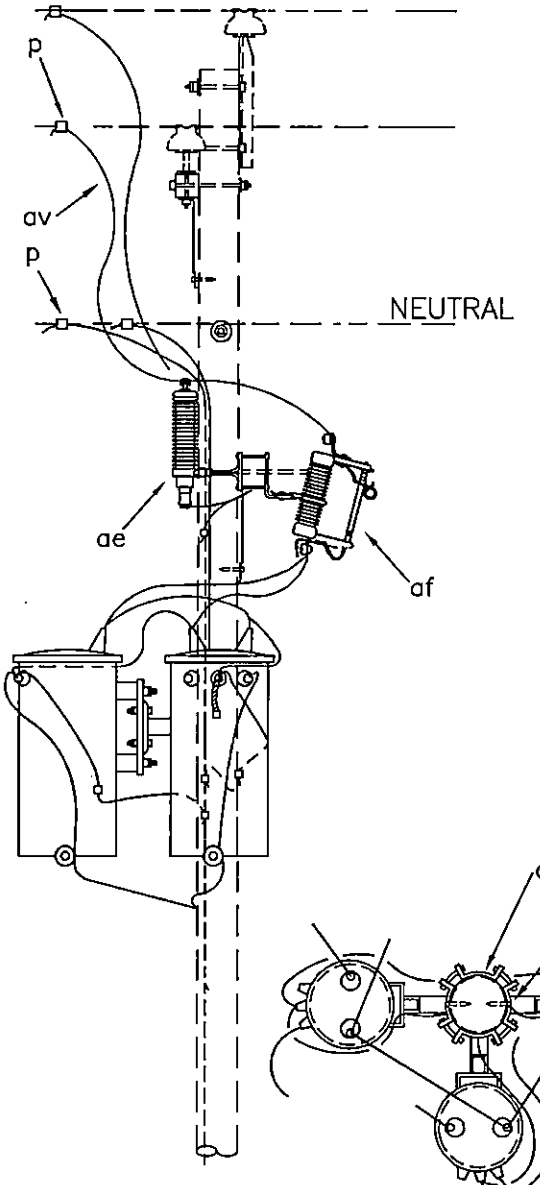
BANK RATING: The maximum safe kVA rating of the bank is three times the kVA rating of the smallest transformer.

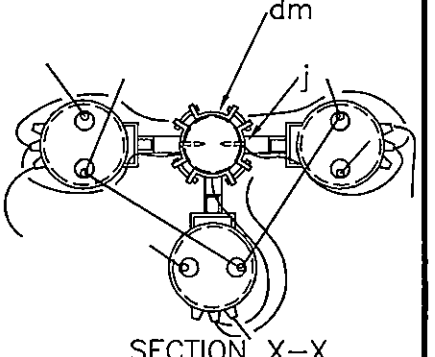
NOTES:
One–half of the above voltages apply when a 240 volt bank is used.
All tanks to be grounded.
Disconnect all secondary neutrals from tank and do not ground. Do not ground bank on primary side. (If grounded, the bank would be a grounding bank for the entire circuit.)
The grounding secondary wire is a current carrying phase wire operating at ground potential and must be identified throughout the circuit run. It is not a neutral.

TRANSFORMER/METER CONNECTION GUIDE
UNGROUNDED WYE – CORNER GROUNDED DELTA FOR 240 or 480 VOLT POWER LOADS

APRIL 2005	3 – PHASE PRIMARY	
RUS		G3.2G







SECTION X–X

NOTES:

1. See Drawing "Q3.3" for additional connection and metering details.

ITEM	QTY	MATERIAL
d	2	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		Screw, lag, 1/2" x 4", as req'd
n	1	Bolt, dble arm, 5/8" x req'd length
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge, (9 kV)

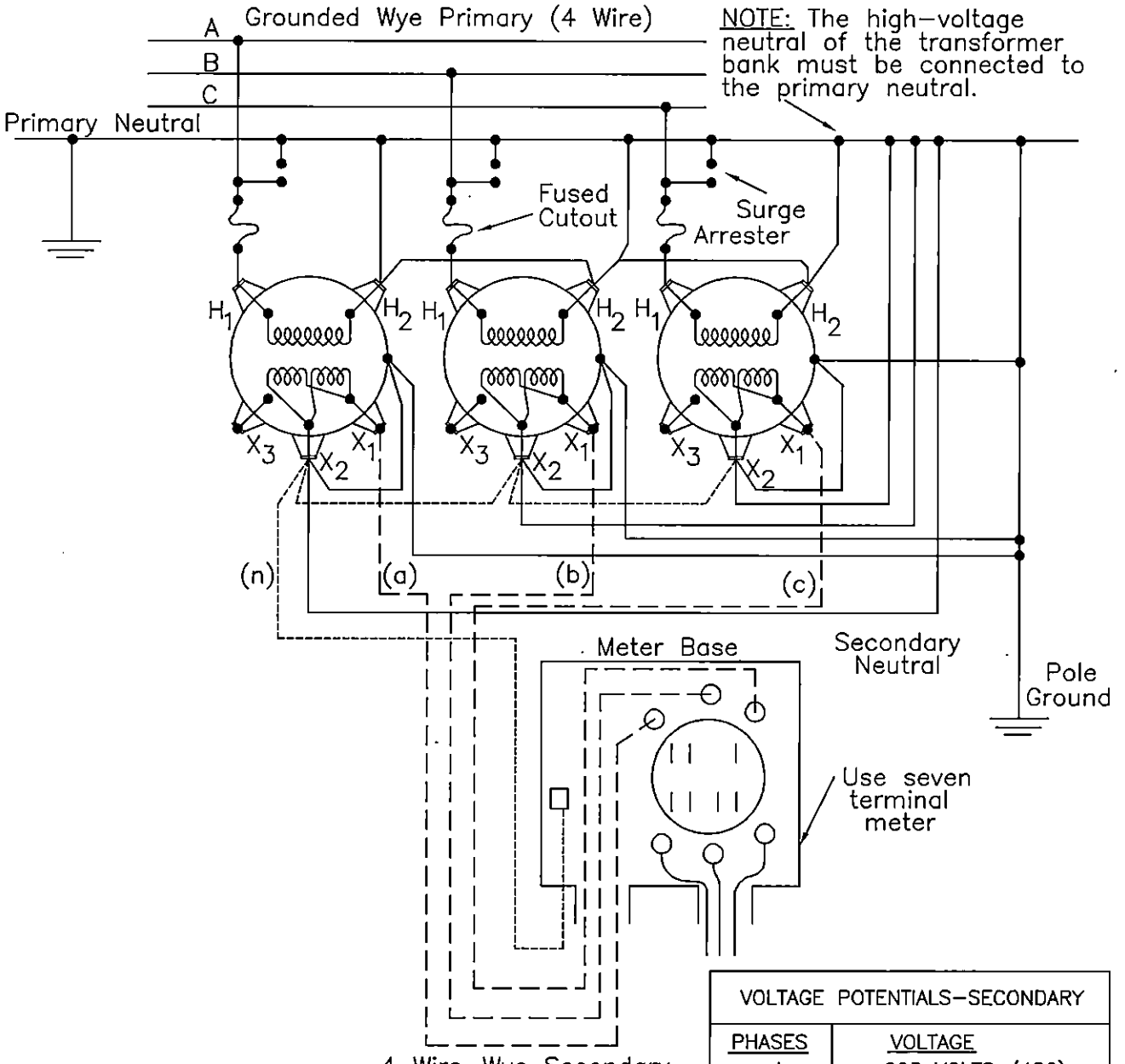
ITEM	QTY	MATERIAL
af	3	Cutout, dist. open (15 kV)
an	3	Transformer, 12.47 kV, conventional
av		Jumpers, bare, stranded
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer, cluster with
		adapter plates as req'd
ek	5	Locknuts
fo	3	Bracket, transformer, insulated

DESIGN PARAMETERS:

See Guide Drawing "G3.3G"

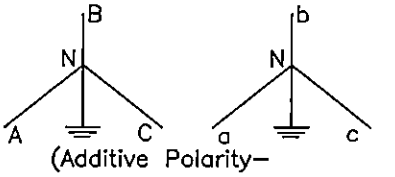
THREE–PHASE TRANSFORMER BANK
GROUNDED–WYE PRIMARY
GROUNDED WYE, 4 WIRE SECONDARY

APRIL 2005	3 – PHASE PRIMARY	G3.3
RUS	12.47/7.2 kV	(G312–)



VOLTAGE POTENTIALS–SECONDARY	
PHASES	VOLTAGE
a–b	208 VOLTS (480)
b–c	208 VOLTS (480)
a–c	208 VOLTS (480)
a–N	120 VOLTS (277)
b–N	120 VOLTS (277)
c–N	120 VOLTS (277).

0° ANGULAR DISPLACEMENT



(Additive Polarity–
See TRANSFORMER SPECIFICATIONS)

APPLICATION: Used to supply 120/208 volt single-phase and 208 volt, three-phase power loads.

See drawing "G3.3" or "VG3.3" for construction details. Reconnect secondary windings of transformers as shown. Matched (impedance and kVA) transformers are usually used.

BANK RATING: Each unit will supply 1/3 of the three-phase load and all of the single-phase load connected to it.

CAUTION: The primary and secondary neutrals must be firmly tied together and grounded or else excessive secondary voltages may develop.

TRANSFORMER/METER CONNECTION GUIDE
GROUNDED WYE – GROUNDED WYE
FOR 120/208 VOLT POWER LOADS

APRIL 2005	3 – PHASE PRIMARY	
RUS		G3.3G

GROUNDING ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
H1.1	(M2-11)	GROUNDING ASSEMBLY - GROUND ROD TYPE
H2.1	(M2-13)	GROUNDING ASSEMBLY - TRENCH TYPE
H3.1	(M2-15)	GROUNDING ASSEMBLY - GROUND ROD TYPE (FOR SECTIONALIZING AIRBREAK SWITCH)
H4.1	(M2-15A)	GROUNDING ASSEMBLY - PLATFORM TYPE (FOR SECTIONALIZING AIRBREAK SWITCH)
H5.1	(M2-12)	GROUNDING IMPROVEMENT ASSEMBLY – PLATE TYPE
H5.2 H5.3	(M2-12A)	GROUNDING IMPROVEMENT ASSEMBLY – WRAP-AROUND TYPE

CONSTRUCTION SPECIFICATIONS FOR GROUNDING

Ground rods (item "ai") shall be driven to their full length in undisturbed earth, a minimum of 2 feet from the face of the pole. The tops of the ground rods shall be at least 12 inches below the surface of the earth. The ground wire (item "av") shall be attached to the rod with a ground rod clamp (item "aj") and shall be secured to the pole with staples. The staples on the ground wire shall be spaced 2 feet part, except for the first 8 feet above the ground and the top 8 feet of the ground wire where they shall be spaced 6 inches apart.

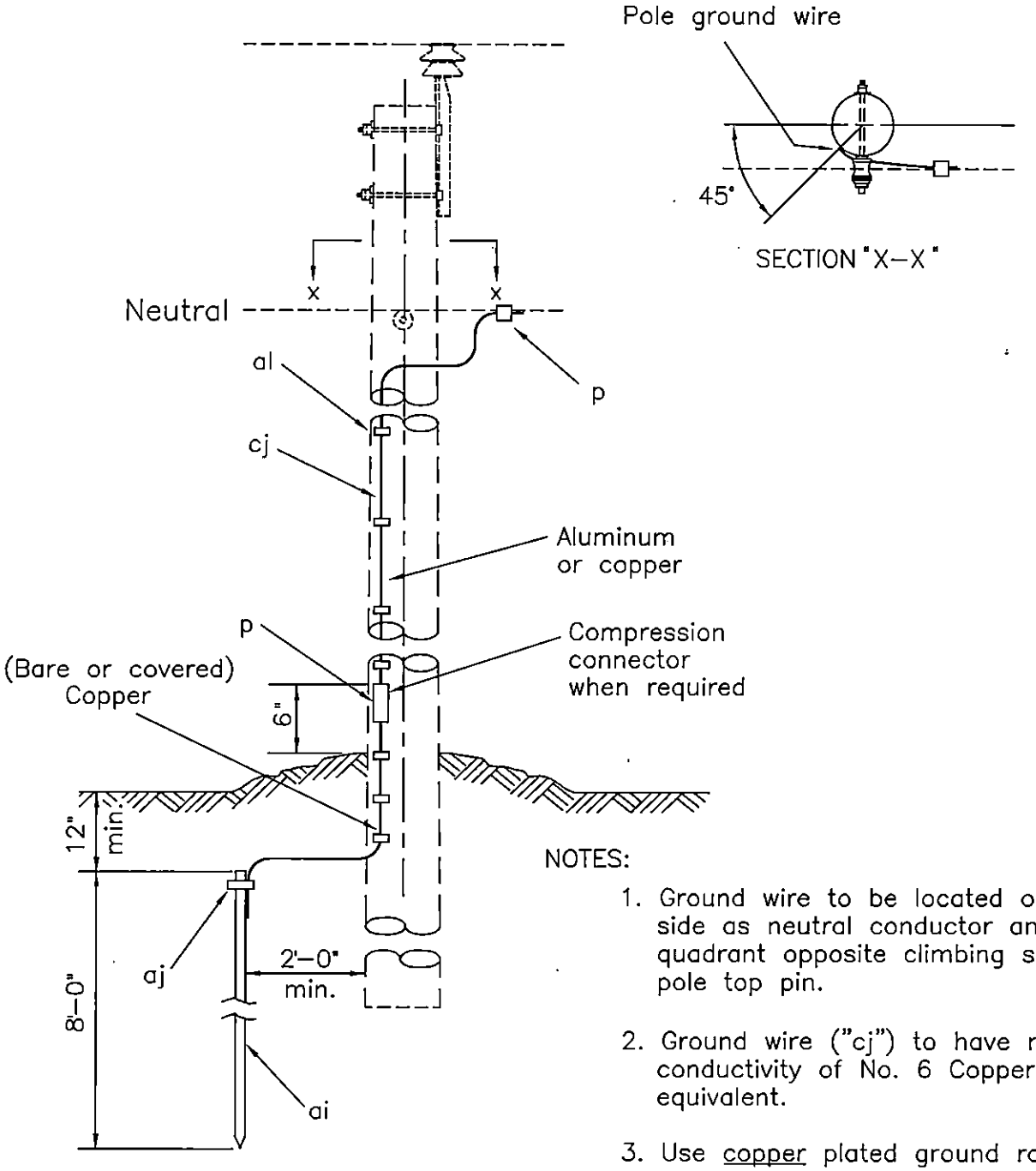
The connection between the ground rod and the system neutral should be made by one continuous piece of conductor (the pole ground wire), and shall be installed in the shortest and most direct path according to the construction drawings. Splices, if required, shall be made using a compression type connector and shall be installed a minimum of 6 inches above the ground line. The pole ground wire shall be connected to the system neutral using a compression type connector.

All equipment shall have at least 2 connections from the frame, case, or tank to the multi-grounded system neutral conductor as shown on the construction drawings. The pole ground wire may be used for one or both of these connections.

All neutral conductors on the pole shall be bonded directly to each other, and connected to the pole ground wire if present. All equipment ground wires, neutral conductors, downguys, messenger wires, and surge-protection ground wires shall be interconnected and attached to a common (pole) ground wire in accordance with the requirements of the National Electrical Safety Code (NESC).

Borrowers shall install effectively grounded driven ground rods (assembly H1.1) or trench type grounding assemblies (assembly H2.1) a maximum of 1,320 feet (433 meters) apart along overhead distribution lines. Customer-owned or other installed electric service grounds shall not be counted in the above minimum grounding assembly requirement.

Whereas under certain circumstances, plate type and wrap-around type grounding improvement assemblies (assemblies H5.1 and H5.2, respectively) may meet the grounding electrode requirements of Rule 094B4 of the NESC, RUS does not allow these types of grounding assemblies to be used to meet the NESC requirement of 4 grounds per mile because the effectiveness of these types of grounds in "disturbed" earth is often questionable. However, RUS encourages the installation of these grounding improvement assemblies to augment and improve the overall grounding of the distribution system that in turn generally improves the performance of line protection devices and improves safety.



NOTES:

1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Ground wire ("cj") to have minimum conductivity of No. 6 Copper or equivalent.
3. Use copper plated ground rod and copper ground wire and staples, or use galvanized steel ground rod, staples and soft annealed iron, 3–strand, 5/16" ground wire with class C galvanizing.

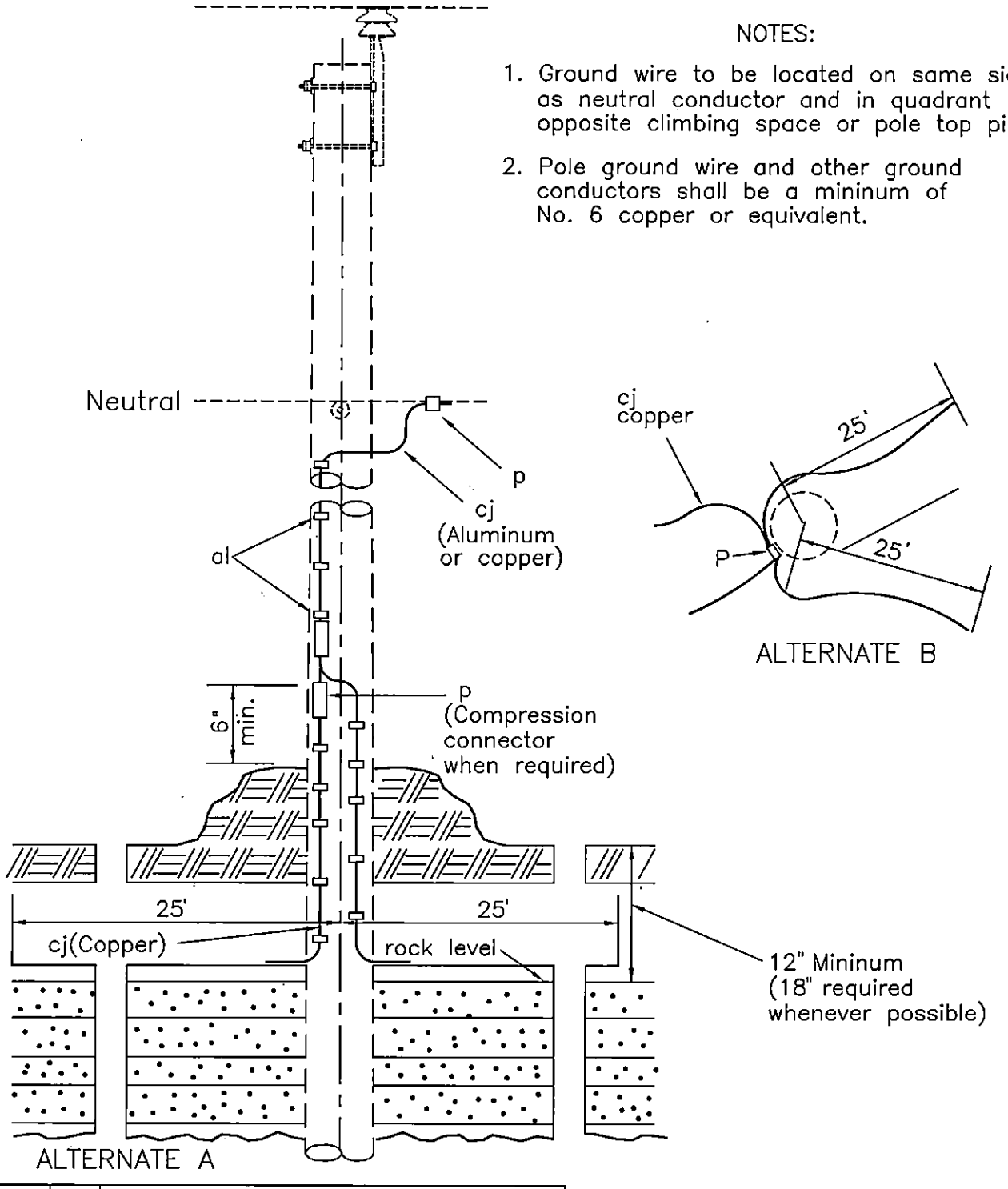
ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
ai	1	Rod, ground, 5/8" min. diameter
aj	1	Clamp, ground rod
al		Staple, ground wire, as req'd
cj		Wire, pole ground, as req'd

GROUNDING ASSEMBLY – GROUND ROD TYPE

APRIL 2005		H1.1
RUS		(M2–11)

NOTES:

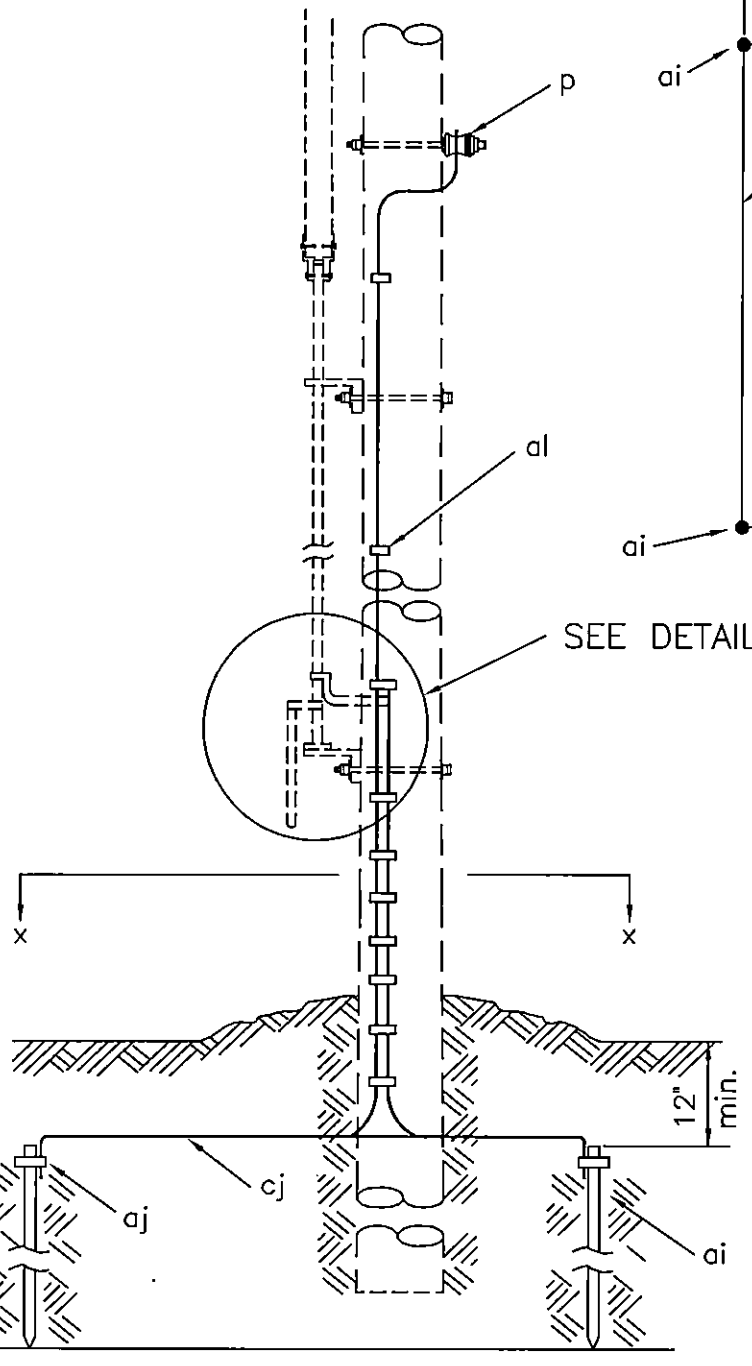
1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Pole ground wire and other ground conductors shall be a mininum of No. 6 copper or equivalent.

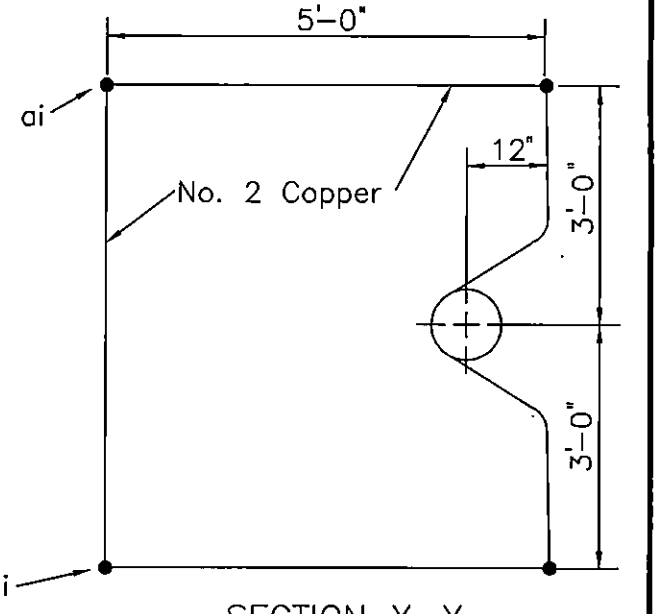


ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
al		Staple, ground wire, as req'd
cj		Wire pole ground as req'd See Note 3 on Drawing H1.1

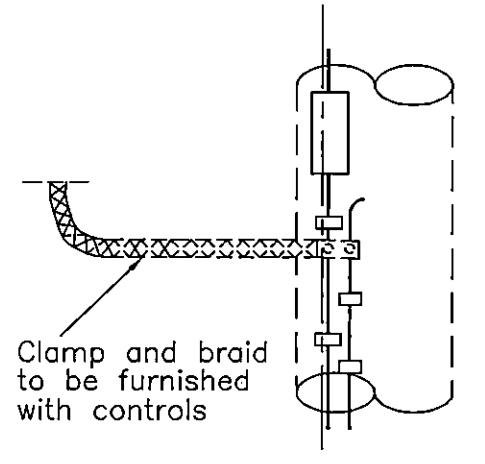
GROUNDING ASSEMBLY — TRENCH TYPE

APRIL 2005 RUS		H2.1 (M2-13)





SECTION X–X
(Detail of ground Grid)



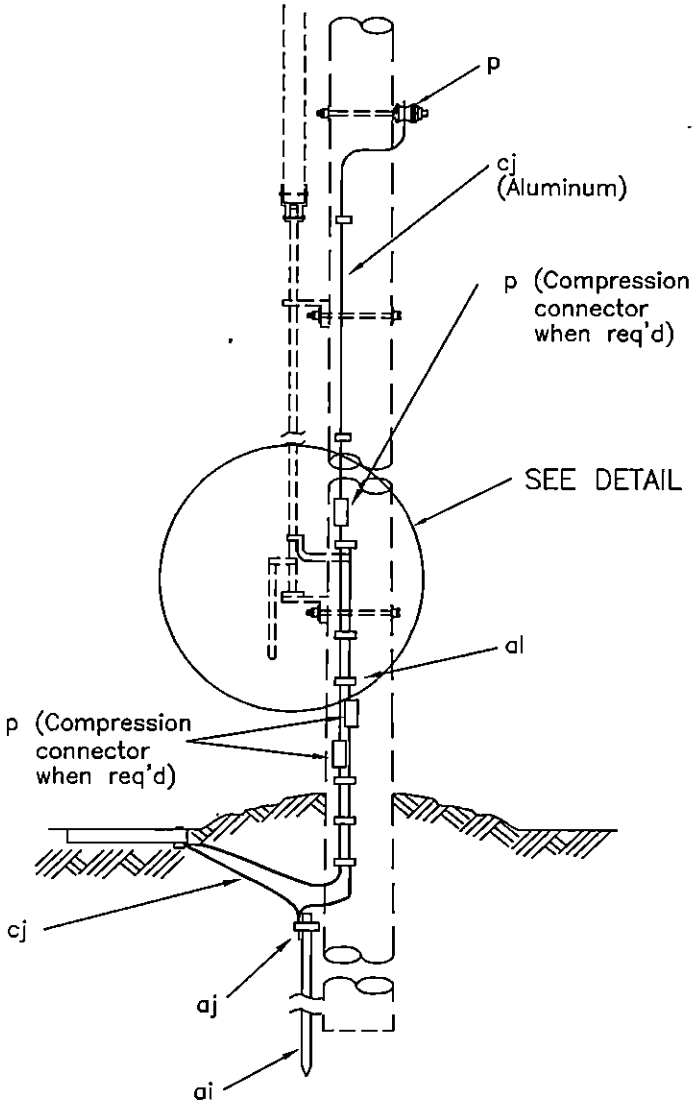
DETAIL

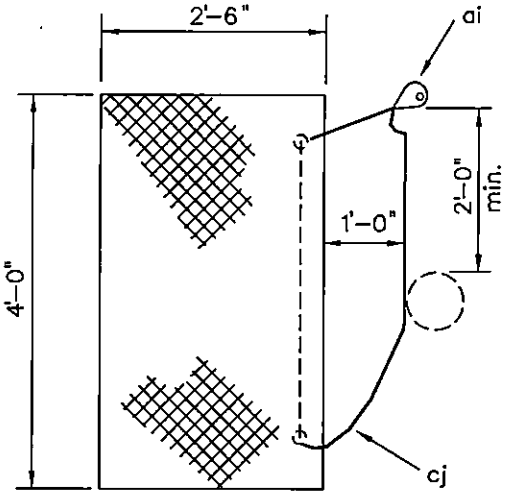
ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
ai	4	Rod, ground, 5/8" min. dia., copper covered
aj	4	Clamp, ground rod
al		Staple, ground wire, (copper),as req'd
cj		Wire, pole ground, #2 S.D. Copper, as req'd

CAUTION: Rubber gloves should be worn when operating switch.

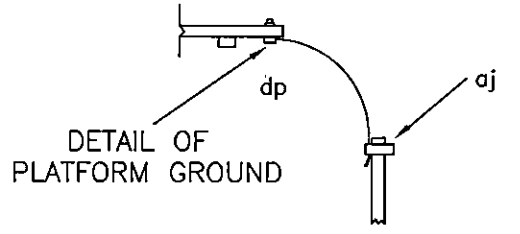
GROUNDING ASSEMBLY – GROUND ROD TYPE (FOR SECTIONALIZING AIRBREAK SWITCH)

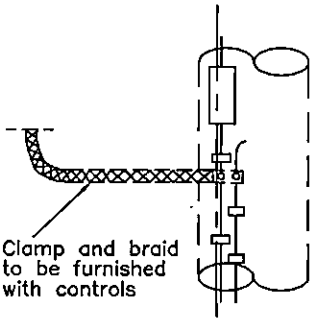
APRIL 2005		H3.1
RUS		(M2–15)





DETAIL OF PLATFORM





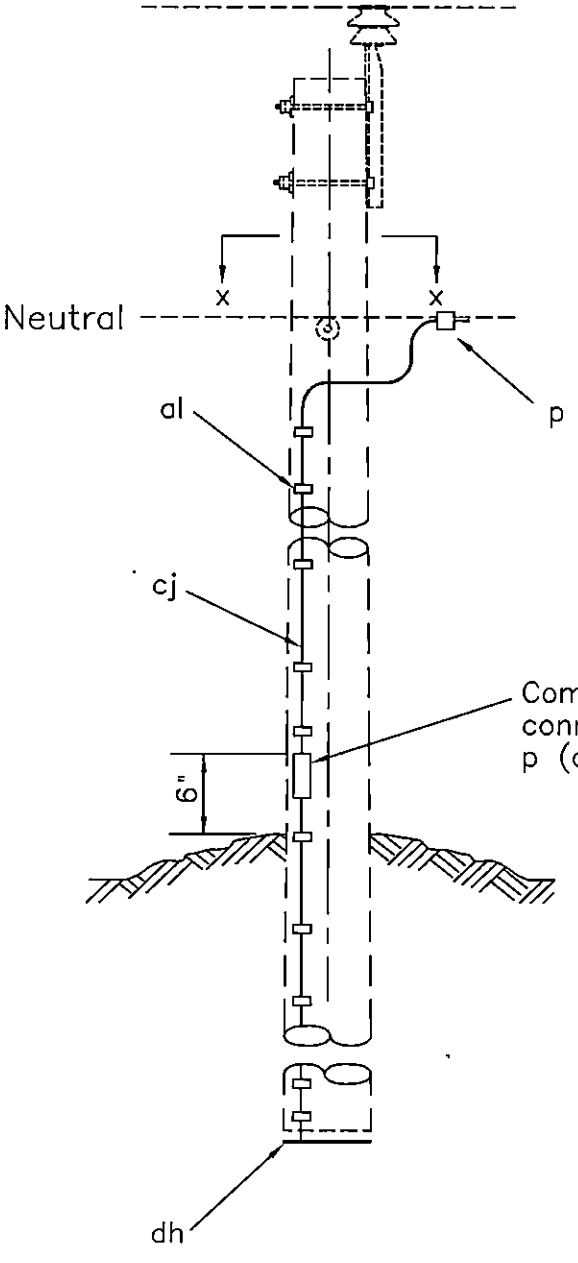
DETAIL

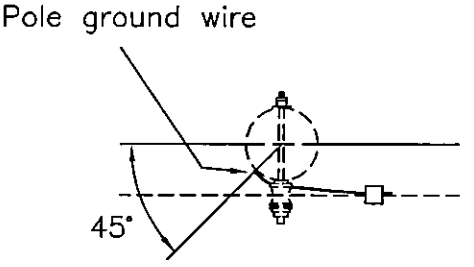
ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
ai	1	Rod, ground, 5/8 min. dia., (galv.)
aj	1	Clamp, ground rod, (galvanized steel)
al		Staple, ground wire, (galv.), as req'd
cj		Wire pole ground, as req'd Soft annealed iron, 5/16" with class C galvanizing
dp	2	Clamp, ground wire, with lock washer
	1	Platform, grounding plate, galv. iron

NOTE: Wear rubber gloves when operating switch.

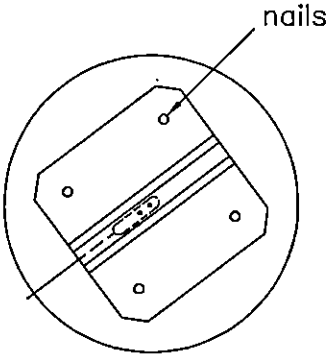
GROUNDING ASSEMBLY — PLATFORM TYPE (FOR SECTIONALIZING AIRBREAK SWITCH)

APRIL 2005		H4.1
RUS		(M2-15A)





SECTION "X–X"



Plan View
Grounding plate (dh)

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" apart except for a distance of 8' above ground and 8' from top of pole where they shall be 6" apart.
3. Copper ground wire ("cj") to have a minimum conductivity of No. 6 Copper or equivalent.

ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
al		Staple, ground wire, as req'd
cj		Wire, pole ground, as req'd
dh	1	Plate, grounding, butt type
	4	Nails, 1", galvanized, roofing

DESIGN PARAMETERS:

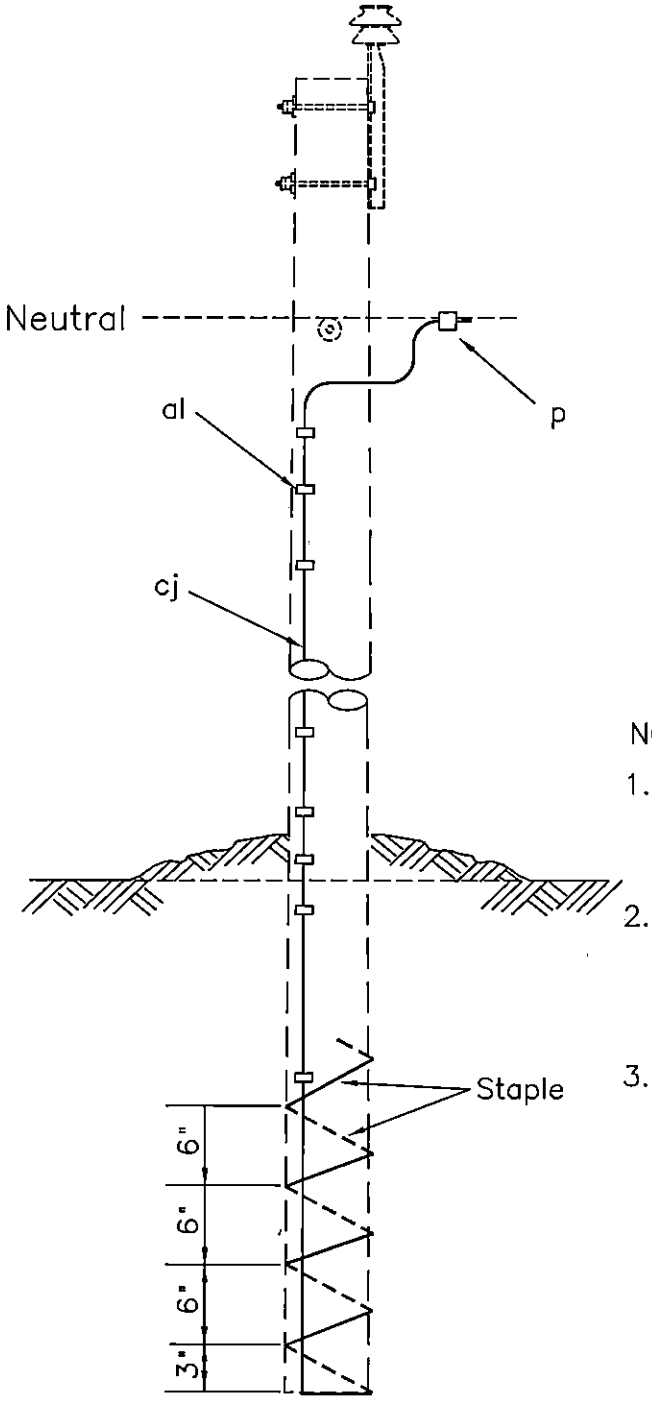
RUS SPECIFIES THAT THIS ASSEMBLY CAN NOT BE COUNTED AS A SYSTEM GROUNDING ELECTRODE REQUIRED BY THE NESC BUT RECOMMENDS ITS USE FOR OVERALL SYSTEM GROUNDING IMPROVEMENT.

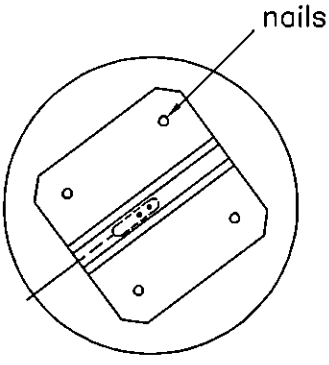
GROUNDING IMPROVEMENT ASSEMBLY – PLATE TYPE

APRIL 2005

RUS

H5.1
(M2–12)





Plan View
Grounding plate (dh)

Designate assembly with grounding plate as "H2.3"

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" apart except for a distance of 8' above ground and 8' from top of pole where they shall be 6" apart.
3. Copper ground wire ("cj") to have a minimum conductivity of No. 6 Copper or equivalent.

ASSEMBLY:		H2.2	H2.3
ITEM	MATERIAL	QTY	QTY
p	Connector, compression, as req'd		
al	Staples, ground wire, as req'd		
cj	Wire, pole ground, as req'd		
dh	Plate, grounding, butt type		1
	Nails, 1", galvanized, roofing		4

DESIGN PARAMETERS:

RUS SPECIFIES THAT THIS ASSEMBLY CAN NOT BE COUNTED AS A SYSTEM GROUNDING ELECTRODE REQUIRED BY THE NESC BUT RECOMMENDS ITS USE FOR OVERALL SYSTEM GROUNDING IMPROVEMENT.

GROUNDING IMPROVEMENT ASSEMBLY – WRAP–AROUND TYPE

APRIL 2005		H5.2,H5.3 (M2–12A)
RUS		

SECONDARY ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
J1.1	(J8)	SECONDARY ASSEMBLIES - (SMALL ANGLE)
J1.2	(J5)	
J2.1	(J10)	SECONDARY ASSEMBLIES - (LARGE ANGLE)
J2.2	(J7), (J7C)	
J3.1	(J6), (J11)	SECONDARY ASSEMBLIES - (DEADEND, MISC.)
J4.1	(J12)	

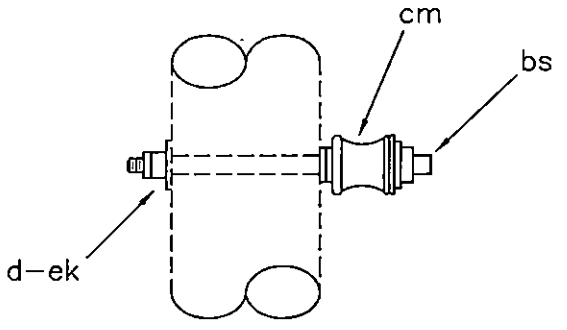
CONSTRUCTION SPECIFICATIONS FOR SECONDARY CONDUCTORS AND SERVICE DROPS

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.

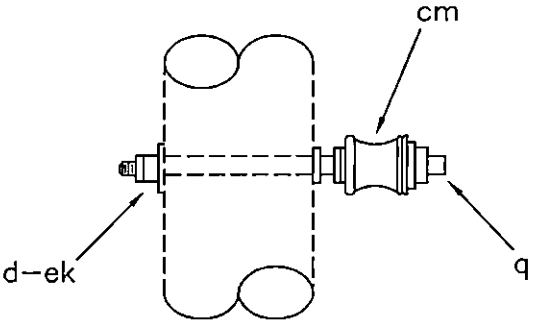
Conductors for secondary underbuild on primary lines may be bare wires, except in those circumstances where conditions may necessitate that covered wires or service cable be used. Service drop conductors shall be covered wires or service cable in accordance with NESC Rule 234C3.

Secondary and service drop conductors shall be installed such that the climbing space on poles is not obstructed. For new construction there shall not be more than one splice per conductor in any span, and splices shall be located at least 10 feet from the conductor support. Covered conductors or service cables used for both the secondary and service drop may be installed in one continuous run.

The "permitted longitudinal loadings" shown on the assembly drawings are based on 50 percent of the mechanical-electrical ratings of the insulators. ***All applied loads must be multiplied by the appropriate NESC overload factors when applicable.***



J1.1



J1.2

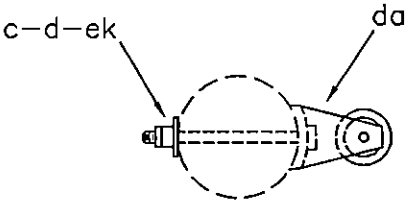
		J1.1	J1.2
ITEM	MATERIAL	QTY	QTY
d	Washer, 2 1/4" square	1	1
q	Bolt, double upset		1
bs	Bolt, single upset	1	
cm	Insulator, spool	1	1
ek	Locknuts	1	1

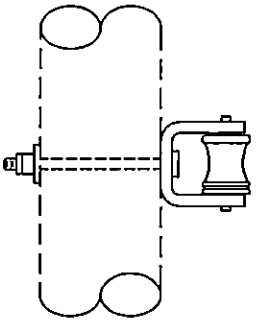
DESIGN PARAMETERS:
MAXIMUM LINE ANGLES

5° – Small Conductors
2° – Larger than #1/0

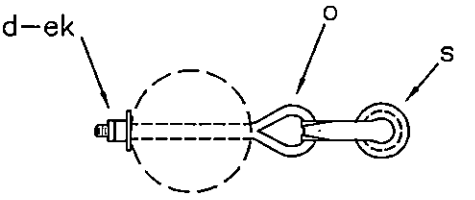
SECONDARY ASSEMBLIES
(SMALL ANGLE)

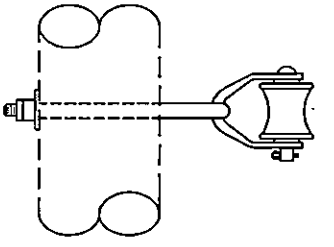
APRIL 2005		J1.1,J1.2
RUS		(J8),(J5)





J2.1





J2.2

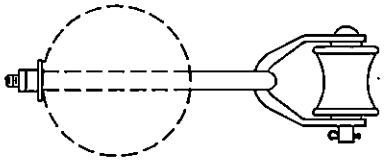
		J2.1	J2.2
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" X req'd length	1	
d	Washer, 2 1/4" square	1	1
o	Bolt, eye, 5/8" X req'd length		1
s	Clevis, secondary, swinging, insulated		1
da	Bracket, insulated	1	
ek	Locknuts	1	1

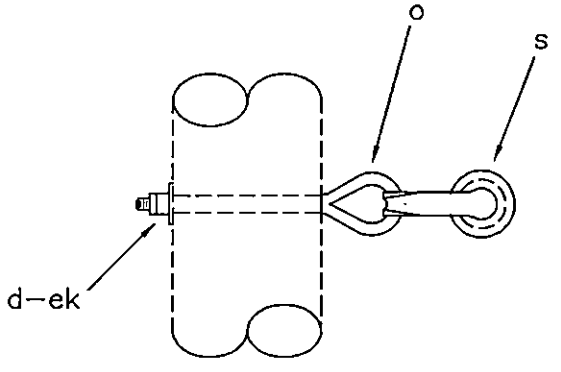
DESIGN PARAMETERS:
MAXIMUM LINE ANGLES

J2.1: 60°
J2.2: 60°

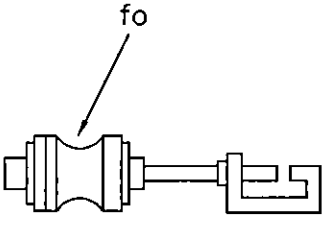
SECONDARY ASSEMBLIES (LARGE ANGLE)

APRIL 2005		J2.1,J2.2 (J10),(J7,J7C)
RUS		





J3.1



J4.1

		J3.1	J4.1
ITEM	MATERIAL	QTY	QTY
d	Washer, 2 1/4" square	1	
o	Bolt, eye, 5/8" x req'd length	1	
s	Clevis, secondary, swinging, insulated	1	
fo	Bracket, transformer secondary		1
ek	Locknuts	1	1

DESIGN PARAMETERS: (J3.1)

PERMITTED LONGITUDINAL LOADING:
1,500 lbs. (ANSI Class 53–2 Insulator)
2,250 lbs. (ANSI Class 53–4 Insulator)

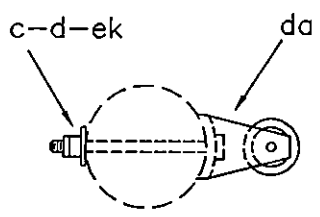
SECONDARY ASSEMBLIES (DEADEND, MISC.)

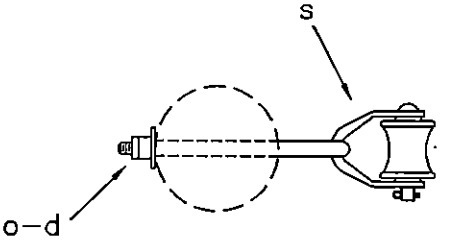
APRIL 2005		J3.1,J4.1 (J6,J11),(J12)
RUS		

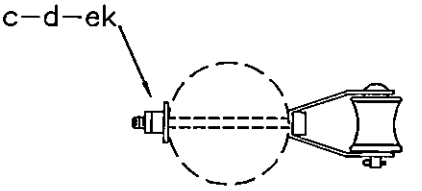
INDEX K

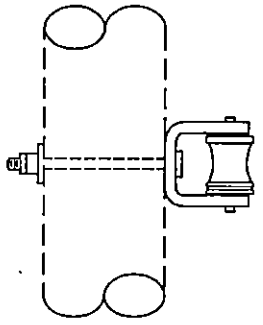
SERVICE ASSEMBLY UNITS

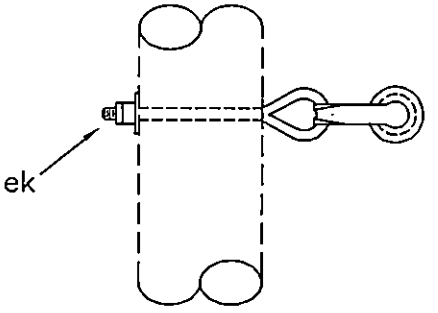
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
K1.1	(K14C)	SECRVICE ASSEMBLIES - (POLE MOUNTED)
K1.2	(K11C)	
K1.3	(K14), (K14L)	
K1.4	(K11), (K11L)	SECRVICE ASSEMBLIES - (POLE MOUNTED)
K1.5	(K15C)	
K2.1	(K10), (K10L)	SERVICE ASSEMBLIES
K2.2	(K10C)	
K2.3	(K10C)	
K3.1	(K17), (K17L)	SERVICE ASSEMBLIES - (MAST TYPE)
K3.2	(K16C)	
K4.1G	(M24)	CABLE SERVICE ASSEMBLY GUIDE
K4.2G	(M24-10)	MAST TYPE SERVICE ASSEMBLY GUIDE

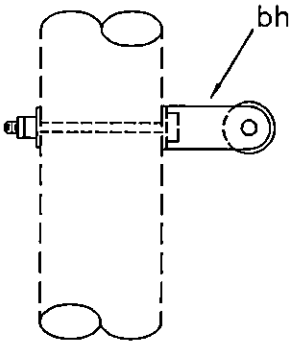












K1.1 K1.2 K1.3

ASSEMBLY: K1		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
c	Bolt, machine, 5/8" X req'd length	1		1
d	Washer, 2 1/4" square	1	1	1
o	Bolt, eye, 5/8" X req'd length		1	
s	Clevis, secondary, swinging, insulated		1	
bh	Clevis, service, deadend, insulated			1
ek	Locknuts	1	1	1
da	Bracket, insulated	1		

ASSEMBLY NUMBERS	
NEW	(OLD)
K1.1	(K14C)
K1.2	(K11C)
K1.3	(K14)
	(K14L)

DESIGN PARAMETERS:

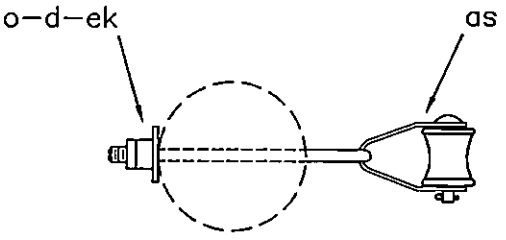
PERMITTED LONGITUDINAL LOADING:
1,500 lbs. (ANSI Class 53–2 Insulator)
2,250 lbs. (ANSI Class 53–4 Insulator)

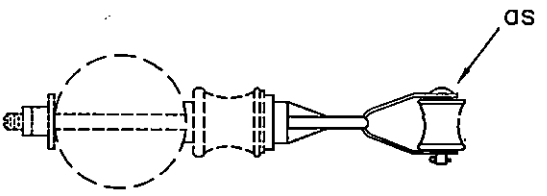
SERVICE ASSEMBLIES (POLE MOUNTED)

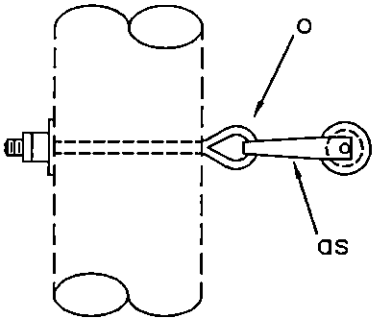
APRIL 2005

RUS

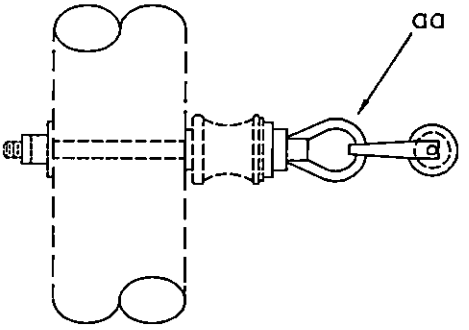
K1.1,K1.2,K1.3







K1.4



K1.5

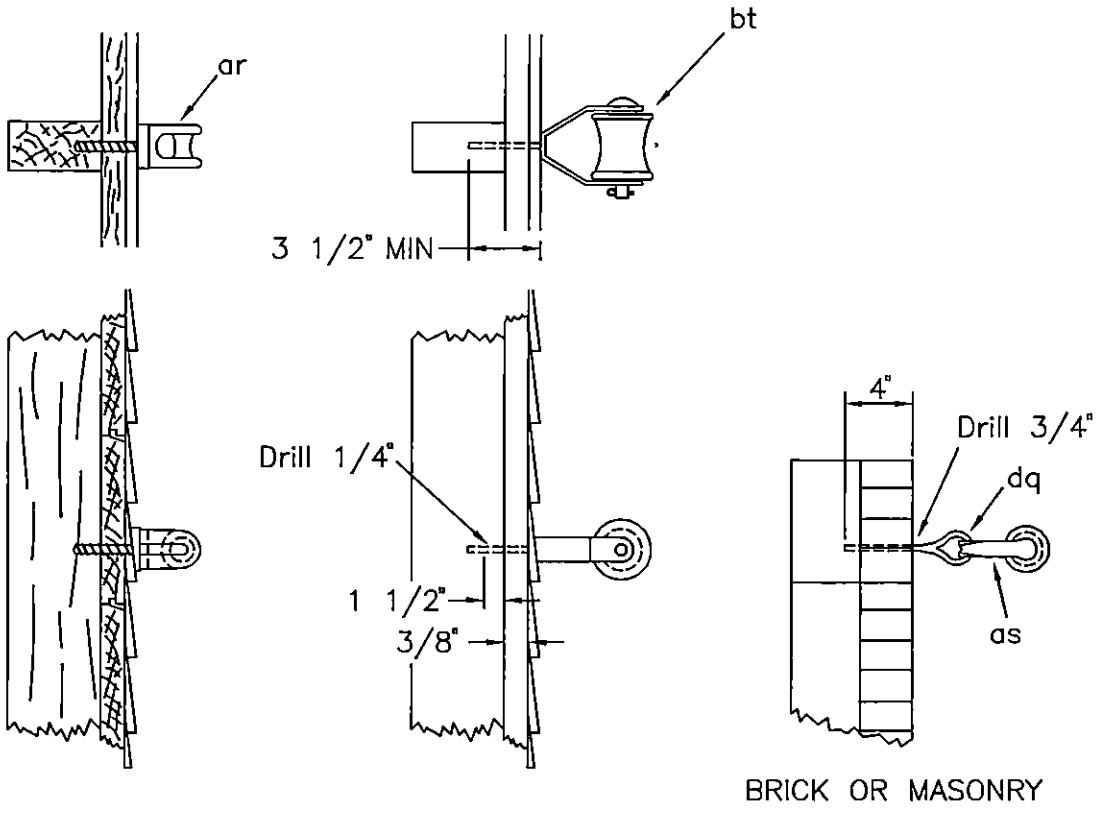
ASSEMBLY: K1		.4	.5
ITEM	MATERIAL	QTY	QTY
d	Washer, 2 1/4" square	1	
o	Bolt, eye, 5/8" X req'd length	1	
aa	Nut, eye		1
as	Clevis, service, swinging, insulated	1	1
ek	Locknuts	1	

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD:
1,500 lbs. (ANSI Class 53–2 Insulator)
2,250 lbs. (ANSI Class 53–4 Insulator)

SERVICE ASSEMBLIES (POLE MOUNTED)

APRIL 2005		K1.4,K1.5 (K11,K11L),(K15C)
RUS		

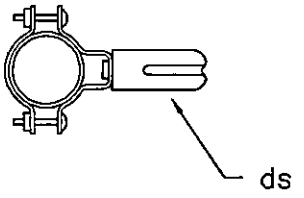


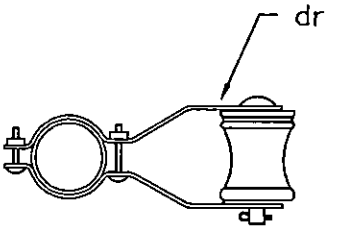
NOTE: Assembly K2.1 not suitable for large conductors or cable services.

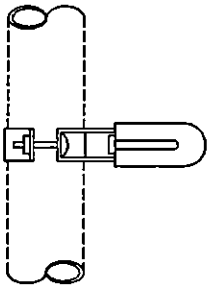
ASSEMBLY: K2		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
ar	Wireholder	1		
as	Clevis, secondary, swinging, insulated			1
bt	Wireholder, clevis type insulated, #24 Woodscrew		1	
dq	Eye, screw, elliptical, 1/2" X 6"			1
	3/4" x 3 1/2" expansion shield			1

SERVICE ASSEMBLIES

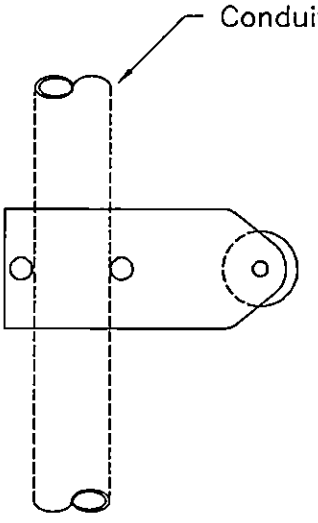
APRIL 2005		K2.1,K2.2,K2.3
RUS		(K10,K10L),(K10C)







K3.1



K3.2

NOTE: Assembly K3.1 not suitable for loarge conductors or cable services.

ASSEMBLY: K3		.1	.2
ITEM	MATERIAL	QTY	QTY
dr	Clevis, conduit, insulated		1
ds	Wireholder, conduit	1	

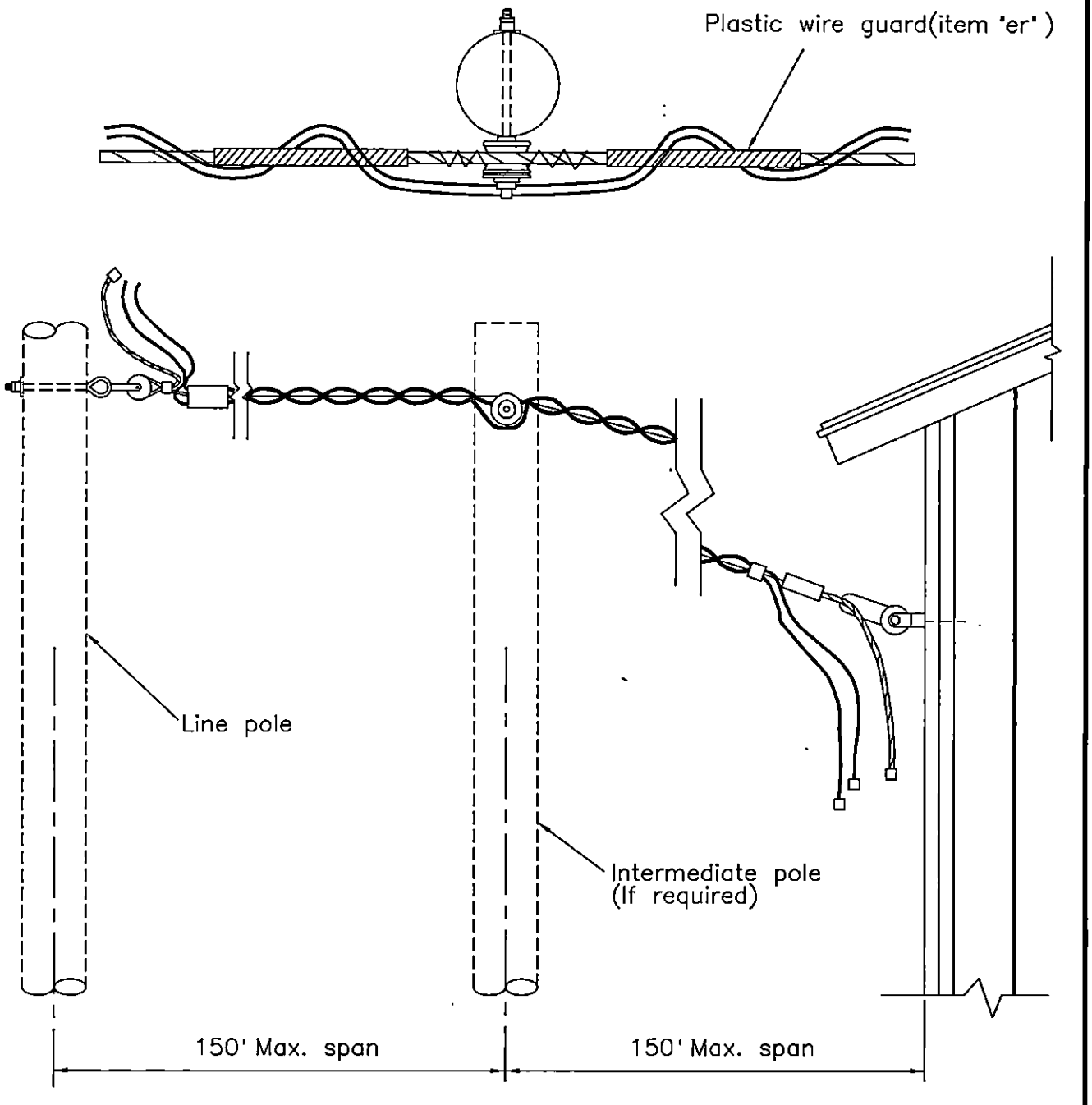
DESIGN PARAMETERS:

PERMITTED LOADING (lbs)

	Deadend	Cantilever
K3.1	1500	800
K3.2	1500	400

SERVICE ASSEMBLIES (MAST TYPE)

APRIL 2005		K3.1,K3.2 (K17,K17L),(K16C)
RUS		

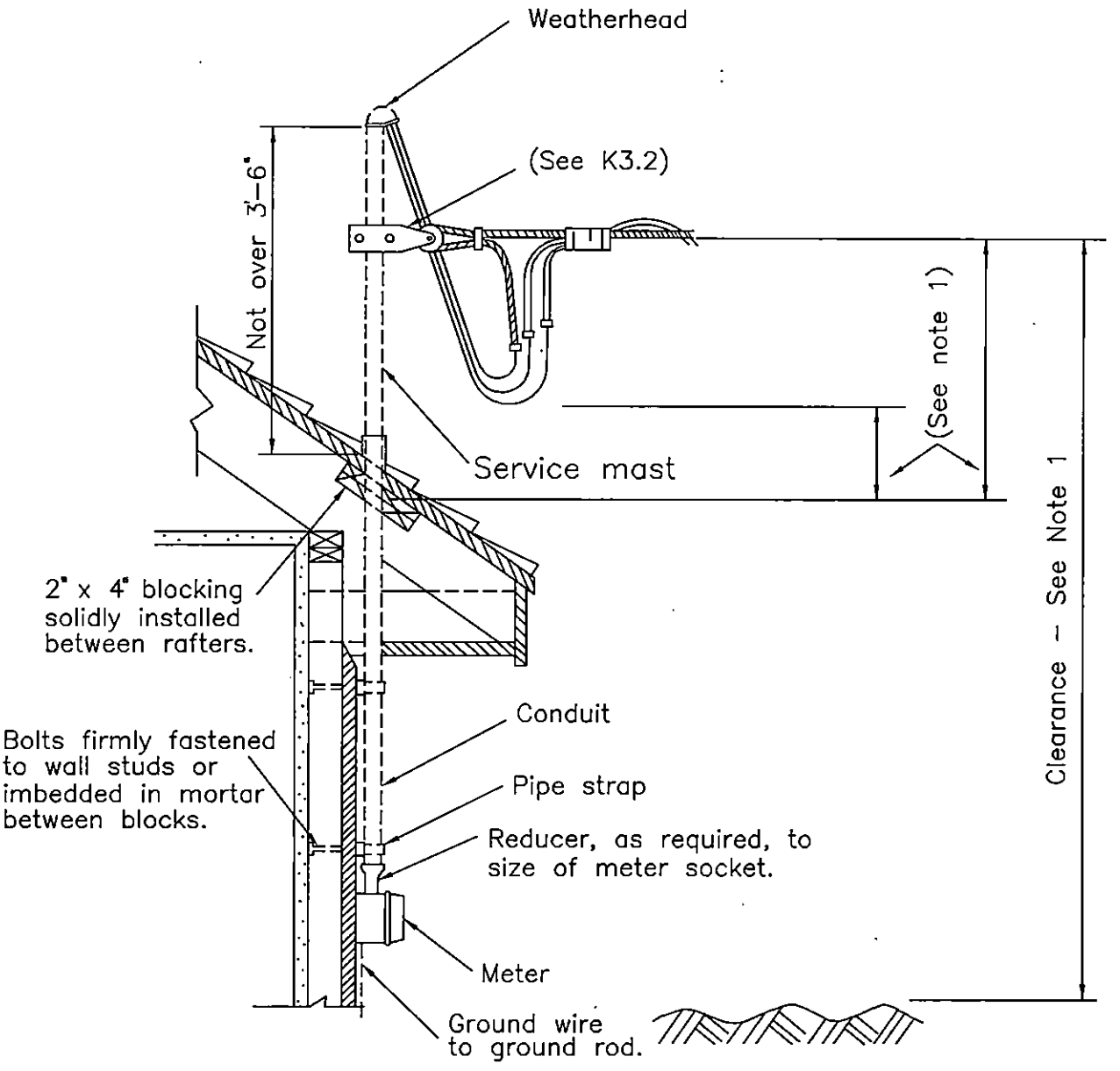


NOTES:

1. Services as short as possible are preferred.
2. See NESC Table 232–1 for minimum ground clearances.
3. Refer to secondary and service assemblies for construction details.
4. Service connectors to be insulated compression type.

CABLE SERVICE ASSEMBLY GUIDE

APRIL 2005		K4.1G
RUS		(M24)



NOTES:

1. All clearances to be in conformance to the most stringent requirements of the NESC, NEC or other codes of governmental or regulating authorities as applicable.

2. If length of conduit exceeds 10 feet, coupling is permitted on end adjacent to meter.

MAST TYPE SERVICE ASSEMBLY GUIDE

APRIL 2005		K4.2G
RUS		(M24-10)

INDEX L

TYING ASSEMBLIES

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
L1.1	(M41-1)	PRIMARY ANGLE TYING ASSEMBLIES
L1.2	(M41-10)	
L1.3	(M42-3)	PRIMARY DEADEND TYING ASSEMBLIES
L1.4	(M42-21)	
L1.5	(M42-11)	
L2.1		NEUTRAL ANGLE TYING ASSEMBLIES
L2.2		
L2.3		NEUTRAL DEADEND TYING ASSEMBLIES
L2.4		
L2.5	(M42-13)	
L3.1	(M41-1)	NEUTRAL & SECONDARY ANGLE TYING ASSEMBLIES
L3.2	(M41-10)	
L3.3	(M42-21)	NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES -
L3.4	(M42-3)	(COPPER)
L3.5	(M42-11)	NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES -
L3.6		(ACSR)
L4.1		TYING ASSEMBLIES, SERVICES
L4.2		TYING ASSEMBLIES, CABLE SERVICES
L4.3		
L4.4		

CONSTRUCTION SPECIFICATIONS FOR CONNECTORS, STIRRUPS, CLAMPS, TAPS, AND JUMPERS

Jumpers and other leads connected to line conductors shall have sufficient slack to allow free movement of the conductors without causing the jumpers to be pulled from their connectors. Even if not shown on the drawings, jumpers shall have at least two bends in a vertical plane, or one in a horizontal plane, or the equivalent.

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

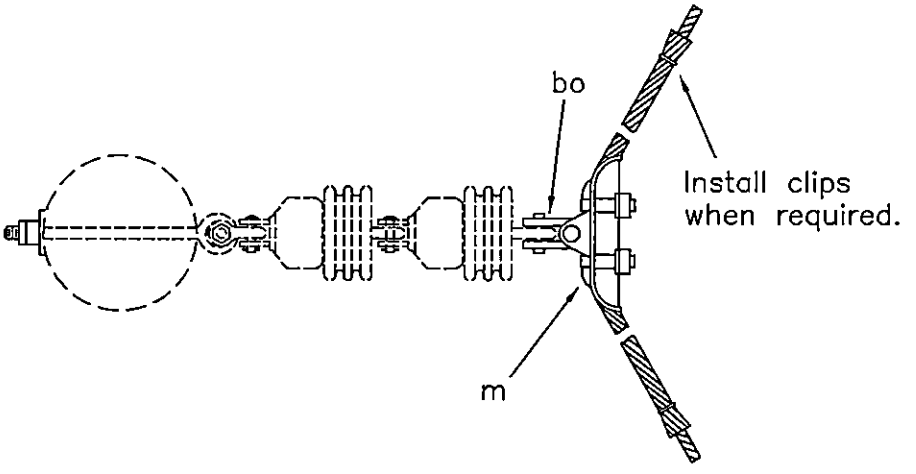
Connectors and hot-line clamps suitable for the purpose shall be installed as shown on the drawings and also in accordance with the manufacturer's specifications and recommendations. On all hot-line clamp installations, the clamp and jumper shall be installed so that they are permanently bonded to the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

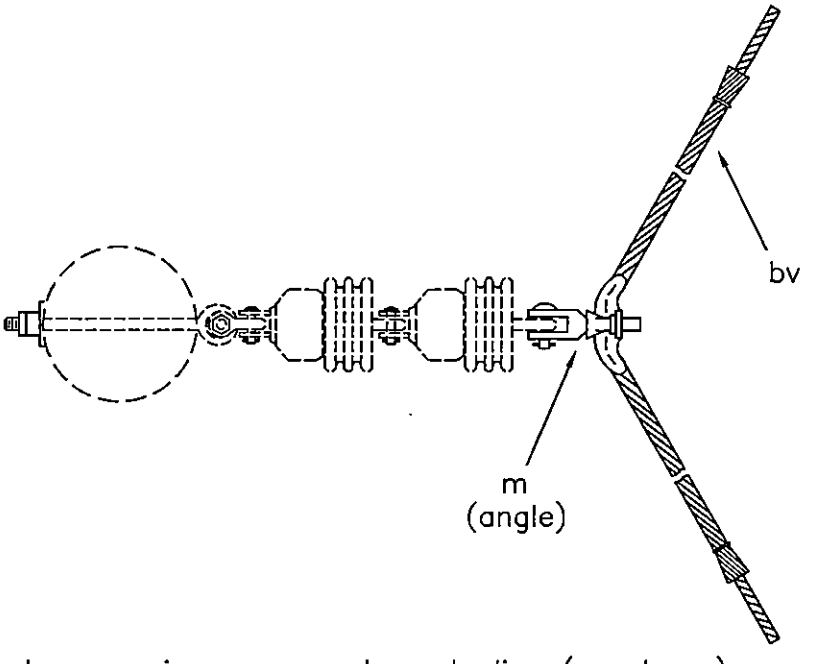
Stirrups may be used to connect tap conductors (jumper wires) to primary conductors if the following criteria are met:

- The stirrup and hot line clamp are sized to meet or exceed the current carrying capacity of the tap conductor or equipment jumper;
- All stirrup conductors are made of copper or bronze;
- All stirrup conductors are made of #2 copper equivalent conductivity or larger;
- All-purpose or aluminum hot line clamps are not used with stirrups;
- All stirrups, connectors, and clamps are installed in accordance with the manufacturer's specifications;
- Stirrups with two compression connectors are not used in areas prone to aeolian vibration;
- Stirrups are not used to connect main lines together or to connect heavily loaded tap lines to main lines.

Stirrups are not recommended to be used to connect reclosers, autotransformers, or line regulators to primary conductors. Stirrups and hot line clamps shall not be used for sectionalizing taps nor taps for main lines for operational or maintenance purposes. Permanent compression or bolted type connectors shall be used because of their better current carrying capabilities and reliability. Line switches, fused cutouts, or solid blade cutouts should be used at line locations where occasional line sectionalizing may be required.

At locations where permanent connections using compression or bolted type connectors are not desired, and where the installation of sectionalizing equipment is also not desired, hot line clamps (over armor rod on aluminum conductors) shall be installed.





NOTES:

1. ACSR conductors require armor rods and clips (as shown).
2. Use angle suspension clamp with #2 or #4 ACSR only.

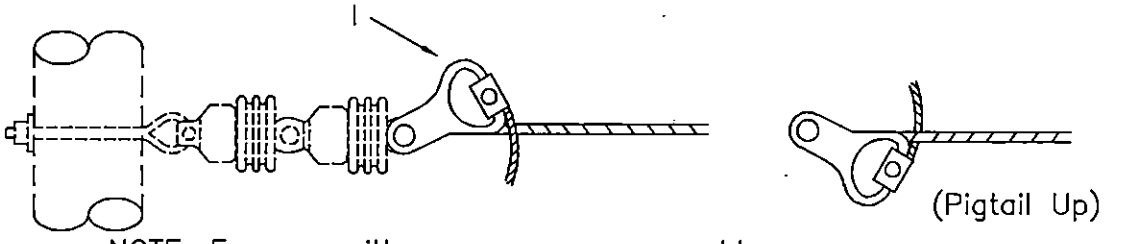
ASSEMBLY: L1		.1	.2
ITEM	MATERIAL	QTY	QTY
m	Clamp, 2 bolt, suspension (distribution)	1	
m	Clamp, angle, suspension (distribution)		1
bo	Shackle, anchor	1	1
bv	Rods, armor (as req'd)		

DESIGN PARAMETERS:

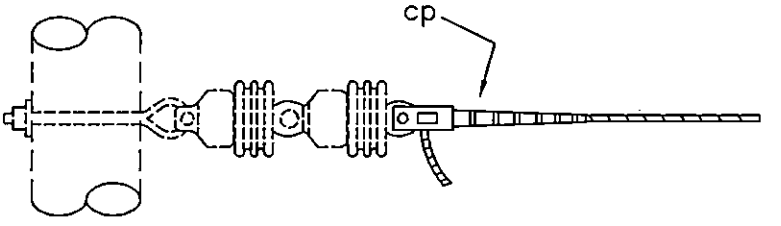
30° to 60° Line Angles

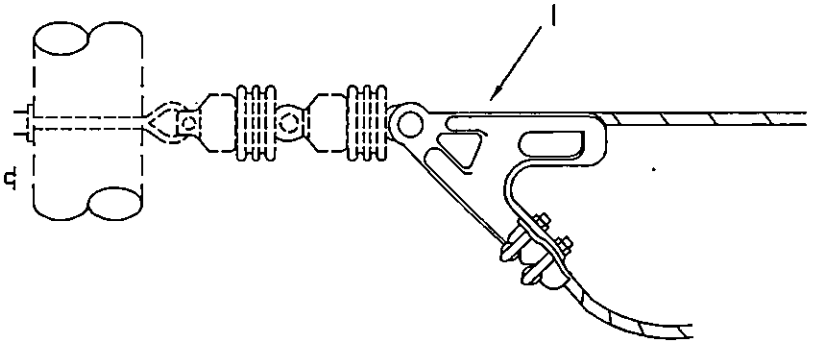
PRIMARY ANGLE TYING ASSEMBLIES

APRIL 2005		L1.1,L1.2
RUS	12.47/7.2 kV	(M41-1),(M41-10)



NOTE: For use with copper or copperweld–copper conductors only.





NOTES:

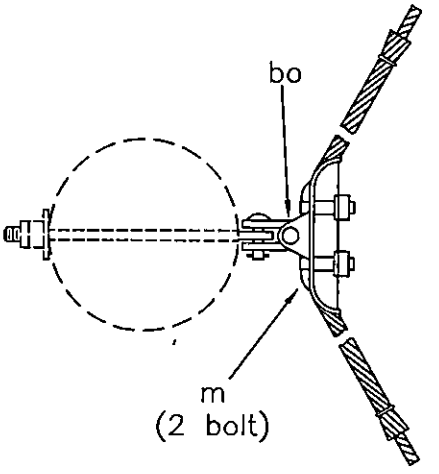
1. Item "by" may be substituted for item "cp" shown.
2. Specify "ej" clamp instead of "I" clamp for conductors larger than #4/0 ACSR.
3. Armor tape required for conductors in galvanized fittings not having aluminum liners.
4. Bend pigtails away from line conductors to avoid chafing.

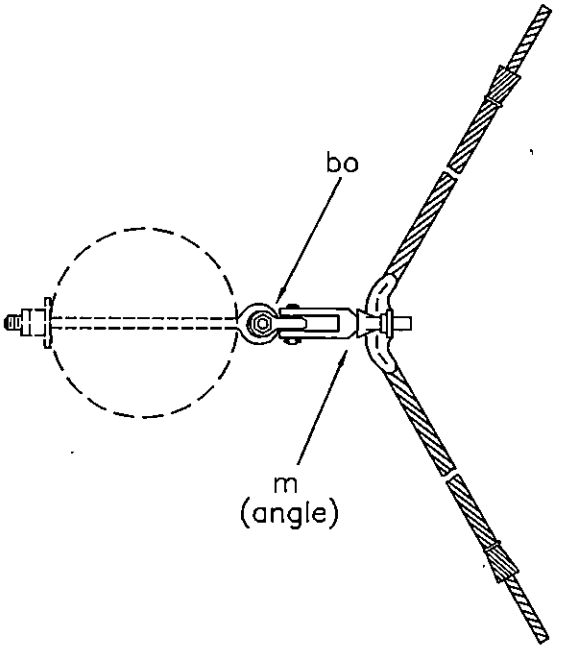
ASSEMBLY NUMBERS	
NEW	(OLD)
L1.3	(M42–3)
L1.4	(M42–21)
L1.5	(M42–11)

ITEM	MATERIAL	ASSEMBLY: L1 .3 QTY	.4 QTY	.5 QTY	
I	Clamp, deadend (distribution)	1		1	
by	Deadend, automatic or formed type				(Not Shown)
cp	Deadend, compression type		1		

PRIMARY DEADEND TYING ASSEMBLIES

APRIL 2005		
RUS	12.47/7.2 kV	L1.3,L1.4,L1.5





NOTES:

1. ACSR conductors require armor rods and clips (as shown).
2. Use angle suspension clamp with #2 or #4 ACSR only.

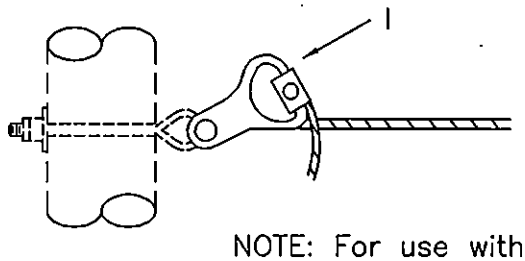
ASSEMBLY: L2		.1	.2
ITEM	MATERIAL	QTY	QTY
m	Clamp, 2 bolt, suspension (distribution)	1	
m	Clamp, angle, suspension (distribution)		1
bo	Shackle, anchor	1	1
bv	Rods, armor (as req'd).		

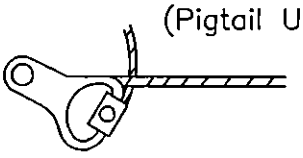
DESIGN PARAMETERS:

30° to 60° Line Angles

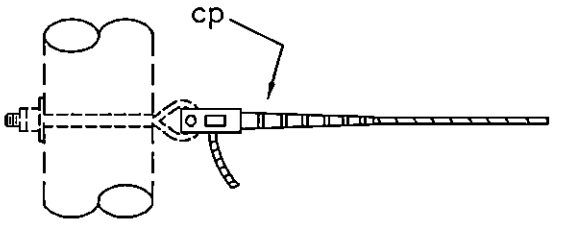
NEUTRAL ANGLE TYING ASSEMBLIES

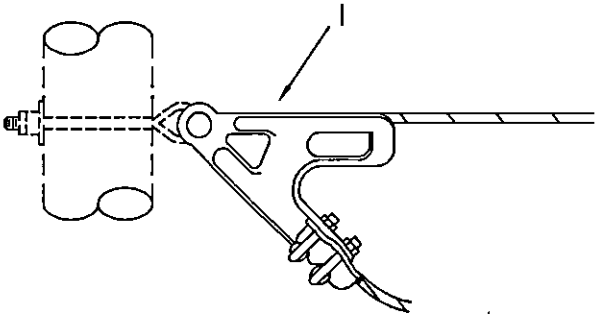
APRIL 2005		
RUS		L2.1,L2.2





NOTE: For use with copper or copperweld–copper conductors only.





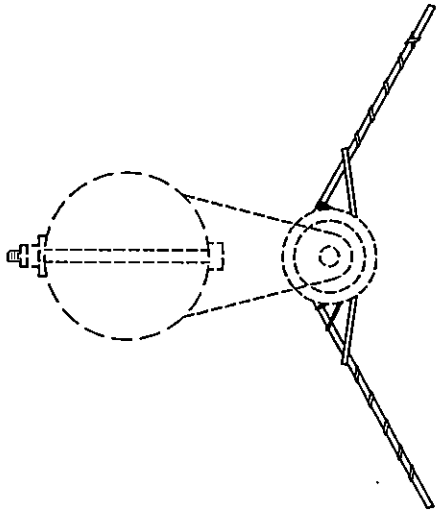
NOTES:

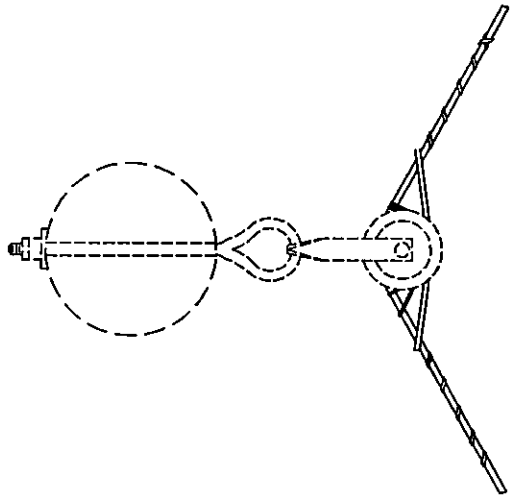
1. Item "by" may be substituted for item "cp" shown.
2. Specify "ej" clamp instead of "l" clamp for conductors larger than #4/0 ACSR.
3. Armor tape required for conductors in galvanized fittings not having aluminum liners.
4. Bend pigtails away from line conductors to avoid chafing.

ASSEMBLY: L2		.3	.4	.5	
ITEM	MATERIAL	QTY	QTY	QTY	
l	Clamp, deadend (distribution)	1		1	
by	Deadend, automatic or formed type				(Not Shown)
cp	Deadend, compression type		1		

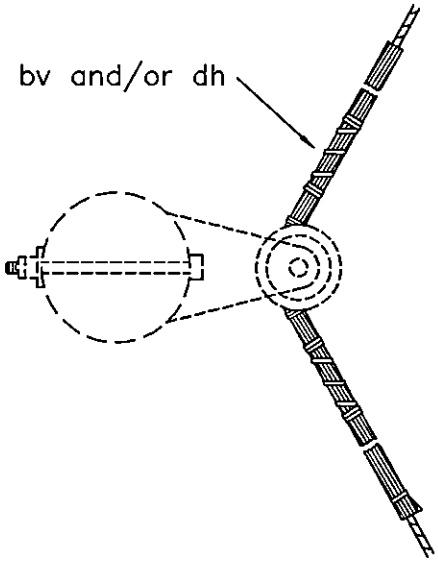
NEUTRAL DEADEND TYING ASSEMBLIES

APRIL 2005		L2.3,L2.4,L2.5
RUS		(M42–13)

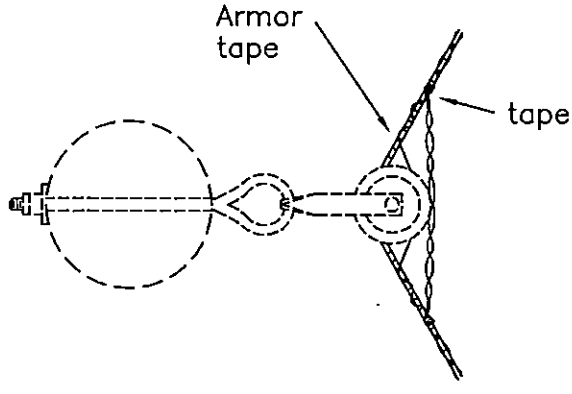




For use with copper or copperweld–copper conductors.



ACSR Conductors

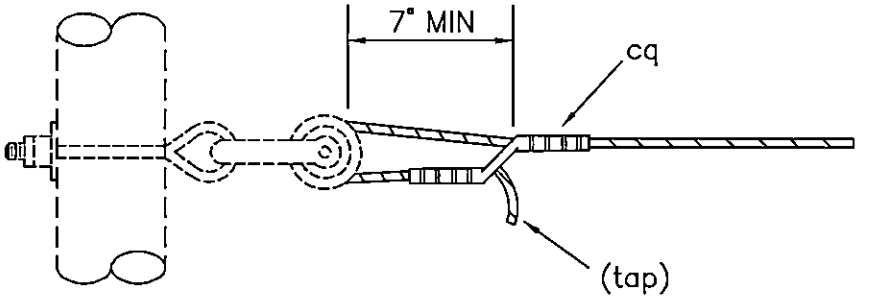


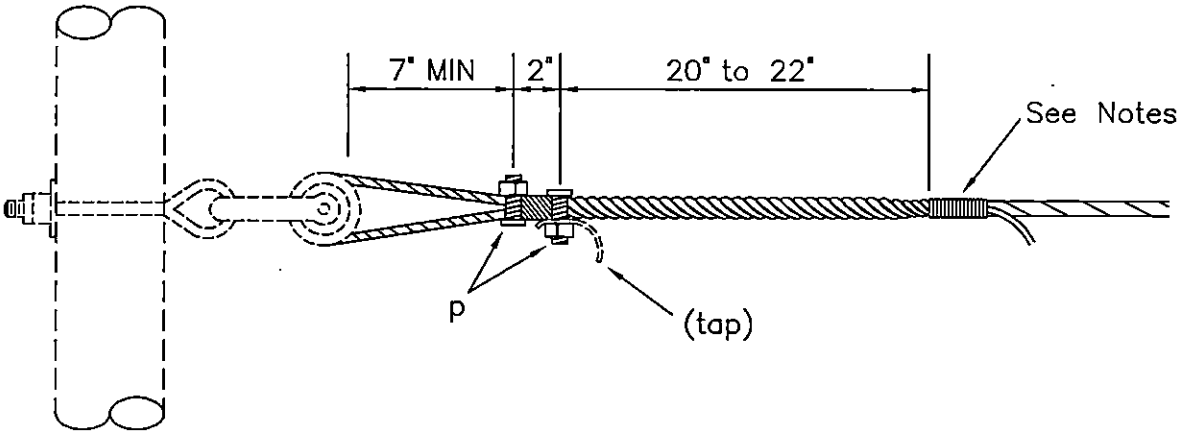
Self Supporting
Cable Conductors

ITEM	MATERIAL
bv	Rod, armor (formed type)
dh	Tie, insulator (formed type)

NEUTRAL & SECONDARY ANGLE TYING ASSEMBLIES

APRIL 2005		L3.1,L3.2
RUS		(M41–1),(M41–10)





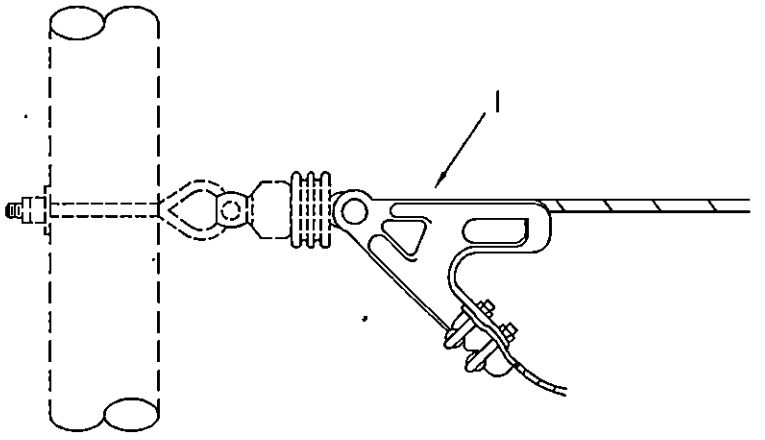
NOTES:

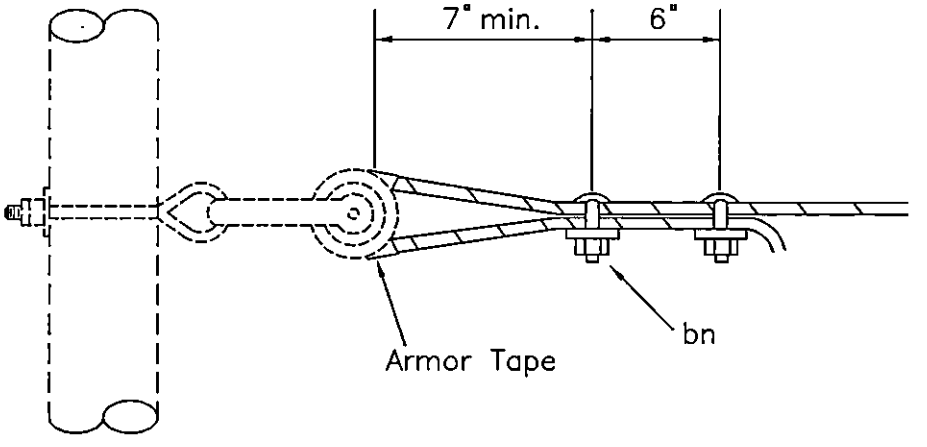
1. Bend all pigtails away from line conductor to avoid chafing.
2. Extend one strand of free end (the copperweld strand of copperweld–copper conductor) against line conductor. Wrap free ends of conductor along line conductor using same lay. Serve copper strands six turns each and then cut off.
3. For solid conductors, use same dimensions and install third connector "p" in lieu of serving.

ASSEMBLY: L3		.3	.4
ITEM	MATERIAL	QTY	QTY
p	Connectors, as req'd		
cq	Deadend, secondary	1	

NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES (COPPER)

APRIL 2005		L3.3,L3.4
RUS		(M42–21),(M42–3)





NOTES:

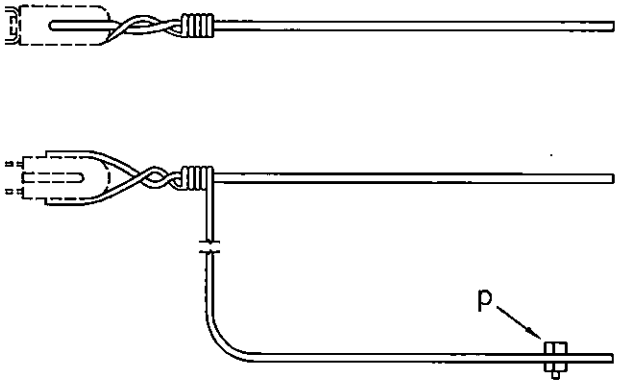
1. Armor tape wrapping to extend not more than two wraps beyond the mouth of deadend clamp or spool insulator.

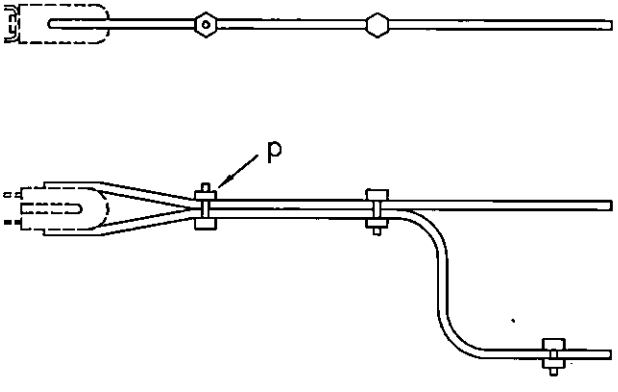
2. For #1/0 and larger, use spool with 3" minimum groove diameter.

ASSEMBLY: L3		.5	.6
ITEM	MATERIAL	QTY	QTY
i	Clamp, deadend	1	
bn	Clamp, loop deadend		2

NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES (ACSR)

APRIL 2005		L3.5,L3.6
RUS		(M42-11,13)





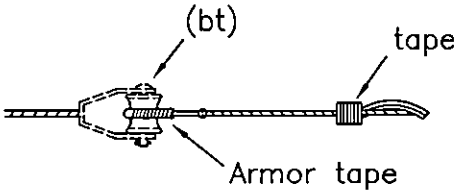
This type of construction should be used for small, aluminum covered conductors.

NOTE: Service connectors (p) to be applied over bare wire and then taped as required.

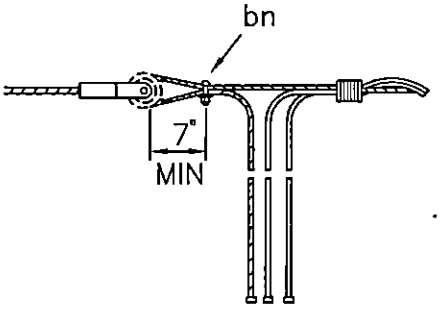
ITEM	MATERIAL
p	Connectors, as req'd

TYING ASSEMBLY, SERVICES

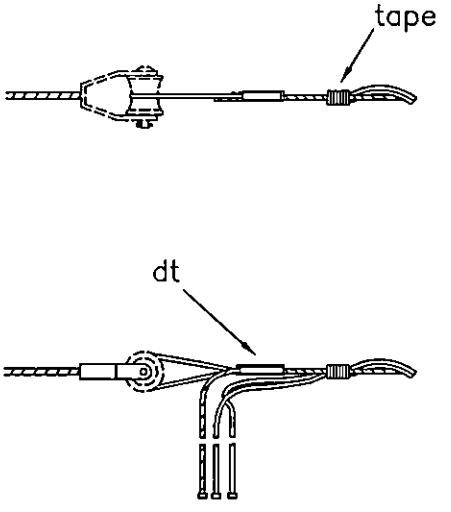
APRIL 2005		
RUS		L4.1



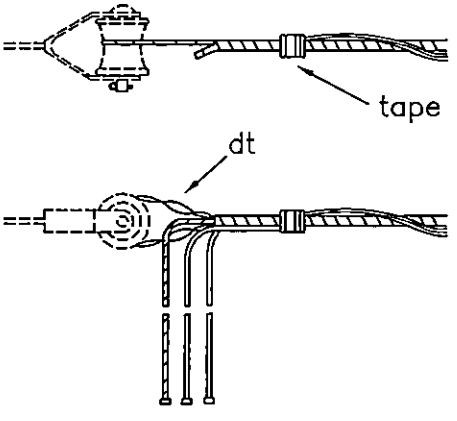
NOTE:
Groove diameter of insulator 1 3/4" min.



LOOP TYPE



WEDGE TYPE



PREFORMED TYPE

NOTES:

1. This type of construction should be for 3 or 4 conductor service cables with bare ACSR neutral.
   CAUTION: Not suitable for K2.1 or K3.1 Service Assemblies.
2. Service connectors (p) to be insulated, compression type.

ASSEMBLY: L4		.2	.3	.4
ITEM	MATERIAL	QTY	QTY	QTY
dt	Service deadend, wedge type			1
dt	Service deadend, preformed type		1	
bn	Clamp, loop deadend	1		

TYING ASSEMBLIES, CABLE SERVICES

APRIL 2005		
RUS		L4.2,L4.3,L4.4

MISCELLANEOUS ASSEMBLY UNITS AND GUIDES

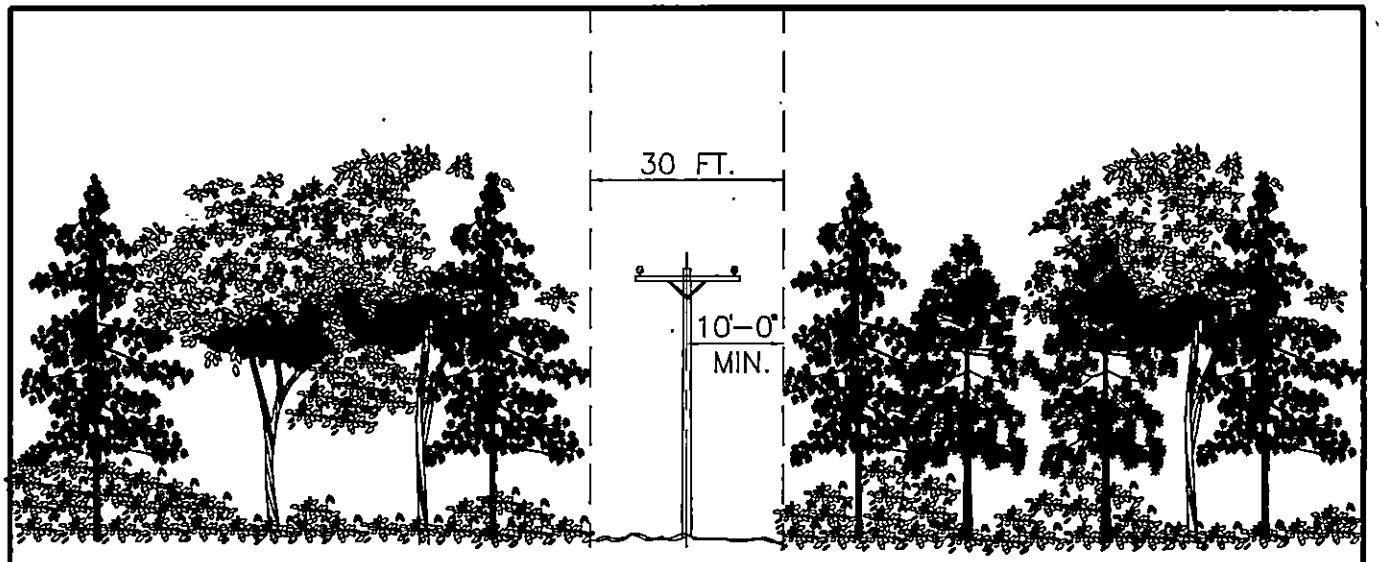
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
M1.30G	(R1)	RIGHT-OF-WAY CLEARING GUIDE

SPECIFICATIONS FOR RIGHT-OF-WAY CLEARING

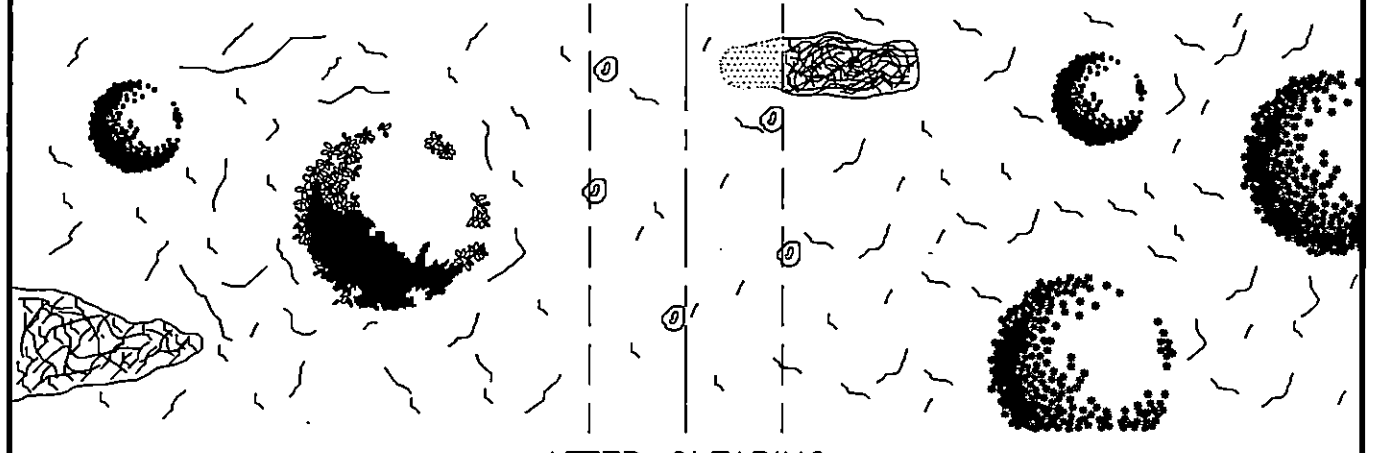
The right-of-way shall be prepared by removing trees, clearing underbrush, and trimming trees so that the right-of-way is cleared close to the ground and to the width specified. However, low growing shrubs, which will not interfere with the operation or maintenance of the line, can be left undisturbed if so directed by the property owner. Slash may be chipped and blown on the right-of-way if so allowed. Trim, but do not remove shade, fruit, or ornamental trees unless otherwise authorized.

All trimming shall be done using good arboricultural practices.

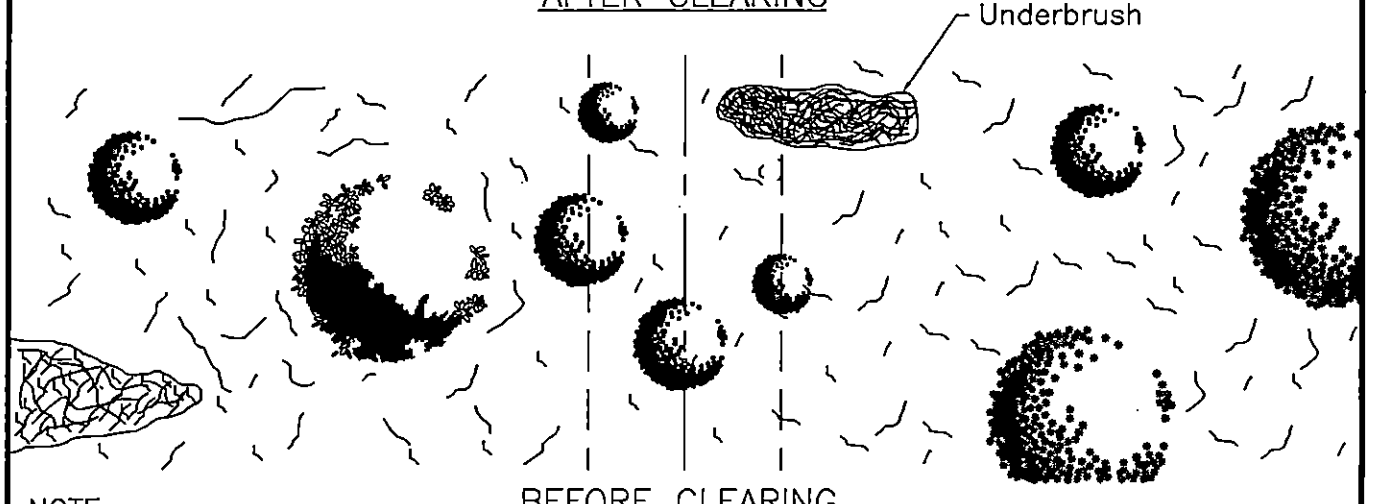
The landowner's written permission is usually required prior to cutting trees outside of the right-of-way. Trim trees fronting each side of the right-of-way symmetrically unless otherwise specified. Remove dead trees beyond the right-of-way which would strike the line in falling. Also, either remove or top leaning trees beyond the right-of-way that would strike the line in falling.



ELEVATION



AFTER CLEARING



BEFORE CLEARING

NOTE:
Change suffix of drawing number to designate clearing width. (e.g. M1.30G specifies 30 foot wide clearing).

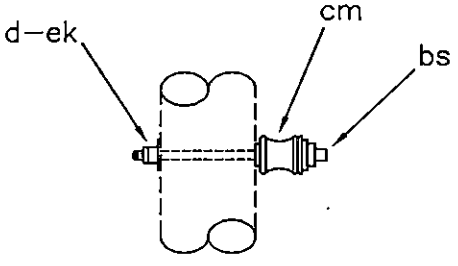
RIGHT-OF-WAY CLEARING GUIDE

APRIL 2005		M1.30G
RUS		(R1)

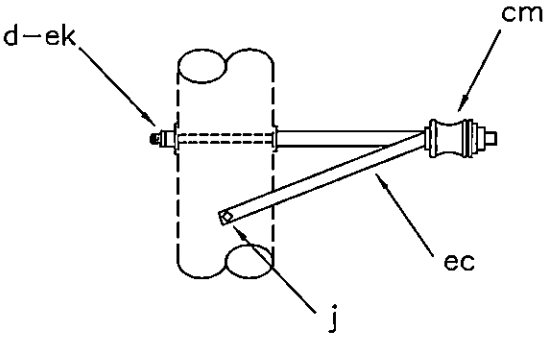
INDEX N

NEUTRAL ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
N1.1		NEUTRAL ASSEMBLIES - TANGENT
N1.2	(M5-19)	
N1.11		NEUTRAL SUPPORTS ON CROSSARMS
N2.21		
N2.1		NEUTRAL ASSEMBLIES - LARGE ANGLE
N2.1L		
N5.1	(M5-25)	NEUTRAL ASSEMBLIES - (SINGLE DEADENDS)
N5.2		
N5.3	(M5-26)	
N6.1		NEUTRAL ASSEMBLY - DOUBLE DEADEND
N6.21		NEUTRAL ASSEMBLY - DOUBLE DEADEND ON CROSSARMS



N1.1



N1.2

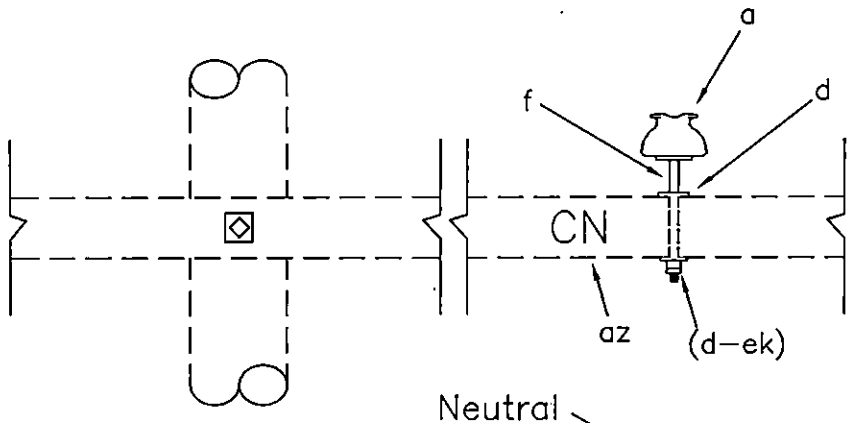
ASSEMBLY:		N1.1	N1.2
ITEM	MATERIAL	QTY	QTY
d	Washer, 2 1/4" square	1	1
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	1	1

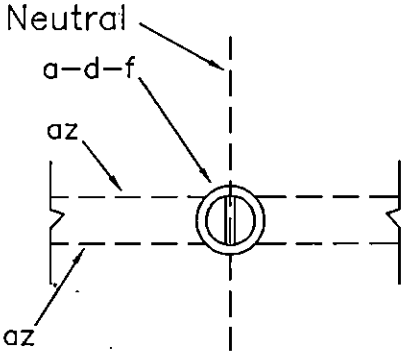
DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:
5° – Small Conductors
2° – Larger than #1/0

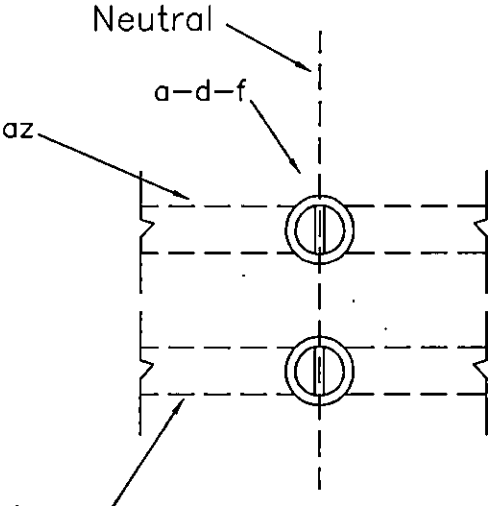
NEUTRAL ASSEMBLIES – TANGENT

APRIL 2005		N1.1, N1.2 (M5–19)
RUS		





N1.11



N2.21

NOTE: Install either identification letters (az) or white insulator(s).

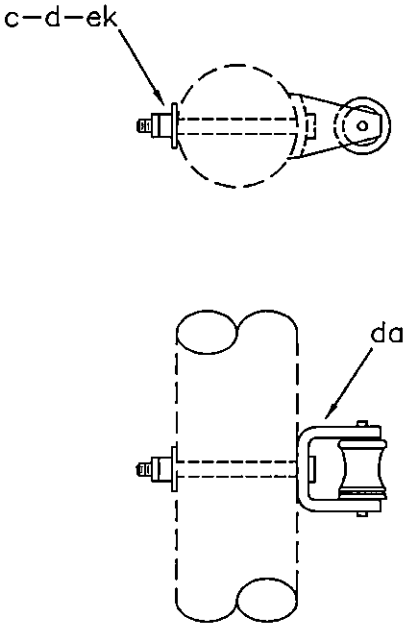
ASSEMBLY:		N1.11	N2.21
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type, 15 kV, white	1	2
d	Washer, 2 1/4" square	1	2
f	Pin, crossarm, steel, 5/8" x 10 3/4"	1	2
az	Letters, 2" C, 2" N, with 1" nails	4	4

DESIGN PARAMETERS:

N1.11: See TABLE II
N2.21: See TABLE IV

NEUTRAL SUPPORTS ON CROSSARMS

APRIL 2005		N1.11,
RUS		N2.21



N2.1
(ANSI Class 53–2 Insulator)

N2.1L
(ANSI Class 53–4 Insulator)

ASSEMBLY: N2		.1	.1L
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" X req'd length	1	1
d	Washer, 2 1/4" square	1	1
o	Bolt, eye, 5/8" X req'd length		
s	Clevis, secondary, swinging, insulated		
da	Bracket, with 3" x 1 3/4" spool insulator	1	
da	Bracket, with 3" x 3" spool insulator		1
ek	Locknuts	1	1

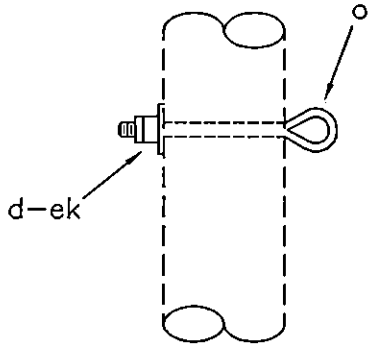
DESIGN PARAMETERS:

N2.1: See TABLE VI
N2.1L: See TABLE VII

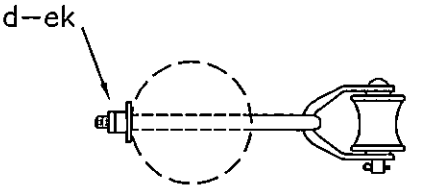
NEUTRAL ASSEMBLIES – LARGE ANGLE

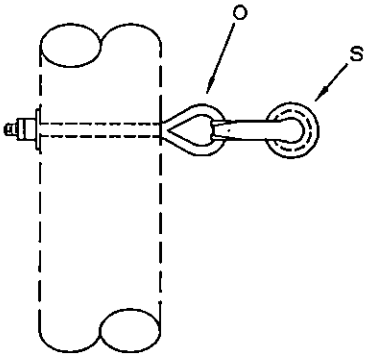
APRIL 2005
RUS

N2.1, N2.1L

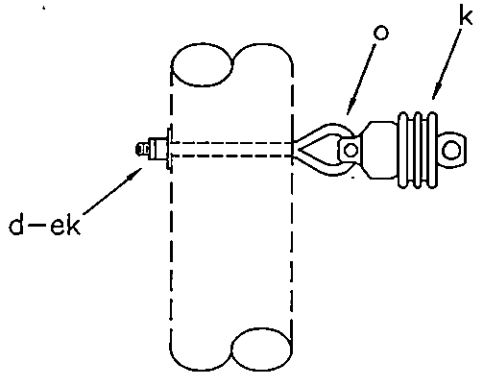


N5.1





N5.2



N5.3

ASSEMBLY: N5		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square 3" curved	1	1	1
k	Insulator, suspension, 4 1/4"			1
o	Bolt, eye, 5/8" X req'd length	1	1	1
s	Clevis, secondary, swinging, insulated		1	
ek	Locknuts	1	1	1

ASSEMBLY NUMBERS	
NEW	(OLD)
N5.1	(M5–25)
N5.2	
N5.3	(M5–26)

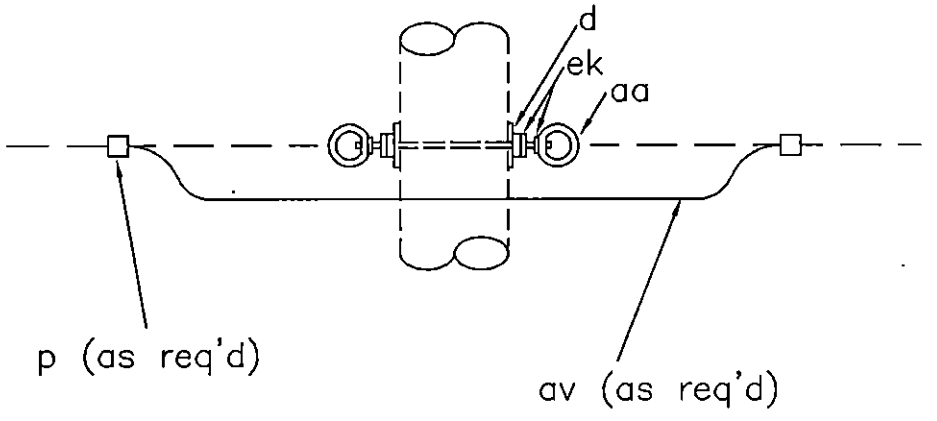
DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOADING:

N5.1,N5.3 = 5,000 lbs.
N5.2 = 1,500 lbs.
(ANSI Class 53–2 Insulator)
N5.2 = 2,250 lbs.
(ANSI Class 53–4 Insulator)

NEUTRAL ASSEMBLIES (SINGLE DEADENDS)

APRIL 2005		
RUS		N5.1,N5.2,N5.3



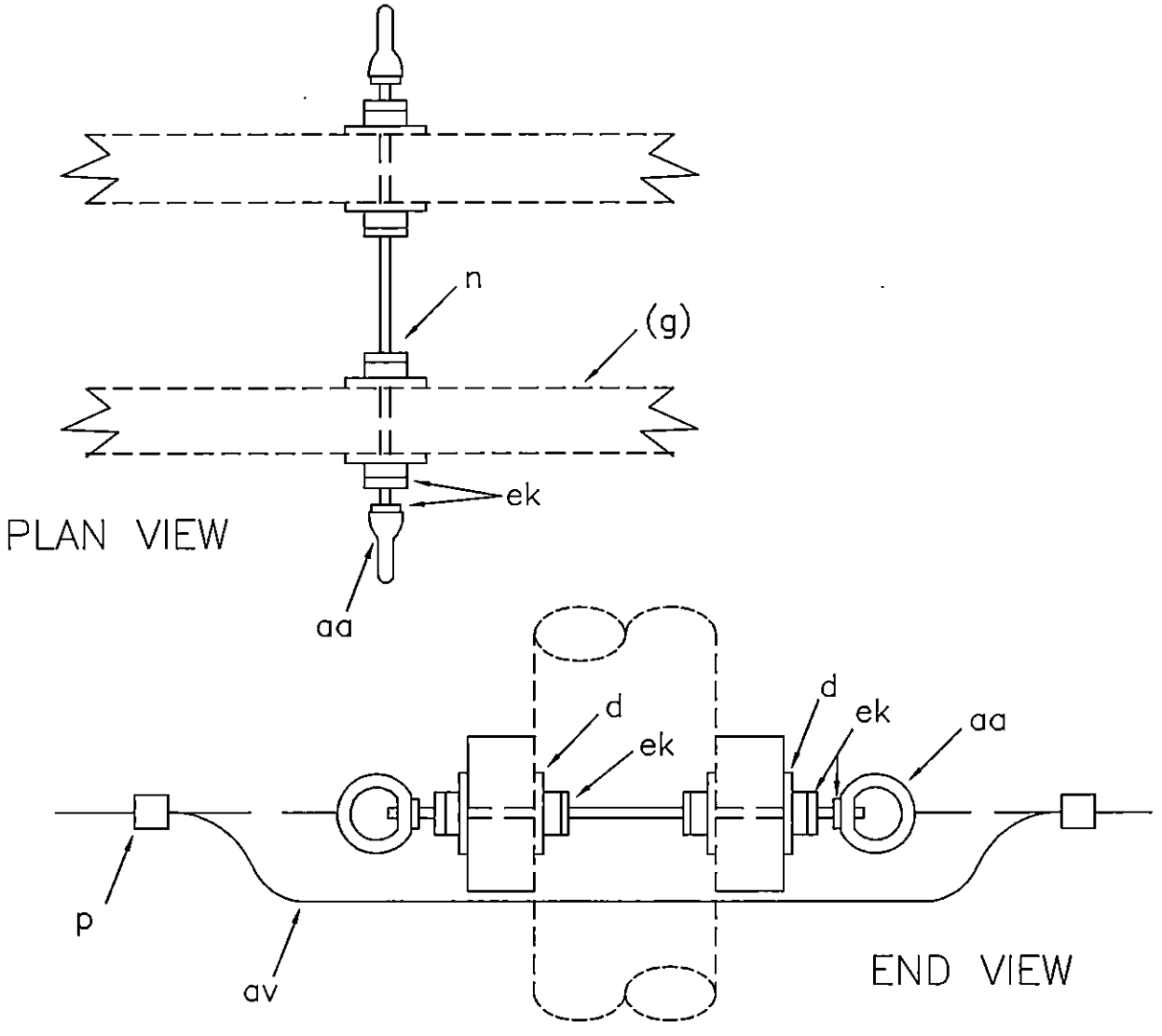
ITEM	QTY	MATERIAL
d	2	Washer, square 3" curve
n	1	Bolt,double arming,5/8" x req'd length
p		Connectors, as req'd
aa	2	Nut, eye, 5/8"
av		Jumpers, as req'd
ek	4	Locknuts

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOADING: 5,000 lbs.

NEUTRAL ASSEMBLY – DOUBLE DEADEND

APRIL 2005		
RUS		N6.1



NOTES:

1. Doubling arming bolt, item "n" and eye nut, item "aa", may be replaced with doubling arming eye bolt, item "dy."
2. Maximum line angle may be increased to 15° by installing anchor shackles, item "bo" to (horizontally mounted) eye nuts and installing side guys.

ITEM	QTY	MATERIAL
d	4	Washer, square, 2 1/4"
n	1	Bolt,double arming,5/8" x req'd length
p		Connectors, as req'd
aa	2	Nut, eye, 5/8"
av		Jumpers, as req'd
ek	6	Locknuts

DESIGN PARAMETERS:

PERMITTED UNBALANCED TENSION:
(See drawings where assembly used)

ALLOWABLE LINE ANGLE = 5°
(See Note 2)

NEUTRAL ASSEMBLY – DOUBLE DEADEND ON CROSSARMS

APRIL 2005		
RUS		N6.21

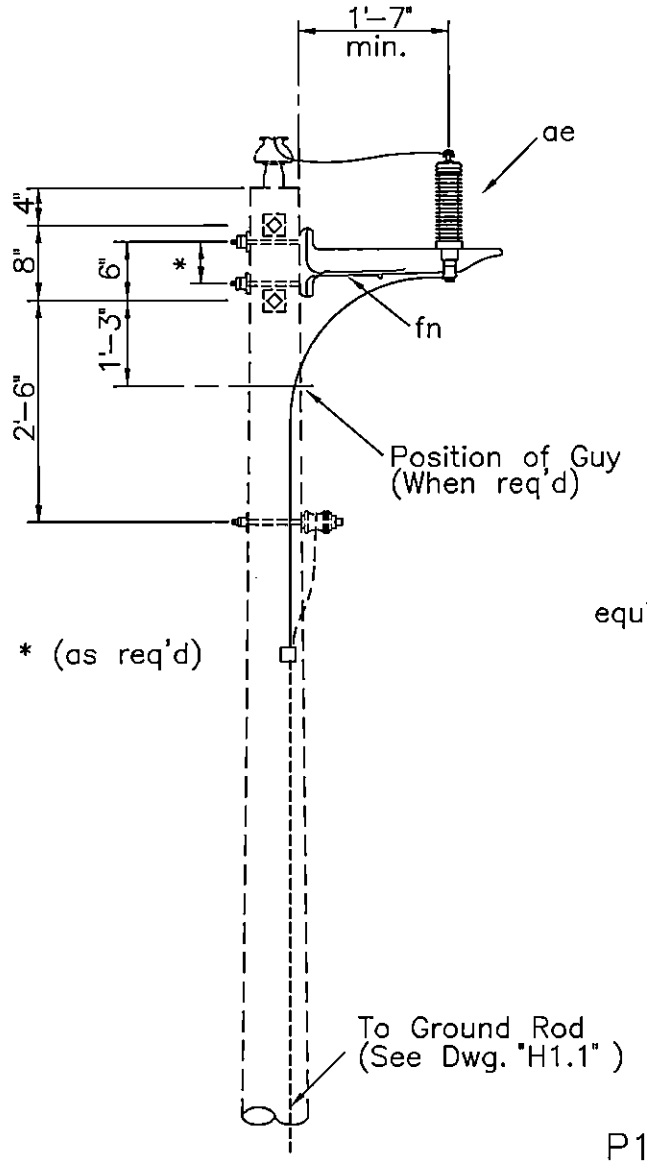
PROTECTION ASSEMBLY UNITS

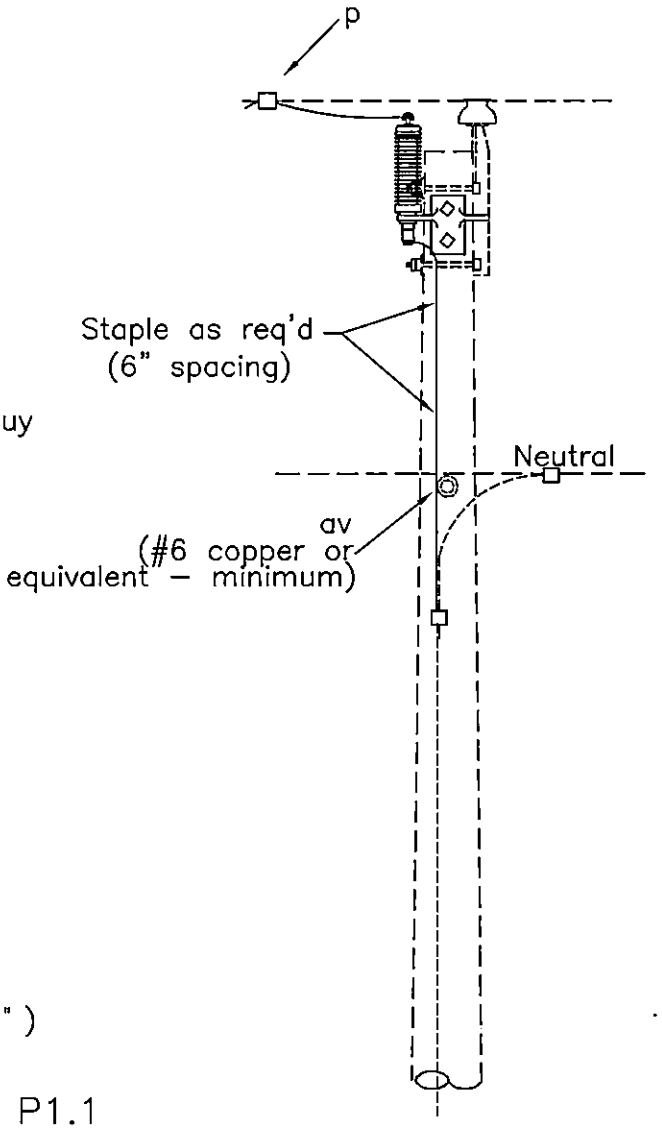
DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
P1.01	(M5-6)	SURGE ARRESTERS - SINGLE PHASE
P1.1		
P1.1NG		SURGE ARRESTER GUIDE - NARROW PROFILE
P1.3		SURGE ARRESTERS - 3 SINGLE PHASE
P3.1G		RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 8-FOOT CROSSARMS (TANGENT)
P3.2G		RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 10-FOOT CROSSARMS (TANGENT)
P3.3G		RAPTOR PROTECTION, PERCH GUARDS - GUIDE
P3.4G		RAPTOR PROTECTION, SINGLE-PHASE, CSP TRANSFORMER (TANGENT POLE)
P3.5G		RAPTOR PROTECTION ASSEMBLY GUIDE THREE-PHASE TRANSFORMER BANK

CONSTRUCTION SPECIFICATIONS FOR RAPTOR PROTECTION

Raptor injury and electrocution around power lines are major wildlife concerns of the U.S. Fish and Wildlife Service. Raptors are protected by the Endangered Species Act, the Eagle Protection Act, and the Migratory Bird Treaty Act. The electrocution issue may be a problem especially on lines with voltages of 69 kV or less. Reports indicate that raptor concerns exist primarily on distribution lines in western and southwestern states; however, hazards can exist anywhere in the United States where large birds are present.

The provisions included on the "P3" series of construction drawings will help to minimize or eliminate bird electrocutions. This construction should be used in areas where raptors or other large birds are present. It may be prudent to adopt these designs for all new construction.

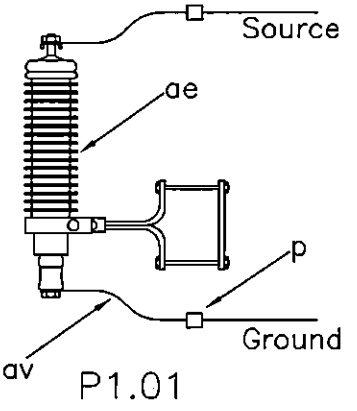




P1.1

NOTE: Use "P1.01" on existing arm, a minimum of 19" from face of pole.

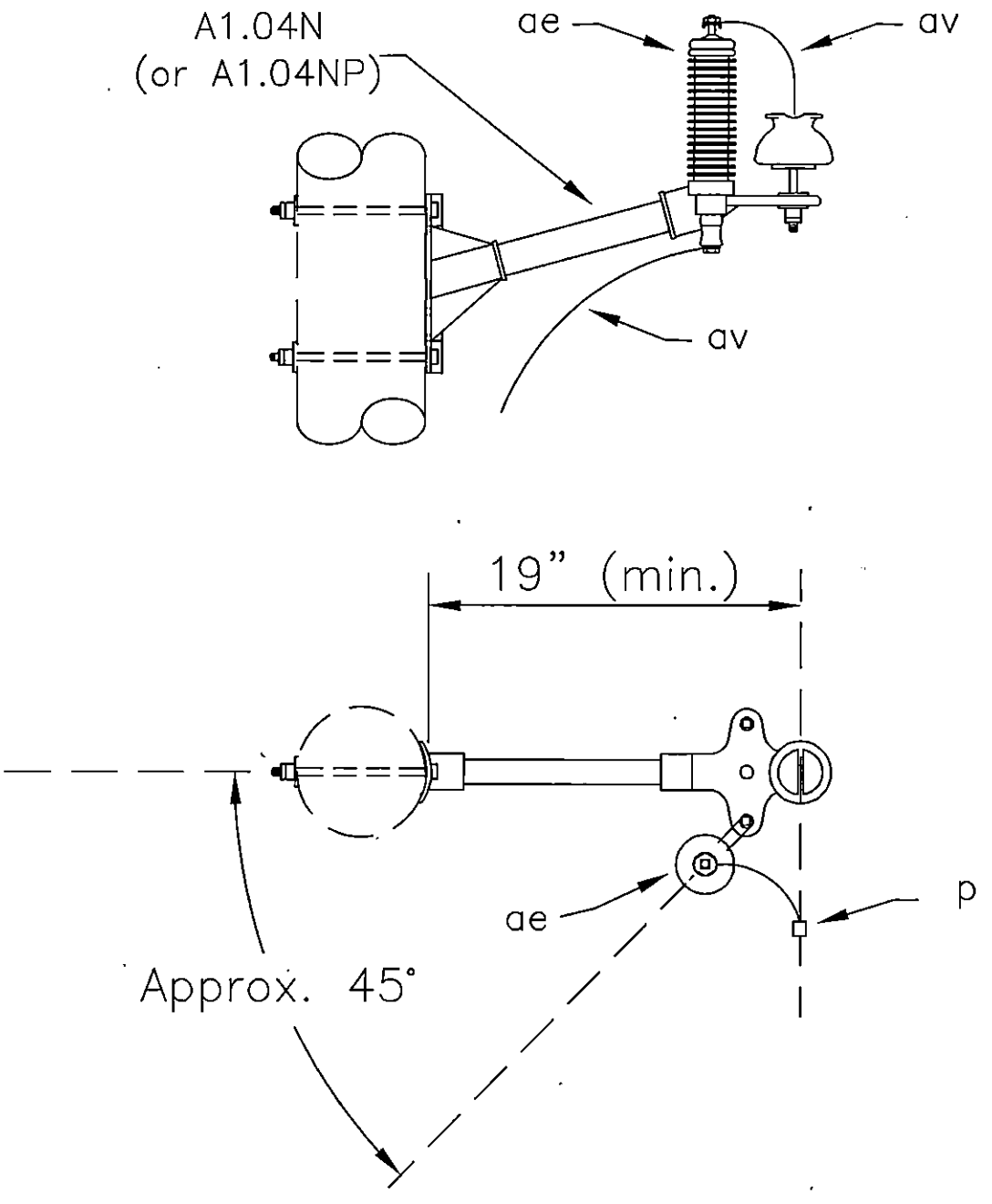
ASSEMBLY: P1		.01	.1
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8 x req'd length		2
d	Washer, square, 2 1/4		2
p	Connectors, as req'd		
ae	Arrester, surge, (9 kV)	1	1
av	Jumpers, as req'd		
fn	Bracket, cutout extension		1
ek	Locknuts		2



P1.01

SURGE ARRESTERS – SINGLE PHASE

APRIL 2005	1 – PHASE PRIMARY	P1.01, (M5–6)
RUS	12.47/7.2 kV	P1.1



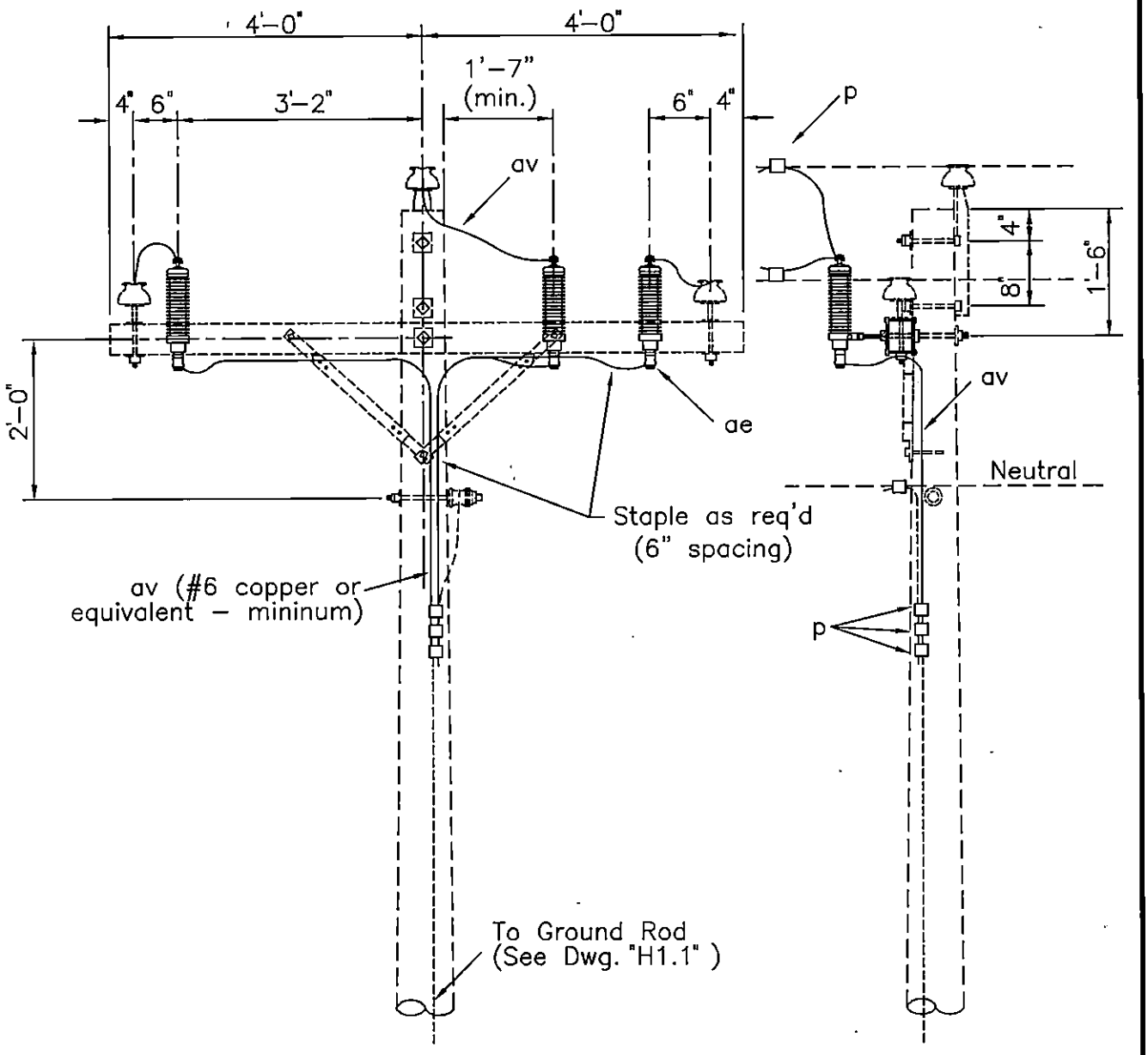
ITEM	MATERIAL
	Assembly A1.04N or A1.04NP
ae	Arrester, surge (9kV)
av	Jumpers, as req'd
p	Connectors, as req'd

NOTE: May be used on an apparatus mounting bracket (item "fm") of any 1, 2 or 3–phase narrow profile assembly. Specify quantity of surge arresters (item "ae").

Design Parameters:

SURGE ARRESTER GUIDE–NARROW PROFILE

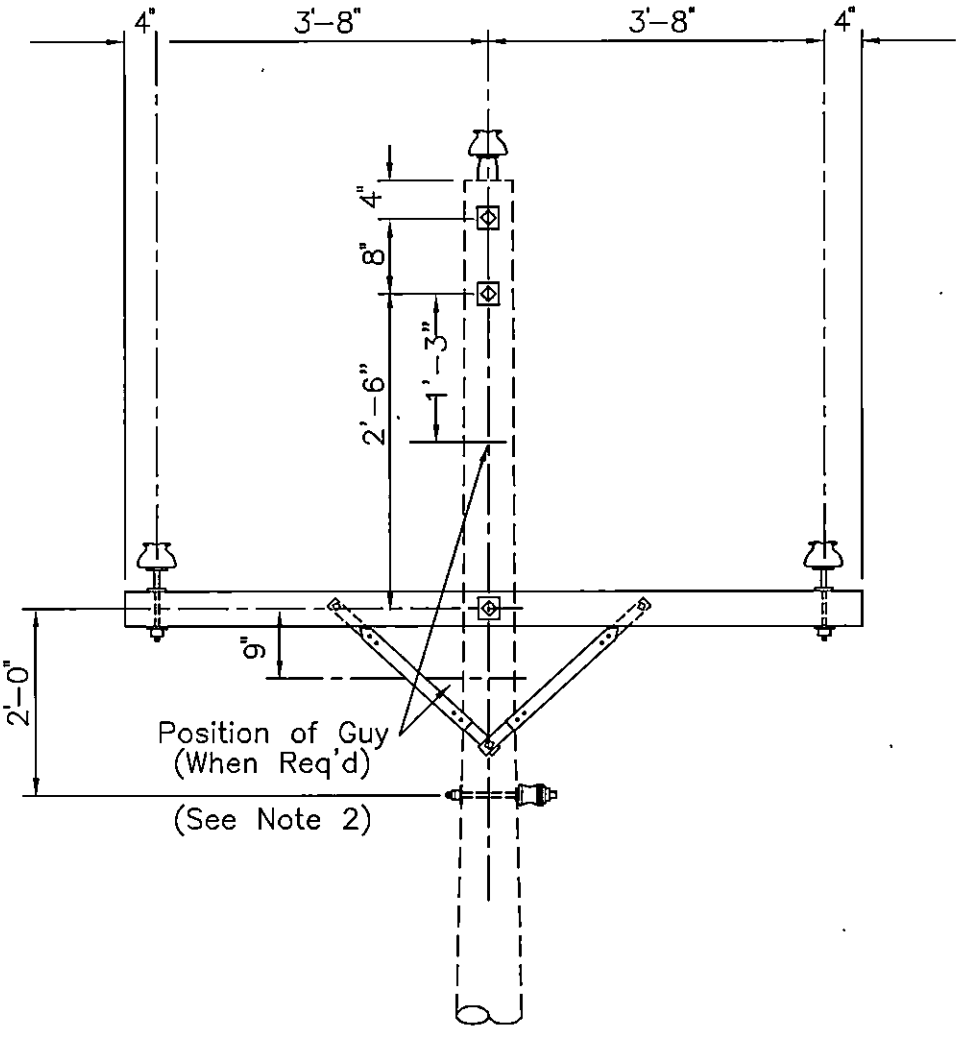
APRIL 2005	1 – PHASE PRIMARY	P1.1NG
RUS	12.47/7.2 kV	



ITEM	QTY	MATERIAL
p		Connectors, as req'd
ae	3	Arrester, surge, (9 kV)
av		Jumpers, as req'd

SURGE ARRESTERS – 3 SINGLE PHASE

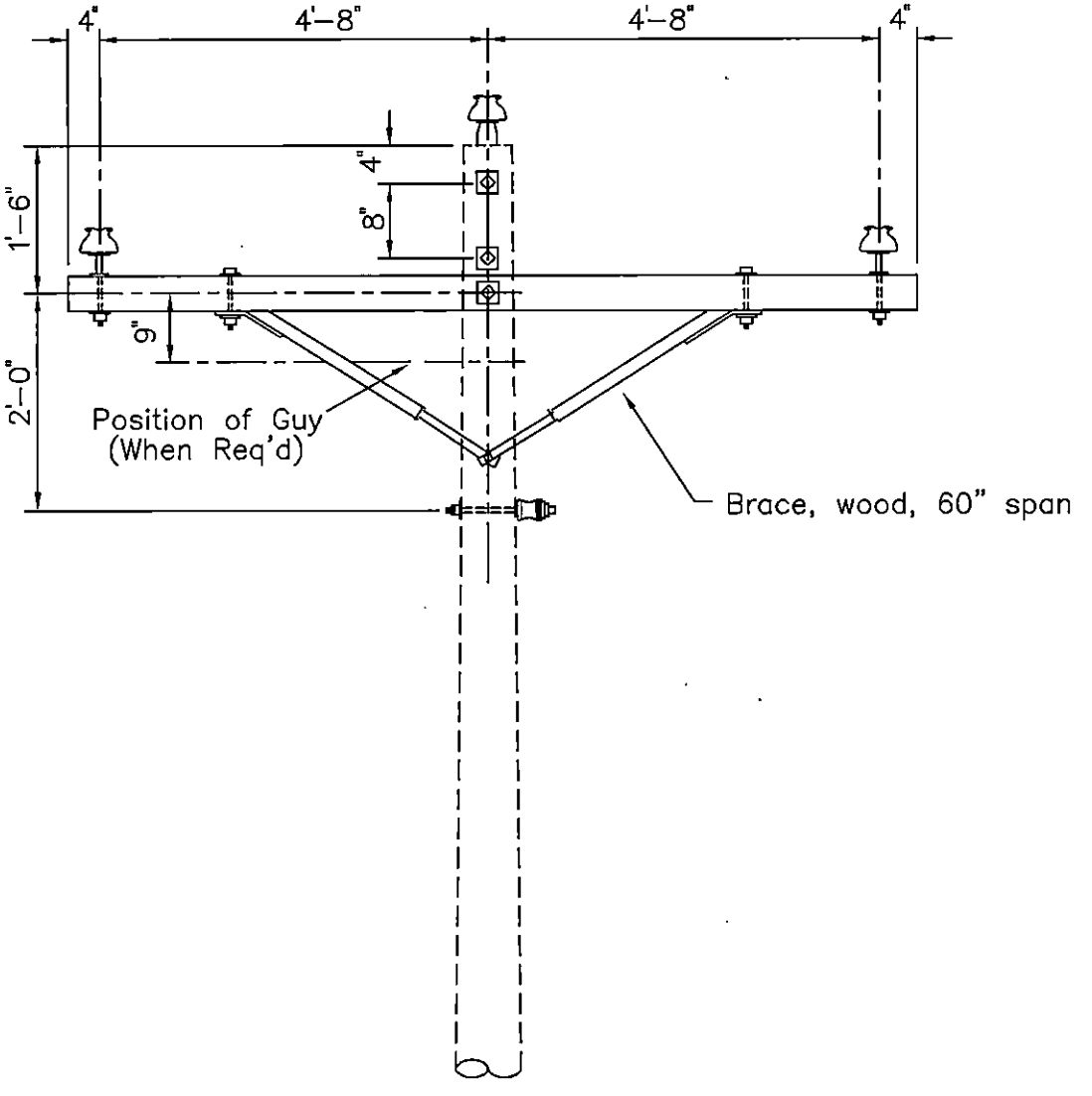
APRIL 2005	3 – PHASE PRIMARY	
RUS	12.47/7.2 kV	P1.3



NOTES:

1. See "C1.11" and "C2.21" drawings for additional construction details and materials.
2. All down guys must be insulated at top of pole.

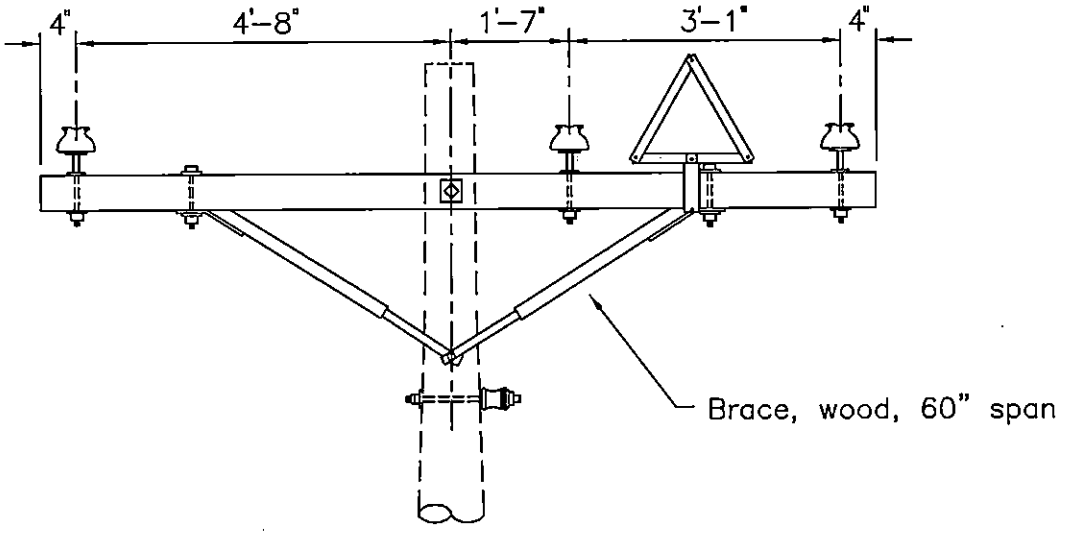
DESIGN PARAMETERS:	RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 8 FOOT CROSSARMS (TANGENT)		
	APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	P3.1G

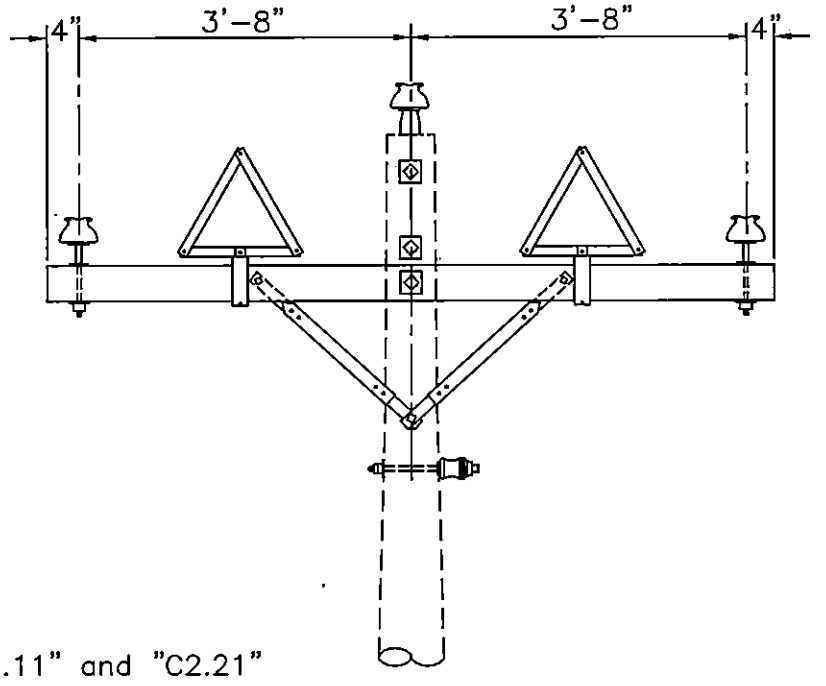


NOTE:

1. See "C1.11" and "C2.21" drawings for additional construction details and materials.

DESIGN PARAMETERS:	RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 10 FOOT CROSSARMS (TANGENT)		
	APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	P3.2G



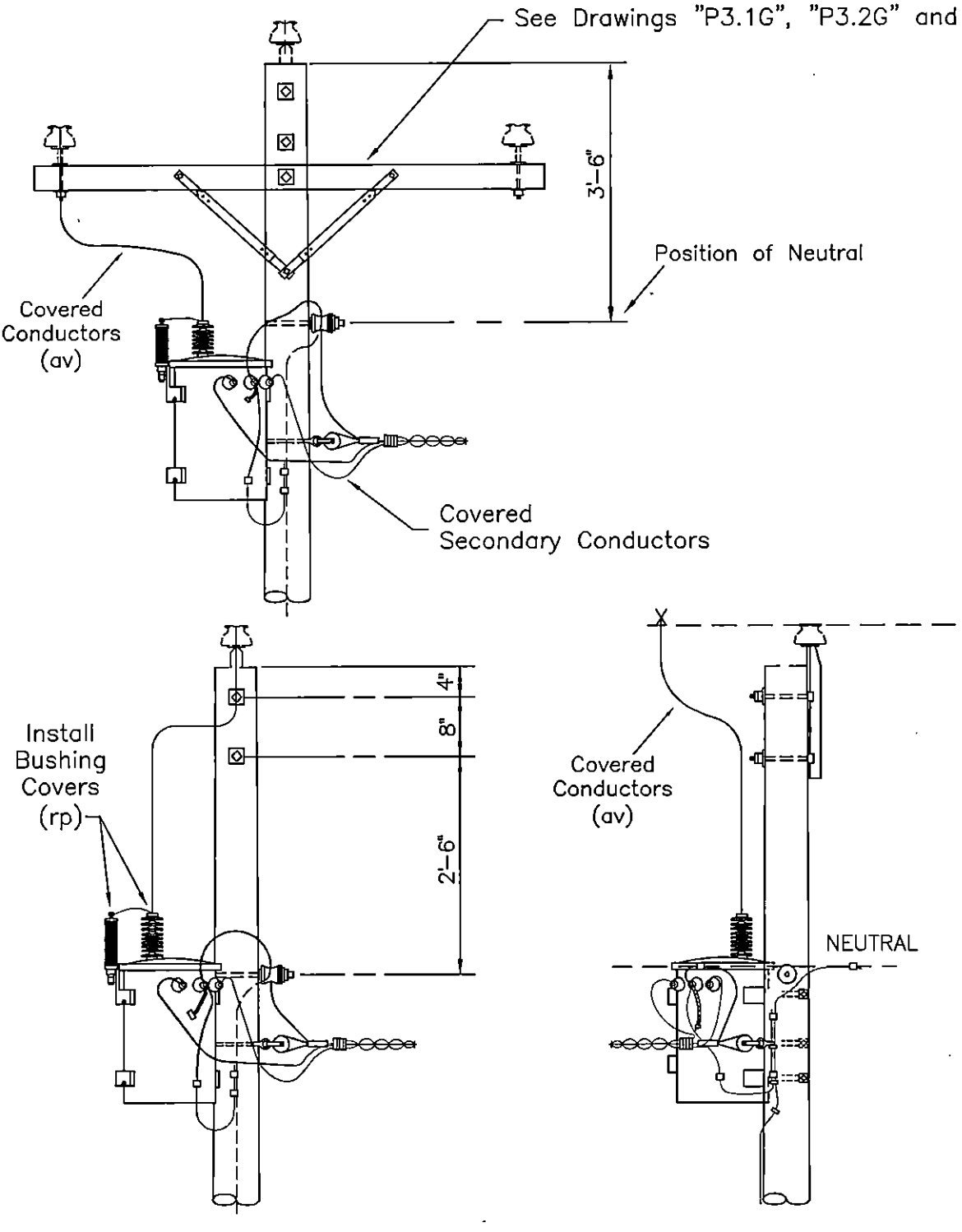


NOTE: See "C1.11" and "C2.21" drawings for additional construction details and materials.

DESIGN PARAMETERS:

RAPTOR PROTECTION PERCH GUARDS–GUIDE

APRIL 2005	3–PHASE PRIMARY	
RUS	12.47/7.2 kV	P3.3G



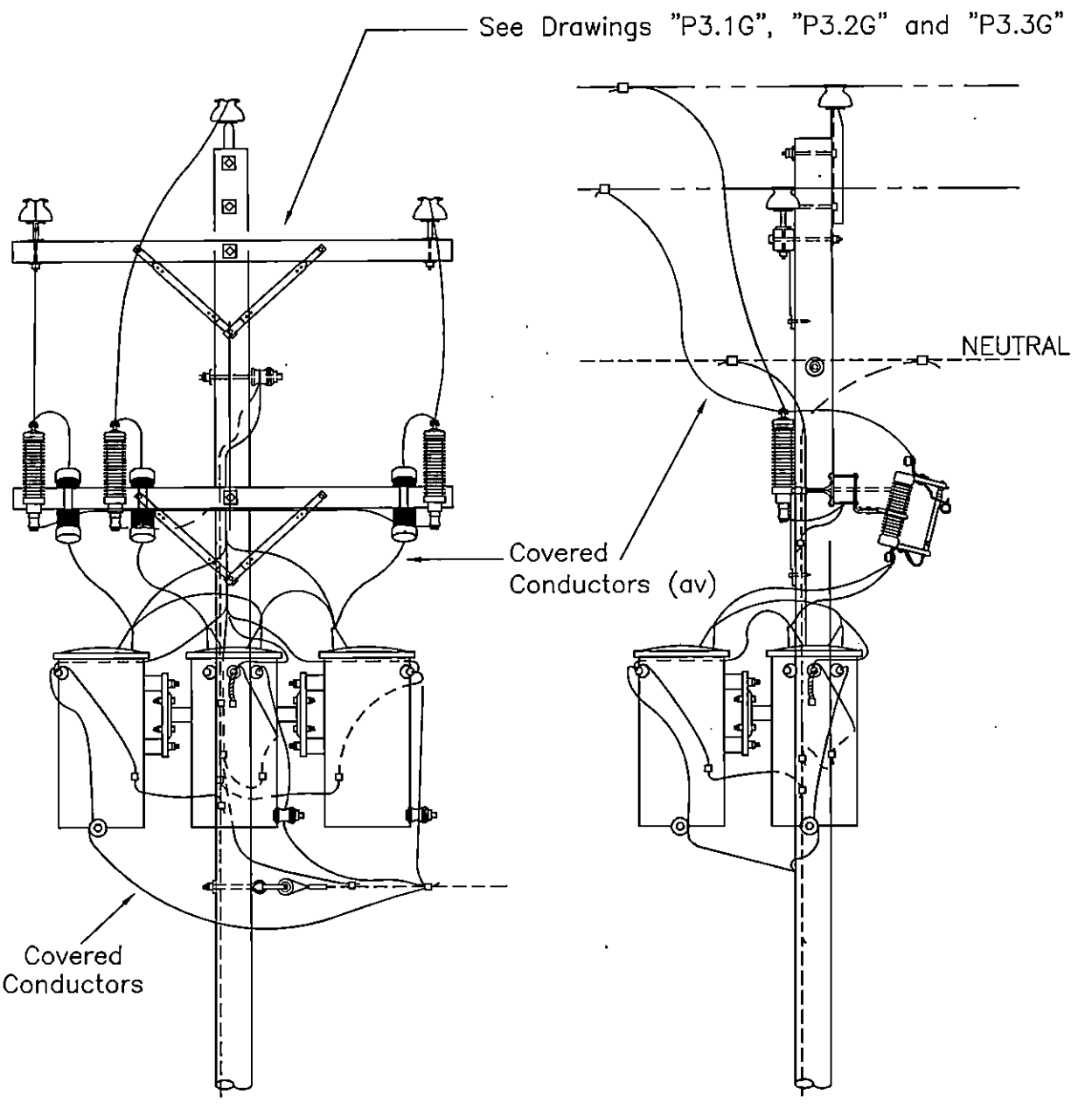
Note: Specify Insulated Transformer Covers (Lids);
Minimum Dielectric Strength=15kV

DESIGN PARAMETERS:

See Assembly "G1.2"

RAPTOR PROTECTION
SINGLE-PHASE, CSP TRANSFORMER
(TANGENT POLE)

APRIL 2005		
RUS	12.47/7.2 kV	P3.4G



Notes: 1. Specify Insulated Transformer covers (lids); Minimum Dielectric Strength 15kV
2. Install bushing covers (rp) on all surge arresters and transformer bushings.

DESIGN PARAMETERS:

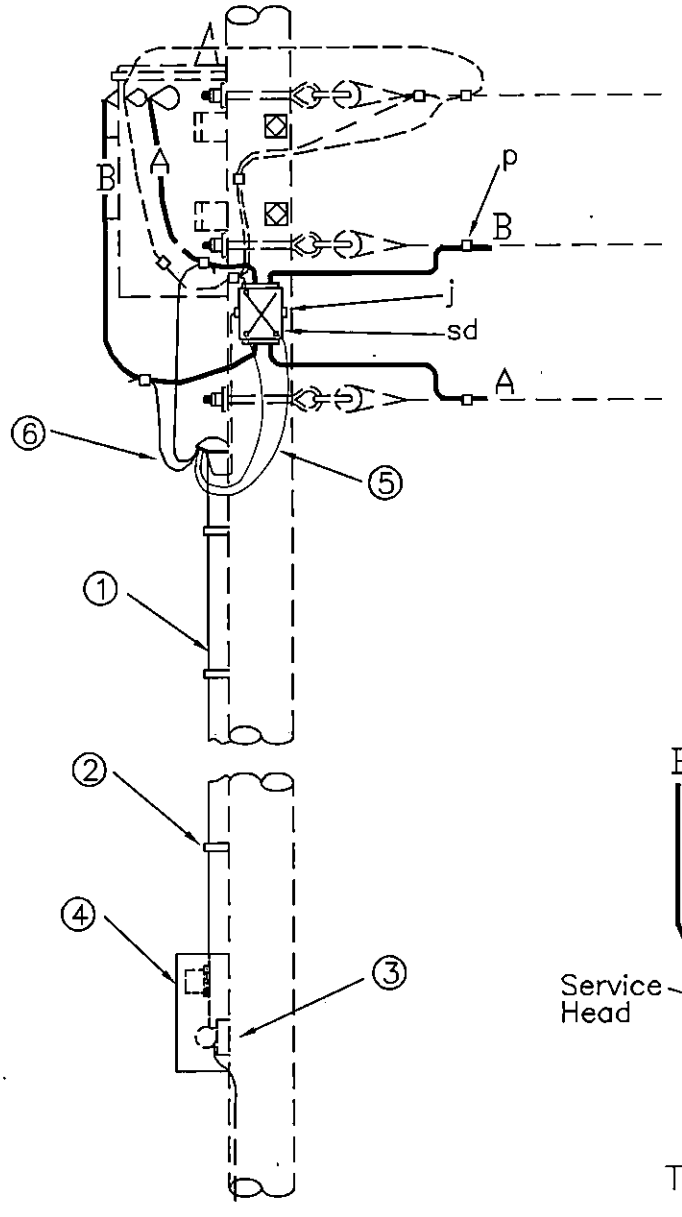
See Assembly "G3.3"

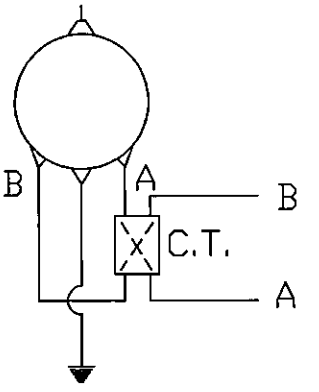
RAPTOR PROTECTION ASSEMBLY GUIDE
THREE–PHASE TRANSFORMER BANK

APRIL 2005	3 – PHASE PRIMARY	
RUS	12.47/7.2 kV	P3.5G

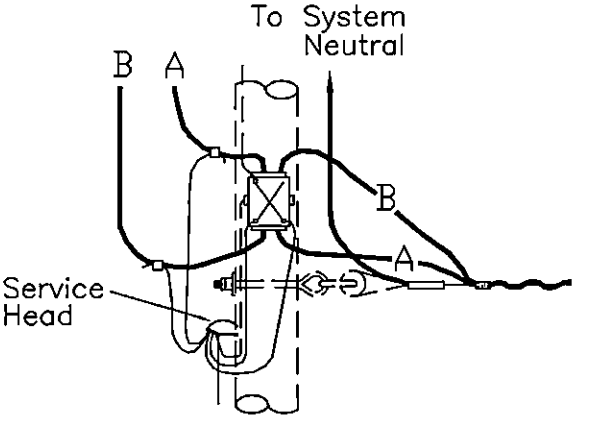
METERING ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
Q1.1	(M8)	SECONDARY METERING - SINGLE-PHASE, 120/240 VOLTS
Q2.1G	(M8-10)	POLE TYPE SERVICE ASSEMBLY GUIDE
Q2.2G	(M8-9)	YARD POLE METER INSTALLATION GUIDE
Q3.1	(M8-6)	SECONDARY METERING - THREE-PHASE, 120/240 VOLTS (4 WIRE DELTA)
Q3.2	(M8-12)	SECONDARY METERING - THREE-PHASE, 240 OR 480 VOLTS (3 WIRE CORNER GROUNDED DELTA)
Q3.3	(M8-11)	SECONDARY METERING - THREE-PHASE, 120/208 VOLTS (4 WIRE GROUNDED WYE)
Q4.1	(M8-15)	PRIMARY METERING, THREE-PHASE (4 WIRE GROUNDED WYE)





WIRING DIAGRAM



TRIPLEX SERVICE

NOTE: Customer owned, installed and maintained equipment, including "point of attachment" shall be located a minum of 5 feet away from this assembly.

ITEM	QTY	MATERIAL
j	2	Screw, lag, 1/2" x 4"
p		Connectors, as required
sd	1	Transformer, Current
①		Conduit, 1 1/4" as required
②		Straps, conduit, as required

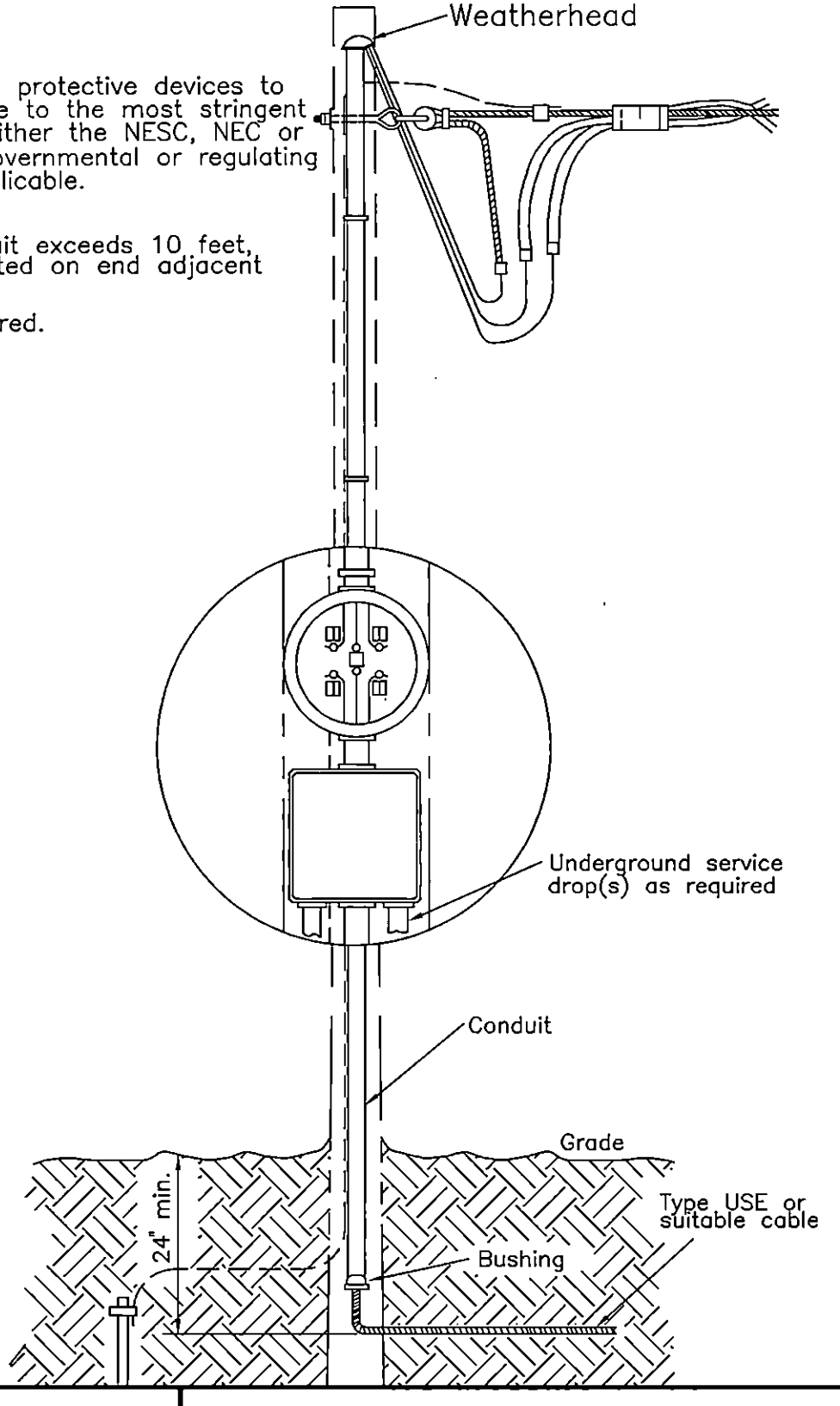
ITEM	QTY	MATERIAL
③	1	Condulet, type LB
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

SECONDARY METERING
SINGLE PHASE, 120/240 VOLTS

APRIL 2005		Q1.1
RUS		(M8)

NOTES:

1. All Clearances and protective devices to be in conformance to the most stringent requirements of either the NESC, NEC or other codes of governmental or regulating authorities as applicable.
2. If length of conduit exceeds 10 feet, coupling is permitted on end adjacent to meter.
3. Guy pole as required.



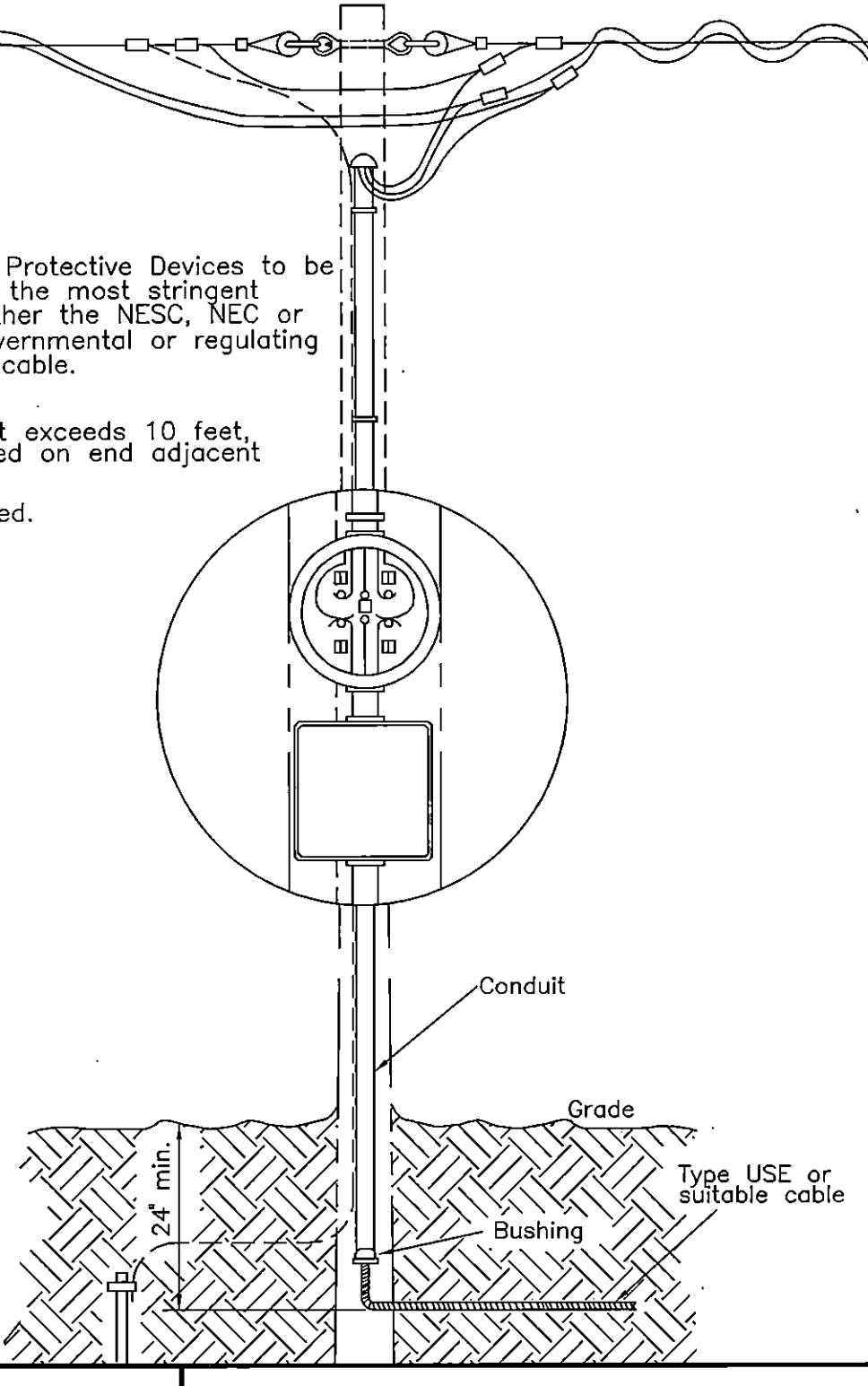
DESIGN PARAMETERS:
(See NOTE 1)

POLE TYPE SERVICE ASSEMBLY GUIDE

APRIL 2005		Q2.1G
RUS		(M8–10)

NOTES:

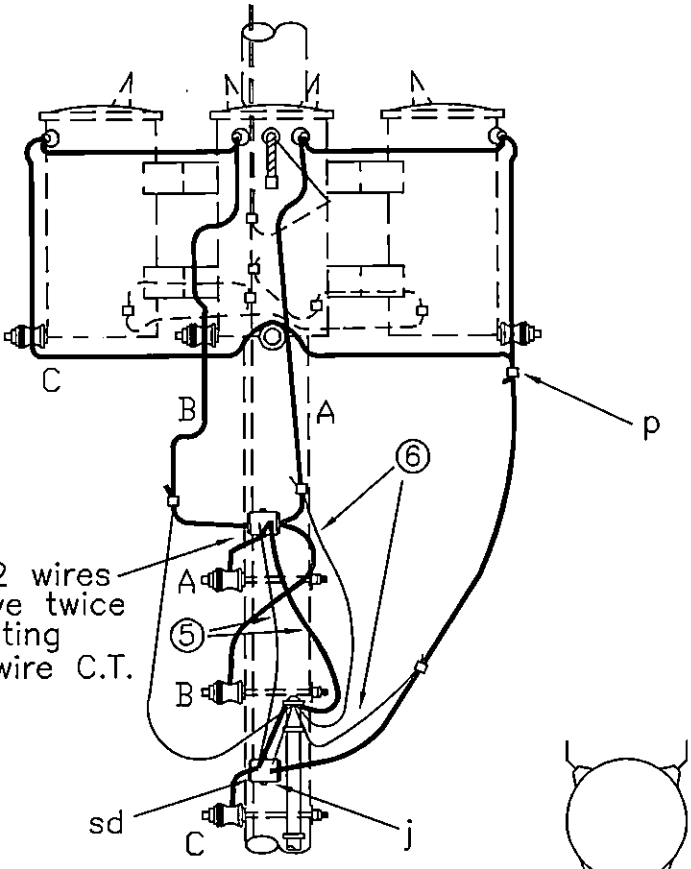
1. All Clearances and Protective Devices to be in conformance to the most stringent requirements of either the NESC, NEC or other codes of governmental or regulating authorities as applicable.
2. If length of conduit exceeds 10 feet, coupling is permitted on end adjacent to meter.
3. Guy pole as required.

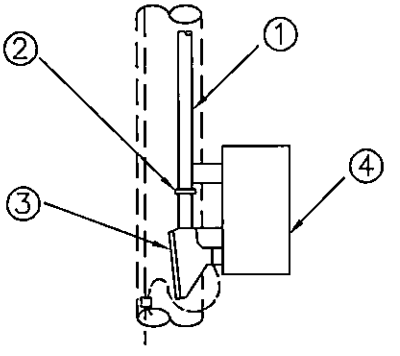


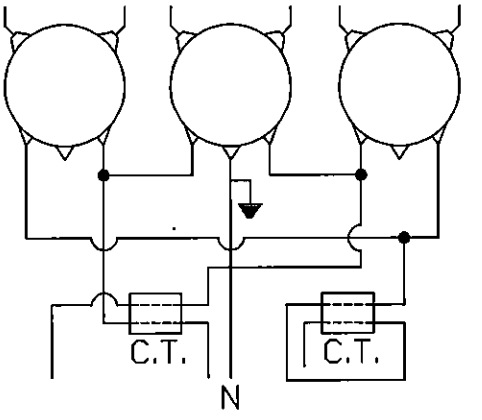
DESIGN PARAMETERS:
(See NOTE 1)

YARD POLE METER INSTALLATION GUIDE

APRIL 2005		Q2.2G
RUS		(M8–9)







WIRING DIAGRAM
FOR INSTRUMENT TRANSFORMERS

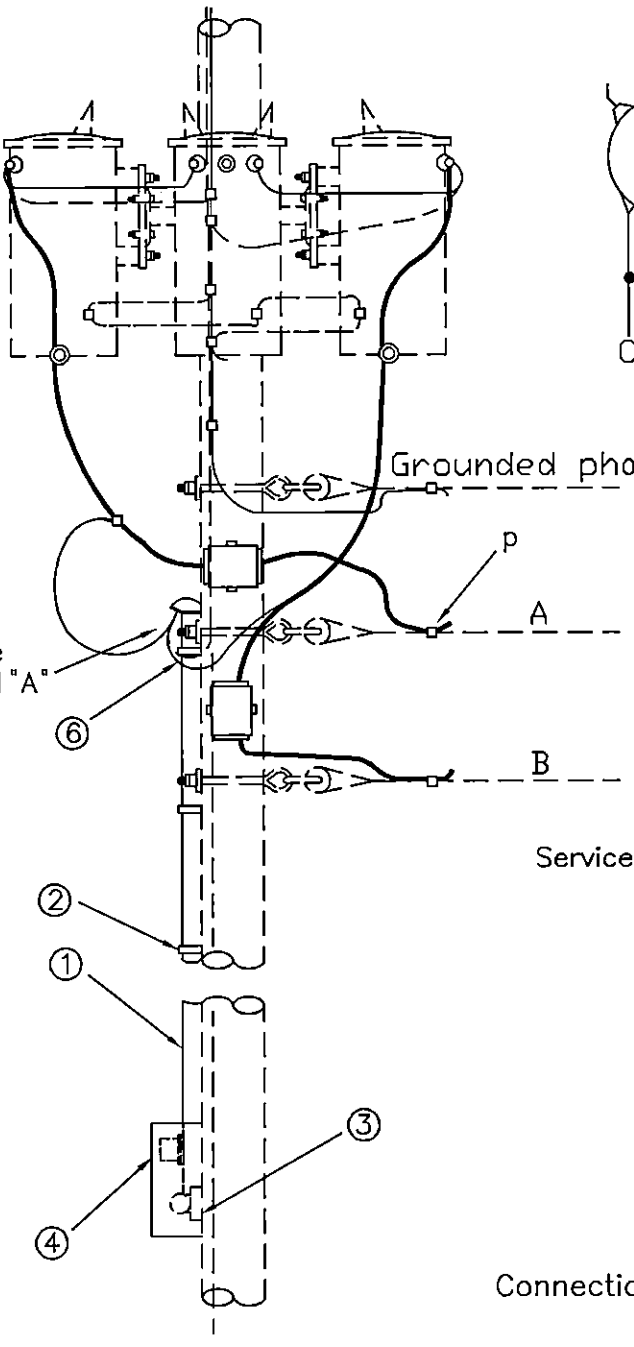
NOTE: Customer owned, installed and maintained equipment, including "point of attachment" shall be located a minum of 5 feet away from this assembly.

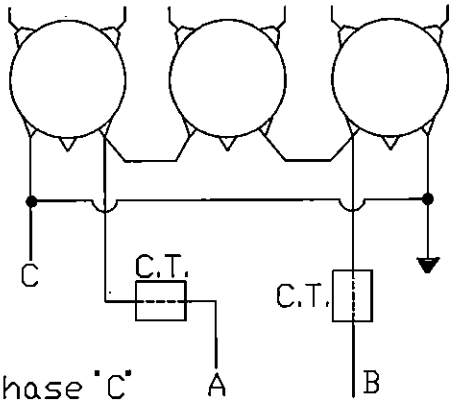
ITEM	QTY	MATERIAL
j	4	Screw, lag, 1/2" x 4"
p		Connectors, as required
sd	2	Transformer, Current
①		Conduit, 1 1/4" as required
②		Straps, conduit, as required

ITEM	QTY	MATERIAL
③	1	Condulet, type "LB"
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

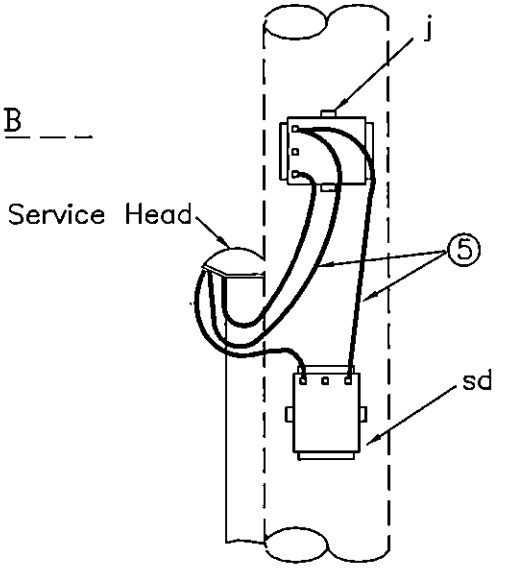
SECONDARY METERING
THREE PHASE, 120/240 VOLTS
(4 WIRE DELTA)

APRIL 2005		Q3.1
RUS		(M8-6)





WIRING DIAGRAM



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

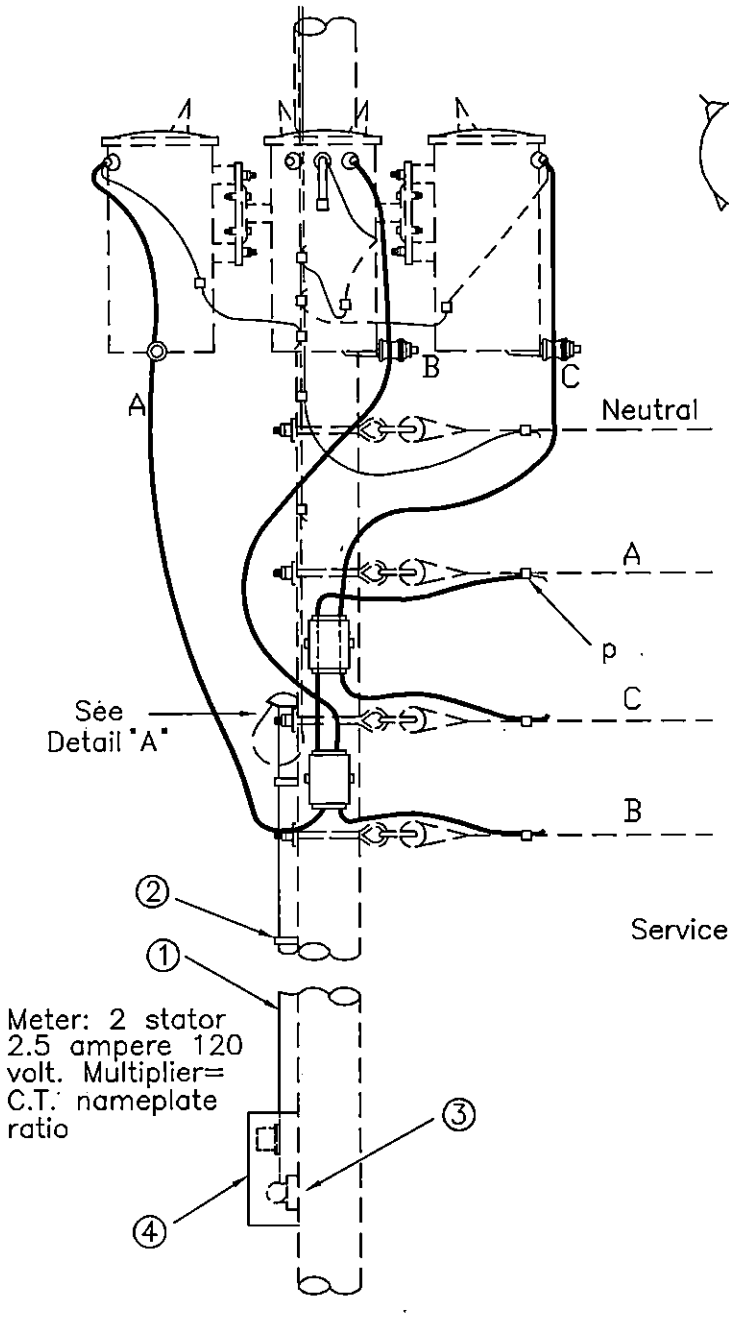
NOTES: PT metering is recommended for 480 volt service.
Customer owned, installed and maintained equipment, including "point of attachment" shall be located a minimum of 5 feet away from this assembly.

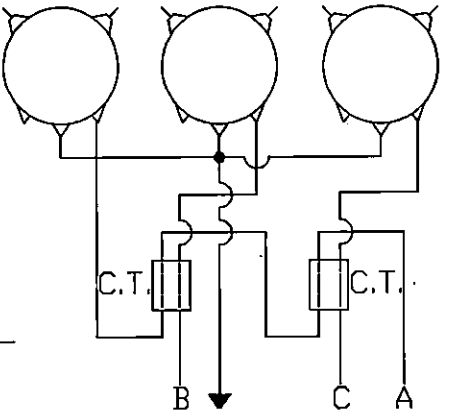
ITEM	QTY	MATERIAL
j	4	Screw, lag, 1/2" x 4"
p		Connectors, as required
sd	2	Transformer, Current
①		Conduit, 1 1/4" as required
②		Straps, conduit, as required

ITEM	QTY	MATERIAL
③	1	Condulet, type "LB"
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

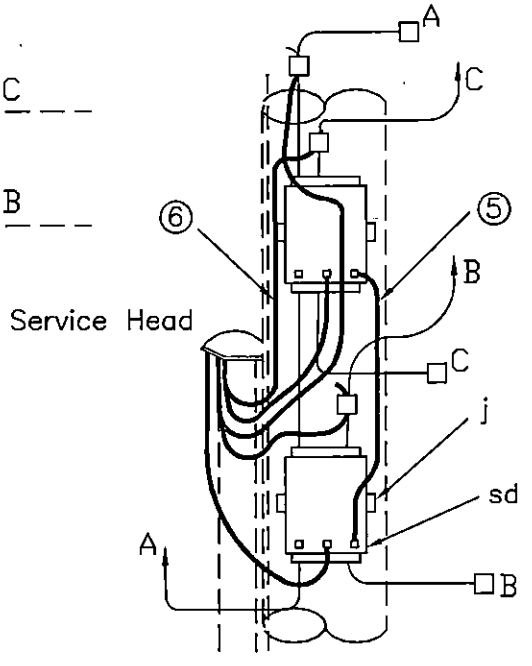
SECONDARY METERING
THREE PHASE, 240 or 480 VOLTS
(3 WIRE CORNER GROUNDED DELTA)

APRIL 2005		Q3.2
RUS		(M8–12)





WIRING DIAGRAM



DETAIL "A"

Connections from C.T.'s to Service Head

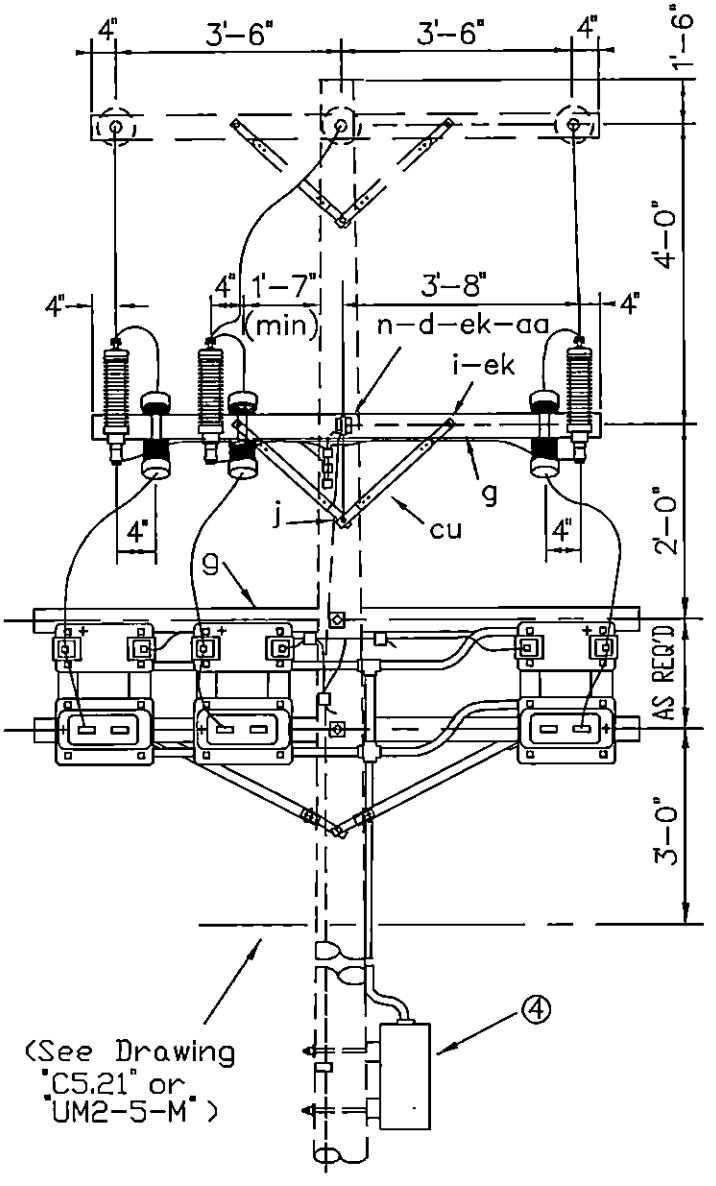
NOTES: Ground current transformers as required (not shown)
Customer owned, installed and maintained equipment, including "point of attachment" shall be located a minimum of 5 feet away from this assembly.

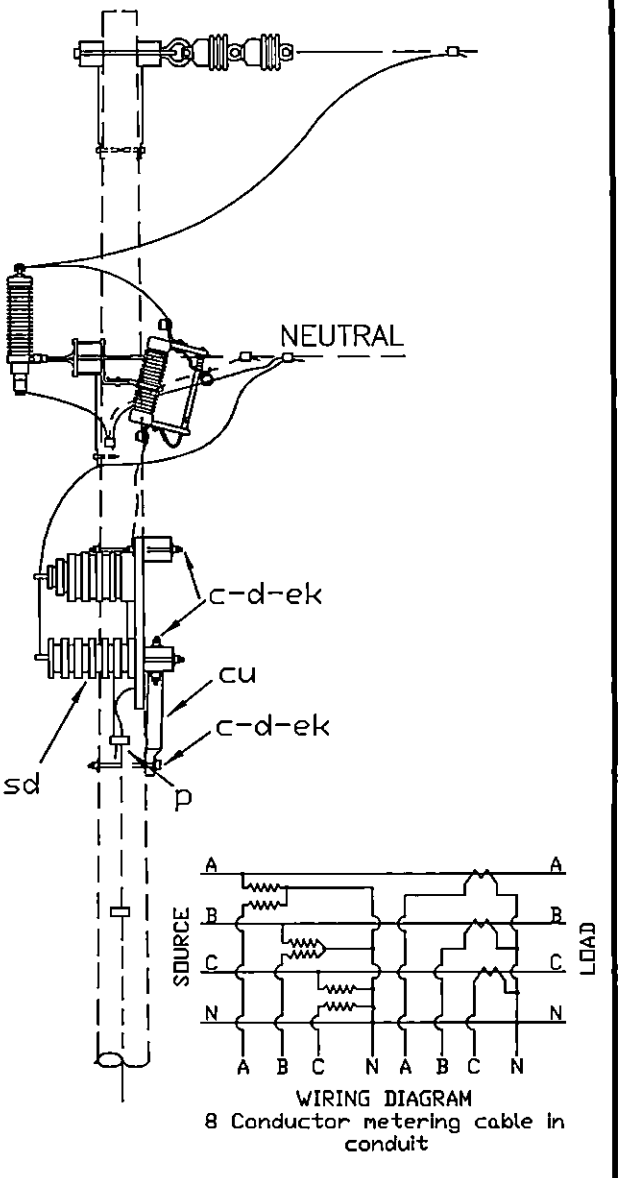
ITEM	QTY	MATERIAL
j	4	Screw, lag, 1/2" x 4"
p		Connectors, as required
sd	2	Transformer, Current
①		Conduit, 1 1/4" as required
②		Straps, conduit, as required

ITEM	QTY	MATERIAL
③	1	Condulet, type "LB"
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

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

APRIL 2005		Q3.3
RUS		(M8-11)





WIRING DIAGRAM
8 Conductor metering cable in conduit

ITEM	QTY	MATERIAL
c	5	Bolt, machine, 5/8" x req'd length
c	26	Bolt, machine, 1/2" x req'd length
d	33	Washer, 2 1/4" square
d	2	Washer, round, 1 3/8" dia.
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
n	1	Bolt,double arming,5/8" x req'd length
p		Connectors, as required
aa	1	Nut, eye, 5/8"
av		Jumper, primary, bare, as required

ITEM	QTY	MATERIAL
ae	3	Arrester, surge (9 kV)
af	3	Cutout, dist. open (15 kV)
cu	2	Brace, 28"
cu	1	Brace, wood, 60" span
④		Meter box, meter on test block
		Condulets, as required
sd	3	Transformer, current
se	3	Transformer, potential
ek	34	Locknuts
*	6	Mounting brackets
		Metering cable, as req'd

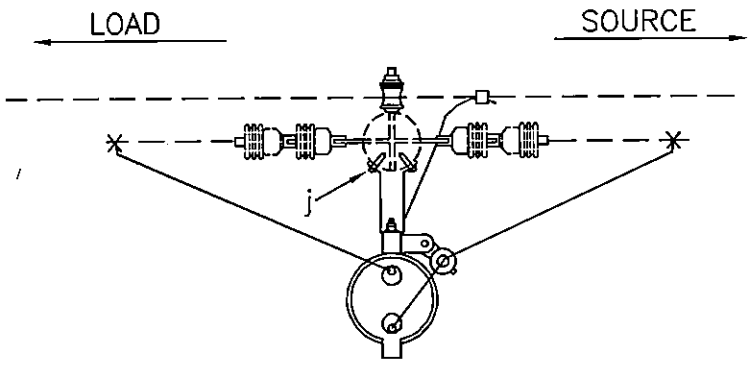
*Specify this item to be furnished by the transformer manufacturer.

PRIMARY METERING THREE PHASE (4 WIRE GROUNDED WYE)

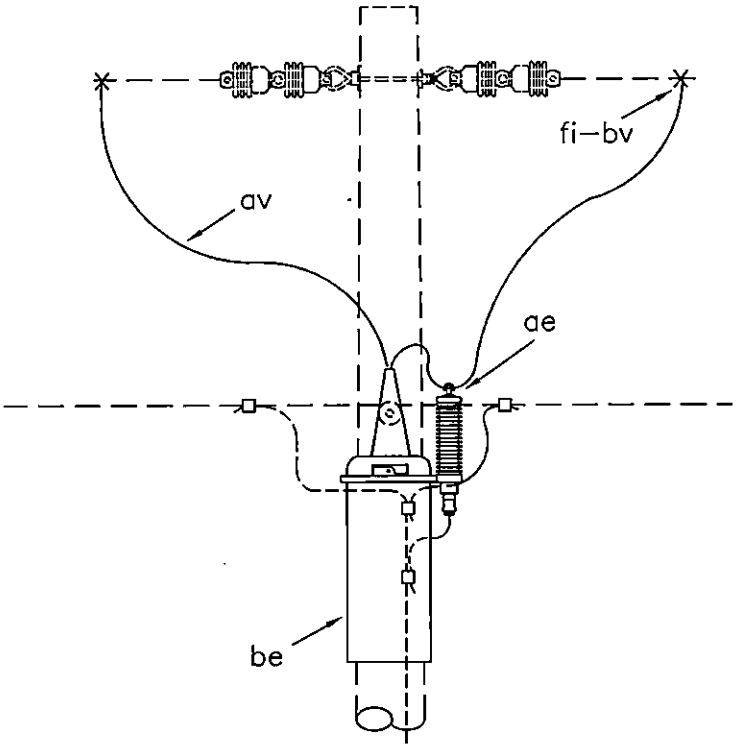
APRIL 2005		Q4.1
RUS	12.47/7.2 kV	(M8-15)

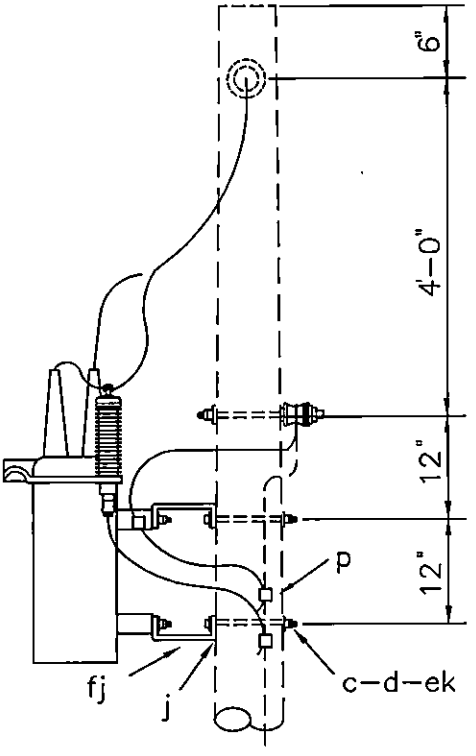
OIL CIRCUIT RECLOSER ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
R1.1	(M3-10)	OIL CIRCUIT RECLOSER
R1.2	(M3-23A)	OIL CIRCUIT RECLOSER - (WITH BYPASS CUTOUT)
R2.1 R3.1	(M3-11A) (M3-12A)	(THREE) OIL CIRCUIT RECLOSERS
R2.2 R3.2	(M3-24A) (M3-25A)	(THREE) OIL CIRCUIT RECLOSERS (WITH BYPASS SWITCHES)
R3.3	(M3-30)	THREE-PHASE OIL CIRCUIT RECLOSER WITH BY-PASS SWITCHES



PLAN





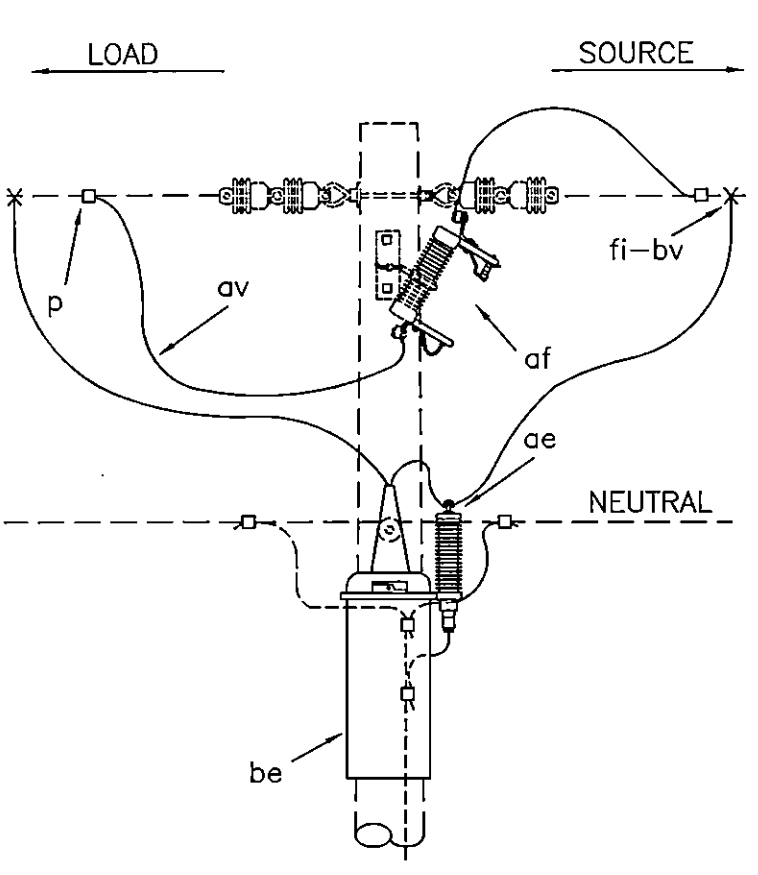
NOTE: The recloser terminal bushing connected to the coil should be connected to the source.

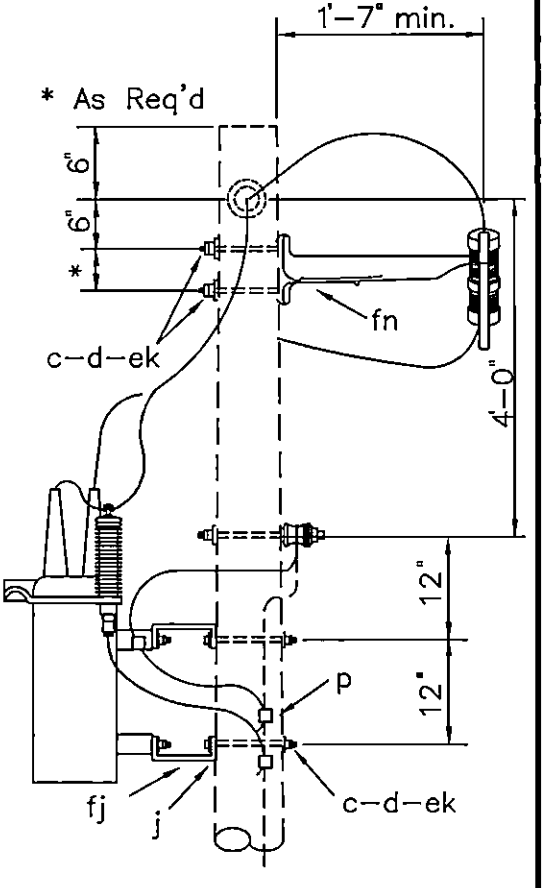
ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
j	4	Screw, lag, 1/2" x 4"
p		Connector, as required
ae	1	Arrester, surge (9 kV)
av		Jumpers, stranded, as required

ITEM	QTY	MATERIAL
be	1	Recloser, oil circuit (12.47 kV)
bv		Rod, armor, as req'd
ek	2	Locknuts
fi	2	Connector, hot line
fj	2	Brackets, extension, 9" long

OIL CIRCUIT RECLOSER

APRIL 2005	1 – PHASE PRIMARY	R1.1
RUS	12.47/7.2 kV	(M3–10)





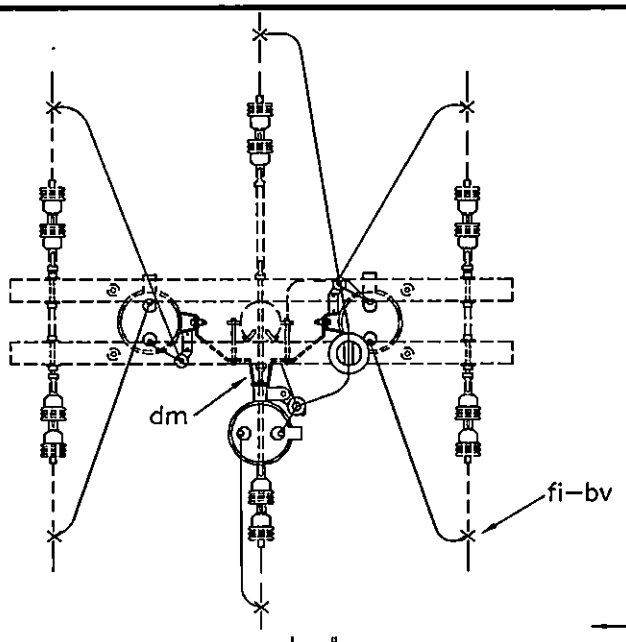
NOTE: The recloser terminal bushing connected to the coil should be connected to the source.

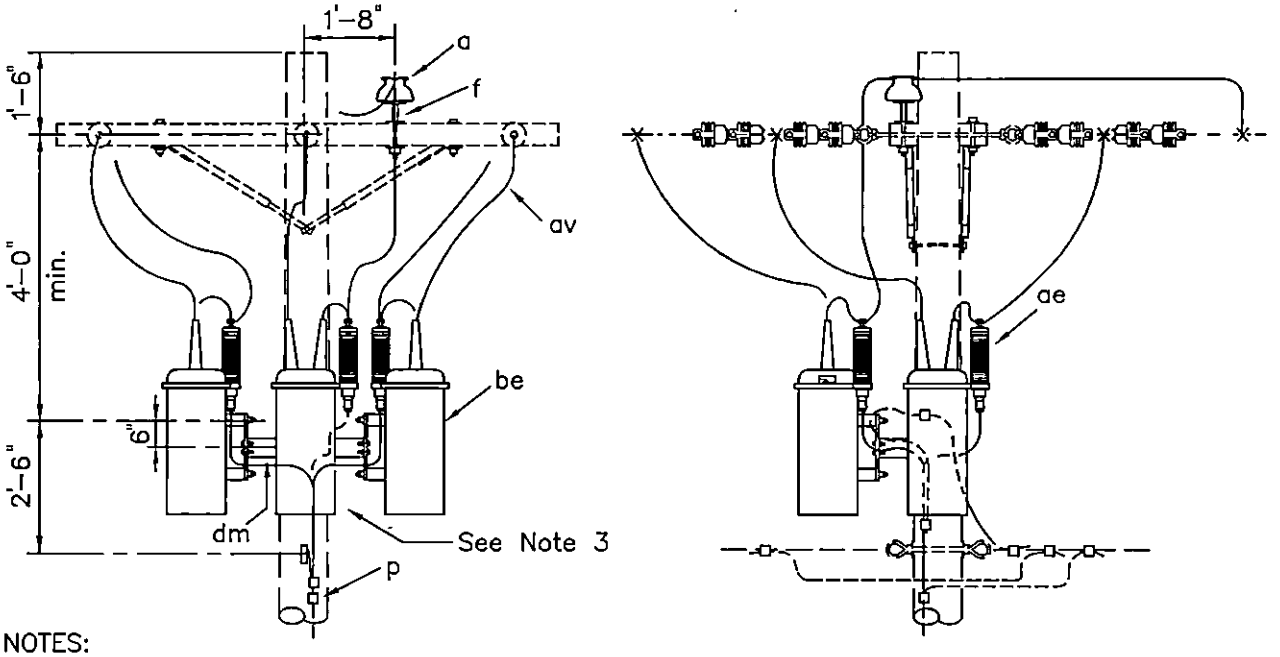
ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
j	4	Screw, lag, 1/2" x 4"
p		Connector, as required
ae	1	Arrester, surge (9 kV)
af	1	Cutout, distribution, open (15 kV)
av		Jumpers, stranded, as required

ITEM	QTY	MATERIAL
be	1	Recloser, oil circuit (12.47 kV)
bv		Rod, armor, as req'd
ek	4	Locknuts
fi	2	Connector, hot line
fj	2	Brackets, extension, 9" long
fn	1	Bracket, extension

OIL CIRCUIT RECLOSER (WITH BYPASS CUTOUT)

APRIL 2005	1 – PHASE PRIMARY	R1.2
RUS	12.47/7.2 kV	(M3–23A)





NOTES:

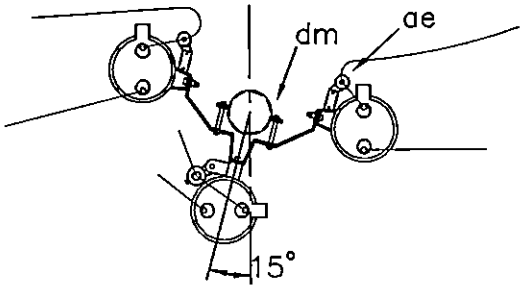
1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. For 2–phase installations, omit recloser and related items on center phase and designate as R2.1.
3. Each recloser tank shall have two connections to ground.

ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
a	1	Insulator, pin type, (12.47/7.2 kV)
f	1	Pin, crossarm, steel, 5/8" x 10 3/4"
p		Connector, as required
ae	3	Arrester, surge (9 kV)
av		Jumpers, stranded, as required

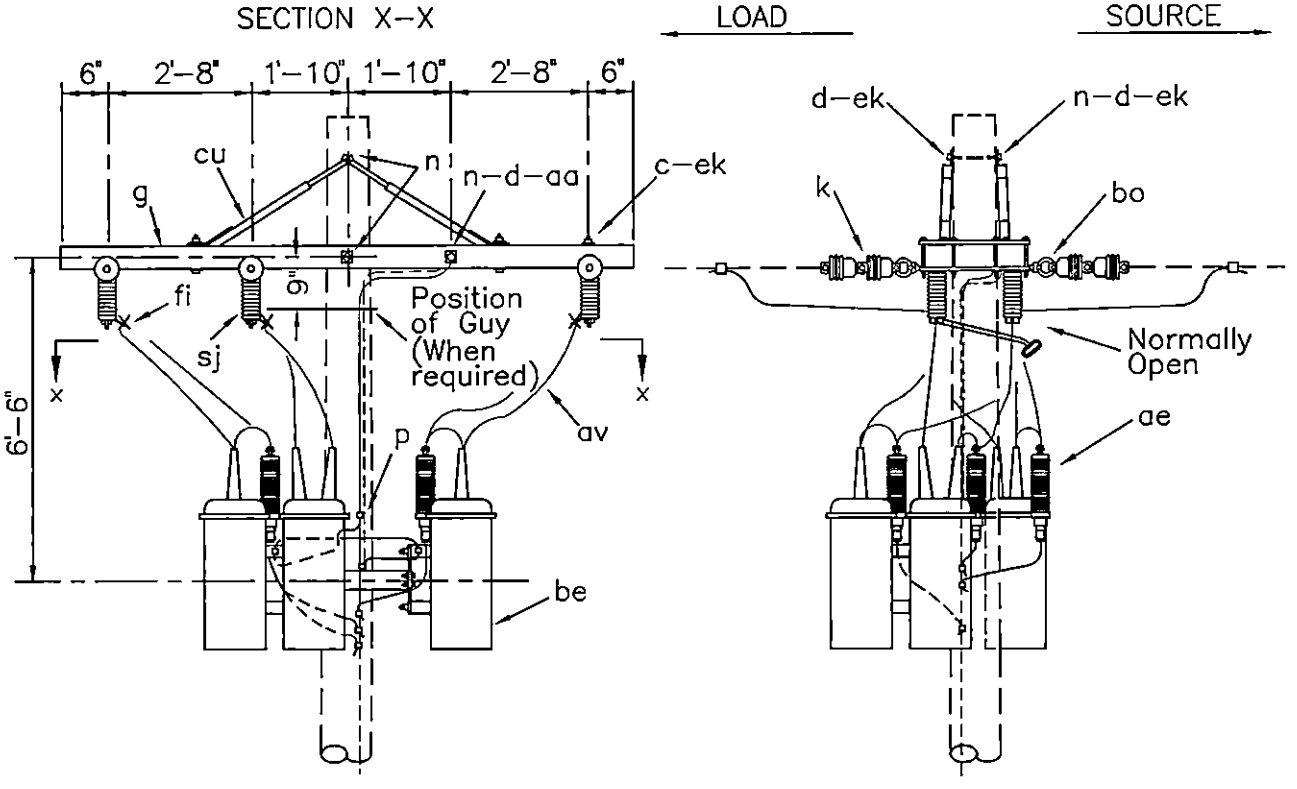
ITEM	QTY	MATERIAL
be	3	Recloser, oil circuit (12.47 kV)
bv	6	Rod, armor, as req'd
ek	2	Locknuts
fi	6	Connector, hot line
dm	1	Bracket, cluster type, with 14" adapter
		plate

(THREE) OIL CIRCUIT RECLOSERS

APRIL 2005	3 – PHASE PRIMARY	R2.1,R3.1
RUS	12.47/7.2 kV	(M3–11A),(M3–12A)



SECTION X–X



NOTES:

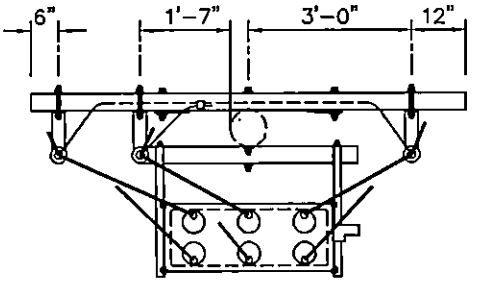
1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. For 2–phase installations, omit recloser and related items on center phase and designate as "R2.2".
3. Each recloser tank shall have two connections to ground.

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	14	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	10	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
k	12	Insulator, suspension, 4 1/4"
n	3	Bolt, double arm, 5/8" x req'd length
p		Connectors, as required
aa	2	Nut, eye, 5/8"
ae	3	Arresters, surge, (9 kV)

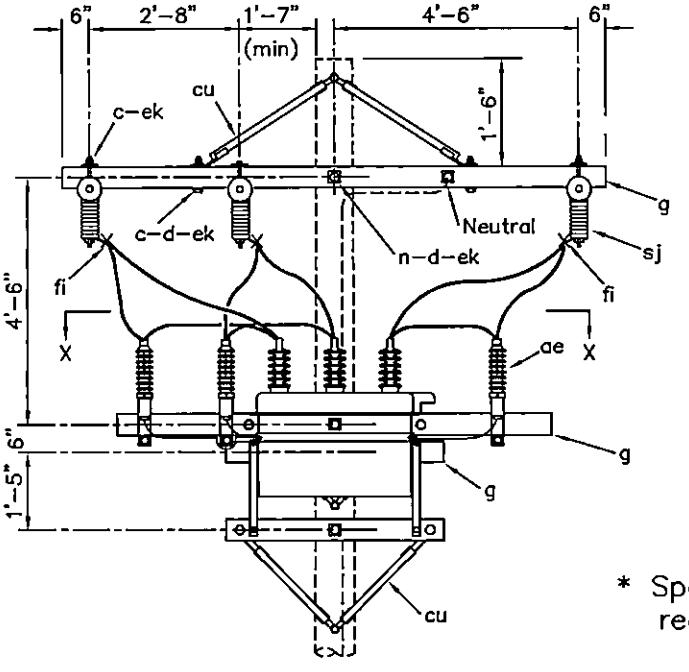
ITEM	QTY	MATERIAL
av		Jumpers, stranded, as req'd
be	3	Recloser, oil circuit (12.47 kV)
bo	6	Shackle, anchor
cu	2	Brace, wood, 60" span
dm	1	Bracket, cluster type with 14" adapter plate
ek	28	Locknuts
fi	6	Connector, hot line
sj	3	Switch, OCR, by–pass, (15 kV)

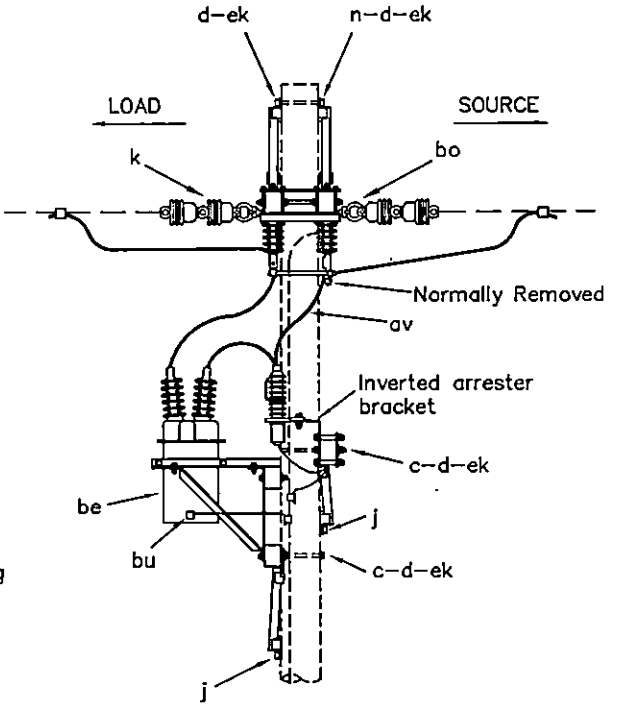
(THREE) OIL CIRCUIT RECLOSERS (WITH BYPASS SWITCHES)

APRIL 2005	3 – PHASE PRIMARY	R2.2,R3.2
RUS	12.47/7.2 kV	(M3–24A),(M3–25A)



SECTION X–X





* Specify this item to be furnished by recloser manufacturer.

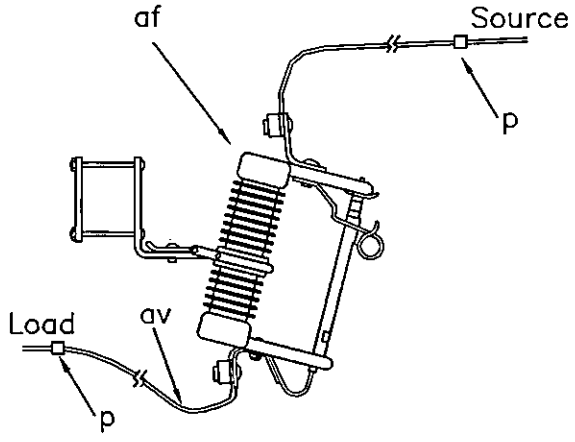
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
c	3	Bolt, machine, 5/8"x req'd length	aa	2	Nut, eye, 5/8"
c	4	Bolt, machine, 1/2"x req'd length	ae	3	Surge arrester
d	12	Washer, sq. 2–1/4"x 3/16", 13/16"hole	av	–	Jumpers, stranded, as req'd
d	4	Washer, rd. 1–3/8" dia., 9/16" hole	be	1	Recloser, oil circuit – 3 phase
g	2	Crossarm, 3–5/8"x 4–5/8"x 10'–0"	*	1	Mounting bracket for 3 phase recloser
g	1	Crossarm, 3–5/8"x 4–5/8"x 8'–0"	bo	6	Shackle, anchor
g	2	Crossarm, 3–5/8"x 4–5/8"x 4'–0"	bu	1	Connector, solderless
j	2	Screw, lag, 5/8"x req'd length	cu	2	Brace, crossarm, wood, 60" span
k	12	Insulator, suspension	cu	4	Brace, crossarm, wood, 28"
l	6	Clamp, deadend	ek	–	Locknuts, as req'd
n	3	Bolt, double arming, 5/8"x req'd length	fi	6	Connector, hot line
p	–	Connectors, as req'd	sj	3	Switch, recloser by–pass

THREE–PHASE OIL CIRCUIT RECLOSER WITH BY–PASS SWITCHES

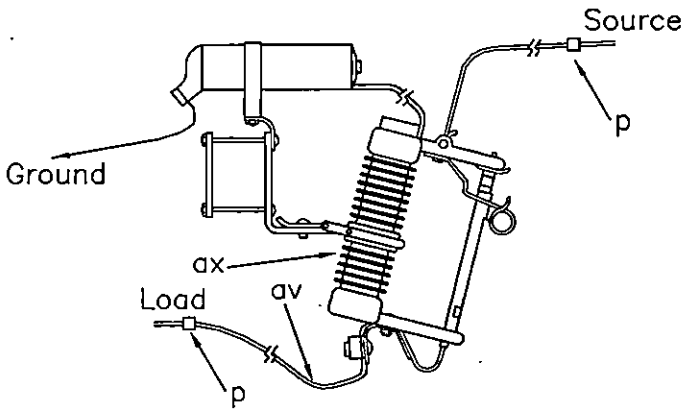
APRIL 2005	3 – PHASE PRIMARY	R3.3
RUS	12.47/7.2 kV	(M3–30)

SECTIONALIZING ASSEMBLY UNITS

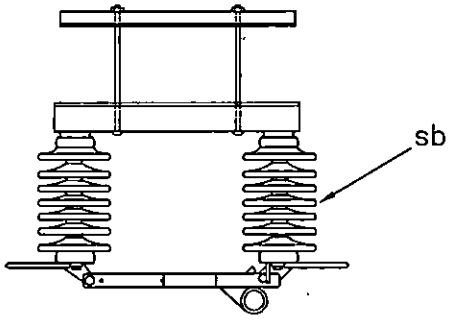
DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
S1.01 S1.02 S2.01	(M5-9) (M5-10)	MISCELLANEOUS CUTOUTS AND DISCONNECT SWITCH
S1.1	(M3-4)	CUTOUT - SINGLE PHASE
S1.1N		CUTOUT GUIDE - NARROW PROFILE
S1.3		COUTOUTS - (THREE SINGLE-PHASE)
S2.3	(M3-3B)	LINE TENSION SWITCHES – (THREE SINGLE-PHASE)
S2.21 S2.31	(M3-2A) (M3-3A)	DISCONNECT SWITCHES - (TWO OR THREE SINGLE-PHASE)
S2.32	(M3-15)	GROUP-OPERATED AIRBREAK SWITCH - (THREE-PHASE)
S3.1	(M3-41)	SECTIONALIZER
S3.2		SECTIONALIZER (WITH BYPASS CUTOUT)



S1.01



S1.02



S2.01

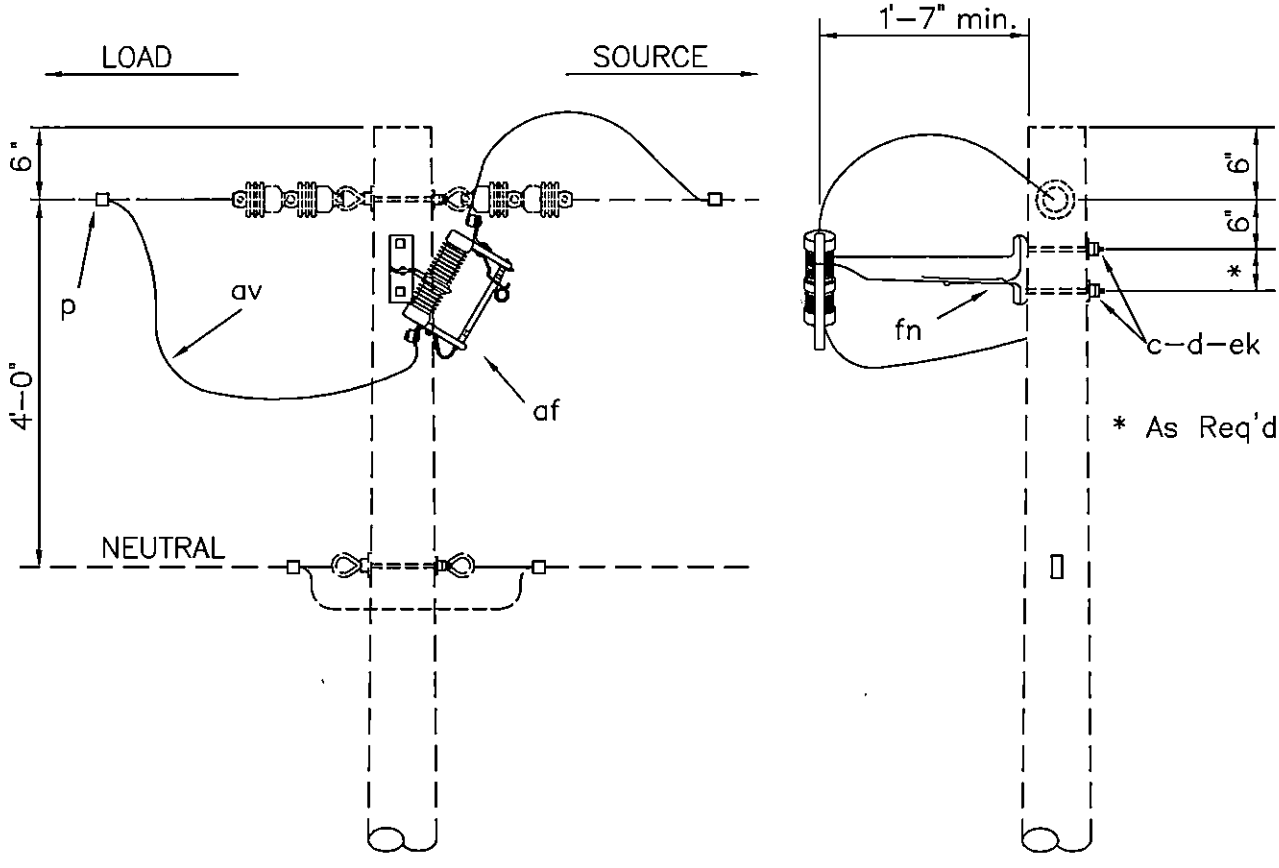
NOTES: Specify cutouts to be furnished with fuse tube or switch blade.

"S2.01" may be used with assembly "C6.21" (mount braces above crossarm). See "S2.32".

ASSEMBLY: S		1.01	1.02	2.01
ITEM	MATERIAL	QTY	QTY	QTY
p	Connector, as req'd			
af	Cutout, dist., open (15 kV)	1		
ax	Cutout, & Arrester Comb. (9 kV)		1	
av	Jumpers, as req'd			
sb	Switch, disconnect (15 kV)			1

MISCELLANEOUS CUTOUTS AND DISCONNECT SWITCH

APRIL 2005		S1.01,S1.02,S2.01
RUS	12.47/7.2 kV	(M5-9),(M5-10)

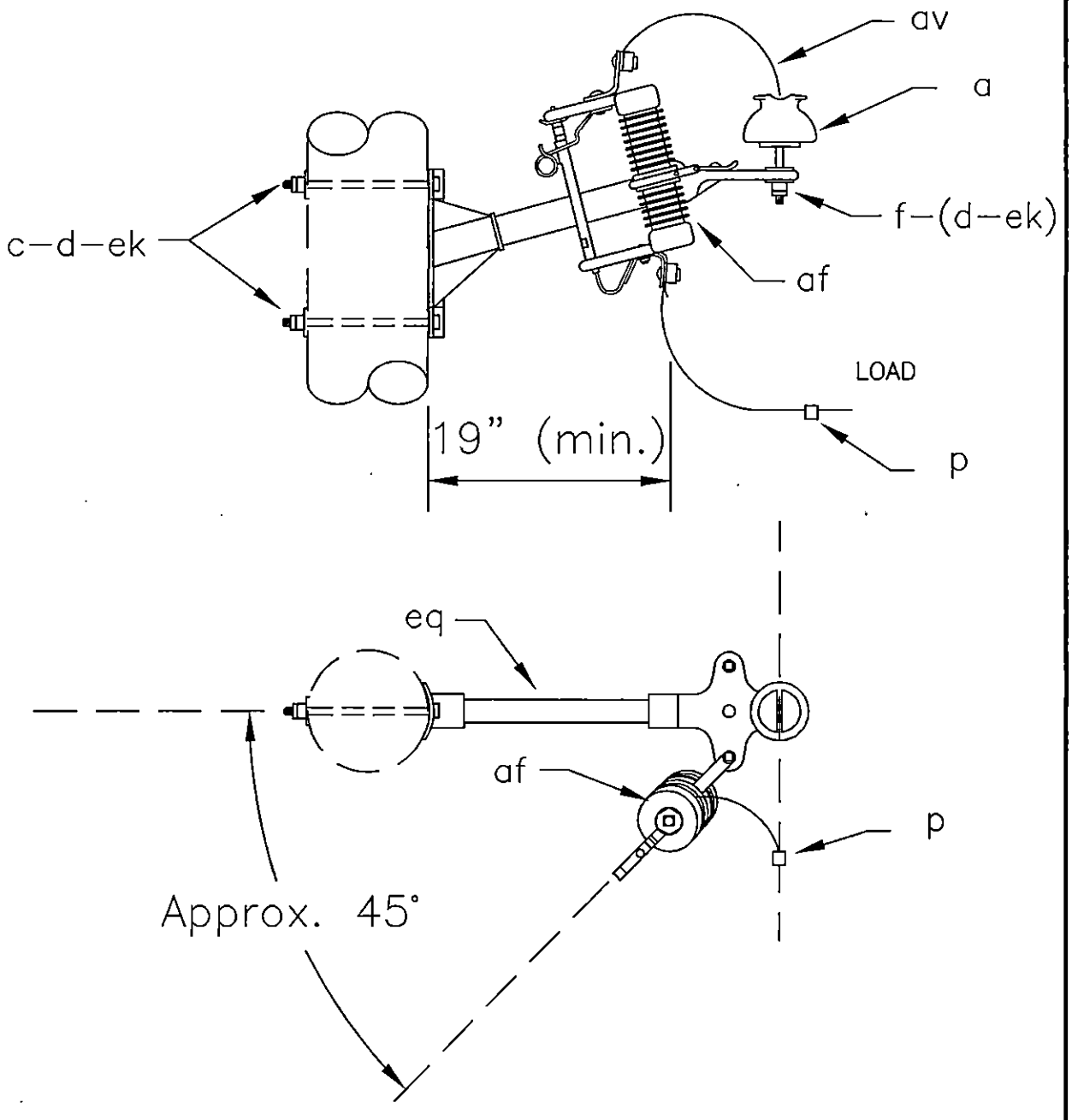


NOTE: Specify fuse size or solid blade

ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
p	2	Connector, compression type
af	1	Cutout, distribution, open (15 kV)
av		Jumpers, as required
ek	2	Locknuts
fn	1	Bracket, extension

CUTOUT – SINGLE PHASE

APRIL 2005		S1.1
RUS	12.47/7.2 kV	(M3–4)



ITEM	MATERIAL	QTY
a	Insulator, pin type (12.47/7.2 kV)	1
c	Bolt, machine, 5/8" x req'd length	2
d	Washer, square 2 1/4"	2
f	Pin, crossarm, 5/8" x 6 1/2"	1
af	Cutout, distribution, open (15kV)	1
av	Jumpers, as required	
ek	Locknuts	2
eq	Bracket, insulator/equipment	1

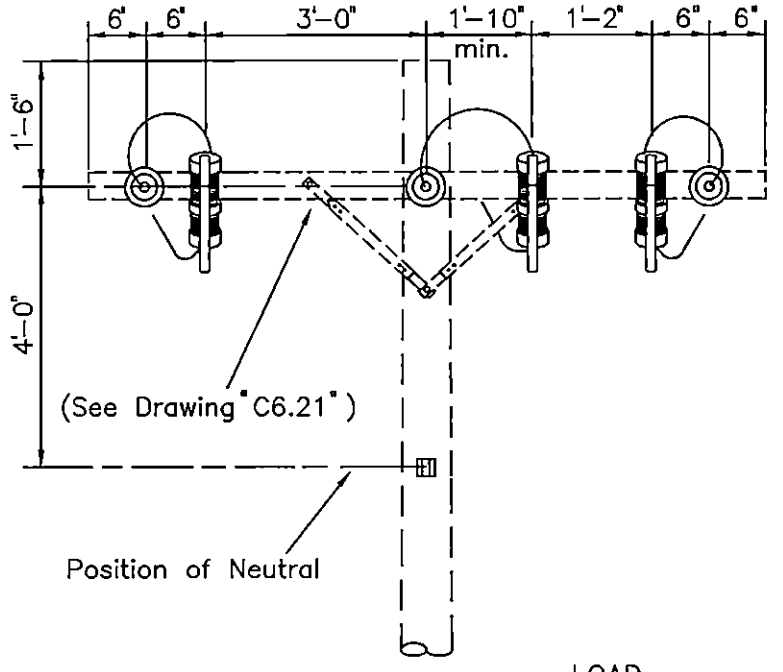
NOTE: Also see "A5.4NG".

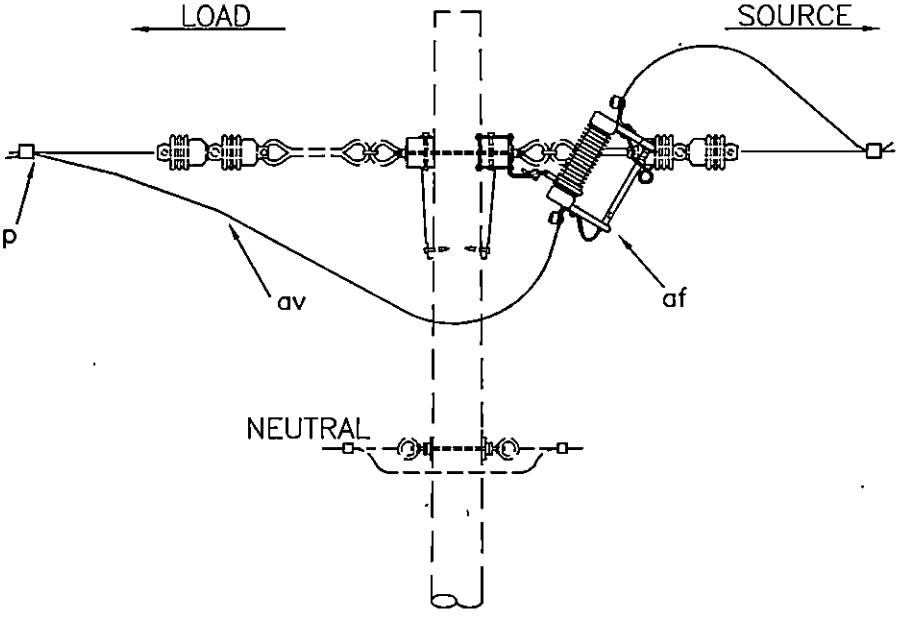
Design Parameters:

Maximum Line Angles:
See Table II

CUTOUT–NARROW PROFILE

APRIL 2005	1 – PHASE PRIMARY	S1.1N
RUS	12.47/7.2 kV	



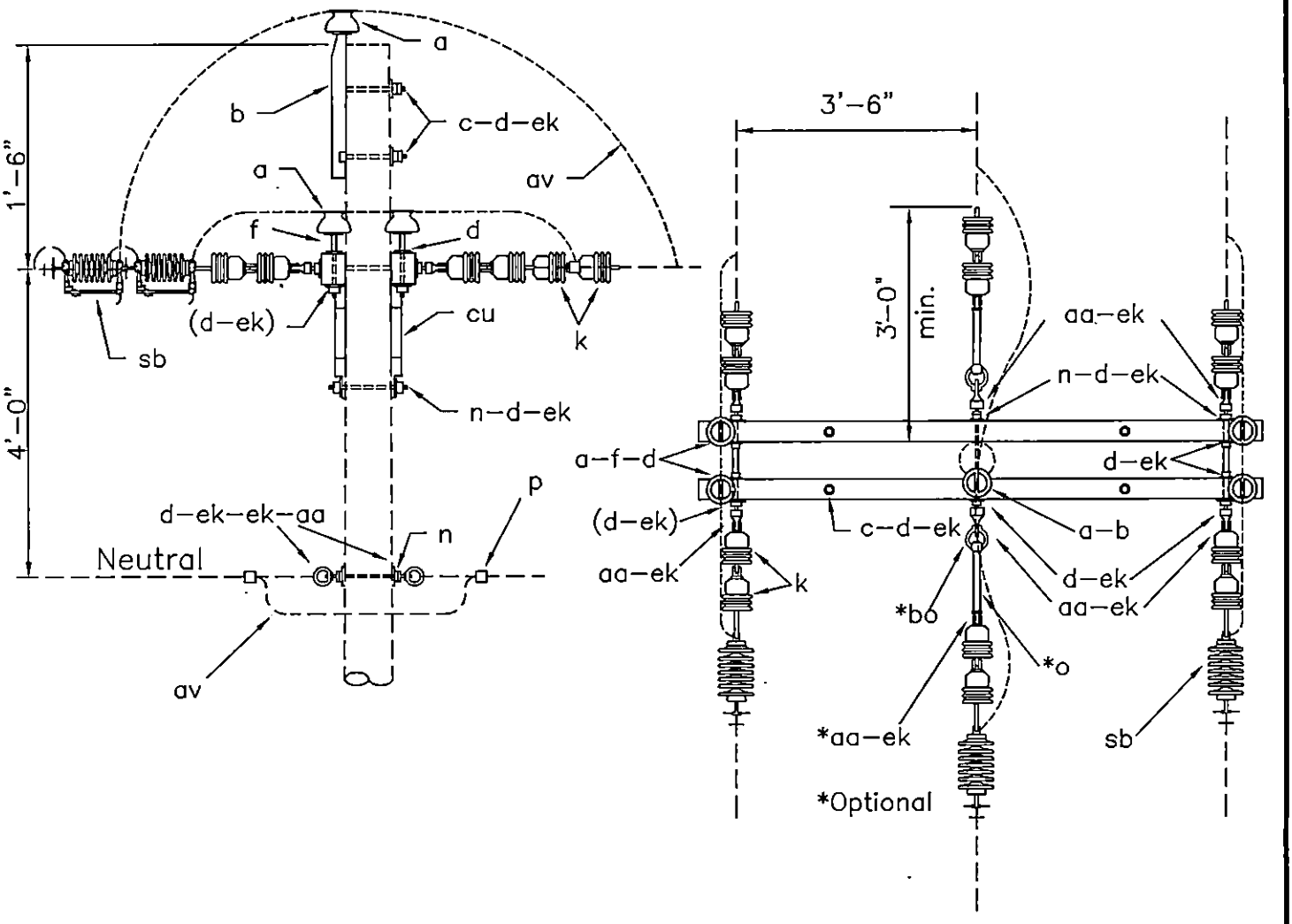


NOTES:
1. Specify fuse size or solid blade.
2. Mount cutouts so that blades face climbing face of pole.

ITEM	QTY	MATERIAL
p	6	Connector, compression type
af	3	Cutout, distribution open (15 kV)
av		Jumpers, as req'd

CUTOUTS
(THREE SINGLE–PHASE)

APRIL 2005		
RUS	12.47/7.2 kV	S1.3



NOTE:
See Assembly C6.21 for additional details.

ITEM	QTY	MATERIAL	ITEM	QTY	MATERIAL
a	5	Insulator, pin type	o	2	Bolt, eye, 5/8"x req'd length
b	1	Pin, pole top, 20"	p		Connectors, as required
c	4	Bolt, machine, 1/2" x req'd length	aa	10	Nut, eye, 5/8"
c	2	Bolt, machine, 5/8" x req'd length	av		Jumpers and leads as req'd
d	20	Washer, square, 2 1/4"	bo	2	Shackle, anchor
d	4	Washer, round, 1 3/8"	cu	2	Brace, wood, 60" span
f	4	Pin, crossarm, steel, 5/8"x10 3/4"	ek	30	Locknuts
g	2	Crossarm, 3 5/8"x4 5/8"x8'–0"	sb	3	Switch, line tension
k	12	Insulators, suspension			
n	5	Bolt,double arming,5/8"x req'd length			

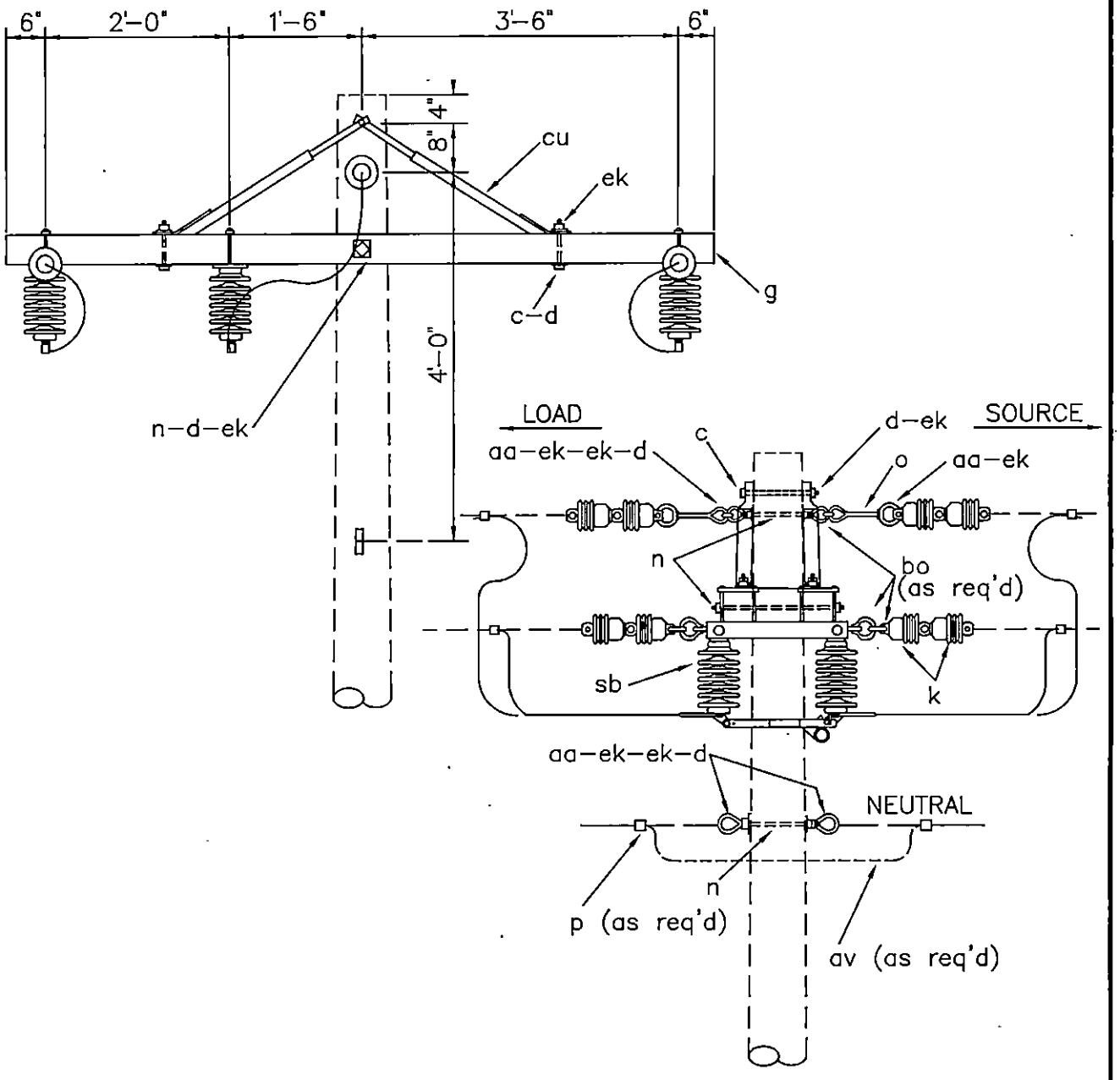
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

LINE TENSION SWITCHES (THREE SINGLE–PHASE)

APRIL 2005	3 – PHASE PRIMARY	S2.3 (M3–3B)
RUS	12.47/7.2 kV	



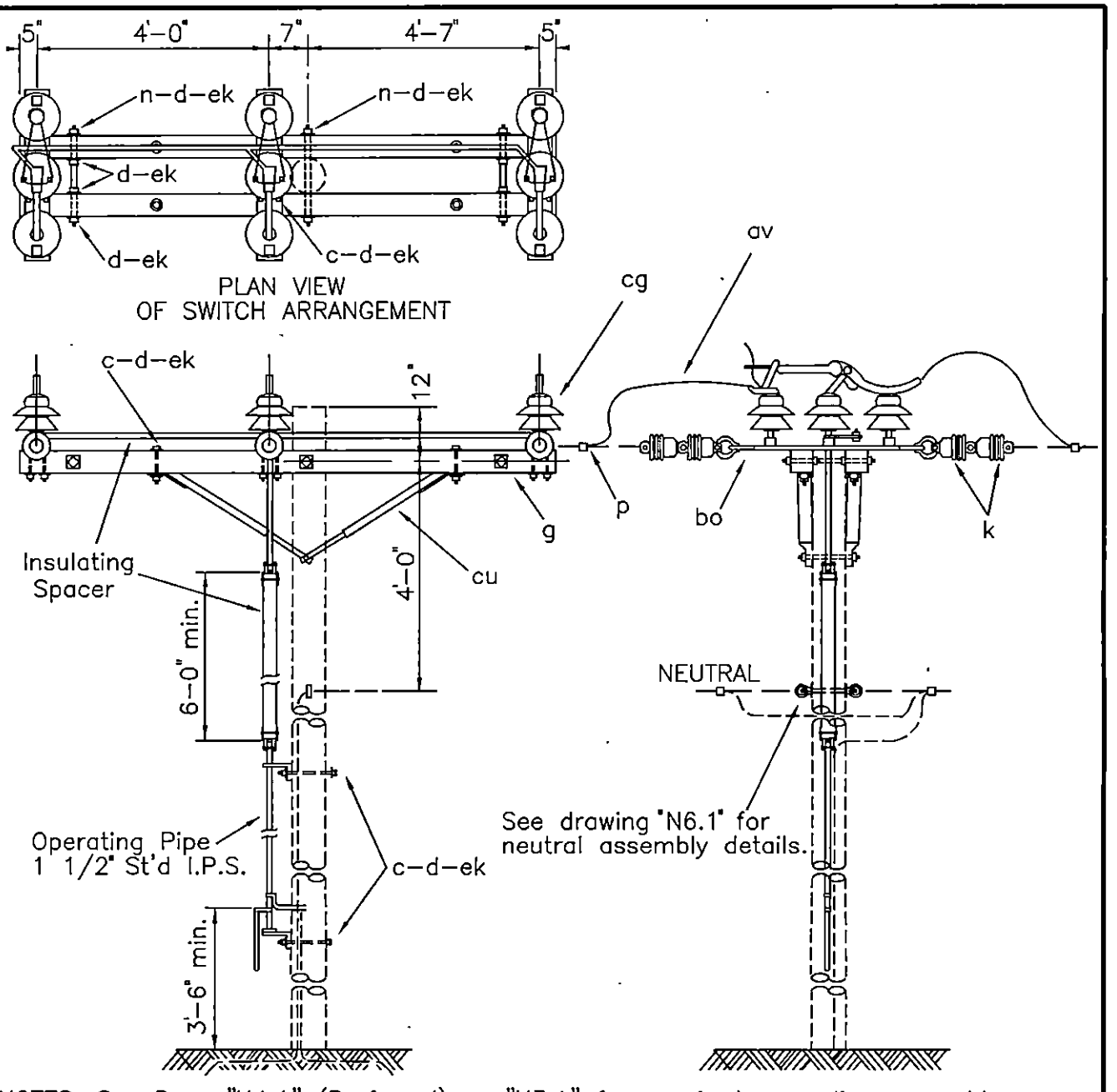
NOTE: For 2–phase installations, omit switch and related items on center phase and designate as "S2.21."

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	1	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	11	Washer, square, 2 1/4"
d	4	Washer, square, 3", curved
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
k	12	Insulator, suspension, 4 1/4"
n	5	Bolt, double arm, 5/8" x req'd length

ITEM	QTY	MATERIAL
o	2	Bolt, eye, 5/8" x req'd length
p		Connectors, compression as required
aa	6	Nut, eye, 5/8"
av		Jumpers, as required
bo	6	Shackle, anchor
cu	2	Brace, wood, 60" span
sb	3	Switch, disconnect, 15 kV,
		with mounting hardware

DISCONNECT SWITCHES (TWO or THREE SINGLE–PHASE)

APRIL 2005		S2.21,S2.31
RUS	12.47/7.2 kV	(M3–2A),(M3–3A)



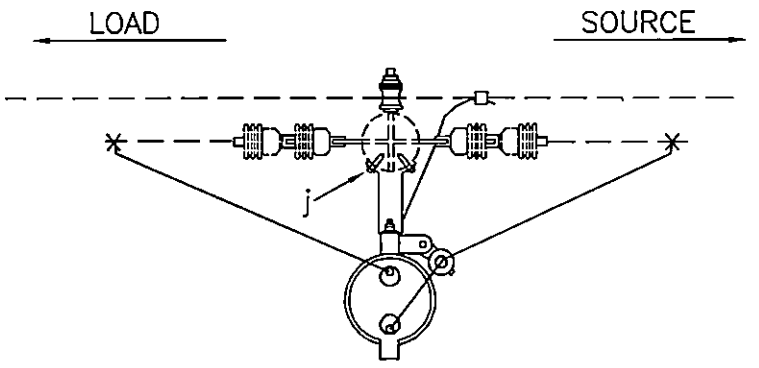
NOTES: See Dwg. "H4.1" (Preferred) or "H3.1" for required grounding assembly. RUS accepted pre-assembled, group operated, airbreak switches may be used. Install according to manufacturer's instructions.

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	15	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	25	Washer, square, 2 1/4"
d	2	Washer, square, 3"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'-0"
k	12	Insulator, suspension, 4 1/4"
n	4	Bolt, double arm, 5/8" x req'd length
p		Connectors, as required

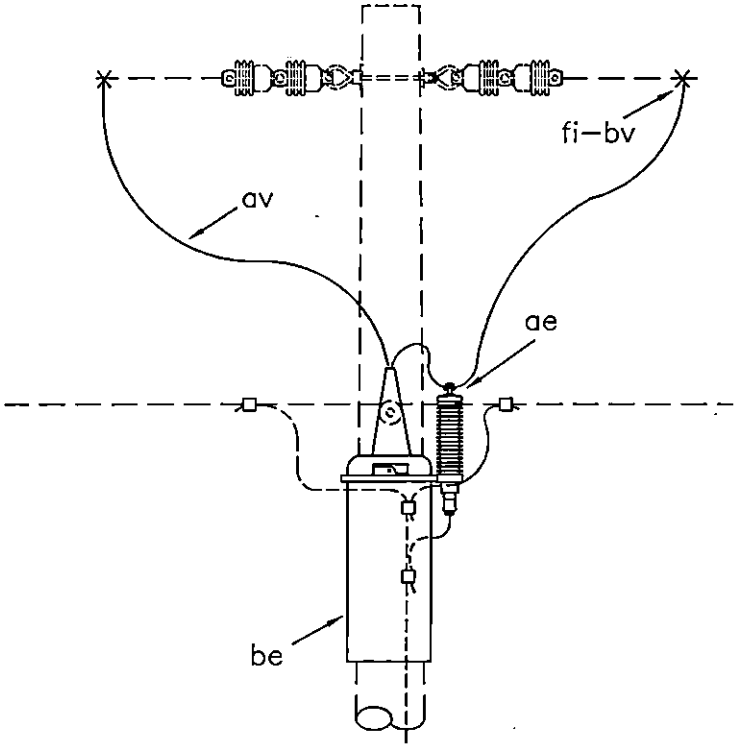
ITEM	QTY	MATERIAL
aa	2	Nut, eye, 5/8"
av		Jumpers, as required
bo	6	Shackle, anchor
cg	1	Switch, airbreak, group operated
		15 kV, w/ operating mechanism
cu	2	Brace, wood, 60" span
ek	33	Locknuts

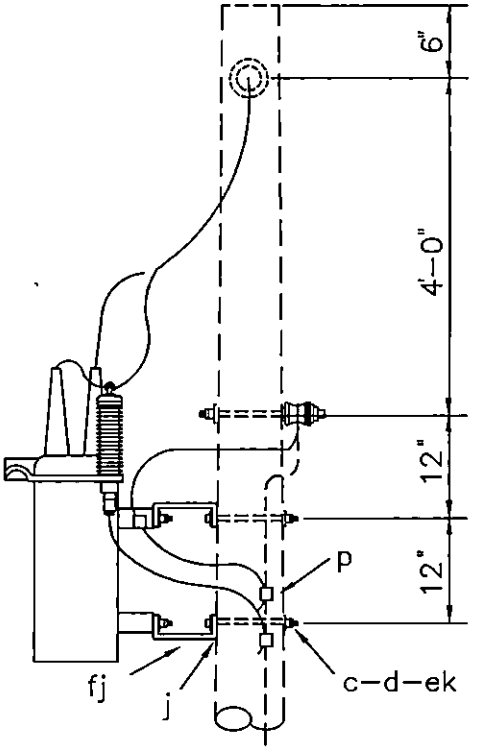
GROUP-OPERATED AIRBREAK SWITCH (THREE-PHASE)

APRIL 2005	3 - PHASE PRIMARY	S2.32
RUS	12.47/7.2 kV	(M3-15)



PLAN





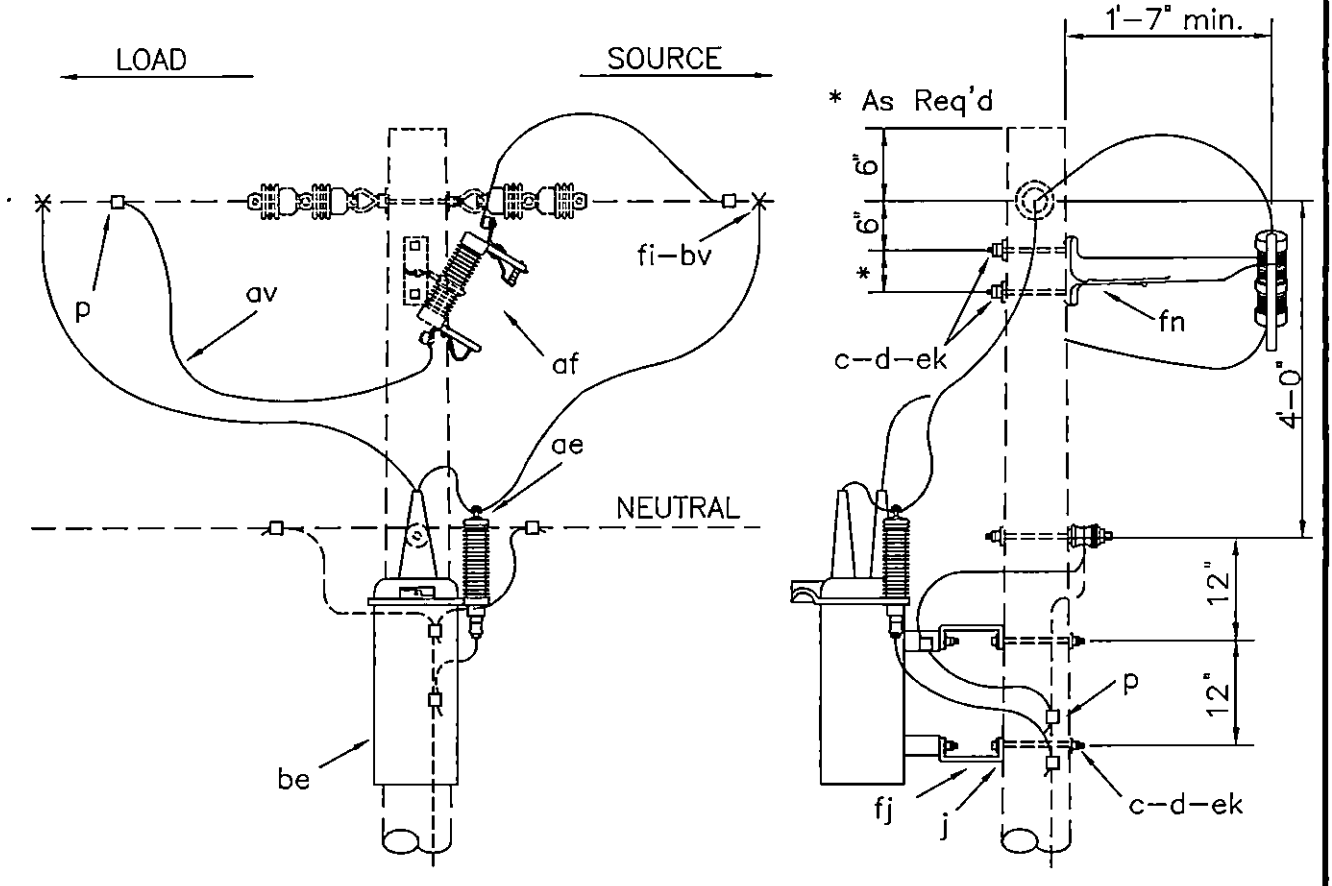
NOTE: The sectionalizer terminal bushing connected to the coil should be connected to the source.

ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
j	4	Screw, lag, 1/2" x 4"
p		Connector, as required
ae	1	Arrester, surge (9 kV)
av		Jumpers, stranded, as required

ITEM	QTY	MATERIAL
el	1	Sectionalizer (12.47 kV)
bv		Rod, armor, as req'd
ek	2	Locknuts
fi	2	Connector, hot line
fj	2	Brackets, extension, 9" long

SECTIONALIZER

APRIL 2005 RUS	1 – PHASE PRIMARY 12.47/7.2 kV	S3.1 (M3–41)



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

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
j	4	Screw, lag, 1/2" x 4"
p		Connector, as required
ae	1	Arrester, surge (9 kV)
af	1	Cutout, distribution, open (15 kV)
av		Jumpers, stranded, as required

ITEM	QTY	MATERIAL
el	1	Sectionalizer (12.47kV)
bv		Rod, armor, as req'd
ek	4	Locknuts
fi	2	Connector, hot line
fj	2	Brackets, extension, 9" long
fn	1	Bracket, extension

SECTIONALIZER

APRIL 2005	1 – PHASE PRIMARY	S3.2
RUS	12.47/7.2 kV	

WOOD POLES, CROSSARMS AND BRACES

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
W1.1G	(M20)	POLE FRAMING GUIDE
W2.1G	(M19)	DISTRIBUTION CROSSARM DRILLING GUIDE
W3.1	(M5-17)	CROSSARM BRACES
W3.2	(M5-13)	

CONSTRUCTION SPECIFICATIONS FOR POLES AND CROSSARMS

Large, dense poles that have no serious defects shall be used at transformer, deadend, angle, and corner locations.

Poles shall be set so that the crossarm gains face in opposite directions on every other pole. However at line deadends, the last two poles shall be set so that the pole gains face the deadend. 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. On lines that curve, the crossarms shall be installed on the side of the pole that faces the midpoint of the curve. On sloping terrain, the crossarms shall be installed on the uphill side of the pole. Pole top insulator brackets and pole top pins shall be installed on the opposite side of the pole from the gain.

At line angles and deadends, poles shall be set such that they lean away from the strain of the primary conductors. They shall be set such that the final rake is not less than 1 inch for each 10 feet of pole height above ground after the conductors are installed at the required tension.

Newly set poles shall be backfilled and tamped to the full depth. Excess dirt shall be banked around the base of the pole.

POLE SETTING DEPTHS

The minimum depth for setting poles is:

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

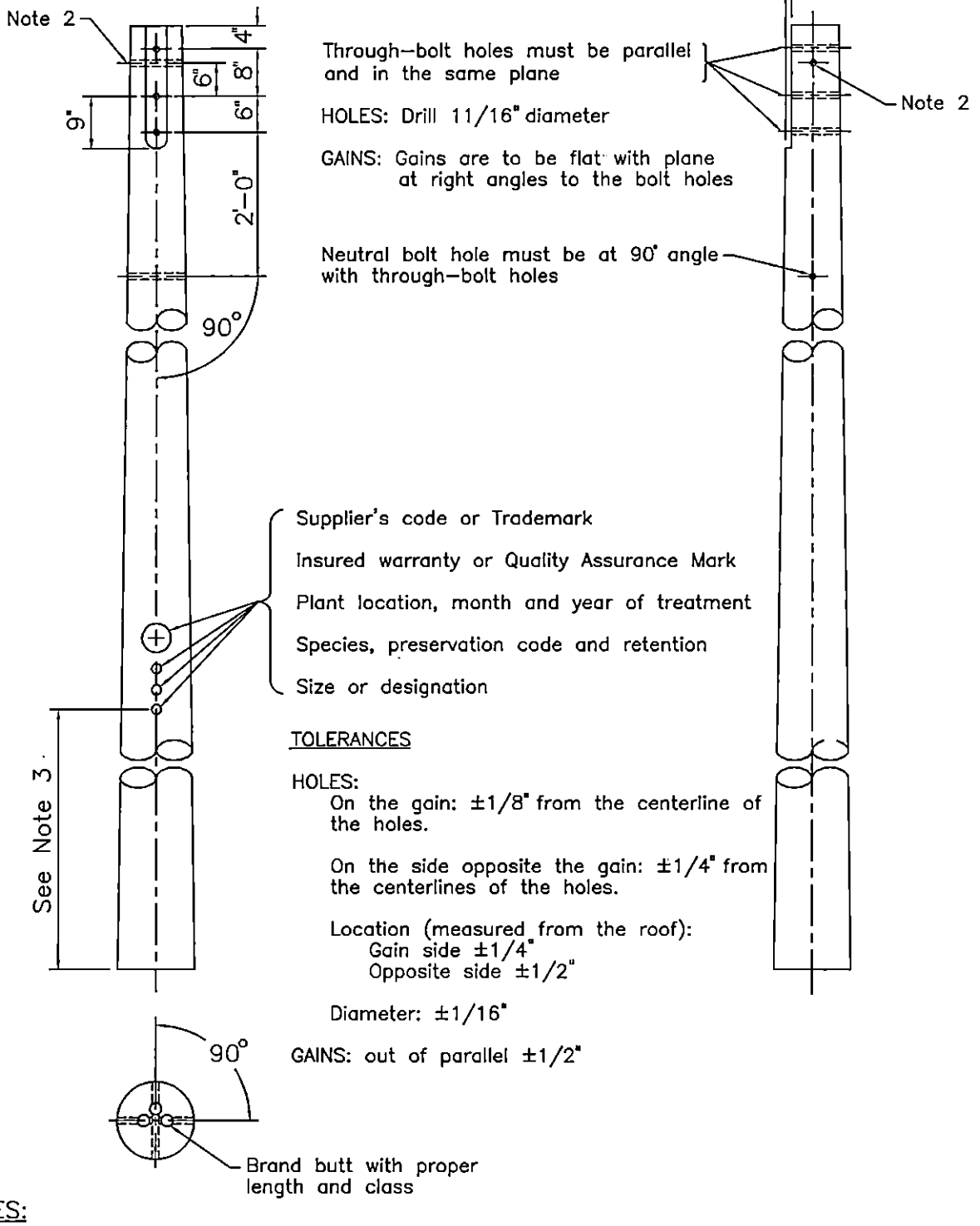
"Setting in Soil" depths apply where:

- Poles are set in soil;
- There is a layer of soil of more than two (2) feet in depth over solid rock; or
- 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 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 two (2) feet or less in depth over solid rock, the depth of the hole shall be the depth of the soil in addition to the depth specified under "Setting in All Solid Rock" provided. However, this 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.



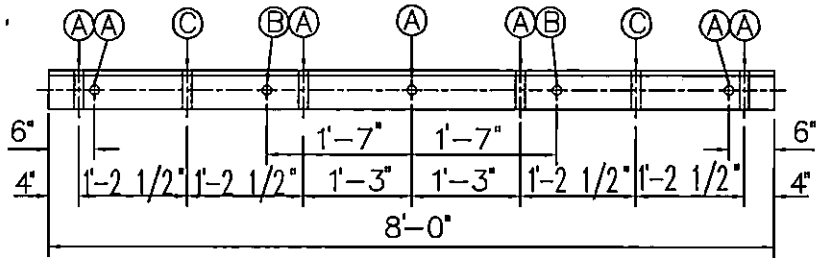
NOTES:

1. 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.
2. Anti-split bolt hole is optional and is to be drilled only when so specified by the purchaser.
3. Bottom of brand or center of metal disk shall be 10' ±2" from the pole butt for poles less than 55' in length; 14' ±2" for poles 55' and longer.

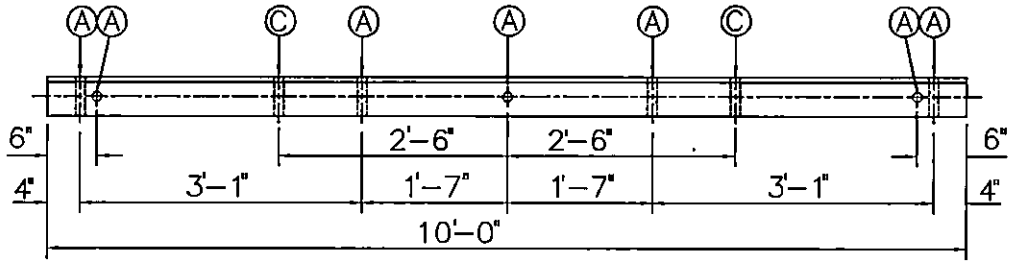
POLE FRAMING GUIDE

APRIL 2005		W1.1G
RUS		(M20)

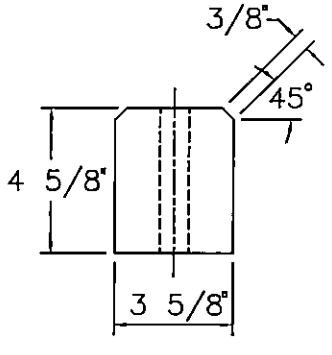
TOLERANCES AND SIZES OF HOLES			
NOMINAL		GO	NO GO
Ⓐ	11/16"	5/8"	3/4"
Ⓑ	7/16"	3/8"	1/2"
Ⓒ	9/16"	1/2"	5/8"



TYPE 04



TYPE 05M



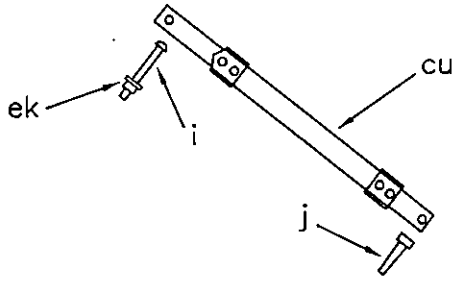
TYPICAL END SECTION

NOTES:

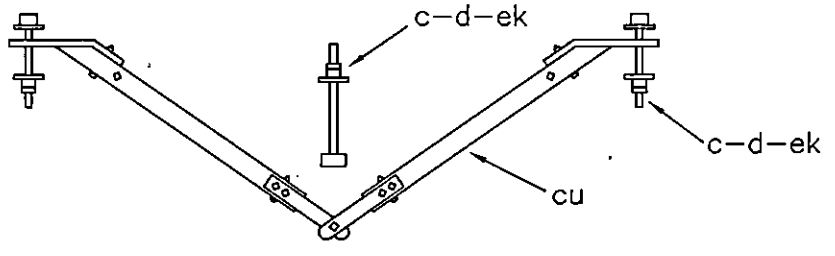
1. Holes are to be located within ±1/8"
2. Length of the crossarm is to be within ±1/4"
3. The tolerance of the cross section is +1/8" and −0" at time of manufacture.
4. All holes are to be drilled on centerlines of crossarm faces.

DISTRIBUTION CROSSARM DRILLING GUIDE

APRIL 2005		W2.1G
RUS		(M19)



W3.1



W3.2

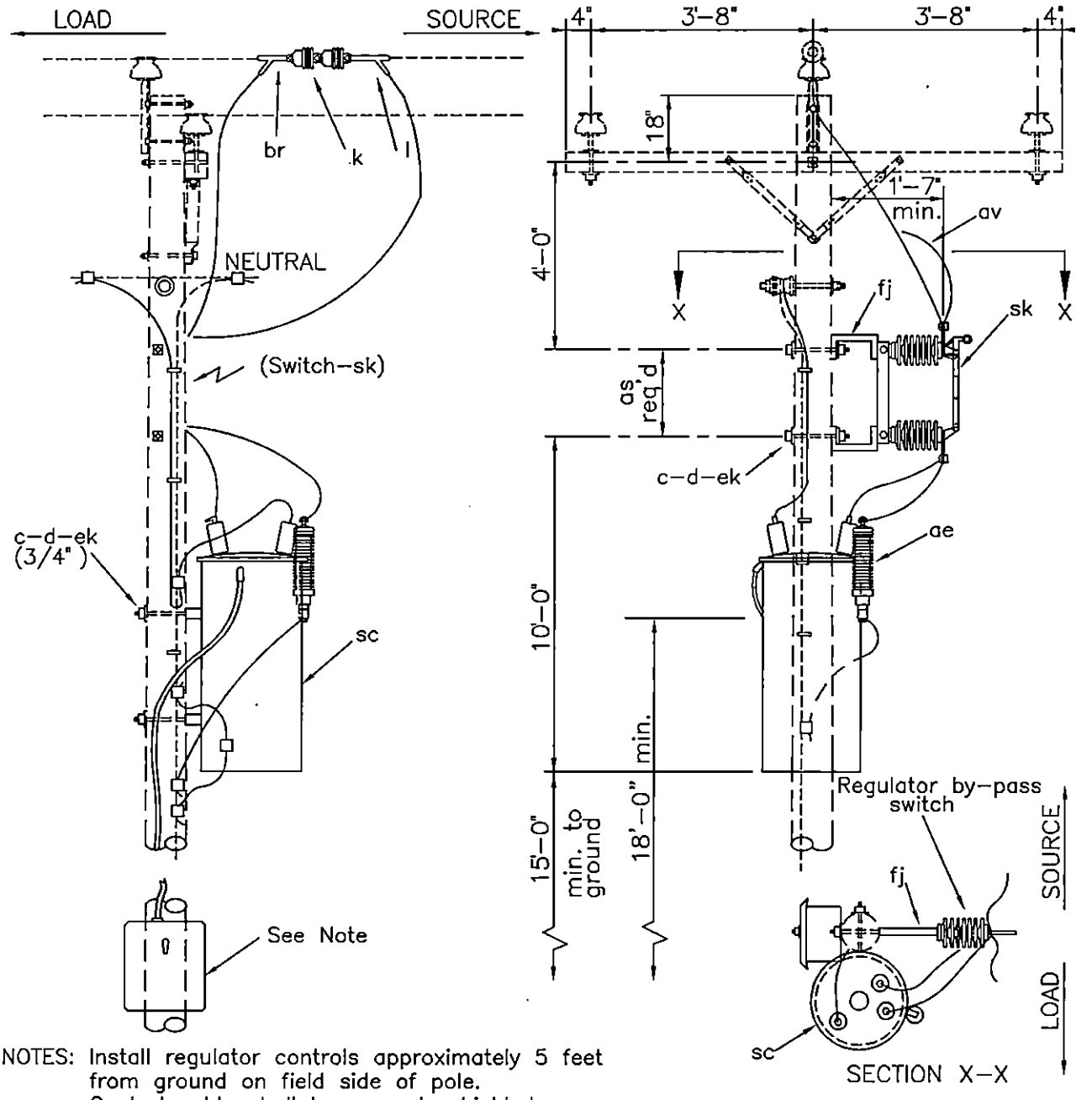
		W3.1	W3.2
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 1/2" x req'd length		2
c	Bolt, machine, 5/8" x req'd length		1
d	Washer, round, 1 3/8"		2
d	Washer, square, 2 1/4"		1
i	Bolt, carriage, 3/8" x 4 1/2"	1	
j	Screw, lag, 1/2" x 4"	1	
cu	Brace, 28", wood (or fiberglass)	1	
cu	Brace, wood, 60"		1
ek	Locknuts	1	3

CROSSARM BRACES

APRIL 2005		W3.1,W3.2
RUS		(M5–17),(M5–13)

VOLTAGE ALTERATION EQUIPMENT ASSEMBLY UNITS

DRAWING NUMBERS 1728F-804 (New)	Bulletin 50-3 (Old)	DRAWING TITLE (DESCRIPTION)
Y1.1	(M7-11)	VOLTAGE REGULATOR, POLE MOUNTED (ONE SINGLE-PHASE)
Y1.3	(M7-13)	VOLTAGE REGULATOR, PLATFORM MOUNTED (THREE SINGLE-PHASE)
Y2.1 Y2.2		AUTOTRANSFORMER, POLE MOUNTED (ONE SINGLE-PHASE, STEP-DOWN)
Y3.1	(M9-11)	SINGLE-PHASE CAPACITOR BANK
Y3.2 Y3.3	(M9-12) (M9-13)	THREE-PHASE CAPACITOR BANK
Y3.4		SWITCHED CAPACITOR BANK - THREE-PHASE



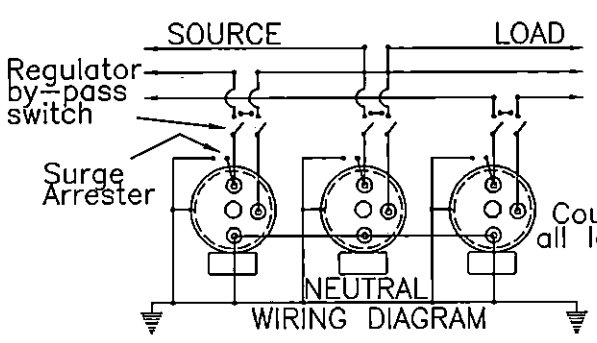
NOTES: Install regulator controls approximately 5 feet from ground on field side of pole.
Control cable shall be properly shielded or installed in suitable conduit.

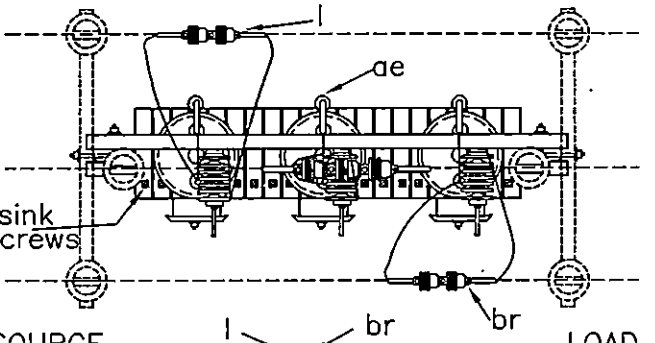
ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
c	2	Bolt, machine, 3/4" x req'd length
d	2	Washer, square, 2 1/4"
d	2	Washer, square, 3," curved
k	2	Insulator, suspension, 4 1/4
l	2	Clamp, deadend
p		Connectors, compression, as req'd
ae	1	Arrester, surge (9 kV)

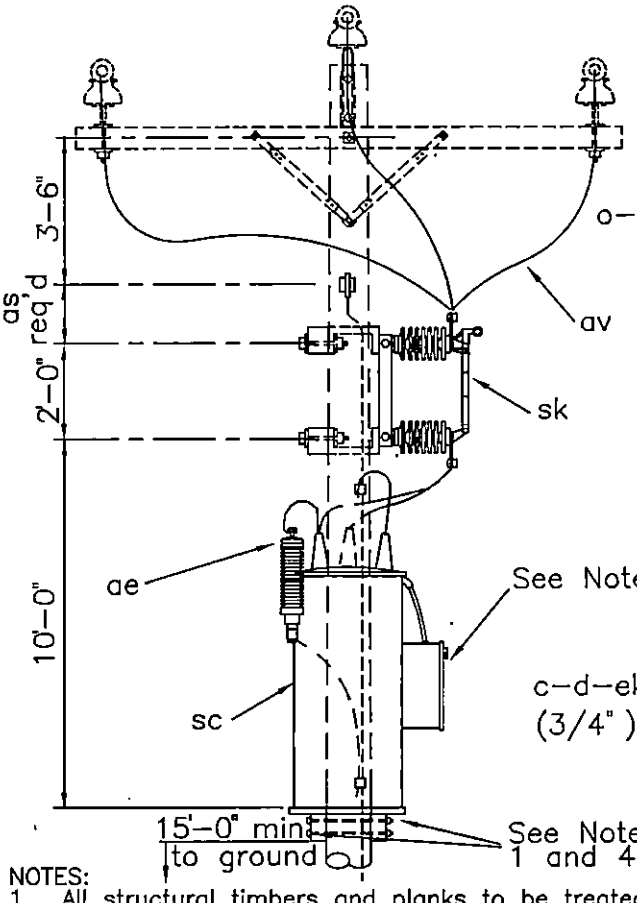
ITEM	QTY	MATERIAL
av		Jumpers, bare, stranded, as req'd
br	1	Chain link
bu		Connector, grounding
fj	2	Bracket, extension, 9"
sc	1	Regulator, voltage, step–type
		12.47/7.2 kV
sk	1	Switch, regulator by–pass
ek	4	Locknuts

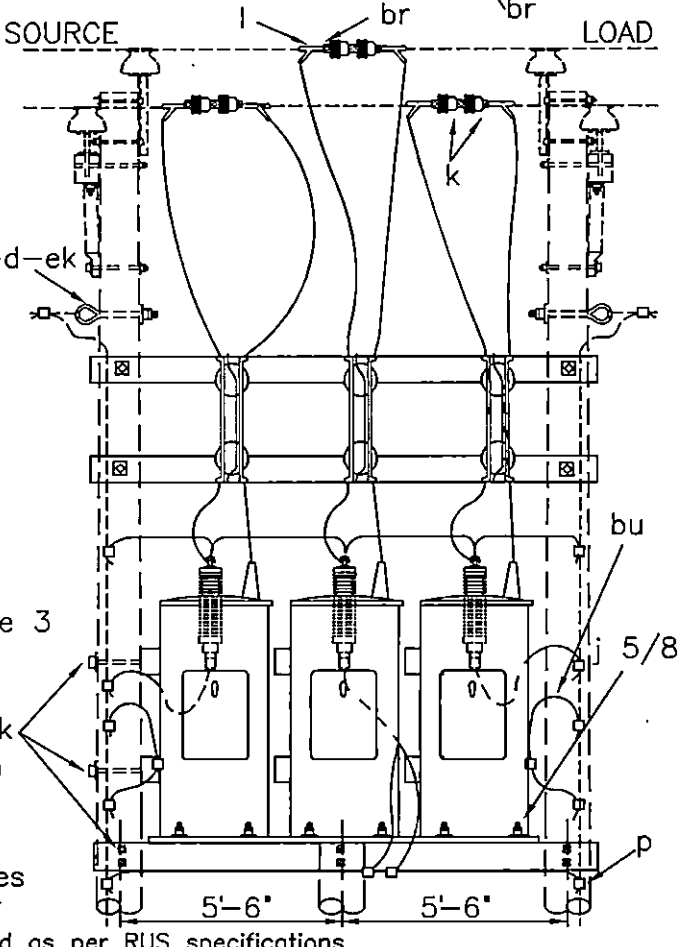
VOLTAGE REGULATOR, POLE MOUNTED (ONE SINGLE–PHASE)

APRIL 2005		Y1.1
RUS	12.47/7.2 kV	(M7–11)









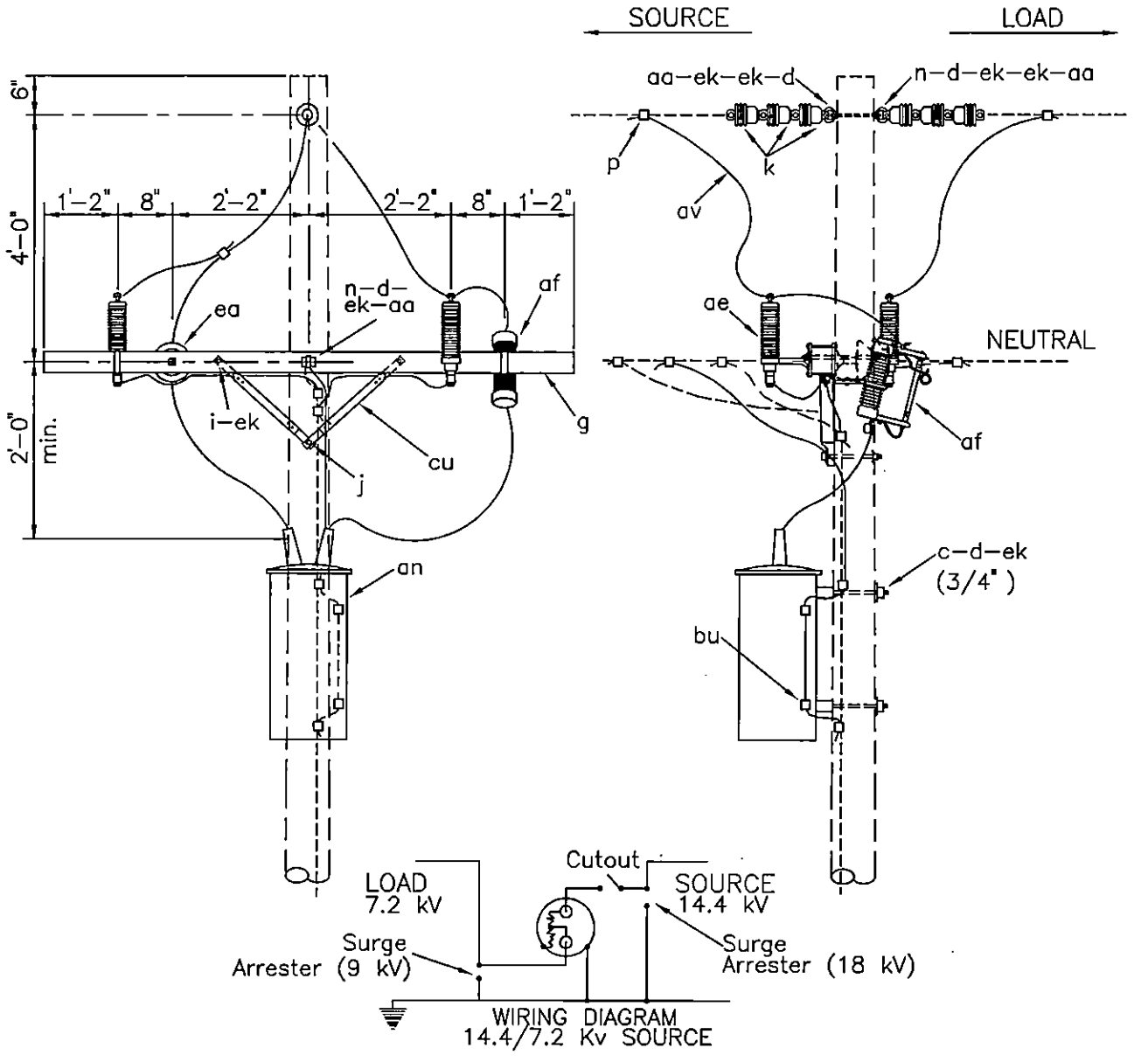
NOTES:
1. All structural timbers and planks to be treated as per RUS specifications.
2. Each regulator must be bolted to platform or pole.
3. Control boxes may be installed on poles below regulators, (Specify additional control cable).
4. 4 x 6.25 /ft. channel steel or 6 x 2.91#/ft. channel aluminum may be substituted for structural timbers.

ITEM	QTY	MATERIAL
c	12	Bolt, machine, 1/2" x req'd length
c	6	Bolt, machine, 5/8" x req'd length
c	6	Bolt, machine, 3/4" x req'd length
d	12	Washer, round, 1 3/8" diam.
d	24	Washer, square, 2 1/4"
j		Screw, lag, 1/2" x 5", as req'd
j	8	Screw, lag, 5/8" x 6"
k	6	Insulator, suspension, 4 1/4"
l	6	Clamp, deadend
o	2	Bolt, eye, 5/8" x req'd length
p		Connectors, compression, as req'd
ae	3	Arrester, surge (9 kV),

ITEM	QTY	MATERIAL
ae	3	Arrester, by-pass (furnished by manufacturer)
av		Jumpers, bare, stranded, as req'd
br	3	Chain link
bu	3	Connector, grounding
ek	26	Locknuts
sc	3	Regulator, voltage, step-type 12.47/7.2 kV
sk	3	Switch, regulator by-pass
	2	Structural timber, 4" x 12" x 12'
		Planks, 2" or 3" thick – length and number as req'd

VOLTAGE REGULATORS, PLATFORM MOUNTED (THREE SINGLE-PHASE)

APRIL 2005 RUS	3 – PHASE PRIMARY 12.47/7.2 kV	Y1.3 (M7-13)



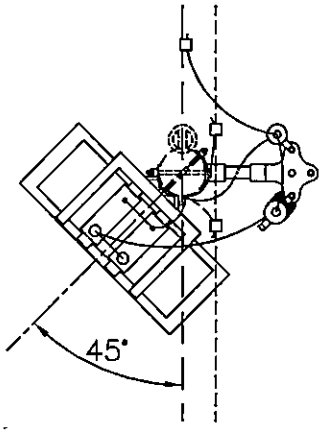
NOTE: For step-up operation, (7.2 kV source; 14.4 kV load), interchange the surge arrester locations, make autotransformer connections as required, and designate assembly as "Y2.2."

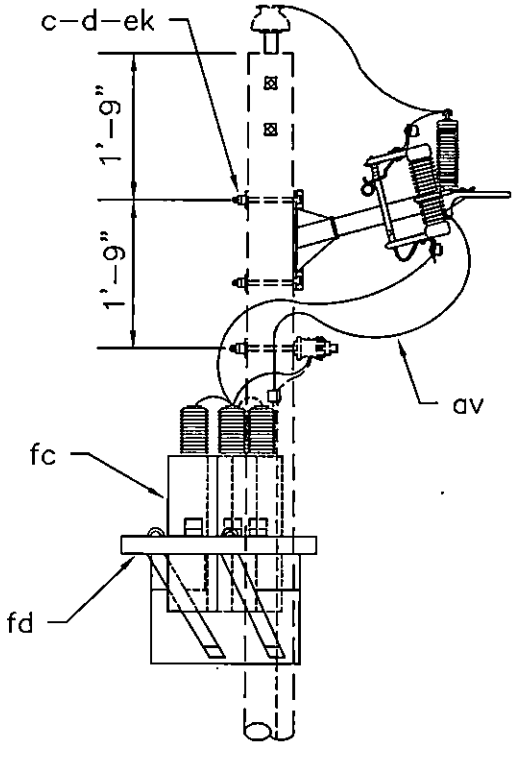
ITEM	QTY	MATERIAL
c	2	Bolt, machine, 3/4" x req'd length
d	1	Washer, square, 2 1/4"
d	5	Washer, square, 3", curved
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
k	6	Insulator, suspension, 4 1/4"
n	2	Bolt, dbl arm, 5/8" x req'd length
p		Connectors, compression, as req'd

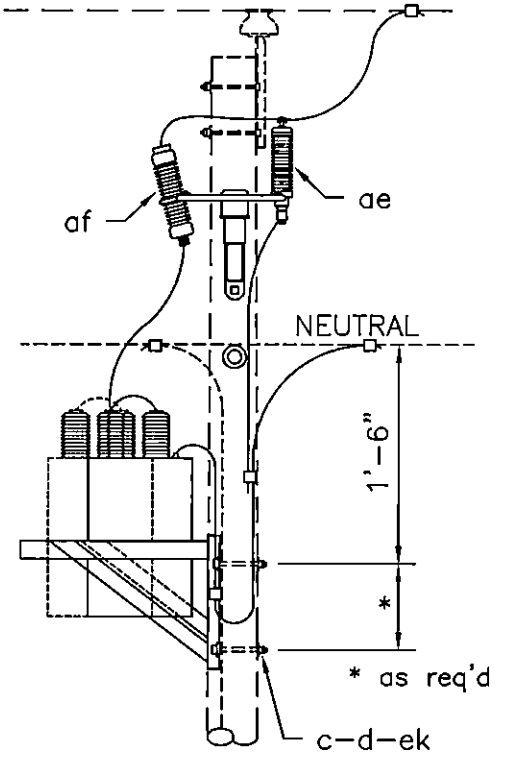
ITEM	QTY	MATERIAL
aa	4	Nut, eye, 5/8"
ae	1	Arrester, surge (9 kV)
ae	1	Arrester, surge (18 kV)
af	1	Cutout, dist. open (27 kV)
an	1	Transformer, auto,14.4 kV 7.2 kV
av		Jumpers, bare, stranded, as req'd
bu	2	Connector, grounding
cu	2	Brace, 28"
ea	1	Insulator, post type, (25 kV)
ek	12	Locknuts

AUTOTRANSFORMER, POLE MOUNTED (ONE SINGLE-PHASE, STEP-DOWN)

APRIL 2005	1 - PHASE PRIMARY	
RUS	(14.4 kV to 7.2 kV)	Y2.1,Y2.2







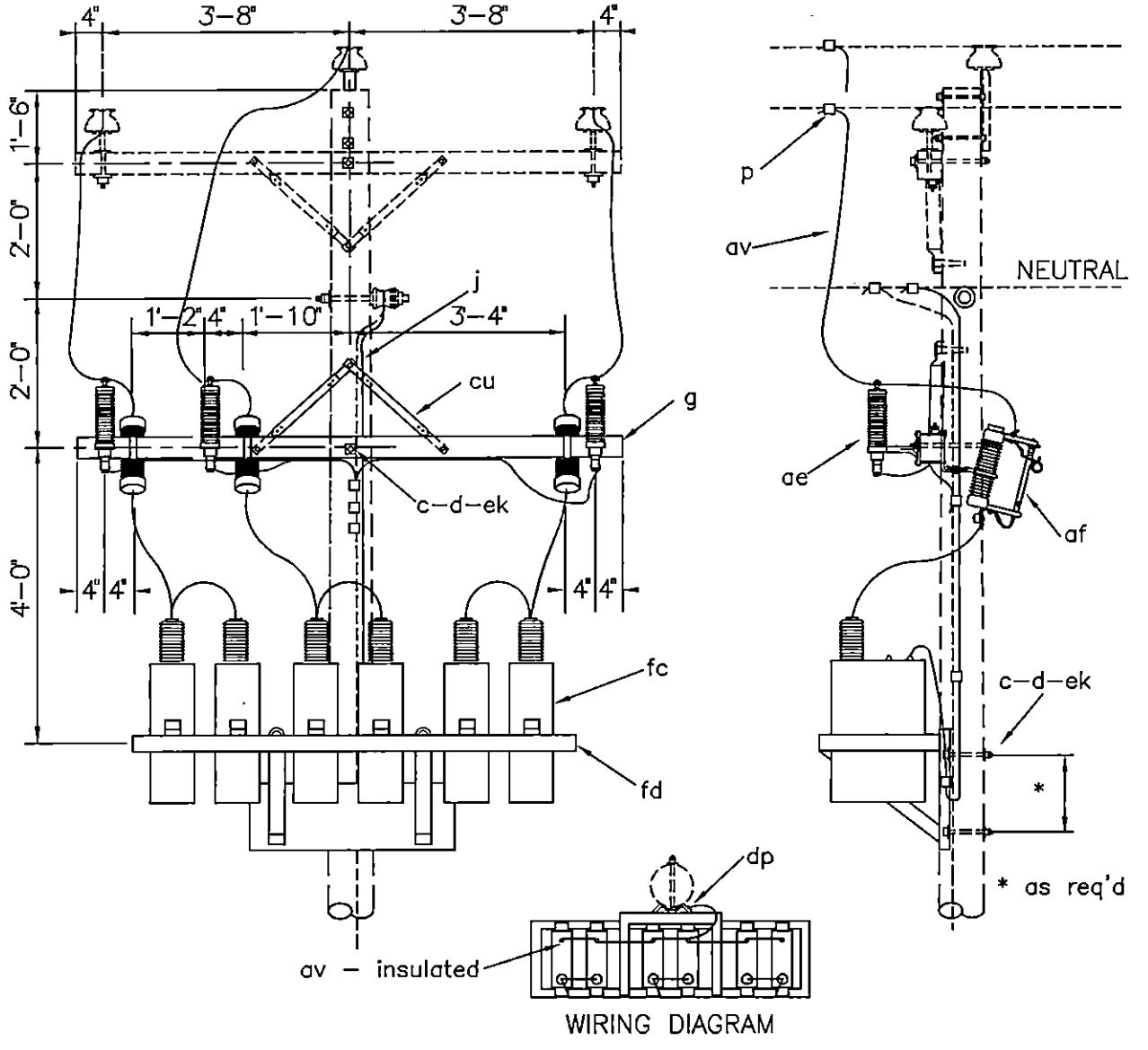
NOTES:
1. Specify number and kVAr required.
2. Load break cutouts for installations over 75 kVAr.
3. Specify insulating caps for primary terminal bushings.

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
p		Connectors, as req'd
ae	1	Arrester, surge (9 kV)
af	1	Cutout, dist., loadbreak, (15 kV)
av		Jumpers, bare, stranded, as req'd
av		Jumpers, insulated, as req'd

ITEM	QTY	MATERIAL
dp	1	Clamp, ground wire
ek	4	Locknuts
eq	1	Bracket, insulator/equipment
fc		Capacitor, shunt, 12.47/7.2 kV
		(specify number and kVAR)
fd	1	Hanger, capacitor

SINGLE PHASE CAPACITOR ASSEMBLY

APRIL 2005 RUS	1 - PHASE PRIMARY 12.47/7.2 kV	Y3.1 (M9–11)



WIRING DIAGRAM

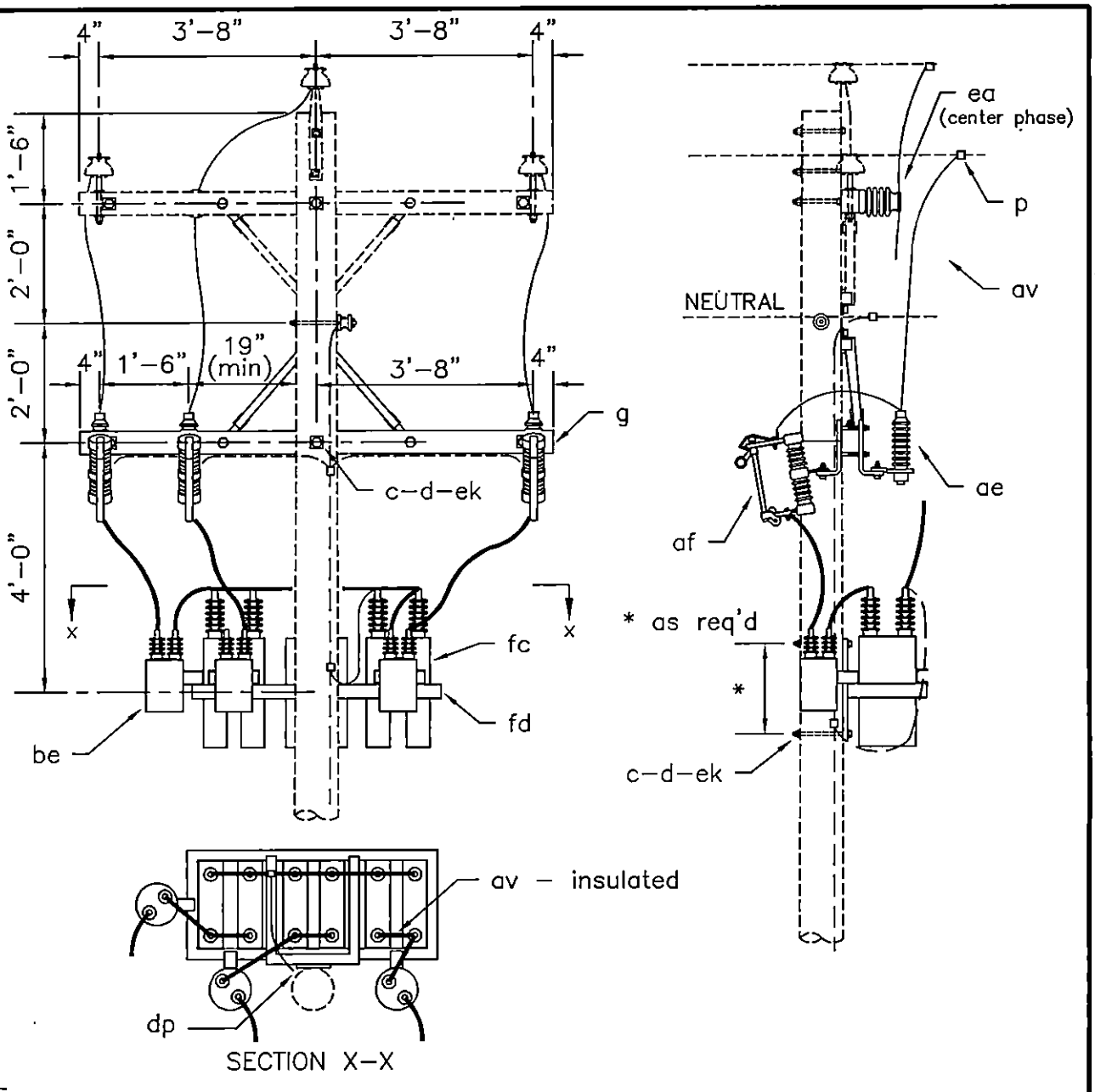
NOTE:
1. Specify insulating caps for primary terminal bushings.
2. For two-phase assemblies, omit capacitors and other material on center phase; designate assembly as "Y3.2."

ITEM	QTY	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 5/8" X 8-0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge (9 kV)
af	3	Cutout, dist., loadbreak, (15 kV)

ITEM	QTY	MATERIAL
av		Jumpers, bare, stranded, as req'd
av		Jumpers, insulated, as req'd
cu	2	Brace, 28"
dp	1	Clamp, ground wire
ek	5	Locknuts
fc		Capacitor, shunt, 12.47/7.2 kV
		(specify number and kVAR)
fd	1	Hanger, capacitor

THREE PHASE CAPACITOR BANK

APRIL 2005	3 - PHASE PRIMARY	Y3.2,Y3.3
RUS	12.47/7.2 kV	(M9-12),(M9-13)



NOTE:

1. Specify insulating caps for primary terminal bushings.

ITEM	QTY	MATERIAL
c	3	Bolt, machine, 5/8" x req'd length
d	3	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"
p		Connectors, as req'd
ae	3	Arrester, surge (9 kV)
af	3	Cutout, dist., loadbreak, (15 kV)
av		Jumpers, bare, stranded, as req'd

ITEM	QTY	MATERIAL
av		Jumpers, insulated, as req'd
be	3	Switch, oil, with controls
cu	2	Brace, 28
dp	1	Clamp, ground wire
ea	1	Insulator, post type (15kv)
ek	5	Locknuts
fc		Capacitor, shunt, 12.47/7.2 kV
		(specify number and kVAR)
fd	1	Hanger, capacitor

THREE–PHASE SWITCHED CAPACITOR BANK

APRIL 2005	3 – PHASE PRIMARY	Y3.4
RUS	12.47/7.2 kV	

Calculation of Maximum Line Angles

The following formula and the data tabulated below were used to calculate the maximum line angles on pin and spool insulator assemblies:

$$Sin(\theta/2) = \frac{P-(Fw\times Sw\times Ww)}{2\times Ft\times T} \qquad \theta = 2\times Arc\sin\left[\frac{P-(Fw\times Sw\times Ww)}{2\times Ft\times T}\right]$$

Where:

θ = Maximum Line Angle (calculated): [Degrees]
P = Designated Maximum Transverse Load (allowed on pin or insulator): [lbs]
Fw = Wind Overload Factor for Transverse Loads
Ft = Wire Tension Overload Factor for Transverse Loads
Sw = Wind Span (equals ½ sum of adjacent spans): [ft]
Ww = Wind Load on Conductor: [lbs/ft] *(See Table Below)*
T = Design Tension of Conductor: [lbs] *(See Table Below)*

From NESC Table 253-1 for Grade C Construction:

Fw = 1.75 for non-crossing spans (Footnote 4 to Table 253-1)
= 2.20 for crossing spans
Ft = 1.30

CONDUCTOR SIZE & TYPE	Strength	Maximum Tension	Design Tension *(T)(lbs)*
4 ACSR (7/1)	2360	60%	1416
2 ACSR (6/1)	2850	60%	1710
2 ACSR (7/1)	3640	60%	2184
1/0 ACSR (6/1)	4380	60%	2628
123.3 AAC (7)	4460	60%	2676
2/0 ACSR (6/1)	5310	50%	2655
3/0 ACSR (6/1)	6620	50%	3310
4/0 ACSR (6/1)	8350	40%	3340
246.9 AAC (7)	8560	40%	3424
336.4 ACSR (18/1)	8680	40%	3472
336.4 ACSR (26/7)	14100	35%	4935

	WIND LOAD *(Ww) (lbs/ft)* by NESC Loading District		
	LIGHT	MEDIUM	HEAVY
4 ACSR (7/1)	0.1928	0.2523	0.4190
2 ACSR (6/1)	0.2370	0.2720	0.4387
2 ACSR (7/1)	0.2438	0.2750	0.4417
1/0 ACSR (6/1)	0.2985	0.2993	0.4660
123.3 AAC (7)	0.2985	0.2993	0.4660
2/0 ACSR (6/1)	0.3353	0.3157	0.4823
3/0 ACSR (6/1)	0.3765	0.3340	0.5007
4/0 ACSR (6/1)	0.4223	0.3543	0.5210
246.9 AAC (7)	0.4223	0.3543	0.5210
336.4 ACSR (18/1)	0.5130	0.3947	0.5613
336.4 ACSR (26/7)	0.5408	0.4070	0.5737

TABLE I

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 500 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			**LIGHT LOADING DISTRICT**			
4 ACSR (7/1)	14	13	13	12	12	11
2 ACSR (6/1)	11	11	10	10	9	9
2 ACSR (7/1)	9	8	8	8	7	7
1/0 ACSR (6/1)	7	7	6	6	5	5
123.3 AAAC (7)	7	7	6	6	5	5
2/0 ACSR (6/1)	7	6	6	5	5	4
3/0 ACSR (6/1)	5	5	4	4	4	3
4/0 ACSR (6/1)	5	5	4	4	3	3
246.9 AAAC (7)	5	5	4	4	3	3
336.4 ACSR (18/1)	5	4	3	3	2	2
336.4 ACSR (26/7)	3	3	2	2	2	1
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	14	13	12	11	11	10
2 ACSR (6/1)	11	10	10	9	9	8
2 ACSR (7/1)	9	8	8	7	7	6
1/0 ACSR (6/1)	7	7	6	6	5	5
123.3 AAAC (7)	7	7	6	6	5	5
2/0 ACSR (6/1)	7	6	6	6	5	5
3/0 ACSR (6/1)	5	5	5	4	4	4
4/0 ACSR (6/1)	5	5	5	4	4	3
246.9 AAAC (7)	5	5	4	4	4	3
336.4 ACSR (18/1)	5	5	4	4	3	3
336.4 ACSR (26/7)	4	3	3	3	2	2
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	12	11	10	9	8	6
2 ACSR (6/1)	10	9	8	7	6	5
2 ACSR (7/1)	8	7	6	5	5	4
1/0 ACSR (6/1)	6	6	5	4	4	3
123.3 AAAC (7)	6	6	5	4	4	3
2/0 ACSR (6/1)	6	6	5	4	3	3
3/0 ACSR (6/1)	5	4	4	3	3	2
4/0 ACSR (6/1)	5	4	4	3	2	2
246.9 AAAC (7)	5	4	4	3	2	2
336.4 ACSR (18/1)	4	4	3	3	2	1
336.4 ACSR (26/7)	3	3	2	2	1	1

TABLE II

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction (Re-calculate for NESC Grade B)

Designated Maximum Transverse Load = 750 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			LIGHT LOADING DISTRICT			
4 ACSR (7/1)	22	21	21	20	20	19
2 ACSR (6/1)	18	17	17	16	16	15
2 ACSR (7/1)	14	13	13	13	12	12
1/0 ACSR (6/1)	11	11	10	10	10	9
123.3 AAAC (7)	11	11	10	10	9	9
2/0 ACSR (6/1)	11	11	10	10	9	9
3/0 ACSR (6/1)	9	8	8	7	7	6
4/0 ACSR (6/1)	8	8	7	7	6	6
246.9 AAAC (7)	8	8	7	7	6	6
336.4 ACSR (18/1)	8	7	7	6	6	5
336.4 ACSR (26/7)	5	5	5	4	4	3
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	21	21	20	19	19	18
2 ACSR (6/1)	18	17	16	16	15	14
2 ACSR (7/1)	14	13	13	12	12	11
1/0 ACSR (6/1)	11	11	10	10	10	9
123.3 AAAC (7)	11	11	10	10	9	9
2/0 ACSR (6/1)	11	11	10	10	9	9
3/0 ACSR (6/1)	9	8	8	8	7	7
4/0 ACSR (6/1)	9	8	8	7	7	7
246.9 AAAC (7)	8	8	8	7	7	6
336.4 ACSR (18/1)	8	8	7	7	6	6
336.4 ACSR (26/7)	6	5	5	5	4	4
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	20	19	18	17	15	14
2 ACSR (6/1)	16	15	14	13	12	11
2 ACSR (7/1)	13	12	11	10	10	9
1/0 ACSR (6/1)	11	10	9	8	8	7
123.3 AAAC (7)	10	10	9	8	8	7
2/0 ACSR (6/1)	10	10	9	8	8	7
3/0 ACSR (6/1)	8	8	7	6	6	5
4/0 ACSR (6/1)	8	7	7	6	6	5
246.9 AAAC (7)	8	7	7	6	6	5
336.4 ACSR (18/1)	8	7	6	6	5	5
336.4 ACSR (26/7)	5	5	4	4	4	3

TABLE III

MAXIMUM LINE ANGLES (Degrees)

PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 1,000 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			LIGHT LOADING DISTRICT			
4 ACSR (7/1)	30	29	29	28	28	27
2 ACSR (6/1)	24	24	23	23	22	22
2 ACSR (7/1)	19	19	18	18	17	17
1/0 ACSR (6/1)	16	15	15	14	14	13
123.3 AAAC (7)	15	15	14	14	13	13
2/0 ACSR (6/1)	15	15	14	14	13	13
3/0 ACSR (6/1)	12	12	11	11	10	10
4/0 ACSR (6/1)	12	11	11	10	10	9
246.9 AAAC (7)	11	11	11	10	10	9
336.4 ACSR (18/1)	11	10	10	9	9	8
336.4 ACSR (26/7)	8	7	7	6	6	6
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	29	29	28	27	27	26
2 ACSR (6/1)	24	23	23	22	22	21
2 ACSR (7/1)	19	18	18	17	17	16
1/0 ACSR (6/1)	16	15	15	14	14	13
123.3 AAAC (7)	15	15	14	14	13	13
2/0 ACSR (6/1)	15	15	14	14	13	13
3/0 ACSR (6/1)	12	12	11	11	11	10
4/0 ACSR (6/1)	12	12	11	11	10	10
246.9 AAAC (7)	12	11	11	10	10	10
336.4 ACSR (18/1)	11	11	11	10	10	9
336.4 ACSR (26/7)	8	8	7	7	7	6
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	28	27	26	24	23	22
2 ACSR (6/1)	23	22	21	20	19	18
2 ACSR (7/1)	18	17	16	16	15	14
1/0 ACSR (6/1)	15	14	13	13	12	11
123.3 AAAC (7)	14	14	13	12	12	11
2/0 ACSR (6/1)	15	14	13	12	12	11
3/0 ACSR (6/1)	12	11	10	10	9	9
4/0 ACSR (6/1)	11	11	10	10	9	8
246.9 AAAC (7)	11	11	10	9	9	8
336.4 ACSR (18/1)	11	10	10	9	8	8
336.4 ACSR (26/7)	8	7	7	6	6	5

TABLE IV

MAXIMUM LINE ANGLES (Degrees)

PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 1,500 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			LIGHT LOADING DISTRICT			
4 ACSR (7/1)	46	46	45	45	44	44
2 ACSR (6/1)	38	37	37	36	35	35
2 ACSR (7/1)	29	29	28	28	28	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	17	17	17
4/0 ACSR (6/1)	18	18	17	17	16	16
246.9 AAAC (7)	18	17	17	17	16	16
336.4 ACSR (18/1)	17	17	16	16	15	15
336.4 ACSR (26/7)	12	12	11	11	10	10
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	46	45	44	44	43	42
2 ACSR (6/1)	37	37	36	36	35	34
2 ACSR (7/1)	29	29	28	28	27	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	18	17	17
4/0 ACSR (6/1)	19	18	18	17	17	17
246.9 AAAC (7)	18	18	17	17	17	16
336.4 ACSR (18/1)	18	17	17	16	16	16
336.4 ACSR (26/7)	12	12	12	12	11	11
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	44	43	42	41	39	38
2 ACSR (6/1)	36	35	34	33	32	31
2 ACSR (7/1)	28	27	27	26	25	24
1/0 ACSR (6/1)	23	23	22	21	20	20
123.3 AAAC (7)	23	22	21	21	20	19
2/0 ACSR (6/1)	23	22	22	21	20	19
3/0 ACSR (6/1)	18	18	17	17	16	15
4/0 ACSR (6/1)	18	17	17	16	16	15
246.9 AAAC (7)	18	17	16	16	15	15
336.4 ACSR (18/1)	17	17	16	15	15	14
336.4 ACSR (26/7)	12	12	11	11	10	10

TABLE V

MAXIMUM LINE ANGLES (Degrees)

PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 2,000 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			LIGHT LOADING DISTRICT			
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	52	51	50	50	49	49
2 ACSR (7/1)	40	39	39	38	38	38
1/0 ACSR (6/1)	33	32	32	31	31	30
123.3 AAAC (7)	32	32	31	31	30	30
2/0 ACSR (6/1)	32	32	31	31	30	30
3/0 ACSR (6/1)	26	25	25	24	24	23
4/0 ACSR (6/1)	25	25	24	24	23	23
246.9 AAAC (7)	25	24	24	23	23	22
336.4 ACSR (18/1)	24	23	23	22	22	21
336.4 ACSR (26/7)	17	16	16	15	15	15
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	60	60	60	60	60	59
2 ACSR (6/1)	51	51	50	49	49	48
2 ACSR (7/1)	40	39	39	38	38	37
1/0 ACSR (6/1)	33	32	32	31	31	30
123.3 AAAC (7)	32	32	31	31	30	30
2/0 ACSR (6/1)	32	32	31	31	30	30
3/0 ACSR (6/1)	26	25	25	24	24	24
4/0 ACSR (6/1)	25	25	25	24	24	23
246.9 AAAC (7)	25	24	24	24	23	23
336.4 ACSR (18/1)	24	24	23	23	22	22
336.4 ACSR (26/7)	17	17	16	16	16	15
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	60	60	59	58	57	55
2 ACSR (6/1)	50	49	48	47	46	45
2 ACSR (7/1)	39	38	37	36	35	35
1/0 ACSR (6/1)	32	31	30	30	29	28
123.3 AAAC (7)	31	31	30	29	29	28
2/0 ACSR (6/1)	31	31	30	29	29	28
3/0 ACSR (6/1)	25	24	24	23	23	22
4/0 ACSR (6/1)	25	24	24	23	22	22
246.9 AAAC (7)	24	24	23	22	22	21
336.4 ACSR (18/1)	24	23	22	22	21	21
336.4 ACSR (26/7)	17	16	16	15	15	14

TABLE VI

MAXIMUM LINE ANGLES (Degrees) ON SPOOL INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

(ANSI Clss 53-2 Spool Insulator)

Designated Maximum Transverse Load = 1,500 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			LIGHT LOADING DISTRICT			
4 ACSR (7/1)	46	46	45	45	44	44
2 ACSR (6/1)	38	37	37	36	35	35
2 ACSR (7/1)	29	29	28	28	28	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	17	17	17
4/0 ACSR (6/1)	18	18	17	17	16	16
246.9 AAAC (7)	18	17	17	17	16	16
336.4 ACSR (18/1)	17	17	16	16	15	15
336.4 ACSR (26/7)	12	12	11	11	10	10
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	46	45	44	44	43	42
2 ACSR (6/1)	37	37	36	36	35	34
2 ACSR (7/1)	29	29	28	28	27	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	18	17	17
4/0 ACSR (6/1)	19	18	18	17	17	17
246.9 AAAC (7)	18	18	17	17	17	16
336.4 ACSR (18/1)	18	17	17	16	16	16
336.4 ACSR (26/7)	12	12	12	12	11	11
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	44	43	42	41	39	38
2 ACSR (6/1)	36	35	34	33	32	31
2 ACSR (7/1)	28	27	27	26	25	24
1/0 ACSR (6/1)	23	23	22	21	20	20
123.3 AAAC (7)	23	22	21	21	20	19
2/0 ACSR (6/1)	23	22	22	21	20	19
3/0 ACSR (6/1)	18	18	17	17	16	15
4/0 ACSR (6/1)	18	17	17	16	16	15
246.9 AAAC (7)	18	17	16	16	15	15
336.4 ACSR (18/1)	17	17	16	15	15	14
336.4 ACSR (26/7)	12	12	11	11	10	10

TABLE VII

MAXIMUM LINE ANGLES (Degrees) ON SPOOL INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

(ANSI Clss 53-4 Spool Insulator)

Designated Maximum Transverse Load = 2,250 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE			LIGHT LOADING DISTRICT			
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	59	58	58	57	57	56
2 ACSR (7/1)	45	45	44	44	43	43
1/0 ACSR (6/1)	37	37	36	36	35	35
123.3 AAAC (7)	36	36	35	35	35	34
2/0 ACSR (6/1)	37	36	35	35	34	34
3/0 ACSR (6/1)	29	28	28	28	27	27
4/0 ACSR (6/1)	29	28	28	27	27	26
246.9 AAAC (7)	28	27	27	26	26	25
336.4 ACSR (18/1)	27	27	26	25	25	24
336.4 ACSR (26/7)	19	18	18	18	17	17
			MEDIUM LOADING DISTRICT			
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	59	58	57	57	56	55
2 ACSR (7/1)	45	45	44	44	43	42
1/0 ACSR (6/1)	37	37	36	36	35	35
123.3 AAAC (7)	36	36	35	35	35	34
2/0 ACSR (6/1)	37	36	36	35	35	34
3/0 ACSR (6/1)	29	29	28	28	27	27
4/0 ACSR (6/1)	29	28	28	27	27	27
246.9 AAAC (7)	28	28	27	27	26	26
336.4 ACSR (18/1)	28	27	27	26	26	25
336.4 ACSR (26/7)	19	19	19	18	18	18
			HEAVY LOADING DISTRICT			
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	57	56	55	54	53	52
2 ACSR (7/1)	44	43	42	42	41	40
1/0 ACSR (6/1)	36	36	35	34	33	33
123.3 AAAC (7)	36	35	34	34	33	32
2/0 ACSR (6/1)	36	35	34	34	33	32
3/0 ACSR (6/1)	29	28	27	27	26	26
4/0 ACSR (6/1)	28	28	27	26	26	25
246.9 AAAC (7)	27	27	26	26	25	24
336.4 ACSR (18/1)	27	26	26	25	24	24
336.4 ACSR (26/7)	19	18	18	17	17	17

LONGITUDINAL LOADING ON CROSSARM ASSEMBLIES

Applied vertical loads need to be considered when determining the permitted longitudinal loading of crossarm deadend assemblies. The following mathematical relationship, which relate vertical and longitudinal loading, has to be satisfied to avoid overstressing the wood fibers of crossarms:

$$\frac{\sum Applied\ Vertical\ Moments}{Permitted\ Vertical\ Moment\ (Capacity)} + \frac{\sum Applied\ Longitudinal\ Moments}{Permitted\ Longitudinal\ Moment\ (Capacity)} \leq 1$$

The following applies to RUS standard distribution, deadend, crossarm assemblies:

- *Permitted Vertical Moment (Capacity) of Assembly* = $N \times M_v \times F_s$
- *Permitted Longitudinal Moment (Capacity) of Assembly* = $N \times M_h \times F_s$
- $\sum$ *Applied Vertical Moments* =

$$D_1 \times \left[\left(S_{in} \times W_1\right) + \left(S_{out} \times W_2\right)\right] \times F_{OLV} + D_2 \times \left[\left(S_{in} \times W_3\right) + \left(S_{out} \times W_4\right)\right] \times F_{OLV} + M_{LW}$$

- $\sum$ *Applied Longitudinal Moments* =

$$\left[D_1 \times \left(L_{1\text{-}in} - L_{1\text{-}out}\right) + D_2 \times \left(L_{2\text{-}in} - L_{2\text{-}out}\right)\right] \times F_{OLL}$$

The units of measure of the above four groups of terms are "ft-lbs." Note that all of the calculations apply to one-half of the crossarm assembly (on either the right or left side of the pole looking parallel to the line). Each conductor attachment location, at a distance D_1 or D_2 from the center of the assembly, has either one conductor attached ("into" the assembly) or has two back-to-back conductors attached (one "into" and one "out from" the assembly).

Following are the definitions and values of the variables in the above equations:

M_v	=	7,650	Vertical crossarm moment (capacity) (ft-lbs)
M_h	=	5,060	Longitudinal crossarm moment (capacity) (ft-lbs)
M_{LW}	=	1,000	Load moment attributed to weight of lineworker (ft-lbs)
F_s	=	0.85	Strength Factor (2002 NESC Table 261-1A) - Grade C
	=	0.65	" " " " " " - Grade B
F_{OLV}	=	1.90	Overload factor - Vertical (2002 NESC Table 253-1) - Grade C
	=	1.50	" " " " " " " - Grade B
F_{OLL}	=	1.30	Overload factor - Longitudinal (2002 NESC Table 253-1) - Grade C
	=	1.65	" " " " " " " - Grade B
D_1	=	1.75	Distance to nearest conductors on 10-foot crossarm assemblies (ft)
D_2	=	4.50	Distance to farthest conductors on 10-foot crossarm assemblies (ft)
D_1	=	3.50	Distance to conductor(s) on 8-foot crossarm assemblies (ft)
W_i	=		Vertical unit weight of conductor plus NESC ice and wind loads (lbs/ft)
S_{in}	=		One-half of the total span length "into" the assembly (ft)

S_{out}	=	One-half of the total span length "out from" the assembly (ft)
N	=	Number of crossarms
L_{in}	=	Tension of each conductor "into" the assembly (lbs)
L_{out}	=	Tension of each conductor "out from" the assembly (lbs)

For purposes of simplifying mechanical loading calculations, the following assumptions and approximations are made:

- All of the conductor spans "into" a crossarm assembly have the same length; all of the conductor spans "out from" a crossarm assembly have the same length. The length "*S*," where $S = S_{in} + S_{out}$, is called a "*weight span.*"

- The tensions of all of the conductors into the crossarm assembly (L_{in}) are the same; the tensions of all of the conductors out from the crossarm assembly (L_{out}) are the same. "*L*" is the difference of the conductor tensions ($L = L_{in} - L_{out}$) at each (phase) conductor attachment location on the assembly.

- All of the conductors attached to the crossarm assembly are the same type and size as the largest conductor. Thus in the above equation: $W_1 = W_2 = W_3 = W_4 = W$.

- A load moment (M_{LW}) of 250 pounds (which might be attributed to a lineworker, materials or equipment) times 2 feet and times a constant overload factor of 2.0 (the product equals 1,000 ft-lbs) is added to the applied vertical load moments to satisfy NESC Rule 261D4b requirements. (***Note: Standard construction practices and RUS discourage lineworkers from standing on crossarms.***)

After applying the above assumptions and substitutions, the equation can be simplified and re-written as:

$$\frac{(D_1 + D_2) \times (W \times S) \times F_{OLV} + 1{,}000}{N \times M_v \times F_s} + \frac{(D_1 + D_2) \times L \times F_{OLL}}{N \times M_h \times F_s} \leq 1 \quad \text{(ft-lbs)}$$

This equation can be solved for "*L*" as a function of all of the other variables in the equation. Tables A and B show the calculated *permitted unbalanced conductor tensions* ("*L*") for several commonly used distribution conductors versus three different weight spans ("S"), for standard RUS crossarm deadend assemblies and NESC Grade C construction.

TABLE A

PERMITTED UNBALANCED CONDUCTOR TENSION (Lbs / Phase)*

SINGLE and DOUBLE DEADEND ASSEMBLIES; 1 PHASE EACH SIDE OF POLE- NESC Grade C

CONDUCTOR SIZE	Vertical Loading (lbs/ft)	2 CROSSARMS WEIGHT SPANS** (feet) 200	300	400	3 CROSSARMS WEIGHT SPANS** (feet) 200	300	400
NESC LIGHT LOADING DISTRICT (0.00" Ice; 9 lb Wind)							
4 ACSR (7/1)	0.0670	1,730	1,720	1,710	2,670	2,670	2,660
2 ACSR (6/1)	0.0913	1,720	1,710	1,700	2,670	2,660	2,650
123.3 AAAC (7)	0.1157	1,720	1,710	1,700	2,660	2,650	2,640
1/0 ACSR (6/1)	0.1452	1,710	1,700	1,680	2,660	2,640	2,630
2/0 ACSR (6/1)	0.1831	1,700	1,690	1,670	2,650	2,630	2,610
3/0 ACSR (6/1)	0.2309	1,700	1,670	1,650	2,640	2,620	2,600
246.9 AAAC (7)	0.2318	1,700	1,670	1,650	2,640	2,620	2,600
4/0 ACSR (6/1)	0.2911	1,680	1,660	1,630	2,630	2,600	2,570
312.8 AAAC (19)	0.2936	1,680	1,650	1,630	2,630	2,600	2,570
336.4 ACSR (18/1)	0.3653	1,670	1,630	1,600	2,610	2,580	2,540
NESC MEDIUM LOADING DISTRICT (0.25" Ice; 4 lb Wind)							
4 ACSR (7/1)	0.2247	1,700	1,670	1,650	2,640	2,620	2,600
2 ACSR (6/1)	0.2673	1,690	1,660	1,640	2,630	2,610	2,580
123.3 AAAC (7)	0.3172	1,680	1,650	1,620	2,620	2,590	2,560
1/0 ACSR (6/1)	0.3467	1,670	1,640	1,610	2,620	2,580	2,550
2/0 ACSR (6/1)	0.3998	1,660	1,620	1,590	2,610	2,570	2,530
3/0 ACSR (6/1)	0.4647	1,650	1,610	1,560	2,600	2,550	2,510
246.9 AAAC (7)	0.4846	1,650	1,600	1,550	2,590	2,540	2,500
4/0 ACSR (6/1)	0.5439	1,630	1,580	1,530	2,580	2,530	2,470
312.8 AAAC (19)	0.5709	1,630	1,570	1,520	2,570	2,520	2,460
336.4 ACSR (18/1)	0.6557	1,610	1,550	1,490	2,560	2,490	2,430
NESC HEAVY LOADING DISTRICT (0.50" Ice; 4 lb Wind)							
4 ACSR (7/1)	0.5379	1,640	1,580	1,530	2,580	2,530	2,480
2 ACSR (6/1)	0.5989	1,620	1,570	1,510	2,570	2,510	2,450
123.3 AAAC (7)	0.6741	1,610	1,540	1,480	2,550	2,490	2,420
1/0 ACSR (6/1)	0.7036	1,600	1,540	1,470	2,550	2,480	2,410
2/0 ACSR (6/1)	0.7719	1,590	1,520	1,440	2,540	2,460	2,390
3/0 ACSR (6/1)	0.8539	1,570	1,490	1,410	2,520	2,440	2,350
246.9 AAAC (7)	0.8927	1,570	1,480	1,390	2,510	2,430	2,340
4/0 ACSR (6/1)	0.9520	1,560	1,460	1,370	2,500	2,410	2,320
312.8 AAAC (19)	1.0037	1,550	1,450	1,350	2,490	2,390	2,300
336.4 ACSR (18/1)	1.1015	1,530	1,420	1,310	2,470	2,370	2,260

NOTES: ***Reduce tabulated tensions by 40% for NESC Grade B construction.***

**(Lbs/Phase) means tension difference at each point on crossarms where conductors are attached.*

*** **Weight span** equals 1/2 span length into assembly plus 1/2 span length out from assembly.*

*Weight Span for **single deadend assembies** only equals 1/2 span length into assembly.*

Last 3 notes at end of TABLE B also apply to TABLE A.

TABLE B

PERMITTED UNBALANCED CONDUCTOR TENSION (Lbs / Phase)*

DOUBLE DEADEND ASSEMBLIES - 2 PHASES EACH SIDE OF POLE - NESC Grade C

CONDUCTOR SIZE	Vertical Loading (lbs/ft)	2 CROSSARMS WEIGHT SPANS** (feet) 200	300	400	3 CROSSARMS WEIGHT SPANS** (feet) 200	300	400
NESC LIGHT LOADING DISTRICT (0.00" Ice; 9 lb Wind)							
4 ACSR (7/1)	0.0670	960	950	950	1,490	1,480	1,480
2 ACSR (6/1)	0.0913	950	950	940	1,480	1,480	1,470
123.3 AAAC (7)	0.1157	950	940	930	1,480	1,470	1,460
1/0 ACSR (6/1)	0.1452	940	930	920	1,470	1,460	1,450
2/0 ACSR (6/1)	0.1831	940	920	900	1,470	1,450	1,430
3/0 ACSR (6/1)	0.2309	930	910	880	1,460	1,440	1,410
246.9 AAAC (7)	0.2318	930	900	880	1,460	1,430	1,410
4/0 ACSR (6/1)	0.2911	920	890	860	1,450	1,420	1,390
312.8 AAAC (19)	0.2936	920	890	860	1,450	1,420	1,390
336.4 ACSR (18/1)	0.3653	900	870	830	1,430	1,400	1,360
NESC MEDIUM LOADING DISTRICT (0.25" Ice; 4 lb Wind)							
4 ACSR (7/1)	0.2247	930	910	890	1,460	1,440	1,420
2 ACSR (6/1)	0.2673	920	890	870	1,450	1,420	1,400
123.3 AAAC (7)	0.3172	910	880	850	1,440	1,410	1,380
1/0 ACSR (6/1)	0.3467	900	870	840	1,430	1,400	1,370
2/0 ACSR (6/1)	0.3998	890	860	820	1,420	1,390	1,350
3/0 ACSR (6/1)	0.4647	880	840	790	1,410	1,370	1,320
246.9 AAAC (7)	0.4846	880	830	780	1,410	1,360	1,310
4/0 ACSR (6/1)	0.5439	870	810	760	1,400	1,340	1,290
312.8 AAAC (19)	0.5709	860	810	750	1,390	1,340	1,280
336.4 ACSR (18/1)	0.6557	850	780	720	1,380	1,310	1,250
NESC HEAVY LOADING DISTRICT (0.50" Ice; 4 lb Wind)							
4 ACSR (7/1)	0.5379	870	820	760	1,400	1,350	1,290
2 ACSR (6/1)	0.5989	860	800	740	1,390	1,330	1,270
123.3 AAAC (7)	0.6741	840	780	710	1,370	1,310	1,240
1/0 ACSR (6/1)	0.7036	840	770	700	1,370	1,300	1,230
2/0 ACSR (6/1)	0.7719	820	750	670	1,350	1,280	1,200
3/0 ACSR (6/1)	0.8539	810	720	640	1,340	1,250	1,170
246.9 AAAC (7)	0.8927	800	710	630	1,330	1,240	1,160
4/0 ACSR (6/1)	0.9520	790	700	600	1,320	1,230	1,130
312.8 AAAC (19)	1.0037	780	680	580	1,310	1,210	1,110
336.4 ACSR (18/1)	1.1015	760	650	550	1,290	1,180	1,080

NOTES: ***Reduce tabulated tensions by 40% for NESC Grade B construction.***

**(Lbs/Phase) means tension difference at each point on crossarms where conductors are attached.*

*** **Weight span** equals 1/2 span length into assembly plus 1/2 span length out from assembly.*

Calculations assume all conductors same size and type as largest conductor and level spans.

Assemblies have been multiplied by strength factor of 0.85 (2002 NESC Table 261-1A).

Applied loads have been multiplied by overload factors (2002 NESC Table 253-1).

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
A1	A1.1	No material changes
A1A	A1.2	No material changes
A1-1	A2.1	No material changes
A1-1A	A2.2	No material changes
A1P	A1.1P	No material changes
A1AP	A1.2P	No material changes
A1-1AP	A2.2P	No material changes
A1-1P	A2.1P	No material changes
A2	A2.3	No material changes
A2P	A2.3P	No material changes
A3	A3.1	Replace 2 washers abutting pole
A4	A4.1	Replace 4 washers abutting pole
A5	A5.1	Replace 2 washers abutting pole
A5-1		Discontinued *(Material same as A5.1; Replaced with A5.2G)*
A5-2	A5.2	Replace 2 washers abutting pole
A5-2A		Discontinued *(Same as A5.2 and note)*
A5-3		Discontinued *(Same as A5.1 and note)*
A5-4		Discontinued *(Combination of A5.1, A1.1 and A5.2G)*
A6	A6.1	Replace 4 washers abutting pole
A7	A5.21	No material changes
A7-1	A5.31	No material changes
A8	A6.21	No material changes
A9	A2.21	Add 4 washers under crossarm pins
A9P	A2.21P	Add 2 washers under crossarm pins
A9-1	A1.11	Add 2 washers under crossarm pins
A9-1P	A1.11P	Add 1 washer under crossarm pin
A22		Discontinued *(Combination of A1.11, A1.11 and A1.12G)*
A22P		Discontinued *(Combination of A1.11P, A1.1 and A1.12G)*
B1	B1.11	Add 2 washers under crossarm pins
B1A	B1.12	Add 2 washers under crossarm pins
B1P	B1.11P	No material changes
B1AP	B1.12P	No material changes
B1-1	B2.24	Add 4 washers under crossarm pins
B1-1A	B2.25	Add 4 washers under crossarm pins
B1-1P	B2.24P	No material changes
B1-1AP	B2.25P	No material changes
B2	B2.21	Add 4 washers under crossarm pins
B2P	B2.21P	No material changes
B3	B3.1	Replace 2 washers abutting pole and slight material changes

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
B3A		Discontinued *(Similar to B3.1)*
B4-1		Discontinued *(Replaced with guide B4.1G)*
B4-1A		Discontinued *(Replaced with guide B4.1G)*
B5-1	B5.1	Replace 3 washers abutting pole and slight material changes
B5-1A		Discontinued *(Similar to B5.1)*
B7	B5.21	Neutral position and material slightly different
B7-1	B5.31	Neutral position and material slightly different
B8	B6.21	Neutral and material slightly different
B9	B2.22	Add 6 washers under crossarm pins
B9-1	B1.14	Add 3 washers under crossarm pins
B9-2		Discontinued *(Same as B2.22 except for 10-foot crossarms)*
B9-3		Discontinued *(Same as B1.14 except for 10-foot crossarms)*
B9P	B2.22P	Add 2 washers under crossarm pins
B9-1P	B1.14P	Add 1 washer under crossarm pin
B9-2P		Discontinued *(Same as B2.22P except for 10-foot crossarms)*
B9-3P		Discontinued *(Same as B1.14P except for 10 foot crossarms)*
B22		Discontinued *(Same as two B1.11s)*
B22P		Discontinued *(Same as two B1.11Ps)*
C1	C1.11	Add 2 washers under crossarm pins
C1A	C1.12	Add 2 washers under crossarm pins
C1P	C1.11P	No material changes
C1AP	C1.12P	No material changes
C1PL		Discontinued *(Same as C1.11P except crossarm braces)*
C1-1	C2.24	Add 4 washers under crossarm pins
C1-1A	C2.25	Add 4 washers under crossarm pins
C1-1AP	C2.24P	No material changes
C1-1P	C2.25P	No material changes
C1-3P	C2.21P	No material changes
C1-4PL		Discontinued *(Second center insulator not needed)*
C1-2	C1.11L	No material changes
C1-3	C2.21L	No material changes
C1-4	C1.13L	No material changes
C2	C2.21	Add 4 washers under crossarm pins
C2-1	C2.52	Add 6 washers under crossarm pins
C2-2	C2.52L	No material changes
C2-2PL	C2.52P	2 fewer double arming bolts – optional
C3	C3.1	Replace 4 washers abutting pole; add neutral eyebolt
C3-1	C3.1L	Replace 8 washers abutting pole
C4-1		Discontinued *(Replaced with guide C4.1G)*

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
C5-1	C5.2	Replace 4 washers abutting pole
C7	C5.21	Replace 1 washer abutting pole
C7-1	C5.31	Replace 1 washer abutting pole
C7A	C5.71L	Replace 1 washer abutting pole
C7-2	C5.22	Slight material changes
C8	C6.21	Different neutral and crossarm brace materials
C8-1		Discontinued *(Replaced with C6.51)*
C8-2		Discontinued *(Similar to C5.21)*
C8-3	C6.31L	Different neutral position and materials
C9	C2.51	Add 8 washers under crossarm pins and anti-split bolt
C9-1	C1.41	Add 4 washers under crossarm pins
C9-2	C2.51L	Replace 2 crossarm pins with clamp-type
C9-3	C1.41L	Replace 1 crossarm pin with clamp-type
C9-1P	C1.41P	Add 1 washer under crossarm pin
C9-2PL	C2.51P	Add 2 washers under crossarm pins; 2 fewer double arming bolts – optional
C9-3PL		Discontinued *(Nearly same as C9-1P)*
C22		Discontinued *(Combination of C1.11, A1.11 and C6.91G)*
C24		Discontinued *(Replaced with C6.91G)*
DC-C1	D1.81	Add 6 washers under crossarm pins
DC-C1A		Discontinued
DC-C1-1A		Discontinued
DC-C1PL		Discontinued *(Replaced with D1.81P)*
DC-C1-3PL		Discontinued *(Replaced with D2.91P)*
DC-C2		Discontinued *(Wrong neutral for line angle)*
DC-C2-1	D2.91	Add 12 washers under crossarm pins
DC-C3		Discontinued *(Replaced by two C3's and D3.1G)*
DC-C4-1		Discontinued *(Replaced by four C3's and D4.1G)*
DC-C8	D6.91	Slightly different neutral and other material.
DC-C25		Discontinued *(Replace with guide drawing D5.91G)*
E1-1		Discontinued *(See E1.1)*
E1-2	E1.1	Add Guy Marker
E1-3	E1.1L	Add Guy Marker
E2-1		Discontinued
E2-2	E1.4	Different guy strand wire *(Different permitted loads)*
E2-3	E1.4L	Replace 5/8" thimble eye bolt and nut with 3/4"
E3-2		Discontinued
E3-3	E1.2	Add Guy Marker *(Different permitted loads)*
E3-10		Discontinued

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
E4-2		Discontinued *(See note 3 on E1.4)*
E4-3		Discontinued *(See note 3 on E1.4)*
E5-1		Discontinued
E5-2		Discontinued
E6-2		Discontinued *(See E2.1G)*
E6-3		Discontinued *(See E2.1G)*
E7-2		Discontinued *(See E3.1LG)*
E7-3		Discontinued *(See E3.1LG)*
E8-2		Discontinued *(See E4.3LG)*
E8-3		Discontinued *(See E4.3LG)*
E11		Discontinued *(See E1.2)*
E12		Discontinued *(See E1.2)*
F1-1	F1.6	No material changes
F1-2	F1.8	No material changes
F1-3	F1.10	No material changes
F1-4	F1.12	No material changes
F1-1C		Discontinued *(Not in List of Materials)*
F1-2C		Discontinued *(Not in List of Materials)*
F1-3C		Discontinued *(Not in List of Materials)*
F1-1P	F3.6	No material changes
F1-2P	F3.8	No material changes
F1-3P	F3.10	No material changes
F1-4P	F3.12	No material changes
F1-1S	F2.6	No material changes
F1-2S	F2.8	No material changes
F1-3S	F2.10	No material changes
F1-4S	F2.12	No material changes
F2-1		Discontinued
F2-2		Discontinued
F2-3		Discontinued
F2-4		Discontinued
F4-1E	F4.1	No material changes
F4-1S	F4.2	No material changes
F5-1	F5.1	No material changes
F5-2	F5.2	No material changes
F5-3	F5.3	No material changes
F6-1	F6.6	No material changes
F6-2	F6.8	No material changes
F6-3	F6.10	No material changes

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
G9-	G1.7	No material changes
G65-		Discontinued
G105-	G1.2	No material changes
G10-	G1.8	No material changes
G66-		Discontinued
G106-	G1.3	No material changes
G39-		Discontinued - *Same as G9-*
G67-		Discontinued
G136-		Discontinued - *Same as G105-*
G210-	G2.1	No material changes *(Drawing modified)*
G310-	G3.1	No material changes *(Drawing modified)*
G311-	G3.2	No material changes *(Drawing modified)*
G312-	G3.3	No material changes *(Drawing modified)*
J5	J1.2	No material changes
J6	J3.1	No material changes
J7	J2.2	No material changes
J7C		Discontinued - *Same as J7*
J8	J1.1	No material changes
J10	J2.1	No material changes
J11		Discontinued - *Same as J6*
J12	J4.1	No material changes
K10	K2.1	No material changes
K11	K1.4	No material changes
K14	K1.3	No material changes
K10C	K2.2	No material changes
(K10C)	K2.3	No material changes
K10L		Discontinued - *Same as K10*
K11L		Discontinued - *Same as K11*
K14L		Discontinued - *Same as K14*
K11C	K1.2	No material changes
K14C	K1.1	No material changes
K15C	K1.5	No material changes
K16C	K3.2	No material changes
K17	K3.1	No material changes
K17L		Discontinued - *Same as K17*
M2-1		Discontinued
M2-11	H1.1	No material changes
M2-2		Discontinued
M2-12	H5.1	No material changes

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
M2-2A		Discontinued
M2-12A	H5.2	No material changes
M2-2A2		Discontinued
M2-12A2		Discontinued
M2-3		Discontinued
M2-13	H2.1	No material changes
M2-7		Discontinued
M2-17		Discontinued
M2-9		Discontinued
M2-15	H3.1	No material changes
M2-15A	H4.1	No material changes
M3-1A		Discontinued
M3-4	S1.1	Replace lag screw with machine bolt and washer
M3-2A	S2.21	Slight material changes
M3-3A	S2.31	Slight material changes
M3-3B	S2.3	No material changes
M3-10	R1.1	Slight material changes *(Add bracket)*
M3-41	S3.1	Slight material changes *(Add bracket)*
M3-11		Discontinued *(See R3.1)*
M3-12		Discontinued *(Replaced with R3.1)*
M3-11A	R2.1	No material changes
M3-12A	R3.1	No material changes
M3-15	S2.32	Slight material changes
M3-23		Discontinued
M3-24		Discontinued
M3-25		Discontinued
M3-23A	R1.2	Slight material changes *(Add bracket)*
M3-24A	R2.2	Slight material changes
M3-25A	R3.2	Slight material changes
M3-30	R3.3	Slight material changes
M5-1		Discontinued
M5-2	A1.01	No material changes
M5-5	A1.011	Add 1 washer under crossarm pin
M5-6	P1.01	No material changes
M5-7	A1.011P	No material changes
M5-8	A5.02	No material changes
M5-9	S1.01	No material changes
M5-10	S1.02	No material changes
M5-11		Discontinued

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
M5-12		Discontinued
M5-13	W3.2	No material changes
M5-14		Discontinued
M5-16		Discontinued
M5-17	W3.1	No material changes
M5-18	A1.01P	No material changes
M5-19	N1.2	No material changes
M5-20		Discontinued *(See A5.3)*
M5-21		Discontinued
M5-22		Discontinued
M5-23		Discontinued
M5-24	A5.01	No material changes
M5-25	N5.1	Replace 1 washer abutting pole
M5-26	N5.3	Replace 1 washer abutting pole
M7-11	Y1.1	Minor material changes – *replace crossarms with bracket*
M7-13	Y1.3	Minor material changes
M8	Q1.1	Minor material changes
M8-6	Q3.1	No material changes
M8-9	Q2.2G	Modified guide drawing; no material
M8-10	Q2.1G	Modified guide drawing; no material
M8-11	Q3.3	Minor material changes
M8-12	Q3.2	Minor material changes
M8-15	Q4.1	Minor material changes
M9-11	Y3.1	No material changes
M9-12	Y3.2	Minor material changes
M9-13	Y3.3	Minor material changes
M19	W2.1G	Modified guide drawing; no material
M20	W1.1G	Modified guide drawing; no material
M21		Discontinued *(Guide drawing)*
M22-1		Discontinued *(Guide drawing)*
M22-2		Discontinued *(Guide drawing)*
M24	K4.1G	Modified guide drawing; no material
M24-1		Discontinued *(Guide drawing)*
M24-10	K4.2G	Modified guide drawing; no material
M26-5		Discontinued *(Guide drawing)*
M27		Discontinued *(Guide drawing)*
M27-1		Discontinued *(Guide drawing)*
M27-1A	G1.1G	Modified guide drawing; no material
M27-2		Discontinued *(Guide drawing)*

Disposition of Assemblies in Bulletin 50-3 (D 804)

Old Assembly Number (Bulletin 50-3)	New Assembly Number (1728F-804)	Material Changes and Comments
M28		Discontinued *(See G1.1G)*
M29-1		Discontinued *(See guide drawings in Sections A and C)*
M29-2		Discontinued *(See guide drawings in Sections A and C)*
M30-1		Discontinued *(Guide drawing)*
M30-2		Discontinued *(Guide drawing)*
M40-11		Discontinued *(Guide drawing)*
M41-1		Discontinued *(Replaced assemblies L1.1 and L3.1)*
M41-10		Discontinued *(Replaced assemblies L1.2 and L3.2)*
M42-3		Discontinued *(Replaced assemblies L1.3 and L3.4)*
M42-11		Discontinued *(Replaced assemblies L1.5 and L3.5)*
M42-13		Discontinued *(Replaced assembly L2.5)*
M42-21		Discontinued *(Replaced assemblies L1.4 and L3.3)*
M43-4		Discontinued *(Guide drawing)*
M43-10		Discontinued *(Guide drawing)*
M52-3		Discontinued *(Guide drawing)*
M52-4		Discontinued *(Guide drawing)*
R1	M1.30G	Modified guide drawing; no material
	249 Total Assemblies *(257 – 8 discontinued duplicates)* 82 Discontinued 94 Re-used: No material changes 37 Re-used: Washer changes only 36 Re-used: Other slight material changes 167 Total assemblies re-used 32 Total Guide Drawings 24 Discontinued 8 Re-used 180 Total pages	

Bulletin 1728F-804: New Assemblies and Guide Drawings	
NUMBER	**ASSEMBLY / GUIDE DRAWING DESCRIPTION**
NEW SINGLE-PHASE PRIMARY POLE TOP ASSEMBLIES	
A1.011L	SINGLE SUPPORT - PRIMARY
A1.04N A1.04NP	SINGLE SUPPORT – NARROW PROFILE
A1.3	SINGLE SUPPORT
A1.3P	SINGLE SUPPORT (POST INSULATORS)
A1.4N A1.5N	SINGLE SUPPORT – NARROW PROFILE (TANGENT)
A1.4NP A1.5NP	SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
A1.6N	SINGLE SUPPORT - NARROW PROFILE
A1.6NP	SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
A1.12G	SINGLE PHASE JUNCTION GUIDE
A2.01 A2.01P A2.021 A2.021P	DOUBLE SUPPORT - PRIMARY
A2.04N A2.04NP	DOUBLE SUPPORT – NARROW PROFILE
A2.4N A2.5N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
A2.4NP A2.5NP	DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
A2.6N	DOUBLE SUPPORT - NARROW PROFILE
A2.6NP	DOUBLE SUPPORT – NARROW PROFILE (POST INSULATORS)
A3.2 A3.3	SUSPENSION ANGLE
A3.4 A3.5 A3.6 A3.7 A3.8 A3.9	SUSPENSION ANGLE
A4.2	DEADEND ANGLE (15° - 90°)
A5.03	SINGLE DEADENDS
A5.3	SINGLE DEADENDS

A5.4 A5.5 A5.6 A5.7 A5.8 A5.9	SINGLE DEADENDS
A5.2G	SINGLE PHASE TAP GUIDE
A5.3NG	SINGLE PHASE TAP GUIDE - NARROW PROFILE
A5.4NG	SINGLE PHASE TAP GUIDE - NARROW PROFILE (WITH CUTOUT AND ARRESTER)
A6.2	DOUBLE DEADEND (FEED THROUGH)
A6.22G	DOUBLE DEADEND GUIDE (FEED THROUGH ON CROSSARMS)
NEW TWO-PHASE PRIMARY POLE TOP ASSEMBLIES	
B1.1N B1.2N	SINGLE SUPPORT - NARROW PROFILE (TANGENT)
B1.1NP B1.2NP	SINGLE SUPPORT - NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.3N	SINGLE SUPPORT - NARROW PROFILE
B1.3NP	SINGLE SUPPORT – NARROW PROFILE (POST INSULATORS)
B1.4N B1.5N	SINGLE SUPPORT - NARROW PROFILE (TANGENT)
B1.4NP B1.5NP	SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.6N	SINGLE SUPPORT - NARROW PROFILE
B1.6NP	SINGLE SUPPORT - NARROW PROFILE (POST INSULATORS)
B1.7N B1.8N	SINGLE SUPPORT - NARROW PROFILE (TANGENT)
B1.7NP B1.8NP	SINGLE SUPPORT - NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.9N	SINGLE SUPPORT - NARROW PROFILE
B1.9NP	SINGLE SUPPORT - NARROW PROFILE (POST INSULATORS)
B1.13	SINGLE SUPPORT ON CROSSARM
B1.13P	SINGLE SUPPORT ON CROSSARM (POST INSULATORS)
B2.1N B2.2N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
B2.1NP B2.2NP	DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B2.3N	DOUBLE SUPPORT - NARROW PROFILE
B2.3NP	DOUBLE SUPPORT - NARROW PROFILE (POST INSULATORS)
B2.4N B2.5N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
B2.4NP	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)

B2.5NP	(POST INSULATORS)
B2.6N	DOUBLE SUPPORT - NARROW PROFILE
B2.6NP	DOUBLE SUPPORT - NARROW PROFILE (POST INSULATORS)
B2.7N B2.8N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
B2.7NP B2.8NP	DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B2.9N	DOUBLE SUPPORT - NARROW PROFILE
B2.9NP	DOUBLE SUPPORT - NARROW PROFILE (POST INSULATORS)
B3.2 B3.3	SUSPENSION ANGLE
B3.4 B3.5 B3.6 B3.7 B3.8 B3.9	SUSPENSION ANGLE
B4.1G	DEADEND ANGLE GUIDE ($90^0 - 150^0$)
B4.2G	DEADEND ANGLE GUIDE ($15^0 - 90^0$)
B5.2 B5.3	SINGLE DEADENDS
B5.4 B5.5 B5.6 B5.7 B5.8 B5.9	SINGLE DEADENDS
NEW THREE-PHASE PRIMARY POLE TOP ASSEMBLIES	
C1.1N C1.2N	SINGLE SUPPORT – NARROW PROFILE (TANGENT)
C1.1NP C1.2NP	SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C1.3N	SINGLE SUPPORT - NARROW PROFILE
C1.3NP	SINGLE SUPPORT - NARROW PROFILE (POST INSULATORS)
C1.4N C1.5N	SINGLE SUPPORT - NARROW PROFILE (TANGENT
C1.4NP C1.5NP	SINGLE SUPPORT - NARROW PROFILE (TANGENT) (POST INSULATORS)
C1.6N	SINGLE SUPPORT - NARROW PROFILE
C1.6NP	SINGLE SUPPORT - NARROW PROFILE (POST INSULATORS)
C1.7N C1.8N	SINGLE SUPPORT - NARROW PROFILE (TANGENT)
C1.7NP C1.8NP	SINGLE SUPPORT - NARROW PROFILE) (TANGENT) (POST INSULATORS)

C1.9N	SINGLE SUPPORT - NARROW PROFILE
C1.9NP	SINGLE SUPPORT - NARROW PROFILE (POST INSULATORS)
C1.12L	SINGLE SUPPORT ON CROSSARM – (TANGENT) (LARGE CONDUCTORS)
C1.13	SINGLE SUPPORT ON CROSSARM
C1.13P	SINGLE SUPPORT ON CROSSARM (POST INSULATORS)
C1.81G	THREE-PHASE JUNCTION GUIDE
C2.1N C2.2N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
C2.1NP C2.2NP	DOUBLE SUPPORT – TANGENT (POST INSULATORS) (NARROW PROFILE)
C2.3N	DOUBLE SUPPORT - NARROW PROFILE
C2.3NG	DOUBLE SUPPORT – NARROW PROFILE (ALTERNATIVE GUYING GUIDE
C2.3NP	DOUBLE SUPPORT - NARROW PROFILE (POST INSULATORS)
C2.4N C2.5N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
C2.4NP C2.5NP	DOUBLE SUPPORT – NARROW PROFILE TANGENT (POST INSULATORS)
C2.6N	DOUBLE SUPPORT - NARROW PROFILE
C2.6NP	DOUBLE SUPPORT - NARROW PROFILE (POST INSULATORS)
C2.7N C2.8N	DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
C2.7NP C2.8NP	DOUBLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
C2.9N	DOUBLE SUPPORT - NARROW PROFILE
C2.9NP	DOUBLE SUPPORT - NARROW PROFILE (POST INSULATORS)
C3.2 C3.3	SUSPENSION ANGLE
C3.4 C3.5 C3.6 C3.7 C3.8 C3.9	SUSPENSION ANGLE
C4.1G	DEADEND GUIDE ($90^{O} – 150^{O}$)
C4.2G	DEADEND GUIDE ($15^{O} – 90^{O}$)
C5.1 C5.3	SINGLE DEADENDS - VERTICAL
C5.4 C5.5 C5.6 C5.7 C5.8	SINGLE DEADENDS - VERTICAL

C5.9	
C5.11G	SINGLE PHASE TAP GUIDE
C5.21L C5.31L	SINGLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)
C5.32	SINGLE DEADEND ON CROSSARMS - ALTERNATIVE
C5.82G	THREE PHASE HORIZONTAL TAP GUIDE
C6.31	DOUBLE DEADEND ON CROSSARMS
C6.21L	DOUBLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)
C6.52 C6.53	DOUBLE DEADEND ON 10-FOOT CROSSARMS
C6.52G	DOUBLE DEADEND ON 10-FOOT CROSSARMS (FEEDTHROUGH GUIDE)
C6.91G	DOUBLE DEADENDS (BUCKARMS) GUIDE
NEW DOUBLE CIRCUIT PRIMARY POLE TOP ASSEMBLIES	
D1.4N D1.4NP D1.5N D1.5NP	SINGLE SUPPORT - NARROW PROFILE – (TANGENT) (and POST INSULATORS
D1.82	SINGLE SUPPORT ON CROSSARMS – (TANGENT)
D1.81L D1.82L	SINGLE SUPPORT ON CROSSARMS – (TANGENT) (LARGE CONDUCTORS)
D1.81P D1.82P	SINGLE SUPPORT ON CROSSARMS - (TANGENT) (POST INSULATORS)
D1.83	SINGLE SUPPORT ON CROSSARMS
D1.83L	SINGLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)
D1.83P	SINGLE SUPPORT ON CROSSARMS (POST INSULATORS)
D2.9N D2.9NP	DOUBLE SUPPORT - NARROW PROFILE (and POST INSULATORS
D2.91L	DOUBLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)
D2.91P	DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)
D3.1G	SUSPENSION ANGLE GUIDE
D4.1G	DEADEND ANGLE GUIDE
D5.91G	THREE PHASE TAP GUIDE
NEW GUYING ASSEMBLIES	
E1.3L	SINGLE DOWN GUY - LARGE CONDUCTORS (POLE BAND TYPE)
E1.5	GUY STRAIN INSULATOR
E2.1G	DOUBLE DOWN GUY GUIDE - (THROUGH BOLT TYPE)
E3.1LG	THREE DOWN GUY GUIDE - HEAVY DUTY (THROUGH BOLT TYPE)
E4.3LG	FOUR DOWN GUY GUIDE - LARGE CONDUCTORS (POLE BAND TYPES)

NEW TRANSFORMER ASSEMBLIES	
G1.2G	POLE TYPE TRANSFORMER LOCATION GUIDE
G1.4 G1.5	SINGLE-PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)
G1.6	SINGLE-PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)
G2.1G	TRANSFORMER / METER CONNECTION GUIDE THREE-PHASE, OPEN-WYE - OPEN DELTA FOR 120/240 VOLT POWER LOADS
G3.1G	TRANSFORMER / METER CONNECTION GUIDE UNGROUNDED WYE - CENTER TAP GROUNDED DELTA FOR 120/240 VOLT POWER LOADS
G3.2G	TRANSFORMER / METER CONNECTION GUIDE UNGROUNDED WYE - CORNER GROUNDED DELTA FOR 240 OR 480 VOLT POWER LOADS
G3.3G	TRANSFORMER / METER CONNECTION GUIDE GROUNDED WYE - GROUNDED WYE FOR 120/208 VOLT POWER LOADS
NEW GROUNDING ASSEMBLIES	
H5.3	GROUNDING IMPROVEMENT ASSEMBLIES - WRAP-AROUND TYPE
NEW TYING ASSEMBLIES	
L1.1 L1.2	PRIMARY ANGLE TYING ASSEMBLIES
L1.3 L1.4 L1.5	PRIMARY DEADEND TYING ASSEMBLIES
L2.1 L2.2	NEUTRAL ANGLE TYING ASSEMBLIES
L2.3 L2.4 L2.5	NEUTRAL DEADEND TYING ASSEMBLIES
L3.1 L3.2	NEUTRAL & SECONDARY ANGLE TYING ASSEMBLIES
L3.3 L3.4	NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES - (COPPER)
L3.5 L3.6	NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES - (ACSR)
L4.1	TYING ASSEMBLIES, SERVICES
L4.2 L4.3 L4.4	TYING ASSEMBLIES, SERVICES

NEW NEUTRAL ASSEMBLIES	
N1.1	NEUTRAL ASSEMBLIES - TANGENT
N1.11 N2.21	NEUTRAL SUPPORTS ON CROSSARMS
N2.1 N2.1L	NEUTRAL ASSEMBLIES - LARGE ANGLE
N5.2	NEUTRAL ASSEMBLIES - (SINGLE DEADENDS)
N6.1	NEUTRAL ASSEMBLY - DOUBLE DEADEND
N6.21	NEUTRAL ASSEMBLY - DOUBLE DEADEND ON CROSSARMS
NEW PROTECTION ASSEMBLIES	
P1.1	SURGE ARRESTERS - SINGLE PHASE
P1.1NG	SURGE ARRESTER GUIDE - NARROW PROFILE
P1.3	SURGE ARRESTERS - 3 SINGLE PHASE
P3.1G	RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 8-FOOT CROSSARMS (TANGENT)
P3.2G	RAPTOR PROTECTION ASSEMBLY GUIDE SUPPORT ON 10-FOOT CROSSARMS (TANGENT)
P3.3G	RAPTOR PROTECTION, PERCH GUARDS - GUIDE
P3.4G	RAPTOR PROTECTION, SINGLE-PHASE, CSP TRANSFORMER (TANGENT POLE)
P3.5G	RAPTOR PROTECTION ASSEMBLY GUIDE THREE-PHASE TRANSFORMER BANK
NEW SECTIONALIZING ASSEMBLIES	
S2.01	MISCELLANEOUS CUTOUTS AND DISCONNECT SWITCH
S1.1N	CUTOUT GUIDE - NARROW PROFILE
S1.3	COUTOUTS - (THREE SINGLE-PHASE)
S3.2	SECTIONALIZER (WITH BYPASS CUTOUT)
NEW VOLTAGE ALTERATION EQUIPMENT ASSEMBLIES	
Y2.1 Y2.2	AUTOTRANSFORMER, POLE MOUNTED (ONE SINGLE-PHASE, STEP-DOWN)
Y3.4	SWITCHED CAPACITOR BANK - THREE PHASE
	215 Total new assemblies (95 narrow profile) **32 Total new guide drawings** (4 narrow profile)

RUS Standard Format and Meaning of Overhead Distribution Assembly Numbers

The RUS standard numbering format for overhead distribution assemblies is: $L_1N_1.N_2$

L_1 is an alphabetic character that represents the *category* or group of similar assemblies that fulfill a similar and specific function in the construction or operation of an overhead distribution line. For example, the assemblies in category "C" are pole top assemblies that support three primary conductors (3-phase) and a neutral conductor.

The following table shows the 19 distribution assembly categories and the letter (L_1) RUS has assigned to represent them.

DESIGNATED MEANINGS of ASSEMBLY CATEGORY NUMBERS (L_1)		
A 1-Phase, pole-top	**H** Grounds	**Q** Metering
B 2-Phase, pole-top	**J** Secondaries	**R** Reclosers
C 3-Phase, pole-top	**K** Services	**S** Sectionalizing
D Double Circuit, pole-top	**L** Conductor Tying	**W** Poles, Crossarms
E Guys	**M** Miscellaneous	**Y** Volt. Alteration Equip.
F Anchors	**N** Neutrals	
G Transformers	**P** Protection	

N_1 is a numeric character that represents a *subcategory* or group of similar assemblies within a category. The different assemblies in a subcategory all fulfill the same specific functional purpose, but their function is somewhat different than the other assemblies within their associated assembly category (L_1). For example, within categories "A" through "D" the subcategory "1" assemblies are all *tangent or small angle* pole top assemblies that (only) support the primary and neutral conductors.

The following table shows the RUS designated meaning of the numbers (N_1) that represent the 6 subcategories within pole-top assembly categories "A" through "D".

DESIGNATED MEANINGS of SUBCATEGORY NUMBERS (N_1) for POLE TOP ASSEMBLIES	
1	Tangent or Small Angles (single pin or post type insulators)
2	Small Angles (double pin or post type insulators)
3	Large Angles (suspension type insulators)
4	Large Angles (double deadends)
5	Single Deadends or Taps
6	Double Deadends-

RUS has assigned meanings to the subcategory numbers (N_1) for the remaining 15 (L_1) categories of overhead distribution assemblies, however, the list and meanings of these numbers is long and varied and beyond the scope of this summary exhibit. The remaining subcategory numbers and their assigned meanings are tabulated in RUS

Bulletin 1728F-800, "Construction Assembly Unit Numbers and Format." This bulletin is posted on the RUS website at: http://www.usda.gov/rus/electric/bulletins.htm.

N_2, which is always either a one or two digit number, is defined as the *assembly identification number*. This number is used to differentiate the similar assemblies in a subcategory (N_1) of assemblies

RUS has assigned assembly identifications numbers from 11 through 99 to pole top assemblies that are constructed with crossarms. Furthermore, the two-digit crossarm assembly identification numbers have been assigned the designated meaning shown in the following table.

DESIGNATED MEANINGS of ASSEMBLY IDENTIFICATION NUMBERS (N_2) for CROSSARM ASSEMBLIES	
11-19	Single 8-foot crossarms
21-29	(1 set of) Double 8-foot crossarms
31-39	(1 set of) Triple 8-foot crossarms
41-49	Single 10-foot crossarms
51-59	(1 set of) Double 10-foot crossarms
61-69	*Not used – Reserved for future*
71-79	(1) Pre-assembled (manufactured) single crossarm assembly (item "gj")
81-89	Multiple crossarm assemblies
91-99	Multiple crossarm assemblies

The *prefix* "V" in front of a standard assembly number indicates that the assembly is used for 24.9/14.4 kV line construction. A standard assembly number with no prefix indicates that the assembly is used for 12.47/7.2 kV line construction.

A *suffix* is an alphabetic character placed at the end of a standard assembly number. A suffix describes the type of the assembly. Presently, RUS only uses the following 4 suffixes whose designated meanings are shown in parentheses:

G (Guide drawing, not an assembly)
L (Large conductor construction)
N (Narrow profile construction assembly)
P (Assembly with post type insulators)

Not all assembly numbers have suffixes and some may have more than one suffix letter.

TABLE OF SELECTED SI TO METRIC CONVERSIONS

LENGTH

To Convert From	*To*	*Multiply By*	
foot (ft.)	meter (m)	3.048	E-01
inch (in.)	meter (m)	2.540	E-02
kilometer (km)	meter (m)	1.000	E+03
mile (mi.)	meter (m)	1.609344	E+03

AREA

To Convert From	*To*	*Multiply By*	
circular mil (cmil)	square meter	5.067075	E-10
square centimeter	square meter	1.000	E-04
square foot	square meter	9.290304	E-02
square kilometer	square meter	1.000	E+06
square mile	square meter	2.589988	E+06

FORCE

To Convert From	*To*	*Multiply By*	
kilogram force (kgf)	newton (N)	9.806650	
kip	newton (N)	4.448222	E+03
pound force (lbf)	newton (N)	4.448222	

MASS

To Convert From	*To*	*Multiply By*	
pound (avoirdupois) (lb)	kilogram (kg)	4.535924	E-01

I/A
V2/13

WA Exhibit No. 1

JOB DUTIES OF WILFRED ARNETT

EXPERIENCE

General:

Over fifty years of line and staff utility technical, engineering, and management experience. Extensive engineering management experience at BellSouth having responsibility for Outside Plant Engineering, Planning, and Project Management. Thirty years of negotiations experience with Federal, state and local agencies and railroad, common carrier, CATV and electric utility companies. Experienced in dealing with utility agreements, engineering and construction contracts and other issues that directly impact utility operations, revenues and costs. Managed Joint Use and Right of Way Acquisition for BellSouth North Sector (GA, NC, SC). Responsible for Contract Engineering and Right of Way administration for Georgia, North Carolina and South Carolina from 1987 until 1994. Responsible for liaison activities with Federal Highway Administration and with the Departments of Transportation in Georgia, North Carolina and South Carolina. Also responsible for training of field forces and managers on policies and procedures relative to joint use and the use and occupancy of public and private right of way. Accounting major – State University of West Georgia. Past Member of Transportation Research Board, Utilities Committee A2A07, National Academy of Sciences, involved in utility impacts on roadway safety. Past President of Georgia Chapter 22, International Right of Way Association (IRWA) and past Chairman for Region 6, IRWA (Southeast US). Extensive experience in joint-use contract matters having negotiated contracts between IOU's and ILEC's and third-party occupants representing over 12 million poles.

Work History:

7/13 – Present Managing Principal/Director, TRC Engineers, Inc. Responsible for joint use support and consulting to Investor-Owned, Cooperatively-owned and Municipal electric companies regarding operational provisions and rental rates in joint-use agreements and pole attachment agreements. Currently Director of joint use operations and client support for TRC nationwide.

10/97 - 7/13 Vice President of USS, Inc. Directed the provision of engineering, and field inspection services to support various utility and communications companies/agencies.

10/97 - 7/13 Member of RASR Associates, LLC, a Consultant to Investor-Owned,

Cooperatively-owned and Municipal electric companies regarding operational provisions and rental rates in joint-use agreements and pole attachment agreements. Represented over 75 power companies/authorities.

3/96 – 10/97 Vice President of Universal Ensco and Universal Field Services in Georgia. Responsible for Right of Way acquisition and Outside Plant Engineering staff.

10/94 - 2/96 Manager, BellSouth Consumer Multimedia Services, Atlanta, GA. Outside Plant Engineering and Right of Way responsibilities for BellSouth's entry into Broadband Network provisioning and Video Dial Tone Project in Metro Atlanta.

10/87 - 10/94 Manager - Joint Use, Right of Way, DOT Liaison, Contracts (Engineering and Right of Way) & License Agreements (CATV, etc.), for North Sector (GA, NC, SC) of BellSouth Telecommunications, Inc.

10/75 - 10/87 Supervising Engineer - Southern Bell, Carrollton, GA. Responsible for Outside Plant Engineering, Planning, and the Loop Assignment Center.

9/73 - 10/75 Outstate Construction Staff Supervisor - Southern Bell. Responsible for GA Maintenance Budget, District Operational Reviews of construction practices and Conformance Testing for 9 Districts in Georgia.

9/71 – 9/73 Outstate Engineering Staff Supervisor – Southern Bell. Responsible for Capital Budget, major project reviews and Operational Reviews of engineering practices in 9 Districts in Georgia.

6/68 – 9/71 Outside Plant Engineer with various line assignments in Southeast and Central Georgia, including Savannah, Augusta and Dublin.

10/66 – 6/68 Outside Plant Technician – Southern Bell Telephone in Savannah, GA.

Other Affiliations:

Member of Carrollton First United Methodist Church
Served Georgia Army National Guard, Battery B – 214th Artillery, 1967 – 1973 (Staff Sergeant)
Supporting member of Transportation Research Board – National Academy of Sciences
Georgia Cattlemen's Association

I/A
V2/V3

WA Exhibit No. 2.1 - TVA Rental Rate Formula
Blue Ridge EMC
FY 2014 Data

Line #	Description	Amount	Definition/Data Input Code
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Safety Space	3.33	
3	Unusable space	27.30	Calculation-excludes Safety Space
4	Number of attaching entities	2.35	Per audit
5	Pole height	36.83	Calculated with CPR detail
6	**Attacher responsibility percentage**	**41.25%**	(Ln 1 +(1/(Ln 4-1)*Ln 2)+((1/Ln 4)*Ln 3))/Ln 5
	Net Cost of a Bare Pole		
7	Gross pole investment (Acct. 364)	49,295,043	
8	Accumulated depreciation for poles	16,755,290	
9	Accumulated deferred income taxes	0	
10	Net pole investment	32,539,753	
11	Appurtenance factor	87.00%	
12	Gross pole investment allocable to attachments	28,309,585	Line 10 x Line 11
13	Total number of poles	107,751	
14	**Net cost of a bare pole**	**$262.73**	Line 12/Line 13
	Net Carrying Charge		
15	Total general and administrative	10,164,119	
16	Total electric plant in service	425,883,764	
17	Total electric plant accumulated depreciation	134,648,942	
18	Total electric plant accumulated deferred income taxes	0	
19	**Administrative carrying charge**	**3.49%**	Line 15/(Line 16 - Line 17 - Line 18)
20	Maint expense for overhead lines-Current Year	7,674,619	
21	Maint expense for overhead lines-Current Year - 1	8,203,571	
22	Maint expense for overhead lines-Current Year - 2	7,117,045	
23	Maint expense for overhead lines-3-Year Average	7,665,078	(Line 20 + Line 21 + Line 22) / 3
24	Pole investment in Accts. 364, 365, & 369	158,218,973	
25	Depreciation (poles) related to Accts. 364, 365, & 369	45,505,682	
26	Accumulated deferred income taxes for 364, 365, & 369	0	
27	**Maintenance carrying charge**	**6.80%**	Line 23/(Line 24 - Line 25 - Line 26)
28	Gross pole investment (Acct. 364)	49,295,043	
29	Net pole investment	32,539,753	Line 10
30	Depreciation rate for gross pole investment	3.60%	
31	**Depreciation carrying charge**	**5.45%**	(Line 28/Line 29) x Line 30
32	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	2,160,782	
33	Total utility plant in service	425,883,764	
34	Total company accumulated depreciation	134,648,942	
35	Total company accumulated deferred income taxes	0	
36	**Taxes carrying charge**	**0.74%**	Line 32/(Line 33 - Line 34 - Line 35)
37	Applicable rate of return (default)	8.50%	TVA Required Rate
38	**Return carrying charge (ROI * Net) / Gross**	**8.50%**	
39	**Total carrying charges**	**24.99%**	Line 19 + Line 27 + Line 31 + Line 36 + Line 38
	RATE		
40	**Attacher responsibility percentage**	**41.25%**	Line 6
41	**Net cost of a bare pole**	**$262.73**	Line 14
42	**Total carrying charges**	**24.99%**	Line 39
43	**Pole attachment rental rate**	**27.08**	Line 40 x Line 41 x Line 42

WA Exhibit No. 2.2 - TVA Rental Rate Formula
Blue Ridge EMC
2015 Data

Line #	Description	Amount	Definition/Data Input Code
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Safety Space	3.33	
3	Unusable space	27.28	Calculation-excludes Safety Space
4	Number of attaching entities	2.35	Per audit
5	Pole height	36.85	Calculated with CPR Detail
6	**Attacher responsibility percentage**	**41.21%**	(Ln 1 +(1/(Ln 4-1)*Ln 2)+((1/Ln 4)*Ln 3))/Ln 5
	Net Cost of a Bare Pole		
7	Gross pole investment (Acct. 364)	50,390,546	
8	Accumulated depreciation for poles	17,924,217	
9	Accumulated deferred income taxes	0	
10	Net pole investment	32,466,329	
11	Appurtenance factor	87.29%	
12	Gross pole investment allocable to attachments	28,339,266	Line 10 x Line 11
13	Total number of poles	108,086	
14	**Net cost of a bare pole**	**$262.19**	Line 12/Line 13
	Net Carrying Charge		
15	Total general and administrative	9,870,339	
16	Total electric plant in service	440,866,858	
17	Total electric plant accumulated depreciation	144,871,920	
18	Total electric plant accumulated deferred income taxes	0	
19	**Administrative carrying charge**	**3.33%**	Line 15/(Line 16 - Line 17 - Line 18)
20	Maint expense for overhead lines-Current Year	7,951,569	
21	Maint expense for overhead lines-Current Year - 1	7,674,619	
22	Maint expense for overhead lines-Current Year - 2	8,203,571	
23	Maint expense for overhead lines-3-Year Average	7,943,253	(Line 20 + Line 21 + Line 22) / 3
24	Pole investment in Accts. 364, 365, & 369	164,546,374	
25	Depreciation (poles) related to Accts. 364, 365, & 369	48,323,315	
26	Accumulated deferred income taxes for 364, 365, & 369	0	
27	**Maintenance carrying charge**	**6.83%**	Line 23/(Line 24 - Line 25 - Line 26)
28	Gross pole investment (Acct. 364)	50,390,546	
29	Net pole investment	32,466,329	Line 10
30	Depreciation rate for gross pole investment	3.60%	
31	**Depreciation carrying charge**	**5.59%**	(Line 28/Line 29) x Line 30
32	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,477,001	
33	Total utility plant in service	440,866,858	
34	Total company accumulated depreciation	144,871,920	
35	Total company accumulated deferred income taxes	0	
36	**Taxes carrying charge**	**0.50%**	Line 32/(Line 33 - Line 34 - Line 35)
37	Applicable rate of return (default)	8.50%	TVA Required Rate
38	**Return carrying charge (ROI * Net) / Gross**	**8.50%**	
39	**Total carrying charges**	**24.76%**	Line 19 + Line 27 + Line 31 + Line 36 + Line 38
	RATE		
40	**Attacher responsibility percentage**	**41.21%**	Line 6
41	**Net cost of a bare pole**	**$262.19**	Line 14
42	**Total carrying charges**	**24.76%**	Line 39
43	**Pole attachment rental rate**	**26.75**	Line 40 x Line 41 x Line 42

WA Exhibit 2.3 - TVA Rental Rate Formula
Blue Ridge EMC
FY 2016 Data

Line #	Description	Amount	Definition/Data Input Code
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per Audit
2	Safety Space	3.33	
3	Unusable space	27.26	Calculation - excludes Safety Space
4	Number of attaching entities	2.35	Per audit
5	Pole height	36.87	Calculated with CPR detail
6	**Attacher responsibility percentage**	**41.16%**	(Ln 1 +(1/(Ln 4-1)*Ln 2)+((1/Ln 4)*Ln 3))/Ln 5
	Net Cost of a Bare Pole		
7	Gross pole investment (Acct. 364)	51,209,182	
8	Accumulated depreciation for poles	19,197,595	
9	Accumulated deferred income taxes	0	
10	Net pole investment	32,011,587	
11	Appurtenance factor	87.41%	
12	Gross pole investment allocable to attachments	27,981,967	Line 10 x Line 11
13	Total number of poles	108,330	
14	**Net cost of a bare pole**	**$258.30**	Line 12/Line 13
	Net Carrying Charge		
15	Total general and administrative	9,666,925	
16	Total electric plant in service	454,916,323	
17	Total electric plant accumulated depreciation	156,430,349	
18	Total electric plant accumulated deferred income taxes	0	
19	**Administrative carrying charge**	**3.24%**	Line 15/(Line 16 - Line 17 - Line 18)
20	Maint expense for overhead lines-Current Year	8,486,535	
21	Maint expense for overhead lines-Current Year - 1	7,951,569	
22	Maint expense for overhead lines-Current Year - 2	7,674,619	
23	Maint expense for overhead lines-3-Year Average	8,037,574	(Line 20 + Line 21 + Line 22) / 3
24	Pole investment in Accts. 364, 365, & 369	168,093,587	
25	Depreciation (poles) related to Accts. 364, 365, & 369	51,825,495	
26	Accumulated deferred income taxes for 364, 365, & 369	0	
27	**Maintenance carrying charge**	**6.91%**	Line 23/(Line 24 - Line 25 - Line 26)
28	Gross pole investment (Acct. 364)	51,209,182	
29	Net pole investment	32,011,587	Line 10
30	Depreciation rate for gross pole investment	3.60%	
31	**Depreciation carrying charge**	**5.76%**	(Line 28/Line 29) x Line 30
32	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,698,970	
33	Total utility plant in service	454,916,323	
34	Total company accumulated depreciation	156,430,349	
35	Total company accumulated deferred income taxes	0	
36	**Taxes carrying charge**	**0.57%**	Line 32/(Line 33 - Line 34 - Line 35)
37	Applicable rate of return (default)	8.50%	TVA Required Rate
38	**Return carrying charge (ROI * Net) / Gross**	**8.50%**	
39	**Total carrying charges**	**24.98%**	Line 19 + Line 27 + Line 31 + Line 36 + Line 38
	RATE		
40	Attacher responsibility percentage	41.16%	Line 6
41	Net cost of a bare pole	$258.30	Line 14
42	Total carrying charges	24.98%	Line 39
43	**Pole attachment rental rate**	**26.56**	Line 40 x Line 41 x Line 42

WA Exhibit No. 2.4 - Transmission Pole Bare Pole Cost
Blue Ridge EMC
FY 2016 Data

Net Cost of a Bare Pole-Transmission			
7	Gross pole investment (Acct. 355)	25,154,088	
8	Accumulated depreciation for poles	7,702,588	
9	Accumulated deferred income taxes	0	
10	Net pole investment	17,451,500	
11	Appurtenance factor	96.37%	
12	Gross pole investment allocable to attachments	16,818,257	Line 10 x Line 11
13	Total number of poles	4,629	
14	**Net cost of a bare pole**	**$3,633.24**	Line 12/Line 13

WA Exhibit No.2.5
FCC Cable Only Rate - Default Space

FCC CABLE-ONLY RATE
Blue Ridge EMC
FY 2016 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1	Presumption
2	Total usable space	13.50	Presumption
3	**Attacher responsibility percentage**	**7.41%**	Line 1/Line 2
	Net Cost of a Bare Pole		
4	Gross pole investment (Acct. 364)	51,209,182	
5	Accumulated depreciation for poles	19,197,595	
6	Accumulated deferred income taxes	0	
7	Net pole investment	32,011,587	Line 4 - Line 5 - Line 6
8	Appurtenance factor	87.41%	
9	Net pole investment allocable to attachments	27,981,967	Line 7 x Line 8
10	Total number of poles	108,330	
11	**Net cost of a bare pole**	**$258.30**	Line 9/Line 10
	Carrying Charge		
12	Total general and administrative	9,666,925	
13	Total electric plant in service	454,916,323	
14	Total electric plant accumulated depreciation	156,430,349	
15	Total electric plant accumulated deferred income taxes	0	
16	**Administrative carrying charge**	**3.24%**	Line 12/(Line 13 - Line 14 - Line 15)
17	Maintenance expense for overhead lines	8,486,535	
18	Pole investment in Accts. 364, 365, & 369	168,093,587	
19	Depreciation (poles) related to Accts. 364, 365, & 369	51,825,495	
20	Accumulated deferred income taxes for 364, 365, & 369	0	
21	**Maintenance carrying charge**	**7.30%**	Line 17/(Line 18 - Line 19 - Line 20)
22	Gross pole investment (Acct. 364)	51,209,182	
23	Net pole investment	32,011,587	Line 7
24	Depreciation rate for gross pole investment	3.60%	
25	**Depreciation carrying charge**	**5.76%**	(Line 22/Line 23) x Line 24
26	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,698,970	
27	Total utility plant in service	454,916,323	
28	Total company accumulated depreciation	156,430,349	
29	Total company accumulated deferred income taxes	0	
30	**Taxes carrying charge**	**0.57%**	Line 26/(Line 27 - Line 28 - Line 29)
31	Applicable rate of return (default)	11.00%	
32	**Return carrying charge**	**11.00%**	FCC Mandate
33	**Total carrying charges**	**27.87%**	Line 16 + Line 21 + Line 25 + Line 30 + Line 32
	RATE		
34	**Attacher responsibility percentage**	**7.41%**	Line 3
35	**Net cost of a bare pole**	**$258.30**	Line 11
36	**Total carrying charges**	**27.87%**	Line 33
37	**Pole attachment rate for cable-only**	**5.33**	Line 34 x Line 35 x Line 36

WA Exhibit No. 3

I/A
V2 / V3

TVA Restricted Information – Confidential and Business Sensitive

PROPOSED BOARD RESOLUTION
(Pole Attachments)

WHEREAS, TVA regulates the retail rates of the Local Power Companies (LPCs) that distribute TVA power and establishes the terms and conditions under which TVA power is sold to ensure that LPC systems are operated for the benefit of the electric consumers and that rates are kept as low as feasible;

WHEREAS, so that electric system assets and funds are not used in a manner that would result in the subsidization of non-electric activities, an LPC's electric system must be appropriately compensated for the use of electric system assets, including use by cable and telecommunication providers making or maintaining wireline attachments on an LPC's electric system poles;

WHEREAS, a memorandum from the Chief Financial Officer and Executive Vice President, Financial Services (CFO), dated January 22, 2016 (Memorandum), a copy of which is filed with the records of the Board as Exhibit _____, recommends that the Board of Directors approve the recommended methodology for regulation of pole attachment rates by adopting the Determination on Regulation of Pole Attachments as described in the Memorandum;

BE IT RESOLVED, that after review of said Memorandum, the Board of Directors finds it to be appropriate and in the interest of TVA to approve the recommended methodology for regulation of pole attachment rates and adopts the Determination on Regulation of Pole Attachments attached to and described in the Memorandum.

RESOLVED further, that the Board hereby authorizes and directs the Chief Executive Officer (CEO), to take all actions necessary or appropriate to implement the Determination on Regulation of Pole Attachments as further described in the Memorandum.

January 22, 2016
Financial Services

Board of Directors

SUBJECT

The Board is requested to approve the recommended methodology for regulation of pole attachment rates by adopting the Determination on Regulation of Pole Attachments set out in Attachment A and further described in this memorandum. The Board is further requested to authorize the Chief Executive Officer (CEO) to take all actions necessary or appropriate to implement the Determination on Regulation of Pole Attachments as described.

BACKGROUND

TVA sells electric power to local power companies that distribute TVA power (LPCs) pursuant to the Property Clause of the Constitution. Specifically, TVA electric power is property of the United States, and Congress has delegated to TVA the authority to manage that property. Through the TVA Act, Congress has vested broad discretion in the TVA Board of Directors in the exercise of their authority to sell surplus power. Section 10 of the TVA Act authorizes the TVA Board:

> ... to include in any contract for the sale of power such terms and conditions, including resale rate schedules, and to provide for such rules and regulations as in its judgment may be necessary or desirable for carrying out the purposes of this chapter ...

TVA is the exclusive retail rate regulator for LPCs that distribute TVA power. Further, through the wholesale power contract with each LPC, TVA seeks to ensure that electric systems are operated for the benefit of electric consumers and that rates are kept as low as feasible. It is important to achieving these objectives that TVA ensure that LPC electric systems are appropriately compensated for the use of electric system assets for non-electric purposes.

Over the last few years, TVA has seen an increased regulatory focus on pole attachment fees in the Valley. For example, in 2012 the Kentucky Cable Telecommunications Association (KCTA) petitioned the Kentucky Public Service Commission (KYPSC) to order that the KYPSC has jurisdiction over the rates charged by TVA LPCs. In 2015, the KYPSC determined that it was preempted from regulating the pole attachment rates charged by TVA LPCs. KCTA has appealed the decision by the KYPSC. Similarly in 2014, an opinion was sought from the Tennessee Attorney General regarding the jurisdiction of the State of Tennessee (State) to regulate the pole attachment rates of TVA LPCs. The Tennessee Attorney General concluded that such regulation by the State is not currently "clearly preempted," but stated that if TVA were to assert its regulatory authority over the rates and revenues of TVA LPCs in a way that directly affected pole attachments, then regulation by the State would likely be preempted.

These and other activities in the Valley led to TVA's reevaluation of the need to refine TVA's regulation of pole attachment rates to ensure that electric systems are being appropriately compensated for the use of electric system assets. Failure to do so has a direct impact on the

retail rates charged by LPCs because electric ratepayers will be forced to subsidize the business activities of those entities attaching to the assets of LPCs for non-electric purposes.

ALTERNATIVES CONSIDERED

TVA's Regulatory Assurance staff (Staff) reviewed information related to pole attachment regulation throughout the country and sought input from LPCs and the Tennessee Valley Public Power Association (TVPPA) on the need for further regulation and suggested methods for such regulation. TVPPA proposed a rate formula to TVA, and after consideration of feedback that was received, Staff developed a draft proposal for refinement of TVA's pole attachment regulation. TVA sought feedback from LPCs on the proposal, and based on that feedback TVA developed the following recommendation. TVA has held webinars and other meetings with LPCs to discuss and solicit input on pole attachment regulation. Feedback from individual LPCs and the TVPPA Board of Directors has been generally supportive of TVA's efforts and the actions recommended.

RECOMMENDED ACTION AND POTENTIAL IMPACTS

It is recommended that the Board approve the methodology recommended by Staff for regulation of pole attachment rates that is further described below by adopting the Determination on Regulation of Pole Attachments set out in Attachment A. A summary of Staff's considerations and the feedback received in developing this recommendation is provided as Attachment B.

After studying several methodologies for calculating pole attachment rates, Staff developed a methodology that provides for the fully allocated cost of the pole and is consequently designed to better protect the electric ratepayer. Under this rate methodology, the pole attachment rate is calculated by first establishing the total annual cost of pole ownership, which includes administration, depreciation, maintenance, taxes, and return on investment (ROI). The total cost is then allocated among pole users based on: the actual number of pole users; an equal allocation of support space among the pole users; an equal allocation of safety space among pole users that are attaching for communication purposes; and an allocation of usable space to each pole user.

The methodology provides for equal sharing of support space among all users, including electric. Safety space, however, is allocated equally among users that are attaching for communication purposes. While Staff had initially developed a methodology that allocated safety space to all users, based on input from TVPPA and LPCs, Staff further evaluated the appropriate allocation of safety space. As noted by the National Electrical Safety Code, the safety space on a pole is for the safety of communication workers. Staff concluded that it is proper to allocate safety space to users that attach for communication purposes, and the methodology is reflected in Attachment A.

Certain assumptions have been used for simplification and ease of administration in developing a fully allocated cost methodology for individual LPCs. The calculation assumes: an average

pole height of 37.5 feet, which is consistent with pole attachment rate formulas used in many jurisdictions; a 15% discount factor to remove items such as cross arms and anchors from pole costs; a uniform ROI equal to 8.5%; and that one foot (or two feet depending on the attacher) of space is occupied by each non-electric attaching party. Space allocation will be determined using the actual number of attaching parties per pole, including the pole owner. TVA may adjust the appropriateness of using assumptions and the assumptions being used from time to time. Any such adjustments will be reported at least annually to the Audit, Risk, and Regulation Committee of the TVA Board.

Some LPCs asked that TVA allow an LPC to apply actual data in place of the other assumptions used in the formula, noting that some LPCs have actual system data that would allow for a more accurate calculation. Staff considers a uniform ROI important to promoting consistency across the Valley, but agrees that it may be appropriate to allow LPCs to use actual system data for average pole height and discount factor. Accordingly, where such data is available and the LPC provides sufficient justification to TVA supporting the use of actual data inputs for both pole height and discount factor assumptions, the LPC may be permitted to use actual data. This is reflected in Attachment A.

Staff completed a preliminary analysis to better understand the potential impacts of the proposed new pole attachment rate methodology. Based on a review of current pole attachment rates charged by LPCs, the mid-point in the Valley is approximately $18. Applying the recommended methodology may result in a mid-point of approximately $30. Although most LPCs are expected to see increased rates, some will see decreases from rates that are currently charged. These impacts will likely change once individual LPC pole accounting data is reconciled and validated by both the LPC and TVA.

Several LPCs expressed concern about the variance from current rates that will be produced by the methodology. While Staff considers these changes necessary to ensure proper cost recovery, Staff also recognizes the need to mitigate impacts of new rates. Accordingly, the recommendation reflected in Attachment A provides for a phase-in period. Further, before an LPC may apply the rate derived from the fully allocated cost methodology, Staff must validate data and approve such rate. Following the Board's adoption of the methodology set out in Attachment A, Staff will evaluate the rates calculated by analyzing each LPC's actual data. It is recommended that the CEO be authorized to approve a mechanism, if needed, to further address LPC rates that fall outside certain statistical parameters. This mechanism would be subject to review by the Audit, Risk, and Regulation Committee of the TVA Board prior to implementation.

It is recommended that the Board authorize and direct the CEO to take all actions necessary or appropriate to implement the Determination on Regulation of Pole Attachments. Further, for purposes of clarity, TVA will develop a contract amendment in form and substance acceptable to the Office of the General Counsel to more specifically incorporate TVA's regulatory control over pole attachment rates into the wholesale power contract.

Staff will continue to work with LPCs and TVPPA to provide for orderly implementation of the pole attachment methodology. All LPCs will be expected to enter into the contract amendment described above as soon as practicable. An LPC may begin using the rate methodology adopted herein as soon as TVA completes an evaluation of and affirms the rate. All LPCs are expected to begin using the new pole attachment rate methodology by January 2017, but no later than January 2018, as described in Attachment A.

Attachments

Attachment A: Determination on Regulation of Pole Attachments
Attachment B: Summary of Considerations and Comments

John M. Thomas III
Executive Vice President and Chief Financial Officer
Financial Services
MR 6 D-C

Attachments
cc (Attachments)
Dwain K. Lanier, MR 6D-C
Daniel P. Pratt, MR 6D-C
Van M. Wardlaw, BR 5D-C
Laura J. Campbell, MK 1A-MET
Jeffrey T. McKenzie, WT 7C-K
EDMS, WT CA-K

Sherry A. Quirk Date

William D. Johnson Date

Tennessee Valley Authority
Determination on Regulation of Pole Attachments
February 2016

Determination By TVA Board

TVA is the exclusive retail rate regulator for local power companies (LPCs) that distribute TVA power. Primarily through the wholesale power contract with each LPC, TVA seeks to ensure that electric systems are operated for the benefit of electric consumers and that electric rates are kept as low as feasible. Ensuring that LPCs are appropriately compensated for the use of electric system assets is important to achieving these goals. Importantly, failure to do so will have a direct impact on retail electric rates because electric ratepayers will be forced to subsidize the business activities of those entities that are utilizing electric system assets. To this end, TVA has evaluated the need to refine its regulation of the rates charged by LPCs where parties such as cable or telecommunication (including broadband) providers make or maintain wireline attachments to electric system assets.

The TVA Board determines it to be appropriate to refine TVA's regulation in this area by identifying the methodology to be used by TVA LPCs in determining pole attachment rates and clarifying TVA's regulatory control over pole attachments within the wholesale power contract between TVA and each LPC.[1]

Methodology

In establishing the formula to reflect the fully allocated cost methodology for each individual LPC, certain assumptions have been used to simplify the calculation. The calculation for each attaching party assumes: an average pole height of 37.5 feet; a 15 percent cross arm discount factor; and allocation of either one foot or two feet of space depending on space occupied by the communication attaching party; and a uniform return on investment (ROI) equal to 8.5%.

A more detailed explanation of the components in the pole attachment formula is located in Appendix 1, and an example of the data used in the formula is located in Appendix 2. The formula to be used by all LPCs in establishing pole attachment rates is:

Pole Attachment Rate = (Space Allocation) x (Net Cost of Bare Pole) x (Carrying Cost)

Space Allocation - The percentage share of space based upon amount, types, and purposes of space on the pole. Space is allocated based on: the actual number of pole users; an equal allocation of support space among the pole users; an equal allocation of safety space among pole users that are attaching for communication purposes; and an allocation of usable space to each pole user. (See Appendix 3)

[1] Nothing herein is intended to apply to reciprocal or joint use agreements at this time, although TVA expects that appropriate costs will be borne by all participants in these reciprocal or joint use agreements.

- **Net Cost of Bare Pole** – The net pole investment, after applying Discount Factor, divided by the number of poles.
- **Carrying Cost** - Annual operating expenses associated with pole ownership. (Administrative Charge, Maintenance Charge, Depreciation Charge, and Taxes as a percent of net plant plus the Return on Investment)

It is recognized that there may be circumstances in which it is appropriate for LPCs to use actual system data where such data is available. Accordingly, if an LPC provides sufficient justification to TVA supporting the use of actual data inputs for both average pole height and discount factor, TVA may approve the use of such data. Further, TVA may re-evaluate the assumptions used in the formula periodically as well as the appropriateness of using assumptions or actual data in the formula and make adjustments as deemed appropriate. Any such adjustments will be reported at least annually to the Audit, Risk, and Regulation Committee of the TVA Board.

Before an LPC may apply the rate derived from the fully allocated cost methodology, TVA must validate data and approve such rate. Thereafter, on an annual basis, TVA will evaluate and approve the rate to be used. In the event that the methodology produces a rate for an individual LPC that TVA determines to be outside certain statistical parameters, an additional level of review will be required for such rate.[2] Recognizing that LPCs will need a period of time to phase-in any necessary changes to pole attachment rates to mitigate the effect of any significant changes in rates, TVA will work with LPCs to implement the rates derived from the methodology adopted herein using the attached Guideline Adjustment Scale (See Appendix 4) to provide for a transition period to the new rates.

Once the LPC begins applying the rate derived from the fully allocated cost methodology to its arrangements with communication attachers, such rate should be properly adjusted either by using the Handy Whitman Index or by applying the updated TVA approved pole attachment rate. TVA also expects pole attachment counts to be updated on a reasonable cycle in order to ensure accurate revenue collection to cover costs.

Incorporation into Wholesale Power Contract

For purposes of clarity, each LPC is expected to enter into an agreement with TVA as soon as practicable to more specifically incorporate TVA's regulatory control over pole attachment rates into the wholesale power contract. An LPC may begin using the rate methodology adopted herein as soon as TVA completes an evaluation of and affirms the rate. All LPCs are expected to begin using the new pole attachment rate methodology by January 2017 for all new and renewal contracts. In the event that individual LPCs' circumstances warrant, TVA may extend the time for implementation to no later than January 2018. TVA will develop guidance for LPCs to address the application of new rates where existing contracts contain such provisions as automatic renewal, extension, or re-opener provisions.

[2] Following the Board's adoption of the methodology, TVA Staff will evaluate the rates calculated by analyzing each LPC's actual data. If it is determined that there is a need to do so, the CEO is authorized to approve a mechanism to further address LPC rates that fall outside certain statistical parameters, subject to review by the Audit, Risk, and Regulation Committee of the TVA Board prior to implementation.

Attachment A - Appendix 1

Pole Attachment Formula Components

Definitions: For purposes of this Exhibit, the following definitions shall apply, and all financial data have been obtained from the local power companies (LPCs) most recent Annual Report to the Tennessee Valley Authority:

"**Administrative Charge**" shall mean the total of all of the LPCs' administrative and general expenses shown in all of the Sample LPCs' FERC Account 625 (which is a totaling account for FERC Accounts 920, 921, 923-926, 929 & 930) divided by the total of all of the LPCs' electric plant, net of accumulated depreciation.

"**Carrying Costs**" shall mean the sum of the Administrative Charge, the Depreciation Charge, the Maintenance Charge, the Rate of Return, and the Tax-Equivalent Charge, all of which shall be stated as a percentage of net plant.

"**Depreciation Charge**" shall mean the median depreciation rate for the LPCs' multiplied by the quotient of the LPCs' gross FERC Account 364 plant divided by the LPCs' net FERC Account 364 plant.

"**Maintenance Charge**" shall mean the three year average of the LPCs' FERC Account 593 plant expenses divided by the sum of the Sample LPCs' plant shown in FERC Accounts 364, 365 and 369, net of accumulated depreciation.

"**Net Cost of Bare Pole**" shall mean the pole investment as shown in the LPCs' FERC Account 364, net of accumulated depreciation, multiplied by 1 minus the discount factor divided by the total number of LPC utility poles included in FERC Account 364.

"**Discount Factor**" represents the percentage of distribution pole plant items (only) in FERC Account 364 excluding cross arms, anchors, etc.

"**Return on Investment**" shall mean eight and a half percent (8.5%).

"**Space Allocation**" is based upon a standard average 37.5 foot pole and the actual number of parties per pole, including the pole owner.

"**Tax and Tax-Equivalent Charges**" shall mean the quotient of the LPCs' tax and/or tax-equivalent payments shown in FERC Account 408.1 divided by all of the LPCs' electric plant, net of accumulated depreciation.

Attachment A - Appendix 2
Pole Attachment Formula Example

Net Cost of Bare Pole	$	278.93	(a)
Carrying Charge		26.61%	(b)
Annual Cost of Ownership (a*b=X)	$	74.22	X
Space Allocation (% of Total Pole)			
Fully Allocated Cost Formula (B+(1/(A-1)*C)+(1/A)*E)/(D+E)		28.44%	Y
Maximum Rate per Pole			
Fully Allocated Cost Formula (X*Y=Z)	$	21.11	Z

Space Allocation: Assumptions include 3 entities attaching to 37.5' pole.

(A) Number of Attaching Parties	3	
(B) Space Occupied by Attaching Party	1	feet
(C) Safety Space	3.33	feet
(D) Total Usable Space	13.5	feet
(E) Total Support Space (6' Ground + 18' Clearance)	24	feet

Net Cost of a Bare Pole:

(1) Gross Pole Investment (FERC A/C 364)	$	7,545,190.30	
(2) Depreciation Reserve (FERC A/C 108.364)	$	1,972,753.62	
(3) Gross Plant Investment (FERC A/C 364, 365,& 369)	$	14,998,392.35	
(4) Net Investment (Poles) (L(1)-L(2))	$	5,572,436.68	
(5) Net Investment (Bare Pole) (L(4) x .85)	$	4,736,571.18	
(6) Number of Poles		16,981	
(7) Net Cost of a Bare Pole (L(5)/L(6))	$	278.93	(a)

Carrying Charge:

(1) Administrative Charge	3.26%
(2) Maintenance Charge	8.56%
(3) Depreciation Charge	4.06%
(4) Taxes	2.23%
(5) Return on Investment	8.50%
(6) Total Carrying Charge Rate (L(1)+L(2)+L(3)+L(4)+L(5))	26.61% (b)

Administrative Charge

(1) A&G Expense (TVA AR Rpt item 625 & a/c 935 -page 6)	$ 1,321,181.13
(2) Net Plant Investment (TVA AR Rpt item 6-Page 1)	$ 40,478,879.32
(3) Administrative Charge (L(1)/L(2))	3.26%

Maintenance Charge

(1) Maintenance Exp.(Three yr avg. -TVA AR a/c 593-Page 6)	$ 837,521.00
(2) Net Investment (Pole Accounts 364, 365 & 369)	$ 9,779,762.19
(3) Maintenance Charge (L(1)/L(2))	8.56%

Depreciation Charge

(1) Depreciation Rate (TVA AR Rpt -page 11)	3.00%
(2) Gross Pole Investment (Account 364)	$ 7,545,190.30
(3) Net Pole Investment (Account 364)	$ 5,572,436.68
(4) Depreciation Charge (L(1) x (L(2)/L(3))	4.06%

Taxes

(1) Total Current and Deferred Taxes (TVA AR a/c 408 Property -pg 29)	$ 902,919.19
(2) Net Plant Investment	$ 40,478,879.32
(3) Taxes (L(1)/L(2))	2.23%

Return on Investment

Authorized by Regulatory Authority	8.50%

Attachment A - Appendix 3
Space Allocation Illustration:
The Fully Allocated Cost Method

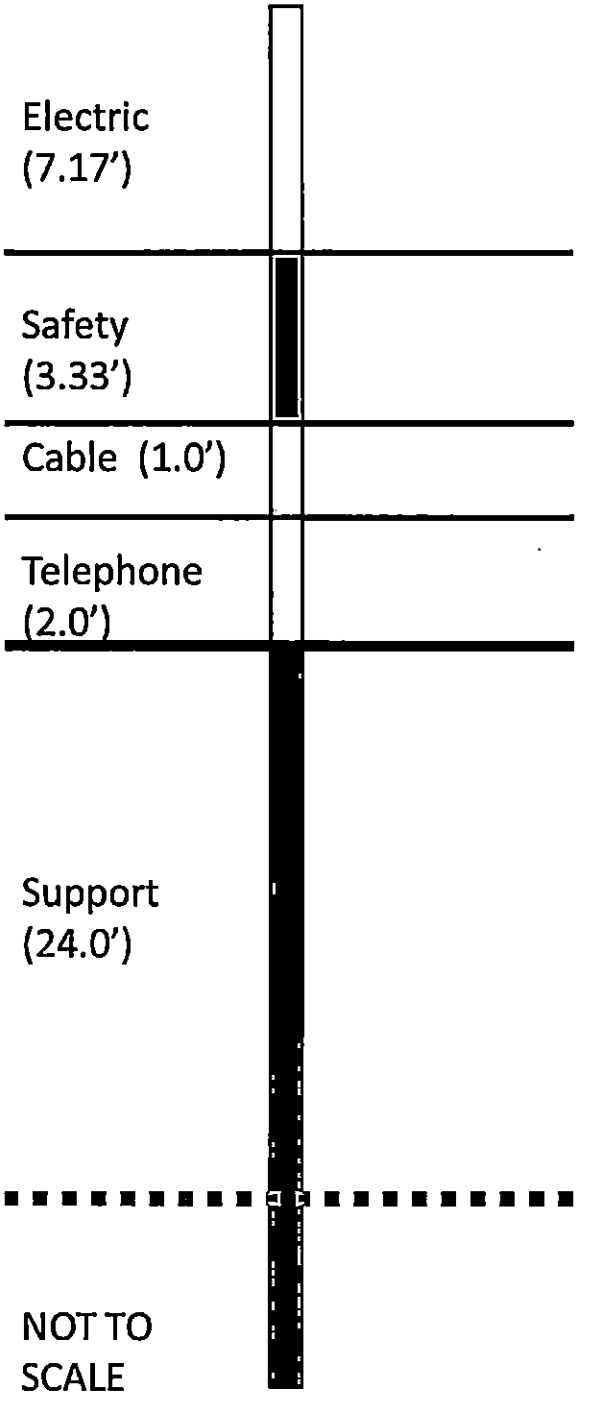
Allocates usable space

Equal sharing of safety space among all users attaching for communication purposes

Equal sharing of support space among all users including electric

Space allocation is 28.44% based on assumed 37.5 foot pole with 3 average users

Results in a fair allocation of costs among pole owner and pole users



Attachment A - Appendix 4

Guideline Adjustment Scale:

		Monthly - Adjustment (+/-)	
Dollar Variance	**Transition Period ***	**Low**	**High**
$ 0 - $ 5	Immediate action	$ -	$ 0.42
$ 6 - $10	No more than 2 years	$ 0.21	$ 0.42
$11 - $20	No more than 3 years	$ 0.31	$ 0.56
$21 - $30	No more than 4 years	$ 0.44	$ 0.63
$31 or greater	No more than 5 years	$ 0.52	$ > 0.52

* Transition period begins upon effective date of new or updated contract with attaching party.

TVA RESTRICTED AND PRE-DECISIONAL

Attachment B

Summary of Consideration and Comments

Related to Recommendation to TVA Board February 2016

To understand the proposal being made to the TVA Board, the following summary is being provided to address: 1) pole attachment rate methodologies, 2) the scope of pole attachment regulation, and 3) comments TVA received regarding such regulation.

I. METHODOLOGIES

TVA's Regulatory Assurance staff (Regulatory Staff) reviewed several methodologies by which other regulatory bodies set pole attachment rates. After such review, Regulatory Staff focused on four methodologies. Generally, all formulas for calculating pole attachment rates are the product of space factor and annual pole cost. Space factor, which establishes the percentage of annual pole costs that each user of the pole will bear, is the primary driver in the differences between formulas.

A. The Federal Communications Commission Method (FCC):

The FCC has established formulas for determining pole attachment rates for cable and telecommunication attachments for investor-owned utilities. The FCC uses separate formulas for cable and telecommunication service attachments. The FCC rate for cable service attachments results in the lowest rate, requiring the attacher to typically only pay a rate that amounts to recovery of approximately 7.4% of the annual pole cost. The traditional telecommunication formula produces a rate that is typically 16.9% of the annual pole cost in non-urban areas and 11.2% in urban areas. In order to further the FCC's goal of "promoting consistent, cross-industry attachment rates that encourage deployment and adoption of broadband Internet access services,"[1] the FCC, in recent years, has taken steps to "bring cable and telecom rates for pole attachments into parity at the cable-rate level" by applying certain allocators that serve to reduce recovery of capital and operating costs. The FCC does not have jurisdiction to regulate the pole attachment rates of municipal and cooperative systems.

After careful review, Regulatory Staff recognized that because the FCC formulas are designed to further the policy goal of encouraging broadband investment, particularly in rural areas, they do not appropriately compensate the electric utility for the attachment. Unlike the FCC, however, TVA is charged with keeping electric rates as low as feasible, and ensuring that electric ratepayers do not subsidize other business activities is important in achieving this objective. The manner in which the FCC methods determine space allocation on poles requires pole owners to absorb most of the capital and operating costs of a pole on the assumption that pole owners do not take the interests of attaching entities into account in making their capital

[1] *Implementation of Section 224 of the Act; A National Broadband Plan for Our Future*, WC Docket No. 07-245, GN Docket No. 09-51, Order on Reconsideration, (released Nov. 24, 2015)
https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-151A1.pdf

investment decisions. This is particularly true in the cable formula, which only accounts for the space occupied on the usable space of a pole. Regulatory Staff disagrees with this assumption.

TVA's recommended methodology differs from the FCC telecommunication formula in determining the space factor in several respects. Safety space, which is an amount of unused space that is required on utility poles to safely separate electric facilities from communication facilities, is assigned to the electric pole owner even though the safety space is solely for the safety of communication workers. Regarding support space, the FCC telecommunication method assigns 1/3 of the support space to the pole owner, which is the electric utility, and then the remaining 2/3 of the support space is equally shared among all attaching entities, which also includes the electric utility. The recommended TVA methodology allocates all of the safety space to the communications attachers and equally allocates support space among all attachers, including electric.

B. The American Public Power Association Model (APPA):

The APPA has created a model licensing agreement that covers attachments to municipal utility poles, ducts, and conduits owned by municipal electric utilities and a shared-cost formula for calculating rates. The APPA model is designed to provide the utility with full recovery of its expenses and fair compensation for use of its poles, and Regulatory Staff was able to utilize many components from the APPA model. The primary difference between the TVA proposed methodology and the APPA methodology is in allocation of safety space.

In determining the space factor, the APPA model allocates safety space equally among all pole users, including electric. Like the APPA model, TVA plans on employing assumptions for average pole height and discount factor, but with flexibility to allow the use of actual data when it is available and otherwise justified.

C. "Analysis of Pole Attachment Rate Issues in Tennessee," prepared by Tennessee Advisory Commission on Intergovernmental Relations (TACIR[2]):

In 2007, the TACIR commissioned a study of proposed legislation in Tennessee that addressed the issue of pole attachments by cable and telecommunication providers to the poles owned by cooperative and municipally owned utilities. The TACIR report collected information about methods used by electric providers in Tennessee, and it provided a comparison of the FCC cable formula, the FCC telecommunication formula, and a "full-cost" methodology utilized by some electric utilities. The full cost allocation method reviewed in the TACIR report most closely met the objectives of TVA's pole attachment regulation. For a three-party pole, this method generally results in a space factor of 28.4%, which allocates safety space to non-electric users and provides for equal sharing of support space. This is consistent with the final TVA recommendation.

[2] Available at https://www.tn.gov/assets/entities/tacir/attachments/pole_attachment_rate_issues.pdf

D. Tennessee Valley Public Power Association (TVPPA):

In response to a request from TVA, TVPPA proposed a methodology for TVA to consider in its regulation of pole attachment rates. (See Appendix 1) Like the formula reviewed in the TACIR report, TVPPA proposed a methodology that provides for an equal allocation of support space, an equal allocation of safety space to all communication users, and an allocation of usable space to each pole user. Because Regulatory Staff concluded that the methodology proposed by TVPPA best reflects full cost allocation, the final recommendation is largely consistent with the TVPPA proposal. It does, however, differ in a few respects. Notably, the Regulatory Staff recommendation includes an 8.5% ROI instead of 10%, and the TVA methodology uses the actual number of pole attachers instead of an assumption of three per pole.

II. SCOPE

The scope of pole attachment regulation by many regulatory bodies is broader than the regulation that TVA is seeking to refine with this current effort. Regulatory Staff considered whether such regulation should include joint use agreements or other similar reciprocal agreements with telephone companies that also own poles within LPCs' respective service areas. Because joint use and reciprocal arrangements provide benefits (from reciprocal use of poles) that are not present in non-reciprocal arrangements, the rate methodology under consideration was not determined at this time to be well-suited to address joint use and other reciprocal arrangements.

Further, Regulatory Staff noted that many regulatory bodies not only regulate the rate for pole attachments but also the terms and conditions for pole attachment, such as dismantling fees and penalties. Regulatory Staff contemplated a similar regulatory scope but determined that regulating beyond the rate is neither feasible nor appropriate at this time.

III. COMMENTS

A. Solicitation of Input

On August 12, 2015, TVA sent a letter to LPCs and the Tennessee Valley Public Power Association (TVPPA) indicating that TVA was evaluating further refinement of TVA's regulation of pole attachment rates. TVA invited recommendations on a pole attachment methodology. (See Appendix 2) TVPPA recommended the methodology described above, and TVA reviewed the TVPPA recommendation along with research conducted by Regulatory Staff. On November 10, 2015, TVA provided to all LPCs for input a draft recommendation addressing refinement of TVA's regulation of pole attachment rates and setting out a proposed methodology. (See Appendix 3)

TVA conducted a series of webinars and meetings with LPCs and received feedback from many of them and TVPPA. Largely, that feedback fell into three broad categories: methodology; changes in rates/implementation; and scope of regulation. Regulatory Staff considered the feedback in developing the final recommendation made to the TVA Board. Below is a summary of the Regulatory Staff's consideration of the feedback received.

B. Summary of Feedback

1. Methodology

TVA's initial draft recommendation provided for the safety space on an electric pole to be allocated equally among all attachers, including electric. TVA specifically asked for input on this issue, and many LPCs expressed concern about the appropriateness of allocating any of this space to electric. While some LPCs supported the equal allocation of safety space, almost all that commented on this issue noted that safety space is only required for the protection of communication workers. The National Electrical Safety Code recognizes this space as being a "Communication Worker Safety Zone," and many LPCs urged TVA to recognize this by allocating all of the safety space to non-electric attachers. Regulatory Staff agrees that safety space should be allocated to the communications attachers and this is reflected in the ultimate recommendation to the TVA Board.

For simplification and ease of administration, the methodology developed by Regulatory Staff for calculation of pole attachment rates includes certain assumptions. Regulatory Staff attempted to balance rate calculations for each LPC with concerns about cost and other resource constraints associated with compiling and validating individual data components that may not be easily available. The initial draft that was provided to LPCs for input included assumptions for pole height, discount factor, return on investment, space occupied per attacher, and number of attachers per pole. Feedback on each of these is provided below:

- Pole Height – Regulatory Staff's initial draft recommendation assumed a pole height of 37.5 feet, which is consistent with the assumption included in pole attachment rate formulas used in many jurisdictions. Several LPCs noted that pole heights vary significantly and questioned whether actual pole height data should be used. Some expressed concerns about using such assumptions since some LPCs operate and maintain an electric system with an average pole height greater than 37.5 feet and some LPCs may be lower. LPCs also indicated that utilizing each LPC's actual average pole height will produce a more accurate rate for that utility. While Regulatory Staff considers pole height to be an area where it is appropriate to utilize an assumption, the final recommendation to the TVA Board allows for LPCs to use actual data for both pole height and discount factor when requested by the LPC and verified by TVA as appropriate.
- Discount Factor – In order to determine the cost of a pole, the net pole cost as reflected in the LPC's financial records is reduced by an amount determined to represent costs associated with items such as cross arms and anchors because these items are not used by communication attachers. Consistent with some of the methodologies reviewed, Regulatory Staff considers 15% of the net pole costs to be a fair representation of these costs. Some LPCs suggested that it would be more appropriate to permit LPCs to use their actual system data for this input into the formula. As explained above, this is reflected in the final recommendation.
- Return on Investment – Staff has recommended that the methodology include an 8.5% return on investment (ROI). Several LPCs questioned the use of a standard ROI instead

of allowing for the use of individual LPC calculations of the cost of capital. Some suggested that 8.5% is too high, and others thought it is too low. Rather than using an individualized ROI that is calculated for each LPC system, Regulatory Staff considers a uniform ROI to be appropriate in order to promote consistency across the Valley. The assumption included in the methodology was calculated by TVA's Treasury Staff utilizing 2014 LPC financial data. TVA provided additional information to LPCs to describe the manner in which TVA concluded that 8.5% represents a reasonable weighted average cost of capital for LPCs as reflected in the final Regulatory Staff recommendation. (See Appendix 4)

- Space Occupied per Attacher – The initial draft recommendation included an assumption that one foot of space is occupied by each attaching party. Some LPCs noted that the amount of space used by an attacher can vary depending upon the type of attachment and questioned whether different assumptions should be used. To address this, Regulatory Staff modified the formula to calculate a rate for either one foot of space or two feet of space. This is reflected in the final recommendation to the TVA Board.
- Number of Attachers per Pole – Regulatory Staff's initial draft recommendation utilized an assumption of three attachers per pole in determining space allocation. Regulatory Staff considered this to be a reasonable average to use across the Valley, and this assumption is consistent with some of the other methodologies that were reviewed. Several LPCs provided information about the actual number of attachers on their system and questioned the use of an assumption instead of actual data. This feedback increased TVA's level of confidence that LPCs have the data available to determine the actual number of attachers. In the final recommendation to the TVA Board, space allocation will be determined using the actual number of attachers on the poles.

Tax-equivalent charges directly paid by LPCs are included in determining the carrying costs component of the proposed formula. Some LPCs suggested that 5% of the LPC power costs should also be added to their annual pole costs because LPC wholesale rates include an amount that represents payments paid by TVA to state and local governments in-lieu-of taxes (PILOT). Regulatory Staff does not consider it appropriate to include these power costs because they do not directly apply to the cost of the pole asset.

2. Change in Rates and Implementation Issues

As LPCs evaluated the rates for their own systems using the methodology being proposed to the TVA Board, many raised concerns about both the variance from current rates and the appropriate way to implement the rates. Several LPCs noted that their own rates are likely to increase based on a preliminary review of the rate methodology. They expressed concern about the reaction of current attachers to these increases and suggested that this could result in legal challenges and collection problems. Some LPCs suggested that it may be appropriate to cap the rates produced by the methodology or to otherwise provide for some flexibility in determining the appropriate rate for an LPC. For example, one LPC questioned whether TVA would allow an LPC to charge the Valley-wide average pole rate or a rate that is within a certain band of the Valley-wide average pole rate.

While Regulatory Staff considers it necessary for the TVA Board to adopt a methodology that ensures appropriate cost recovery for the use of electric system assets, Regulatory Staff recognizes the need to mitigate some of the impacts associated with the new rates. Accordingly, where rates are determined to be outside certain statistical parameters an additional level of review will be required. Following the Board's adoption of a methodology, Regulatory Staff will evaluate and analyze the rates calculated by applying each LPC's actual data to the methodology. The recommendation being made to the TVA Board provides for TVA's Chief Executive Officer (CEO) to approve a mechanism to further address LPC pole attachment rates that fall outside certain statistical parameters.

Regulatory Staff is also recommending a phase-in approach to implementing new pole attachment rates. This is designed to provide a period of time for the LPC and attaching parties to adjust to changes in rates calculated by the new methodology. TVA received many questions related to implementation and TVA's expectations related to new and existing contracts. Regulatory Staff believes that the nature of the issues raised is such that they can be resolved through continued discussion between TVA and LPCs.

3. Scope of Recommendation

Several LPCs suggested that TVA's regulatory focus should extend beyond the rates charged for attachments. For example, some suggested that TVA should authorize punitive actions to be taken for certain actions, such as failure to pay in a timely manner and failure to remove attachments. Some LPCs noted that certain actions by attaching parties can create safety and other concerns for the electric department. Some also suggested that TVA should develop regulations or guidance to address things such as non-payment, late fees, back-billing for unreported attachments, contractual issues, and enforcement of new rates.

Regulatory Staff considers these issues to be outside the scope of the present effort and is not making any recommendations to the TVA Board at this time. Regulatory Staff will continue to work with LPCs on issues related to pole attachments and evaluate the appropriateness of further regulation.

Attachment B - Appendix 1

TVPPA

Tennessee Valley
Public Power Association, Inc.

PO Box 6189
Chattanooga, TN 37401-6189
423.756.6511 • Fax: 423.267.2280
www.tvppa.com

October 8, 2015

Ms. Jennifer Brogdon
TVA Regulatory Assurance
1101 Market Street MR 6D
Chattanooga TN 37402

Dear Ms. Brogdon:

As you know, the Board of Directors of the Tennessee Valley Public Power Association (TVPPA) and various TVPPA committees have been evaluating ways in which TVA could more directly regulate pole attachment rates for TVPPA member systems. While pole attachment rates are already within TVA's regulatory oversight, this approach would provide a more specific framework for evaluating and regulating these rates.

The TVPPA Board of Directors discussed this matter at its September 14, 2015 meeting. At that meeting, the Board of Directors unanimously approved some pole cost calculation and cost allocation principles for recommendation to TVA based upon the work of the TVPPA Joint Use Committee and the TVPPA Regulatory Committee. TVPPA has developed a proposed Rate Formula based upon this methodology.

We have attached an overview of the proposed Rate Formula as Exhibit A. Exhibit B contains more detailed information on the Rate Formula. TVPPA submits that the Rate Formula provides a rate methodology that appropriately shares costs of pole ownership between local power companies and the parties that utilize their poles. The Rate Formula calculates the total annual cost of pole ownership, including administration, depreciation, maintenance, taxes and payments in lieu of taxes, cost of capital and a rate of return, and then allocates that total cost among pole users based on an assumed system average number of pole users. The allocation methodology provides for an equal allocation of support space on the pole among all pole users, an equal allocation of safety space on the pole among pole users other than the electric system, and an allocation of usable space to each pole user.

As you will note, TVPPA suggests that this formula should be limited to regulation of rates included in license agreements between local power companies and third parties making or maintaining wireline attachments in the communications space on the local power companies' poles. Today, local power companies typically operate under long-standing joint use arrangements or other similar reciprocal agreements with telephone companies that also own poles within the local power companies' respective service areas. This regulatory policy is not intended to apply to such current or future joint use arrangements.

The TVPPA Board recommends that TVA adopt a transition period that will give local power companies sufficient time to compile, review and, if necessary, reconcile their pole plant accounting records in order to capture the appropriate costs of ownership. This transition period should also allow local power companies sufficient time to phase in any necessary changes to their pole attachment rates to mitigate any significant changes in rates – positive or negative – on TVPPA member systems and the parties that utilize their poles. To provide greater predictability and stability for this rate structure, TVPPA further submits that TVA should allow local power companies to use plant account data from multiple years where necessary to normalize a local power company's plant costs; and TVPPA requests that TVA allow local power companies to utilize a generally accepted index, such as the Handy-Whitman Index, to adjust costs on intervals not to exceed five (5) years.

The transition plan will play a critical role in ensuring the success of this more detailed regulatory structure, and TVPPA would welcome the opportunity to discuss transition issues in greater detail with TVA. The TVPPA Joint Use and Regulatory Committees have a wealth of knowledge on this topic and will be valuable resources to TVA in this process.

We appreciate the opportunity to work with you and others at TVA on this issue. The TVPPA Board, its Committees, its staff and I will be available at your convenience to discuss next steps in this process.

Sincerely,

Jack W. Simmons
President & CEO

EXHIBIT A

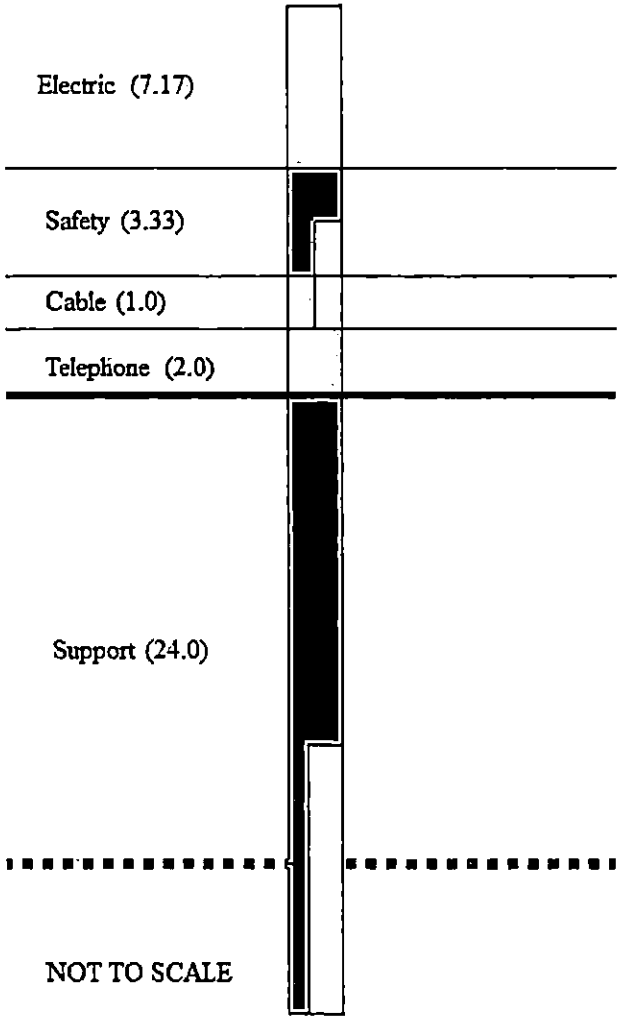
Pole Attachment Rate Formula

Attachment Rate	=	Pole Cost	*	Carrying Costs	*	Space Allocation

- Pole cost = Net cost of a bare pole (the average investment per pole net of depreciation)
- Carrying costs = Annual operating expenses associated with pole ownership
  - Administrative
  - Maintenance
  - Depreciation
  - Taxes and in lieu of tax payments
  - Cost of capital and rate of return
- Space allocation = share of costs based upon amount of space on a pole

EXHIBIT A

Space Allocation: The Fully Allocated Cost Method



- The fully allocated cost method allocates:
  - Usable Space
  - Equal sharing of Safety Space with communications attachers
  - Equal sharing of Support Space with all users (including local power company)
- Space Allocation: 28.44%, based upon an assumed 37.5' pole with 3 average users
- This allocation method results in a more equal allocation of costs among the pole owner and pole users

Attachment B - Appendix 1

EXHIBIT B

Rate Formula

1. **Attachment Rate Calculation**. A local power company (or "LPC") will use the following formula for calculating a cost-based pole attachment rate:

Attachment Rate = Pole Cost * Space Allocation * Carrying Costs

2. **Definitions**. For purposes of this Exhibit, the following definitions shall apply, and an LPC shall calculate the Pole attachment rate financial data drawn from the LPC's Annual Report filings with TVA:

a. "Administrative Charge" shall mean the total of all of the LPC's administrative and general expenses associated with ownership of its overhead plant, including without limitation those expenses shown in the LPC's FERC Account 625 (which is a totaling account for FERC Accounts 920, 921, 923-926, 929 & 930) divided by the total of all of the LPC's electric plant, net of accumulated depreciation.

b. "Carrying Costs" shall mean the sum of the Administrative Charge, the Depreciation Charge, the Maintenance Charge, the Rate of Return, and the Tax-Equivalent Charge, all of which shall be stated as a percentage of net plant.

c. "Depreciation Charge" shall mean the depreciation rate for the LPC's pole plant multiplied by the quotient of the LPC's gross FERC Account 364 plant divided by the LPC's net FERC Account 364 plant.

d. "Maintenance Charge" shall mean the total of all of the LPC's maintenance expenses associated with ownership of its overhead plant, including without limitation the LPC's FERC Account 593 plant expenses divided by the sum of the LPC's plant shown in FERC Accounts 364, 365 and 369, net of accumulated depreciation.

e. "Pole Cost" shall mean eighty-five percent (85%) of the pole investment as shown in the LPC's FERC Account 364, net of accumulated depreciation, divided by the total number of LPC utility poles included in FERC Account 364.

f. "Rate of Return" shall mean ten percent (10%).

g. "Space Allocation" shall mean twenty-eight and 44/100 percent (28.44%), which is based upon an average 37.5 foot pole and an average of three pole users per pole, including the pole owner.

h. "Tax and Tax-Equivalent Charges" shall mean the total of all of the LPC's tax and tax equivalent charges associated with ownership of its overhead plant, including without limitation the quotient of the Sample LPCs' tax and/or tax-equivalent payments shown in FERC Account 408.1 divided by all of the Sample LPCs' electric plant, net of accumulated depreciation.

3. **Applicability.** The Rate Formula is limited to regulation of rates included in license agreements between LPCs and third parties making or maintaining wireline attachments in the communications space on the local power companies' poles. As of the date of adoption of this policy, LPCs typically operate under long-standing joint use arrangements or other similar reciprocal agreements with telephone companies that also own poles within the local power companies' respective service areas. Those agreements provide for a different allocation and sharing of operating and financial responsibilities between the parties. While a LPC is not precluded from using this rate policy for joint use agreements, nothing in this rate policy is intended to apply to such current or future joint use arrangement.

Attachment B - Appendix 2

Tennessee Valley Authority, 1101 Market Street, MR 6D-C, Chattanooga, Tennessee 37402-2801

August 12, 2015

Dear :

At the February 5, 2014, TVPPA Regulatory Committee meeting, TVA President and CEO Bill Johnson stated that in light of increased regional regulatory focus on pole attachment fees, TVA will evaluate whether further refinement of its regulation of Local Power Company (LPC) pole attachment rates is needed. TVA, pursuant to the TVA Act, has the exclusive authority to regulate retail rates and service practices of LPCs, including establishing terms and conditions under which TVA power is resold. TVA has a duty to ensure that electrical power is supplied at the lowest feasible cost, and this requires that the electric system is appropriately compensated for the use of electric system assets. To this end, in accordance with Mr. Johnson's directive, TVA is further analyzing the pole attachment charges throughout the Valley to determine whether current practices ensure appropriate recovery so that ratepayers are charged costs properly assigned to their electric system.

TVA appreciates the efforts by TVPPA's Joint Use Committee, on behalf of the TVPPA membership, in studying pole attachment rate practices at TVA's request. We look forward to the Committee making a recommendation to TVA on a fair and consistent pole attachment cost recovery methodology. Given that any regulatory policy changes in pole attachment regulation will impact many, if not all, LPCs, TVA encourages TVPPA's and LPCs' engagement and input on this matter. If, as a result of these efforts, TVA staff concludes that refinements to TVA's pole attachment regulation are necessary or desirable, we expect to make such a proposal to the TVA Board at its February 2016 meeting. In order to provide adequate time for review and consideration of feedback from all 155 LPCs, the following preliminary timeline has been established:

- August to September 2015 - TVA continues to coordinate with TVPPA Joint Use Committee and solicits input from LPCs. Send all feedback to Barry Barnett at jbbarnett@tva.gov.
- September 2015 - Date by which TVA expects a recommendation from LPCs and TVPPA
- September 2015 - TVA completes draft recommendation and provides to TVPPA and LPCs
- October 2015 to November 2015 - TVA solicits feedback from LPCs and TVPPA on TVA's draft recommendation
- January 2016 - TVA finalizes recommendation for TVA Board action Sincerely,

Jennifer Brogdon
Director
Regulatory Assurance

Attachment B - Appendix 3

Tennessee Valley Authority, 1101 Market Street, MR 6D-C, Chattanooga, Tennessee 37402-2801

November 10, 2015

Dear TVA Local Power Company:

TVA has been reviewing its regulation of pole attachment rates. We appreciate the local power companies (LPCs) who responded to our August 12 request and provided input to TVA on an appropriate and consistent cost recovery methodology. TVA also appreciates the collaborative efforts of TVPPA and the Joint Use Committee who, on behalf of its members, studied pole attachment rate practices and made a proposal to TVA.

TVA has incorporated feedback from LPCs and TVPPA in developing the enclosed pole attachment rate methodology. Information is provided on the scope, methodology, and implementation plan.

So that you can fully consider TVA's recommendation, I am enclosing a rate calculation template to assist you in calculating the pole attachment rate that would be derived from the formula proposed in TVA staff's recommendation if it is ultimately adopted by the TVA Board. An excel spreadsheet version will be e-mailed to you for your use. If you need assistance with the template, please contact Laura McDade at 423-751-2474 or ldmcdade@tva.gov.

TVA plans to present a final recommendation to the TVA Board at the February 2016 meeting. As you will see in the enclosed recommendation, TVA is specifically seeking additional input on the allocation of safety space to pole users. Please submit your input on TVA's Staff Recommendation to Barry Barnett at 865-632-2107 or jbbarnett@tva.gov. To allow adequate time for TVA's review and consideration, please provide your feedback on this recommendation by November 30. Please note that a webinar is scheduled Thursday, November 19 from 2:00 p.m. until 4:00 p.m. (CT) to provide an opportunity for more discussion.

In order to better analyze pole attachment rates, TVA would appreciate current pole attachment rate information from you. Your assigned TVA Distributor Assurance field accountant will contact your accountant for information in the coming days. If you have any questions, please contact me at 423-751-8397 or a member of the Regulatory Assurance staff.

Sincerely,

(Original Signed By):

Jennifer Brogdon
Director
Regulatory Assurance

Enclosures

Attachment B - Appendix 3

Tennessee Valley Authority

TVA Staff Recommendation for Refining Pole Attachment Rate Regulation

Provided For Input

November 10, 2015

Scope

Tennessee Valley Authority (TVA) is the exclusive retail rate regulator for local power companies (LPCs) that distribute TVA power. One primary objective of TVA is to ensure that power is sold at rates as low as feasible, and accordingly, LPC electric systems must be appropriately compensated for the use of electric system assets for non-electric purposes. As part of approving each LPC's electric rates, TVA evaluates each LPC's revenue requirements which, among other things, include revenue from pole attachment fees.

TVA staff's recommendation for refining its pole attachment regulation (Staff Recommendation) is being provided for TVPPA's and LPC's input, and a final recommendation ultimately will be proposed to the TVA Board. The scope of the Staff Recommendation is limited to regulation of rates included in agreements between LPCs and third parties making or maintaining wireline attachments, such as cable or telecommunication (including broadband) providers. This recommendation is not intended to apply to reciprocal or joint use agreements at this time although TVA also expects appropriate costs to be borne by all participants in these reciprocal or joint use agreements.

Methodology

TVA staff reviewed information related to pole attachment regulation throughout the country. Staff has observed that most methods for calculating pole attachment rates are based on the annual cost (or carrying charge) of a pole and the proportion of the attaching space on the pole occupied by an attachment. TVA does not feel that these methods recover the full costs associated with the pole attachment, so the Staff Recommendation provides for a pole attachment rate methodology that recovers the full cost of the pole in order to ensure that electric system ratepayers are not incurring costs that should be borne by attachers.

Under this proposed rate methodology, the pole attachment rate is calculated by first establishing the total annual cost of pole ownership, which includes administration, depreciation, maintenance, taxes, and rate of return. The total cost is then allocated among pole users based on: an assumed system average number of pole users; an equal allocation of support space among the pole users; an equal allocation of safety space among pole users; and an allocation of usable space to each pole user. As to the allocation of safety space among all pole users, TVA is specifically seeking additional input.

It has been suggested to TVA that allocation of safety space to only the third-party attachers would be more appropriate because the safety space is for the benefit of those third parties. Accordingly, while the attached methodology reflects an equal allocation of this space, TVA staff will further evaluate this issue along with any additional feedback that is received.

TVA recognizes that LPCs will need a period of time to phase-in any necessary changes to pole attachment rates to mitigate any significant changes in rates that will impact the LPCs and the attachers. Accordingly, TVA will work with LPCs to implement the rates derived from this rate methodology using the attached Guideline Adjustment Scale (Appendix 1) to provide for a transition period to the new rates. The Guideline Adjustment Scale provides for a period of time to adjust rates based on the difference between current and new rates.

In establishing the formula to reflect the fully allocated cost methodology for each individual LPC, TVA has utilized certain assumptions to simplify the calculation. For example, the calculation assumes an average of three attaching parties per pole, an average pole height of 37.5 feet, a 15 percent cross arm discount factor, and a uniform return on investment equal to 8.5%. A uniform return on investment percent used by all LPCs in the calculation of their pole cost rate will help promote consistency across the Valley. TVA will re-evaluate this percentage periodically for the pole attachment formula. A more detailed explanation of the components in the pole attachment formula is located in Appendix 2, and an example of the data used in the formula is located in Appendix 3.

Formula: (Space Allocation) x (Net Cost of Bare Pole) x (Carrying Cost)

- **Space Allocation** - The share of cost based upon amount, types, and purposes of space on the pole. (See Appendix 4)
- **Net Cost of a Bare Pole** – 85% of the net pole investment divided by the number of poles.
- **Carrying Cost** - Annual operating expenses associated with pole ownership. (Administrative, Maintenance, Depreciation, and Taxes as a percent of net plant plus input for return on investment.)

Once the LPC is applying the rate derived from the fully allocated cost methodology, then the LPC may use the Handy Whitman Index to annually escalate the pole attachment rate. Also, TVA would expect pole attachment counts to be updated in a reasonable cycle time to ensure accurate revenue collection to cover cost.

Implementation

Contingent upon TVA Board approval, TVA and LPCs should enter into an agreement no later than January 2017 to put the new methodology and rate into effect, some of which will be transitioned over time. TVA expects LPC's financial and accounting records to be accurate and urges LPCs to begin reviewing accounting information now. TVA recognizes that some LPCs may need this additional time (until January 2017) to review and reconcile pole plant accounting data.

Appendix 1

Guideline Adjustment Scale:

		Monthly - Adjustment (+/-)			
Dollar Variance	**Transition Period ***	**Low**		**High**	
$ 0 - $ 5	Immediate action	$	-	$	0.42
$ 6 - $10	No more than 2 years	$	0.21	$	0.42
$11 - $20	No more than 3 years	$	0.31	$	0.56
$21 - $30	No more than 4 years	$	0.44	$	0.63
$31 or greater	No more than 5 years	$	0.52	$	> 0.52

* Transition period begins once current contractual agreements have expired.

Appendix 2

Pole Attachment Formula Components

Definitions: For purposes of this Exhibit, the following definitions shall apply, and all financial data have been obtained from the local power companies (LPCs) most recent Annual Report to the Tennessee Valley Authority:

"**Administrative Charge**" shall mean the total of all of the LPCs' administrative and general expenses shown in all of the Sample LPCs' FERC Account 625 (which is a totaling account for FERC Accounts 920, 921, 923-926, 929 & 930) divided by the total of all of the LPCs' electric plant, net of accumulated depreciation.

"**Carrying Costs**" shall mean the sum of the Administrative Charge, the Depreciation Charge, the Maintenance Charge, the Rate of Return, and the Tax-Equivalent Charge, all of which shall be stated as a percentage of net plant.

"**Depreciation Charge**" shall mean the median depreciation rate for the LPCs' multiplied by the quotient of the LPCs' gross FERC Account 364 plant divided by the LPCs' net FERC Account 364 plant.

"**Maintenance Charge**" shall mean the three year average of the LPCs' FERC Account 593 plant expenses divided by the sum of the Sample LPCs' plant shown in FERC Accounts 364, 365 and 369, net of accumulated depreciation.

"**Pole Cost**" shall mean eighty-five percent (85%) of the pole investment as shown in the LPCs' FERC Account 364, net of accumulated depreciation, divided by the total number of Sample LPC utility poles included in FERC Account 364.

"**Rate of Return**" shall mean eight and a half percent (8.5%).

"**Space Allocation**" shall mean twenty-six and 96/100 percent (26.96%), which is based upon an average 37.5 foot pole and an average of three parties per pole, including the pole owner.

"**Tax and Tax-Equivalent Charges**" shall mean the quotient of the LPCs' tax and/or tax-equivalent payments shown in FERC Account 408.1 divided by all of the LPCs' electric plant, net of accumulated depreciation.

Appendix 3
Pole Attachment Formula Example

Net Cost of a Bare Pole	$	278.56	(a)
Carrying Charge		26.81%	(b)
Annual Cost of Ownership (a*b=X)	$	74.68	X
Space Allocation (% of Total Pole)			
Fully Allocated Cost Formula (B+(1/(A)*C)+(1/A)*E)/(D+E)		26.96%	Y
Maximum Rate per Pole			
Fully Allocated Cost Formula (X*Y=Z)	$	20.13	Z

Space Allocation: Assumptions include 3 entities attaching to 37.5' pole.		
(A) Number of Attaching Parties	3	
(B) Space Occupied by Attaching Party	1	feet
(C) Safety Space	3.33	feet
(D) Total Usable Space	13.5	feet
(E) Total Support Space (6' Ground + 18' Clearance)	24	feet

Net Cost of a Bare Pole:		
(1) Gross Pole Investment (FERC A/C 364)	$	7,545,190.30
(2) Depreciation Reserve (FERC A/C 108.364)	$	1,972,753.62
(3) Gross Plant Investment (FERC A/C 364, 365,& 369)	$	14,998,392.35
(4) Net Investment (Poles) (L(1)-L(2))	$	5,572,436.68
(5) Net Investment (Bare Pole) (L(4) x .85)	$	4,736,571.18
(6) Number of Poles		17,004
(7) Net Cost of a Bare Pole (L(5)/L(6))	$	278.56 (a)

Carrying Charge:	
(1) Administrative Charge	3.26%
(2) Maintenance Charge	8.75%
(3) Depreciation Charge	4.06%
(4) Taxes	2.23%
(5) Return on Investment	8.50%
(6) Total Carrying Charge Rate (L(1)+L(2)+L(3)+L(4)+L(5))	26.81% (b)

Administrative Charge		
(1) A&G Expense (TVA AR Rpt item 625 & a/c 935 -page 6)	$	1,321,181.13
(2) Net Plant Investment (TVA AR Rpt item 6-Page 1)	$	40,478,879.32
(3) Administrative Charge (L(1)/L(2))		3.26%
Maintenance Charge		
(1) Maintenance Exp.(Three yr avg. -TVA AR a/c 593-Page 6)	$	855,593.57
(2) Net Investment (Pole Accounts 364, 365 & 369)	$	9,779,762.19
(3) Maintenance Charge (L(1)/L(2))		8.75%
Depreciation Charge		
(1) Depreciation Rate (TVA AR Rpt -page 11)		3.00%
(2) Gross Pole Investment (Account 364)	$	7,545,190.30
(3) Net Pole Investment (Account 364)	$	5,572,436.68
(4) Depreciation Charge (L(1) x (L(2)/L(3))		4.06%
Taxes		
(1) Total Current and Deferred Taxes (TVA AR a/c 408 Property -pg 29)	$	902,919.19
(2) Net Plant Investment	$	40,478,879.32
(3) Taxes (L(1)/L(2))		2.23%
Return on Investment		
Authorized by Regulatory Authority		8.50%

Appendix 4
Space Allocation:
The Fully Allocated Cost Method

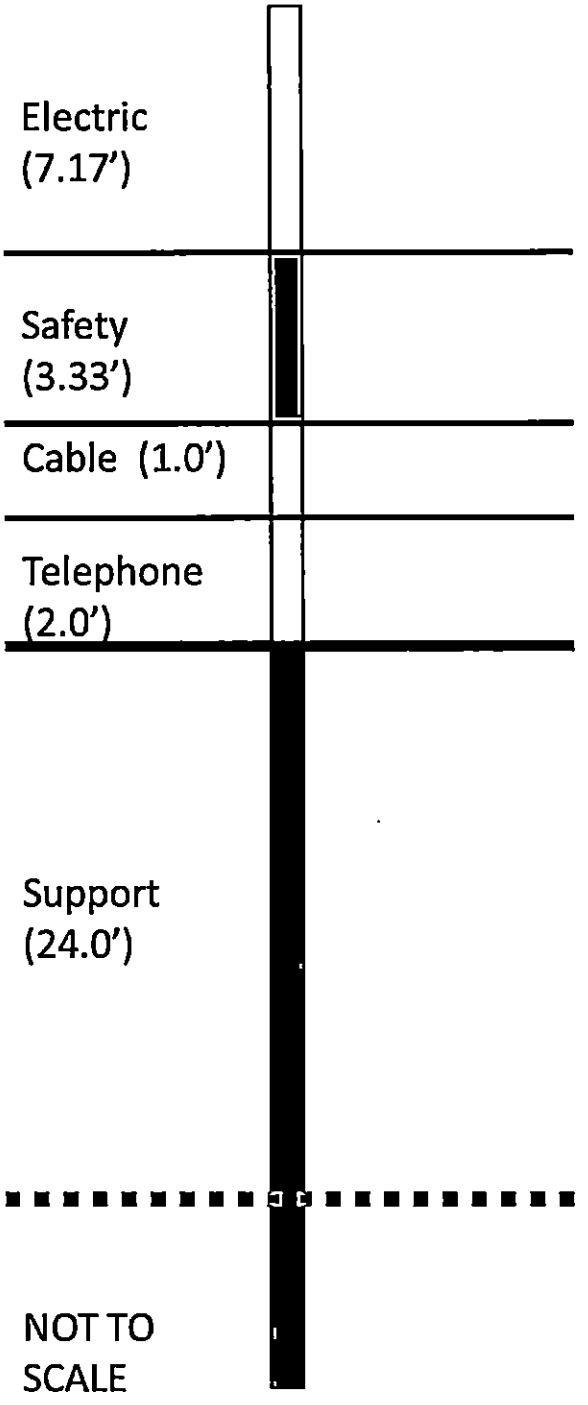
Allocates usable space

Equal sharing of safety space among all users including electric

Equal sharing of support space among all users including electric

Space allocation is 26.96% based on assumed 37.5 foot pole with 3 average users

Results in equal allocation of costs among pole owner and pole users



POLE ATTACHMENT FEE CALCULATION
FISCAL YEAR ENDED JUNE 30, 2014

Select Local Power Company	*Input Fiscal Year of Data*
	2014

This template is a tool to calculate pole attachment rates under TVA's proposed pole attachment recommendation. To use, input data specific to the local power company for the gray sections only. All other numbers calculate automatically. Source locations for the required data are noted in blue. For any questions or help populating the required data, please contact Laura McDade at (423) 751-2474 or ldmcdade@tva.gov.

DATA INPUTS

Data required for gray sections only.

Plant Account Data

	2014	
Total Plant		
Item 1 - Gross Plant	$ -	ANNUAL REPORT, PAGE 1
Item 2 - Depreciation	-	ANNUAL REPORT, PAGE 1
Net Plant	$ -	

	2014		
	Gross Plant	Depreciation	Net Plant
Plant Related to Poles	ANNUAL REPORT, PAGES 9 & 11		
Account 364 - Poles, Towers, and Fixtures	$ -	-	$ -
Account 365 - Overhead Conductors & Devices	$ -	-	$ -
Account 369 - Services	$ -	-	$ -
Total	$ -	$ -	$ -

Account 364 Data

	2014	
Number of Poles Pole	-	LPC INTERNAL POLE COUNT RECORDS
Depreciation (% Gross Plant)	0.00%	ANNUAL REPORT, PAGE 11

Expense Data

	2014	
Item 625 + Account 935 - Administrative &General Expense	$ -	ANNUAL REPORT, PAGE 6
Account 408.1 - Property Taxes Net	$ -	ANNUAL REPORT, PAGE 29
Current Deferred Operating Income Taxes Net	$ -	LPC INTERNAL ACCOUNTING RECORDS
Noncurrent Deferred Operating Income Taxes	$ -	LPC INTERNAL ACCOUNTING RECORDS

Account 593 - Overhead Lines Distribution Maintenance		ANNUAL REPORT, PAGE 6
2012	$ -	*Note: Confirm that account 593 captures maintenance expenses for accounts 364, 365 & 369*
2013	$ -	
2014	$ -	
3 Year Average	$ -	

Rate of Return

Authorized by Regulatory Authority	8.5%

CALCULATIONS

Space Allocation Scenarios	3 party, 1 foot
(A) Number of Attaching Parties	3
(B) Space Occupied by Attaching Party	1
(C) Safety Space	3.33
(D) Total Usable Space	13.50
(E) Total Support Space (6' Ground + 18' Clearance)	24
Space Allocation (% of Total Pole)	
Fully Allocated Cost Formula (B+(1/(A)*C)+(1/A)*E)/(D+E)	26.96%
Net Cost of a Bare Pole (Breakdown below)	NA
Carrying Charge Rate (Breakdown below)	NA
Annual Cost of Ownership	NA

Maximum Rate per Pole (Space Allocation % x Annual Cost)	3 party, 1 foot
Fully Allocated Cost Formula.	NA

POLE ATTACHMENT FEE CALCULATION
FISCAL YEAR ENDED JUNE 30, 2014

Select Local Power Company		*Input Fiscal Year of Data*
[redacted]		2014

Breakdown of Inputs in Calculations

Net Cost of a Bare Pole		
(1) Gross Pole Investment	$	-
(2) Depreciation Reserve	$	-
(3) Net Current Deferred Operating Income Taxes	$	-
(4) Net Noncurrent Deferred Operating Income Taxes	$	-
(5) Net Deferred Operating Income Taxes (L(3)+L(4))	$	-
(6) Gross Plant Investment	$	-
(7) Net Deferred Operating Income Taxes (Poles) ((L(1)/L(6) x L(5))		NA
(8) Net Investment (Poles) (L(1)-L(2)-L(7))		NA
(9) Net Investment (Bare Pole) (L(8) x .85)		NA
(10) Number of Poles		-
(11) Net Cost of a Bare Pole (L(9)/L(10))		**NA**
Carrying Charge Rate		
Carrying Charge		
(1) Administrative Charge		NA
(2) Maintenance Charge		NA
(3) Depreciation Charge		NA
(4) Taxes		NA
(5) Return on Investment		8.5%
(6) Total Carrying Charge Rate (L(1)+L(2)+L(3)+L(4)+L(5))		**NA**
Administrative Charge		
(1) A&G Expense (625 + 935)	$	-
(2) Net Plant	$	-
Investment		
(3) Administrative Charge (L(1)/L(2))		NA
Maintenance Charge		
(1) Average Maintenance Expense (593)	$	-
(2) Net Investment (Pole Accounts 364, 365 & 369)	$	-
(3) Maintenance Charge (L(1)/L(2))		NA
Depreciation Charge		
(1) Depreciation Rate		0.00%
(2) Gross Pole Investment (Account 364)	$	-
(3) Net Pole Investment (Account 364)	$	-
(4) Depreciation Charge (L(1) x (L(2)/L(3))		NA
Taxes		
(1) Total Current and Deferred Taxes	$	-
(2) Net Plant Investment	$	-
(3) Taxes (L(1)/L(2))		NA
Return on Investment		
Authorized by Regulatory Authority		8.5%

WACC with Public Utility Basis Capital Structure

- Using a Public Power Utility Basis Model implied LPC capital structure and applying a CAPM approach to derive targeted ROE, a reasonable WACC for LPCs would be 8.5%

Components	TVA Equivalent Debt	Lower Cost Debt	Lowest Cost Debt
Debt Rate of Return	7.0%	6.8%	6.6%
Equity Rate of Return	8.7%	8.7%	8.7%
WACC RESULTS			
LPC Average	8.4%	8.3%	8.3%
LPC Minimum	7.6%	7.5%	7.4%
LPC Maximum	8.7%	8.7%	8.7%

- The table above does not include any adjustments for project specific risk, which should be considered when calculating hurdle rates for project analysis
- The equity return of 8.7% is estimated using the Capital Asset Pricing Model

  $r_i = r_{rf} + \beta(R_m - r_{rf})$

  r_{rf} = 4.08% (30 year average of 10-year US Treasury Bond Yield)

  β = 0.93 (debt/equity per Utility Basis model; utility unlevered Barra beta estimate of 0.42*)

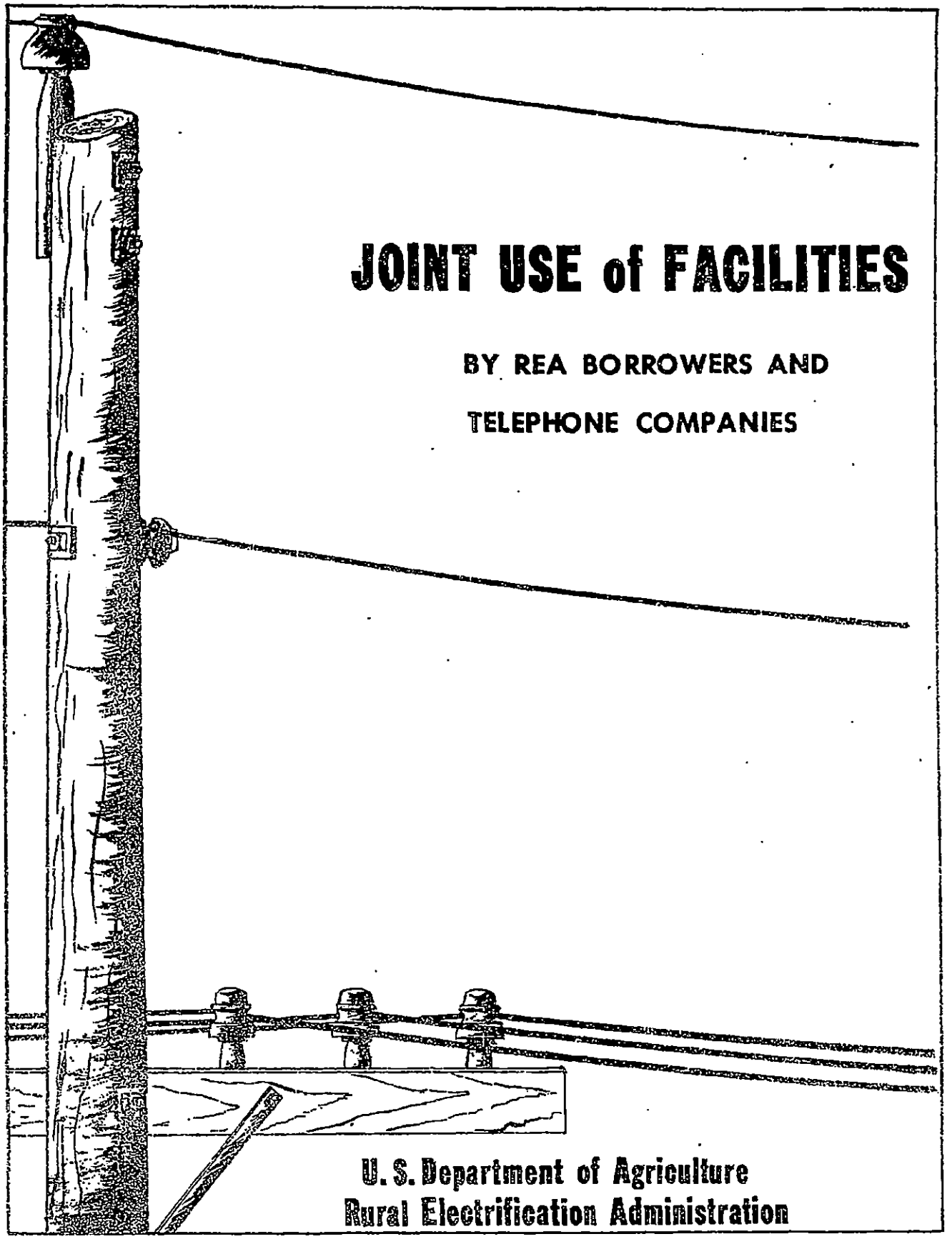
  $(R_m - r_{rf})$ = 5% (research-based long-term average equity return)**

* beta estimate sourced from January 2015 update of Betas by Sector by Aswath Damodaran, Stern School of Business, NYU

** 5% was commonly used prior to 2008, after which all equity market risk premium have significantly increased. A light downward trend is observed after 2010 according to a KPMG study in January 2015.

WA Exhibit No. 4

I/A
V2/V3



JOINT USE of FACILITIES

BY REA BORROWERS AND TELEPHONE COMPANIES

U. S. Department of Agriculture
Rural Electrification Administration

CONSIDERATIONS INVOLVED IN JOINT USE OF FACILITIES BY REA BORROWERS AND TELEPHONE COMPANIES

TABLE OF CONTENTS

CONSIDERATIONS INVOLVED IN JOINT USE OF FACILITIES BY REA BORROWERS AND TELEPHONE COMPANIES

Introduction

Joint use of facilities by power and telephone systems has been found to be feasible in rural areas with the development of high strength telephone wires that can match rural power line spans and the development of generally accepted construction standards and safety devices to minimize any possible hazards. The power line carrier telephone system, wherein the power wires act as guides for carrier radio waves, is another recent development having application in rural areas.

Joint use raises for REA borrowers questions of policy with respect to (1) protecting and advancing the interests of their members in connection with telephone rates and area coverage, (2) uniform relations with local telephone companies in their areas that may include mutuals, independents and members of the Bell Telephone System, and (3) development of engineering, construction and operating practices in cooperation with the local telephone companies that will make joint use an asset to all. Joint use raises for REA questions with respect to use of loan funds and protection of the Government's interests in borrowers' systems as they may be affected by joint use arrangements.

Joint Use Obj

The joint use contract forms, copies of which were distributed to all borrowers with the Administrator's memorandum of July 3, 1947, were designed to include desirable legal, business and technical factors to provide adequate protection for REA borrowers and to establish a practical working framework for relations between REA borrowers and their local telephone companies when they wish to engage in joint use of facilities.

I. Objective of Joint Use of Facilities

The primary objective of joint use of facilities is to achieve savings in cost by eliminating one pole line. Elimination of structural conflicts as well as local regulations may also require or make joint use desirable.

The costs as well as the savings of joint use construction should be shared equitably by the power and telephone suppliers. Where the savings are appreciable, it can well mean that both services can be extended into areas where construction might not otherwise be economically feasible. Therefore, even though power system poles are already in place and can accommodate telephone facilities with little, if any, extra cost, telephone companies should be required to make payments representing their fair share of the costs of the poles so that savings can accrue to the consumers of electricity as well as to the telephone subscribers. In other words, the power consumers should not be asked to subsidize telephone subscribers.

II. REA Financing as Related to Joint Use Facilities

As a general rule, an REA borrower should not invest REA loan funds in joint use facilities in a given area to a greater extent than would have been required to provide facilities capable of rendering electric service alone in the same given area. This will raise no serious problem since the pole sizes in common use by REA borrowers are capable of accommodating certain telephone facilities and the contracts provide that the telephone companies shall pay any additional capital outlays required as well as rentals for the benefits they secure from the use of REA borrowers' poles and wires. Moreover, since telephone companies may also set and own joint use poles, an REA borrower should actually have a lesser investment in pole plant than would be required for separate line construction considering an area as a whole.

III. Telephone Company Qualifications

The sample forms of contracts and the recommended payments contained therein are predicated on the assumption that the telephone supplier is fully competent to carry its part of responsibility and that the REA borrower will not be put to any additional expense by reason of the telephone supplier's lack of knowledge or competence. Therefore, REA borrowers, before entering joint use agreements, should satisfy themselves that:

A. the telephone company concerned is a financially responsible organization which is fully capable of bearing its proper share of the costs and responsibilities for any possible hazards.

B. the telephone company has available a qualified engineering and construction force to assure that its facilities on joint use lines will be installed in accordance with accepted construction standards and safety practices.

C. the telephone company has a maintenance and operations force capable, where necessary, of maintaining its own facilities when installed jointly with power lines.

IV. Insurance

The contract forms have no clauses concerning insurance coverage on the assumption that each party will carry its usual insurance and that in the event of any claims, liability will be assessed according to the legal responsibility that is determined.

REA borrowers should satisfy themselves that the local telephone companies with which they share joint use facilities either

A. provide adequate reserves for insurance, or

B. carry adequate insurance policies.

The Bell Telephone System, for example, is self insured and sets aside reserves against losses. However, smaller telephone companies should be required to have liability insurance coverage comparable to that carried by REA borrowers.

I/A
V2/R3

WA Exhibit No. 5
Blue Ridge EMC 2016
Average Attaching Entities

BREMC Distribution Poles in Joint Use		
A	B	A x B
# Attachers (Including BREMC)	Joint Use Poles	
2	37,137	74,274
3	17,915	53,745
4	878	3,512
5	31	155
Totals	**55,961**	**131,686**
Avg # Attaching Entities		**2.35**

WA Exhibit No. 6

I v2 / A v3

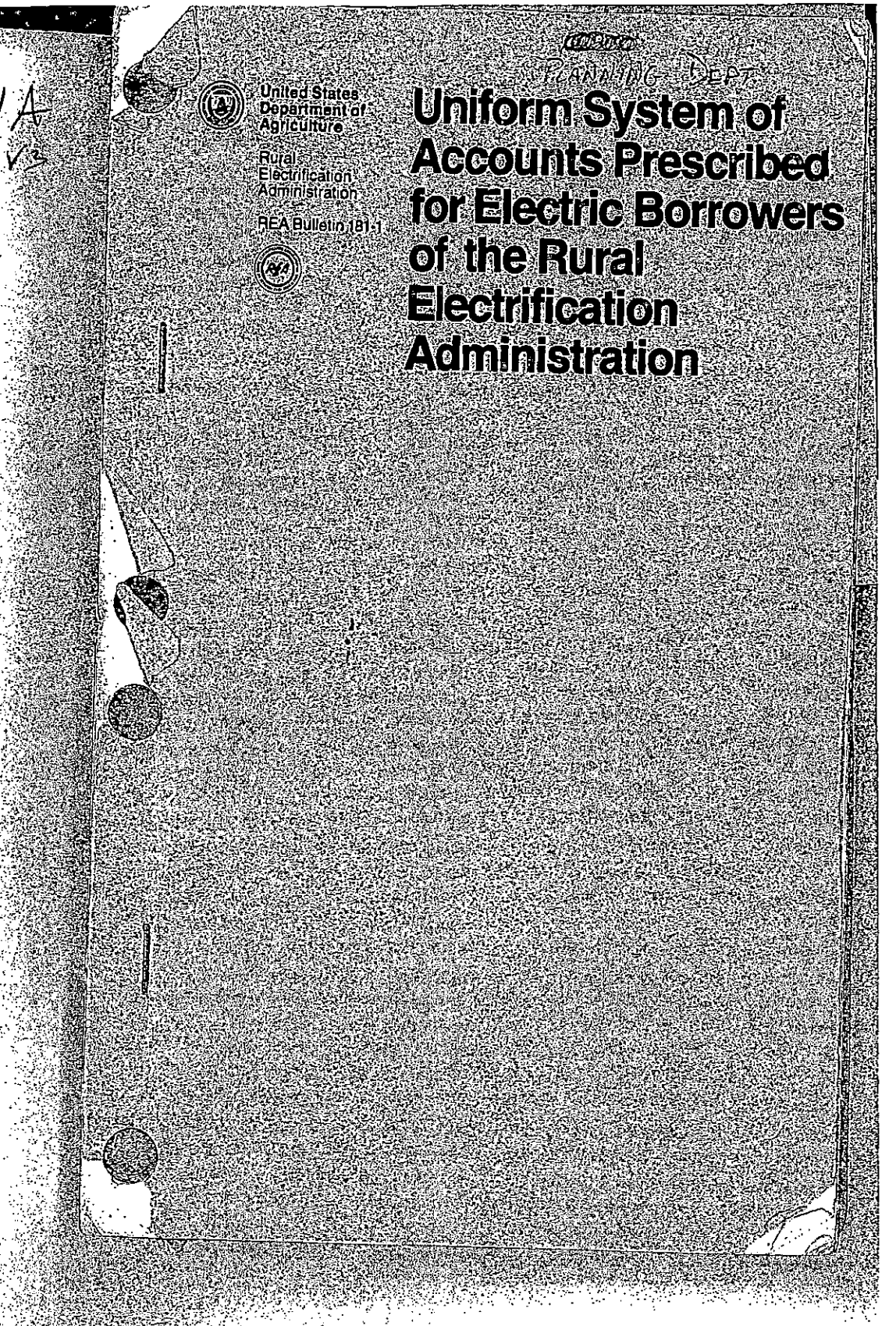
BLUE RIDGE ELECTRIC CPR Master with Balance Querydate : '31-dec-2016 11:59:59 PM' , Co_ID : '1'

Cpr #	Description	Depr Rate	Gldepexp	Gldepacc	Plant Type	CPR Quantity	CPR Amount	Height	
3640038	POLES 20 FT CLASS 7	0.3000	4030000	1086000	D	[illegible]	[illegible]	20	2500
3640039	POLES 30 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	30	0
3640040	POLES 30 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	30	600
3640041	POLES 30 FT CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	30	690
3640042	POLES 30 FT CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	30	1560
3640043	POLES 30 CLASS 6	0.3000	4030000	1086000	D	[illegible]	[illegible]	30	912330
3640044	POLES 35 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	315
3640045	POLES 35 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	210
3640046	POLES 35 FT CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	2625
3640047	POLES 35 FT CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	15505
3640048	POLES 35FT CLASS 5	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	547505
3640049	POLES 35 FT CLASS 6	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	224735
3640050	POLES 35 FT CLASS 7	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	17885
3640051	POLES 40 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	1160
3640052	POLES 40 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	19520
3640053	POLES 40 CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	66200
3640054	POLES 40 -CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	1064520
3640055	POLES 40 CLASS 5	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	427800
3640056	POLES 40 CLASS 6	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	59960
3640057	POLES 45 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	4680
3640058	POLES 45 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	61560
3640059	POLES 45 FT CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	167085
3640060	POLES 45 CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	176535
3640061	POLES 45 FT CLASS 5	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	33525
3640062	POLES 45 FT CLASS 6	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	2070
3640063	POLES 50 CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	4350
3640064	POLES 50 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	44250
3640065	POLES 50 FT CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	56950
3640066	POLES 50 CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	4050
3640067	POLES 50 FT CLASS 6	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	2050
3640068	POLES 55 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	55	4400
3640069	POLES 55 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	55	7810
3640070	POLES 55 CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	55	7810
3640071	POLES 55 FT CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	55	1045
3640072	POLES 60 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	3000
3640073	POLES 65 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	1560
3640074	POLES 65 FT CLASS H2	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	2795
3640075	POLESTEEL 55 -CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	55	385
3640076	POLE AL 38 #20-865 HAPCO	0.3000	4030000	1086000	D	[illegible]	[illegible]	38	25992
3640077	POLESTEEL 35/3 DIST.	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	105
3640078	POLESTEEL 40/3 DIST.	0.3000	4030000	1086000	D	[illegible]	[illegible]	40	920
3640079	POLE STEEL 45/3 DIST.	0.3000	4030000	1086000	D	[illegible]	[illegible]	45	1215
3640080	POLESTEEL 50/3 DIST.	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	600
3640089	POLE, 60 FT CLASS1	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	60
3640090	POLE, 70FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	70	560
3640091	POLE, STEEL 60-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	540
3640092	POLE, STEEL 55 LD-1	0.3000	4030000	1086000	D	[illegible]	[illegible]	55	550
3640093	POLE AL 38' BRONZE #20-865-P31	0.3000	4030000	1086000	D	[illegible]	[illegible]	38	2508
3640095	POLES 70 FT CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	70	0
3640096	POLE, STEEL, 35' MT. HG 41X6", TWO ARMS,BRONZE	0.3000	4030000	1086000	D	[illegible]	[illegible]	35	210
3640098	POLESTEEL 85-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	85	425
3640099	POLES 65 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	325
3640100	POLES 50FT CLASS H1	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	50
3640101	POLESTEEL 60-CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	120
3640102	POLESTEEL 50-LD1	0.3000	4030000	1086000	D	[illegible]	[illegible]	50	200
3640103	POLE 85 CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	85	0
3640106	POLESTEEL 80-H4/LD5	0.3000	4030000	1086000	D	[illegible]	[illegible]	80	240
3640107	POLESTEEL 75-LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	75	150
3640108	POLESTEEL 75-H4/LD5	0.3000	4030000	1086000	D	[illegible]	[illegible]	75	75
3640109	POLESTEEL 60-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	480
3640110	POLESTEEL 70-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	70	910
3640111	POLESTEEL 70-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	70	140
3640112	POLESTEEL 65-H4/LD5	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	195
3640113	POLES 60FT CLASS 4	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	0
3640114	POLEBOTTOM STL 60-LD1	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	0
3640115	POLESTEEL 85-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	85	170
3640118	POLEBOTTOM STL 65 LD1	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	130
3640119	POLETOP STL 60-90 LD1	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	120
3640120	POLESTEEL 85' CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	85	425
3640121	POLESTEEL 75-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	75	150
3640122	POLESTEEL 90-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	90	630
3640123	POLESTEEL 70-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	70	140
3640124	POLESTEEL 80-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	80	1120
3640125	POLES 60FT CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	0
3640126	POLES 65 FT CLASS 3	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	0
3640127	POLESTEEL 65'-CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	130
3640133	POLESTEEL 120-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	120	0
3640134	POLESTEEL 65-CLASS 2	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	455
3640135	POLESTEEL 70' CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	70	210
3640136	POLESTEEL 75-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	75	300
3640137	POLESTEEL 85-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	85	425
3640138	POLESTEEL 85-H5/LD6	0.3000	4030000	1086000	D	[illegible]	[illegible]	85	170
3640139	POLESTEEL 90-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	90	180
3640140	POLESTEEL 95-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	95	0
3640141	POLESTEEL 95-H4/LD5	0.3000	4030000	1086000	D	[illegible]	[illegible]	95	0
3640142	POLESTEEL 95-H6/LD7	0.3000	4030000	1086000	D	[illegible]	[illegible]	95	0
3640143	POLESTEEL 100-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	100	0
3640144	POLESTEEL 100-H7/LD8	0.3000	4030000	1086000	D	[illegible]	[illegible]	100	0
3640145	POLESTEEL SELF-SUP 90'	0.3000	4030000	1086000	D	[illegible]	[illegible]	90	0
3640146	POLE, 110 SELF SUPPORT	0.3000	4030000	1086000	D	[illegible]	[illegible]	110	0
3640147	POLESTEEL 95' BOONE/BR TRANS #BM9	0.3000	4030000	1086000	D	[illegible]	[illegible]	95	0
3640148	POLESTEEL, 120' H7/LD8	0.3000	4030000	1086000	D	[illegible]	[illegible]	120	0
3640149	POLE, GALVANIZED STEEL 100'	0.3000	4030000	1086000	D	[illegible]	[illegible]	100	0
3640150	POLE STEEL 100' H3	0.3000	4030000	1086000	D	[illegible]	[illegible]	100	0
3640151	POLESTEEL 115-H5/LD6	0.3000	4030000	1086000	D	[illegible]	[illegible]	115	0
3640152	POLESTEEL 110' H4/LD5	0.3000	4030000	1086000	D	[illegible]	[illegible]	110	110
3640153	POLESTEEL 100-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	100	0
3640154	POLESTEEL 110-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	110	0
3640155	POLESTEEL 105-H6/LD7	0.3000	4030000	1086000	D	[illegible]	[illegible]	105	0
3640156	POLESTEEL 105-H3/LD4	0.3000	4030000	1086000	D	[illegible]	[illegible]	105	105
3640157	POLESTEEL 105' H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	105	105
3640159	POLESTEEL 95-H5/LD10	0.3000	4030000	1086000	D	[illegible]	[illegible]		0
3640160	POLE,POLETOP BRACKET 54" BROWN	0.3000	4030000	1086000	D	[illegible]	[illegible]		0
3640161	POLE,STEEL 65 LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	65	260
3640162	POLE,POLETOP BRACKET 54" GREEN	0.3000	4030000	1086000	D	[illegible]	[illegible]		0
3640164	POLESTEEL 90-H2/LD3	0.3000	4030000	1086000	D	[illegible]	[illegible]	90	90
3640166	POLESTEEL 80-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	80	80
3640167	POLES 80 FT CLASS 1	0.3000	4030000	1086000	D	[illegible]	[illegible]	80	0
3640168	POLE STEEL LD1	0.3000	4030000	1086000	D	[illegible]	[illegible]	75	150 height from Lee Layton email 08/15/16
3640171	POLESTEEL 90-H5/LD6	0.3000	4030000	1086000	D	[illegible]	[illegible]	90	180
3640174	POLESTEEL 105-H4/LD5	0.3000	4030000	1086000	D	[illegible]	[illegible]	105	105
3640177	POLESTEEL 60-H1/LD2	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	120
3640178	Pole, Steel 115 GPTP115X	0.3000	4030000	1086000	D	[illegible]	[illegible]	115	0
3640179	Pole, Cell Tower, 60'	0.3000	4030000	1086000	D	[illegible]	[illegible]	60	0
3640180	Pole, Moto, From RidgeLink	0.2300	4030000	1086000	D	[illegible]	[illegible]		
						108,330	536,826,528.67		3994160

AVERAGE POLE HEIGHT 36.87

WA Exhibit No. 7

I/A
V2/V3



6. Hollow-core oil-filled cable, including straight or stop joints pressure tanks, auxiliary air tanks, feeding tanks, terminals, potheads and connections, ventilating equipment, etc.
7. Lead and fabric covered conductors, including insulators, compound filled, oil filled, or vacuum splices, potheads, etc.
8. Lightning arresters.
9. Municipal inspection.
10. Permits.
11. Protection of street openings.
12. Racking of cables.
13. Switches.
14. Other line devices.

359 Roads and trails.

This account shall include the cost of roads, trails, and bridges used primarily as transmission facilities.

ITEMS

1. Bridges, including foundation piers, girders, trusses, flooring, etc.
2. Clearing land.
3. Roads, including grading, surfacing, culverts, etc.
4. Structures, constructed and maintained in connection with items included herein.
5. Trails, including grading, surfacing, culverts, etc.

NOTE: The cost of temporary roads, bridges, etc., necessary during the period of construction but abandoned or dedicated to public use upon completion of the plant, shall be charged to the accounts appropriate for the construction.

4. DISTRIBUTION PLANT

360 Land and land rights.

This account shall include the cost of land and land rights used in connection with distribution operations. (See electric plant instruction 7.)

NOTE: Do not include in this account the cost of permits to erect poles, towers, etc., or to trim trees. (See account 364, Poles, Towers and Fixtures, and account 365, Overhead Conductors and Devices.)

361 Structures and improvements.

This account shall include the cost in place of structures and improvements used in connection with distribution operations. (See electric plant instruction 8.)

362 Station equipment.

This account shall include the cost installed of station equipment, including transformer banks, etc., which are used for the purpose of changing the characteristics of electricity in connection with its distribution.

ITEMS

1. Bus compartments, concrete, brick and sectional steel, including items permanently attached thereto.
2. Conduit, including concrete and iron duct runs not part of building.
3. Control equipment, including batteries, battery charging equipment, transformers, remote relay boards, and connections.
4. Conversion equipment, indoor and outdoor, frequency changers, motor generator sets, rectifiers, synchronous converters, motors, cooling equipment, and associated connections.
5. Fences.
6. Fixed and synchronous condensers, including transformers, switching equipment, blowers, motors, and connections.
7. Foundations and settings, specially constructed for and not expected to outlast the apparatus for which provided.
8. General station equipment, including air compressors, motors, hoists, cranes, test equipment, ventilating equipment, etc.
9. Platforms, railings, steps, gratings, etc., appurtenant to apparatus listed herein.
10. Primary and secondary voltage connections, including bus runs and supports, insulators, potheads, lightning arresters, cable and wire runs from and to outdoor connections or to manholes and the associated regulators, reactors, resistors, surge arresters, and accessory equipment.
11. Switchboards, including meters, relays, control wiring, etc.
12. Switching equipment, indoor and outdoor, including oil circuit breakers and operating mechanisms, truck switches, disconnect switches.

NOTE: The cost of rectifiers, series transformers, and other special station equipment devoted exclusively to street lighting service shall not be included in this account, but in account 373, Street Lighting and Signal Systems.

363 Storage battery equipment.

This account shall include the cost installed of storage battery equipment used for the purpose of supplying electricity to meet emergency or peak demands.

ITEMS

1. Batteries, including elements, tanks, tank insulators, etc.
2. Battery room connections, including cable or bus runs and connections.
3. Battery room flooring, when specially laid for supporting batteries.
4. Charging equipment, including motor generator sets and other charging equipment and connections, and cable runs from generator or station bus to battery room connections.
5. Miscellaneous equipment, including instruments, water stills, etc.
6. Switching equipment, including end-cell switches and connections, boards and panels, used exclusively for battery control, not part of general station switchboard.
7. Ventilating equipment, including fans and motors, louvers, and ducts not part of building.

NOTE: Storage batteries used for control and general station purposes shall not be included in this account but in the account appropriate for their use.

364 Poles, towers and fixtures.

This account shall include the cost installed of poles, towers, and appurtenant fixtures used for supporting overhead distribution conductors and service wires.

ITEMS

1. Anchors, head arm, and other guys, including guy guards, guy clamps, strain insulators, pole plates, etc.
2. Brackets.
3. Crossarms and braces.
4. Excavation and backfill, including disposal of excess excavated material.
5. Extension arms.
6. Foundations.
7. Guards.
8. Insulator pins and suspension bolts.
9. Paving.
10. Permits for construction.
11. Pole steps and ladders.
12. Poles, wood, steel, concrete, or other material.
13. Racks complete with insulators.
14. Railings.
15. Reinforcing and stubbing.
16. Settings.
17. Shaving, painting, gaining, roofing, stenciling, and tagging.
18. Towers.
19. Transformer racks and platforms.

365 Overhead conductors and devices.

This account shall include the cost installed of overhead conductors and devices used for distribution purposes.

ITEMS

1. Circuit breakers.
2. Conductors, including insulated and bare wires and cables.
3. Ground wires, clamps, etc.
4. Insulators, including pin, suspension, and other types, and tie wire or clamps.
5. Lightning arresters.
6. Railroad and highway crossing guards.
7. Splices.
8. Switches.
9. Tree trimming, initial cost including the cost of permits therefor.
10. Other line devices.

NOTE: The cost of conductors used solely for street lighting or signal systems shall not be included in this account but in account 373, Street Lighting and Signal Systems.

WA Exhibit No. 8

Before the
Federal Communications Commission
Washington, D.C. 20554

CC Docket No. 86-212

In the Matter of

Amendment of Rules and Policies Governing the Attachment of Cable Television Hardware to Utility Poles

REPORT AND ORDER

Adopted: June 10, 1987; Released: July 23, 1987

By the Commission:

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I. INTRODUCTION

1. On June 6, 1986, we released a Notice of Proposed Rule Making (NPRM) in CC Docket No. 86-212, *Amendment of Rules and Policies Governing the Attachment of Cable Television Hardware to Utility Poles*. The NPRM proposed to amend our rules and policies governing the attachment of cable television (CATV) hardware to poles owned or controlled by telephone or electric utilities. This Report and Order addresses those issues raised by the NPRM and the commenters in this proceeding.

II. BACKGROUND

2. Congress mandated that the Commission ensure that the rates, terms, and conditions under which cable television operators attach their hardware to utility poles are just and reasonable (unless the state elects to assert such jurisdiction). 47 U.S.C. § 224. Sections 1.1401 through 1.1415 of the Commission's Rules, 47 C.F.R. §§ 1.1401-1.1415, were promulgated to implement Section 224. *See Adoption of Rules for the Regulation of Cable Television Pole Attachments*, CC Docket 78-144, *First Report and Order*, 68 FCC 2d 1585 (1978); *Second Report and Order*, 72 FCC 2d 59 (1979); *Memorandum Opinion and Order in CC Docket 78 - 144*, 77 FCC 2d 187 (1980), *aff' d, Monongahela Power Co. v. FCC*, 655 F.2d 1254 (D.C. Cir. 1981). Recently the United States Court of Appeals for the District of Columbia Circuit determined in *Alabama Power Company v. FCC*, 773 F.2d 362 (1985) (*Alabama Power*), [1] that the Commission's methodology did not result in the calculation of the maximum just and reasonable rate allowable under the Act and the Commission had not adequately explained its rationale. Accordingly, the NPRM offered proposed policy changes and revised rules for comment, pursuant to Sections 1, 4(i), and 403 of the Communications Act, 47 U.S.C. §§ 151, 154(i), and 403.[2]

A. Legislative History of Section 224

3. It has been common practice for cable television operators to lease space on utility poles in order to provide cable television service to a community. This arrangement was unregulated by any federal authority until the late 1970's, when Congress, in response to concern raised by the cable industry, enacted the Pole Attachment Act of 1978, Pub. Law No. 95-234, § 6, 92 Stat. 33, 35 (codified at 47 U.S.C. § 224). In Section 224 Congress established a range of just and reasonable pole attachment rates which "assures a utility the recovery of not less than the additional costs of providing pole attachments, nor more than an amount determined by multiplying the percentage of the total usable space . . . which is occupied by the pole attachment by the sum of the operating expenses and actual capital costs of the utility attributable to the entire pole . . . ." 47 U.S.C. § 224(d)(1). To determine this just and reasonable pole attachment rate, Congress directed the Commission to "institute an expeditious program which will necessitate a minimum of staff, paperwork and procedures consistent with fair and efficient regulation." S. Rep. No. 95-580,

95th Cong., 1st Sess. 21 (1977). To that end, Congress noted that although there may be some difficulty in determining the components of the operating expenses and actual capital costs of the utility, special accounting measures or studies should not be necessary since the majority of the cost and expense items attributable to the utility pole plant are already established and reported to various regulatory bodies and therefore the information is already a matter of public record. *Id.* at 19-20. Congress did not expect the Commission to reexamine the reasonableness of the cost methodology sanctioned by the various regulatory agencies, and it recognized that the Commission would have to "make its best estimate" of some of the less readily identifiable costs. *Id.* at 20.

4. As indicated above, the range of rates set out by Congress grants the Commission discretion to fix the rate somewhere between the incremental costs of the utility and the cable operator's share of the utility's fully allocated costs. Incremental costs consist of those costs which would not be incurred by the utility's "but for" the presence of cable attachments. *Id.* at 19. Congress noted that incremental costs might include pre-construction survey costs and engineering, make-ready and change-out[3] costs incurred in preparing the utility pole for cable attachments. *Id.* at 19. However, it expected a pole attachment rate based on incremental costs to be minimal, since most of those costs would have been fully recovered in the make-ready charges already paid by the cable company. *Id.*

5. By contrast, fully allocated costs refer to the operating expenses and capital costs incurred by the utility in owning and maintaining poles regardless of the presence of cable. Operating expenses and capital costs of poles include interest on debt, return on equity, depreciation, taxes, administrative and maintenance expenses. *Id.* at 19-20. In practical terms, Congress intended the Commission to establish a formula by which rates could readily be calculated based on the Commission's best judgment as to how to allocate costs between the utility and the cable operator. *Id.*

6. Based on the statutory language, the Commission established the following formula to determine the cable company's share of the utility's fully allocated costs of owning a pole:

Maximum = *Space Occupied by CATV* x (Operating Expenses + Capital Costs of Poles)
Rate Total Usable Space

See , e. g., Continental Cablevision of New Hampshire, Inc. v. Concord Electric Company, Mimeo No. 5536 (released July 3, 1985); *Capital Cities Cable, Inc. v. Southwestern Public Service Co.*, Mimeo No. 5431 (released June 28, 1985). Although operating expenses and capital costs of poles (also known as "carrying charges) can be expressed directly as dollar amounts, these costs may also be expressed as a percentage of pole investment. 47 C.F.R. § 1.1404(g)(9). Thus, the operating expenses and capital costs of poles normally are determined from the cost of a bare pole and the carrying charges attributable to the cost of owning a pole. Consequently, the Commission used the following formula to calculate the maximum just and reasonable rate per pole attachment:

Maximum = *Space Occupied by CATV* x Cost of a x Carrying
Rate Total Usable Space Bare Pole Charges

We determined the cost of a bare pole, that is, the pole with non-pole-related appurtenances removed, from the following formula:

Net Cost of a Gross Pole Depreciation 15% Net Bare Pole[4] = *Investment - Reserve - Pole Investment*
Number of Poles

For the purpose of establishing a just and reasonable rate, the Commission characterized these costs as approximating fully allocated costs, the upper end of the range of rates established by Congress. *Second Report and Order*, CC Docket No. 78-144, 72 FCC 2d 59, 71 (1979) (*Second Report*).

B. Background of Current Rule Making

7. In *Alabama Power* the court found that the so-called "maximum" rate established by the Commission does not accurately reflect the maximum rate allowed under the Act. Specifically, it raised questions about the Commission's computations of the administrative and tax expense components of the carrying charges.[5] Although the Commission usually includes guys and anchors[6] as part of the cost of a bare pole, it excluded them in *Alabama Power* because, contrary to the normal practice, the cable company was required to supply its own. The exclusion of the cost of guys and anchors, the court said, was in error. However, the court raised, but did not consider, the issue of whether requiring the cable company to provide and install guys and anchors is a cost, borne by the cable company, that should be considered part of the maximum rate described by § 224(d)(1) (*i.e.*, a deduction from the maximum rate). Likewise, it questioned whether the items eliminated from the pole line account (FERC Account 364) to obtain the cost of a bare pole are, in fact, pole related, and, if so, erroneously omitted from the Commission's calculations.

8. As to the carrying charges components, the court questioned the Commission's policy of using only pole-related accounts in the numerator of the fraction to determine the administrative expense component but a denominator that represents a utility's total electric plant investment. According to the court, this fraction yields an artificially low percentage. As for the tax component of carrying charges, the court did not dispute *per se* the Commission's policy in pole attachment cases of using the flow-through method of accounting (*i.e.*, taxes actually paid) and rejecting the normalization method.[7] Rather, it pointed out that since a more recent Commission decision (in a non-pole attachment case) adopted the normalization approach, the unexplained inconsistency could not be upheld.[8] In addition, because the Commission made no attempt to establish the utility's incremental costs (the minimum rate), the court rejected the Commission's argument that, although it may not have set the maximum statutory rate, its order should be upheld since the rate fell within the minimum and maximum rates permitted under the statute. Therefore, the court judged the validity of the order solely on the basis of whether the

Commission achieved its stated goal of setting the maximum statutory rate and found that we failed to set the maximum rate.

9. In this Rule Making proceeding we have examined the questions raised by the court since they affect the method traditionally used to determine the operating expenses and capital costs of poles in our maximum rate formula. We have also reviewed whether the Commission need only set a rate within the zone established by the statute, rather than a rate approaching the statutory maximum. At the same time we have reviewed the procedural rules to clarify the steps that should be taken and the information that should be submitted by the parties in each complaint proceeding. Comments and Reply comments relating to these issues have been filed.[9]

III. ADJUSTMENTS TO THE FORMULA

A. Cost of a Bare Pole

1. Non - Pole - Related Appurtenances [10]

10. In our formula to determine the cable company's share of the utility's fully allocated costs of owning a pole, we adjusted the net pole investment by 15 percent to eliminate the investment in crossarms and other non-pole related items. As indicated previously, utility-supplied guys and anchors were always included as part of the cost of a bare pole except when the cable company was required to supply its own. The NPRM sought comments on what items should be classified as non-pole-related, whether the 15 percent adjustment adequately reflects such investment and, if not, what suitable rebuttable presumption should be adopted. It indicated that parties could propose different figures for telephone and electric companies, although we expressed a concern that different figures for different types of utilities might increase the burden on the staff and parties without concommitant public interest benefits. The comments on this issue were extensive, with considerable variation as to what the percentage adjustment should be, how the adjustment should be calculated, and what items should be classified as non-pole related.

11. National Cable Television Association (NCTA) asserts that utility guys and anchors should be classified as non-cable-related. It argues that guys and anchors benefit utilities, not cable systems, and therefore utilities should bear their entire cost. However, it notes that utilities typically do not maintain records which would reveal the embedded investment in guys and anchors separate from other non-cable-related appurtenances. As a result, it suggests that the Commission should establish a new rebuttable presumption for adjustments for non-cable-related appurtenances to reflect utility guys and anchors as non-cable appurtenances. NCTA Comments at 24. Because actual average non-cable-related investment is different for telephone companies and electric companies, it recommends that the adjustment for the electric company appurtenances should be set at 35 percent and the adjustment for telephone companies should be 20 percent. *Id.*[11]

12. Continental Cablevision (Continental) states that, while *Alabama Power* found utility guys and anchors of benefit to all pole users, the Commission must recognize that these guys and anchors stabilize more than just the poles. Therefore, it maintains that the investment in guys and anchors should also be spread across the utility's investment in the overhead plant they stabilize (*e.g.*, aerial cable and aerial wire). Continental Comments at 18. Continental Cablevision recommends that in calculating the amount of investment in utility-supplied guys and anchors to include in the cost of a bare pole, we should first determine the investment in all investment accounts benefitting from the guys and anchors - such as Federal Energy Regulatory Commission (FERC) Accounts 368 (line transformers), 369 (services), 364 (poles), and 373 (street lighting). The utility's investment in guys and anchors would then be allocated to pole investment in the same proportion that Account 364 bears to investment in these other accounts. It asserts that this is the allocation method approved by the court in *Texas Power*.[12] Continental Comments at 27-39 and Reply Comments at 5. Utilizing this methodology, Continental Cablevision submits that the appurtenance ratio for telephone companies of 15 percent should be retained and the appurtenance ratio for electric utilities should be raised to 30 percent. *Id.*

13. Cable Operators and Associations states that accounting for the appurtenance investment must be a matter of approximation, unless the Commission resorts to detailed tariff proceedings. Cable Operators and Associations Comments at 16.[13] It asserts that, based upon a survey of appurtenance investment in pole attachment proceedings before state regulatory commissions, the appurtenance ratio should be 20 percent for electric utilities and 15 percent for telephone companies. *Id.* at 18.

14. Edison Electric Institute (EEI) asserts that the appurtenance ratio should be minimal since the normal standard is armless construction for both electric and telephone utilities. EEI Comments at 5. It states that to the extent that some crossarms are included in pole accounts, these have the effect of making more room available on the pole for CATV attachments and, therefore, cable operators avoid the cost of changeout. *Id.*

15. Bell Atlantic states that crossarms are used almost exclusively by electric utilities (open wire plant). Bell Atlantic Comments at 3. It indicates that because of the economic and technical advantages of insulated wire groups and sheathed cable, open wire facilities have been virtually abandoned by telephone companies. Instead, cable and insulated wire pair are attached directly to the poles, without the need for crossarms. *Id.* Bell Atlantic argues that open wire telephone plant remains in use only in some rural telephone companies where customer density, traffic demands, limited growth, and other factors have not dictated its replacement. *Id.* It recommends that, rather than an overall 15 percent ratio, the Commission should apply a two part test whereby there would be no deduction for crossarm costs for utilities that declare they have no (defined as less than 1 percent of total pole investment) crossarm investment. There would be a presumed deduction of 15 percent or a different, factually supported figure for a utility that declares that it has some (more than 1 percent) crossarm investment. *Id.* at 4.

16. BellSouth and several other utilities maintain that the legislative history makes it clear that it is those costs attributable to the entire pole, irrespective of their relationship to the CATV attachments, that are relevant in defining the maximum rate, and it is irrelevant whether a particular cost is "cable related." Therefore, they assert, there should be no deduction for appurtenances from the pole plant. *See*, *e. g.*, BellSouth Reply Comments at 7.

17. First, we agree with those commenters who maintain that, in determining which items should be classified as excluded appurtenances, the relevant standard is whether the items are pole-related, rather than whether they are cable-related. Section 224(d)(1) of the Pole Attachment Act defines the maximum rate as "an amount determined by multiplying the percentage of the total usable space . . . which is occupied by the pole attachment by the sum of the operating expenses and actual capital costs of the utility *attributable to the entire pole* . . . ." (Emphasis added.) In discussing Subsection (d) of the Act, the Senate Report states that "the upper end of this range is expressed in terms of a charge to the CATV pole user which reflects its proportionate share of the *total costs of the pole*, such total being the recurring operating expenses and capital costs attributable to the utility pole. Cable's proportionate share would be calculated by determining the percentage of usable space used by the CATV system . . . and multiplying that percentage by the *total of the capital costs and operating expenses of the entire pole.*" (Emphasis added).[14] In addition, the court in *Alabama Power* held that "the question is not whether the investments are cable related, but whether they were pole related . . . ."[15] However, certain appurtenances, although included in the pole line account, are not part of the pole plant itself, but are required for the specific use of the utility. Therefore, a determination must be made as to the proper appurtenance ratio which relects the utility's investment in crossarms and other user-specific items which do not reflect the cost of owning and maintaining poles.

18. We reject the argument that guys and anchors are solely user-related and therefore utility-supplied guys and anchors should be excluded from the net cost of a bare pole. We believe that guys and anchors are required to stabilize the pole plant and are therefore pole-related within the meaning of Section 224(d). Moreover, the court in *Alabama Power* held that the costs of the guys and anchors supplied by the utility may not be excluded from the cost of a bare pole even if the cable company supplied some of its own guys and anchors.[16] Since the investment in guys and anchors was generally already included in the net cost of a bare pole, however, no adjustment to the appurtenance ratio is necessary to reflect our determination that these costs should be included.

19. The comments by both the utilities and cable companies present a wide range of recommended appurtenance ratios for both electric utilities and telephone companies. Several commenters have presented evidence in support of their assertion that the 15 percent figure we have traditionally used as the deduction for crossarms and other non-pole-related investment is conservative as to electric utilities. However, the evidence presented by the parties to support a different figure is not compelling.[17] Therefore, with no extensive engineering analysis in the record as to which items should or should not be classified as non-pole-related appurtenances and the percentage of the pole line account attributable to these items, we adopt a reasonable compromise position and retain the 15 percent figure for electric utilities.[18] The record also indicates, and indeed most commenters agree, that the investment in telephone non-pole-related appurtenance is less than that required by electric utility engineering.[19] Indeed, because telephone companies today generally attach cable and insulated wire directly to the pole instead of using crossarms, which constitute a significant portion of the appurtenances to be removed from the pole line account, the typical telephone company's investment in crossarms appears to be considerably less than that of the electric utility. Therefore, we find that the adjustment for non-pole-related items for telephone companies should be reduced. However, the commenters have not presented evidence in support of a specific ratio and, therefore, we shall adopt a reasonable compromise position and utilize an appurtenance ratio of 5 percent for telephone companies. These ratios shall be rebuttable presumptions to be utilized in the event no party chooses to present probative, direct evidence on the actual investment in non-pole-related appurtenances.

2. Guys and Anchors Provided by the Cable Company

20. As we discussed previously, the court in *Alabama Power* concluded that the cost of the guys and anchors supplied by a utility should be included in the cost of a bare pole even if the cable operator supplied some of its own guys and anchors. However, the court raised the question of whether an offset or credit should be made to the maximum pole attachment rate when the cable company supplies its own guys and anchors. We solicited comments on the issue.

21. The utilities argue that no credit or offset should be given for guys and anchors provided by cable operators. They assert that any guys or anchors the cable company supplies are used to provide support for additional stress caused by the cable company's attachments. The expense, they maintain, is equivalent to make-ready work and is directly associated with the provision of the cable company's service and, as the cost causer, the cable company should bear the expense. *See, e.g.*, Southwestern Bell Comments at 2-3.

22. The cable operators argue that an offset is appropriate. Cable Companies states that the benefit the utility derives from the guys and anchors set by cable systems is the improved overall stability and safety of pole plant. Cable Companies Comments at 7. Cable Operators and Associations maintains that guys and anchors installed by cable companies benefit the utility by further stabilizing the pole against stress. Cable Operators Comments at 26. It also argues that if a CATV company is required to install its own guys and anchors, the utility's chargeable pole attachment investment should be reduced by at least 5 percent. *Id.* at 28.

23. NCTA maintains that the cost of guys and anchors are user-specific and therefore the investment of utilities and cable systems in guys and anchors should be treated as if it were user-specific rather than pole-related. NCTA Comments at 21. It states that, under this approach, cable systems would not be required to contribute to the costs of the guys and anchors necessary to support the utility's wires, but neither would they be entitled to a credit or offset for the costs that they incur for guys and anchors to support CATV wires. *Id.*

24. As we discussed previously, utility guys and anchors have been determined to be of benefit to all pole users. Thus, cable operators must pay a proportionate share of these costs. However, there is no persuasive evidence presented in the record that could lead us to conclude that the guys and anchors provided by the cable company benefit other pole users and therefore entitle the cable companies to a credit or offset for their investment in these items. However, this does not mean that a cable company could not establish that its guys and anchors

benefit other pole users. Therefore, we will allow the cable companies to present evidence on this issue in individual complaint cases. If a cable operator is able to present evidence that guys and anchors which it provides when it attaches its facilities to the poles benefit either the utility or other pole users, we will allow a credit or offset for its investment in these items.[20]

B. Carrying Charges

25. Administration, taxes, cost of capital, depreciation and maintenance are the components within the carrying charge utilized in the formula to determine the cable company's share of the utility's fully allocated costs of owning a pole.

1. Administrative Expenses

26. As we discussed in paragraph 8, *supra*, the court in *Alabama Power* questioned the validity of our approach to allocating administrative expenses (dividing cable related administrative expenses by the total plant investment). The court, in holding that such a division necessarily yields an artificially low percentage, stated that we could properly derive an allocator by dividing total administrative expenses by total plant investment if we determined that the percentage of administrative expenses relating to pole investment approximates the percentage of administrative expenses relating to the overall investment in utility plant.

27. In the NPRM we stated that we would prefer to use a ratio of pole-related administrative expenses to total pole plant investment, but acknowledged the lack of publicly available reports from which pole-related administrative expenses can be determined. We invited comments on whether the ratio of administrative expenses to total plant investment is the same as that of pole-related administrative expenses to pole plant investment and, therefore, an acceptable method by which to calculate the administrative expenses component of the formula. As an alternative method for determining the administrative expense ratio, we proposed, for purposes of computing the rate, to distribute administrative expenses among other operation, maintenance and depreciation expense components of the carrying charge, thereby eliminating a separate category for administrative expenses.

28. Generally, the utilities advocate we adopt total administrative expenses to total plant investment as the ratio to determine administrative expenses associated with pole plant. The cable operators who commented on the issue preferred our proposed distribution ratio.

29. Continental Cablevision states that our "distribution ratio" is a valid method of including administrative expenses in our formula because by applying this ratio to pole related maintenance and depreciation expense, the administrative expenses of pole attachment activity are accounted for in a manner that spreads administrative costs across services by their relative expenses, rather than by their relative investment. It states that the method recognizes the fact that pole attachment service is not heavily labor intensive. Continental Comments at 44-45. However, Continental Cablevision did state that although it believes the "distribution ratio" has merit, it would not oppose the alternative use of the ratio of administrative expenses to net plant. Continental Reply Comments at 9.

30. Cable Operators and Associations states that most of the identifiable costs incurred by a utility in affording pole attachment rights are separately paid for by the cable operators. Cable Operators Comments at 52. It states that, through the utilities' inspection and make-ready practices, utilities have underwritten their routine distribution plant expenses at the cable companies' expense. Thus, it argues, cable operators are paying not only for cable administration but for general distribution plant administration. *Id.* at 54. Cable Operators asserts that when cable companies do pay for routine utility administrative expenses, the utilities' administrative expenses are not routinely adjusted for the reimbursement. *Id.*

31. Cable Companies indicates that it agrees with the concept of the Commission's proposed methodology, which eliminates a separate expense component for administrative expenses. Cable Companies Comments at 10. However, as discussed in more detail in paragraph 41, *infra*, it argues that administrative costs recovered in separate application fees are insignificant, and therefore any administrative cost component should be eliminated from the carrying charges until some verifiable cost data can be supplied. *Id.*

32. Adelphia Communications declares that all non recurring costs which are incurred by a utility to prepare pole plant for CATV attachments (application processing, surveys and inspections, engineering, make-ready rearrangements and pole change-outs) are paid up front by the cable operators. Adelphia Comments at 22. Any recurring costs incurred by a utility for the provision of attachment rights to a cable operator, such as periodic inspections or needed rearrangements, are paid by the cable company. Therefore, the only remaining recurring costs must be limited to the direct administrative costs related to pole attachments and perhaps a share of maintenance expenses. It represents that such costs are minimal. *Id.* at 22-23.

33. In supporting the ratio of total administrative expenses to total plant, Ameritech, Bell Atlantic, Edison Electric Institute and Cincinnati Bell state there is no basis for the Commission's belief that administrative expense relating to poles, in proportion to total investment, is appreciably smaller than administrative expense relating to other utility plant. Ameritech Comments at 9; Bell Atlantic Comments at 8; EEI Comments at 7; Cincinnati Bell Comments at 3. Ameritech argues that, while it is true that poles constitute a relatively simple type of utility asset compared to the more complex plant used to provide utility service, certain administrative expenses are incurred with respect to CATV pole attachment matters which typically are not incurred with respect to other more complex plant (*e. g.*, expenses associated with regulatory Rule Making and complaint proceedings initiated by CATV operators and legislative enactments sponsored by CATV interests). Ameritech Comments at 9. Several utilities, including Cincinnati Bell, BellSouth and Edison Electric Institute, state that while there are no records to isolate pole related administrative expenses, such expenses may actually be higher than that related to other utility plant because the overhead associated with maintenance and repair is higher than, for example, telephone company electronic switches which are relatively maintenance free. *See* , *e. g.*, Cincinnati Bell Comments at 3; BellSouth Comments at 8; EEI Comments at 7.

34. Arizona Public Service Company supports adoption of the total administrative expenses to total plant ratio and states that, although poles may have less associated overhead than other complex assets, they may also cost less and thus the ratio of administrative expenses to plant investment may remain close to constant as one moves from poles to total company plant investment. Arizona Public Service Comments at 11. Arizona Public Service asserts the proposed distribution ratio can be improved by removing the fuel related expenses since such expenses do not relate to administrative expenses. It also proposes other modifications to the distribution ratio, including loading maintenance of overhead lines to include related supervisory expenses and payroll tax expenses. *Id.* at 13-20.

35. Union Electric, Southern Utilities and Kansas Power & Light do not support the distribution ratio. They maintain that the Commission's proposal to spread administrative expenses among operations and maintenance (O&M) expenses and depreciation expense is not appropriate since administrative expenses are not likely to vary as other O&M expenses vary. They note that a major component of O&M expense for electric utilities is the cost of fuel burned. Also, they assert that administrative expenses are a function of day-to-day operations and do not share a direct relationship with depreciation expenses which are a function of accounting plant life. Union Electric Comments at 3. Southern Utilities Comments at 44-45; Kansas Power & Light Comments at 6.

36. Southwestern Bell and U.S. Telephone Association endorse the ratio of total administrative expenses to total plant investment, but recommend that the denominator be changed to total net plant investment since the resulting factor will be applied to net pole line investment. Southwestern Bell Comments at 7; U.S. Telephone Association Reply Comments at 7.

37. Upon further review, we have determined that the benefits of using a distribution ratio for the calculation of the administrative expenses associated with the pole plant do not outweigh its disadvantages. As we have continuously stressed throughout this proceeding, our goal is to adopt a formula which, using publicly available data, results in a rate which approaches the maximum level within the just and reasonable range. At the same time the components of the formula should be predictable and retain a level of certainty that will facilitate negotiated settlements based on our formula. Indeed, Commission procedures and calculations should remain simple and expeditious and not modelled on ratemaking or complex tariff proceedings. The commenters have proposed a number of additions, deletions, or other modifications of the various components of the distribution ratio which substantially complicate the methodology. Without drawing a conclusion on the relative merit of these proposals, we conclude that a modified distribution ratio does not further our goal of a simple, predictable formula. On the other hand, as for our concern whether the ratio of administrative expenses to total plant is the same as that of pole-related administrative expenses to pole plant investment, there is nothing in the record to demonstrate the actual relationship between these ratios. Therefore, since the proposed distribution ratio is not only more complicated than a total expense to total plant ratio, but is also not demonstrably superior to the total expense to total plant ratio, we will adopt, as suggested in *Alabama Power*, the ratio of total administrative and general expenses to total plant investment.[21]

2. Offsets and Credits

38. We are concerned, however, that there may be a double recovery by some utilities for amounts paid for such expenses as application processing, inspections, and certain make-ready work. We requested comments as to whether cable companies should receive an offset or credit for expenditures they are required to make in addition to the routine make-ready charges and the annual per pole rate.

39. The cable companies argue that they should receive an offset or credit for certain additional fees or charges against expenses included in the administrative expenses component of the carrying charge. They maintain that the costs associated with these extra charges are already recovered by the utilities in the rate, based on fully allocated costs, which the cable operators pay. The utilities oppose such an offset, arguing that those additional charges which cable companies pay relate to costs incurred solely for the benefit of attaching cable facilities to the poles.

40. Cable Companies submits that they are made to pay application fees to attach to the utilities' poles. They maintain that the processing and recordkeeping related to these applications constitute most of the administrative costs incurred by utilities in connection with cable television pole attachments. Cable Companies Comments at 10. They argue that the full costs to the utilities of administering this aspect of pole attachments is directly covered by these fees and that the only direct costs that remain are associated with the annual or semiannual billing and collection of pole attachment fees. Cable Companies asserts that billing and collection do not involve significant costs to the utilities. *Id.* at 10-11. Cable Companies points out that, as with administrative pole costs in general, there are no accurate records to reflect the relationship between application fees paid and costs incurred. *Id.* at 11. It therefore recommends that the administrative cost component be omitted from the carrying charge until some verifiable cost data can be supplied. Alternatively, it recommends that full credit for application fees and other contributions to the pole plant administrative costs must be provided in order to avoid double recovery. *Id.* at 12.

41. Continental Cablevision submits that the matters covered by application fees and inspection fees are included in the administrative expenses component of the carrying charge. Continental Cablevision Reply Coments at 11. It states that it is not proper to charge cable operators for all additional costs and then to require them to also pay a rate based on fully allocated costs. *Id.*

42. Adelphia Communications maintains that it is appropriate to limit administrative expenses to "additional costs" - those costs which would not have been incurred by a utility but for the provision of attachment rights to a cable operator. Adelphia Comments at 22. It states that nonrecurring additional costs are those of a one-time nature which are incurred to prepare pole plant for CATV attachments and include application processing, surveys and inspections, engineering, make-ready rearrangements[22] and pole change-outs. It points out that all of these costs are paid up front by the cable operator. *Id.* Thus, Adelphia Communications argues, the only additional costs remaining are those consisting of recurring expenses. It argues that, since any periodic inspections or

needed rearrangements are paid by the cable operator, the recurring expenses must be limited to the direct administrative costs related to pole attachments and perhaps a share of maintenance expense. *Id.* Such costs, Adelphia Communications asserts, never exceed one dollar per pole. *Id.* at 23.

43. In opposing any offset or credit for application fees, the utilities argue that the application fee is charged to cover the direct expense of processing the CATV pole attachment contract. They state that such costs are incurred solely for the benefit of the CATV operator. *See*, *e.g.*, BellSouth Reply Comments at 6; Bell Atlantic Reply Comments at 7-8. The utilities maintain that, in addition to the costs associated with processing the contract, the utilities incur administrative costs relating to its pole plant that are separate and apart from the application process. *Id.*

44. A separate charge or fee for items such as application processing or periodic inspections of the pole plant is not justified if the costs associated with these items are already included in the rate, based on fully allocated costs, which the utility charges the cable company since the statute does not permit utilities to recover in excess of fully allocated costs.[23] Therefore, we find it appropriate to allow a cable company to present evidence to justify a refund to it for expenditures it has made and which it believes relate to costs which are already covered in the carrying charges. We will indeed look closely at make ready inspection and other charges which the cable companies may be paying to ensure that there is no double recovery by the utilities for expenses for which they will be or have already been reimbursed through the annual pole rental fee.[24]

3. Taxes

45. Traditionally, we have used a "taxes paid" (flow through) methodology when calculating the tax component of the carrying charges which reflects total tax liability in the year in which such liability is incurred. The court in *Alabama Power* questioned this approach because it is contrary to the tax accounting method that we employed for determining rates in other Commission dockets.[25]

46. Under tax normalization, for financial reporting purposes, utilities depreciate equipment over its estimated useful life (straight line tax depreciation). However, for tax purposes, through claiming accelerated depreciation and investment tax credits on their tax returns, utilities claim higher depreciation expense in the early years of the service life of an asset and lower depreciation in later years. The effect is to produce lower tax payments with respect to the early years which are offset by increased tax payments in the later years. The amount of income taxes deferred through the use of accelerated depreciation is recorded for accounting purposes in an accumulated deferred tax reserve and represents funds provided for capital investment. Most regulatory commissions, concluding that the accumulated deferred tax reserve represents cost free capital, adjust for the cost-free nature of the reserve in one of two ways to prevent the utility from earning a return on the portion of its investment financed by the reserve. The majority of commissions which follow the normalization practice deduct the depreciation related deferred income taxes from the utility's rate base, creating a smaller rate base upon which the allowed rate of return may be earned. Some commissions follow the alternative ratemaking treatment of including the reserve in the utility's capital structure at zero cost, which has the effect of reducing the authorized rate of return.[26]

47. In the NPRM, we recognized that the current trend in ratemaking is to adopt the tax normalization method and expressed a preference for the tax normalization approach in resolving pole attachment cases. We solicited comments on how tax normalization can be accomplished for both telephone and electric utilities with publicly available data.

48. Most of the commenters support normalized taxes for the development of CATV pole attachment rates, with many of them presenting a proposed methodology. Several commenters support the use of a tax normalization approach but assert that there should be an adjustment to either the utility's pole investment or its cost of capital to prevent the utility from earning a return on the accumulated deferred tax reserve. *See*, *e.g.*, NCTA Comments at 30. Edison Electric Institute supports tax normalization but believes that since more than one method of calculating normalized taxes may be lawful, each utility should be permitted to use the method used by the public utility commission in its jurisdiction. EEI Comments at 9. Texas Power & Light, while supporting normalization, asserts that the Commission should approve more than one method for calculating normalized taxes. It argues that a utility should be permitted to develop acceptable alternatives to meet its unique and specific needs. Texas Power Comments at 8.

49. Cable Operators and Associations and Cable Companies object to normalization. Cable Operators maintains that tax normalization was designed not to anticipate actual tax payments, but to create an interest-free pool of revenue loaned from utility ratepayers to utilities in order to promote expansion. Cable Operators Comments at 56. It also asserts that normalization is applied to stabilize rates and minimize the frequency of utility rate increase requests. It states that, by contrast, pole attachment rates are calculated annually. *Id.* at 57. Cable Operators also argues that normalization is applied exclusively to utility services, and the Commission and state jurisdictions have long held that pole attachments are not utility services. *Id.*

50. Bell Atlantic maintains that, contrary to the assertions of Cable Operators and Associations, normalization does not represent "an interest-free loan" to the utility since it is an accounting principle that requires that current and future ratepayers share in the tax benefits of capital formation incentives (*e.g.*, accelerated depreciation, investment tax credits). It enables all customers that bear the cost of the underlying asset to share in the tax benefits derived from that asset. Bell Atlantic Reply Comments at 9.

51. Mountain States Telephone argues that depreciation related deferred income taxes should not be deducted from the tax normalization calculation. It states that, unlike its ratepayers, cable operators have always paid pole attachment rates based on taxes paid, and as a result, the full benefit of accelerated tax depreciation was "flowed-through" to cable companies up front. Mountain States Comments at 15-16. Mountain States maintains that cable operators have contributed nothing toward the deferred tax reserve and to now exclude deferred tax reserves from the pole investment would provide cable operators with this benefit a second time. *Id.* at 16.

52. We have reviewed the evidence presented and have concluded that we should employ a normalized tax calculation in determining the operating expenses and capital costs of the utility in owning and maintaining its poles. None of the commenters have advanced persuasive reasons to dissuade us from utilizing tax normalization in the formula to determine pole attachment rates. Indeed, we recognize that the current trend in ratemaking is to adopt the tax normalization method. We have studied the proposed methods of calculating normalized taxes and, in doing so, we reject the arguments of some commenters that each utility should develop its own methodology. It is essential that a uniform method for the normalization of taxes be utilized to permit interested parties to independently verify, from publicly available data, the reasonableness of a utility's procedure for determining the tax component of the carrying charge. Consistent with our goal of utilizing a simple and predictable approach, we have chosen formulas which are both reasonable and straight- forward. The FERC and FCC accounts and the formulas that we will use for determining the normalized tax component are listed in Appendix B.[27] We have also determined that our application of tax normalization should include an adjustment to reflect the state regulatory commissions' treatment of accumulated deferred tax reserve. To more closely align our formula with state ratemaking practices the adjustment will be reflected in one of the two ways previously discussed.[28] If the state regulatory commission treats deferred taxes as a rate base deduction the formula for determining pole attachment rates should include a deduction of the accumulated tax reserve from the utility's pole investment. If the state regulatory commission includes the reserve in the utility's capital structure at zero cost, no further adjustment by the Commission would be required in pole attachment proceedings. By our adoption of the state-authorized rate of return there is an automatic adjustment for the cost-free nature of the portion of the utility's investment that consists of the accumulated deferred tax reserve.[29]

C. Minimum Rate Versus Maximum Just and Reasonable Rate

53. As we stated in the NPRM, it has been Commission policy to identify only a rate approaching the statutory just and reasonable maximum rate which is based on fully allocated costs.[30] The court in *Alabama Power* noted that, because our methodology focused exclusively on the maximum rate range, we made no effort to establish the minimum rate based on incremental costs. The court reasoned that if we have not established both the upper and lower level of the statutory range, a less than maximum rate determined by the Commission's formula may not be supported if the lower end of the zone of reasonableness is not defined. Our policy of identifying only a rate approaching the maximum level was established by a statutory scheme under which virtually all complaints were filed by cable companies alleging that a utility is charging in excess of its fully allocated costs. In addition, in those few cases filed by utilities, the utility argued that the rate being charged should be at the maximum level under the statute. We foresee that complaints by cable companies claiming that a rate exceeds fully allocated costs will continue to be the norm and, therefore, we will continue to focus on the upper end of the statutory range. Thus we proposed in the NPRM not to establish the minimum rate in routine cases. Instead, we proposed the change to Section 1.1409(b) of our Rules which would formalize the presumption that the pole attachment rate determined by the formula falls above the utility's incremental costs.[31] If the utility wished to rebut this presumption, it would have the burden of proving the minimum statutory rate.[32]

54. We requested comments on a method that would result in a rate approaching the maximum statutory rate without the need for complex calculations or excessive reliance on internal company records. Most of the utilities emphasized their assertion that establishing the maximum just and reasonable rate must be the primary goal in pole attachment ratemaking and that the minimum rate should rarely be an issue.[33] However, the cable companies generally proposed a rate less than the statutory maximum rate. They urge that we consider an overall rate adjustment based on the status of cable operators as subordinate users of poles. NCTA, whose comments on the matter mirror those of the other cable company commenters, asserts that while Congress gave the Commission the flexibility to establish rates within the boundaries of incremental and fully allocated costs, it expected the Commission to consider the nature and value of the rights conferred by the utilities in deciding where, between these two extremes, an appropriate rate lies. NCTA Comments at 3, citing Senate Report 95-580 at 19. It states that where the cable operator and the utility share use of the poles with fully equivalent rights, a rate based on fully allocated costs is appropriate. The more a cable operator's pole rights are subordinate to those of the utility, it believes, the more the rate should approach the incremental costs of providing pole attachments. *Id.* NCTA states that the difference between fully allocated costs and incremental costs in the context of pole attachments is not trivial and, thus, establishing a rate that takes into account cable's subordinate status, rather than automatically setting the maximum statutory rate, will have a significant economic impact.[34]

55. NCTA and the other commenting companies argue that there should be a "subordinate user" factor to reflect that, under the typical pole attachment agreement, the cable operator is given a "mere revocable license." *See*, *e.g.*, Continental Comments at 10. They propose that the Commission reduce the maximum rate established by the Commission's formula by this factor to compensate for their subordinate rights on poles. The cable companies maintain that a set of the terms and conditions under which they must operate will demonstrate a number of inequities within the pole attachment agreements to which they are a party. For example, they state that pole attachment agreements commonly require that the cable television system pay the utility in advance for all costs associated with its initial attachment to the pole (make-ready charges) even though they may not be permitted to attach to the poles for several months. These costs frequently include such items as inspections and pole change-outs. Moreover, despite these payments, the contracts frequently stipulate that the cable system may be removed from the pole at any time, for whatever reason, and, in many instances, with little advance notice. All of the commenting cable operators listed specific allegations which they argue demonstrate that the proper just and reasonable rate should be less than a statutory maximum rate based on fully allocated costs. Many of the arguments presented by the cable operators to demonstrate that a "subordinate user" factor is appropriate were also dis-

cussed in relation to the "double recovery" issue regarding cable operators' payment of fees for costs which may already have been compensated for in the carrying charges of the formula.[35]

56. Cable Companies state that cable operators pay for inspections and upgrades of pole plant which benefit only the utility and its own use of its poles, but which are paid for solely by the cable operator. Cable Companies Comments at 3. It states that the fees assessed by some utilities for inspections remain excessively high in many cases and contract terms continue to be completely one-sided, with utilities refusing any attempts to equalize even minor aspects of the relative contractual obligations of the parties. *Id.*

57. Adelphia Communications states that under the typical attachment agreement make-ready charges are often applied in a manner designed to harass and delay the cable operator. Adelphia Comments at 11. It argues that CATV installation is not a priority for most utilities and there are many instances of cable operators waiting months for make-ready work to be completed. According to Adelphia Communications, utilities will not allow a cable operator to do the work itself or even hire an outside contractor. *Id.* Both Adelphia Communications and NCTA assert that one of the clearest illustrations of cable's subordinate status is the standard provision in pole attachment contracts that requires cable systems to pay all costs arising from pole change-outs. NCTA states that it would be appropriate to charge the CATV operator a certain percentage of these pole change-out replacement costs, but the typical contract requires the cable company to pay all of these costs, including the entire cost of the new pole, even when the need for such a changeout is not caused by the attachment of cable facilities, but rather by the additional requirements or attachments of some other user, including the utility itself. NCTA Comments at 11. Adelphia Communications adds that there have been a number of incidents where the utility has required a larger replacement pole even though there is enough space on the old pole to accommodate the cable facilities. Adelphia Comments at 15. Both commenters state that another manifestation of cable's subordinate rights is the utility's inspection of cable pole attachments at unpredictable and frequent times and the requirement that the cable operator pay for the inspection. They maintain that the frequency and extent of periodic inspection has increased greatly and that when the utility conducts such inspections it also inspects its own wires and equipment which may need adjustment. Nevertheless, the common contractual provisions require cable operators to pay the entire cost of the pole inspection. NCTA Comments at 11-12; Adelphia Comments at 16. In addition, Cable Operators and Associations asserts that most pole attachment agreements require cable operators to hold utilities harmless from claims, even when the utilities are negligent. Cable Operators Comments at 42.

58. The commenting cable operators offered proposals as to how this "subordinate user" factor could be quantified and included as a deduction to the formula utilized to determine the pole attachment rates. Adelphia Communications suggests that where a utility offers a standard industry contract, the terms of which include those elements that are indicative of the cable operator's subordinate status, the proper rate should be one-half the calculated maximum so long as that rate exceeds the minimum. The percentage of the maximum would increase as the rights granted to the cable operator increased. Adelphia Comments at 23. Maryland/Delaware Cable Television Association and Continental Cablevision propose that cable pole attachment rates be set at 75 percent of the maximum rate.[36] Maryland/Delaware Cable Comments at 12; Continental Comments at 13-16. They state that any concern that such an approach might result in a rate which recovers less than the incremental costs could be addressed through the Commission's proposed procedural change, whereby the utility would have the burden of establishing that such rate is below the statutory minimum just and reasonable rate.[37] Cable Operators and Associations also proposes a 75 percent figure, but it applies the figure to a different base. It argues that the Commission's formula should calculate net chargeable pole investment as 75 percent of the net pole investment since subordination of cable's interests in the pole plant must be accounted for in the rate base. Cable Operators Comments at 45-50.

59. NCTA and Cable Companies state that an acceptable approach to assessing the magnitude of rate reduction that should result from cable's subordinate user status is to model it on the discount practice found in the utility industries (interruptible rate schedules for gas and electric customers) and the satellite communications business (preemptible transponder users).[38] In making a comparable discount for cable operators to reflect their subordinate status NCTA recommends that there should be a reduction of 30 percent of the net cost of a bare pole while Cable Companies recommends that a discount of 25 percent be applied to the lease rate itself. NCTA Comments at 15; Cable Companies Comments at 15.

60. None of the utilities believe that the status of cable operators under pole attachment agreements requires an adjustment to the formula rate to reflect a subordinate status. Several commenting utilities argue that the statutory maximum rate already incorporates a substantial discount for cable operators. BellSouth argues that there are significant financial advantages to cable operators attaching to utility poles rather than building their own plant. BellSouth Reply Comments at 3-4. According to Bell Atlantic, cable operators already receive substantial concessions through discounts for telephone utilities' nonexistent crossarm investment, the use of embedded rather than current costs and the understatement of the amount of usable space that cable occupies. Bell Atlantic Reply Comments at 2.

61. U.S. Telephone Association maintains that the subordinate user discount is beyond the scope of the NPRM and should be addressed, if at all, to the Congress. U.S. Telephone Comments at 12. It states that if the Commission accepts cable's contention that a subordinate user discount should be entertained, it must set forth a new Rule Making to address that issue. *Id.* U.S. Telephone Association also argues that the discount is unwarranted because the Commission has historically utilized a fully distributed cost methodology to measure the maximum statutory rate and the subordinate user discount is an incremental cost adjustment. It also argues that the use of, and thus the wear and tear on, poles is increased by cable attachments and, in general, cable facilities make more frequent attachments and cause more maintenance concerns than do utility users. *Id.*

62. Ameritech states that there is no basis for a rate discount since cable operators pay a rate based on no more than 8 percent of the costs of a pole. Ameritech

Comments at 9-10. Ameritech states that the Pole Attachment Act specifically recognizes that a pole attachment contract containing terms and conditions which recognize the priority rights of the utility may also include a rate based on the utility's fully allocated costs. *Id.* at 9.

63. Southwestern Bell concedes that it does give telephone companies a higher priority than cable companies for restorative measures since telephone service is often needed for life-or-death emergencies and franchised telephone companies are required by law to provide reasonably continuous service to their customers. It maintains that seldom are there emergency situations for cable operators or statutory requirements concerning continuity of service. *Id.* at 5.

64. Mountain States Telephone asserts that if a cable company believes that a particular term or condition is unjust and unreasonable, the cable company should ask the utility to negotiate that portion of the contract. If the cable operator is unsuccessful, it can petition the Commission to revise those terms or conditions at issue. Mountain States Comments at 10. Mountain States maintains that as long as an attachment fee is within the statutory zone of reasonableness, the Commission is without authority to lower a contractually agreed-to rate.

65. In response to the cable companies' analogy of the discount practices of utilities and the satellite communications business, Edison Electric Institute maintains that there is no valid comparison between interruptible rates and rates for allegedly subordinate users of a pole. EEI Comments at 10. EEI states that for interruptible rates and customers, an electric utility can actually quantify its savings. It argues that there are no savings to the utility in the case of cable attachments, even assuming that such attachments could in some circumstances be removed from the pole. *Id.*

66. Texas Power asserts that by requesting a substantial discount from fully-allocated-cost-based rates because of a status as a subordinate user, the cable companies are seeking to apply a value of service concept to the Commission's rate formula which it believes is an incorrect standard. Texas Power Comments at 3. Texas Power also states that the mere existence of certain contract provisions does not necessary imply that actual practices in the field reflect a subordinate status. *Id.* at 4.

67. Alabama Power argues that, since pole attachment rates are designed to reflect the underlying cost of providing service, the "subordinate user discount" proposal, which is based on the concept of value of service, should be rejected. Alabama Power Comments at 3. It states that cable operators are very seldom displaced from any particular pole and while a cable system may face interruption on a few of its poles during a year, it seldom will face interruption on a significant number of poles. *Id.* at 4. Alabama Power also states that it is inappropriate for cable operators to compare their position under a pole attachment agreement with those of parties to a joint-use pole agreement since successful joint-use pole agreements are based upon mutual benefits and responsibilities. Alabama Power argues that there are no such mutual benefits available to utilities under pole attachment agreements with cable companies. *Id.* at 6.

68. In response to the cable companies' assertion that the manner in which utilities conduct their inspection programs demonstrates cable's subordinate status, Virginia Electric alleges that its inspection program is not designed to reengineer its own plant at the cable operator's expense but, instead, to correct numerous safety violations and detect unauthorized cable attachments. Virginia Electric Comments at 3. Virginia Electric states that it is accompanied by a representative of each cable system surveyed during its inspection of that company's attachments and at that time inspection sheets are prepared that document any safety violations.

69. With respect to the provision in pole attachment agreements that CATV operators indemnify utilities "even against the utilities' own negligence", Southern Utilities asserts that such a provision is justified. It states that, because the attachment of cable facilities to its poles increases the universe of persons who may be expected to be on and near the utility's poles and in proximity to its lines and cables, CATV attachments significantly increase a utility's potential exposure to damage liability whether or not it is negligent. Southern Utilities Comments at 10. Southern Utilities states that an award of damages in such a case may exceed the utility's aggregate CATV pole attachment revenues for several years, yet if the injury would not have occurred but for the presence of CATV facilities, then the damages award is a direct cost of permitting pole attachments, whether or not the injury resulted from the utility's sole negligence. *Id.* Southern Utilities reasons that it may be appropriate to permit a cable company to demonstrate that its rights under a particular pole attachment agreement are materially inferior to those of other users of the utility's poles such that it should be entitled to a discount from the maximum rate. It states that such a showing could be based upon a comparison of contract provisions and of the individual utility's actual practices, but not merely by general allegations of asserted "industry practices." *Id.* at 32. However, Southern Utilities argues that such an approach must also be consistent with value of service pricing and, as a consequence, must recognize that the maximum rate level from which such a discount is allowed is the cost of alternatives available to the CATV operator, or the rate levels paid by other non-owner users, and not a small percentage of the stripped down, CATV-only pole. *Id.*

70. Arizona Public Service Company states that costs associated with pole arrangements and change-outs subsequent to cable attachment, if required by the utility, might be construed as a burden imposed on cable operators by a utility. However, but for the presence of cable, there would be ample room on the pole for the desired use by the utility. It explains that cable is not charged by Arizona Public Service for a subsequent change-out unless cable's presence caused the change-out. Arizona Public Service Comments at 7. In addition, it concurs with EEI that it is inappropriate to compare cable pole users with interruptible rate customers. *Id.* at 8-10. It also asserts that cable operators should be given fewer contractual rights than the owner of the pole since cable operators do not have the attendant rights or the responsibilities that the pole owner has. *Id.* at 15. It argues that abuses of the make-ready and inspection fee provisions should be handled in individual enforcement proceedings rather than an overall deduction from all fully allocated cost-based rates. *Id.* at 16.

71. In enacting the Pole Attachment Act, Congress directed that, to be "just and reasonable", a rate must fall somewhere between the lower limit of the utility's incremental costs associated with the pole and the upper bound of the cable company's proportionate share of the

fully allocated costs that are pole-related.[39] A review of the Senate Report reveals that "the standard permits the contracting parties, or the Commission, to determine a CATV pole attachment rate somewhere between avoidable costs and fully allocated costs."[40]

72. In enacting Section 224 of the Act, Congress was aware that utilities conferred subordinate rights on cable operators in relation to their own use of pole space. Congress contemplated that pole attachment rates might be established at less than the statutory maximum in order to reflect these subordinate rights. The Senate Report states that a pole attachment fee designed to recover all of the utility's fully allocated costs might justify conferring on cable operators all of the rights other utility users have with respect to the poles. By contrast, treating cable as a clearly secondary user, subordinate vis-a-vis the provision of electric and telephone service, would be reflected in a fee designed to recover only a utility's avoidable costs, which, the Report states, could be expected to be minimal.[41]

73. None of the cable operators has made a persuasive showing that they in practice enjoy such subordinate rights to justify that we mandate in this proceeding rates based on less than fully allocated costs. This is particularly true in light of the fact that no party could to our satisfaction translate any alleged subordinate right into a specific dollar amount to be subtracted from the statutory maximum rate.[42]

74. What is more, the vast majority of the "subordinate rights" raised by the parties in reality are allegations that cable operators are paying additional unreasonable charges or being subjected to unreasonable practices. Rather than rectifying these problems by mandating reductions to the per-pole rate, it would be wiser to address these issues directly. In theory, if a utility is purportedly charging a rate based on fully allocated costs, then it should not also be charging additional fees because, by definition, fully allocated costs encompass all pole-related costs. In addition, if a particular condition is so onerous as to be unreasonable, we will eliminate the unreasonable condition rather than adjusting the rate.[43] Therefore, as proposed in the NPRM, we will continue to focus on the maximum rate. If, however, a cable operator can make a specific, quantifiable and supportable proposal for a rate which falls between the statutory minimum and maximum rates, we will examine the proposal. We note, however, that such a showing cannot be based on "inferior rights" which are the result of double payment of costs or from unreasonable terms or conditions in the pole attachment contract which should be eliminated.

75. While we will not go so far as to establish a formula to calculate a minimum rate routinely due to cable operators with subordinate status, we believe that an adjustment to that rate which approaches the statutory maximum just and reasonable rate may be appropriate in those cases where a cable operator is a party to a pole attachment agreement with onerous contractual provisions. Our experience in adjudicating pole attachment complaints and the record in this proceeding reveal a broad range of contractual terms and conditions, some of which are onerous in the circumstances of the case. Where onerous terms exist the cable company may be entitled to compensation or reimbursement.

76. For example, assuming all other factors are equal, the rate should not be the same for a cable company which is required to pay the entire cost of change-outs, even when not caused by the cable's presence, as for a cable company which only pays for the change-outs it causes. While we reject the arguments advanced by the cable commenters that we should adopt an overall deduction from the fully-allocated-cost-based rates because of a cable operator's subordinate status on the poles, we will address allegations that unreasonable make-ready, or inspection, change-out requirements or other abuses are in violation of the Act in individual complaint proceedings. Therefore, while there is a presumption that the rate calculated from the formula adopted in this proceeding results in a just and reasonable rate, a cable operator may rebut this presumption with evidence to the contrary. The cable operator will have the burden of proving that specific contract provisions are unreasonable, which should result in a reduced annual rental rate or other offset. Any showing by the cable company must be based upon an analysis of specific contract provisions and the individual utility's actual practices, as well as prevailing practices in the industry or in the state in which the cable company operates. We will not adopt any substantive guidelines as to which terms or conditions may warrant a deduction or the quantification of any such deduction. However, we note that a number of terms and conditions have been brought to our attention which should be given close scrutiny in individual complaint cases.[44]

77. We concur with the utilities that if a cable company believes that a particular term or condition is unjust and unreasonable, the cable company could request that the utility renegotiate the contract. If unsuccessful, the cable company should file a complaint with the Commission seeking to be relieved of that term or condition. However, we also recognize that, even with regulation of the utilities' pole attachment rates, utilities still maintain a superior bargaining position over CATV systems in negotiating the rates, terms and conditions for pole agreements and scheduling make-ready work for the attachment of cable facilities. Our willingness to review contract provisions and the possibility of either revising an unlawful term or condition or ordering an adjustment to the maximum rate because of an onerous term or condition should serve as an impetus to utilities to negotiate in good faith with regard to terms and conditions of the agreement before they are presented to the Commission.[45]

IV. PROCEDURAL RULES AND INFORMATION REQUESTS

78. As previously stated, this Rule Making also proposed revising our rules to simplify and clarify those procedures that should be followed and the information that should be submitted by the parties in each pole attachment complaint proceeding. To simply the process for handling pole attachment complaints, we proposed to expand the definitions of "complaint" and "complainant" to allow for a complaint to be filed by a cable television association or an association of utilities. Most of the utilities opposed these definitional changes. They state that the statute contemplates case-by-case, individual negotiations and that increasing the number of parties only decreases the likelihood of any settlement and inhibits the timely resolution of the controversy. EEI Comments at 11; Ameritech Comments at 14; Arizona PSC Comments at 29. The clear and convincing evidence leads to a contrary conclusion. As we stated in the NPRM, a utility will typically enter into comparable agreements with sev-

eral CATV operators within the utility's service area, and the issues in contention with that utility usually focus on the same or similar contractual provisions.[46] Therefore, any settlement that is agreed to by all the parties will serve as precedent to resolve complaints which otherwise would have been resolved on a more time consuming, case-by-case basis. Allowing cable associations to file complaints will further facilitate settlement in those situations by providing a more centralized group with which the utilities can negotiate. Indeed, we note that even under our old Rules, cable associations were instrumental in developing state- or region-wide settlements in pending proceedings.

79. It has also been argued that the proposed modifications of Sections 1.1402(d) and (e) of the Rules are not necessary because Section 1.1404(a) of the Commission's Rules expressly provides that "complainants may join together to file a joint complaint." EEI Comments at 12; Arizona PSC Comments at 28; BellSouth Comments at 10. While the current rules do provide for joint complaints, they do not permit complaints by trade associations in their own name. The proposed change would, for example, allow a CATV operators' association to request information from the utility and file one joint complaint if one set of data applies to several CATV operators. The utility could then supply one set of data to the association instead of responding to numerous cable operator information requests and multiple complaints.

80. Several commenters point out that if the proposed changes to Section 1.1402(d) and (e) are adopted, as a condition to permitting a complaint by an association, the complaint should identify all members of the association and should include the pole attachment contracts covered by the complaint as well as a certification from each member of the association that the complaint is being filed on its behalf. We agree that the real parties in interest who would be bound by our decision should be identified. Therefore, in adopting the proposed modifications to Section 1.1402(d) and (e) we will supplement Section 1.1404(a) of the Rules to read "Complaints filed by associations shall specifically identify each utility or cable television company who is a party to the complaint and shall be accompanied by a document from each identified member certifying that the complaint is being filed on its behalf." This change will go far to resolving the problems raised by the utilities, while also permitting a more efficient proceeding involving similarly situated cable operators.[47]

81. We proposed several changes in our Rules regarding information that must be included in a complaint. We proposed to eliminate the requirement in Section 1.1404(d)(1) and (2) that a complainant submit evidence that a utility uses or controls poles or that the cable system actually has attachments on the poles. Instead of providing specific evidence, the complainant would only be required to submit verified statements of the relevant facts unless those facts were disputed by the respondent. Alabama Power argues that the rule change "would, in effect, shift the burden of proof with respect to these items to the utility." Alabama Power Comments at 19. Ameritech asserts that the existing rule remains necessary because the pole attachment proceedings are conducted "without resort to extensive discovery and evidence to supplement the pleadings." Ameritech Comments at 15. These contentions are without merit. Our proposals neither shift the burden of proof nor unduly restrict the evidentiary record since the complainant would still be required to submit additional data in response to a dispute initiated by the respondent regarding these matters. Therefore, the proposed changes to Sections 1.1404(d)(1) and (2) will be adopted as proposed.

82. Sections 1.1404(g)(2) and (4), 47 C.F.R. §§ 1.1404(g)(2) and (4), require respectively that a complaint contain the crossarm investment for pole lines and the depreciation reserve associated with the crossarm investment. To clarify these sections we proposed to revise the phrase to read: "the investment in crossarms and other items which do not reflect the cost of owning and maintaining poles, if available." This change would recognize that the adjustment for items not related to the cost of owning or maintaining a pole consists of more than crossarms themselves and that many utilities do not keep the detailed subaccounts from which they could supply this information. The only opposition to the amendment was a general opposition to the elimination of any portion of the investment in pole line accounts. Therefore, the proposed revisions to Sections 1.1404(g)(2) and (4), 47 C.F.R. § 1.1404(g)(2) and (4), are adopted as proposed.

83. Section 1.1404(g)(5), 47 C.F.R. § 1.1404(g)(5), requires that the complaint contain the total number of poles owned and controlled by the utility. In determining the cost of a bare pole, the total number of poles must be adjusted if some of the utility's poles are jointly owned with another entity. We proposed to require that the complaint specify the number of jointly owned poles, if any, and the percentage of each joint pole owned by the subject utility. None of the parties commenting in this proceeding opposed the proposed revisions. Accordingly, the proposed changes to Section 1.1404(g)(5), 47 C.F.R. § 1.1404(g)(5), are adopted.[48]

84. Our Rules state that the complaint shall also include, *inter alia*, the rate of return figure authorized for the utility for intrastate service in the jurisdiction in which the cable company obtains pole attachment services. 47 C.F.R. § 1.1404(g)(10). We will continue to utilize the most recent authorized intrastate rate of return as the cost of capital figure in our computation of pole attachment rates. Our proposed change would require a utility to supply a copy of the state administrative or court decision as an attachment to its response to the complaint if the rate of return is at issue in the proceedings, noting the section of the decision which specifically establishes the authorized rate of return. BellSouth maintains that utilities should not be required to provide copies of publicly available documents. BellSouth Comments at 11. We disagree. As we stated in the NPRM, the utility is in the best position to know the most recent decision regarding its rate of return.[49] By requiring the utility to furnish the relevant document it will ensure that the Commission has the most recent figure in its possession. Furthermore, we have modified the proposed rule to require that the utility inform the Commission whether the decision is final or subject to any further proceedings either before the state regulatory body or in a court. Clearly, these requirements would not be burdensome and would go far toward ensuring that accurate, up to date information is utilized in pole attachment proceedings. Therefore, Section 1.1404(g)(10) is adopted as modified herein.

85. In assessing whether a rate is too high a cable company requests certain information from the utility which, in our experience more often than not, cooperates

by providing the information. To address those few instances of untimely cooperation or unresponsiveness by a utility, we propose to amend Section 1.1404(h), 47 C.F.R. § 1.1404(h), to emphasize that the utility should supply the information listed in Section 1.1404(g), along with the relevant supporting pages from its FERC Form 1, its FCC Form M, or other public report, within 30 days of the request by the cable operator. BellSouth and Texas Power argue that it should not be necessary to supply information which is publicly available. BellSouth Comments at 12; Texas Power Comments at 12. We do not agree. As we stated in the NPRM,[50] some of the information, for instance, the total number of poles owned, controlled, or used by an electric utility (*see* Sections 1.1404(g)(5) and (6) of the Rules), is within the sole control of the utility. Moreover, there is often a delay in obtaining the most recent data from publicly available records. As a result, the complaint has often been based on older data than that used by the utility in its response. If the utility supplies the actual supporting pages from its report, the determination of the pole attachment rate should be simplified since all of the parties and the Commission will be using the same data and will have the necessary supporting data to resolve any discrepancies. If a complaint is eventually filed, the cable company will be required to submit these supporting pages with its complaint. We expect utilities to provide documents even though a complaint has not yet been filed in order to promote prompt resolution of matters in controversy. Also, we would emphasize that we are expediting the complaint process by imposing a definite time period within which utilities must respond. Therefore, Section 1.1404(h) is adopted as proposed.

86. Section 1.1404(i), 47 C.F.R. § 1.1404(i), provides that the complaint shall include a brief summary of all steps taken to resolve the dispute prior to filing. We proposed to amend Section 1.1404(i) by adding language allowing the complainant to explain that negotiations did not take place because they appeared to be useless under the circumstances and why it believes such steps were fruitless. Several commenters oppose this amendment because they believe that it would relieve the cable operator of any obligation to try to resolve the dispute between the parties. EEI Comments at 12; Arizona PSC Comments at 31. We disagree. It is in the interests of both the utility and the cable company to resolve disputes without resorting to filing a complaint before the Commission. If the utility wants to begin negotiations, it simply has to offer to negotiate since it is on notice that a cable company may be contemplating filing a rate complaint when the utility receives an information request from a cable company prior to filing a complaint. Accordingly, the proposed change to Section 1.1404(i) is adopted as modified herein.[51]

87. As previously discussed, if a utility argues that the proposed rate is below its incremental costs, it will have the burden of showing that this figure is below the minimum statutory rate. We, therefore, proposed to amend Section 1.1409(b), 47 C.F.R. § 1.1409(b), to reapportion the burden of establishing a prima facie case. Several commentors argued that the issue of a minimum rate is rarely raised and, therefore, there is no justification for shifting the traditional burden of proof away from the complainant. We agree that the minimum rate will probably be raised only infrequently in complaint proceedings. However, we find that it is appropriate that the utility have the burden of setting forth a prima facie case in such cases since information regarding incremental costs would be solely within the control of the utility. This is consistent with traditional burdens of going forward with the evidence in complaint proceedings.[52] Accordingly, the proposed amendment to Section 1.1409(b) is adopted.[53]

V. REGULATORY FLEXIBILITY ACT INITIAL ANALYSIS

88. *Reason for Action.* The Commission is issuing this Report and Order because of the need to modify our policies governing cable television attachments to utility poles and to clarify certain rules regarding pole attachment complaints, pursuant to the findings of the U.S. Court of Appeals in *Alabama Power, supra.*

89. *The Objective.* The objective of this Report and Order is to adopt changes to our pole attachment rate formula and Rules. The Commission has modified its pole attachment formulas and adopted revised rules which will facilitate the prompt resolution of complaints concerning the rates, terms and conditions of pole attachments.

90. *Legal Basis.* The authority for this Report and Order is contained in Sections 1, 4(i), 224, and 403 of the Communications Act. 47 U.S.C. §§ 151, 154(i), 224, and 403.

91. *Description, potential impact and number of small entities affected.* The adopted changes will have the net effect of not increasing the burden either on small cable operators who wish to file complaints or on small utilities which must respond to the complaints. In keeping with our Congressional mandate, the adopted policy and rule changes will continue to utilize a formula which relies on publicly available data.

92. *Recording, recordkeeping and other compliance requirements.* No additional recording or recordkeeping will be required by the items adopted in this Report and Order. At present we request electric utilities to supply certain information with their response to the complaint. The adopted rules will request the utility to supply that information to the cable company or the cable association which, in turn, will include those pages with the complaint. In addition, if the allowed rate of return or treatment of accumulated deferred taxes is at issue, the utility will be required to submit the order from the state regulatory body which sets the rate of return or determines the treatment of deferred taxes. These changes will affect the timing of submitting material to the Commission, but the material itself is already in the possession of one of the parties and is usually submitted in the course of the pleading cycle in any event. By submitting the data at an earlier stage, the issues to be pleaded should be simplified.

93. *Federal rules which overlap, duplicate or conflict with this rule.* None

94. *Any significant alternatives minimizing impact on small entities* and consistent with stated objectives. There are no significant alternatives which would minimize the impact on small entities. The Commission's alternative would be to take no steps to improve the complaint process in response to the concerns raised by the court in Alabama Power, supra. This would be inconsistent with

the current Commission objective of providing service to the public in the most efficient, expeditious manner possible.

VI. PAPERWORK REDUCTION ACT STATEMENT

95. The decisions contained herein have been analyzed with respect to the Paperwork Reduction Act of 1980 and found to impose a new or modified information collection requirement on the public. Implementation of any new or modified requirement will be subject to approval by the Office of Management and Budget as prescribed by the Act.

VII. ORDERING CLAUSES

96. Accordingly, IT IS ORDERED that, pursuant to Sections 4(i), 4(j), 201-205, 218, 220, 403, and 404 of the Communications Act of 1934, 47 U.S.C. §§ 154(i), 154(j), 201-205, 218, 220, 403 and 404, the policies and requirements set forth herein ARE ADOPTED.

97. IT IS FURTHER ORDERED that, pursuant to the authority contained in Sections 4(i) and 224 of the Communications Act, 47 U.S.C. §§ 154(i), 224, Subpart J of Part 1 of the Commission's Rules and Regulations ARE AMENDED, as set forth in the attached Appendix D, effective September 28, 1987.

FEDERAL COMMUNICATIONS COMMISSION

William J. Tricarico
Secretary

APPENDIX A

Comments have been filed by the following:

West Penn Power Company
Kansas Power & Light Company
Union Electric Company
Potomac Edison Company
Utah Power & Light Company
National Cable Television Association, Inc (NCTA)
Consolidated Edison Company of New York
Kentucky Cable Television Association
Arizona Public Service Company
Pacific Bell and Nevada Bell (Pacific Companies)
Montana Power Company
Alabama Power Company
Cincinnati Bell Telephone Company
Edison Electric Institute (EEI)
Maryland/Delaware Cable Television Association, Inc.
Southwestern Bell Telephone Company
United States Telephone Association
Virginia Electric & Power Company
Adelphia Communications Corporation, *et al.*
Ameritech operating Companies (Ameritech)
comprising Illinois Bell, Indiana Bell, Michigan Bell, Ohio Bell and Wisconsin Bell
Bell Atlantic Telephone Companies
comprising Bell of Pennsylvania, Diamond State Telephone, the four Chesapeake and Potomac Telephone Companies and New Jersey Bell
BellSouth Corporation
comprising South Central Bell and Southern Bell
Cable Companies
comprising ACI, Inc., Cablevision Industries, Inc., Cardinal Communications, Colony Communications, Comsat Cable Communications, Cox Cable Communications, Mickelson
Media, Multimedia Cablevision, New Channel Corp., New England Cablevision, Par Cable, Sammonis Communications, Sonic Communications, Televenets, Inc.,
Triax, GP, Inc., US Cable Corporation
Continental Cablevision
Southern Utilities
comprising Georgia Power Company, Gulf Power Company and Mississippi Power Company
Mountain States Telephone & Telegraph Company, Northwestern Bell Telephone Company and Pacific Northwest Bell Telephone Company
Texas Power & Light Company, Dallas Power & Light Company and Texas Electric Service Company
Western Communications Inc. and Gill Industries, Inc.
Arizona Public Service Company
Cable Operators and Associations
comprising Texas Cable TV Assn., California Cable Television Assn., Georgia Cable Assn., Indiana Cable Television Assn., Virginia Cable Television Assn., American Cablesystems Corp., Cablevision Service Company, Chasco Cablevision, Ltd., Daniels and Associates, Inc., Harron Communications Corp., Multi-Channel TV Cable Company, Perry Cable TV Corp., Rogers Cablesystems of America, St. Charles CATV, Inc., Telecable Corporation, Tele-Communications, Inc., United Artists Cablesystems Corp., United Cable Television Corp.
Kansas City Power & Light Company
Mississippi Power & Light Company

Lincoln Electric System

Reply Comments have been filed by the following:
Alabama Power Company
Arizona Public Service Company
Edison Electric Institute
National Cable Television Association
Southwestern Bell Telephone Company
Virginia Electric & Power Company
Texas Power & Light Company
United States Telephone Association
Adelphia Communications Corporation, *et al.*
Ameritech Operating Companies
Bell Atlantic Telephone Companies
BellSouth Corporation
Cable Companies
Continental Cablevision, *et al.*
Cable Operators and Associations
Southern Utilities
Mountain States Telephone & Telegraph Company, Northwestern Bell Telephone Company and Pacific Northwest Bell Telephone Company
New York Telephone Company and New England Telephone & Telegraph Company (NYNEX)
Pacific Bell and Nevada Bell

F/A
V2/V3

WA Exhibit No. 9
BREMC Appurtenance Factor Calculation
YE 2016 CPR Data

BLUE RIDGE ELECTRIC CPR Master with Balance Querydate : '31-dec-2016 11:59:59 PM' , Co_ID : '1'

Cpr #	Description	Depr Rate	Gldepexp	Gldepacc	Plant Type	CPR Quantity	CPR Amount
3640001	ANCHORS EXP 8 120IN 2MI ++	0.3000	4030000	1086000	D	98	$20,893.07
3640002	ANCHOR EXP 10 200 IN 2 MIN	0.3000	4030000	1086000	D	17,894	$1,412,896.20
3640003	ANCHOR ROCK 15 IN	0.3000	4030000	1086000	D	40	$6,152.91
3640004	ANCHOR ROCK 30 IN	0.3000	4030000	1086000	D	234	$45,216.12
3640005	ANCHORS ROCK 53 IN	0.3000	4030000	1086000	D	267	$38,274.93
3640006	ANCHORHELIX DBL PIS 8 10	0.3000	4030000	1086000	D	577	$137,793.67
3640007	ANCHORDBL.DIST. 10 /10	0.3000	4030000	1086000	D	225	$26,380.67
3640008	ANCHOR HELIX 10 PIS	0.3000	4030000	1086000	D	69,234	$6,209,142.82
3640009	ANCHOR HELIX 8 PIS	0.3000	4030000	1086000	D	15	$1,343.09
3640010	ARMDAVIT 6 FT 115 KV	0.3000	4030000	1086000	D	0	$0.00
3640011	ARMDAVIT 8 FT 115 KV	0.3000	4030000	1086000	D	2	$1,729.85
3640012	BRACES X-ARM WOOD 36IN PR	0.3000	4030000	1086000	D	16,451	$2,556,673.16
3640013	ARMSTEEL 8 (DIST.) #D-3001	0.3000	4030000	1086000	D	12	$4,414.75
3640014	CROSSARM10 STEEL D30-422	0.3000	4030000	1086000	D	139	$62,664.26
3640015	STEEL ARMTAN.GALV. 3.5X3.5X	0.3000	4030000	1086000	D	44	$33,946.44
3640016	ARMSTEEL 10 DEADEND	0.3000	4030000	1086000	D	347	$74,844.62
3640017	ARMTANG. F.GLASS HD 8	0.3000	4030000	1086000	D	3	$1,250.48
3640018	ARMTANG. F.GLASS HD 10	0.3000	4030000	1086000	D	101	$19,731.97
3640019	ARMTANG F.GLASS HD 12	0.3000	4030000	1086000	D	93	$44,356.96
3640020	ARMDE F.GLASS 10 /4 POS.	0.3000	4030000	1086000	D	79	$15,686.29
3640021	ARMDE F.GLASS 12 /4 POS.	0.3000	4030000	1086000	D	34	$18,323.65
3640022	BRACKET CUTOUT MTG 3 PH	0.3000	4030000	1086000	D	806	$335,533.00
3640023	BRACKETALUMAFORM (1-PB)	0.3000	4030000	1086000	D	17	$1,092.67
3640024	CROSSARM FIBERGLASS 4	0.3000	4030000	1086000	D	2	$269.95
3640025	CROSSARM STEEL 4 FT	0.3000	4030000	1086000	D	218	$48,650.41
3640026	CROSSARMSTEEL 5 FT	0.3000	4030000	1086000	D	0	$0.00
3640027	8 SINGLE X-ARM ASSMY	0.3000	4030000	1086000	D	262	$87,130.57
3640028	8 DBL. X-ARM ASSBLY	0.3000	4030000	1086000	D	322	$101,126.69
3640029	10 SINGLE X-ARM ASSMY	0.3000	4030000	1086000	D	73	$16,382.54
3640030	10 DBL. X-ARM ASSMY	0.3000	4030000	1086000	D	173	$70,658.56
3640031	X-ARM 3 5/8 X 4 5/8 X 8 FT	0.3000	4030000	1086000	D	12,160	$1,704,396.40
3640032	X-ARM 3 5/8 X 4 5/8 X 10 FT	0.3000	4030000	1086000	D	4,618	$797,614.70
3640033	XARM 3 3/4X5 3/4X 16 18	0.3000	4030000	1086000	D	0	-$0.01
3640034	XARM 5 3+4X7 3+4X22 FT	0.3000	4030000	1086000	D	17	$10,934.91
3640035	X ARM STEEL 10 FT	0.3000	4030000	1086000	D	241	$113,935.78
3640036	HANGER TRANS CLUSTER	0.3000	4030000	1086000	D	64	$16,625.08
3640037	HANGR TRANS OR REG CLSTR HD	0.3000	4030000	1086000	D	25	$11,987.09
3640038	POLES 20 FT CLASS 7	0.3000	4030000	1086000	D	125	$23,012.46
3640039	POLES 30 FT CLASS 1	0.3000	4030000	1086000	D	0	$0.00
3640040	POLES 30 FT CLASS 2	0.3000	4030000	1086000	D	20	$3,958.87
3640041	POLES 30 FT CLASS 3	0.3000	4030000	1086000	D	23	$4,295.66
3640042	POLES 30 FT CLASS 4	0.3000	4030000	1086000	D	52	$9,837.64
3640043	POLES 30 CLASS 6	0.3000	4030000	1086000	D	30,411	$6,590,213.58
3640044	POLES 35 FT CLASS 1	0.3000	4030000	1086000	D	9	$1,830.60
3640045	POLES 35 FT CLASS 2	0.3000	4030000	1086000	D	6	$1,177.94
3640046	POLES 35 FT CLASS 3	0.3000	4030000	1086000	D	75	$14,448.17
3640047	POLES 35 FT CLASS 4	0.3000	4030000	1086000	D	443	$81,794.85
3640048	POLES 35FT CLASS 5	0.3000	4030000	1086000	D	15,643	$3,448,470.99
3640049	POLES 35 FT CLASS 6	0.3000	4030000	1086000	D	6,421	$1,189,818.15
3640050	POLES 35 FT CLASS 7	0.3000	4030000	1086000	D	511	$94,333.15
3640051	POLES 40 FT CLASS 1	0.3000	4030000	1086000	D	29	$12,697.94
3640052	POLES 40 FT CLASS 2	0.3000	4030000	1086000	D	488	$200,681.07
3640053	POLES 40 CLASS 3	0.3000	4030000	1086000	D	1,655	$664,066.26
3640054	POLES 40 -CLASS 4	0.3000	4030000	1086000	D	26,613	$11,732,579.05
3640055	POLES 40 CLASS 5	0.3000	4030000	1086000	D	10,695	$4,070,547.47
3640056	POLES 40 CLASS 6	0.3000	4030000	1086000	D	1,499	$569,146.45
3640057	POLES 45 FT CLASS 1	0.3000	4030000	1086000	D	104	$56,906.14
3640058	POLES 45 FT CLASS 2	0.3000	4030000	1086000	D	1,368	$661,200.06
3640059	POLES 45 FT CLASS 3	0.3000	4030000	1086000	D	3,713	$1,711,544.06
3640060	POLES 45 CLASS 4	0.3000	4030000	1086000	D	3,923	$1,498,922.91
3640061	POLES 45 FT CLASS 5	0.3000	4030000	1086000	D	745	$282,969.24
3640062	POLES 45 FT CLASS 6	0.3000	4030000	1086000	D	46	$17,440.21
3640063	POLES 50 CLASS 1	0.3000	4030000	1086000	D	87	$63,761.73
3640064	POLES 50 FT CLASS 2	0.3000	4030000	1086000	D	885	$658,685.03
3640065	POLES 50 FT CLASS 3	0.3000	4030000	1086000	D	1,139	$953,510.47
3640066	POLES 50 CLASS 4	0.3000	4030000	1086000	D	81	$76,470.39

WA Exhibit No. 9
BREMC Appurtenance Factor Calculation
YE 2016 CPR Data

BLUE RIDGE ELECTRIC CPR Master with Balance Querydate : '31-dec-2016 11:59:59 PM' , Co_ID : '1'

Cpr #	Description	Depr Rate	Gldepexp	Gldepacc	Plant Type	CPR Quantity	CPR Amount
3640067	POLES 50 FT CLASS 5	0.3000	4030000	1086000	D	41	$38,707.24
3640068	POLES 55 FT CLASS 1	0.3000	4030000	1086000	D	80	$63,372.50
3640069	POLES 55 FT CLASS 2	0.3000	4030000	1086000	D	142	$112,785.65
3640070	POLES 55 CLASS 3	0.3000	4030000	1086000	D	142	$129,217.13
3640071	POLES 55 FT CLASS 4	0.3000	4030000	1086000	D	19	$17,937.50
3640072	POLES 60 FT CLASS 2	0.3000	4030000	1086000	D	50	$43,474.24
3640073	POLES 65 FT CLASS 2	0.3000	4030000	1086000	D	24	$24,887.93
3640074	POLES 65 FT CLASS H2	0.3000	4030000	1086000	D	43	$40,595.40
3640075	POLESTEEL 55 -CLASS 1	0.3000	4030000	1086000	D	7	$17,327.94
3640076	POLE AL 38 #20-865 HAPCO	0.3000	4030000	1086000	D	684	$139,068.20
3640077	POLESTEEL 35/3 DIST.	0.3000	4030000	1086000	D	3	$7,544.56
3640078	POLESTEEL 40/3 DIST.	0.3000	4030000	1086000	D	23	$24,715.92
3640079	POLE.STEEL 45/3 DIST.	0.3000	4030000	1086000	D	27	$28,813.83
3640080	POLESTEEL 50/3 DIST.	0.3000	4030000	1086000	D	12	$13,168.12
3640081	TRANSFORMER PLATFORM 13	0.3000	4030000	1086000	D	10	$20,809.76
3640082	OVERHEAD SUPPORT AL 14FT	0.3000	4030000	1086000	D	19	$38,285.20
3640083	TRANSFORMER PLATFORM 16	0.3000	4030000	1086000	D	12	$29,963.96
3640084	ANCHOR EXP. 300 SQ IN	0.3000	4030000	1086000	D	57	$21,412.87
3640085	X ARM 5 5/8 X 7 3/8 X 26 FT	0.3000	4030000	1086000	D	33	$36,389.21
3640086	X ARM 4 3+4X5 3+4X8 FT	0.3000	4030000	1086000	D	11	$9,179.70
3640087	X ARM 4 3+4X5 3+4X10 FT	0.3000	4030000	1086000	D	2	$1,228.60
3640088	ARM, STEEL 8'	0.3000	4030000	1086000	D	6	$2,157.36
3640089	POLE, 60 FT CLASS1	0.3000	4030000	1086000	D	1	$544.29
3640090	POLE, 70FT CLASS 1	0.3000	4030000	1086000	D	8	$11,216.00
3640091	POLE, STEEL 60-H2/LD3	0.3000	4030000	1086000	D	9	$66,388.96
3640092	POLE, STEEL 55 LD-1	0.3000	4030000	1086000	D	10	$101,647.44
3640093	POLE,AL 38' BRONZE #20-865-P31	0.3000	4030000	1086000	D	66	$102,289.11
3640094	ARMSTEEL 10' TANGENT(DIST)	0.3000	4030000	1086000	D	60	$22,808.80
3640095	POLES 70 FT CLASS 2	0.3000	4030000	1086000	D	0	-$0.01
3640096	POLE, STEEL, 35' MT. HG 41'X6", TWO ARMS BRONZE	0.3000	4030000	1086000	D	6	$7,105.35
3640097	XARM, STEEL, D.E. 60"	0.3000	4030000	1086000	D	14	$1,392.18
3640098	POLESTEEL 85-H2/LD3	0.3000	4030000	1086000	D	5	$28,883.66
3640099	POLES 65 FT CLASS 1	0.3000	4030000	1086000	D	5	$3,530.01
3640100	POLES 50FT CLASS H1	0.3000	4030000	1086000	D	1	$697.16
3640101	POLESTEEL 60'-CLASS 1	0.3000	4030000	1086000	D	2	$7,327.29
3640102	POLESTEEL 50'-LD1	0.3000	4030000	1086000	D	4	$32,793.57
3640103	POLE 85 CLASS 1	0.3000	4030000	1086000	D	0	$0.00
3640104	ANCHOR,TRIPLE SCREW, TRANS	0.3000	4030000	1086000	D	11	$2,695.45
3640105	ARMSTEEL DAVIT 9.5' 230KV	0.3000	4030000	1086000	D	0	$0.01
3640106	POLESTEEL 80-H4/LD5	0.3000	4030000	1086000	D	3	$31,719.27
3640107	POLESTEEL 75-LD4	0.3000	4030000	1086000	D	2	$6,609.70
3640108	POLESTEEL 75-H4/LD5	0.3000	4030000	1086000	D	1	$7,233.77
3640109	POLESTEEL 80-H2/LD3	0.3000	4030000	1086000	D	6	$52,196.55
3640110	POLESTEEL 70-H2/LD3	0.3000	4030000	1086000	D	13	$136,686.35
3640111	POLESTEEL 70-H1/LD2	0.3000	4030000	1086000	D	2	$23,240.79
3640112	POLESTEEL 65-H4/LD5	0.3000	4030000	1086000	D	3	$21,090.12
3640113	POLES 60FT CLASS 4	0.3000	4030000	1086000	D	0	$0.00
3640114	POLEBOTTOM STL 60-LD1	0.3000	4030000	1086000	D	0	$0.00
3640115	POLESTEEL 85-H1/LD2	0.3000	4030000	1086000	D	2	$11,669.41
3640116	ARMSTEEL 8' TANGENT [DIST]	0.3000	4030000	1086000	D	0	$0.00
3640117	ANCHOR ROCK 8' (TRANSM)	0.3000	4030000	1086000	D	35	$8,388.97
3640118	POLEBOTTOM STL 65 LD1	0.3000	4030000	1086000	D	2	$11,592.85
3640119	POLETOP STL 60-90 LD1	0.3000	4030000	1086000	D	2	$13,342.70
3640120	POLESTEEL 85' CLASS 1	0.3000	4030000	1086000	D	5	$10,800.00
3640121	POLESTEEL 75-H1/LD2	0.3000	4030000	1086000	D	2	$8,291.63
3640122	POLESTEEL 90-H3/LD4	0.3000	4030000	1086000	D	7	$44,074.15
3640123	POLESTEEL 70-H3/LD4	0.3000	4030000	1086000	D	2	$22,592.33
3640124	POLESTEEL 80-H3/LD4	0.3000	4030000	1086000	D	14	$309,394.36
3640125	POLES 60FT CLASS 3	0.3000	4030000	1086000	D	0	$0.00
3640126	POLES 65 FT CLASS 3	0.3000	4030000	1086000	D	0	$0.00
3640127	POLESTEEL 65'-CLASS 1	0.3000	4030000	1086000	D	2	$19,135.97
3640128	X ARM 3 5/8 X 9 1/2 X 40 FT	0.3000	4030000	1086000	D	0	$0.00
3640129	BRACE X ASY TM-110-10FT 6IN	0.3000	4030000	1086000	D	0	$0.00
3640130	BRACE V 8FT	0.3000	4030000	1086000	D	0	$0.01
3640131	X-ARM 3 5/8 X 9 1/2 X 23'	0.3000	4030000	1086000	D	0	$0.00
3640132	X-ARM 3 5/8 X 9 1/2 X 20'	0.3000	4030000	1086000	D	1	$295.09

WA Exhibit No. 9
BREMC Appurtenance Factor Calculation
YE 2016 CPR Data

BLUE RIDGE ELECTRIC CPR Master with Balance Querydate : '31-dec-2016 11:59:59 PM', Co_ID : '1'

Cpr #	Description	Depr Rate	Gldepexp	Gldepacc	Plant Type	CPR Quantity	CPR Amount
3640133	POLESTEEL 120-H3/LD4	0.3000	4030000	1086000	D	0	$0.00
3640134	POLESTEEL 65-CLASS 2	0.3000	4030000	1086000	D	7	$65,932.50
3640135	POLESTEEL 70' CLASS 1	0.3000	4030000	1086000	D	3	$25,392.03
3640136	POLESTEEL 75-H2/LD3	0.3000	4030000	1086000	D	4	$38,021.93
3640137	POLESTEEL 85-H3/LD4	0.3000	4030000	1086000	D	5	$57,970.76
3640138	POLESTEEL 85-H5/LD6	0.3000	4030000	1086000	D	2	$19,784.25
3640139	POLESTEEL 90-H1/LD2	0.3000	4030000	1086000	D	2	$17,939.76
3640140	POLESTEEL 95-H1/LD2	0.3000	4030000	1086000	D	0	$0.00
3640141	POLESTEEL 95-H4/LD5	0.3000	4030000	1086000	D	0	$0.00
3640142	POLESTEEL 95-H6/LD7	0.3000	4030000	1086000	D	0	$0.00
3640143	POLESTEEL 100-H1/LD2	0.3000	4030000	1086000	D	0	$0.00
3640144	POLESTEEL 100-H7/LD8	0.3000	4030000	1086000	D	0	$0.00
3640145	POLESTEEL SELF-SUP 90'	0.3000	4030000	1086000	D	0	$0.00
3640146	POLE, 110 SELF SUPPORT	0.3000	4030000	1086000	D	0	$0.00
3640147	POLESTEEL 95' BOONE/BR TRANS #BA49	0.3000	4030000	1086000	D	0	$0.00
3640148	POLESTEEL, 120' H7/LD8	0.3000	4030000	1086000	D	0	$0.00
3640149	POLE, GALVANIZED STEEL 100'	0.3000	4030000	1086000	D	0	$0.00
3640150	POLE STEEL 100' H3	0.3000	4030000	1086000	D	0	$0.00
3640151	POLESTEEL 115-H5/LD6	0.3000	4030000	1086000	D	0	$0.00
3640152	POLESTEEL 110' H4/LD5	0.3000	4030000	1086000	D	1	$0.00
3640153	POLESTEEL 100-H3/LD4	0.3000	4030000	1086000	D	0	$0.00
3640154	POLESTEEL 110-H2/LD3	0.3000	4030000	1086000	D	0	$0.00
3640155	POLESTEEL 105-H6/LD7	0.3000	4030000	1086000	D	0	$0.00
3640156	POLESTEEL 105-H3/LD4	0.3000	4030000	1086000	D	1	$538.84
3640157	POLESTEEL 105' H1/LD2	0.3000	4030000	1086000	D	1	$519.17
3640158	XARM STEEL TANGENT 12' DIXIE/MCLEAN	0.3000	4030000	1086000	D	40	$55,711.29
3640159	POLESTEEL 95-H9/LD10	0.3000	4030000	1086000	D	0	$0.00
3640160	POLE,POLETOP BRACKET 54" BROWN	0.3000	4030000	1086000	D	0	$0.00
3640161	POLE,STEEL 65 LD3	0.3000	4030000	1086000	D	4	$21,810.49
3640162	POLE,POLETOP BRACKET 54" GREEN	0.3000	4030000	1086000	D	0	$0.00
3640163	PLATFORM TRANSF, 14'AL	0.3000	4030000	1086000	D	6	$24,773.13
3640164	POLESTEEL 90-H2/LD3	0.3000	4030000	1086000	D	1	$6,182.10
3640165	X-ARM, 5-5/8" X 7-3/8" X 32'	0.3000	4030000	1086000	D	10	$12,170.43
3640166	POLESTEEL 80-H1/LD2	0.3000	4030000	1086000	D	1	$7,341.74
3640167	POLES 80 FT CLASS 1	0.3000	4030000	1086000	D	0	$0.00
3640168	POLE STEEL LD1	0.3000	4030000	1086000	D	2	$21,707.27
3640169	ANCHOR, 6" 3/4" x 5.5'RO	0.3000	4030000	1086000	D	0	$0.00
3640170	SUBSTATION PACKAGE	0.3000	4030000	1086000	D	1	$11,396.26
3640171	POLESTEEL 90-H5/LD6	0.3000	4030000	1086000	D	2	$29,483.00
3640172	XARM,STEEL,DE,12',DIST	0.3000	4030000	1086000	D	14	$17,556.35
3640173	ARM,CROSS,STEEL,DE,14'	0.3000	4030000	1086000	D	2	$12,135.66
3640174	POLESTEEL 105-H4/LD5	0.3000	4030000	1086000	D	1	$657.46
3640175	ANCHOR,10"HUB STYLE,HD 12,000LB	0.3000	4030000	1086000	D	21	$4,420.33
3640176	ANCHOR,DOUBLE HELIX,TRANS	0.3000	4030000	1086000	D	2	$1,428.33
3640177	POLESTEEL 60-H1/LD2	0.3000	4030000	1086000	D	2	$25,217.89
3640178	Pole, Steel,115 GPTP115X	0.3000	4030000	1086000	D	0	$0.00
3640179	Pole, Cell Tower, 60'	0.3000	4030000	1086000	D	0	$0.00
3640180	Pole, Moto, From RidgeLink	0.2300	4030000	1086000	D	0	$0.00
(1)	Total Account 364					233,584	$51,209,181.87

(2) Total Poles/Anchors/Guys (shaded) $ 44,762,968.10

Appurtenance Factor (Line 2 / Line 1) 87.41%

F/A
v2 v3

WA Exhibit No. 10
Charter Communications Space
Number of Attachments - Number of Poles

2016 BREMC Inventory Results

Entity (NJUNS Code)	***Att's***	***Poles***	***Avg Att's per pole***	***Foreign Poles***
CHA-B (CHAWAT)	15990	14264	1.12	0
CHA-L (CHALEN)	10673	9694	1.10	0
CHA-W (CHAWKL)	1011	930	1.09	0
Total Charter	**27674**	**24888**	**1.11**	**0**

WA Exhibit No. 11

OUTSIDE PLANT ENGINEERING HANDBOOK

August 1994

AT&T reserves the right to make changes to the product(s) described in this document in the interest of improving internal design, operational function, and/or reliability. AT&T does not assume any liability which may occur due to the use or application of the product(s) or circuit layout(s) described herein.

Developed by
AT&T Network Systems Customer Education & Training

Cable Sags

AT&T 627-210-018

Significant changes concerning vertical clearances were made in the 1990 edition of the National Electrical Safety Code (NESC). Primarily, rather than specify the minimum vertical clearance under nominal operating conditions, that is, no load conditions at 60°F (15.5°C), NESC Rule 232 specifies that vertical clearances apply during maximum sag conditions. For telephone cable, maximum sag may occur at either the high-temperature condition of 120°F (48.9°C) or at 32°F (0°C) with an ice load. The condition that results in the largest cable sag must be used with the minimum clearance requirements to determine the required pole attachment height.

The expected worse-case sag for copper cable supported by 6M, 6.6M, 10M, 16M, and 25M strand in the light, medium, and heavy storm-load region is shown in the following graphs. The sag is based on the recommended stringing-tension shown in the table on page 10-39.

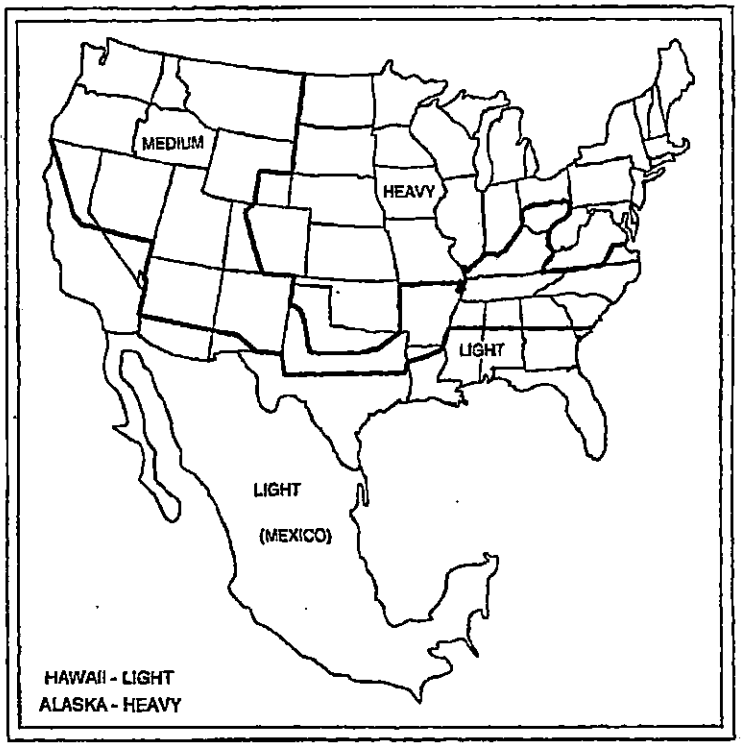
To use the graphs, first select the one that applies to the particular strand and storm-load region of interest. Next, select the curve on the graph that corresponds to the proper cable weight. Cable weights are shown in AT&T 626-101-005 and 626-xxx-xxx and in Section 14, "CABLE AND WIRE" of this document. Locate the span length of interest on the horizontal axis, and draw a vertical line from that point to the appropriate cable-weight curve. From that point, draw a horizontal line that intersects with the vertical axis. This point on the vertical axis corresponds to the worse-case sag condition.

This worse-case sag must be added to the minimum required vertical clearance (see Section 11, "CLEARANCES FOR AERIAL PLANT") to determine the minimum pole-attachment height for that particular combination of cable weight, span length, strand, and storm-load region.

Storm Loading Areas

AT&T 919-120-200, 1993 NESC Section 25

The National Electric Safety Code (NESC) divides the United States into three storm loading areas based on the frequency, severity, and damaging effects of ice and wind storms. These areas and the design load data for each are defined below.



Unexposed guys need not be grounded for protection reasons; however, connecting anchor guys to a grounded telephone cable strand is recommended, as it will lower the cable-to-ground impedance. This helps to reduce cable damage caused by lightning. It also helps to reduce telephone noise by increasing the effectiveness of the cable shield.

SAGS AND TENSIONS — COPPER CABLE

Suspension Strand

AT&T 627-200-015

Galvanized suspension strand is available in two types. Class A is for general use under normal field conditions. Class C is for use where severe corrosion problems exist, for example, in industrial or coastal areas.

The 6.6M strand is made of extra high-strength steel and is smaller, lighter, and less expensive than 6M strand. For guying, they are interchangeable. As suspension strands, however, they are limited to different span lengths, as shown on Page 10-39.

The 2.2M strand should not be used to support aerial cable, except small cables in pole-to-building or building-to-building construction.

Dimensions and breaking strengths of strand are shown below.

GALVANIZED STRAND			
Size	Breaking Strength (lb)	Diameter (in.)	Weight (lb/ft)
2.2M	2400	3/16	0.077
6M	6000	5/16	0.225
6.6M	6650	1/4	0.121
10M	11500	3/8	0.270
16M	18000	7/16	0.390
25M	25000	1/2	0.510

Stringing Tension for Strand

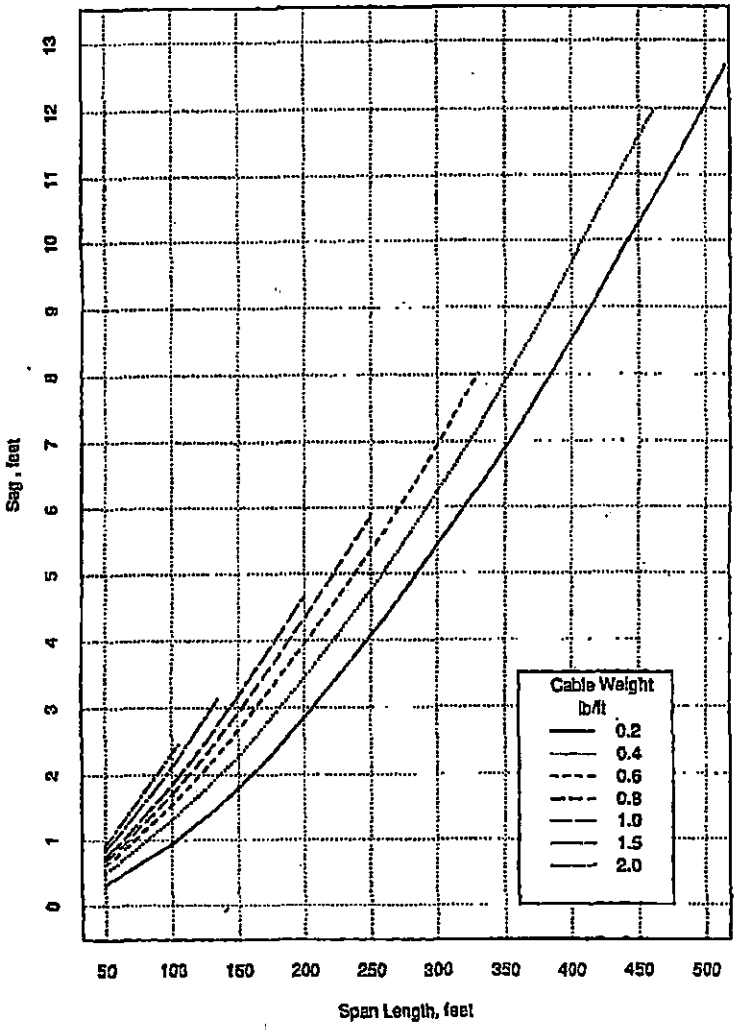
AT&T 627-210-018, 919-565-400

The proper stringing tension is a compromise between high tension (which causes cable bowing and creeping) and low tension (which results in excessive sag and requires taller poles to obtain clearances). Recommended stringing tensions for supporting strand are shown in the following table.

Strand	Span Length (ft)	Stringing Tension (lb) at Temperature (°F)					
		0°	20°	40°	60°	80°	100°
6M	Up to 250	1550	1400	1250	1100	900	825
	250-450	1475	1350	1225	1100	1000	900
	Over 450	1375	1275	1175	1100	1025	950
6.6M	Up to 250	900	800	700	600	500	425
	250-450	850	750	675	600	525	475
	Over 450	775	700	650	600	550	525
10M	Up to 400	2675	2475	2275	2100	1900	1725
	Over 400	2600	2425	2250	2100	1925	1800
16M	Any	4425	4150	3875	3600	3325	3075
25M	Any	9125	8800	8400	8000	7625	7250

The proper stringing tension for self-supporting cable depends not only on temperature and span lengths, but also on cable weight. The tables for self-supporting cables are too voluminous to be included here. See AT&T 627-700-011.

6.6-M Strand - Medium Loading Region
(Based on NESC Rule 232)



Alpeth Sheath (Air Core)

These cables are primarily designed for aerial use. ***They should not be used for buried installation.*** If the environment where they are being installed is subject to sheath damage due to wildlife, etc., the Alpeth-UM design shown on Page 14-16 should be used.

ALPETH SHEATH (AIR CORE)

Cable Code	No. Of Pairs	AWG	Avail-ability	Standard Length #420 Reel Ft.(m)	Nominal Outside Dia. In.(mm)	Nominal Weight		Comcode
						Lbs./Ft.	Gr./m	
BHBA	0025	19	S	9720(2963)	0.82(21)	0.33	491	100022151
	0050	19	NS	4860(1482)	1.09(28)	0.59	878	100022185
	0100	19	NS	3240(988)	1.48(38)	1.12	1667	100022243
	0200	19	NS	2400(732)	1.97(50)	2.18	3244	100022300
	0300	19	NS	1590(485)	2.36(60)	3.21	4777	100022334
BHAA	0025	22	S	9810(2991)	0.62(16)	0.19	283	100021146
	0050	22	S	9810(2991)	0.80(20)	0.33	491	100021179
	0100	22	S	4900(1494)	1.09(28)	0.60	893	100021237
	0200	22	S	3920(1195)	1.45(37)	1.13	1682	100021294
	0300	22	S	3270(997)	1.68(43)	1.67	2485	100021328
	0400	22	S	2170(662)	1.93(49)	2.18	3244	100021351
	0600	22	S	1360(415)	2.28(58)	3.21	4777	100021385
	0900	22	S	1190(363)	2.82(72)	4.75	7069	103711339
BKMA	025	24	S	11340(3457)	0.58(15)	0.13	193	100023043
	0050	24	S	10200(3109)	0.70(18)	0.22	327	100023076
	0100	24	S	8500(2591)	0.88(22)	0.39	580	100023134
	0200	24	S	5430(1656)	1.18(30)	0.72	1071	100023191
	0300	24	S	4240(1293)	1.38(35)	1.05	1563	100023225
	0400	24	S	3770(1150)	1.53(39)	1.39	2069	100023258
	0600	24	S	2390(729)	1.87(47)	2.03	3021	100023282
	0900	24	S	1670(510)	2.31(59)	2.97	4420	100023316
	1200	24	S	1360(415)	2.53(64)	4.00	5953	103711313
	1500	24	S	1020(311)	2.86(73)	4.95	7366	103711305
	1800	24	S	910(278)	3.04(77)	5.92	8810	103711297

ALPETH SHEATH (AIR CORE) (Contd)								
Cable Code	No. Of Pairs	AWG	Avail-ability	Standard Length #420 Reel Ft.(m)	Nominal Outside Dia. In.(mm)	Nominal Weight		Comcode
						Lbs./Ft.	Gr./m	
BKTA	0025	26	NS	10580(3225)	0.52(13)	0.10	149	100024025
	0050	26	S	10580(3225)	0.58(15)	0.16	238	100024058
	0100	26	S	10580(3225)	0.70(18)	0.27	402	100024116
	0200	26	S	8820(2689)	0.94(24)	0.48	714	100024173
	0300	26	S	7500(2287)	1.09(28)	0.70	1042	100024207
	0400	26	S	5240(1598)	1.29(33)	0.91	1354	100024231
	0600	26	S	3720(1134)	1.54(39)	1.33	1979	100024264
	0900	26	S	2610(796)	1.81(46)	1.94	2887	100024298
	1200	26	S	2140(653)	2.01(51)	2.54	3780	103711248
	1500	26	S	1430(436)	2.28(58)	3.15	4688	103711255
	1800	26	S	1430(436)	2.42(61)	3.75	5581	103711412
	2100	26	NS	1160(354)	2.61(66)	4.35	6473	103711404
	2700	26	NS	910(278)	2.90(74)	5.56	8274	103711386

Notes:

1. AWG metric equivalent: 19 Ga = 0.9 mm, 22 Ga = 0.6 mm, 24 Ga = 0.5 mm, 26 Ga = 0.4 mm.
2. Pulling eye available on all pair sizes.
3. Longer lengths are available: contact an AT&T Sales Representative.

Depth of Setting Poles

AT&T 919-120-600, -700

Length of Pole (ft)	Depth of Set (ft)	
	Firm Earth	Solid Rock
20	4	3
25	5	3
30	5-1/2	3-1/2
35-40	6	4
45	6-1/2	4-1/2
50	7	4-1/2
55	7-1/2	5
60	8	5
65	8-1/2	6
70	9	6
75	9-1/2	6
80	10	7
85	10-1/2	7
90-100	11	7
105-125	12	8

In sloping ground, increase the depth of set by amount A, as shown on the next page.

For depth of setting unguyed corner and dead-end poles, see Page 10-25.

WA Exhibit No. 12

I/A
v2 v3

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This software package helps system engineering and construction groups model and optimize conduit cable pulls before construction begins. This software provides a user-friendly technique for predicting expected tensions and fill ratios for a specific cable pull. The construction process can them be optimized and "best pull" locations identified, thus helping to reduce frustration and cost for crews in the field.

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SpanMaster is a great tool for determining the "what ifs" of aerial plant design. SpanMaster makes it easy to conduct a design "checkup" before actual installation begins to determine how strand size, cable bundle size, span length, and the amount of sag will affect the tension being applied to the span's poles under loaded conditions. With SpanMaster the user can easily change design variables one at a time and watch as the resultant span tension changes in response. Finally, the printed documentation provided by SpanMaster can be a very important tool when using jointly shared poles.*Download Patch:* After you download SpanMaster and try to open it, you may receive an error message stating that your computer is missing MSVBVMSD.DLL. Msvbvm50.exe is a self-extracting file that installs the latest versions of the Microsoft Visual Basic run-time files that all applications created with Visual Basic 5.0 need in order to work. If this happens, go to MicroSoft site and download the patch (http://support.microsoft.com/kb/180071).

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I/A v2/v3

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

BREMC CATV Sag Calculations 10/13/17 BREMC Average - 257'
1 - 1/4" EHS Messenger
1 - .565" Coax (Jacketed)
1 - 96 Fiber Optic Cable
1.5% Design Sag

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-096-LN	0.2612	5.52E+05	0.577	7.47E-06	0.1010	144156	611
P3-565JCA	0.3068	1.87E+06	0.625	1.79E-05	0.1120	573836	350
Bundle			1.202		0.3340		

NESC RESULTS

Loading Condition	Temp. (F)	Ice Load lb/ft	Ice Thick in	Wind Constant lb/ft	Horz Wind Load lb/sq ft	Result Load + Const lb/ft	Sag ft	Tension lb	% Len Chg From Input Conditions
Rule 251 - Medium	15.0	0.451	.25	.2	4.0	1.169	5.76	1673	0.07
232A1	120.0	0.000	.00	.0	0.0	0.334	4.40	626	0.02

Span Length = 257.00 ft
Span Sag = 3.86 ft (46.3 in)
Span Tension = 715 lb
Max Load = 6,650 lb
Usable load (60%) = 3,990 lb
Catenary Length = 257.154 ft
Stress Free Length @
Installed Temperature = 256.953 ft

Unloaded Strand
Sag = 2.51 ft (30.1 in) 0.98 %
Tension = 398 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	2.74	1,006	-0.03	N/A
-30.0	2.83	973	-0.03	N/A
-20.0	2.92	942	-0.03	N/A
-10.0	3.02	912	-0.02	N/A
.0	3.12	883	-0.02	N/A
10.0	3.22	856	-0.02	N/A
20.0	3.32	830	-0.02	N/A
30.0	3.43	804	-0.01	N/A
40.0	3.53	780	-0.01	N/A
50.0	3.64	757	-0.01	N/A
60.0	3.75	736	0.00	N/A
70.0	3.85	715	0.00	N/A
80.0	3.96	695	0.00	N/A
90.0	4.07	677	0.01	N/A
100.0	4.18	659	0.01	N/A
110.0	4.29	642	0.01	N/A
120.0	4.40	626	0.02	N/A
130.0	4.51	611	0.02	N/A
140.0	4.62	597	0.03	N/A

WA Exhibit No. 13.1

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

BREMC CATV Sag Calculations 10/13/17 BREMC 2014 Average - 258.51'
1 - 1/4" EHS Messenger
1 - .565" Coax (Jacketed)
1 - 96 Fiber Optic Cable
1.5% Design Sag

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-096-LN	0.2612	5.52E+05	0.577	7.47E-06	0.1010	144156	611
P3-565JCA	0.3068	1.87E+06	0.625	1.79E-05	0.1120	573836	350
Bundle			1.202		0.3340		

NESC RESULTS

Loading Condition	Temp. (F)	Ice Load lb/ft	Ice Thick in	Wind Constant lb/ft	Horz Wind Load lb/sq ft	Result Load + Const lb/ft	Sag ft	Tension lb	% Len Chg From Input Conditions
Rule 251 - Medium	15.0	0.451	.25	.2	4.0	1.169	5.80	1681	0.07
232A1	120.0	0.000	.00	.0	0.0	0.334	4.43	630	0.02

Span Length = 258.51 ft
Span Sag = 3.88 ft (46.5 in)
Span Tension = 720 lb
Max Load = 6,650 lb
Usable load (60%) = 3,990 lb
Catenary Length = 258.665 ft
Stress Free Length @
Installed Temperature = 258.462 ft

Unloaded Strand
Sag = 2.52 ft (30.2 in) 0.97 %
Tension = 402 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	2.76	1,010	-0.03	N/A
-30.0	2.85	978	-0.03	N/A
-20.0	2.94	947	-0.03	N/A
-10.0	3.04	917	-0.02	N/A
.0	3.14	888	-0.02	N/A
10.0	3.24	860	-0.02	N/A
20.0	3.34	834	-0.02	N/A
30.0	3.45	809	-0.01	N/A
40.0	3.55	785	-0.01	N/A
50.0	3.66	762	-0.01	N/A
60.0	3.77	740	0.00	N/A
70.0	3.88	719	0.00	N/A
80.0	3.99	700	0.00	N/A
90.0	4.10	681	0.01	N/A
100.0	4.21	663	0.01	N/A
110.0	4.32	646	0.01	N/A
120.0	4.43	630	0.02	N/A
130.0	4.54	615	0.02	N/A
140.0	4.65	601	0.03	N/A

WA Exhibit 13.2

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

BREMC CATV Sag Calculations 10/13/17 BREMC 2015 Average - 257.53'
1 - 1/4" EHS Messenger
1 - .565" Coax (Jacketed)
1 - 96 Fiber Optic Cable
1.5% Design Sag

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-096-LN	0.2612	5.52E+05	0.577	7.47E-06	0.1010	144156	611
P3-565JCA	0.3068	1.87E+06	0.625	1.79E-05	0.1120	573836	350
Bundle			1.202		0.3340		

NESC RESULTS

Loading Condition	Temp. (F)	Ice Load lb/ft	Ice Thick in	Wind Constant lb/ft	Horz Wind Load lb/sq ft	Result Load + Const lb/ft	Sag ft	Tension lb	% Len Chg From Input Conditions
Rule 251 - Medium	15.0	0.451	.25	.2	4.0	1.169	5.78	1676	0.07
232A1	120.0	0.000	.00	.0	0.0	0.334	4.41	628	0.02

Span Length = 257.53 ft
Span Sag = 3.86 ft (46.4 in)
Span Tension = 717 lb
Max Load = 6,650 lb
Usable load (60%) = 3,990 lb
Catenary Length = 257.685 ft
Stress Free Length @
Installed Temperature = 257.483 ft

Unloaded Strand
Sag = 2.51 ft (30.1 in) 0.97 %
Tension = 400 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	2.74	1,007	-0.03	N/A
-30.0	2.84	975	-0.03	N/A
-20.0	2.93	944	-0.03	N/A
-10.0	3.03	914	-0.02	N/A
.0	3.13	885	-0.02	N/A
10.0	3.23	857	-0.02	N/A
20.0	3.33	831	-0.02	N/A
30.0	3.43	806	-0.01	N/A
40.0	3.54	782	-0.01	N/A
50.0	3.65	759	-0.01	N/A
60.0	3.75	737	0.00	N/A
70.0	3.86	717	0.00	N/A
80.0	3.97	697	0.00	N/A
90.0	4.08	678	0.01	N/A
100.0	4.19	661	0.01	N/A
110.0	4.30	644	0.01	N/A
120.0	4.41	628	0.02	N/A
130.0	4.52	613	0.02	N/A
140.0	4.63	598	0.03	N/A

WA Exhibit No. 13.3

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

BREMC CATV Sag Calculations 10/13/17 BREMC 2016 Average - 257.01'
1 - 1/4" EHS Messenger
1 - .565" Coax (Jacketed)
1 - 96 Fiber Optic Cable
1.5% Design Sag

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-096-LN	0.2612	5.52E+05	0.577	7.47E-06	0.1010	144156	611
P3-565JCA	0.3068	1.87E+06	0.625	1.79E-05	0.1120	573836	350
Bundle			1.202		0.3340		

NESC RESULTS

Loading Condition	Temp. (F)	Ice Load lb/ft	Ice Thick in	Wind Constant lb/ft	Horz Wind Load lb/sq ft	Result Load + Const lb/ft	Sag ft	Tension lb	% Len Chg From Input Conditions
Rule 251 - Medium	15.0	0.451	.25	.2	4.0	1.169	5.76	1673	0.07
232A1	120.0	0.000	.00	.0	0.0	0.334	4.40	626	0.02

Span Length = 257.01 ft
Span Sag = 3.86 ft (46.3 in)
Span Tension = 715 lb
Max Load = 6,650 lb
Usable load (60%) = 3,990 lb
Catenary Length = 257.164 ft
Stress Free Length @
Installed Temperature = 256.963 ft

Unloaded Strand
Sag = 2.51 ft (30.1 in) 0.98 %
Tension = 398 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	2.74	1,006	-0.03	N/A
-30.0	2.83	973	-0.03	N/A
-20.0	2.92	942	-0.03	N/A
-10.0	3.02	912	-0.02	N/A
.0	3.12	883	-0.02	N/A
10.0	3.22	856	-0.02	N/A
20.0	3.32	830	-0.02	N/A
30.0	3.43	804	-0.01	N/A
40.0	3.53	780	-0.01	N/A
50.0	3.64	757	-0.01	N/A
60.0	3.75	736	0.00	N/A
70.0	3.86	715	0.00	N/A
80.0	3.96	695	0.00	N/A
90.0	4.07	677	0.01	N/A
100.0	4.18	659	0.01	N/A
110.0	4.29	642	0.01	N/A
120.0	4.40	626	0.02	N/A
130.0	4.51	611	0.02	N/A
140.0	4.62	597	0.03	N/A

WA Exhibit No. 13.4

September 1969

Approved for Reprint – April 1988

SPECIFICATIONS FOR CONSTRUCTION

1. General

All construction work shall be done in a thorough and workman-like manner in accordance with the Staking Sheets, Plans and Specifications, and the Construction Drawings.

The Sixth Edition of the National Electrical Safety Code shall be followed except where local regulations are more stringent, in which case local regulations shall govern.

2. Distributing Poles

In distributing the poles, large, choice, close-grained poles shall be used for transformer, deadend, angle, and corner poles.

3. Pole Setting

The minimum depth for setting poles shall be as follows:

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

"Setting in Soil" specifications shall apply:

a. Where poles are to be set in soil.

b. Where there is a layer of soil of more than two (2) feet 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" specifications 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 two (2) feet or less in depth over solid rock, the depth of the hole shall be the depth of the soil in addition to

Fr2/A v1

WA Exhibit No. 14
Pole Attachment
Rental Formula Comparisons

	RENTAL FORMULAE				
POLE SPACE	**TVA**	**APPA**	**ARKANSAS**	**FCC CABLE**	**Telecom Plus - US HR**
POLE HEIGHT	37.5'	37.5'	37.5'	37.5'	37.5'
POWER	7.17' Allocated	Part of 10.17' of "Assignable" (Usable) Space	8.17' Allocated	Not Specified - Part of 13.5' of "Usable" Space	Not Specified - Part of 13.5' of "Usable" Space
COMMUNICATIONS WORKER SAFETY SPACE	Allocated Equally to 2 Communications Entities	3.33' Allocated to "Common Space"	Included in the "Un-Usable" Space	Included in the "Usable" Space	Included in the "Usable" Space
COMMUNICATIONS SPACE	Allocated to Communications Attachers	Allocated to Communications Attachers	Allocated to Communications Attachers	Allocated to Communications Attachers - Part of 13.5' of "Usable" Space	Allocated to Communications Attachers - Part of 13.5' of "Usable" Space
CATV	1' Allocated	1' Allocated	1' Allocated	1' Allocated	1' Allocated
TELCO	2' Allocated	1' Allocated	1' Allocated	N/A	1' Allocated
SUPPORT SPACE	Shared Equally By All Attachers (Including Owner)	Included In "Common" Space	Included as Part of the "Un-usable" Space	Known as "Un-usable" Space	Known as "Un-usable" Space
MINIMUM ATTACHMENT HEIGHT TO GROUND LINE	18'	18'	27.33' Which Includes the Safety Space. 1/3 Allocated Fully to Owner and 2/3 Allocated Equally to All Attachers Including Owner	18'	18'
IN GROUND FOR STABILITY	6'	6'		6'	6'
PRESUMED NUMBER OF ATTACHERS (INCLUDING OWNER)	3	3	3	N/A	3
CALCULATION	$\frac{1+\frac{3.33}{2}+\frac{24}{3}}{37.5}$	$\frac{1+\frac{27.33}{3}}{37.5}$	$\frac{1+\frac{2}{3}x\frac{27.33}{3}}{37.5}$	$\frac{1}{13.5}$	$\frac{1+\frac{24}{3}}{37.5}$
% OF ANNUAL CHARGE ALLOCATED TO CATV	28.44%	26.96%	18.86%	7.41%*	24.00%
				* 1' Divided by 13.5' of "Usable" Space	

WA Exhibit No. 15

FE/A
V3

APPA Pole Attachment Work Book

by

**James Baller, Sean Stokes,
Thomas Unke, and Charles Forster**

**Prepared for the
American Public Power Association**

October 2002

American Public Power Association

B. Annual Attachment Fees

The second aspect of the Model Agreement's fee methodology is an annual attachment fee to compensate the utility for the use of its poles or conduits. As a starting point, the Model Agreement has adopted a pole/conduit attachment rate formula that parallels the new federal attachment formulas contained in the Telecommunications Act applicable to telecommunications service attachments.[6] Since municipal utilities are not, however, regulated by the FCC, the federal formula's methodology was used only as a reference source.

1. Pole Rates

The rate methodology for poles involves a series of calculations addressing the historical average cost of a bare pole, carrying charge components (including administrative, maintenance, depreciation, taxes and cost of capital, which is set at the utility's operating margin). The Rate Calculator program that has been developed as part of the Model Agreement allows the utility the option of entering its specific pole costs and accounts. Like the FCC's formula, the Model Agreement's Rate Calculator establishes an annual fee that is comprised of two elements: a charge for the actual space occupied by the attaching entity; and a charge for the common space on the pole that benefits all users of the pole equally. Together, these two elements create a fully allocated attachment fee.

a. Assigned Space Charge

The formula apportions the cost of "assigned space" on the pole among all attaching entities according to the percentage of the usable space required for each entity. "Assigned space," often referred to in the federal rules as "usable space," is space on a utility's poles that can be used, as defined by applicable engineering and safety standards,

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6 Codified at 47 U.S.C. § 224(e). The FCC adopted regulations implementing the Act's new rate formula for attachments to investor-owned electric utility poles by telecommunications carriers on February 6, 1998, FCC *Report and Order*, CS Docket No. 97-151, FCC 98-20. These rules were subsequently modified as part of the *Order on Reconsideration*.

c. Algebraic Representation of the Formula

The Model Agreement Rate Formula can be expressed in algebraic terms as follows:

Maximum Rate = Assignable Space Factor + Common Space Factor

Assignable Space Factor = $\frac{\text{Space Occupied by Attachment}}{\text{Assignable Space}} \times \frac{\text{Assignable Space}}{\text{Pole Height}} \times \text{Average Cost of Bare Pole} \times \text{Carrying Charge}$

Common Space Factor = $\frac{\text{Common Space}}{\text{Pole Height}} \times \frac{\text{Average Cost of Bare Pole}}{\text{Number of Attachers}} \times \text{Carrying Charge}$

Explanation of Formula:

- **"Pole Height"** is presumed to be 37.5 feet.
- **"Space Occupied by Attachment"** is presumed to be one foot.
- **"Assignable Space"** is presumed to be 10.17 feet per pole.
- **"Common Space"** is presumed to be 27.33 feet per pole.
- **"Average Cost of Bare Pole"** is derived from FERC Account 364 ("gross pole investment"). This figure, representing the historical "Pole Investment," is further reduced by 15 percent to account for the electric utilities' costs of cross-arms, which are not used by communications attachers, and is finally divided by the number of poles owned by the utility to arrive at an historical "Average Cost of Bare Pole."
- **"Carrying Charges"** are expenses attributable to the poles, and include: administrative expenses; taxes; costs of capital; depreciation; and operation and maintenance. The sum of these five expense items will yield a figure that represents the costs of a pole expressed as a percentage of pole investment.

d. Departures from the FCC's Formula

The Model Agreement's Rate Calculator departs from the FCC's formula in four significant respects.[7] First, the rate applies uniformly to all communications attachments. In contrast, the federal formula discussed above only applies to "telecommunications service providers" and does not apply to cable television companies. Under the federal rules, cable television companies that are utilizing their attachments solely to provide cable service are only required to pay an attachment rate based on the percentage of the assigned space on the pole that they occupy.[8] Thus, there is no allocation of the common space costs to cable television companies.

The Model Agreement specifically rejected the application of separate rates for cable television companies and telecommunications providers. The cable television rate is a holdover from a desire in the late 1970s to assist the (then) nascent cable television industry by establishing a low rate for cable attachments. The cable formula does not reflect the actual cost to utilities of providing pole space, nor does it compensate utilities fairly for the value of their assets. Instead, the cable formula only recognizes the incremental cost of providing pole attachment space. As a result, under the federal rules, cable pole attachment rates are, in effect, subsidized by utility customers. Conditions have changed dramatically since the enactment of the cable attachment formula in 1978. Cable operators no longer need financial incentives and protection, and in the increasingly competitive utility environment, it is even more difficult to justify the additional costs absorbed by utilities and their customers for services that are unrelated to their core electric service.

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7 While all of these departures are sound both legally and operationally, all APPA members should be aware that the cable and telecommunications industry will likely assert counter arguments.

8 The FCC has concluded that the provision of cable modem access service is not a "cable service" but has nevertheless concluded that it is entitled to the "cable television pole attachment rate." The U.S. Supreme Court recently upheld this determination in *National Cable & Telecommunications Ass'n v. Gulf Power Co.*, 534 U.S. 327 (2002).

In addition, the application of two separate rates increases the administrative complexity of the pole attachment process. In contrast, the Model Agreement's single rate formula allows for administrative simplicity, is nondiscriminatory, and, as mentioned above, recognizes that the type or content of information transmitted over a communications system does not physically or materially impact the nature of the pole attachment or the burden that it places on the pole.

The second departure relates to the calculation basis for computing the carrying charge rate. The calculator computes a carrying charge rate based on a percentage of gross cost of a pole. This departure does not have a financial impact upon the calculation. However, it provides more clarity in the development in the attachment rate carrying charge.

The third departure relates to the allocation of common space, which adopts a "pure per capita" approach for the allocation of the common space. Under such an approach the assigned space would be allocated in the same manner as in the FCC formula, but all of the common space would be apportioned equally among the attaching entities rather than only two-thirds, as is provided under the federal rules. A pure-per-capita approach would require the utility to be included in the count of total entities attached to a pole, and the utility would be attributed an equal percentage of the common space with all other attachers.

The pure-per-capita approach has the advantage of being more equitable to all parties because the common costs are divided evenly among all of the users of the pole irrespective of the number of users. The Telecommunication Act's allocation, in all instances, of one-third of the common costs of the pole to the electric utility is arbitrary and the result of political compromise that does not represent a true equal allocation of common costs. The FCC formula is never equitable because the FCC treats the utility itself as an attaching entity, which means that in all cases the utility will bear one-third of the common space costs plus an additional percentage of the common space costs depending on how many parties have attached to the pole (*e.g.*, if only one other party is on the pole, the utility would be allocated two-thirds of the common costs of the pole). In

contrast, a pure-per-capita approach will ensure full recovery of common costs from all users. Despite the fact that the utility is not included within the definition of "Attaching Entity" in Article 1 of the Model Agreement, in order to use a pure-per-capita approach the utility should nevertheless count itself as an attaching party when performing the rate calculations.

The fourth and final departure from the FCC's formula is with respect to the FCC's allocation of the 40-inch "neutral zone" or "safety space" that separates the electric space from the communications space on a pole as usable space ("assigned space"). Because communications attachments are presumed to occupy only one foot of assigned space, the allocation of the safety space to assigned space results in the utility bearing the full costs of the safety space. Since the safety space would not exist on electric utility poles but for the need to protect communications workers and communications facilities, it arguably should be attributed to the communications entities as part of the costs of their assigned space. Nevertheless, in recognition that the safety space provides benefits to all users of the pole including the utility, a more balanced approach would be to allocate the safety space to the common-space designation and apportion it evenly among all attaching entities. While the FCC has repeatedly resisted any such modification of its formula, a state court in Washington upheld the City of Seattle's allocation of the safety space to the common space on a pole. Other authorities have reached similar conclusions. For example, the public service commissions of Kentucky, Maine and Wisconsin have allocated a portion of the safety space to cable and telecommunications providers.[9] In order to effectuate this change from the FCC's presumptions, the utility will need to decrease the size of the assigned space by 40 inches and increase the size of the

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[9] The Illinois Commerce Commission (ICC) found that "it is fair and reasonable to assign 15% of the neutral space to the CATV operator; this results in an allocation of 6 inches of the 40-inch neutral space to the CATV operator." The ICC, however, ultimately changed the allocation formula to eliminate allocation of any portion of neutral space to the attaching cable operator in a bow to political pressure over the potential impact on cable service rates from such a change. See, *Central Illinois Public Service Co. v. Illinois Commerce Commission*, 644 N.E.2d 817, 820, 821, 823-24 (1994).

common space by 40 inches. The Rate Calculator has been designed to make this adjustment.

The model incorporates two assumptions that may be considered rebuttable by attachers. Those two assumptions are the allocation of the one-foot usable space for attaching entities and the assignment of an average pole height of 37.5 feet for purposes of allocating costs. In addition, the model allows for the input of an average number of attachers, which may also be rebutted by attaching entities.

2. Conduit Formula

Although the agreement is written to be applicable to both poles and conduits, the development of a conduit rate calculator is beyond the scope of this project and will need to be developed on an individual basis by utilities.

I/A V2/V3

POLE ATTACHMENT TOOLKIT

Overview

The members of the National Rural Electric Cooperative Association (NRECA), in a resolution passed in March 2003, directed the Association to develop a "toolkit"—a set of practical guidelines, legal and accounting information, and examples—to help electric cooperatives address a host of issues associated with pole attachments. The resolution stated:

A growing problem nationwide with pole attachments is the lack of communication and coordination by telecommunications and cable television providers when they attach to the pole. Commonly, cables are attached without the cooperative's knowledge, and/or in such a fashion that they endanger the distribution system through ice, snow or wind loading. Although this is a state-by-state issue it is occurring nationwide. Therefore, we ask NRECA to develop a toolkit of information to provide cooperatives with guidance to address the legal, regulatory, financial and safety issues associated with pole attachments.

NRECA Resolution 03-K-1 (2003)
"Regulation of Pole Attachments and
Safeguarding of Electric Cooperative Infrastructure"

This document is a product of NRECA's response to that resolution. It should be a helpful resource for electric cooperatives, and their attorneys and advisors, in managing their relationships with pole-attaching entities, whether it be in drafting new contracts or renegotiating existing ones, ensuring appropriate recovery of costs, avoiding legal and liability risks, dealing with potential or member fallout from a difficult relationship with an attaching company, or handling the day-to-day safety and other related concerns of operating a distribution system with attachments.

The toolkit consists of six main sections:

1. **Political and Member Relations Issues.** Attachments to electric cooperative poles are not generally subject to federal regulation, but they may be subject to state regulation. In fact, attachers in some states have been actively lobbying state legislatures and state utility commissions to regulate electric cooperatives in the rates, terms, and conditions of attachment they impose. This section offers guidance on dealing with this trend and presents case histories in which three statewide associations of electric cooperatives—Arkansas, Tennessee, and Virginia—share lessons they learned from such challenges.
2. **Engineering and Operations Issues.** Electric cooperatives want to be sure that attachments don't present a hazard to personnel or property and don't interfere with cooperatives' primary mission: to provide electricity to consumers. This section presents a series of practical, commonsense "dos"—recommended practices and policies—that will help cooperatives maintain good relationships with attachers and ensure that they adhere to construction and safety standards in order to avoid engineering/operations problems.

3. **Rate Methodologies and Tax Implications.** Most electric cooperatives have no regulatory requirements for how to set rates for pole attachments. This section offers cooperatives three cost-based rate methodologies to consider, along with a discussion of their advantages and disadvantages: (1) formulas developed and approved by the Federal Communications Commission (the cable-only formula and the telecom formula), (2) a formula considered by the U.S. Congress when it was developing the 1996 Telecommunications Act (the telecom-plus formula), and (3) a formula developed by a state (the State of Maine formula). The section presents spreadsheets that illustrate how the calculations are done for each methodology. It also examines accounting and income tax issues—federal and state—on revenues and costs from pole attachments. It notes that the tax treatment of pole attachment transactions will vary, depending on the contract and whether the co-op is tax exempt or taxable.
4. **Legal and Regulatory Issues.** A myriad of issues pertain to pole attachments—issues of property law, particularly easements, antitrust, contracts, taxes, bankruptcy, and liability. This section explores these issues, and provides insightful background information on FCC, Rural Utilities Service (RUS), and state regulation. Throughout, it discusses examples of recent litigation involving utilities and attachers. ("Poles" also include a cooperative's ducts, conduits, and rights-of-way, and attaching entities include any provider of electric, telephone, cable TV, Internet, or similar services.)
5. **Sample License Agreement.** After a brief introduction and explanation of provisions and notation, this section presents a sample agreement that co-ops can readily adapt to their individual situations. The sample agreement is designed to cover standard types of pole attachments (it applies to distribution poles, not to conduits or transmission facilities). Its provisions are both protective of electric cooperative interests and reasonable. To the extent possible, it uses simple, straightforward language rather than needlessly complex legal and technical jargon.
6. **2003 Survey Results.** To give members some insight for benchmarking their own pole attachment experiences and practices, including rate setting, NRECA sponsored a confidential survey of distribution system members. This section summarizes the survey results, then presents the results as a "slide show" of bar graphs, pie charts, and other graphic devices, all with interpretive notes. (The survey was conducted by an independent research firm and the results are presented as aggregate data and ranges in order to preserve confidentiality and address antitrust concerns.)

The Pole Attachment Toolkit is the product of a team effort. NRECA staff from the Energy Policy, Government Relations, and Market Research departments, and the Cooperative Research Network, as well as members of the Transmission and Distribution Engineering Overhead Line subcommittee, worked with consultants and with staff members and attorneys of cooperatives to develop the document:

POLE ATTACHMENT TOOLKIT

Rate Methodologies

Telecom Plus

As explained in the "FCC Formulas" section, the current FCC telecom formula allocates one-third of the total annual unusable space costs exclusively to the utility pole owner, while the other two-thirds are allocated equally among all attachers, including the pole owner.

Congress provided no explanation for the mandatory allocation of one-third of the unusable space costs solely to the pole owner when it enacted the 1996 Telecommunications Act. What is suspected is that the formula eventually adopted by Congress was the result of a compromise between the House of Representatives and the Senate, each of which approved formulas containing markedly different allocation schemes for unusable space costs.

The House approved a formula that would have allocated 100% of the unusable space costs among all attachers (including the utility pole owner), so that the utility pole owner would not have to shoulder one-third of those costs by itself. (See H.R. Conf. Rep. No. 104-458, at 206 (1996).) Usable space costs, on the other hand, would have been allocated to the attacher on the basis of the percentage of the usable space used by the attacher (presumed to be 1/13.5, or 7.4%). (See the same House conference report.) The Senate approved a bill that would have allocated the unusable costs in the same manner as usable costs are currently allocated (i.e., on the basis of the percentage of the usable space used by the attacher, which is presumed to be 1/13.5, or 7.4%). (See S. Rep. No. 104-23, at 87-88 (1995).) An apparent compromise was reached in the House-Senate conference, resulting in the enacted formula, which allocates two-thirds of the unusable space costs among all attachers, and allocates the remaining one-third solely to the utility pole owner. (See 47 U.S.C. § 224(e)(2).) No explanation was provided in the Conference Report for this apparent compromise. (See H.R. Conf. Rep. No. 104-458, at 207 (1996).)

DEFENSE OF THE HOUSE-APPROVED (TELECOM-PLUS) FORMULA

The House-approved formula was reasonable on its face, because it is premised on the belief that all of the attachers to the pole benefit equally from the unusable space portion of the pole. (See H.R. Conf. Rep. No. 104-458, at 206 (1996).) Assuming that all parties benefit equally, the allocation of 100% of unusable space costs among all attachers would be fair.

Cable and telecom attachers would likely disagree that all parties benefit equally from the unusable space portion of the pole. They may argue that, were they to construct their own stand-alone poles, they would not need poles that were so long, so closely spaced and so strong. Their argument therefore would be that the electric utility pole owner benefits more than the attachers from the unusable space portion of the pole because the pole owner is the only entity that needs such strong, tall, and closely spaced poles.

This argument, however, ignores three important facts.

- The Washington, D.C., law firm of Keller and Heckman LLP developed the sample agreement and rate methodologies components.
- Tom Strait of the Washington Utility Group provided tax and accounting expertise.
- The statewide cooperative associations of Arkansas, Tennessee, and Virginia shared their legislative and member relations experiences.
- Members of the Overhead Line subcommittee of NRECA's Transmission and Distribution Engineering committee and the Electric Cooperative Bar Association, as well as individual NRECA members and RUS staff personnel, contributed their insight, comments, and suggestions for the Toolkit.

Members of NRECA who have questions about the Toolkit, or any of the issues raised in it, are invited to contact the NRECA staff members who contributed to the document. The contributors' phone numbers and e-mail addresses are listed in the sections they helped to prepare. In addition, our consultants offer an initial consultation to members, free of charge. The consultants' contact information is similarly listed in the sections they helped to prepare.

Legal Notice

NRECA has endeavored to provide in this Toolkit timely, accurate and helpful information to its members about the numerous legal, regulatory, financial, operational and other issues associated with pole attachments. However, NRECA does not make any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, nor does NRECA assume any liability with respect to the use of, or damages resulting from the use of, any information, methodology, or process provided in this document.

The information provided in the toolkit is not an exhaustive review of every issue, and is not tailored to specific state law or specific facts and circumstances. Therefore, NRECA strongly encourages its members to consult with qualified legal counsel and tax and accounting advisors about their system's specific legal, regulatory, tax, and accounting issues.

1. The electric utility distribution system typically is the only distribution system that exists. Unless the attacher wishes to build its own separate distribution system, it must avail itself of the existing electric distribution system. On that one existing distribution system, a certain percentage of each pole is rendered unusable because of structural and safety code requirements. This unusable space is required in order to enable the utility to construct the pole in the first place and, in turn, for all entities to attach to the pole. As a consequence, any attacher affixing equipment to that distribution line benefits as much as the utility and any other attacher from the unusable space, and, thus, it can be argued, should pay its fair share.

2. Even by paying its fair share of a more expensive distribution line, each attacher still pays less than the alternative of building another independent distribution system. Arguably then, utilities effectively are subsidizing attachers by paying for a disproportionate percentage of the unusable space. Attachers receive a "free ride" relative to the costs they would incur in constructing a stand-alone distribution system. On the other hand, cable and telecom attachers might argue that the electric utility would incur the costs associated with its distribution system regardless of any attachments and the utility should therefore only charge the attacher its incremental cost.

3. An argument exists that the FCC's telecom formula already unjustly favors attachers; that is, the FCC's telecom rate formula assigns too many costs to the usable space on the pole, and allocates those costs inequitably. It therefore makes little sense to allocate such costs by dividing the space occupied (1 foot, presumed) by the amount of space that might one day be used for attachments (13.5 feet, presumed). Instead, those costs could be allocated by dividing the space occupied by the amount of space actually used for attachments. In addition, costs associated with the 40 inches of safety space could be assigned to the unusable space portion of the pole, not the usable space portion. If these changes were implemented, they would result in fewer costs being assigned to the usable space portion of the pole, and more costs being assigned to the unusable space. Moreover, the percentage of usable space costs allocated to each attacher would be higher. However, cable and telecom attachers may counterargue that the electric utility's distribution system is a monopoly and the utility could charge unjust and/or unreasonable rates if unregulated.

Even though the House-approved version appears to have produced a more favorable rate to the electric utility, the Senate version was not as generous—thus, the need for a compromise. The cable and telecom attachers may argue that the Senate version (described above) had more merit. Regardless, an electric cooperative must be in a position to support its methodology and resulting rates should the rates be challenged.

CALCULATING THE TELECOM-PLUS FORMULA

The only difference between the telecom-plus calculation and the current FCC telecom rate is that 100% of the unusable space costs is allocated equally among all attachers, instead of just two-thirds. The telecom-plus rate, although not adopted by Congress or sanctioned by the FCC, represents what many utilities would consider a more equitable allocation of costs. The formula for calculating the telecom-plus rate is as follows:

$$\text{Maximum rate (telecom-plus)} = \text{attacher responsibility percentage} \times \text{net cost of a bare pole} \times \text{carrying charge rate}$$

$$\text{Telecom-plus responsibility percentage} = \frac{\text{space occupied} + \left(\frac{\text{unusable space}}{\text{no. of attaching entities}}\right)}{\text{pole height}}$$

ADVANTAGES AND DISADVANTAGES OF USING THE TELECOM-PLUS FORMULA

Unregulated electric co-ops should consider the following advantages to using the telecom-plus formula to calculate pole attachment rates:

- It allocates more costs to attachers, because it is based on the reasonable assumption that all attachers benefit equally from the unusable space portion of the pole.
- It results in a considerably higher pole attachment rental rate than either the FCC cable-only or FCC telecom rate.
- It produces a cost-based rate and, therefore, satisfies the federal tax law requirement that cooperatives operate on a cost basis.
- It has an air of legitimacy because it was proposed by the U.S. House of Representatives, and because it follows all FCC guidelines except for the allocation of unusable space.

Unregulated electric co-ops should consider the following disadvantages to using the telecom-plus formula to calculate pole attachment rates:

- Although it was proposed by the House of Representatives, it was never enacted by the full Congress.
- It incorporates FCC guidelines (except for the allocation of unusable space), and some of those guidelines appear to be disadvantageous to utility pole owners.
- The telecom-plus rate formula has not been sanctioned by the FCC and may not be readily embraced by state or federal regulators.

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WA Exhibit No. 17

October 21, 2008

EX PARTE NOTICE

Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

RE: *Implementation of Section 224 of the Act; Amendment of the Commission's Rules and Polices Governing Pole Attachments,* WC Docket No. 07-245, RM-11293, RM-11303

Dear Ms. Dortch:

In its November 20, 2007, Notice of Proposed Rulemaking in the above-referenced docket,[1] the Commission, in accordance with the mandates of Section 706 of the 1996 Act, tentatively concluded that it should promote national broadband deployment through the adoption of a uniform rate specifically for broadband-related pole attachments.[2] Under existing rules, the rates that pole owners charge attachers cover all attachments, whether or not they are used for broadband, and those rates tend to be dramatically different for different broadband providers. The present structure thus distorts competition in broadband services, and it does so, moreover, by forcing some broadband providers to pay excessive pole attachment rates.[3] That structure is thus contrary to the mandate of section 706, and it is imperative that the Commission address this problem. AT&T and Verizon applaud the Commission's initiative to address this problem.

In the NPRM, the Commission tentatively concluded that, due to the critical need to create even-handed treatment and incentives for broadband deployment, adoption of a uniform rate for all pole attachments capable of supporting broadband Internet access service is warranted. Thus, the Commission tentatively concluded, all categories of providers should pay the *same pole attachment rate for all attachments used for broadband service.*[4] AT&T and Verizon set forth below a proposed uniform broadband rate formula that achieves the

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[1] *Implementation of Section 224 of the Act; Amendment of the Commission's Rules and Polices Governing Pole Attachments,* WC Docket No. 07-245, RM-11293, RM-11303, Notice of Proposed Rulemaking (Rel. November 20, 2007) (NPRM).

[2] *See* NPRM at ¶ 36.

[3] *See, generally,* Time Warner Telecom, Inc.'s White Paper on Pole Attachment Rates filed in Petition of the United States Telecom Association for Rulemaking to Amend Pole Attachment Rate Regulation and Complaint Procedures, RM-11293, and Petition for Rulemaking of Fibertech Networks, LLC, RM-11303 at pp. 3-9 (January 16, 2007).

[4] *See* NPRM at ¶ 36. Thus, attachments used exclusively for non-broadband service, *e.g.*, cable-only service, or cable + telecom-only service, would not be covered under the uniform broadband rate concept.

Commission's goals of competitive parity and a single uniform rate for broadband capable attachments. Specifically, this proposal would result in a just and reasonable uniform rate for all pole attachments capable of supporting broadband Internet access service, thereby eliminating the regulatory disparities that currently distort competition for broadband services. Moreover, it would do so in a way that would result in just and reasonable rates, as required by Section 224, and that would afford adequate compensation to pole owners. The AT&T and Verizon proposal also would provide the benefit of greater simplicity than present formulas under Section 224 and the Commission's rules.

I. The New Formula.

A. Section 1.1409(e)(2) of the Rules.

The starting point for the formula is familiar: the existing Section 224 formula for telecommunications carriers, established in Section 1.1409(e)(2) of the Commission's rules.[5] All of the essential elements of the structure of that formula are present, though there are some adjustments to the assumptions for those values. Thus, this is a formula with which all attachers (and the Commission) already have general experience, and the adjustments – as will be detailed – will simplify the application. Three essential elements, however, are unchanged: (1) the use of net pole investment;[6] (2) carrying charges; and (3) pole heights.[7] These elements provide the foundation for the annual recovery by pole owners of their poles' costs.

B. Adjustments to Certain Elements.

There are certain changes to the following elements that appear in Section 1.1409(e)(2):

1. *Allocation of unusable space.* In the Section 1.1409(e)(2) formula, the attaching entities' financial responsibilities are limited to a portion of two-thirds of the unusable space. The pole owner is assigned a portion of that two-thirds, and also the costs of the remaining one-third of unusable space. Under the AT&T and Verizon proposal, the costs associated with

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[5] *See* 47 C.F.R. § 1.1409(e)(2). Indeed, much of the structure and assumptions of the formula is similar to Dominion Virginia Power's proposal in these proceedings. *See* Decl. of M. Roberts, Attached to Comments of Ameren Services Company and Virginia Electric and Power Company (Dominion Power) at ¶¶ 12-15.

[6] Where net pole investment is zero, or negative, the formula should "us[e] gross figures rather than net figures, with the exception of the rate of return element of the carrying charges. . . ." *Amendment of Commission's Rules and Policies Governing Pole Attachments*, CS Docket No. 97-98, and *Implementation of Section 703(e) of the Telecommunications Act of 1996*, CS Docket No. 97-151, Consolidated Partial Order on Reconsideration, FCC 01-170, at ¶¶ 35, 39 (2001) (*Consolidated Partial Recon. Order*).

[7] It is generally understood that poles average 37.5' in height. *See* Decl. of V. Mahanger MacPhee, Attached to Comments of AT&T, March 7, 2008. *See also Implementation of Section 703(e) of the Telecommunications Act of 1996*, and *Amendment of Commission's Rules and Policies Governing Pole Attachments*, CS Docket No. 97-151, Report and Order, FCC 98-20, at ¶ 22 (1998). The assumptions in this proposal on pole heights remain unchanged from the existing telecommunications formula.

unusable space would be divided equally among all attachers and the pole owner.

2. *The presumed number of attachers.* Under existing formulae, there are two presumptions regarding the number of attachers. For poles in urban areas, five attachers are presumed (including the pole owner). In rural areas, the presumption is three (including the pole owner).[8] This formula, on the other hand, presumes four attachers (including the pole owner) in all areas.[9]

3. *The presumed amount of usable space by attachers.* The Section 1.1409(e)(2) formula presumes the use of one foot of space by attachers on poles. This assumption continues in this proposal, and is extended to include all attachers.[10]

C. The Result.

The formula that results from these changes is as follows:

$$\text{Max Rate/pole} = \frac{\text{Occupied Space} + \text{Equivalent Share of Unusable Space}}{\text{Pole Height}} \times \text{Net Pole Investment} \times \text{Carrying Charge Rate}$$

The resulting rates achieved through the use of the AT&T and Verizon formula effectuate the language and spirit of the Commission's tentative conclusions in the NPRM, as outlined above, and responsibly promote the Commission's Section 706-based objectives. Application of the formula will produce a uniform rate for broadband-capable pole attachments that is demonstrably equitable, and reasonably approximates the normative results envisioned by the Commission in

[8] *See, e.g., Consolidated Partial Order on Reconsideration*, FCC 01-170, at ¶¶ 71-72.

[9] The record before the Commission establishes that the 1.1409(e)(2) presumptions do not reflect present pole attachment reality. In fact, the record evidence shows that, on average, there are between 2-3 attachers per pole (not including the pole owner). *See, e.g.*, Comments of American Electric Power Service Corporation, *et al.*, at pp. 19-28 (March 7, 2008); Comments of Alabama Power *et al.*, at pp. 20-22 (March 7, 2008); and Comments of the Edison Electric Institute and the Utilities Telecom Council at 45-47 (March 7, 2008). The present formula's presumption, thus, more accurately reflects the actual number of pole attachers than the present telecommunications Section 1.1409(e)(2) formula.

[10] *See, e.g., Implementation of Section 703(e) of the Telecommunications Act of 1996*, and *Amendment of Commission's Rules and Policies Governing Pole Attachments*, CS Docket No. 97-151, Report and Order, FCC 98-20, at ¶ 86 (1998) (presumptive one foot of usable space for cable attachers affirmed and applied "to attachments by telecommunications carriers generally" as an "expeditious and equitable method for determining reasonable rates"). Moreover, including ILECs within the 1' standard is justifiable on two principal grounds: (1) some of the space attributed to ILECs under decades-old, legacy joint use agreements has since been used to accommodate attachments by CLECs and cable providers; and (2) modern technology, used by all broadband providers, has greater capacity than the legacy technology in use when the joint use agreements were negotiated and may require less space for attachments.

the NPRM. And, perhaps more importantly, it eliminates a source of competitive distortion in the broadband market.

II. Legal Authority.

The Commission has ample authority to adopt this proposal as a mechanism to promote broadband deployment.[11] First, as the Commission has observed, Section 706 directs the Commission to "promote the deployment of broadband infrastructure."[12] It is appropriate, thus, for the Commission to "separate out those pole attachments that are used to offer broadband Internet access service" and prescribe a competitively neutral rate structure for those attachments, which is accomplished in this proposal. Second, as explained in Verizon and AT&T's Comments,[13] Section 224(b)(1) makes plain that "the Commission shall regulate the rates, terms, and conditions *for pole attachments* to provide that such rates, terms, and conditions are just and reasonable"[14]; and (2) Section 224(a)(4) expressly defines the term "pole attachment" as "*any* attachment *by a . . . provider of telecommunications service* to a pole, duct, conduit, or right-of-way owned or controlled by a utility."[15] There is no dispute that ILECs are providers of telecommunications services when they offer telecommunications services to the public for a fee.[16] Thus, Section 224 provides the Commission the authority to adopt a new rate formula to ensure just and reasonable rates for broadband attachments by all broadband providers.

Moreover, the Supreme Court has recognized the legitimacy of such an approach and the authority of the Commission to pursue it. In *NCTA v. Gulf Power Co.*, the Court specifically acknowledged the Commission's authority to establish pole attachment rates that it deems appropriate for the promotion of broadband deployment, including the removal of barriers to infrastructure investment. *See NCTA v. Gulf Power Co.*, 534 U.S. 327, 339 (2002). Disparate rates for broadband-capable pole attachments, which necessarily skew competition and chill

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[11] The implementation of an order adopting this proposal, of course, would implicate existing joint use and licensing agreements. The D.C. Circuit has held that Section 224 of the Act gives the Commission the power to prospectively release parties from contractual arrangements relating to pole attachments so that the parties may conform those arrangements to Commission rules implementing Section 224. *See Monongahela Power Co. et al. v. Federal Communications Comm'n,* 655 F2d. 1254, 1256-57 (1981) Indeed, the Commission has previously exercised that authority. Accordingly, and consistent with its authority under Section 224, the Commission should require parties prospectively to conform their agreements to any new rate standards it adopts in this proceeding.

[12] NPRM at ¶ 36.

[13] *See* Comments of Verizon at 6-10 ; Comments of AT&T at 25-33.

[14] 47 U.S.C. § 224(b)(1) (emphasis added).

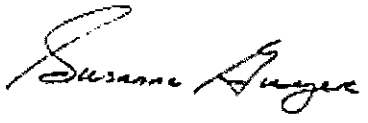
[15] *Id.* § 224(a)(4) (emphasis added).

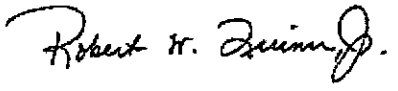
[16] *See id.* § 153(46) ("The term 'telecommunications service' means the offering of telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used."). *See also Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, 11 FCC Rcd 15499, ¶¶ 992-993 (1996) (recognizing that ILECs are providers of telecommunications service) , *modified by,* 11 FCC Rcd 13,042 (1996), *aff'd in part, vacated in part by sub nom. Competitive Telecomms. Ass'n v. FCC*, 117 F.3d 1068 (8th Cir. 1997).

broadband investment, is exactly the kind of regulatory barrier that should be removed in order to promote the unfettered broadband investment and buildout that Congress sought through the passage of Section 706 of the Act, and that the Supreme Court has recognized as legitimate.

This proposal is fully consistent with Section 224. As the Supreme Court noted in *NCTA*, Section 224's cable and telecom attachment formulas are not the "exclusive rates" applicable to pole attachments. Rather, they "are simply subsets of – but not limitations upon" – the Commission's authority to "prescribe just and reasonable rates . . . without necessary reliance upon a specific statutory formula devised by Congress." *NCTA*, 534 U.S. at 335-36. The uniform broadband-capable pole attachment rate produced by this proposal, thus, not only satisfies the Commission's Section 706 mandate, but does so in a way that is fully consistent with the Section 224's "just and reasonable rate" requirements.[17]

Respectfully submitted,





Susanne A. Guyer
Verizon
Senior Vice President
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AT&T
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[17] A harmonious construction of two statutory provisions, particularly within the same Act, is preferred of course, unless the Legislature expresses a clear intent to the contrary. *See, e.g., Implementation of the Cable Television Consumer Protection and Competition Act of 1992*, MM Docket No. 92-265, Memorandum Opinion and Order on Reconsideration and First Report and Order, 10 FCC Rcd 3105, 3125, ¶ 38 ("more compelling rule of statutory construction" requires that interpretation of language in one section of a statute be construed harmoniously with other provisions in the same statute.)

WA-18 I/A v2 v3

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ARKANSAS PUBLIC SERVICE COMMISSION

IN THE MATTER OF A RULEMAKING PROCEEDING TO CONSIDER CHANGES TO THE ARKANSAS PUBLIC SERVICE COMMISSION'S POLE ATTACHMENT RULES	))))	**DOCKET NO. 15-019-R ORDER NO. 5**

ORDER

On March 20, 2015, by Order No. 1 in this docket, the Arkansas Public Service Commission (Commission) initiated this rulemaking proceeding to consider whether, under Ark. Code Ann. §§ 23-4-1001 *et seq.*, in furtherance of its jurisdiction and its mandate from the Arkansas General Assembly, a modification of the Commission's existing Pole Attachment Rules (PARs) would be just, reasonable, and in the public interest. The Commission directed the General Staff (Staff) of the Commission to file proposed amendments to the PARs, along with written comments, by May 21, 2015. By this Order, the Commission adopts modifications to the PARs.

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North Carolina Utilities Commission

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We want your opinion. The Commission is updating its website. Please take our short survey.

The North Carolina Utilities Commission is an agency of the State of North Carolina created by the General Assembly to regulate the rates and services of all public utilities in North Carolina. It is the oldest regulatory body in state government. The present Commission evolved from the Railroad Commission which was created in 1891 and given authority to regulate railroad, steam boat, and telegraph companies.

Today, the Commission regulates electric, telephone (including payphone service and shared tenant service), natural gas, water, wastewater, water resale, household goods transportation, buses, brokers, and ferryboats. To a limited degree, the Commission regulates electric membership corporations, small power producers, and electric merchant plants. The Commission is also responsible for administering programs in North Carolina to ensure the safety of natural gas pipelines. The Commission does not regulate telephone membership corporations, cable TV, satellite, commercial mobile radio service, cellular, pagers, or data and internet service providers. For more information about the Commission, visit our History and Description page.

Mission Statement

The Commission is responsible to both the public and utilities and, by law (G. S. 62-2), must regulate in a manner designed to implement the policy of the State of North Carolina to:

- Provide fair regulation of public utilities in the interest of the public.
- Promote the inherent advantage of regulated public utilities.
- Promote adequate, reliable, and economical utility service.
- Promote least cost energy planning.
- Provide just and reasonable rates and charges for public utility services and promote conservation of energy.
- Assure that facilities necessary to meet future growth can be financed on reasonable and fair terms.
- Encourage and promote harmony between utility companies and their customers.
- Foster planned growth of public utility services.
- Coordinate energy supply facilities with the state's development.
- Cooperate with other states and the federal government in providing interstate and intrastate public utility service and reliability of energy supply.
- Facilitate the construction of facilities in and the extension of natural gas service to unserved areas.

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Phone Scams Target Utility Customers

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§ 117-10. Formation authorized.

Any number of natural persons not less than three may, by executing, filing and recording a certificate as hereinafter provided, form a corporation not organized for pecuniary profit for the purpose of promoting and encouraging the fullest possible use of electric energy in the rural section of the State by making electric energy available to inhabitants of the State at the lowest cost consistent with sound economy and prudent management of the business of such corporations. (1935, c. 291, s. 5.)

WA Exhibit No. 21

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992	)	MM Docket No. 92-266
	)	
Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment	)	

REPORT ON CABLE INDUSTRY PRICES

Adopted: December 20, 2006 **Released: December 27, 2006**

By the Commission: Chairman Martin and Commissioner McDowell issuing separate statements; Commissioners Copps and Adelstein concurring and issuing separate statements.

I. INTRODUCTION

1. Section 623(k) of the Communications Act, as amended by the Cable Television Consumer Protection and Competition Act of 1992 ("Cable Act"),[1] requires the Commission to publish annually a statistical report on average rates for the cable basic service tier, cable programming service tier, and equipment.[2] The Cable Act also requires the Commission to compare the average rates of cable operators subject to "effective competition," as identified through specific adjudications, with those of cable operators that have not been found subject to effective competition.[3] This Report is issued in compliance with those statutory obligations.

2. Overall, cable prices increased more than 5 percent last year and by 93 percent since the period immediately prior to Congress's enactment of the Telecommunications Act of 1996. Expanded basic prices rose more than 6 percent or twice the rate of inflation last year. Prices are 17 percent lower where wireline cable competition is present. DBS competition, however, does not appear to constrain

[1] Section 623(k) was adopted as Section 3(k) of the 1992 Cable Act, Pub. L. No. 102-385, 106 Stat. 1460, codified at 47 U.S.C. § 543(k).

[2] The term "service tier" generally refers to a category of cable service or other services provided by a cable operator and for which a separate rate is charged by the cable operator. *See* 47 U.S.C. § 522(17). Cable operators are required to offer a "basic cable service tier" that includes, at a minimum, local broadcast stations and public, educational, and governmental ("PEG") access channels that may be required pursuant to an agreement with a local government. *See* 7 U.S.C. § 543(b)(7). A "cable programming service tier" includes channels other than channels carried on the basic service tier or for which per channel ("premium") or per program ("pay-per-view") charges apply. *See* 47 U.S.C. § 543(k)(1)(2). The term "equipment" refers to a set-top converter box, remote control unit, and other equipment used to access cable television programming. *See* 47 U.S.C. § 543(b)(3).

[3] 47 U.S.C. § 543(k)(1) (cross-referencing 47 U.S.C. § 543(a)(2)).

cable prices – average prices are the same as or slightly higher in communities where DBS was the basis for a finding of effective competition than in noncompetitive communities. Finally, increases in programming expenses were equivalent to more than half of the overall increase in prices for the basic and expanded basic tiers.

II. OVERVIEW OF STUDY

3. The information and analysis provided in this Report are based on the Commission's survey of cable industry prices ("Survey") as of January 1, 2005.[4] The Survey requested data from cable system operators serving a random sample of communities. The information collected enables the Commission to compare prices charged by operators serving: (1) communities where operators have not been formally found to meet the statutory test for effective competition ("noncompetitive communities"); and (2) communities where cable operators have been granted relief from rate regulation for their basic-service tier because they meet the statutory test for effective competition ("communities relieved from rate regulation"). We surveyed cable operators that served 497 out of the 31,655 noncompetitive communities and cable operators that served 228 out of the 1,128 communities relieved from rate regulation pursuant to the statute.

4. In selecting cable operators in the communities relieved from basic-tier rate regulation, we relied on the Commission's formal legal decisions regarding effective competition, based on the statutory definition of that term under the Cable Act.[5] Our list of communities relieved from rate regulation is limited to adjudicated findings of effective competition. We are unable to take into account those areas of the country where the conditions for a finding are present, but no finding has been requested or made.

5. The sample of the communities relieved from rate regulation was selected from each of four subgroups according to the primary basis for a finding that the statutory test for effective competition had been met. These subgroups are comprised of findings of effective competition where: (1) a second wireline cable operator serves a community in competition with the incumbent cable operator ("second cable operator");[6] (2) a sufficient percentage of households in a community subscribe to the multichannel video programming distribution ("MVPD") service of a direct broadcast satellite ("DBS") provider; (3) a wireless MVPD service provider, such as that of a multichannel multipoint distribution service ("MMDS") provider, overlaps the service area of a cable operator ("wireless cable operator"); and (4) the

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[4] The Commission directed cable operators to respond to a survey questionnaire. *See Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992, Statistical Report on Average Prices for Basic Service, Cable Programming Services, and Equipment*, 20 FCC Rcd 3485 (2005).

[5] Under the Cable Act, a cable operator may obtain a finding of "effective competition" for a community that meets one of four tests: (1) fewer than 30 percent of households subscribe to the cable operator's service (low penetration test); (2) at least two multichannel video programming distribution ("MVPD") providers each offer a comparable service to at least 50 percent of households and at least 15 percent of all households subscribe to service other than from the largest MVPD (50/15 test); (3) a municipality offers MVPD service to at least 50 percent of households (municipal test); or (4) a local exchange carrier (LEC) or its affiliate, or an MVPD using the facilities of such carrier or its affiliate, offers MVPD service by means other than direct broadcast satellite in an area that is also served by an unaffiliated cable operator (LEC test). *See* 47 C.F.R. § 76.905(b). The term "MVPD" refers to an entity such as, but not limited to, a cable operator that makes available for purchase multiple channels of video programming. *See* 47 C.F.R. § 76.905(d). If a community is deemed subject to effective competition, the local franchising authority may no longer regulate basic service tier rates, unless it seeks and is granted recertification. *See* 47 U.S.C. § 543(a)(2) and 47 U.S.C. § 916(a).

[6] The term "incumbent" refers to a cable operator that provided service before a competing provider entered the market.

incumbent cable operator met the low penetration test at the time of the finding ("low penetration"). In the second cable operator subgroup, we sampled both incumbents and second cable operators. In the DBS, wireless cable operator, and low penetration subgroups, only incumbent cable operators were sampled.

6. Of the communities relieved from rate regulation, 733 communities met the statutory test for effective competition on the basis of DBS competition,[7] 147 met the test due to competition between cable operators, 137 met the test because cable operators faced competition from wireless MMDS operators, and cable operators in 111 communities met the test due to low penetration.

7. Cable operators were asked to complete a questionnaire for each of the communities they serve that were selected for the sample. The Survey focused on basic programming and expanded basic programming (or cable programming service) because these are the service packages required by the statute. Eighty-four percent of subscribers take at least basic-plus-expanded-basic service, and 16 percent take basic service only.[8] The basic service tier consists of local broadcast stations; PEG access channels; and typically a few additional channels that may be of local, regional, or national origination. Subscribers must purchase basic service in order to subscribe to the expanded basic tier. The channels on the expanded basic tier are made up mostly of national cable networks.[9] Operators were asked to report monthly prices of basic and expanded basic service as of January 1, 2005 and January 1, 2004, which permitted us to calculate the annual percentage change.

8. In addition to the monthly prices for basic and expanded basic service, the questionnaire asked for prices of the most highly subscribed digital service tier, customer-premises equipment charges, and service installation charges. Information was gathered on factors that may affect prices, including programming expenses; operating capacity; and number of subscribers to program tiers, Internet access service, and telephony. Averages for each of these elements were calculated by sample subgroup, sample group, and overall as a weighted average of the sample groups.[10]

9. Section III, below, provides a summary of the Survey's findings regarding average prices for basic and expanded basic programming. The January 1, 2005 averages are reported along with annual percentage changes. Section IV provides additional information and tables regarding those findings as well as other Survey findings. Section V presents an econometric analysis estimating the effects of market concentration on cable rates and the effects on cable rates in communities where the statutory test for effective competition has been met. Section VI presents conclusions, and Section VII covers administrative matters. Attachment 1 is an overview of the sample, and Attachments 2 through 11 provide additional statistics, including estimates of statistical sampling variances for the reported price averages. In addition, Appendix A describes the Survey design and sampling procedure and Appendix B

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[7] We note that, because DBS service is available nationwide, there may be other areas of the country where DBS penetration exceeds the 15 percent threshold set forth in the so-called "50/15" effective competition test but the incumbent cable operator has not requested a finding of effective competition.

[8] *See* Table 11. This 16 percent includes the 4 percent of subscribers whose cable service providers do not offer separate rates for the basic tier and an expanded basic tier, but instead bundle all video channels except for digital service, premium, and pay-per-view channels into a basic tier.

[9] The term "expanded basic" generally refers to the cable tier with (a) the most channels and (b) the most subscribers except for basic service. Expanded basic does not include basic service channels, music and other audio channels, mini-tiers of channels, digital service, premium channels, pay-per-view, or video-on-demand channels.

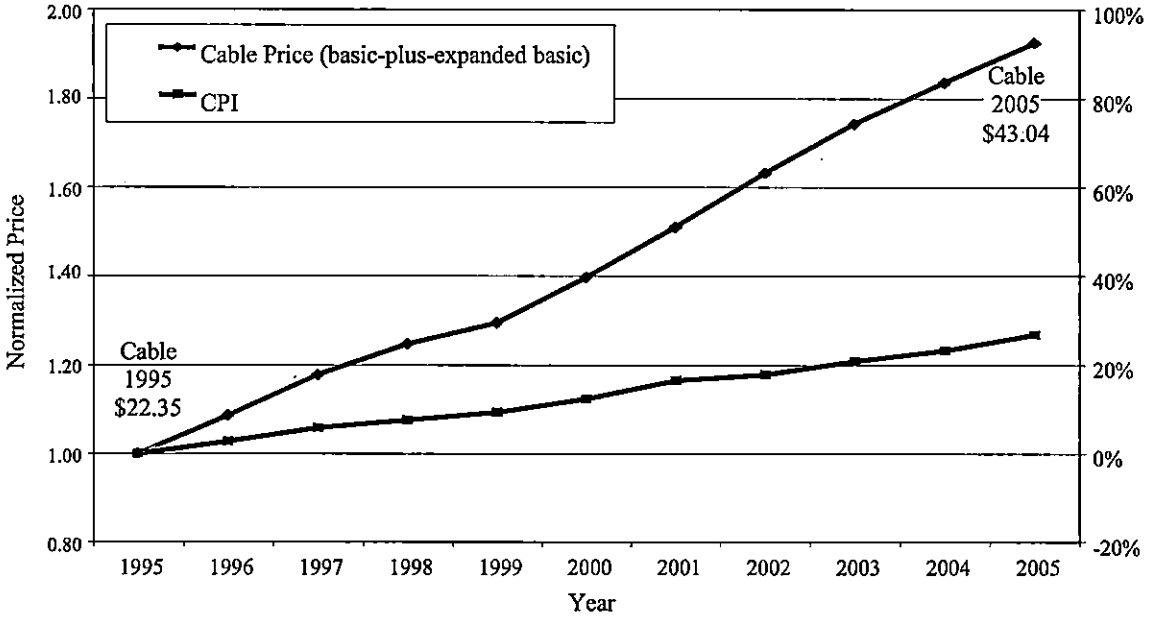
[10] The weights or importance given to each subgroup and group in calculating the overall average price are based upon estimates of the share of cable subscribers in each subgroup and group.

describes in greater depth the econometric analysis presented in Section V.

III. SUMMARY OF FINDINGS

10. *Averages for all communities.* The average monthly price for basic-plus-expanded basic service increased by 5.2 percent, from $40.91 to $43.04, over the 12 months ending January 1, 2005. The price for basic-only service increased by 3.3 percent, from $13.84 to $14.30, and the price for expanded basic service increased by 6.2 percent, from $27.07 to $28.74. As shown in the chart below, since the period immediately preceding enactment of the Telecommunications Act of 1996, prices have risen by 93 percent.[11]

Cable Rates and the CPI, 1995-2005



11. *Differences between noncompetitive communities and communities relieved from basic-tier rate regulation.*[12] In noncompetitive communities, the average monthly price for basic-plus-expanded

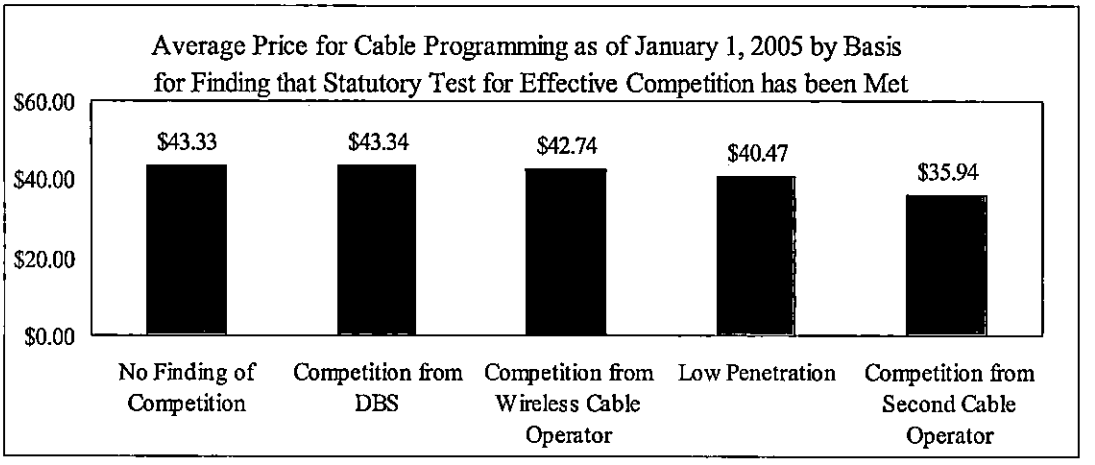
[11] We note that several major MSOs have released quarterly financial data in recent days. Comcast, Time Warner, Cablevision, and Mediacom reported double digit increases in operating cash flow and revenues, as compared with the third quarter of 2005. Comcast reported 15 and 12 percent increases in operating cash flow and revenues, respectively; Time Warner reported 28 and 44 percent increases; Cablevision reported 16 and 13 percent increases; and Mediacom reported 10 and 11 percent increases. Comcast Corp., Comcast Reports *Third Quarter 2006 Results*, (press release), October, 26, 2006; Time Warner Inc., *Time Warner Inc. Reports Third Quarter 2006 Results*, (press release), November 1, 2006; Cablevision Systems Corp., *Cablevision Systems Corporation Reports Third Quarter 2006 Results;* (press release), November 8, 2006; Insight Communications Co., Mediacom Communications Corp., *Mediacom Communications Reports Results for Third Quarter 2006,* (press release), November 2, 2006. Comcast's revenue and operating cash-flow has grown by double digits for 25 consecutive quarters. Mike Farrell, *Comcast Roars in 1Q, Top Operator Grows Across the Board, Lifting Sector Stocks*, MULTICHANNEL NEWS, May 1, 2006 at 6; Comcast Corp., *Comcast Reports Third Quarter 2006 Results*, (press release), October, 26, 2006; and *Comcast Reports Second Quarter 2006 Results*, (press release), July 27, 2006.

[12] Throughout the Report, there is only a slight difference, if any, in the overall average and the average for the noncompetitive group. This is because the group of operators that have received a Commission finding of effective (continued....)

basic programming increased by 5.2 percent, from $41.18 to $43.33 over the 12 months ending January 1, 2005. In communities where the statutory test for effective competition was found to have been met, the average price for basic-plus-expanded basic programming increased by 4.9 percent, from $38.29 to $40.15 over the 12 months ending January 1, 2005. Thus, as of January 1, 2005, the prices charged for basic-plus-expanded basic programming in noncompetitive communities ($43.33) averaged 7.9 percent higher than the prices charged in communities relieved from basic-tier rate regulation ($40.15).

12. The price difference varied by the basis for the finding that the statutory test for effective competition was met. Prices were 20.6 percent higher in noncompetitive communities compared to prices in communities with second wireline cable operators, whereas cable prices were only 7.1 percent higher, 1.4 percent higher and about the same when compared to, respectively, prices in communities with low cable penetration, where a wireless cable competitor is present, or where DBS penetration is the reason for the effective competition finding.

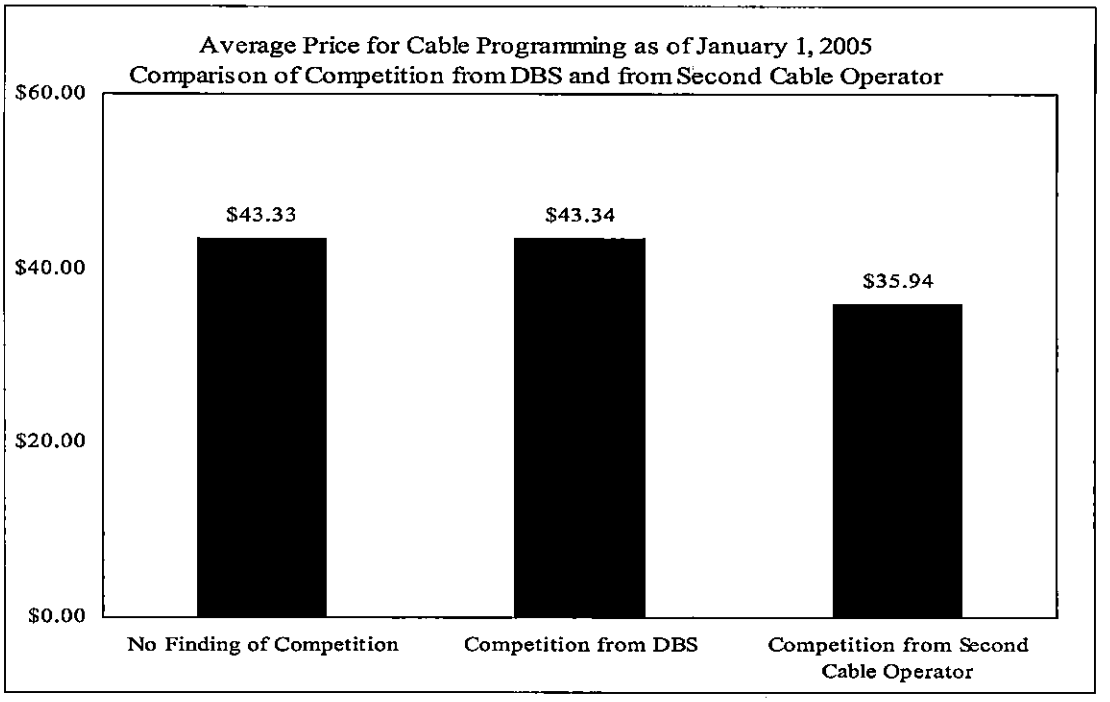
13. The chart below shows the average prices for basic-plus-expanded basic service for noncompetitive communities and communities relieved from rate regulation.



14. Cable prices decrease substantially when a second wireline cable operator enters the market. It does not appear from these results that DBS effectively constrains cable prices. Thus, in the large number of communities in which there has been a finding that the statutory test for effective competition has been met due to the presence of DBS service, competition does not appear to be restraining price as it does in the small number of communities with a second cable operator.

(...continued from previous page)

competition represents a relatively small group of cable subscribers, an estimated 9 percent of the total nationwide, and thus there is only a slight effect from this group on the overall average.



15. Recent experience in Hong Kong provides further evidence that wireline competitors can constrain cable bills. Between 1995 and 2002, cable bills for subscribers of the leading cable service provider, i-Cable, grew at a rate 6.5 times faster than prices for other goods.[13] Since 2003, however, when PCCW, by far i-Cable's biggest competitor today, entered the market with an a la carte offering, i-Cable's average revenue per user has declined by approximately 9 percent.[14] While cable prices in the U.S. increased by 93 percent between 1995 and 2005, i-Cable's subscribers experienced only a 3 percent increase in their bills during this time period.[15] The modest overall increase occurred despite the fact that both Hong Kong's primary cable provider and its main competitor continue to supply many of the most popular U.S. cable networks.[16] Furthermore, i-Cable has moved to differentiate its services, by transitioning from large programming packages to "mini-packages," or theme packages, to compete with

[13] *See* i-Cable Communications Ltd., at http://www,i-cablecomm.com/ir/report/index.php. Between 1995 and 2002, i-Cable Communications Ltd. held an exclusive license to provide pay television service throughout Hong Kong via its Cable TV Hong Kong subsidiary. In July 2002, the Hong Kong government opened the pay television market to competition. Between 1995 and 2002, Cable TV Hong Kong's Average Revenue Per User (ARPU) increased 13 percent. For purposes of this analysis, we use ARPU as a proxy for the average bill paid by cable subscribers. During this same period, Hong Kong's Composite CPI increased approximately 2 percent. *See* The Government of the Hong Kong Special Administrative Region of the People's Republic of China, Census and Statistics Department, at http://www.censtatd.gov.hk.

[14] From 2002 to 2005, i-Cable's ARPU fell from HK$233 to HK$212. In its most recent Annual Report, i-Cable ascribed its declining ARPU to the advent of "aggressive pricing" and "aggressive competition" from its competitors. *See* i-Cable Communications Lt., 2005 Annual Report, at 5, 11, available at http://www.i-cablecomm.com/ir/report/index/php.

[15] *See* http://www.i-cablecomm.com/ir/report/index/php. I-Cable's ARPU increased from HK$206 in 1995 to HK$212 in 2005, an increase of 3 percent.

[16] *See* http://www.i-cablecomm.com./ir/report/index/php; www.pccw.com/eng.

the theme and a la carte programming services of its competitors.[17]

IV. SURVEY RESULTS

A. Basic and Expanded basic Service

16. Table 1 displays average monthly prices for basic and expanded basic service. Between January 1, 2004 and January 1, 2005 the price for basic-only service increased by 3.3 percent, from $13.84 to $14.30. Prices for expanded basic increased by 6.2 percent, from $27.07 to $28.74. Total price for basic-plus-expanded basic tiers increased by 5.2 percent, from $40.91 to $43.04, with a 10-year cumulative increase of 92.6% since the period immediately prior to Congress's enactment of the Telecommunications Act of 1996.

Table 1
Monthly Prices

January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Basic service tier	**$14.30**	**$14.25**	**$14.80**	**$13.59**	**$17.06**	**$13.00**	**$16.54**
Previous year (2004)	$13.84	$13.79	$14.41	$13.01	$15.92	$14.29	$16.07
1-year percent change**	3.3%	3.3%	2.7%	4.5%	7.2%	-9.0%	2.9%
Expanded basic tier	**$28.74**	**$29.08**	**$25.35**	**$22.35**	**$26.28**	**$29.74**	**$23.93**
Previous year (2004)	$27.07	$27.39	$23.88	$21.12	$25.32	$26.90	$22.72
1-year percent change**	6.2%	6.2%	6.2%	5.8%	3.8%	10.6%	5.3%
Basic & expanded basic	**$43.04**	**$43.33**	**$40.15**	**$35.94**	**$43.34**	**$42.74**	**$40.47**
1 year ago (2004)	$40.91	$41.18	$38.29	$34.13	$41.24	$41.19	$38.79
10 years ago (1995)*	$22.35	$22.35	$21.64	---	---	---	---
1-year change in price	5.2%	5.2%	4.9%	5.3%	5.1%	3.8%	4.3%
10-year cumulative change	92.6%	93.9%	85.5%	---	---	---	---
Percentage that Noncompetitive Group is Higher or Lower, Comparing Prices of Basic-Plus-Expanded basic Service							
Year 2005	---	---	7.9%	20.6%	0.0%	1.4%	7.1%
Year 2004	---	---	7.5%	20.7%	-0.1%	0.0%	6.2%
Year 1995	---	---	3.3%	---	---	---	---

Sources: Attachments 2, 10, and 11. * 1995 data unavailable by type of competition. ** 10-year cumulative data unavailable because these data were not collected in 1995.

[17] *See* i-Cable Communications Lt., 2005 Annual Report, at 11, available at http://www.i-cablecomm.com/ir/report/index/php.

17. Table 1 also shows that prices in noncompetitive communities for basic and expanded basic service also increased by 5.2 percent over the latest twelve months, from $41.18 to $43.33, with a 10-year cumulative increase of 93.9 percent. Further, Table 1 shows that in communities relieved from rate regulation, prices increased by 4.9 percent, from $38.29 to $40.15 (with a 10-year cumulative increase of 85.5 percent). Table 1 also shows the percentage differences between the prices charged for basic-plus-expanded basic service in communities relieved from rate regulation overall and the four subgroups of these communities compared with noncompetitive communities. As of January 1, 2005, the prices charged by the noncompetitive communities were on average 7.9 percent higher than the prices charged in communities relieved from rate regulation. The price difference varied by subgroup. Prices were 20.6 percent higher in noncompetitive communities compared to prices in communities with a second cable operator; this figure was notably higher than the differential presented in other competitive scenarios. Prices were 7.1 percent higher, 1.4 percent higher, and at about the same level in noncompetitive communities compared to, respectively, prices in communities deemed competitive by virtue of low penetration, wireless cable operators, or DBS providers.

18. The Bureau of Labor Statistics ("BLS") publishes a Consumer Price Index ("CPI") that measures general price inflation through changes in the prices of a selected group of goods and services.[18] By this measure, general inflation increased by 3.0 percent over the 12 months ending January 2005, significantly less than cable prices rose during that time period.[19]

19. In prior years, the Commission calculated the average rates per channel. This data is not included in the 2005 Price Survey Report because of the weaknesses associated with using it. The average rate per channel does not reflect the prices offered to consumers because cable operators do not permit consumers to purchase channels included in the expanded basic package on an individual basis, nor do they provide refunds to consumers who opt to have certain channels blocked. If cable operators offered consumers the option to purchase channels individually, it would be appropriate to consider the prices charged to consumers for those channels. Further, the use of the average rate per channel as a proxy implies that recently added channels are of equal value to previously existing channels. For example, the use of this data as a proxy would suggest that quality-adjusted prices would be unchanged if there were a 10 percent increase in monthly cable rates and a 10 percent increase in the number of channels; however, this does not take into account how consumers might value the additional channels. In particular, a consumer who placed no value on the additional channels would see a 10 percent increase in his or her monthly cable rates, but no increase in quality.

20. Table 2 displays information on programming expenses incurred by cable operators related to the provision of basic and expanded basic service. These expenses include changes in fees for existing programming as well as additional fees for new programming added during the year. Table 2 shows that programming expenses increased on an average monthly basis by $1.12 per subscriber, from year 2003 to year 2004. The change by sample group equaled $1.10 and $1.36, respectively, for the noncompetitive communities and communities relieved from rate regulation. Table 2 also shows that the change in programming expenses associated with providing basic and expanded basic service was roughly

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[18] BLS, All Urban Consumers, U.S. City Average (monthly series, extracted April 2005), Series ID CUUR0000SA0, All Items Less Food and Energy, Base Period 1982-84=100 ("CPI").

[19] The BLS also publishes an index for cable, satellite television, and satellite radio service. BLS, All Urban Consumers, U.S. City Average, (monthly series), Series ID CUUR0000SERA02, Cable and Satellite Television and Radio Service, Base Period December 1983=100. In prior Price Survey Reports we compared the data collected in our survey to those calculated by BLS for this subcategory. However, the BLS index for this subcategory reflects the prices charged not just for cable service but also for satellite television and satellite radio service. Thus, it is not appropriate to compare the numbers we collect regarding cable prices to those in this BLS subcategory.

equivalent to 53 percent of the change in the price charged for basic and expanded basic service. By sample group, this percentage was equivalent to 51 percent and 73 percent, respectively, for noncompetitive communities and communities relieved from rate regulation.

Table 2
Change in Monthly Programming Expense Per Subscriber
Basic and Expanded Basic Service

Change in Programming Expense	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Year 2003 to year 2004	$1.12	$1.10	$1.36	$1.34	$1.47	$1.19	$1.45
Percent of price change	53%	51%	73%	74%	70%	77%	86%

Source: Attachment 9.

21. Cable operators sometimes can reduce their per-unit programming costs by increasing their subscriber reach. For example, with respect to Time Warner and Comcast's acquisition of Adelphia Communications, industry analysts maintain that "Time Warner may win larger discounts from [programming] networks that were only on Adelphia's systems, since Time Warner would be under no obligation to carry them and could therefore drive a better bargain.[20] Analysts observe, however, that these cost savings are unlikely to benefit consumers directly. Time Warner, for example, "is likely to use the money [saved] to offer new services that produce revenue, like digital phones and video-on-demand. Consumers [would] get discounts for buying bundles of services, but they also [would] spend more money."[21]

B. Digital Service

22. Table 3 displays information on the prices charged for the most highly subscribed digital tier plus equipment consisting of a digital set-top converter and remote control unit. For all communities sampled, over the 12 months ending January 1, 2005, the price for this tier and equipment increased by 1.2 percent, to $12.99. The average number of digital channels received on the most highly subscribed digital tier increased by 7.7 percent, to 33.7 channels. In addition to an average of 33.7 channels offered on the most highly subscribed digital tier, cable operators offered other digital video channels, including mini-tiers, premium channels, and pay-per-view. These included an average of 11.6 high definition television ("HDTV") channels, for those cable operators who have deployed HDTV service, and 108.1 non-HDTV digital channels.

[20] *See, Adelphia Deal May Cut Time Warner's Programming Cost, but Not Consumer's Bills*, New York Times, July 31, 2006, Section C, Page 6.

[21] Id.

Table 3 Digital Tier Plus Equipment							
January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Monthly price *	**$12.99**	**$13.10**	**$11.85**	**$13.11**	**$11.10**	**$11.41**	**$6.65**
1-year percent change	1.2%	1.6%	-1.8%	-1.4%	-3.5%	-0.5%	9.4%
Digital tier channels *	**33.7**	**33.6**	**34.2**	**35.8**	**35.1**	**31.6**	**20.4**
1-year percent change	7.7%	7.7%	5.6%	6.9%	-0.3%	17.0%	5.2%
HDTV channels **	**11.6**	**11.5**	**11.6**	**12.1**	**11.2**	**11.6**	**9.7**
Other digital channels	**108.1**	**107.6**	**113.8**	**120.0**	**113.4**	**104.5**	**100.6**

Sources: Attachments 2, 3, and 9. * Average for the most-highly subscribed digital tier. ** HDTV includes local broadcast simulcasts and multicasts, and all other types of HDTV programming channels.

C. Distribution of Channels

23. Table 4 shows the average number of channels offered to cable subscribers, by category of programming, as of January 1, 2005. Table 4 divides analog programming into two categories: (1) basic-plus-expanded basic channels; and (2) other analog channels, consisting of premium, pay-per-view, and mini-tiers. This latter category averaged only 3.3 channels because many such channels have been moved

Table 4 Distribution of Channels							
January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Analog Programming							
Local broadcast stations	12.3	12.4	11.5	11.2	11.8	11.6	11.2
Public, educational, & govt. access	2.6	2.6	2.7	3.0	2.8	2.0	3.4
Local commercial leased access	0.7	0.7	0.6	0.7	0.4	0.9	0.3
Other local, regional, & national	54.9	54.6	57.2	59.0	55.5	56.8	53.8
Basic & expanded basic tiers	**70.5**	**70.3**	**72.0**	**73.9**	**70.5**	**71.3**	**68.7**
Other analog channels	3.3	3.3	3.3	2.1	4.0	4.0	5.8
Total	**73.8**	**73.6**	**75.3**	**76.0**	**74.5**	**75.3**	**74.5**
Digital Programming							
Most highly subscribed tier	33.7	33.6	34.2	35.8	35.1	31.6	20.4
HDTV channels	11.6	11.5	11.6	12.1	11.2	11.6	9.7
Other digital channels	108.1	107.6	113.8	120.0	113.4	104.5	100.6
Total	**153.4**	**152.7**	**159.6**	**167.9**	**159.7**	**147.7**	**130.7**

Sources: Attachments 3 and 9. Number of channels does not include music or other audio channels.

to digital service. Table 4 also divides digital channels into three categories: (1) most highly subscribed digital tier; (2) HDTV channels; and (3) other digital channels including premium, pay-per-view, and mini-tiers. HDTV includes local broadcast channels as well as other programming transmitted in high definition.

D. Subscriber Equipment

24. Table 5 shows that over the 12 months ending January 1, 2005, the average monthly price charged for leased equipment (consisting of an addressable set-top converter and remote control unit) increased by 5.3 percent, to $4.39, for analog equipment; by 3.7 percent, to $4.99, for digital equipment; and by 2.3 percent, to $7.08, for HDTV equipment. As of January 1, 2005, the price of a CableCARD averaged $1.09 per month.

Table 5
Monthly Equipment Prices

January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Analog equipment	**$4.39**	**$4.38**	**$4.54**	**$4.29**	**$4.43**	**$5.12**	**$5.22**
1-year percent change	5.3%	5.3%	6.1%	5.1%	9.7%	2.6%	6.7%
Digital equipment	**$4.99**	**$4.98**	**$5.07**	**$5.31**	**$4.77**	**$5.42**	**$2.87**
1-year percent change	3.7%	3.8%	4.5%	4.3%	6.2%	2.7%	4.0%
HDTV equipment	**$7.08**	**$7.08**	**$7.08**	**$6.94**	**$7.38**	**$6.82**	**$7.29**
1-year percent change	2.3%	2.3%	2.0%	0.0%	2.6%	6.6%	-5.9%
CableCARD *	**$1.09**	**$1.04**	**$1.63**	**$1.93**	**$1.61**	**$1.09**	**$1.64**

Source: Attachment 5. * Survey data was first collected as of January 1, 2005.

25. Table 6 displays the price for analog programming plus equipment, consisting of basic and expanded basic programming and the lease of an addressable analog converter and remote control. This total equaled $47.43 as of January 1, 2005, based on the price for basic-plus-expanded basic tiers of $43.04 (shown in Table 1) and equipment costs of $4.39 (Table 5). Only 76 percent of cable subscribers had an addressable analog converter made available to them as of January 1, 2005, as compared to 79 percent as of January 1, 2004.[22]

[22] *See* Table 10 and Attachment 7 regarding availabilities of various cable services.

Table 6 Average Price for Programming and Equipment							
January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Monthly Price	**$47.43**	**$47.71**	**$44.69**	**$40.23**	**$47.77**	**$47.86**	**$45.69**
1-year percent change	5.2%	5.2%	5.0%	5.3%	5.5%	3.6%	4.6%
Sources: Tables 1 and 5.							

E. Service Installation Charges

26. Table 7 displays the price of non-recurring charges that cable television subscribers may incur for service installation. As of January 1, 2005, the average charge to install cable service was $45.94 in a home not previously wired for cable and $32.22 in a pre-wired residence (excluding any promotional discounts). Subscribers were charged $28.81 on average for service reconnection. The average charge to install a CableCARD was $18.86 for an existing cable customer and $24.70 for a new cable customer.

Table 7 Service Installation Charges							
January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Unwired home	**$45.94**	**$45.98**	**$45.47**	**$44.55**	**$44.59**	**$49.42**	**$40.93**
1-year percent change	1.3%	1.4%	0.2%	-0.8%	-1.5%	4.7%	4.4%
Pre-wired home	**$32.22**	**$32.23**	**$32.14**	**$30.46**	**$33.17**	**$33.37**	**$33.89**
1-year percent change	1.9%	2.2%	-0.7%	-2.7%	-2.2%	4.8%	5.9%
Service reconnection	**$28.81**	**$28.80**	**$28.85**	**$24.73**	**$29.75**	**$35.53**	**$26.85**
1-year percent change	1.6%	1.9%	-1.4%	-1.0%	-2.1%	-1.6%	6.4%
CableCARD, Current subscriber	**$18.86**	**$18.87**	**$18.71**	**$18.12**	**$19.22**	**$20.63**	**$6.33**
CableCARD, New subscriber	**$24.70**	**$24.68**	**$24.82**	**$19.60**	**$26.31**	**$34.46**	**$9.18**
Source: Attachment 5.							

F. System Operating Capacity

27. Table 8 shows that system operating capacity averaged 736 MHz as of January 1, 2005. This represents a 0.3 percent increase over the previous year. By sample group, noncompetitive communities averaged 734 MHz, and communities relieved from rate regulation averaged 754 MHz.

Table 8
System Operating Capacity

January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-Less	LP Test
Capacity, in MHz	**736**	**734**	**754**	**756**	**751**	**758**	**729**
1-year percent change	0.3%	0.0%	2.7%	n/a	n/a	n/a	n/a

Source: Attachments 6, 10, and 11. n/a: not available.

28. Table 9 shows that 19 percent of subscribers were served by a system with operating capacity of greater than 750 MHz as of January 1, 2005. About two-thirds of all subscribers (68 percent) were served by systems that operated at 750 MHz. Only 13 percent of subscribers were served by systems with an operating capacity below 750 MHz.

Table 9
Percentage of Subscribers
by Capacity of Cable System

January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-Competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Above 750 MHz	19%	18%	24%	23%	35%	7%	23%
750 MHz	68%	69%	66%	68%	49%	93%	56%
331 - 749 MHz	11%	11%	9%	9%	15%	0%	21%
220 - 330 MHz	2%	2%	1%	0%	1%	0%	0%

Source: Attachment 6.

G. Service Availability and Subscription

29. Table 10 displays the percentage of cable subscribers that were offered various services as of January 1, 2005. It shows that 96 percent of subscribers could purchase programming in the form of a basic tier and an expanded basic tier. The other 4 percent of subscribers were offered a basic service tier that included many of the national cable networks typically found on the expanded basic tier, but were not offered the option of purchasing a separate expanded basic tier. Digital programming was offered to 98 percent of subscribers.

Table 10 Availability of Various Cable Services As a Percentage of Cable TV Subscribers							
January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
Expanded basic tier	96%	96%	95%	96%	92%	100%	94%
Digital programming	98%	98%	98%	95%	98%	100%	100%
Cable Internet access	96%	96%	96%	95%	98%	100%	61%
HD programming	89%	90%	81%	82%	73%	96%	44%
CableCARD	88%	88%	85%	80%	87%	100%	39%
HDTV local broadcast	78%	79%	68%	73%	57%	81%	39%
Addressable analog converter	76%	78%	58%	58%	49%	78%	28%
Sports channels tier	63%	63%	63%	62%	52%	85%	39%
Cable telephony	42%	42%	41%	42%	25%	70%	17%
Source: Attachment 7.							

30. Table 11 shows the number of subscribers to various types of service as a percentage of basic cable subscribers to whom each type of service was available as of January 1, 2005. It shows that 88 percent of subscribers purchased the expanded basic tier when it was available. In addition, 38 percent of subscribers purchased digital service when it was available; 31 percent purchased cable Internet access; 9 percent purchased cable telephony; and 4 percent purchased high definition programming. For reference, Table 11 also shows subscribers to particular services as a percent of all basic tier cable subscribers regardless of availability of each service.

Table 11 Subscribers to Various Cable Services							
January 1, 2005	Sample Groups Overall	Sample Group		Subgroups of Communities Relieved from Rate Regulation			
		Non-competitive	Relieved from Rate Regulation	Cable	DBS	Wire-less	LP Test
As a Percentage of Cable TV Subscribers to Whom the Particular Service Is Available							
Expanded basic tier	88%	88%	88%	90%	84%	91%	90%
Digital programming	38%	38%	40%	39%	40%	39%	54%
Cable Internet access	31%	31%	35%	39%	33%	30%	32%
Cable telephony	9%	9%	14%	17%	12%	7%	52%
HDTV programming	4%	3%	4%	5%	3%	3%	2%
As a Percentage of All Cable TV Subscribers							
Expanded basic tier	84%	84%	86%	87%	82%	91%	85%
Digital programming	37%	37%	39%	36%	40%	39%	54%
Cable Internet access	30%	30%	34%	37%	32%	30%	20%
Cable telephony	4%	4%	5%	8%	3%	5%	9%
HDTV programming	3%	3%	3%	4%	3%	3%	1%
Source: Attachment 8.							

V. ECONOMETRIC ANALYSIS

31. In Appendix B of this report, we use econometric analysis to provide a more sophisticated examination of the data collected. As described in Appendix B, we estimate the effect of market structure and other factors on cable prices. Our results show that cable prices tend to be higher in local MVPD markets where cable operators have a larger share of the market. This relationship may indicate an exploitation of market power by dominant firms or may reflect higher costs to serve these markets. In addition, we find that prices tend to be lower in areas served by vertically integrated cable operators than in areas served by unintegrated cable operators, suggesting that vertically integrated operators pass some of their cost savings to their subscribers. Complete results are described in Appendix B.

VI. CONCLUSIONS

32. Cable systems found to face effective competition continue to exhibit lower prices than cable systems that serve communities in which no such finding has been made. As in previous years, the competitive differential varied, with the largest differential occurring in communities with a second cable operator. Overall, for the 12 months ending January 1, 2005, cable prices rose at an average rate of 5.2 percent, compared with general inflation of 3.0 percent for the year ending January 2005.

VII. ORDERING CLAUSES

33. It is ORDERED that this Report be issued pursuant to authority contained in Section 623(k) of the Communications Act of 1934, as amended, 47 U.S.C. § 543(k).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

ATTACHMENT 1

Survey Overview

Sample Groups And Subgroups *	Number of Observations	Estimated Percent of Cable Subscribers	Number of Sample Observations	Survey Questionnaires Completed
Communities Without a Finding of Effective Competition				
Large subgroup				
Communities served by a cable system facility:				
1) of greater than 50,000 subscribers	8,396	61.3%	278	278
2) of 25,001 - 50,000 subscribers	3,714	14.8%	68	68
3) of 10,001 - 25,000 subscribers	4,137	11.3%	52	51
Total	16,247	87.4%	398	397
Medium subgroup				
Communities served by a cable system facility of 1,001 - 10,000 subscribers	7,600	10.1%	52	48
Small subgroup				
Communities served by a cable system facility of 1,000 or fewer subscribers	7,808	2.5%	47	39
Total for noncompetitive sample group	**31,655**	**100.0%**	**497**	**484**
Communities With a Finding of Effective Competition				
Communities with second cable operator				
1) Incumbent cable operator	147	29.7%	56	56
2) Second cable operator	147	10.6%	56	55
Total	294	40.3%	112	111
DBS subgroup	733	36.1%	125	124
Wireless cable operator subgroup	137	20.8%	27	27
Low penetration test	111	2.8%	20	18
Total for effective competition sample group	**1,275**	**100.0%**	**284**	**280**
Noncompetitive Communities and Communities with a Finding of Effective Competition Combined				
Noncompetitive sample group	31,655	91.0%	497	484
Effective competition sample group	1,275	9.0%	284	280
Sample groups combined	**32,930**	**100.0%**	**781**	**764**

* The statistical averages reported in this Survey were calculated (a) at the sample subgroup level; (b) then at the group level as a subscriber-weighted average of subgroups; and (c) finally overall as a subscriber-weighted average of the noncompetitive communities and communities with a finding of effective competition. Subscriber weights were based on the percentages in the table column titled "Estimated Percent of Cable Subscribers." For the large subgroup, averages were calculated at the subcategory level (>50,000, 25,001-50,000, and 10,001-25,000) and then at the subgroup level as a subscriber-weighted average of the subcategories. For the communities with a second cable operator, averages were also calculated at the subcategory level (incumbent and second cable operators) and then at the subgroup level as a subscriber-weighted average of the subcategories.

Sources: This Survey; FCC Form 322, *Cable Community Registration*, filings pursuant to 47 C.F.R § 76.1801; FCC Form-325, *Annual Cable Operator Report*, filings pursuant to 47 C.F.R § 76.403; and FCC effective competition findings made pursuant to 47 U.S.C. § 543(a)(2) and 47 U.S.C. § 916(a).

ATTACHMENT 2

Average Monthly Price

Cable Service Tier	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
January 1, 2005									
Basic	**$14.30**	**$14.25**	**$14.80**	**$13.59**	**$12.43**	**$16.85**	**$17.06**	**$13.00**	**$16.54**
Standard error	*0.41*	*0.38*	*0.72*	*0.75*	*0.56*	*1.29*	*0.64*	*0.69*	*1.61*
Expanded basic	**$28.74**	**$29.08**	**$25.35**	**$22.35**	**$23.35**	**$19.53**	**$26.28**	**$29.74**	**$23.93**
Standard error	*0.52*	*0.49*	*0.90*	*0.97*	*0.82*	*1.39*	*0.86*	*0.74*	*1.82*
Basic + expanded basic tiers	**$43.04**	**$43.33**	**$40.15**	**$35.94**	**$35.78**	**$36.38**	**$43.34**	**$42.74**	**$40.47**
Standard error	*0.32*	*0.30*	*0.62*	*0.88*	*0.89*	*0.86*	*0.44*	*0.36*	*1.17*
Digital tier plus equipment	**$12.99**	**$13.10**	**$11.85**	**$13.11**	**$12.68**	**$14.32**	**$11.10**	**$11.41**	**$6.65**
Standard error	*0.26*	*0.23*	*0.53*	*0.60*	*0.53*	*0.81*	*0.39*	*0.54*	*1.32*
January 1, 2004									
Basic	**$13.84**	**$13.79**	**$14.41**	**$13.01**	**$11.92**	**$16.05**	**$15.92**	**$14.29**	**$16.07**
Standard error	*0.40*	*0.38*	*0.70*	*0.74*	*0.57*	*1.22*	*0.59*	*0.70*	*1.48*
Expanded basic	**$27.07**	**$27.39**	**$23.88**	**$21.12**	**$22.08**	**$18.43**	**$25.32**	**$26.90**	**$22.72**
Standard error	*0.51*	*0.47*	*0.88*	*0.95*	*0.81*	*1.33*	*0.81*	*0.74*	*1.67*
Basic + expanded basic tiers	**$40.91**	**$41.18**	**$38.29**	**$34.13**	**$34.00**	**$34.48**	**$41.24**	**$41.19**	**$38.79**
Standard error	*0.32*	*0.29*	*0.61*	*0.84*	*0.85*	*0.80*	*0.42*	*0.43*	*1.05*
Digital tier plus equipment	**$12.83**	**$12.90**	**$12.07**	**$13.30**	**$13.32**	**$13.26**	**$11.50**	**$11.47**	**$6.08**
Standard error	*0.25*	*0.22*	*0.56*	*0.58*	*0.53*	*0.73*	*0.40*	*0.67*	*1.34*

Sources: Survey.

ATTACHMENT 3

Average Number of Channels

Cable Service	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
January 1, 2005									
Basic tier	**24.9**	**24.9**	**24.5**	**23.8**	**21.2**	**30.9**	**26.0**	**23.3**	**24.6**
Standard error	*0.7*	*0.7*	*1.3*	*1.5*	*0.9*	*3.0*	*1.2*	*1.0*	*2.6*
Expanded basic tier	**45.6**	**45.4**	**47.5**	**50.1**	**52.0**	**45.0**	**44.5**	**48.0**	**44.1**
Standard error	*0.8*	*0.8*	*1.5*	*1.6*	*1.0*	*3.1*	*1.5*	*1.3*	*3.4*
Basic + expanded	**70.5**	**70.3**	**72.0**	**73.9**	**73.2**	**75.9**	**70.5**	**71.3**	**68.7**
Standard error	*0.6*	*0.5*	*0.9*	*0.9*	*0.7*	*1.5*	*0.9*	*0.9*	*2.1*
Digital tier	**33.7**	**33.6**	**34.2**	**35.8**	**35.1**	**37.8**	**35.1**	**31.6**	**20.4**
Standard error	*0.9*	*0.8*	*1.6*	*1.6*	*1.4*	*2.1*	*1.4*	*2.0*	*2.9*
January 1, 2004									
Basic tier	**24.5**	**24.5**	**24.3**	**23.7**	**21.3**	**30.3**	**25.6**	**23.6**	**23.1**
Standard error	*0.7*	*0.7*	*1.3*	*1.5*	*0.9*	*2.9*	*1.1*	*1.1*	*2.7*
Expanded basic tier	**44.3**	**44.0**	**46.6**	**48.9**	**50.6**	**44.3**	**43.6**	**47.6**	**44.1**
Standard error	*0.8*	*0.8*	*1.5*	*1.6*	*1.0*	*3.0*	*1.4*	*1.2*	*3.3*
Basic & expanded	**68.8**	**68.5**	**70.9**	**72.6**	**71.9**	**74.6**	**69.2**	**71.2**	**67.2**
Standard error	*0.6*	*0.5*	*0.9*	*0.8*	*0.6*	*1.4*	*0.9*	*1.0*	*2.2*
Digital tier	**31.3**	**31.2**	**32.4**	**33.5**	**33.2**	**34.2**	**35.2**	**27.0**	**19.4**
Standard error	*1.3*	*1.2*	*1.9*	*1.9*	*1.9*	*2.1*	*1.7*	*2.0*	*2.9*

Source: Survey.

ATTACHMENT 4

Number of Channels,
Comparison of Sample Groups

January 1, 2005	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
Basic service Tier	**24.9**	**24.9**	**24.5**	**23.8**	**21.2**	**30.9**	**26.0**	**23.3**	**24.6**
Previous year (2004)	24.5	24.5	24.3	23.7	21.3	30.3	25.6	23.6	23.1
Percentage change	1.6%	1.6%	0.8%	0.4%	-0.5%	2.0%	1.6%	-1.3%	6.5%
Expanded basic tier	**45.6**	**45.4**	**47.5**	**50.1**	**52.0**	**45.0**	**44.5**	**48.0**	**44.1**
Previous year (2004)	44.3	44.0	46.6	48.9	50.6	44.3	43.6	47.6	44.1
Percentage change	2.9%	3.2%	1.9%	2.5%	2.8%	1.6%	2.1%	0.8%	0.0%
Basic & expanded basic	**70.5**	**70.3**	**72.0**	**73.9**	**73.2**	**75.9**	**70.5**	**71.3**	**68.7**
Previous year (2004)	68.8	68.5	70.9	72.6	71.8	74.6	69.2	71.2	67.2
10-years ago (1995)*	44.0	44.0	38.0	---	---	---	---	---	---
1-year percentage change	2.5%	2.6%	1.6%	1.8%	1.9%	1.7%	1.9%	0.1%	2.2%
10-year cumulative change	60.2%	59.8%	89.5%	---	---	---	---	---	---
Percentage that Noncompetitive Group is Higher or Lower Comparing Number of Basic-Plus-Expanded basic Channels									
2005	---	---	-2.4%	5.1%	4.1%	8.0%	-0.3%	-1.4%	2.3%
1995*	---	---	13.6	---	---	---	---	---	---

Source: Surveys. * 1995 data unavailable by type of competition.

ATTACHMENT 5

Average Equipment and Installation Charges

January 1, 2005	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
Monthly Equipment Charges									
Analog converter & remote control	**$4.39**	**$4.38**	**$4.54**	**$4.29**	**$4.86**	**$2.69**	**$4.43**	**$5.12**	**$5.22**
Standard error	*0.15*	*0.13*	*0.32*	*0.37*	*0.39*	*0.31*	*0.24*	*0.24*	*1.00*
Prior year (1/1/04)	$4.17	$4.16	$4.28	$4.08	$4.62	$2.55	$4.04	$4.99	$4.89
Digital converter & remote control	**$4.99**	**$4.98**	**$5.07**	**$5.31**	**$5.66**	**$4.32**	**$4.77**	**$5.42**	**$2.87**
Standard error	*0.13*	*0.12*	*0.26*	*0.33*	*0.28*	*0.47*	*0.14*	*0.26*	*0.64*
Prior year (1/1/04)	$4.81	$4.80	$4.85	$5.09	$5.48	$4.01	$4.49	$5.28	$2.76
HD converter & remote control	**$7.08**	**$7.08**	**$7.08**	**$6.94**	**$7.13**	**$6.41**	**$7.38**	**$6.82**	**$7.29**
Standard error	*0.19*	*0.17*	*0.38*	*0.38*	*0.25*	*0.72*	*0.25*	*0.56*	*0.66*
Prior year (1/1/04)	$6.92	$6.92	$6.94	$6.94	$7.29	$5.97	$7.19	$6.40	$7.75
CableCARD	**$1.09**	**$1.04**	**$1.63**	**$1.93**	**$1.45**	**$3.25**	**$1.61**	**$1.09**	**$1.64**
Standard error	*0.07*	*0.07*	*0.13*	*0.18*	*0.09*	*0.41*	*0.04*	*0.20*	*0.08*
Non-Recurring Cable TV Installation Charges									
Unwired home	**$45.94**	**$45.98**	**$45.47**	**$44.55**	**$44.05**	**$45.94**	**$44.59**	**$49.42**	**$40.93**
Standard error	*0.76*	*0.64*	*1.95*	*2.62*	*1.58*	*5.53*	*1.15*	*1.76*	*3.96*
Prior year (1/1/04)	$45.34	$45.34	$45.36	$44.92	$44.78	$45.30	$45.27	$47.19	$39.21
Pre-wired home	**$32.22**	**$32.23**	**$32.14**	**$30.46**	**$30.07**	**$31.58**	**$33.17**	**$33.37**	**$33.89**
Standard error	*0.67*	*0.57*	*1.64*	*1.90*	*1.20*	*3.87*	*1.02*	*1.93*	*3.78*
Prior year (1/1/04)	$31.61	$31.53	$32.38	$31.30	$31.40	$31.04	$33.93	$31.83	$32.00
Service reconnection	**$28.81**	**$28.80**	**$28.85**	**$24.73**	**$24.41**	**$25.60**	**$29.75**	**$35.53**	**$26.85**
Standard error	*0.62*	*0.54*	*1.44*	*1.57*	*1.32*	*2.27*	*0.97*	*1.82*	*2.83*
Prior year (1/1/04)	$28.36	$28.27	$29.25	$24.98	$25.09	$24.67	$30.39	$36.10	$25.23
CableCARD, current subscriber	**$18.86**	**$18.87**	**$18.71**	**$18.12**	**$22.45**	**$5.98**	**$19.22**	**$20.63**	**$6.33**
Standard error	*0.84*	*0.74*	*1.85*	*1.66*	*1.63*	*1.77*	*1.27*	*3.14*	*2.58*
CableCARD, new subscriber	**$24.70**	**$24.68**	**$24.82**	**$19.60**	**$24.50**	**$5.89**	**$26.31**	**$34.46**	**$9.18**
Standard error	*1.07*	*0.96*	*2.22*	*1.90*	*1.95*	*1.76*	*1.61*	*3.64*	*4.03*

Source: Survey.

ATTACHMENT 6

Average Operating Capacity

January 1, 2005	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
Cable System Operating Capacity									
Average MHz	736	734	754	756	757	756	751	758	729
Standard error	*7.0*	*6.6*	*11.1*	*12.3*	*13.0*	*10.4*	*11.1*	*5.7*	*32.2*
Percentage of Subscribers by Capacity of Cable System Serving Their Community									
System above 750 MHz	19%	18%	24%	23%	24%	18%	35%	7%	23%
Standard error	*0.03*	*0.02*	*0.05*	*0.06*	*0.06*	*0.06*	*0.04*	*0.05*	*0.10*
System at 750 MHz	68%	69%	66%	68%	67%	73%	49%	93%	56%
Standard error	*0.03*	*0.03*	*0.06*	*0.06*	*0.06*	*0.06*	*0.04*	*0.05*	*0.12*
System from 331 - 749 MHz	11%	11%	9%	9%	9%	8%	15%	0%	21%
Standard error	*0.02*	*0.02*	*0.03*	*0.04*	*0.04*	*0.04*	*0.03*	---	*0.10*
Systems below 331 MHz	2%	2%	1%	0%	0%	0%	1%	0%	0%
Standard error	*0.01*	*0.01*	*0.01*	---	---	---	*0.01*	---	---

Source: Survey.

ATTACHMENT 7

Availability of Various Cable Services

January 1, 2005	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
Availability of Service as a Percent of All Basic Cable Subscribers									
Cable basic tier	100%	100%	100%	100%	100%	100%	100%	100%	100%
Standard error	---	---	---	---	---	---	---	---	---
Expanded basic tier	96%	96%	95%	96%	100%	84%	92%	100%	94%
Standard error	*0.01*	*0.01*	*0.01*	*0.01*	*0.0*	*0.05*	*0.03*	*0.0*	*0.0*
Addressable analog converter	76%	78%	58%	58%	58%	61%	49%	78%	28%
Standard error	*0.03*	*0.03*	*0.06*	*0.07*	*0.07*	*0.07*	*0.05*	*0.08*	*0.11*
Prior yr. (Jan. 1, 2004)	79%	81%	59%	59%	56%	61%	51%	78%	28%
Digital programming	98%	98%	98%	95%	100%	82%	98%	100%	100%
Standard error	*0.01*	*0.01*	*0.01*	*0.01*	*0.00*	*0.05*	*0.01*	*0.00*	*0.00*
Digital tier	97%	98%	96%	92%	100%	68%	98%	100%	100%
Standard error	*0.01*	*0.01*	*0.01*	*0.02*	*0.00*	*0.06*	*0.01*	*0.00*	*0.00*
HDTV programming	89%	90%	81%	82%	91%	59%	73%	96%	44%
Standard error	*0.02*	*0.02*	*0.04*	*0.05*	*0.04*	*0.07*	*0.04*	*0.04*	*0.12*
HDTV broadcast	78%	79%	68%	73%	78%	57%	57%	81%	39%
Standard error	*0.02*	*0.02*	*0.06*	*0.06*	*0.06*	*0.07*	*0.04*	*0.08*	*0.12*
Sports tier	63%	63%	63%	62%	75%	27%	52%	85%	39%
Standard error	*0.03*	*0.03*	*0.06*	*0.06*	*0.06*	*0.06*	*0.05*	*0.07*	*0.12*
CableCARD	88%	88%	85%	80%	96%	32%	87%	100%	39%
Standard error	*0.02*	*0.02*	*0.03*	*0.04*	*0.03*	*0.06*	*0.03*	*0.00*	*0.12*
Cable Internet	96%	96%	96%	95%	98%	88%	98%	100%	61%
Standard error	*0.01*	*0.01*	*0.02*	*0.03*	*0.02*	*0.04*	*0.01*	*0.00*	*0.12*
Cable telephony	42%	42%	41%	42%	40%	48%	25%	70%	17%
Standard error	*0.03*	*0.02*	*0.06*	*0.07*	*0.07*	*0.07*	*0.04*	*0.09*	*0.09*

Source: Survey and *Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment,* 20 FCC Rcd 2718 (2005); 18 FCC Rcd 13284 (2003); 17 FCC Rcd 6301 (2002); 16 FCC Rcd 4346 (2001);.

ATTACHMENT 8

Subscribers to Various Cable Services

January 1, 2005	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
Subscribers as a Percent of All Basic Cable TV Subscribers Who Have Availability to the Particular Service									
Cable basic tier	100%	100%	100%	100%	100%	100%	100%	100%	100%
Standard error	---	---	---	---	---	---	---	---	---
Expanded basic tier	88%	88%	88%	90%	89%	93%	84%	91%	90%
Standard error	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.00*	*0.02*
Digital programming	38%	38%	40%	39%	41%	34%	40%	39%	54%
Standard error	*0.01*	*0.01*	*0.02*	*0.03*	*0.02*	*0.04*	*0.01*	*0.02*	*0.06*
HDTV programming	4%	3%	4%	5%	5%	3%	3%	3%	2%
Standard error	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Cable Internet	31%	31%	35%	39%	35%	52%	33%	30%	32%
Standard error	*0.01*	*0.01*	*0.02*	*0.02*	*0.02*	*0.03*	*0.01*	*0.02*	*0.07*
Cable telephony	9%	9%	14%	17%	6%	46%	12%	7%	52%
Standard error	*0.01*	*0.01*	*0.04*	*0.03*	*0.02*	*0.08*	*0.04*	*0.01*	*0.30*
Subscribers as a Percent of All Cable TV Subscribers									
Cable basic tier	100%	100%	100%	100%	100%	100%	100%	100%	100%
Standard error	---	---	---	---	---	---	---	---	---
Expanded basic	84%	84%	86%	87%	89%	81%	82%	91%	85%
Standard error	*0.01*	*0.01*	*0.01*	*0.02*	*0.01*	*0.01*	*0.06*	*0.01*	*0.01*
Digital programming	37%	37%	39%	36%	41%	24%	40%	39%	54%
Standard error	*0.01*	*0.01*	*0.02*	*0.03*	*0.01*	*0.02*	*0.06*	*0.01*	*0.01*
HDTV programming	3%	3%	3%	4%	5%	2%	3%	3%	1%
Standard error	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*	*0.01*
Cable Internet	30%	30%	34%	37%	34%	45%	32%	30%	20%
Standard error	*0.01*	*0.01*	*0.02*	*0.02*	*0.01*	*0.02*	*0.06*	*0.01*	*0.01*
Cable telephony	4%	4%	5%	8%	3%	22%	3%	5%	9%
Standard error	*0.01*	*0.01*	*0.02*	*0.02*	*0.01*	*0.01*	*0.06*	*0.01*	*0.01*

Source: Survey.

ATTACHMENT 9

Other Report Averages

January 1, 2005	Sample Groups Overall	Non-Comp. Sample	Communities With a Finding of Effective Competition by Primary Basis for Finding						
			Sample Group Overall	Communities with a Second Cable Operator			DBS	Wire-less	LP Test
				Sub-group Overall	First Cable System	Rival Cable System			
Monthly programming expense per subscriber *	**$1.12**	**$1.10**	**$1.36**	**$1.34**	**$1.14**	**$1.88**	**$1.47**	**$1.19**	**$1.45**
Standard error	0.09	0.08	0.18	0.16	0.13	0.24	0.12	0.31	0.16
Local broadcast stations	**12.3**	**12.4**	**11.5**	**11.2**	**11.4**	**10.7**	**11.8**	**11.6**	**11.2**
Standard error	*0.3*	*0.3*	*0.5*	*0.6*	*0.6*	*0.6*	*0.4*	*0.5*	*0.5*
Public, educational, and governmental	**2.6**	**2.6**	**2.7**	**3.0**	**3.1**	**2.7**	**2.8**	**2.0**	**3.4**
Standard error	*0.1*	*0.1*	*0.3*	*0.3*	*0.4*	*0.2*	*0.2*	*0.3*	*0.5*
Local commercial leased access	**0.7**	**0.7**	**0.6**	**0.7**	**0.7**	**0.5**	**0.4**	**0.9**	**0.3**
Standard error	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*	*0.1*
Other analog channels **	**3.3**	**3.3**	**3.3**	**2.1**	**2.2**	**1.8**	**4.0**	**4.0**	**5.8**
Standard error	*0.4*	*0.4*	*0.8*	*0.7*	*0.7*	*0.6*	*0.6*	*1.1*	*1.7*
High definition **	**11.6**	**11.5**	**11.6**	**12.1**	**12.2**	**11.9**	**11.2**	**11.6**	**9.7**
Standard error	*0.3*	*0.3*	*0.5*	*0.5*	*0.4*	*0.7*	*0.4*	*0.7*	*0.9*
Other digital channels **	**108.1**	**107.6**	**113.8**	**120.0**	**126.1**	**102.9**	**113.4**	**104.5**	**100.6**
Standard error	*4.4*	*4.1*	*7.1*	*7.5*	*7.3*	*8.1*	*4.8*	*9.7*	*12.4*

* Equals the difference in the monthly programming expense per subscriber for the basic-plus-expanded basic tiers, comparing year 2003 to year 2004. Monthly programming expense per subscriber for each year was approximated by dividing programming cost by end-of-year basic tier subscribers, dividing by 12 months.

** Includes premium, pay-per-view, mini-tiers, and other video channels. High definition channels also include local broadcast simulcasts and multicasts. Does not include channels counted in Attachment 3 that are part of the basic tier, expanded basic tier, or most-highly subscribed digital tier.

Source: Survey. Note: Results in this table are 5-pecent trended means calculated by removing the lowest and highest 5 percent of sample observation values.

ATTACHMENT 10

Averages for 1995-2005

Date	Basic and Expanded Basic Programming Service				System Operating Capacity (MHz)
	Price of Basic Tier	Price of Expanded Basic Tier	Total Price	Channels	
July 1995	---	---	$22.35	44.0	---
July 1996	---	---	$24.28	47.0	---
July 1997	---	---	$26.31	49.4	---
July 1998	$12.06	$15.82	$27.88	50.1	---
July 1999	$12.58	$16.36	$28.94	51.1	534
July 2000	$12.84	$18.38	$31.22	54.8	623
July 2001	$12.84	$20.91	$33.75	59.4	652
July 2002	$14.45	$22.02	$36.47	62.7	694
January 2003	$13.45	$25.50	$38.95	67.5	---
January 2004	$13.80	$27.24	$41.04	70.3	734
January 2005	$14.30	$28.74	$43.04	70.5	736
10-year-percent change, 1995-2005	---	---	92.6%	60.2%	---

Sources and notes: Years 1995-2004 are from previous Survey Reports including *Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment,* 12 FCC Rcd 3239 (1997) *("1997 Survey")*; 14 FCC Rcd 8331 (1999) *("1998 Survey")*; 15 FCC Rcd 10927 (2000) *("1999 Survey")*; 16 FCC Rcd 4346 (2001) *("2000 Survey")*; 17 FCC Rcd 6301 (2002) *("2001 Survey")*; 18 FCC Rcd 13284 (2003) *("2002 Survey")*; and 20 FCC Rcd 2718 (2005) *("2004 Survey")*. Year 2005 is from this Survey. Some data points have been revised from the historical series reported in the *2004 Survey* to reflect the first survey in which data for that year were published.

Missing data in this table indicates we did not survey those metrics in that year. Ten-year-percent change is unavailable for the basic tier, expanded basic tier, and MHz capacity because we did not survey those metrics in 1995. Prices and channels from 1995-2000 and capacity from 2000-2001 are represented by the averages for noncompetitive communities in Attachment 11, because composite subscriber-weighted averages of noncompetitive communities and effective competition communities were not included in those survey reports. All other numbers in this table are composite subscriber-weighted averages. There is only a slight difference in the average of all communities and the average for the noncompetitive group. This is because the group of cable operators that have received a specific Commission "effective competition" finding represents a relatively small group of cable subscribers, and thus there is only a slight effect from this group on the overall average.

1995-1997: *1997 Survey.* For 1995, only a combined programming plus equipment price was reported. The 1995 price in this table was calculated by subtracting an estimate of equipment price.
1998: *1998 Survey.*
1999: Prices were reported in *1999 Survey,* and capacity was reported in *2004 Survey* based on data collected for *1999 Survey.*
2000: *2000 Survey.*
2001: *2001 Survey.*
2002: *2002 Survey.* For 2002, price in the column labeled "Basic Tier" is out of trend. As another estimate, the *2004 Survey* reports that, in January 2002, the basic tier price is $13.11 and the expanded basic tier price is $23.01 (for a total of $36.12). These January 2002 estimates are the composite subscriber-weighted averages for noncompetitive communities (basic tier price is $13.06 and expanded basic tier price is $23.15 for a total of $36.21), and effective competition communities (basic tier price is $13.70 and the expanded basic tier price is $21.36 for a total of $35.06).
2003-2004: *2004 Survey.* Capacity was not surveyed for 2003. Averages for 2004 in this Attachment are based on the *2004 Survey,* and therefore, do not match the 2004 averages in Table 1 of this Survey, since those averages are based on the *2005 Survey.* In the *2005 Survey,* prices were collected for 2004 and 2005 in order to measure percentage changes across a consistent set of communities. Data collected for the same year for two different surveys are likely to vary slightly because each sample includes a different set of communities. The variability inherent in samples is discussed in Appendix A.
2005: This Survey.

ATTACHMENT 11

**Averages for 1995-2005,
By Sample Group**

Date	Basic and Expanded Basic Programming Service				System Operating Capacity (MHz)
	Price of Basic Tier	Price of Expanded Basic Tier	Total Price	Channels	
Noncompetitive Communities					
July 1995	---	---	$22.35	44.0	---
July 1996	---	---	$24.28	47.0	---
July 1997	---	---	$26.31	49.4	---
July 1998	$12.06	$15.82	$27.88	50.1	---
July 1999	$12.58	$16.36	$28.94	51.1	532
July 2000	$12.84	$18.38	$31.22	54.8	623
July 2001	$12.87	$21.02	$33.89	59.3	652
July 2002	$14.47	$22.14	$36.61	62.7	696
January 2003	$13.38	$25.73	$39.11	67.3	---
January 2004	$13.73	$27.56	$41.29	70.1	734
January 2005	$14.25	$29.08	$43.33	70.3	734
10-year-percent change, 1995-2005	---	---	93.9%	59.8%	---
Communities with a Finding of Effective Competition					
July 1995	---	---	$21.64	38.0	---
July 1996	---	---	$23.32	39.6	---
July 1997	---	---	$25.29	46.5	---
July 1998	$11.12	$15.00	$26.12	54.0	---
July 1999	$12.03	$15.27	$27.30	52.3	619
July 2000	$12.03	$17.41	$29.44	59.9	630
July 2001	$12.43	$19.23	$31.66	60.9	666
July 2002	$14.09	$20.25	$34.34	62.9	677
January 2003	$14.25	$22.61	$36.86	69.7	---
January 2004	$14.58	$23.59	$38.17	72.5	734
January 2005	$14.80	$25.35	$40.15	72.0	754
10-year-percent change, 1995-2005	---	---	85.5%	89.5%	---

Sources and notes: *See* Attachment 10.

APPENDIX A

Survey Methodology

A. Sampling Procedure

1. Our sample was drawn from the list of community-unit identifiers the Commission assigns to each cable operator for each community that a cable operator serves.[1] Prior to drawing our sample, we divided this list into noncompetitive communities and communities relieved from rate regulation, depending on whether the Commission had made a finding of effective competition in that community as of January 1, 2005. Moreover, we assigned each noncompetitive community to one of three subgroups -- large, medium, or small -- depending on the number of subscribers served by the cable system. Each community relieved from rate regulation was also assigned to a subgroup – communities with a second cable operator, DBS, wireless overbuild, or low penetration -- depending on the primary basis for the finding of effective competition. Communities with a second cable operator were further divided into incumbent cable operators and the rival second cable operator. Attachment 1 of this Report provides additional information on these sample groups and subgroups.

2. To determine the number of communities needed in our sample in order to achieve statistical precision, we applied a statistical formula.[2] Based on this formula, the sample size equaled 497 of the 31,655 communities in the noncompetitive group and 284 of the 1,275 communities relieved from rate regulation.[3] We divided the number of observations to be selected from each group into subgroups,[4] based on our estimate of each subgroup's percentage share of cable subscribers. Adjustments were made, however, to ensure that a sufficient number of sample observations were allocated to each subgroup, considering expected price variances within the subgroups. Sample selections were drawn at random from each subgroup, with each community having a known probability of selection. The probability of selection for any one community depended upon our estimate of its number of cable subscribers relative to the total number of cable subscribers in the subgroup. This method of selection was chosen so that the sample would be more representative of a typical subscriber on a nationwide basis. For each subgroup of communities with a finding of effective competition, we selected no more than one community per county from any particular cable operator.

3. After drawing the sample, we asked cable operators to complete a questionnaire for each of their communities selected for the sample. The questionnaire requested data as of January 1, 2005, and more limited amounts of data as of January 1, 2004. Cable operators in the noncompetitive sample group completed 484 of 497 questionnaires, representing a 97% response rate. The "large" subgroup (comprised of communities receiving service from a cable headend facility serving more than 10,000 subscribers) completed 397 of 398 questionnaires; the "medium" subgroup (1,001-10,000 subscribers) completed 48 of 52 questionnaires; and the "small" subgroup (1,000 or less subscribers) completed 39 of 47 questionnaires. Cable operators in the communities relieved from rate regulation completed 280 of 284 questionnaires, representing a 99% response rate. Operators in communities with a second cable

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[1] *See* 47 C.F.R. § 76.1801.

[2] *See* B. J. Mandel, *Statistics for Management* (1984) at 258. Formula parameters were set to determine a sample size large enough to estimate monthly cable prices within 50 cents of actual price with 95 percent probability.

[3] A relatively higher percentage of competitive communities were selected because this group is relatively small and the sampling formula requires a minimum number for statistical precision.

[4] For an explanation of stratified sampling methods, *see, e.g.*, G. W. Snedecor and W. G. Cochran, *Statistical Methods*, 7th ed. (1980) at 435-59.

operator completed 111 of 112 questionnaires; the DBS subgroup completed 124 of 125 questionnaires; the wireless overbuild subgroup completed 27 of 27 questionnaires; and the low penetration subgroup completed 18 of 20 questionnaires.

4. We reviewed the questionnaires for completeness and accuracy. When a response to a question was incomplete or appeared to be incorrect, we asked the responding cable operator to check its answer and revise the response if necessary. After this review process, we calculated the statistical averages for responses to each question. These averages were calculated at the subgroup level, then at the group level as a subscriber-weighted average of subgroups, and finally overall as a subscriber-weighted average of the noncompetitive communities and communities relieved from rate regulation combined. In this manner, the effect from a subgroup's average on its group average, as well as on the overall average, increased in direct proportion to its weight. The weights, which are equal to our estimate of each subgroup's percentage share of cable subscribers nationwide, are shown in Attachment 1.[5]

B. Sampling Accuracy

5. Because our Survey is based on a sample of communities rather than a 100% census, the price averages in this Report are subject to sampling variance. Sample results are likely to be different from results that would be obtained if we were able to collect prices from all communities nationwide. If it were possible to survey all cable communities we might increase the accuracy of this Report, but we would also increase the cost of the Survey. The number of cable communities we selected for our sample strikes a reasonable balance between accuracy and cost. The Attachments report estimates of potential sampling variance or "standard error" for each price average calculated as of January 1, 2005. Standard errors can be used to express a degree of confidence that the true average falls within a range around our sample average. This degree of confidence is usually expressed as assurance that in 95 out of 100 similar samples, the true average will fall within the stated range (the "95 percent confidence interval").[6] Standard errors can also be used to identify whether differences in prices, either over time or between noncompetitive communities and communities relieved from rate regulation, are statistically significant at a 95 percent confidence level.

6. In addition to variance inherent in the process of sampling, variances between sample results and true price averages may occur for reasons involving errors in (a) survey design; (b) survey responses; and (c) data collection and processing. One limit on our survey design involved the community count of subscribers used to develop subscriber-weights to compute weighted averages. As in previous surveys, we estimated the number of subscribers in each community by using the data reported on FCC Form 325 as of 1994, supplemented by current subscriber information whenever possible. These 1994 data are the most recent census of cable subscribers at the community level, and for this reason our weights did not reflect post-1994 growth in cable subscribers. Nevertheless, because it is likely that percentage growth across communities has tended to be evenly distributed, our weights serve as a reasonable, although imperfect, approximation of current weights. To limit survey error, we continued to apply quality control measures to enhance the accuracy of survey responses. When a response to a question was incomplete or out-of-trend, we asked that cable operator to check its answer and revise the response if necessary.

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[5] For a discussion of weighted averages, see W. E. Deming, *Some Theory of Sampling* (1950) at 135-211.

[6] This "95 percent confidence interval" is the range surrounding the sample average plus or minus 1.955 multiplied by the standard error. For example, the price for basic-plus-expanded basic service as of January 1, 2005 averaged $43.04, and the standard error was 32 cents, as shown in Attachment 2. We estimate at a 95 percent confidence level that the true average lies between $42.41 and $43.67. We arrive at the lower end of the range by subtracting 1.955 x $0.32 from our average of $43.10. We arrive at the upper end by adding 1.955 x $0.32 to $43.10.

APPENDIX B

Econometric Analysis

1. In this report, we return to econometric analysis in order to provide a more sophisticated examination of the data collected.[1] The model we describe below was designed to examine the effects of market structure as well as demand and cost factors on cable prices. The estimation of the relationship between market concentration and measures of firm performance was pioneered by Collins and Peterson in their 1969 study of the effects of concentration on profits in 417 industries.[2] Later, Weiss used a slightly different model specification to estimate the effects of concentration on profitability.[3] Since the publication of these two seminal articles, regressions of profit/price on concentration have become a frequently used empirical tool in industrial organization literature.[4]

2. The model is based on the textbook paradigm of "structure-conduct-performance," i.e., performance is affected by conduct (of buyers and sellers), which in turn is affected by structure (of the relevant market).[5] A majority of the studies have used market concentration as a measure of structure, and price or profit as a measure of performance. In this study, we use the same regression techniques that have been used previously and apply them to the MVPD industry to estimate the effects of a cable operator's share of the local market (a measure of market structure) on the price of cable service (a measure of performance).

A. Model Specification

3. Following the approach taken in previous empirical studies, we specify the following log linear relationship between cable prices and market concentration along with other explanatory variables:

$$\text{Log Price}_i = b_o + b_1 \text{Log Market Share}_i + b_2 \text{ Log Income}_i + b_3 \text{Log National Subscribers}_i + b_4 \text{ Log Capacity}_i + b_5 \text{ Log Density}_i + b_6 \text{Vertical Dummy}_i + b_7 \text{ Effective Competition}_i + b_8 \text{Local-into-Local}_i + e_i,$$

Where

Log Price_i = log of cable price at i^{th} cable community,

Log Market Size_i = log of cable's share of the MVPD market in system area,

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[1] For previous econometric studies, *see Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment,* 17 FCC Rcd 6301 (2002); 16 FCC Rcd 4346 (2001); 15 FCC Rcd 10927 (2000); and 14 FCC Rcd 8331 (1999).

[2] N. Collins and L. Peterson, *Price-Cost Margins and Industry Structure,* Review of Economics and Statistics, 51 (Aug. 1969) at 27-286. For discussion of empirical studies, *see* D. Waldman and E. Jensen, *Industrial Organization* (2001) at Ch. 16.

[3] L. Weiss, *The Concentration-Profits Relationship and Antitrust,* in H. Goldschmidt et al, *Industrial Concentration: The New Learning* (1974), updated in F.M. Scherer and D. Ross, *Industrial Market Structure and Economic Performance,* 3rd Ed. (1990) (Scherer and Ross).

[4] *See, e.g.,* T.F. Bresnahan, *Empirical Studies of Industries with Market Power,* R. Schmalnsee and R. Willig, *Handbook of Industrial Organization Vol. II* (1989) at Ch. 17; Scherer and Ross at 4-5; M.D. Whinston, *Lectures on Antitrust Economics: Chapter 3* at 27, www.csio.econ.northwestern.edu (Whinston); and W.N Evans, L. Froeb, and G. Werden, *Endogeneity in the Concentration-Price Relationship: Causes, Consequences, and Cures,* Journal of Industrial Economics (Dec. 1993) at 431-38 (Evans, Froeb, and Werden).

[5] L. Weiss, *The Structure-Conduct-Performance Paradigm and Antitrust,* 127 U. Pa. L. Rev. 1104 (1978-79).

Log Income$_i$ = log of median family income,

Log National Subscriber$_i$ = log of number of parent company subscribers of cable operator,

Log Capacity$_i$ = log of cable plant's capacity in MHz,

Log Density$_i$ = log of population density in the community served,

Vertical Dummy$_i$ = vertical dummy (0,1 indicating presence or absence of vertical affiliation with one or more programming networks),

Effective Competition Dummy$_i$ = effective competition dummy (0,1 indicating whether a petition requesting a finding of effective competition in the community has been granted),

Local-into-Local$_i$ = local-into-local dummy (0,1 indicating availability or non-availability of local programming in DBS operators' program offerings in the community served), and

e_i = error term.

4. The above equation includes variables representing market structure as well as demand and cost factors. Certain variables can influence both demand and cost. For example, median family income can be considered both a demand and a cost factor. High income is generally associated with increased ability to pay for cable services (thus influencing demand), but may also mean that higher labor cost prevails in the area, thus contributing to higher cable prices.

5. Cable plant capacity measured in megahertz is another variable that represents a combination of cost and demand factors. Higher megahertz may enable a cable operator to provide more channels and a variety of services including Internet access and telephony, which may lead to higher demand, which in turn may lead to higher cable prices. But upgrading the cable plant to provide increased capacity in megahertz also requires investment capital and so represents a cost factor. In the past, cable operators have upgraded their plant to meet competition from other MVPD operators, particularly DBS, as well as to be able to provide advanced services.

6. Similarly, population density can represent both a cost and a demand factor. A more densely populated area may suggest higher demand for cable services and therefore higher cable prices. It is possible, however, that a densely populated area may be part of a large city, which may have competing forms of entertainment available to consumers, which in turn may lead to lower demand for cable. Higher density, however, can also mean lower construction costs per home passed, which may lower the cost of providing cable services. The "local-into-local" dummy variable indicates the presence of more intense local competition from DBS in the MVPD market and thus may be associated with lower cable prices in the area. The effective competition dummy variable indicates that the cable operator has been freed from basic rate regulation and may face competition from additional MVPDs.

7. The "vertical affiliation" dummy variable, the "market share" variable, and the "number of nationwide subscribers" variable are three variables that represent market structure in the equation. If a vertically integrated cable operator enjoys cost savings or increased efficiencies due to the ownership of or affiliation with one or more programming networks, then the prices charged by the affiliated cable operator may be lower if some of the benefits are passed on to consumers. Vertically integrated operators

may wield market power in the sale of programming, and may be able to deny carriage of "must-have" affiliated programming to competing MVPD operators. This may lead to higher cable prices.[6]

8. A positive relationship between market share and prices is expected where a dominant firm is able to exploit its dominant position and charge higher prices than its competitors. Higher prices as a result of unilateral action by the dominant firm may in many instances lead to a loss of consumer welfare. However, a positive relationship between market share and prices can also result if the markets in which firms have larger market shares tend to be markets with higher costs. In these circumstances, market share may not be a good indicator of market power and higher prices may not represent a loss of consumer welfare.[7]

9. The variable indicating the number of nationwide subscribers indicates the overall size of the parent company of the cable operator. If large cable operators have a cost advantage over smaller operators, then prices should be lower in areas served by a cable operator that has a large number of subscribers nationwide.

10. Although the above equation provides a useful analysis of the effects of market structure and other demand and cost variables on prices, it may suffer from endogeneity due to omitted relevant variables.[8] Failure to include variables relevant to determining the price of cable service can bias the estimated impact of any included variables, such as market share, that are correlated with the omitted variables. As previously discussed, the failure to properly observe the quality of the product can lead to erroneous conclusions regarding the market share variable. In addition, over time, markets that exhibit higher prices may attract increased investment, increased research and development, and the entry of new competitors, thus affecting market shares. One consequence of the endogeneity of market shares is that the use of the ordinary least squares (OLS) technique to estimate the equation will lead to biased conclusions because of the correlation between the market share variable and the error term, which would violate one of the basic assumptions of OLS.[9]

11. To correct for the endogeneity of market share, we use the instrumental variable (IV) technique to estimate the equation. The instrumental variable method purges the link between explanatory variables and the error term by using appropriate exogenous variables as instruments. The selected instruments must be strongly correlated with the endogenous variable and must not be correlated with the omitted variables, whose effects are incorporated into the error term. We use nine variables related to market size and the cost of entry into the market as instruments for market share since these factors may affect market share but are not necessarily related to the omitted factors. Specifically, we use the following variables as instruments: number of households, location of franchise area in terms of latitude, age of the cable system, percent of Spanish speaking people in the population, percent of multiple dwelling units in the franchise area, percent of households without telephone service, percent of households with children under 18 years of age, presence or absence of a second cable operator in the franchise area, and whether or not the cable operator is regulated.

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[6] T. Chipty, *Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry,* American Economic Review (Jun. 2001) at 428-53.

[7] *See* C.M. Newmark, *Price-Concentration Studies: There You Go Again,* DOJ/FTC Joint Workshop on Merger Enforcement, Concentration and Market Shares panel (Feb. 2004) (Newmark).

[8] *See* Whinston at 28-29 and Evans, Froeb, and Werden.

[9] For a discussion of ordinary least squares and endogeneity, see J. Wooldridge, *Econometric Analysis of Cross Section and Panel Data,* Cambridge: The MIT Press (2002) at Ch. 4: The Single-Equation Linear Model and OLS Estimation at 49-81.

12. We use the natural log of the variables to estimate the equation. Although other functional forms may be equally suited for the estimation of this equation, we choose the log linear form so that the estimated coefficients can be interpreted as elasticities. Cable's market share, national subscriber size, capacity in megahertz, number of households, regulation, the presence of a second cable operator, and local-into-local variables are from the Survey. The vertical integration dummy is based on information provided in the 2004 Competition Report and the age of the cable system is derived from cable system registration information reported by cable operators.[10] All other variables are from the Census Bureau.[11]

B. Results

13. The Table shown below reports the estimated regression coefficients obtained by using the IV technique.[12]

IV Regression Estimation		
Dependent Variable (Log Price)	**Estimate of Coefficient**	**t-Statistic**
Log Income	0.030	1.07
Log National Subscribers	0.025*	5.96
Log Capacity	0.099*	2.69
Log Density	0.026*	4.65
Effective Competition Dummy	-0.042*	4.65
Local-into-Local	0.031	0.70
Log Market Share	0.112*	2.88
Vertical Dummy	-0.104*	6.25
Constant	1.749*	4.69
Observations	659	---
R-Squared	0.28	---
Root Mean Squared Error	0.418	---
* Significant at 99-percent confidence level.		

14. All of the estimated regression coefficients have the sign that was expected, and, except for median income and local-into-local, are statistically significant at a 99% confidence level. The three structural variables, the vertically integrated dummy, nationwide subscribers, and local market share, are all significant at the 99% confidence level. The positive relationship between cable prices and market share may suggest a structure-conduct nexus in which cable operators with high market shares wield

[10] *See* 2004 Competition Report at Table C-1 and www.fcc.gov/mb/engineering/liststate.html.

[11] For some communities, we used state level penetration data to estimate the number of DBS subscribers. This number was then used to estimate cable's share of MVPD subscribers.

[12] The effective competition dummy variable takes on a value of one if a petition for a finding of effective competition has been granted. The statutory definition of effective competition includes "low penetration" cable operators, i.e., those where fewer than 30 percent of households in a franchise area subscribe to the cable operator's service. Since low penetration operators may behave very differently from operators with a more substantial presence, they have been excluded. We tested a regression equation using the low penetration operators as part of the effective competition dummy and, possibly due to the few numbers in the sample, found that the results were almost identical to the results reported here.

unilateral market power to charge higher prices or it may reflect higher costs in markets in which cable operators have large market shares. The estimated coefficient for cable operators with a parent company having a large number of nationwide subscribers is positive and significant indicating no cost advantage for cable operators affiliated with large multiple service operators.

15. Prices are lower in franchise areas where cable operators are vertically integrated than in areas where they are not. The negative coefficient for the vertically integrated variable suggests that vertically integrated operators pass some of their cost savings to their subscribers. The vertically integrated variable, however, is also strongly correlated with the number of nationwide subscribers. This may affect its significance. We tested an alternative specification without the national size variable and found that the coefficient for the vertically integrated variable was slightly smaller but more significant.

STATEMENT OF
CHAIRMAN KEVIN J. MARTIN

Re: Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992, Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment, MM Docket No. 92-266

Congress requires us to issue an annual report on the price of basic cable services. This year's report reveals what we already know from our monthly bills: cable rates are rising. In fact, for the past decade, cable rates have risen faster than the rate of inflation.

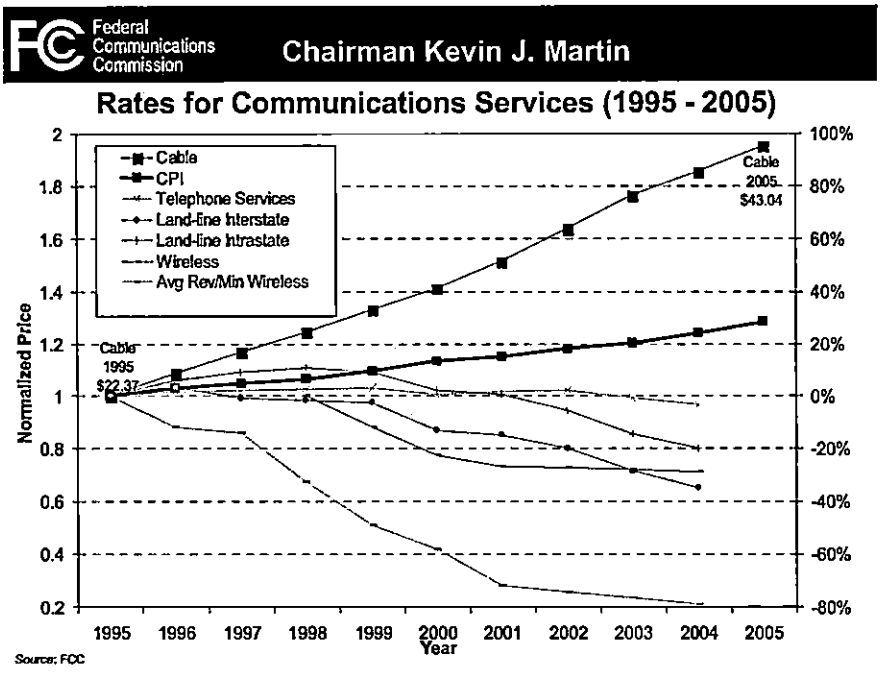
In 1996, Congress passed a comprehensive statute that embraced the idea that competition was preferable to regulation. Since then, the price for every service the Commission regulates has decreased—except for cable. For instance, the average rate for wireless service has plummeted 80% and average interstate telephony rates have decreased almost 40%. This is, in part, because those other services have been subjected to competition from providers who have competed on price, as well as on service options and quality. In contrast, cable prices alone have increased, and they have risen more than 90%. (See attached chart.)

Cable does face some competition from DBS, but our report reveals that DBS and cable do not seem to compete on price. In other words, the presence of a DBS operator does not have an impact on the price the cable operator charges its subscribers. Significantly, however, where a second cable operator is present, cable prices are significantly lower ($43.33 without competition vs. $35.94 where there is competition).

And we are not alone in this conclusion. The Government Accounting Office also concluded that the average monthly cable rate was significantly lower only in areas with another wire-based competitor.[1]

In light of these findings, I believe it is critical then that the Commission act to remove regulatory barriers to the ability of a second cable operator to enter the market. When consumers have the ability to choose among more than one cable operator, they receive one of the most important benefits of competition that the 1996 Act envisioned: lower prices. I look forward to continuing to work to foster additional cable competition and choice that can lead to greater consumer benefits.

[1] *See* U.S. General Accountability Office, *Issues Related to Competition and Subscriber Rates in the Cable Television Industry*, GAO-04-8 (Oct. 2003)


Federal Communications Commission
Chairman Kevin J. Martin
Rates for Communications Services (1995 - 2005)
Cable
CPI
Telephone Services
Land-line Interstate
Land-line Intrastate
Wireless
Avg Rev/Min Wireless
Cable 1995 $22.37
Cable 2005 $43.04
Normalized Price
Year
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
100%
80%
60%
40%
20%
0%
-20%
-40%
-60%
-80%
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
Source: FCC

CONCURRING STATEMENT OF COMMISSIONER MICHAEL J. COPPS

Re: Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992; Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment, MM Docket No. 92-266

As I did last year, I will vote to concur in today's report on ever-rising cable rates. I think the document we release today does represent an improvement over years past, but it still has not achieved the level of comprehensiveness in data-gathering and analysis that I have called for over the years I have been here. Nevertheless, I do thank the Chairman for his willingness to amend the Bureau's methodology in response to some of the criticisms that Commissioner Adelstein and I have made about earlier reports. That helps.

Of particular importance, I note that this year's report contains an econometric analysis of the survey results. This allows us better to gauge the relative importance of the various factors influencing the price of cable service. For instance, it discloses that there is a positive relationship between local market share and cable prices, as well as between a provider's number of nationwide subscribers and prices. In other words, customers of a large national cable company that controls a large share of a local market generally pay more than customers of a company with either a smaller national or local market share. Correlation does not necessarily imply causation, of course, but this result certainly raises troubling questions about market power that I hope will receive the Commission's further attention in future reports.

Despite the welcome addition of econometric analysis, today's report still suffers from some of the same flaws that have been identified by critics of earlier reports. For example, the Government Accountability Office pointed out more than two years ago that the FCC relies on an unreliable definition of competition. Yet today's report continues along the same lines that the GAO criticized. Another example: we continue to rely on the operators' own reports of their rate and cost structures, without any auditing of our own to assure the accuracy of their data.

Given the importance of the cable industry to the nation's economy and the staggering sums that consumers now pay for video service each month – not to mention our statutory mandate under section 623(k) of our Act – I believe the FCC has a plain responsibility to provide more in-depth research. I hope that next year we can build on the improvements in this year's report in order to provide industry, scholars, and the American public with a report that reflects more comprehensively what is actually happening in the cable market and that gives a more robust accounting of the factors that affect cable prices.

CONCURRING STATEMENT OF COMMISSIONER JONATHAN S. ADELSTEIN

Re: *Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992; Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment, MM Docket No. 92-266*

Once again we are presented with an annual *Report on Cable Industry Prices* showing the price Americans pay for cable service spiraling ever upward as cable companies continually report double digit increases in revenues and cash flow.[1] And once again this regular report provides insufficient data and analysis to explain how cable companies' prices are growing at such tremendous rates, leaving both us and Congress without the information we need to know how best to combat rising prices.

The price to consumers for cable service increased an average of 5.2% this year to bring the ten year total price increase on cable television rates to a whopping 93%. Few other goods and services in America cost nearly twice today what they did in 1995. And as anyone would expect from looking at these ever rising prices, the cable companies behind them have swelling revenues year in and year out regardless of the overall American economy. Questions about both ascending prices to consumers and market dominance in the cable industry will be raised many times in other proceedings over the next year. Other than the most basic information that prices are continuing to rise and cable companies are consolidating and growing richer, this report does not give either us or the American people much information to work with in considering future related proceedings.

Over the years, I have consistently pointed out areas where these annual reports need more effort and also have offered many constructive suggestions to improve them. While I am happy to see the econometric analysis finally return in this report, I find its conclusion that cable companies are using unilateral market power to extort unreasonable prices sobering. Unfortunately, however, this appears to be the only positive improvement in the work done on these reports. While an international market comparison is made, it is made to a single foreign city – Hong Kong – clearly hand-picked to support a particular viewpoint. Whether one agrees with that viewpoint or not, a factual analysis such as this is no place to hand pick particular comparisons. Rather, as an expert agency, our analysis should include a broad comparison to many similarly situated foreign markets in order to give an accurate picture of cable competition at home and abroad.

Finally, the econometric analysis that addresses the impact of consolidation, mergers and vertical integration in the cable industry on consumer price is short on a meaningful and thoughtful discussion, beyond the model specification narrative.

The underlying facts analyzed in this annual report are generated solely from a survey of the cable companies and their responses are simply assumed to be accurate. The suggestion to perform an audit of some of these responses to see if we are really being told the truth has been on the table for years. For example, the cable companies attempt to explain their soaring prices through increases in the cost of programming content. How do we know this is the case when the only data we have is nothing more than what the cable companies decide to tell us? Also, there are some curious results shown in the raw data that are not addressed in the analysis. For example, there are some unexplained differences between the price increases in analog cable and the decreases or averaged miniscule increases in high quality digital

[1] ¶ 10, FN 11, *infra*.

service and equipment. However, we do not know what the experts think is the cause of this huge discrepancy, since no analysis was provided.

The lack of meaningful analysis in some areas and wealth of it in others lend this report to criticism. The huge inconsistency in what types of data and analysis will be included in any given year reinforce this weakness since it makes meaningful comparison of the reports nearly impossible. And the lack of auditing makes all the data in these reports suspect at best, especially on the data the cable companies use to justify their prices.

All of these deficiencies and inconsistencies make this report of limited use in examining a cable industry except to tell us what we already know: that consumers keep paying higher prices for cable year after year and that, regardless of economic climate, the cable companies keep posting huge annual profits. One conclusion that is easy to reach is that this market is in desperate need of competition. I am hopeful that the entrance of the telephone companies into this market will provide badly needed competition that can help keep a lid on prices and provide the incentive for innovation and new services for consumers.

STATEMENT OF COMMISSIONER ROBERT M. MCDOWELL

Re: *Implementation of Section 3 of the Cable Television Consumer Protection and Competition Act of 1992; Statistical Report on Average Rates for Basic Service, Cable Programming Service, and Equipment*, MM Docket No. 92-266

This Cable Price Survey presents statistical information about the average rates for cable basic and expanded basic tiers of service in markets with varying levels of competition. Compiling this information, while potentially helpful, is only a first step. While the McDowell family's cable bill has gone up a lot in recent years, I would like for us to study the status of video competition in terms of not only prices, but also value provided to consumers, programming costs, barriers to entry and so forth. What the Cable Price Survey does not provide is an analysis of all of the potential factors that could cause overall rate increases. For instance, are higher rates reflective of many factors including: consumers buying more bundled service offerings; greater value being offered today compared with several years ago (such as the benefits of digital cable over analog, or more channel offerings); cost recovery due to regulatory burdens; or other causes? Such analyses will better inform our actions with respect to furthering competition in the video marketplace. In the meantime, I look forward to continuing to use this report as a resource. Many thanks to the Media Bureau for their work on this report.

WA Exhibit No. 22

I/A
v2 v3

OUTSIDE PLANT ENGINEERING HANDBOOK

August 1994

AT&T reserves the right to make changes to the product(s) described in this document in the interest of improving internal design, operational function, and/or reliability. AT&T does not assume any liability which may occur due to the use or application of the product(s) or circuit layout(s) described herein.

Developed by
AT&T Network Systems Customer Education & Training

Section 9

BURIED PLANT

PLANNING AND DESIGN GUIDELINES

AT&T 917-356-001

Buried plant is recommended as the first choice of providing outside plant (OSP) facilities beyond the underground network.

Selecting Placing Locations

- Select a permanent location for all buried plant, considering such factors as right-of-way limitations, soil type, natural obstacles (that is, rocks and trees), other underground utilities, and possible future excavation, such as that involved in road widening, fences, or ditching.
- Comply with all ordinances and regulations. Where required, secure permits before placing, excavating on private property, crossing streams, pushing pipe, or boring under streets and railways.
- Determine location of existing underground utilities.

Urban and Suburban Residential Areas

AT&T 917-356-100

Place distribution cables along the front property line or in a utility easement along the rear property line. Factors to be considered in selecting cable location are:

- Soil and subsurface conditions
- Natural obstacles such as rocks, trees, and unfavorable terrain
- Location of other utilities and the possibility of joint construction

WA Exhibit No. 23

F/A V2 V3

COMMUNICATIONS ACT AMENDMENTS OF 1978

P.L. 95-234, see page 92 Stat. 33

House Report (Interstate and Foreign Commerce Committee) No. 95-721, Oct. 19, 25, 1977 [To accompany H.R. 7442]

Senate Report (Commerce, Science, and Transportation Committee) No. 95-580, Nov. 2, 1977 [To accompany S. 1547]

Cong. Record Vol. 123 (1977)

Cong. Record Vol. 124 (1978)

DATES OF CONSIDERATION AND PASSAGE

House October 25, 1977; February 1, 6, 1978
Senate January 31, February 6, 1978

The House bill was passed in lieu of the Senate bill after amending its language to contain much of the text of the Senate bill.

The Senate Report is set out.

SENATE REPORT NO. 95-580

[page 1]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 1547) to amend the Communications Act of 1934, as amended, with respect to penalties and forfeitures, and to authorize the Federal Communications Commission to regulate pole attachments, and for other purposes, having considered the same, reports favorably thereon with amendments and recommends that the bill as amended do pass.

Summary and Purpose

The bill (S. 1547) serves two purposes:

(1) To unify, simplify, and enlarge the scope of the forfeiture provisions of the Communications Act of 1934; and

(2) To establish jurisdiction within the Federal Communications Commission (FCC) to regulate the provision by utilities to cable television systems of space on utility poles, ducts, conduits, or other rights-of-way owned or controlled by those utilities.

PENALTIES AND FORFEITURES

S. 1547, as reported, would unify and simplify the forfeiture provisions in the Communications Act of 1934, enlarge their scope to cover all persons subject to the act, provide more practical limitations periods and more effective deterrent levels of forfeiture authority, and would generally afford the Federal Communications Commission greater flexibility in the enforcement of the Communications Act and rules and regulations promulgated thereunder.

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The Communications Act of 1934 now imposes monetary civil penalties on certain individuals who fail to comply with the Communications Act, FCC regulations, or related matters. These civil liabilities

include the forfeiture provisions in section 503(b) (relating to the broadcast services) and section 510 (applicable to nonbroadcast radio stations). S. 1547 would enlarge the scope of forfeiture liability under these sections to cover other persons subject to the Communications Act—such as cable television systems, users of experimental or medical equipment emitting electromagnetic radiation, persons operating without a valid radio station or operator's license, and some communications equipment manufacturers.

S. 1547, as reported, would make three alterations in the existing forfeiture provisions. First, it would extend the limitations period within which notices of liability must be issued: for persons not previously subject to forfeiture liability, 1 year; for nonbroadcast licensees, from the present 90 days to 1 year; and for broadcast licensees, from the present 1 year to 1 year or the current license term, whichever is longer, not to exceed 3 years. Second, the maximum forfeiture that could be imposed for a single violation would be raised to $2,000; for multiple violations, within any single notice of liability, $20,000 for a common carrier, broadcast licensee, or cable system operator, and $5,000 in the case of all other persons. Third, the bill would authorize the Commission to mitigate or remit common carrier forfeitures in the same way as it now may with respect to all other forfeitures. Furthermore, the Commission would be given its choice of using the traditional "show cause" procedure for imposing a forfeiture or alternatively holding an adjudicatory hearing under section 554 of the Administrative Procedure Act.

POLE ATTACHMENT REGULATION

S. 1547, as reported, would empower the Commission to hear and resolve complaints regarding the arrangements between cable television systems and the owners or controllers of utility poles. A pole attachment, for purposes of this bill, is the occupation of space on a utility pole by the distribution facilities of a cable television system—coaxial cable and associated equipment—under contractual arrangements whereby a CATV system rents available space for an annual or other periodic fee from the owner or controller of the pole—usually a telephone or electric power company. The Commission would prescribe regulations to provide that the rates, terms, and conditions for pole attachments are just and reasonable. For a period of 5 years after enactment of this act, the Commission would employ a specified rate-setting formula in determining whether a particular pole attachment rate is just and reasonable. The formula describes a range between marginal and a proportionate share of fully allocated costs within which pole rates are to fall.

Any State which chooses to regulate pole attachments may do so at any time, and will preempt the Commission's involvement in pole attachment arrangements in that State simply by notifying the FCC that it regulates the rates, terms, and conditions for such attachments. S. 1547 in no way limits or restricts the powers of the several States to regulate pole attachments.

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The jurisdictional restrictions of section 2(b) of the act (47 U.S.C. 152(b)) are modified to permit the FCC to regulate practices of intrastate communications common carriers as they relate to pole attach-

ments. Utilities owned by the several States or their political subdivisions, and utilities owned by the Federal Government, are exempt from FCC pole attachment regulation. In like manner, the provisions of S. 1547 do not apply to any cooperative electric or telephone utility, or any railroad.

Background and Need

S. 1547 was introduced by Senator Hollings on May 17, 1977. The committee held hearings on the bill on June 23 and 24, 1977. Additional written submissions were received from interested parties, who expressed their views on the bill in its form as introduced, on a study of pole attachment problems of the Commission's Office of Plans and Policy, and on alternative pole attachment legislation suggested by the FCC's Common Carrier Bureau. That portion of S. 1547 relating to forfeiture authority is identical to S. 2343, which the Senate passed in June 1976 during the 94th Congress.

FORFEITURES

The FCC has long had forfeiture authority over common carriers and maritime radio stations. The FCC was given forfeiture authority over broadcasters in 1960. Section 503(b) of the Communications Act of 1934 was added to make broadcast licensees subject to some "middle ground" remedy other than license revocation (74 Stat. 889—Public Law 86-752, Sept. 13, 1960). In 1962, section 510 (76 Stat. 68—Public Law 87-448, May 11, 1962) was added to permit the Commission to impose forfeitures on nonbroadcast radio licensees for certain specific kinds of misconduct.

The Federal Communications Commission has testified to the committee that its existing forfeiture authority is inadequate to enforce effectively the Communications Act of 1934 in three principal respects:

(1) Not everyone now subject to the act is subject to forfeiture authority;

(2) The limitations period within which a notice of liability must be issued is unrealistic in light of the necessary preliminary field investigations required; and

(3) The maximum amount of forfeitures permitted for single and multiple violations is unrealistically low to be an effective deterrent for highly profitable communications entities or to provide sufficient penalty to warrant the Attorney General's or the various U.S. district attorneys' attention for prosecuting forfeitures within the Federal district courts.

The Commission argues that certain procedural requirements contained in existing forfeiture provisions compel misallocation of Commission assets and prevent the FCC from getting full benefit of extremely limited FCC field resources in the Commission's effort to encourage individuals to comply fully with the Communications Act of 1934. In this connection the Commission notes that there are now over 11 million authorizations in the safety and special radio services—under which falls the citizens band radio service—alone.

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A forfeiture is a civil penalty authorized under the Communications Act for certain violations of that act or related communications statutes, treaties, rules, or regulations. Whenever the Federal Communi-

cations Commission finds that grounds exist to support a suit for collection of forfeiture authorized under the Communications Act of 1934, a written notice of apparent liability is issued by the Commission to the violator. That notification specifies the violation and the amount of the forfeiture. The suspected offender has several alternatives, including immediate payment of the amount specified, a right to show cause in writing why he or she should not be held liable, or admission of liability with the right to argue that the amount of the forfeiture is excessive. If the person who receives the notice of apparent liability submits a statement in writing citing reasons against being held liable, the FCC then must proceed to an order, declaring nonliability or establishing the amount of the forfeiture. If the suspected violator then fails to pay the forfeiture to the Treasury, the case may be referred by the Federal Communications Commission to the Attorney General for appropriate civil action to recover the forfeiture in accordance with section 504(a) of the Communications Act. Section 504(a) authorizes the Attorney General to proceed in the Federal District Court in a trial de novo and to seek judgment for the amount of forfeiture.

S. 1547, as reported, amends this forfeiture procedure by giving the FCC a choice to use either a full adjudicatory hearing before the FCC or the less formal written "show cause" proceeding described above to determine a forfeiture liability. Under S. 1547, as reported, the Commission has full discretion to choose the appropriate proceeding, and may issue either a notice with an opportunity for hearing under section 503(b)(3)(A) or a notice of apparent liability with an opportunity to show in writing why the suspected violator should not be held liable under section 503(b)(4). The choice of the type of proceeding is exclusively the Commission's, and it is determined by the character of the notice the FCC chooses to issue a suspected violator.

The committee believes the FCC needs the alternative of an adjudicatory hearing for the exceptional forfeiture case, where urgency, precedent value, or convenience of the Commission warrants a proceeding exclusively under the Commission's control until a final judgment on appeal is obtained. The Justice Department's only involvement in an adjudicatory hearing before the Commission under new section 503(b)(3) would be to pursue a collection action after final judgment if the violator failed to pay the fine.

OTHER FCC ENFORCEMENT MECHANISMS

Forfeiture is one of several law enforcement mechanisms available to the FCC to enforce its rules and regulations. However, the Commission has argued that other enforcement alternatives are cumbersome and time-consuming procedures which are inappropriate for relatively minor violations. The Commission may enter a cease-and-desist order followed by a civil contempt proceeding which the Department of Justice must agree to prosecute. The cease-and-desist order is particularly cumbersome because the violator is entitled to an FCC order to show cause why a cease and desist order should not be issued. There is then a reply period of at least 30 days with the opportunity for a full

evidentiary hearing. Only then can the FCC issue a cease and desist order which must specify findings, grounds and reasons, and the effective date. (See section 312 (B) and (C).) Failure to obey that order

then becomes subject to civil contempt proceedings by the Department of Justice in a U.S. district court.

Another enforcement alternative is criminal prosecution. Title 18 of the United States Code and the Communications Act of 1934 impose criminal liability for certain specified acts. However, criminal enforcement is exclusively in the hands of the Department of Justice.

An additional enforcement mechanism available to the FCC in certain instances is the authority to suspend or revoke broadcast and nonbroadcast radio station licenses (see section 303(m), section 312 (a)). This suspension and revocation authority has the obvious limitation of not reaching unlicensed operators or persons who are not required to be licensed by the FCC. Moreover, as license revocation constitutes a death sentence for any commercial entity dependent upon its radio license, the FCC is naturally reluctant to use this extreme remedy for behavior which merits only a reprimand or small penalty.

Another enforcement alternative is a "writ of mandamus" issued by a U.S. district court, "commanding such person to comply with the provisions of" the Communications Act of 1934 (see section 401 (a)). It can only be issued by a district court upon application by the Department of Justice at the request of the Federal Communications Commission.

The final enforcement alternative available to the FCC is an accounting order imposed against a common carrier (see section 407). This mechanism is available to the Commission in the case of a common carrier tariff increase. The Commission can permit a tariff increase to go into effect subject to an accounting order, pending final Commission resolution of the lawfulness of the tariff increase. If the tariff is eventually found to be unlawful, the Commission can order the amount subject to the accounting order to be returned to the persons for whose benefit the order was imposed by the FCC. Those individuals must enforce their rights under an accounting order—by suing in the district court or State court with jurisdiction.

Each of these enforcement authorities has severe limitations. Few are applicable to all persons subject to the Communications Act. All are extremely prolonged and expensive procedures, both for the persons charged with the violations and for the Government. Many have limited applicability to certain specific kinds of offenses in the Communications Act. All are relatively low priority matters to the Department of Justice.

EXTENSION OF FORFEITURE SANCTIONS TO ALL PERSONS SUBJECT TO THE COMMUNICATIONS ACT

S. 1547, as reported, extends the forfeiture sanction to all persons who engage in FCC-proscribed conduct. New section 503(b) reaches not only the broadcast station licensees covered by present section 503 (b) and other nonbroadcast radio station licensees and operators covered by present section 510, but extends forfeitures to any person subject to any provisions of the Communications Act or the Commission's rules, including those persons operating without a valid radio

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station license or operator's license, those persons not required to have licenses, and persons such as cable television operators, users of medical and experimental radio equipment not required to be licensed, but

subject to FCC regulation under part 15 or part 18 of FCC rules and regulations, and some communications equipment manufacturers.

There are a number of situations which typically involve the violation of FCC rules for which speedy remedy is not now available to the Commission, including:

(*a*) Failure to conduct annual performance tests required by FCC rules;

(*b*) Failure to file financial and ownership reports and forms required by FCC rules;

(*c*) Unlicensed operations in the increasingly popular citizens band radio service;

(*d*) Interference, obscenity, or other improper conduct by a nonbroadcast radio station which may not fall within 1 of the 12 prohibitions enumerated in present section 510;

(*e*) Initiating cable television relay services without a license or construction permit, or failing to adhere to conditions specified in the construction permit; and

(*f*) Violation of certain other cable television rules.

The committee believes that forfeiture authority is a much more effective sanction than cease-and-desist orders or criminal prosecution for reaching the small number of persons who fail to abide by FCC rules and engage in these types of activities.

S. 1547, as reported, also brings under the Commission's forfeiture authority users of incidental and restricted radiation devices, such as radio receivers, and users of industrial, scientific, and medical equipment, such as industrial heating equipment, which incorporate radio-frequency oscillators. These devices are not subject to FCC licensing provisions, but must be operated in accordance with FCC rules designed to minimize interference with regular radio communication services. The only effective remedy the Commission currently has against such users is cease-and-desist authority which, in the committee's view, is not an effective deterrent to misconduct.

EXPANDED AUTHORITY FOR IMPOSING FORFEITURES

S. 1547 would expand the grounds for forfeiture against nonbroadcast licensees and all other persons subject to FCC regulation to parallel the conduct presently proscribed in section 503(b)(1) for broadcast licensees.

The standard for liability for violations of FCC authorizations and licenses is a substantiality standard. A licensee or cable operator must willfully or repeatedly fail to comply substantially with the license or authorization. The standard for liability for violations of specific FCC rules is also "willful or repeated" but is not a substantiality test. Forfeiture liability arises simply from repeated or willful behavior.

New subparagraphs (A) and (B) of section 503(b)(1) retain the existing standards of law with respect to the burdens of proof necessary to impose a forfeiture by requiring a finding of willful or repeated behavior. Arguments were made before the committee that this

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should be changed to a willful and repeated, or alternatively, a willful or negligent standard. The committee believes no change is warranted in the "willfully or repeatedly" standard. A "willfully and repeatedly"

standard would substantially reduce the FCC's forfeiture authority by imposing a test of willfulness in every case of forfeiture. Substituting a "negligent" standard for the "repeatedly" standard would frustrate the purpose of the forfeiture mechanism. The current law makes it clear that the burden is on the licensees to exercise every possible diligence to comply with the FCC rules. The committee believes that other persons wishing to use the electromagnetic energy spectrum for their own commercial or personal benefit must be willing to accept the same responsibilities commensurate with the privilege.

In summary, the committee does not believe that it is appropriate to change existing law as it applies to broadcast licensees with respect to the general standard of conduct subject to forfeiture liability. Therefore, S. 1547, as reported, retains the test of "willfully or repeatedly" violative behavior as subject to forfeiture liability. This permits forfeiture for a single, willful act, or for inadvertent violations which are repeated. It carries out the underlying philosophy of S. 1547 to treat alike all persons subject to the Communications Act.

LIMITATIONS PERIOD FOR THE ISSUANCE OF NOTICES OF APPARENT LIABILITY

For broadcast licensees S. 1547, as reported, makes the limitations period within which the FCC must issue a notice of forfeiture liability 1 year from the date on which the violation occurred, or within the current license term, whichever is the longer period, but not to exceed 3 years. In the case of any other person, the limitation period is 1 year from the date on which the violation occurred. After that period, the Commission could not begin a forfeiture proceeding. Section 503(b)(6)(A) makes clear that no broadcast station licensee can be subject to forfeiture for a violation which occurred more than 3 years prior to the issuance of the notice, even if the broadcast license term began more than 3 years before the date of the notice.

A longer limitations period is necessary in the area of broadcast regulation. While some violations may be found during regular station inspections by FCC field personnel, the majority of violations of FCC rules are discovered at the time of broadcast license renewal. In most instances, a 1-year period for imposing a forfeiture will have lapsed by the time a station's broadcast license comes up for renewal. Under present law the Commission is left with the sole alternative of revoking a license when a forfeiture would be a much more appropriate response.

The committee believes that an extension of the time limitation for nonbroadcast licensees is also necessary. Usually, violations of the Commission's rules in the nonbroadcast services are detected through field office monitoring. When an apparent violation is found, the field office, as a matter of practice, issues a citation and offers an opportunity to comment on the alleged misconduct. These notices are routinely sent to Washington where they are checked against the licensee's records. In those cases where there is a history of repeated misconduct, or where the misconduct appears to be willful or sufficiently serious, the notice

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of forfeiture liability is issued. The increasing workloads in the nonbroadcast services—over 11 million authorizations are outstanding in the safety and special radio services alone—and the limited number

of staff personnel to review possible violations have made it impossible, in many cases, to issue notices within the 90-day period of present law for nonbroadcast radio licensees. In those cases the Commission is faced with the dilemma of either imposing no sanction for detected violations or resorting to the more stringent sanction of license revocation.

Concern has been expressed to the committee that the extension from 3 months to 1 year for issuances of notices of apparent liability will result in significant lapses of time between detection by the FCC of a violation and the issuance of a notice of violation. Long lapses in time, it is claimed, would make it difficult for nonbroadcast licensees to respond, since it is not generally their practice to keep detailed engineering or other logs pertaining to station operation. Reliance must often be placed on the recollection of radio operators. The Commission has responded that it does not generally contemplate changes in procedures to lengthen the time period to issue notices of apparent liability if the statutory period is lengthened. Rather, such an extension to 1 year will permit the issuance of notices of apparent liability in those cases where the present 90-day period makes issuance impossible.

INCREASES IN THE AMOUNT OF FORFEITURE WHICH CAN BE IMPOSED

S. 1547, as reported, increases the maximum amount of forfeiture which can be imposed for violations: (1) The maximum forfeiture that could be imposed for a single violation would be $2,000; and (2) the maximum forfeiture that could be imposed for multiple violations in any single notice would be $20,000 in the case of a broadcast licensee, broadcast permittee, common carrier, or community antenna television system, and $5,000 in the case of any other person. Currently, broadcast stations are liable only for $1,000 for a single violation and $10,000 for multiple violations specified in any single notice. Those persons subject to forfeiture in existing section 510(a) are liable only for $100 for any single type of violation and a maximum of $500 for multiple violations.

The committee received testimony opposing the large increase in the amount of forfeitures to which nonbroadcast licensees will be subject under S. 1547. The committee believes that the increases are appropriate to protect more effectively the electromagnetic spectrum and its use. The current forfeiture limits are unrealistic and totally inadequate to deter large communications businesses. The same is equally true in the case of individuals. The new forfeiture limits are maximum amounts. The committee does not believe that these maximum penalties are appropriate for every case. The Commission must take into account the facts and culpability of the violator in each case before setting the amount of the forfeiture. The Commission would still retain the discretion to impose small forfeitures for offenses of lesser gravity. The committee notes that it is not FCC policy to fix the amount of forfeitures at the maximum of the statutory limit, but to consider several factors including seriousness of the violation, circumstances, duration, and financial condition of the licensee. (See, for example,

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Williams County Broadcasting Station, Inc., 34 R.R. 2d 105 (1975); *Radio Beaumont, Inc.*, 13 FCC 2d 965, 968 (1968); *Larry Association*, 27 FCC 2d 870 (1961).)

NOTICE REQUIREMENTS

S. 1547, as reported, requires that forfeiture liability could arise only after a person has been served personally or by certified or registered mail with a notice. In addition, it contains a special procedural protection comparable to existing law for those persons who will be made subject to forfeiture liability for the first time and who are presumed to be unaware of Commission regulations. For persons who are not required to hold a license, permit, certificate, or other authorization issued by the Commission, no forfeiture may attach unless prior to the issuance of any notice the Commission has sent a citation for the violation and has provided an opportunity for a personal interview and the person has thereafter engaged in the prohibited conduct. This special citation procedure and interview requirement protects persons who would otherwise be subject to immediate forfeiture for willful violations such as altering electronic devices which emit electromagnetic radiation (such as garage door openers or electronic water heaters or electronic ovens) in violation of FCC rules. Such a person could not be subject to forfeiture until there was clear evidence through the issuance of a citation of violation and interview opportunity that he or she was aware of the applicability of the Commission's rules and regulations governing the proscribed behavior. Only if he or she thereafter engaged in the conduct for which the citation of violation was sent could a notice of liability be issued. In such an event, forfeiture liability would attach not only for the conduct occurring subsequently but also for the conduct for which the citation of violation was originally sent.

Under existing law (section 510), the Commission is obligated to provide a personal interview to any nonbroadcast station licensee or operator who requests an interview after he or she receives a notice of apparent liability. S. 1547, as reported, alters this interview requirement by relieving the Commission of the unnecessary burden of conducting interviews with persons who are licensed or required to hold licenses or other authorizations from the Commission.

The Commission has testified that the elimination of the personal interview as proposed in S. 1547, as reported, is warranted in view of experience gained by the Commission's Field Operations Bureau in conducting interviews under section 510 during the past several years. According to the Commission, little more is accomplished by personal interview than by a written showing of why such forfeiture penalty should not be imposed. The interview is often mistaken to be a hearing. In fact, it serves mainly an internal FCC informational purpose. The usual course of the interview is as follows: Information is presented verbally by the person subject to the Notice of Apparent Liability to the Engineer in Charge (EIC) of the local FCC office, who in turn relays that information in writing to decisionmaking staff located in the appropriate Commission bureau. The participation of the EIC is limited to merely receiving, putting in writing, and forwarding the

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information to appropriate Commission staff. Thus, the same result could be accomplished by corresponding directly with the Commission in Washington.

INCREASED AUTHORITY IN THE FCC TO MITIGATE OR REMIT FORFEITURES

The FCC currently has express authority to mitigate or remit forfeitures under parts II and III of title III, and sections 503(b), 507, and 510 of the Communications Act. S. 1547, as reported, would amend this provision to eliminate the requirement that the person subject to the forfeiture seek the remission or mitigation of the forfeiture.

S. 1547, as reported, would also extend the authority of the FCC to allow remission or mitigation of title II—common carrier—forfeitures. Current law provides the FCC with no express authority to remit, mitigate, or otherwise redo a forfeiture imposed under the common carrier forfeiture provision of the Communications Act. The Commission does have such express authority with respect to all other general forfeiture provisions in the Communications Act. The committee believes this discretion should extend to common carrier forfeitures.

CATV ISSUES

The committee received testimony from cable television interests objecting to any extension of the civil penalty forfeiture authority of the Communications Act as it applies to cable television operators. The committee concurs with the recommendations of the FCC that appropriate forfeiture authority over cable television operators is necessary. The U.S. Supreme Court has affirmed FCC jurisdiction over cable television to the extent that such authority is reasonably ancillary to the Commission's responsibilities for broadcast regulation (*United States* v. *Southwestern Cable Co.*, 392 U.S. 157(1968)[1]; *United States* v. *Midwest Video Corp.*, 406 U.S. 649 (1972))[2]. The full extent of the FCC's ancillary jurisdiction has not been specifically defined either by statute or judicial decision, but the committee believes that is not a valid reason to deny the agency the necessary enforcement authority to insure compliance with its proper regulations. If any particular aspect of FCC regulation exceeds the agency's authority, the remedy is judicial appeal, not across-the-board denial of adequate enforcement powers.

The committee appreciates the concern expressed by some cable operators that the small or rural operator will be fined for violations of technical standards with which it is difficult to comply or which may have only insignificant impact on other services or on cable subscribers.

Such concern is directed in particular to the case where older cable television equipment fails to meet one or more of the technical standards adopted by the Commission in 1972. If, for example, a cable television system constructed not long before 1972 were providing generally acceptable service but failed to meet the 1972 technical standards in some specific way, it might be unreasonable to require replacement of major portions of the cable plant before the end of the anticipated life of the equipment. Therefore, even though the Commission did allow 5 years for systems existing in 1972 to bring themselves into compliance with the technical standards, we would expect

1. 88 S.Ct. 1994, 20 L.Ed.2d 1001.
2. 92 S.Ct. 1860, 32 L.Ed.2d 390, rehearing denied 93 S.Ct. 95, 409 U.S. 898, 34 L.Ed.2d 157.

the Commission to consider the practical financial aspects of plant replacement in determining the appropriateness of forfeitures for noncompliance due solely to characteristics of pre-1972 equipment.

The committee wishes to make clear, however, that such special consideration for systems with older equipment should not excuse inadequate maintenance and engineering practices. If it is feasible to modify, adjust or maintain older equipment to meet the Commission's technical standards, then an operator failing to do so would be subject to forfeitures just as though his or her equipment were more modern. Nor would we expect consideration for older equipment to extend past the useful life of such equipment.

Further, it is the committee's position that certain technical standards relating to prevention of radio interference must prevail over considerations of cable equipment age and replacement costs. Standards, rules, and regulations designed to prevent harmful interference—as defined in FCC rules—to radio navigation and safety services clearly must take precedence.

The Commission has stated that while compliance with the technical standards may involve some difficulty for systems that are providing substandard service, the standards are realistic and, in fact, generally conservative in terms of the ability of the cable industry to comply. The Commission adopted its technical standards in 1972, and undertook a review of these standards later that year to determine the impact of its technical standards performance tests on smaller cable television systems. (*Notice of Inquiry and Proposed Rulemaking in Docket 19659*, 38 FCC 2d 506. 37 Federal Register 28307 (1973).) At the conclusion of this proceeding some changes in the rules were made to ease compliance. However, the Commission concluded that, while it was appropriate to make some distinctions between new and old systems, no such rational breakdown between large and small systems could be developed that would continue to assure that subscribers to small systems received good quality cable service and those persons near small systems were not subject to radio interference as a result of signal leakage. (*Report and Order in Docket 19659*, 47 FCC 2d 769, 38 Federal Register 29083 (1973).)

The Commission affirmed this general conclusion in stating to this committee:

> We are aware that some cable operators, both small and large, may be particularly apprehensive that the enactment of forfeiture legislation will result in a crackdown on cable systems that are leaking radiation in excess of that permitted by the rules. While we are sensitive to the concern of cable operators that the Commission may impose its authority indiscriminately, we see no alternative in this area to a reliance on the normal processes of administration and law to assure reasonable application of necessary standards and rules.
>
> Radiation standards apply not only to cable television systems but to other entities that may be engaged in incidental radiation, and are an essential part of the Commission's effort to make the most efficient possible use of the available radio frequency space. Radiation from a cable system pollutes the radio environment around the system, potentially inter-

fering with the right of nonsubscribers to the quiet enjoyment of their own radio and television reception. And, unlike the service a system provides to its own subscribers, there are few, if any, marketplace incentives for such leakage to be repaired. The individual subject to the interference may have no idea that the poor quality picture he receives is anything other than the result of natural propagation difficulties and general radio noise. While there may well be cable operators in rural areas and backwoods hills and hollows whose radiation seems at this time to cause no injury to anyone, we see no practical way of differentiating in the rules between this minority and the majority of cable operations whose leakage has a potential for creating real reception problems.

The FCC's present enforcement tools of cease and desist and revocation of certificates of compliance are totally inadequate in the cable television area. The forfeiture alternative is essential. The purpose of S. 1547, as reported, is to treat all parties subject to the Communications Act equitably and fairly and is not exclusively aimed at CATV. Any exception for CATV would work great unfairness on other industries which are less likely than cable operators to be familiar with FCC rules and regulations but are nevertheless subject to forfeiture authority.

The committee notes that S. 1547, as reported, is prospective in its effect for cable operators. Section 7 of the bill, as reported by the committee, specifically provides that any act or omission which occurs prior to the effective date of this act shall incur liability under the provisions of existing forfeiture authority as then in effect. Therefore, cable operators will not be subject retroactively to increased forfeitures for violations which occurred prior to the effective date of S. 1547.

POLE ATTACHMENT REGULATION

It is the general practice of the cable television (CATV) industry in the construction and maintenance of a cable system to lease space on existing utility poles for the attachment of cable distribution facilities (coaxial cable and associated equipment). These leasing agreements typically involve the rental of a portion of the communications space on a pole for an annual or other periodic fee as well as reimbursement to the utility for all costs associated with preparing the pole for the CATV attachment. The FCC estimates that there are currently over 7,800 CATV pole attachment agreements in effect. Approximately 95 percent of all CATV cables are strung above ground on utility poles, the remainder being placed underground in ducts, conduits, or trenches. These poles, ducts, and conduits are usually owned by telephone and electric power utility companies, which often have entered into joint use or joint ownership agreements for the use of each other's poles. It is estimated that approximately 70 percent of all utility poles owned by either telephone or electric utilities are actually jointly used. These joint utility agreements commonly reserve a portion of each pole for the use of communications services (telephone, telegraph, CATV, traffic signaling, municipal fire and police alarm systems, et cetera). This communications pole space is usually under the control of the telephone company.

Owing to a variety of factors, including environmental or zoning restrictions and the costs of erecting separate CATV poles or entrenching CATV cables underground, there is often no practical alternative to a CATV system operator except to utilize available space on existing poles. The number of poles owned or controlled by cable companies is insignificant, estimated to be less than 10,000, as compared to the over 10 million utility-owned or controlled poles to which CATV lines are attached.

Sharing arrangements minimize unnecessary and costly duplication of plant for all pole users, utilities as well as cable companies. Nevertheless, pole attachment agreements between utilities which own and maintain pole lines, and cable television systems which lease available space have generated considerable debate. Conflict arises, understandably, from efforts by each type of firm to minimize its share of the total fixed costs of jointly used facilities. Of the more than 10 million poles on which cable operators lease space, fewer than half are controlled by telephone companies, while 53 percent are controlled by power utilities, public and private. Most CATV systems lease space from more than one utility. An estimated 72 percent of all cable systems lease pole space from Bell Telephone operating companies, approximately 65 percent have agreements with investor-owned power companies, an additional 21 percent lease space from independent telephone companies, while 10 percent attach to poles owned by REA cooperatives and 14 percent acquire space from utilities owned by municipalities.

Due to the local monpoly in ownership or control of poles to which cable system operators, out of necessity or business convenience, must attach their distribution facilities, it is contended that the utilities enjoy a superior bargaining position over CATV systems in negotiating the rates, terms and conditions for pole attachments. It has been alleged by representatives of the cable television industry that some utilities have abused their superior bargaining position by demanding exorbitant rental fees and other unfair terms in return for the right to lease pole space. Cable operators, it is claimed, are compelled to concede to these demands under duress. The Commission's Office of Plans and Policy, in a staff report released in August 1977, concluded that, "[a]lthough the reasonableness of current pole attachment rates remains open to question, public utilities by virtue of their size and exclusive control over access to pole lines, are unquestionably in a position to extract monopoly rents from cable TV systems in the form of unreasonably high pole attachment rates" (page 34).

The committee received testimony that the introduction of broadband cable services may pose a competitive threat to telephone companies, and that the pole attachment practices of telephone companies could, if unchecked, present realistic dangers of competitive restraint in the future. The Commission has investigated the competitive interrelationships of telephone and cable companies in various proceedings and contexts, and has taken action to curtail potential anticompetitive practices in several instances. (See for example, *Common Carrier Tariffs for CATV Systems*, 4 FCC 2d 257 (1966); *General Telephone Co. of California*, 13 FCC 2d 448, *af'd.* 413 F. 2d 390 D.C. Cir. *cert. denied*, 396 U.S. 888 (1969). See also, *General Telephone Co. of the Southwest* v. *United States*, 449 F. 2d 846, 857 (5th cir. 1971).)

The pole attachment policies and practices of utilities owning or controlling poles are generally unregulated at the present time. Currently only one State—Connecticut—actually regulates pole attachment arrangements, while in another eight States, regulatory authority apparently exists but has not been exercised—California, Hawaii, Nevada, Alaska, Rhode Island, Vermont, New Jersey, and New York. According to a recent survey conducted by the Commission's Cable Television Bureau, entitled "Cable Television Pole Attachment—State Law and Court Cases," very few States have specific statutory provisions governing attachments to utility poles. Only 15 States, including the District of Columbia, appear to have enacted statutory authority which may be of sufficient breadth to permit regulation by an appropriate State body.

JURISDICTIONAL BASIS FOR FCC REGULATION

Moreover, the Federal Communications Commission has recently decided that it has no jurisdiction under the Communications Act of 1934, as amended, to regulate pole attachment and conduit rental arrangements between CATV systems and nontelephone or telephone utilities. (*California Water and Telephone Co., et al.*, 40 R.R. 2d 419 (1977).) This decision was the result of over 10 years of proceedings in which the Commission examined the extent and nature of its jurisdiction over CATV pole attachments. The Commission's decision noted that, while the Communications Act conferred upon it expansive powers to regulate all forms of electrical communication, whether by telephone, telegraph, cable or radio, CATV pole attachment arrangements do not constitute "communication by wire or radio," and are thus beyond the scope of FCC authority. The Commission reasoned:

> The fact that cable operators have found in-place facilities convenient or even necessary for their businesses is not sufficient basis for finding that the leasing of those facilities is wire or radio communications. If such were the case, we might be called upon to regulate access and charges for use of public and private roads and right of ways essential for the laying of wire, or even access and rents for antenna sites.

In addition the Commission concluded that there was no reason to separate resolution of the purely legal question of jurisdiction on the basis of whether the party owning or controlling the pole was a telephone or nontelephone company.

The committee believes that S. 1547, as reported, will resolve this jurisdictional impasse, by creating within the FCC an administrative forum for the resolution of CATV pole attachments disputes and by prompting the several States, should they wish to involve themselves in these matters, to develop their own plans free of Federal prescriptions.

The committee believes that Federal involvement in pole attachment arrangements should serve two specific, interrelated purposes: To establish a mechanism whereby unfair pole attachment practices may come under review and sanction, and to minimize the effect of unjust or unreasonable pole attachment practices on the wider development of cable television service to the public.

The basic design of S. 1547, as reported, is to empower the Federal Communications Commission to exercise regulatory oversight over the arrangements between utilities and CATV systems in any case where the parties themselves are unable to reach a mutually satisfactory arrangement and where a State or more local regulatory forum is unavailable for resolution of disputes between these parties. S. 1547, as reported, accomplishes this design in the most direct and least intrusive manner. Federal involvement in pole attachments matters will occur only where space on a utility pole has been designated and is actually being used for communications services by wire or cable. Thus, regardless of whether the owner or controller of the pole is an entity engaging in the provision of communications service by wire, if provision has been made for attachment of wire communications a communications nexus is established sufficient to justify, in a jurisdictional sense, the intervention of the Commission. The underlying concept of S. 1547, as reported, is to assure that the communications space on utility poles, created as a result of private agreement between nontelephone companies and telephone companies, or between nontelephone companies and cable television companies, be made available, at just and reasonable rates, and under just and reasonable terms and conditions, to CATV systems.

S. 1547, as reported, stops short of declaring the provision of pole space to CATV "wire or radio communications" per se, or that poles constitute "instrumentalities, facilities, apparatus," et cetera incidental to wire communications (as used in section 3(a) of the Communications Act, 47 U.S.C. 153(a)). However, S. 1547, as reported, does expand the Commission's authority over entities not otherwise subject to FCC jurisdiction (such as electric power companies) and over practices of communications common carriers not otherwise subject to FCC regulation (principally the intrastate practices of interstate or intrastate telephone companies). This expansion of FCC regulatory authority is strictly circumscribed and extends only so far as is necessary to permit the Commission to involve itself in arrangements affecting the provision of utility pole communications space to CATV systems. Even in this instance S. 1547, as reported, does not contemplate a continuing direct involvement by the Commission in all CATV pole attachment arrangements. FCC regulation will occur only when a utility or CATV system invokes the powers conferred by S. 1547, as reported, to hear and resolve compaints relating to the rates, terms, and conditions of pole attachments. The Commission is not empowered to prescribe rates, terms, and conditions for CATV pole attachments generally. It may, however, issue guidelines to be used in determining whether the rates, terms, and conditions for CATV pole attachments are just and reasonable in any particular case.

Moreover, the Commission's jurisdictional reach extends only to those entities which participate in the provision of communications space on utility poles. Thus, an electric power company which owns or controls a utility pole would be subject to FCC jurisdiction only if two preconditions are met: (1) the power company shares its pole with a telephone company, or other communications entity; and (2) a cable television system shares the communications space on the pole with the telephone utility or other communications entity, or occupies the communications space alone. An electric power company owning or

controlling a pole on which no communications space has been designated would not be subject to FCC jurisdiction. S. 1547, as reported, does not vest within a CATV system operator a right to access to a utility pole, nor does the bill, as reported, require a power company to dedicate a portion of its pole plant to communications use.

It has been made clear in testimony by CATV industry representatives to this committee that access to utility poles does not in itself constitute a problem, among other reasons because CATV offers an income-producing use of an otherwise unproductive and often surplus portion of plant. CATV industry representatives estimate that about 15 percent of all utility poles owned or controlled by electric power companies are not occupied by telephone companies as well, and that CATV systems are already attached to a high percentage of these power poles in communities served by cable television.

While S. 1547, as reported, does not legislate a guarantee of access by CATV systems to utility poles, the committee recognizes that it is conceivable that a nontelephone utility which currently provides CATV pole attachment space might discontinue such provision simply in order to avoid FCC regulation. The committee believes that under S. 1547, as reported, the Commission could determine that such conduct would constitute an unjust or unreasonable practice and take appropriate action upon a finding that CATV pole attachment rights were discontinued solely to avoid jurisdiction.

Furthermore, S. 1547, as reported, would not require the Commission, as it stated in its *California Water and Telephone Co.* decision, noted above, "to regulate access and charges for use of public and private roads and right-of-ways essential for the laying of wire, or even access and rents for antenna sites." The communications space must already have been established, meaning that FCC jurisdiction arises only where a pole, duct, conduit, or right-of-way has already been devoted to communications use, and the communications space must already be occupied by a cable television system. Hence any problems pertaining to restrictive easements of utility poles and wires over private property, exercise of rights of eminent domain, assignability of easements or other acquisitions of right-of-way are beyond the scope of FCC CATV pole attachment jurisdiction. Any acquisition of any right-of-way needed by a cable company is the direct responsibility of that company, in accordance with local laws. S. 1547, as reported, is not intended to disturb such matters in any way.

STATE OR LOCAL CATV POLE ATTACHMENT REGULATION

S. 1547, as reported, permits any State which regulates the rates, terms, and conditions for CATV pole attachments to preempt the Federal Communications Commission's regulation of pole attachments in that State. The committee considers the matter of CATV pole attachments to be essentially local in nature, and that the various State and local regulatory bodies which regulate other practices of telephone and electric utilities are better equipped to regulate CATV pole attachments. Regulation should be vested with those persons or agencies most familiar with the local environment within which utilities and cable television systems operate. It is only because such State

or local regulation currently does not widely exist that Federal supplemental regulation is justified.

However, the framework for such State and local regulation is already in place. CATV systems and electric power and telephone utilities are subject, in varying degrees, to local or State regulation in numerous ways. State and local public service commissions and other agencies already possess a wealth of experience in regulating intrastate power and telephone companies. CATV systems are granted franchise permits from the officials in the communities in which they operate. Several States have cable television commissions which perform regulatory functions in addition to those performed by the community franchising authorities.

Nevertheless, in the absence of regulation by these State and local authorities of CATV pole attachments, the Federal Communications Commission should fill the regulatory vacuum to assure that rates, terms, and conditions otherwise free of governmental scrutiny are assessed on a just and reasonable basis. The committee looks to a replacement of interim FCC jurisdiction by the States and localities concerned with the orderly growth of cable television. Since this is a relatively novel issue in many States, there will be a time before many assert CATV pole attachment jurisdiction. Most States will require special legislation in order to empower their utility commissions with the requisite authority. Some States may wish to conduct studies of local needs prior to considering legislative action. There is, too, the possibility that some States may not choose to regulate in this area.

S. 1547, as reported, establishes a simple notification process whereby a State may recapture CATV pole attachment jurisdiction by certifying to the Commission that it regulates the rates, terms, and conditions for CATV pole attachments. The bill as reported makes clear that the Commission shall be foreclosed from regulation with respect to pole attachments in any State which has so certified to the Commission. Receipt of such a certification from the State shall be conclusive upon the Commission. The FCC shall defer to any State regulatory program operating under color of State law, even if debate or litigation at the State level is in progress as to the authority of the State or local body to carry out a CATV pole attachment regulatory program. However, since the purpose of the bill as reported is to create a forum that is, in fact, available to adjudicate pole attachment disputes, State preemption of FCC jurisdiction would not occur if a State only had authority to regulate in this area but was not actually implementing that authority. Thus, if a State is regulating, or is prepared to regulate upon a proper request, the FCC is preempted. Litigation challenging the State's authority would not affect that preemption unless the reviewing court or other authority had imposed a stay of State regulation pending outcome of the litigation.

S. 1547, as reported, unlike the bill as introduced, imposes no rate-setting formula upon the States. The committee believes that the States should have maximum flexibility to develop a regulatory response to pole attachment problems in accordance with perceived State or local needs and priorities. The committee is of the opinion that no Federal formula could accommodate all the various local needs and priorities

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in an entirely satisfactory manner. As noted above, the committee believes that familiarity with the specific operating environment of the utilities and cable television systems within a State, as well as the needs and interests of State or local constituents, is indispensable to efficient and equitable regulation.

Furthermore, imposition of a Federal ratesetting formula on the States would discourage State regulation by leaving only ministerial functions to the State public utility commissions or other regulatory agencies of the States or localities. The committee wishes to facilitate the replacement of FCC regulation in this area, not to vest within the Commission permanent nationwide pole attachment duties.

Ultimately, CATV pole attachment ratesetting involves equity considerations. Decisions regarding the allocation of pole costs among users should reflect in some rough sense the ability of cable subscribers and the utilities' customers to pay for costs which are passed along to them. Another significant equity consideration is the relative importance of each of the respective services to the communities served. Considerations of equity should turn on the needs and interests of local constituents. Given the fact that State public service commissions or local regulatory bodies are better attuned to these needs and interests than a Federal agency, jurisdiction over CATV pole attachments should rest with non-Federal officials.

Because the pole rates charged by municipally owned and cooperative utilities are already subject to a decisionmaking process based upon constituent needs and interests, S. 1547, as reported, exempts these utilities from FCC regulation. Presently cooperative utilities charge the lowest pole rates to CATV pole users. CATV industry representatives indicate only a few instances where municipally owned utilities are charging unsatisfactorily high pole rental fees. These rates presumably reflect what local authorities and managers of customer-owned cooperatives regard as equitable distribution of pole costs between utilities and cable television systems.

As to municipally owned utilities, in many cases the same local entity—the city council—is responsible finally for granting CATV franchises, and setting pole rates and electric and CATV subscriber rates. There are today approximately 2,228 local jurisdictions owning local public power systems. Of these, about 2,112 have the authority to grant CATV franchises as well, and about half or 1,008 of these municipal power systems have granted cable franchises. Thus these localities are in the best position to determine the respective responsibilities of pole users for the costs of erecting and maintaining these facilities.

Cooperatively owned utilities, by and large, are located in rural areas where often over-the-air television service is poor. Thus the customers of these utilities have an added incentive to foster the growth of cable television in their areas. Many stockholders of power or electric cooperatives also subscribe to cable television systems. Moreover, the Rural Electrification Administration of the Department of Agriculture advises this committee that over 60 percent of existing REA loan recipient plant is buried underground, mostly in trenches, and that approximately 95 percent of all new plant is being buried underground. Therefore, as to most cooperative utilities, CATV pole attachment arrangements are unnecessary since there are no leasing agreements associated with use of trenches.

Railroads likewise play an insignificant role in CATV pole attachment matters and are also exempt from FCC regulation under S. 1547, as reported. It is not the committee's intention that S. 1547, as reported, should affect in any way existing circumstances regarding CATV pole attachments on Indian lands.

FCC INTERIM RATE-SETTING FORMULA

S. 1547, as reported, sets forth a rate-setting formula to be employed by the Commission in determining whether the rates for CATV pole attachments in any particular case are just and reasonable. The formula describes a range of permissible rates between "additional costs" and a proportionate share of the "operating expenses and actual capital costs" of the utility pole. In essence, the standard permits the contracting parties, or the Commission, to determine a CATV pole attachment rate somewhere between avoidable costs and fully allocated costs.

The level of pole attachment fees is intimately connected with the terms and conditions of pole space leasing agreements. The reasonableness of a utility's pole attachment practices must be judged with reference to the compensation that it receives from cable companies for the service provided. For example, a pole attachment fee designed to recover all of the utility's fully allocated costs might justify giving cable operators all of the rights with respect to poles as other utility users, subject only to the higher priority that exists for the maintenance of telephone and electric service. Alternatively, a fee designed to recover only the utility's avoidable costs, which could be expected to be minimal since most of those costs are the outlays that should be fully recovered in the make-ready charges, would justify treating cable as a clearly secondary use subordinate in every respect to the provision of electric and telephone service. This interim formula reflects a belief that the annual pole attachment fee should be set somewhere between avoidable and fully allocated costs in order to avoid inhibiting the growth of cable television and to insure that cable operators and their subscribers make some equitable contribution to the fixed costs of the utility systems they use.

The term "additional costs" means those costs which would not be incurred by the pole owner or controller "but for" the CATV attachment. Within this category would fall such items as preconstruction survey costs and engineering, make-ready, and change-out costs incurred in preparing the utility pole for the CATV attachment. Make-ready costs are those necessary to rearrange existing telephone and power lines to maintain clearances between different pole lines required by individual utility construction and safety standards and national electrical safety codes and to reinforce poles when necessary to increase load capacity. In a few limited instances it may be necessary for the utility to replace an existing pole with a larger facility in order to accommodate the CATV user. In those cases it would be appropriate to charge the CATV user a certain percentage of these pole "change-out" replacement costs, sometimes referred to as the "nonbetterment costs." All of these costs arise solely by virtue of the CATV occupation of space within the communications space on the pole.

The term "operating expenses and actual capital costs of the utility," as used in S. 1547, as reported, refers to the costs to the utilities, irre-

spective of the CATV attachment, of owning and maintaining poles. Such costs include interest on debt, return on equity (profit), depreciation, taxes, administrative and maintenance expenses. There will remain some dispute, it is anticipated, as to whether a particular capital or expense item is "attributable" to the pole or whether a determination of rates based on future as opposed to embedded costs is appropriate. For example, maintenance expenses of utility pole crews may be difficult to assign where the same crew performs functions other than maintaining utility poles. Likewise, general office salaries and expenses may not be susceptible to clear attribution to pole maintenance categories. Further, there may be some difficulty in determining the components of "actual" capital costs. As to some of these factors the committee expects that the Commission will have to make its best estimate of some of the less readily identifiable actual capital costs. Special accounting measures or studies should not be necessary.

The committee is advised that the majority of cost and expense items attributable to utility pole plant are already established and that publicly available accounts reflecting total annual pole costs are filed by utilities with the various regulatory agencies with ratemaking jurisdiction over their activities. Since the rate-setting formula set forth in S. 1547, as reported, merely establishes a methodology for assigning pole costs, however determined, under applicable accounting procedures, the committee sees no need for the Commission to establish a separate system of accounting to determine operating expenses and capital costs attributable to poles, or to reexamine on its own initiative, the reasonableness of the cost methodology made by the utilities and sanctioned by State or local regulatory agencies.

Once these expense items and capital costs are determined, the formula provides a method for determining a maximum portion of these total pole costs which may be assigned to the CATV system. The allocation formula provides that a cable system may bear a proportionate share of the total pole costs in exactly the same proportion that its attachment and attendant clearances take up usable space. By way of example, on a typical utility pole 35 feet in length there are 11 feet of usable space (that space above minimum grade level clearance used to attach cable, telephone, and electric wires and associated equipment). By what is virtually a uniform practice throughout the United States, cable television is assigned 1 foot out of the 11 feet of usable space. (While cable only physically occupies approximately 1 inch of this space, the clearance space between CATV and the next adjacent pole user is attributed to CATV.) Cable's share of the total capital costs and operating expenses for the entire 35-foot pole would be one-eleventh. Cable would pay its share of not just the costs of the 11 feet of usable space but of the total costs of the entire pole, including the unusable portion (below grade level, and between grade and minimum clearance levels). This allocation formula reflects the concept of relative use of the entire facility. To the extent that a pole is used for a particular service in greater proportion than it is used for another service, the relative costs of that pole are reflected proportionately in the costs of furnishing the service which has the greater amount of use.

In regard to the rate-setting formula set forth in S. 1547, as reported, the committee wishes to make one point very clear. The particular

methodology selected in this bill is only one of many plausible approaches to assigning pole costs to a CATV system, and should not be considered to reflect the committee's judgment that allocation of pole costs according to relative use is the optimal methodology. The committee's decision to incorporate a specific rate-setting formula in S. 1547, as reported, is based entirely on the following considerations: To assist the Federal Communications Commission during the first few years of regulation in this new area; and to provide the Commission with a sense of congressional intent as to the meaning of the term "just and reasonable rate," so as to avoid lengthy initial proceedings at the Commission to determine what just and reasonable CATV pole attachment rates should be. The rate-setting formula of S. 1547, as reported, should be regarded as an interim measure only, having no precedential effect whatsoever on other rate-setting responsibilities of the Commission. Nor should this interim formula be deemed to reflect the committee's preference that the Commission indefinitely employ this particular methodology or the underlying concept of relative use in the instant case of CATV pole attachments. A 5-year termination of this formula is imposed to afford the Commission greater leeway to select a more appropriate methodology should experience and changed conditions so dictate. After this 5-year period the Commission would be guided by the "just and reasonable" statutory standard.

The bill as reported sets forth no specific guidelines to the Commission to determine whether any term or condition for CATV pole attachments is just and reasonable. Such terms and conditions usually include matters relating to inspections, extent and duration of license, liability for a portion of future capital costs, insurance, surety bonds, lease revocation, and like matters. The committee believes that the open standard of "just and reasonable" is at the same time sufficiently precise and flexible to permit the Commission to make determinations when presented with specific contractual provisions alleged to be excessively onerous or unfair. In any event, the fairness of any term or condition of a CATV pole-leasing agreement will have to be judged in relation to other contract provisions, prevailing practices in the industries involved, and the particular pole rate charges, matters which cannot be precisely translated into statutory language.

FCC CATV POLE ATTACHMENT REGULATORY PROCEDURES

The committee desires that the Commission institute a simple and expeditious CATV pole attachment program which will necessitate a minimum of staff, paperwork and procedures consistent with fair and efficient regulation.

Since S. 1547, as reported, does not define the provision of pole attachments as a common carrier service, the full panoply of regulatory procedures and enforcement mechanisms provided in title II of the Communications Act of 1934, as reported, would not automatically extend to utilities subject to FCC pole attachment regulation. The bill as reported affords the Commission discretion to select the regulatory tools necessary to carry out its new responsibilities, consistent with the simple complaint procedure specified in the bill, as reported. S. 1547, as reported, charges the Commission to develop, after an appropriate

rulemaking proceeding, a flexible program to adjudicate complaints relating to CATV pole attachment rates, terms, or conditions. The Commission's adjudicatory authority would not come into play until a complaining party has brought a matter to the Commission's attention. After hearing the complaint and responsive pleadings, if the Commission determines that a particular rate, term, or condition is unjust or unreasonable, it shall take any action it deems appropriate and necessary, including ordering the parties to undertake further negotiations to arrive at a just and reasonable settlement of the dispute to their mutual satisfaction. Alternatively, the Commission may order a party to show cause why it should not cease and desist from practices found to be unjust or unreasonable.

The Commission may by rulemaking establish regulations governing the form and content of complaints relating to CATV pole attachments, including requirements that the complaining party establish prima facie the unjustness or unreasonableness of any rate, term, or condition and show that the parties involved are unable to resolve the matter themselves and that all available State or local administrative remedies have been exhausted. To assist parties in their private resolution of CATV pole attachment disputes, the Commission may publish guidelines to be used in determining whether a particular rate, term, or condition would be just and reasonable.

The Commission may also prescribe such rules as it deems appropriate relating to the conduct of the complaint procedure established by the bill as reported. Such rules may include such matters as assignment of the burden of proof on contested rates, terms, and conditions, or on such documentation offered by a utility to justify any rate, term, or condition under challenge.

In determining the lawfulness of a utility's rates, terms, and conditions for CATV pole attachments, the Commission may accept in whole or in part the depreciation rates, property valuations, systems of accounts, rates of return and the like established or determined by any State or local agency or any agency of the Federal Government. It is not the intent of S. 1547, as reported, to require the Commission to embark upon a large-scale ratemaking proceeding in each case brought before it, or by general order. It would be extremely difficult for the Commission to attempt such a task. The annual charges for poles vary from one region of the country to another, from one company to another within a region, and within one company by reason of particular historical patterns of development, acquisition, accounting and construction practices, and the varying terms of joint user agreements with other utilities. Any general ratemaking principles which did not take into account such factors would be inherently inefficient, as well as unfair. Rather, the FCC is to focus more narrowly on the just and reasonable assignment of utility pole costs to the CATV user. Among those costs are the utility's rate of return and other capital cost factors, which will already have been established by a State or local agency. There is no need for the Commission to make independent determinations as to each element of a utility's annual pole costs, as S. 1547, as reported, merely requires the Commission to follow, for an interim period of 5 years, a method for assigning pole costs, however determined under applicable accounting procedures.

SECTION-BY-SECTION ANALYSIS

Section 1

This section sets forth the short title of the bill—the "Communications Act Amendments of 1977".

Section 2

This section amends subsection (b) of section 503 of the Communications Act of 1934 (47 U.S.C. 503(b)), to provide as follows:

Paragraph (1) simplifies and unifies the provisions of the Communications Act which invoke civil penalty (forfeiture) liability. It enlarges the category of those subject to forfeiture liability for violations of the Communications Act, the criminal code as it relates to communication by wire or radio, or the rules and regulations of the Federal Communications Commission. The paragraph provides that any person subject to FCC regulation is subject to forfeiture liability. It thus extends forfeiture liability under the Communications Act to many persons not currently subject to any type of forfeiture liability, such as cable systems, users of part 15 or part 18 devices (radio frequency or industrial, scientific, and medical equipment subject to FCC regulation), persons operating without a valid FCC license, and some communications equipment manufacturers. Any person is liable for forfeiture who (1) willfully or repeatedly fails to comply substantially with the terms and conditions of any license, permit, certificate, or other instrument or authorization issued by the Federal Communications Commission; or (2) willfully or repeatedly fails to comply with any of the provisions of the Communications Act, or any rule, regulation, or order of the Federal Communications Commission if such FCC rule, regulation, or order was lawful under either the authority of the Communications Act or the authority of any international treaty, agreement, or convention binding on the United States.

The actions by broadcasters which are subject to forfeiture liability are unchanged. However, people associated with broadcast activities are now subject to forfeiture liability for violations which were formerly enforceable only against the broadcast station licensee, including:

(1) Section 509(a)(4) of the Communications Act which makes it unlawful for any person to participate in any way in a rigged contest program;

(2) Section 1304 of the Criminal Code (18 U.S.C.) which makes it a crime for anyone to broadcast or permit the broadcast of lottery information;

(3) Section 1343 of the Criminal Code (18 U.S.C.) which makes it a crime for anyone to commit fraud by means of wire, radio, or television communications; or

(4) Section 1464 of the Criminal Code (18 U.S.C.) which makes it a crime for anyone to use obscene language on any type of radio.

The amended subsection continues present law by stating that forfeiture under this section shall be in addition to other penalties provided by the Communications Act, and by exempting from the general forfeitures in section 503(b) conduct subject to other forfeiture provisions in title II (Common Carriers) or parts II (Radio Equipment and Radio Operations on Board Ship) and III (Radio Installa-

tions on Vessels Carrying Passengers for Hire) of title III or section 507 (Violation of the Great Lakes Agreement) of the Communications Act.

Paragraph (2) increases the maximum forfeiture liability under section 503(b) from $1,000 to $2,000 for broadcast licensees, from $100 to $2,000 for persons operating nonbroadcast radio stations and to $2,000 for persons not previously covered by the forfeiture provisions.

A continuous violation is made a separate offense each day it occurs and so becomes "repeated" on the second day of the violation. A repeated forfeiture can then be imposed on the second day of a continuing violation and multiple forfeitures can be imposed beginning on the third day of the continuing violation. For nonbroadcast licensees, this represents a significant change in existing law which specifies that multiple liabilities cannot be imposed for any one type of violation irrespective of the number of violations thereof.

Paragraph (2) also sets a maximum on the total forfeiture penalty that can be imposed for multiple liabilities set forth in any single notice, as follows: (1) $20,000 in the case of a broadcast licensee or permittee, common carrier subject to the Communications Act, or community antenna television operator (CATV), and (2) $5,000 in the case of all other persons. The Commission is directed to take into account the nature, circumstances, extent, and gravity of the prohibited acts committed and the violator's culpability, prior offenses, ability to pay and other matters as justice may require when it sets the amount of the forfeiture.

Paragraph (3) gives the FCC the discretion to use a new procedure to enforce forfeiture penalties. The FCC is given its choice of using a full adjudicatory hearing under section 554 of the Administrative Procedure Act or the traditional written "show cause" proceeding, under new paragraph (4). Under this new procedural alternative, the FCC must issue a notice and grant an opportunity for a hearing before the Commission or an administrative law judge. Once the Commission has reached a final judgment on a forfeiture penalty, the violator has a right to seek judicial review of that penalty pursuant to section 402 (a) of the Communications Act, which is the standard appellate procedure applicable to any final FCC order. Any person who fails to pay the forfeiture penalty after it has become final and unappealable is subject to a collection action in the appropriate district court of the United States brought by the Attorney General. The validity and appropriateness of the final order of a forfeiture penalty are not subject to judicial review in such an action.

Paragraph (4) describes the alternate forfeiture procedure available to the FCC. If the FCC chooses to invoke this procedure, no forfeiture liability shall attach unless a written notice of apparent liability was issued by the Federal Communications Commission and either was actually received or was sent by registered or certified mail to the person's last known address. The notice must specifically identify the particular provision of law, rule, regulation, agreement, treaty, convention, licensee, permit, certificate, or other authorization or order involved. Additionally, the paragraph retains the current requirement that any person notified be granted an opportunity to show in writing within a reasonable period as set by FCC rule why he or she should not be held liable.

Paragraph (5) is new. It provides a special procedural protection in addition to the provisions of paragraphs (3) and (4). It applies to everyone except those persons who hold or are engaged in activities which require FCC license, permit, certificate, or other authorization from the Federal Communications Commission or any person who is providing any service by wire subject to the Commission's jurisdiction. Under this additional procedure, the Commission must first send the person a citation of the violation and provide a reasonable opportunity for personal interview with an FCC official at an FCC field office nearest the person's residence. No forfeiture liability under the amended subsection will attach unless the person has thereafter engaged in the conduct for which the citation of violation was sent. When a person subsequently engages in the same conduct for which he or she has already been sent a citation and given an opportunity for interview, a second citation need not be sent. Any subsequent notice and forfeiture may extend not only to the conduct occurring subsequent to the citation of violation, but also to the initial conduct for which the notice of violation was sent and opportunity for personal interview given.

Paragraph (6) amends the present forfeiture limitation periods. It establishes two different limitation periods for forfeiture under the amended subsection. For persons holding a broadcast station license under title III of the Communications Act, no forfeiture liability shall attach for any violation occurring before the current license term or 1 year prior to the date the notice of apparent liability is issued, whichever is earlier. In no event can a notice be issued more than 3 years after the date of the violation. For everyone else, no forfeiture may attach to violations 1 year before the date of the notice issued.

Section 3.

This section conforms section 504(a) of the Communications Act to new section 503(b)(3). A trial de novo in the Federal District Court by the Justice Department will not be necessary in the case of a section 503(b)(3) adjudicatory proceeding. This section also amends existing section 504(b) of the Communications Act which gives the Federal Communications Commission authority to mitigate or remit forfeitures. The FCC would be given new authority to remit or mitigate common carrier forfeitures imposed under title II of the Act. This would be in addition to existing authority to mitigate or permit forfeitures under parts II and III under title III (Maritime Radio Stations), new section 503(b) (General Forfeiture Provisions) and section 507 (Violations of the Great Lakes Agreement). It conforms section 504(a) to reflect the repeal of section 510 and it makes the decision to mitigate or remit forfeitures solely a function of the Commission's discretion by deleting the existing requirement that the person liable must apply for mitigation or remission.

Section 4.

This section repeals existing section 510 of the Communications Act of 1934 (47 U.S.C. 510), which provides for forfeitures applicable to nonbroadcast licensees and operators.

All of the offenses enumerated in section 510 are consolidated in amended section 503(b). The notice, limitation, maximum forfeiture

amount and show cause procedures are amended and consolidated in proposed section 503(b) as discussed above. The requirement that the FCC provide an opportunity for a personal field interview to non-broadcast station licensees after issuing a notice of apparent liability is deleted.

Section 5.

This section modifies existing section 2(b) of the Communications Act of 1934 (47 U.S.C. 152(b)) which limits the jurisdiction of the Commission over connecting carriers to sections 201 through 205 of title II of the act. Since section 6 of S. 1547, as reported, would give the Commission CATV pole attachment regulatory authority over connecting communications common carriers otherwise exempt from the provisions of the 1934 act as noted above, a conflict arises between the limitation on the Commission's jurisdiction of section 2(b) and its duty to regulate under proposed new section 224, set forth in section 6 of S. 1547, as reported. Section 5 of S. 1547, as reported, removes this conflict by removing the jurisdictional limitations of section 2(b) as they would otherwise apply to proposed section 224.

Section 6.

This section adds a new section 224 to title II of the Communications Act of 1934, as amended, relating to regulation by the Commission of the provision of pole attachment space to cable television systems by owners and controllers of utility poles. Subsection (a) of proposed section 224 sets forth definitions of terms used in the succeeding subsections. The term "utility" is defined to include entities such as electric power and telephone companies whose rates or charges are regulated by Federal, State, or local bodies. If such a utility owns or controls utility poles used for wire communication, it is subject to the jurisdiction of the FCC for purposes of section 224. "Wire communication" is defined in section 3(a) of the 1934 act (47 U.S.C. 153(a)). Certain of such utilities are exempted from the provisions of section 224: Railroads, municipally owned power systems, electric and telephone cooperative companies, and like entities owned by the Federal Government, any State, or any political subdivision, agency or instrumentality of any State. The term "pole attachment" is defined to mean the attachment of the cables of a CATV system to a pole or occupation of a duct or conduit, or other right-of-way owned or controlled by a utility. Duct or conduit systems consist of underground reinforced passages for electric and communications facilities as well as underground dips, lateral members, hand holes, splicing boxes, or pull boxes.

Subsection (b) of this section directs the Commission to regulate the rates, terms, and conditions whereby CATV systems attach their cable distribution facilities to poles owned or controlled by utilities. The Commission regulations shall provide that such matters are just and reasonable to all pole users. Subsection (b) also directs the Commission to adopt rules and regulations to implement its regulatory authority within 180 days from the date of enactment. This subsection requires the Commission to adopt procedures to adjudicate complaints relating to CATV pole attachments and directs the Commission to take appropriate action upon a finding that a particular rate, term, or condition for pole attachments is unjust or unreasonable. Among other ac-

tions the Commission may order a party violating the provisions of this section to cease and desist from further violation, pursuant to existing cease and desist provisions of the Communications Act of 1934, as amended.

Subsection (c) of this section restricts the jurisdictional reach of the Commission's pole attachment authority. The Commission shall have no such authority in any State which regulates the rates, terms, and conditions for pole attachments. A State may recapture pole attachment jurisdiction at any time simply by notifying the Commission that it regulates the matters encompassed by this section. Such notification would have the effect of automatically preempting the Commission's authority as to CATV pole attachments in that State.

Subsection (d) of this section defines the term "just and reasonable rate" by describing a range within which a reasonable and just CATV pole attachment rate must fall. The lower end of this range would be a rate which reimburses the utility for its costs borne to accommodate the CATV pole attachment, costs which it would not have incurred but for the presence of CATV cable on its poles. The upper end of this range is expressed in terms of a charge to the CATV pole user which reflects its proportionate share of the total costs of the pole, such total costs being the recurring operating expenses and capital costs attributable to the utility pole. Cable's proportionate share would be calculated by determining the percentage of usable space used by the CATV system (i.e. the actual physical attachment plus clearance space between the CATV attachment and adjacent attachments) and multiplying that percentage by the total of the capital costs and operating expenses of the entire pole.

Subsection (e) of this section limits the effectiveness of the rate-setting formula set forth in subsection (d) to 5 years. Thereafter the Commission shall be guided by the "just and reasonable" standard set forth in subsection (b) of this section.

Section 7.

This section provides that these amendments shall take effect 30 days after the date of enactment. Any act or omission which occurs prior to the effective date of this act shall continue to be subject to forfeiture under the provisions of section 503(b) and 510 as then in effect.

Regulatory Impact Statement

S. 1547, as reported, would expand the scope of the Commission's regulation in several significant respects. As to that portion of the bill relating to forfeitures, the Commission's authority to fine persons or businesses found to violate the provisions of the Communications Act of 1934, Commission rules, and related matters, would extend to entities not previously subject to such forfeiture authority. The Commission already exercises regulatory oversight of the activities of most of these entities. S. 1547, as reported, provides the Commission with an additional enforcement mechanism to assure compliance by these entities with existing rules and regulations applicable to their communications-related activities.

As to the pole attachment regulation sections of S. 1547, as reported, the Commission would be granted regulatory authority over entities

and persons not previously subject to FCC jurisdiction, such as electric power companies, and would expand the scope of the Commission's existing jurisdiction over communications entities (telephone companies) whose interstate practices are already subject to FCC regulatory supervision. Railroads and several types of entities which fall within the overall categories of electric power and telephone utility companies are exempted from the Commission's pole attachment regulation (publicly owned power companies, cooperatively organized telephone and power companies). It is estimated that at least 122 investor-owned electric power companies presently have pole attachment agreements with cable television systems. In addition to the Bell System operating companies, there are an estimated 1,600 independent telephone companies which may fall under FCC pole attachment jurisdiction. The Federal Communications Commission estimates that currently there are 7,800 CATV pole attachment contracts in effect, most of which involve entities not specifically exempted from S. 1547, as reported.

S. 1547, as reported, contemplates the assumption by the States of CATV pole attachment regulation, resulting concurrently in preemption by such States of FCC involvement in CATV pole attachment matters in those States. Accordingly, the extent of the Commission's regulatory responsibilities in this area should gradually diminish. It is not possible at this time to estimate the number of States which will eventually recapture CATV pole attachment jurisdiction from the Commission. At present there are about 15 States which could take such action without enacting special legislation or taking other necessary initial steps.

The committee has been unable to obtain specific predictions of the economic impact on businesses or individuals affected by this bill. The committee has no reason to believe that there will be any impact on personal privacy of businesses or individuals as a result of enactment of S. 1547, as reported. FCC paperwork requirements would not be substantially increased as a result of granting the Commission expanded forfeiture authority. While the Commission's new CATV pole attachment authority might require some increased paperwork as a result of regulations prescribed pursuant to this bill, the committee estimates that such paperwork will gradually diminish as the Commission's initial implementation of CATV pole attachment regulation becomes settled, and as the States act to implement their own CATV pole attachment regulatory plans, thereby replacing FCC involvement in situations where State plans exist.

No additional recordkeeping requirements would be imposed on entities subject to expanded FCC forfeiture authority as a result of this bill. No significantly increased recordkeeping burdens would necessarily fall on entities subject to FCC CATV pole attachment jurisdiction. The bill contemplates that the Commission may accept all relevant data and records which affected electric power and telephone companies file or maintain with the various State or local public utility commissions which otherwise regulate the practices of these entities. Furthermore, the bill directs the Commission to institute a simple complaint procedure to adjudicate CATV pole attachment matters on a case-by-case basis, and does not require the Commission to engage in a large scale regulatory program.

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ESTIMATED COSTS

In compliance with section 403 of the Congressional Budget Act of 1974, the committee requested the Congressional Budget Office to prepare a cost estimate for S. 1547, as reported, which is included in its entirety as follows:

CONGRESSIONAL BUDGET OFFICE,
U.S. CONGRESS,
Washington, D.C., October 17, 1977.

Hon. WARREN G. MAGNUSON,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: Pursuant to section 403 of the Congressional Budget Act of 1974, the Congressional Budget Office has prepared the attached cost estimate for S. 1547, the Communications Act Amendments of 1977.

Should the committee so desire, we would be pleased to provide further details on the attached cost estimate.

Sincerely,

ALICE M. RIVLIN, *Director.*

CONGRESSIONAL BUDGET OFFICE—COST ESTIMATE

OCTOBER 17, 1977.

1. Bill number: S. 1547.
2. Bill title: Communications Act Amendments of 1977.
3. Bill status: As ordered reported by the Senate Committee on Commerce, Science, and Transportation, October 11, 1977.
4. Bill purpose: This bill provides for the regulation, by the Federal Communications Commission (FCC), of rates, terms, and conditions for the attachment of cable television systems to utility poles, conduits, or right-of-way owned or controlled by a utility. It also amends the rules regarding forfeiture liabilities and penalties.
5. Cost estimate:

[In thousands of dollars]

Fiscal year:	*Estimated costs*
1978	173
1979	575
1980	635
1981	697
1982	765

The costs of this bill fall within budget function 400.

6. Basis of estimate: This bill increases the regulatory responsibilities of the FCC, thus increasing its manpower requirements. It is assumed, however, that some of the regulatory functions will be performed by the various States. It is estimated that the FCC will need to hire 20 additional lawyers, economists, and clerks to first develop attachment regulations and then process complaints. Additional lawyers, engineers, and clerks will also be required to enforce forfeiture regulations (estimated at five in the first year of operation and five more over the next 5 years).

For the purpose of this estimate, it is assumed that this bill will be enacted on or about April 1, 1978. On this basis, these personnel re-

quirements will result in an estimated cost of $173,000 during the latter part of fiscal year 1978, increasing to $575,000 when fully implemented in fiscal year 1979. Costs in the following years reflect the increase in personnel for forfeiture regulation, inflation, and shifts in manpower resources as actual processing of complaints begins.

7. Estimate comparison: None.
8. Previous CBO estimate: None.
9. Estimate prepared by: Mark Berkman (225-7760).
10. Estimate approved by:

C. G. NUCKOLS,
(For James L. Blum,
Assistant Director for Budget Analysis).

* * * * * * * * * *

AUTHORIZATION, APPROPRIATION—URANIUM MILL TAILINGS—RADIATION EXPOSURE

P.L. 95-236, see page 92 Stat. 38

Senate Report (Energy and Natural Resources Committee) No. 95-72, Mar. 29, 1977 [To accompany S. 266]

House Report (Interstate and Foreign Commerce Committee) No. 95-649(I), Sept. 29, 1977 [To accompany S. 266]

House Report (Interior and Insular Affairs Committee) No. 95-649(II), Oct. 17, 1977 [To accompany S. 266]

Cong. Record Vol. 123 (1977)

Cong. Record Vol. 124 (1978)

DATES OF CONSIDERATION AND PASSAGE

Senate April 4, 1977; February 7, 1978
House January 24, 1978

The House Report (Parts I and II, this page and p. 143, respectively) is set out.

HOUSE REPORT NO. 95-649—PART I

[page 1]

The Committee on Interstate and Foreign Commerce, to whom was referred the bill (S. 266) to amend Public Law 92-314 to authorize appropriations to the Energy Research and Development Administration for financial assistance to limit radiation exposure from uranium mill tailings used for construction, and for other purposes, having considered the same, report favorably thereon with amendments and recommend that the bill as amended do pass.

* * * * * * * * * *

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EXHIBIT WA-24

WA Exhibit No. 14
Pole Attachment
Rental Formula Comparisons

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Nov 06 2017

POLE SPACE	RENTAL FORMULAE TVA	APPA	ARKANSAS	FCC CABLE	Telecom Plus – US HR
POLE HEIGHT	37.5'	37.5'	37.5'	37.5'	37.5'
POWER	7.17' Allocated	Part of 10.17' of "Assignable" (Usable) Space	8.17' Allocated	Not Specified - Part of 13.5' of "Usable" Space	Not Specified - Part of 13.5' of "Usable" Space
COMMUNICATIONS WORKER SAFETY SPACE	Allocated Equally to 2 Communications Entities	3.33' Allocated to "Common Space"	Included in the "Un-Usable" Space	Included in the "Usable" Space	Included in the "Usable" Space
COMMUNICATIONS SPACE	Allocated to Communications Attachers	Allocated to Communications Attachers	Allocated to Communications Attachers	Allocated to Communications Attachers - Part of 13.5' of "Usable" Space	Allocated to Communications Attachers - Part of 13.5' of "Usable" Space
CATV	1' Allocated	1' Allocated	1' Allocated	1' Allocated	1' Allocated
TELCO	2' Allocated	1' Allocated	1' Allocated	N/A	1' Allocated
SUPPORT SPACE	Shared Equally By All Attachers (Including Owner)	Included In "Common" Space	Included as Part of the "Un-usable" Space	Known as "Un-usable" Space	Known as "Un-usable" Space
MINIMUM ATTACHMENT HEIGHT TO GROUND LINE	18'	18'	27.33' Which Includes the Safety Space. 1/3 Allocated Fully to Owner and 2/3 Allocated Equally to All Attachers Including Owner	18'	18'
IN GROUND FOR STABILITY	6'	6'		6'	6'
PRESUMED NUMBER OF ATTACHERS (INCLUDING OWNER)	3	3	3	N/A	3
CALCULATION	$\frac{1+\frac{3.33}{2}+\frac{24}{3}}{37.5}$	$\frac{1+\frac{27.33}{3}}{37.5}$	$\frac{1+\frac{2}{3}x\frac{27.33}{3}}{37.5}$	$\frac{1}{13.5}$	$\frac{1+\frac{24}{3}}{37.5}$
% OF ANNUAL CHARGE ALLOCATED TO CATV	28.44%	26.96%	18.86%	7.41%*	24.00%
				* 1' Divided by 13.5' of "Usable" Space	

TVA

SPACE ALLOCATION ILLUSTRATION

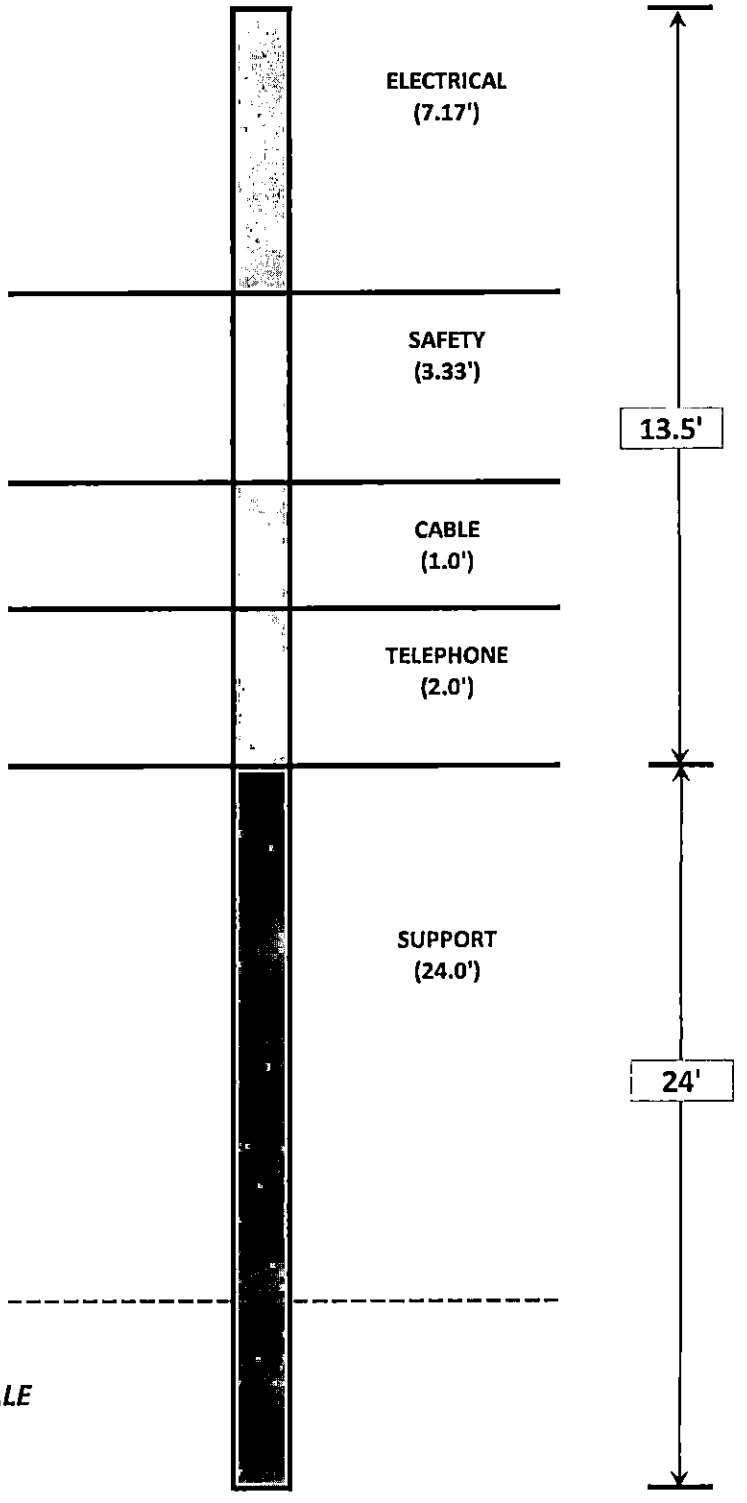
Allocates usable space

Equal sharing of safety space among all users attaching for communication purposes

Equal sharing of support space among all users including electrical

Space allocation is 28.44% based on assumed 37.5 foot pole with 3 average users

Results in a fair allocation of costs among pole owner and pole users



NOT TO SCALE

DELAWARE FORMULA

SPACE ALLOCATION ILLUSTRATION

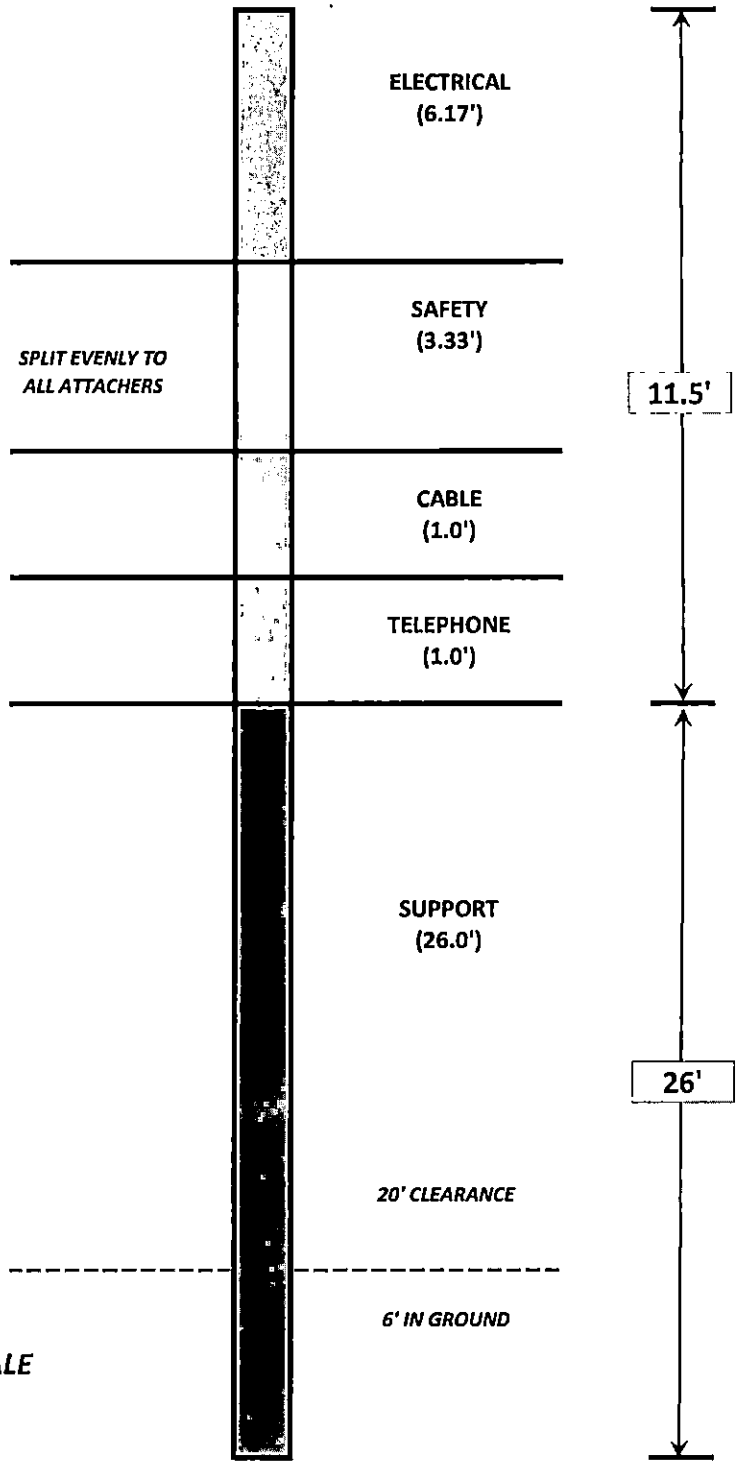
Allocates usable space

Equal sharing of safety space among all users attaching for communication purposes

Equal sharing of support space among all users including electrical

Space allocation is 28.74% based on assumed 37.5 foot pole with 3 average users

Results in a fair allocation of costs among pole owner and pole users



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INDIANA 40' POLE - 2 Party Pole

SPACE ALLOCATION ILLUSTRATION

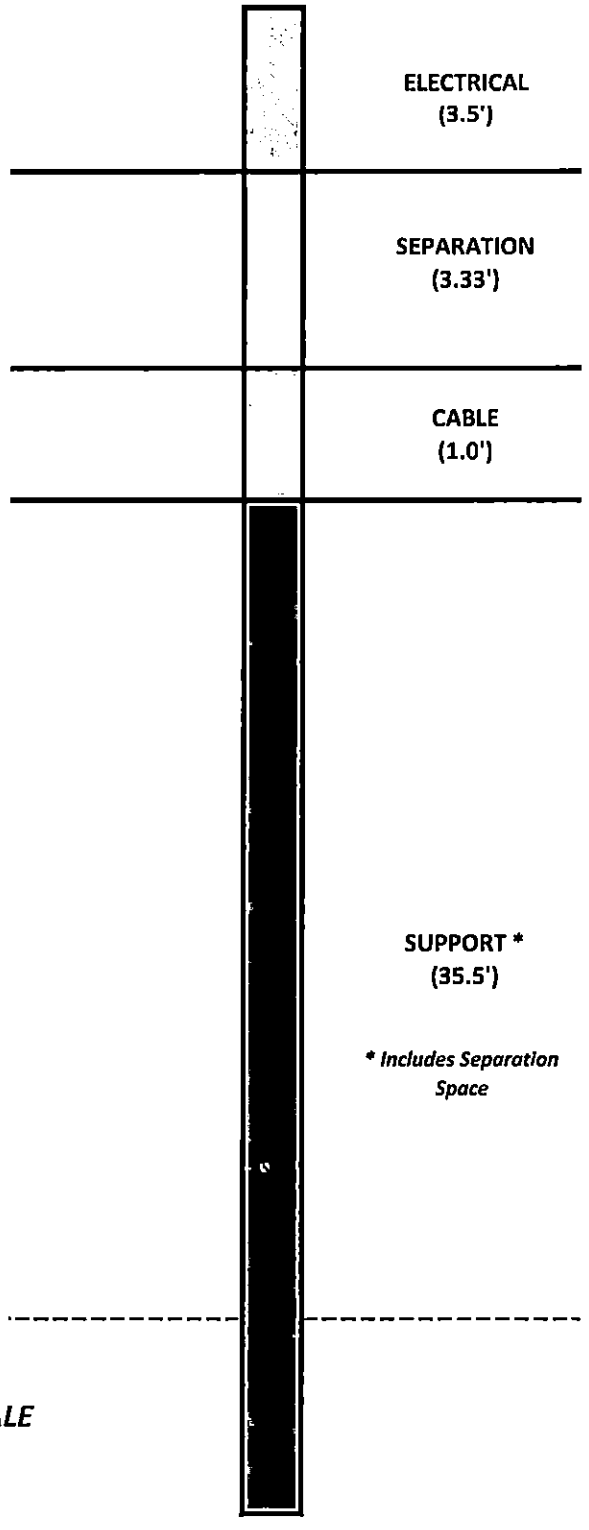
Allocates usable space

Equal sharing of safety space among all users

Equal sharing of support space among all users including electrical

Space allocation is 46.88% based on assumed 40 foot pole with 2 average users

Results in a fair allocation of costs among pole owner and pole users after proration based on the # of 2 & 3 party poles



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INDIANA 40' POLE - 3 Party Pole

SPACE ALLOCATION ILLUSTRATION

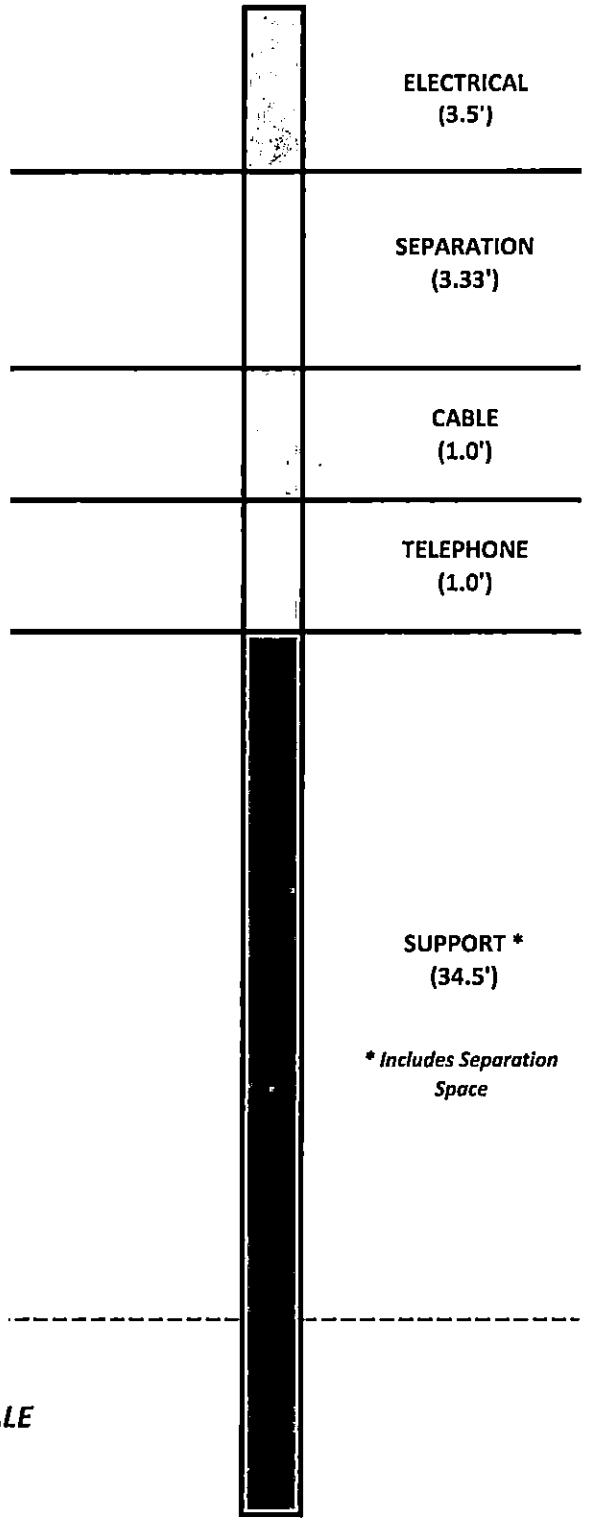
Allocates usable space

Equal sharing of safety space among all users

Equal sharing of support space among all users including electrical

Space allocation is 31.25% based on assumed 40 foot pole with 3 average users

Results in a fair allocation of costs among pole owner and pole users after proration based on the # of 2 & 3 party poles



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CITY OF SEATTLE

SPACE ALLOCATION ILLUSTRATION

STANDARD 47' POLE

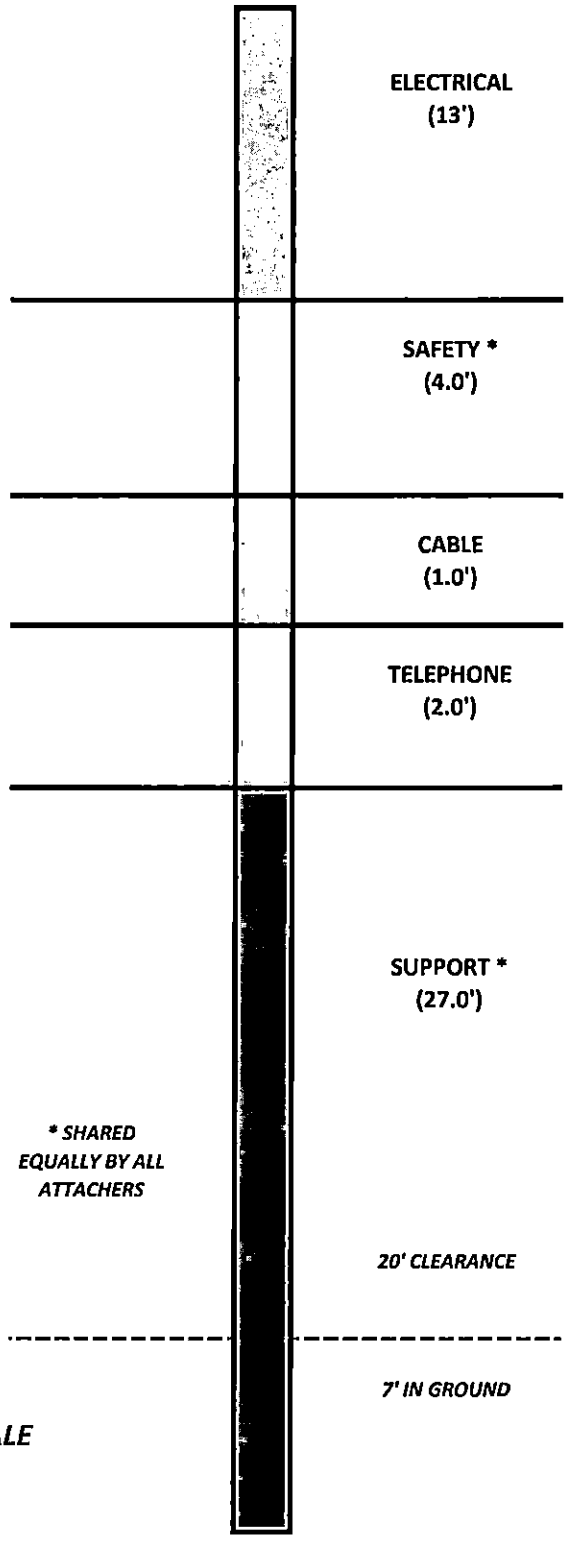
Allocates, direct a/k/a usable space

Equal sharing of safety space among all users attaching

Equal sharing of support space among all users including electrical

Space allocation is 24.11% based on assumed 47 foot pole with 3 average users & CATV using 1' of space

Results in a fair allocation of costs among pole owner and pole users



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APPA CABLE RATE

SPACE ALLOCATION ILLUSTRATION

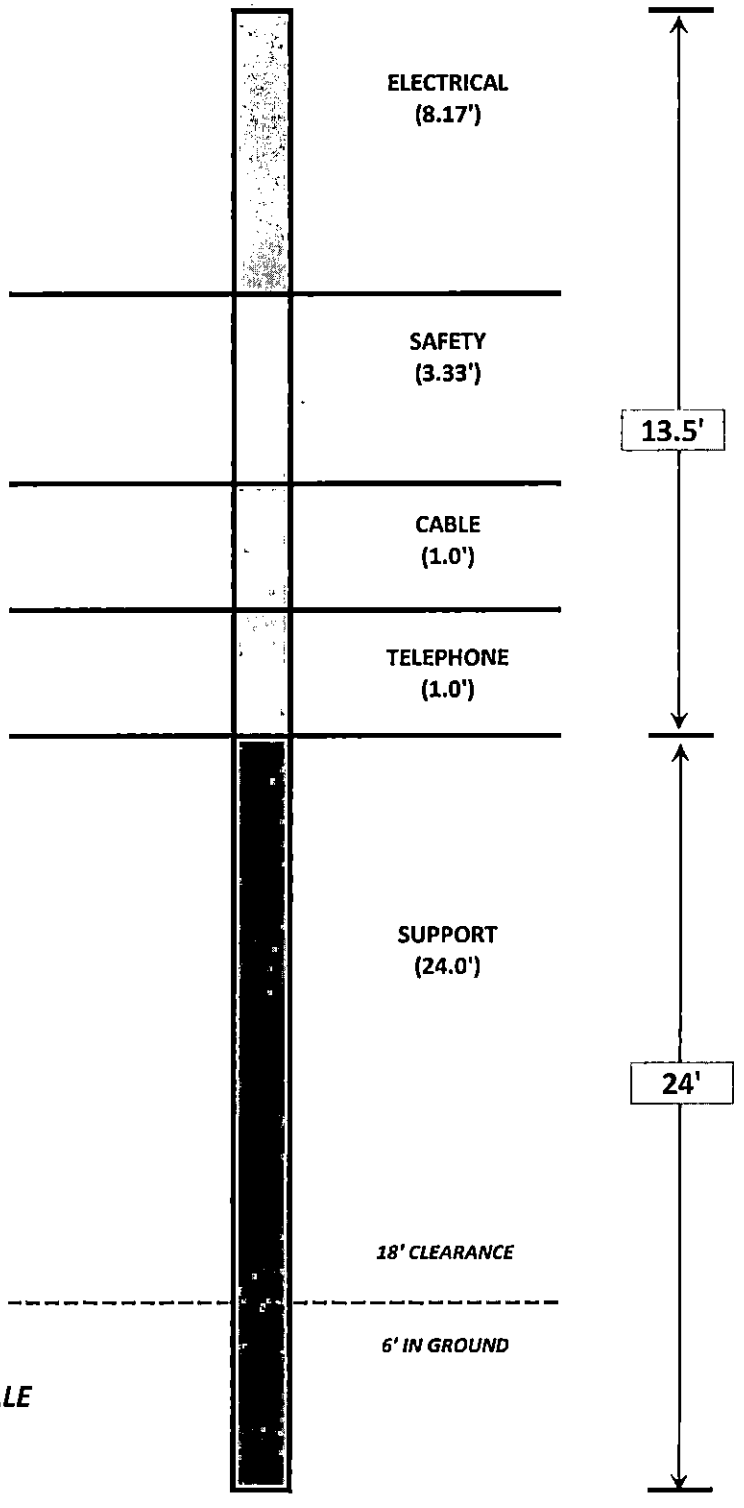
Allocates usable space only

Equal sharing of safety space among all users attaching for communication purposes

Equal sharing of support space among all users including electrical

Space allocation is 26.96% based on assumed 37.5 foot pole with 3 average users

Results in a fair allocation of costs among pole owner and pole users



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ARKANSAS FORMULA

SPACE ALLOCATION ILLUSTRATION

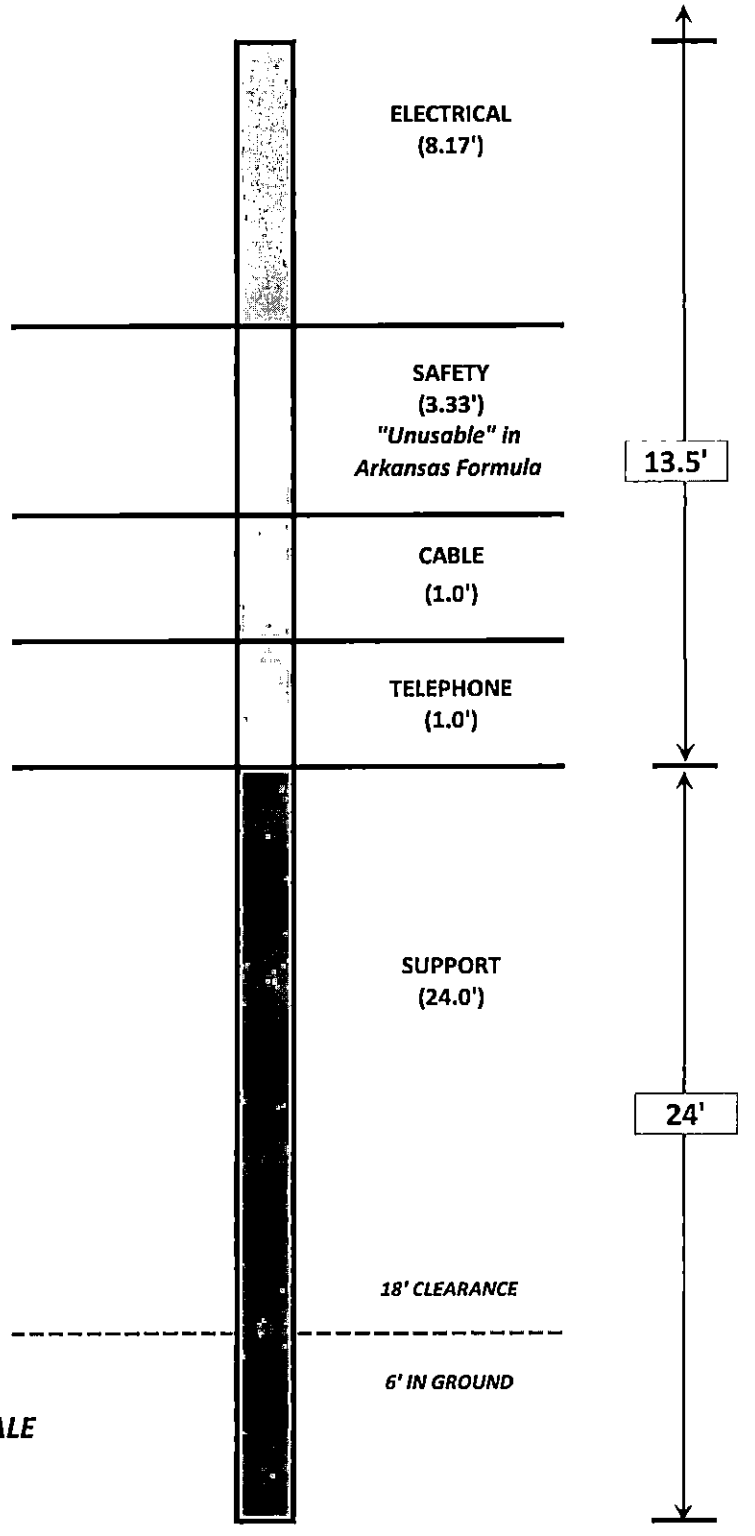
Allocates usable space

Safety space is included in the "Unusable" space.

Pole owner allocated 1/3 of unusable space. Equal sharing of 2/3 support space among all users including electrical

Space allocation is 18.86% based on assumed 37.5 foot pole with 3 average users, including the Owner

Results in a fair allocation of costs among pole owner and pole users



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FCC CABLE RATE

SPACE ALLOCATION ILLUSTRATION

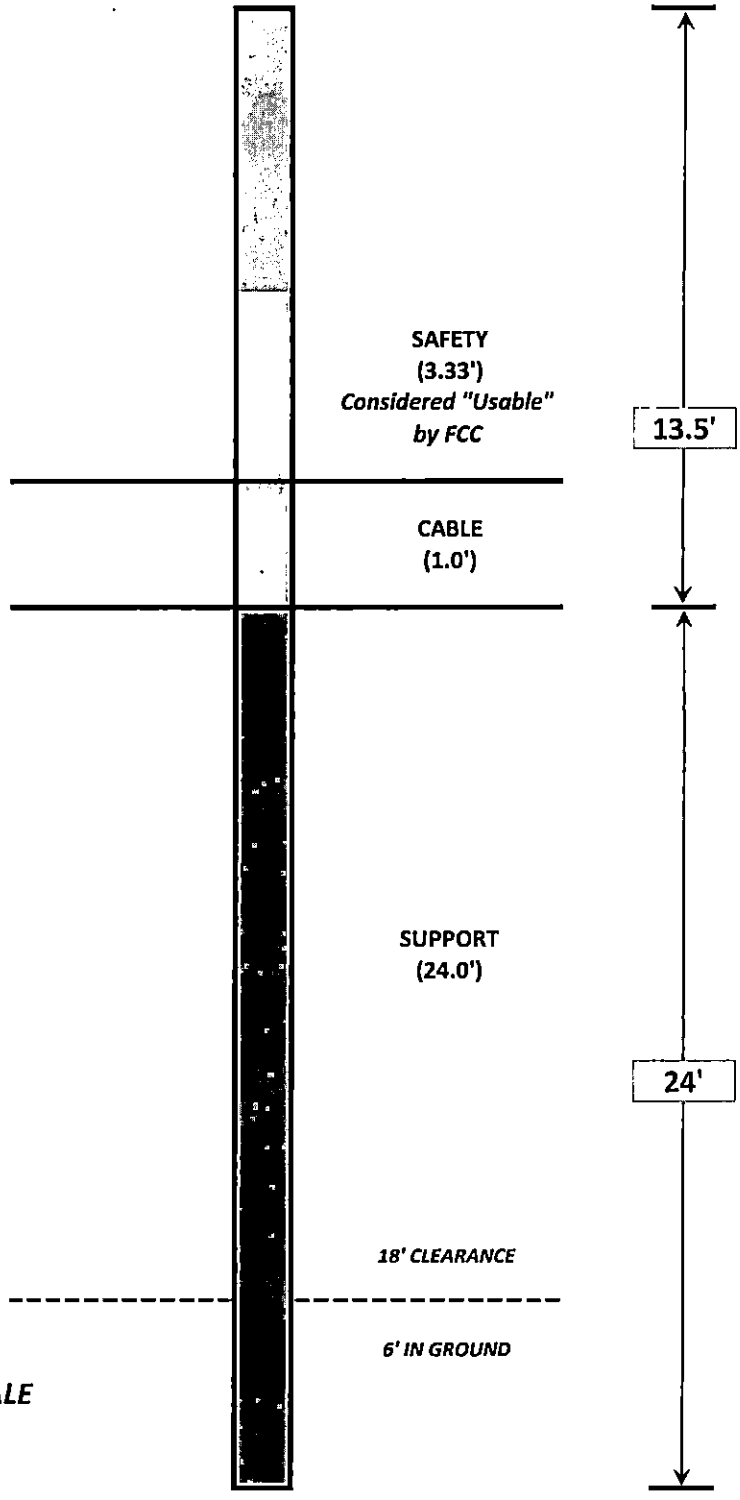
Allocates usable space only

Safety space is included in the "Unusable" space.

No sharing of support space among users

Space allocation is 7.41% based on one foot of space out of 13.5' of usable space

Results in unfair allocation of costs



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Nov 06 2017

EXHIBIT WA-25.1

EXHIBIT WA-25.2

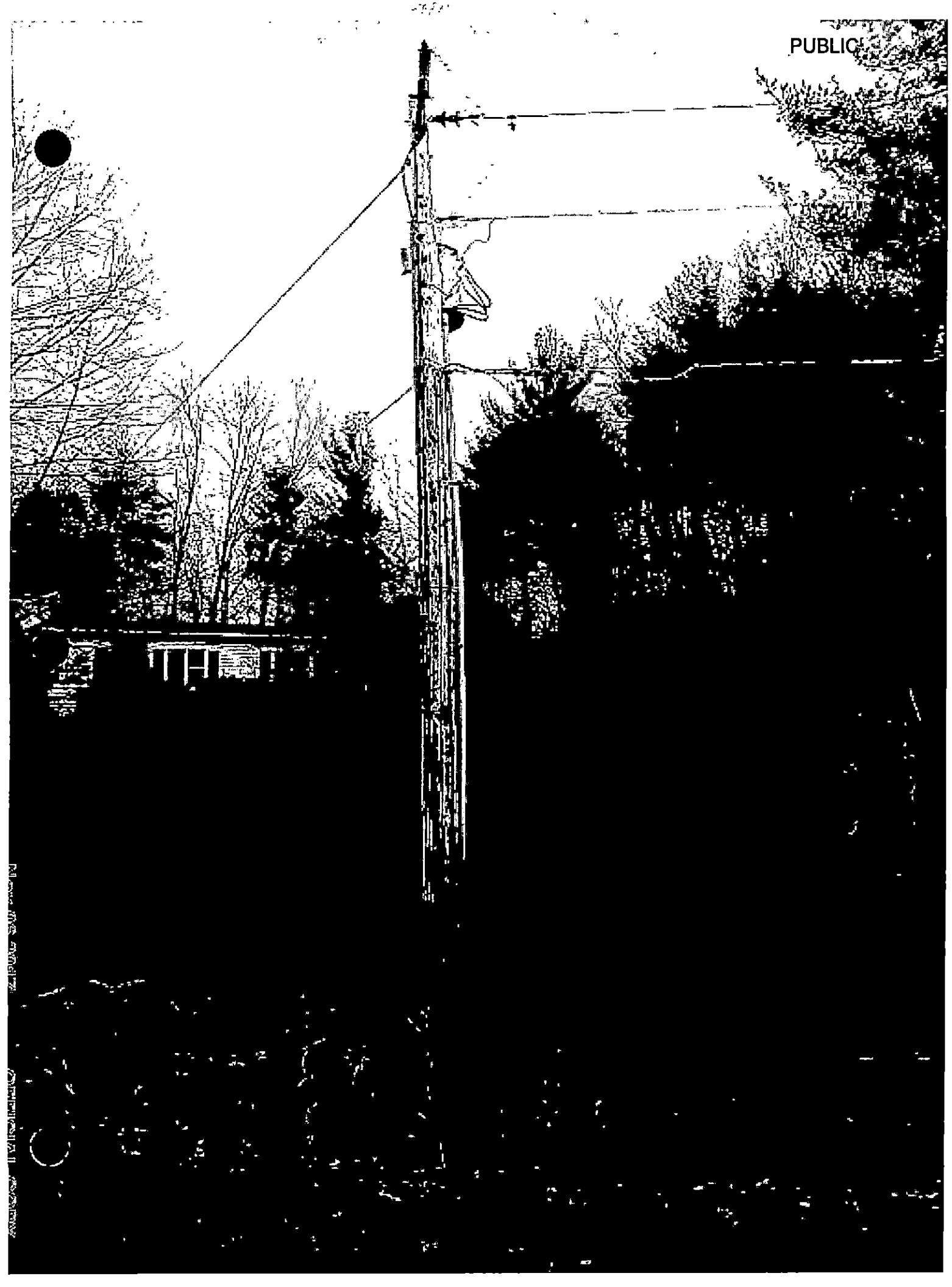
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EXHIBIT WA-25.3

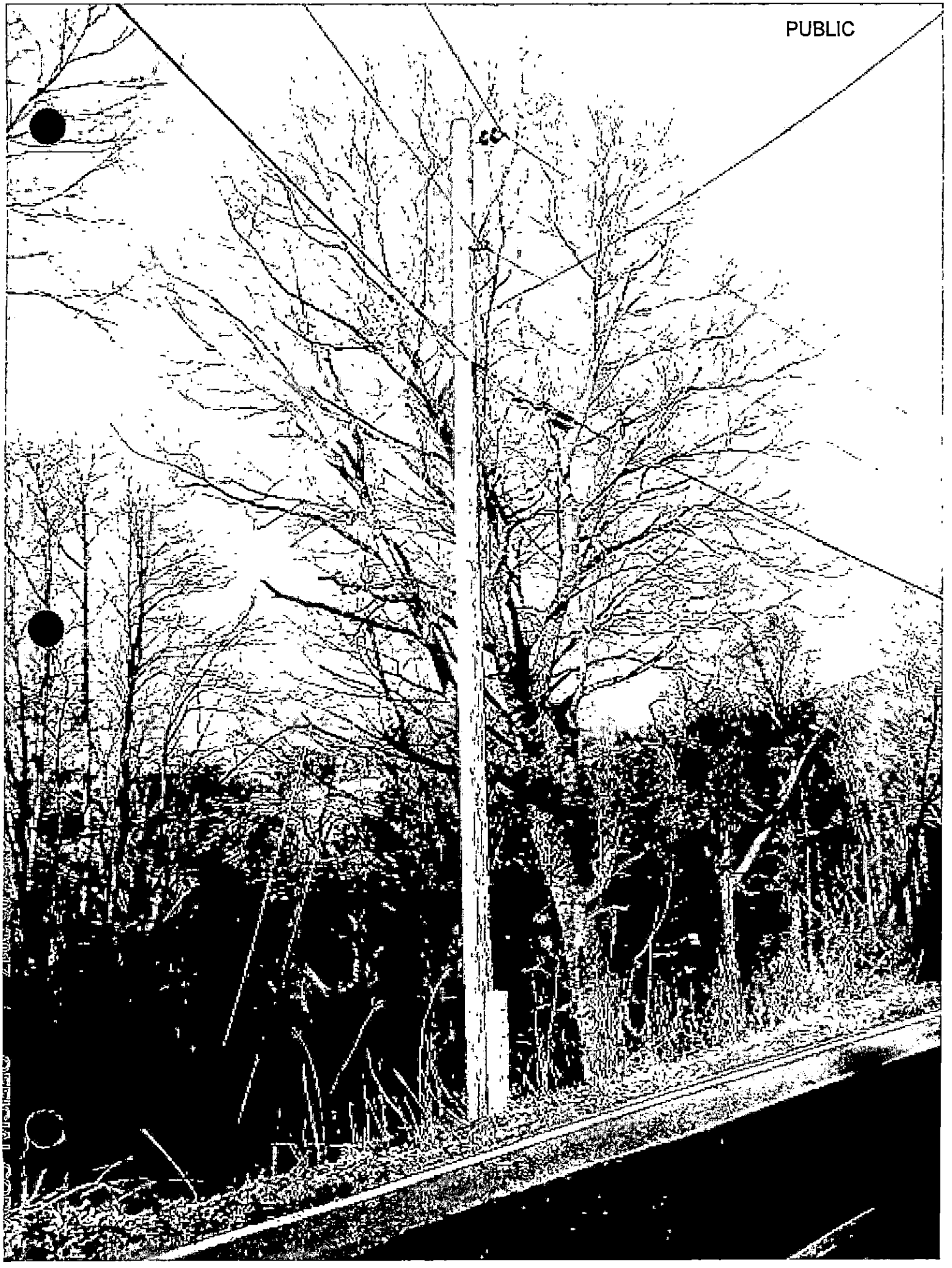
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EXHIBIT WA-26

Pole and Conduit Rental Calculation Information

(Dollars in thousands & Operational Data in whole numbers)

COMPANY: AT&T / BELLSOUTH CORPORATION
STUDY AREA: NORTH CAROLINA
PERIOD: From: Jan 2016 To: Dec 2016
COSA: SBNC
SUBMISSION: 1
Page 1 of 1

Row	Row Title	Amount
	(a)	(b)
Financial Information ($000)		
100	Telecommunications Plant-in-Service	8,009,850
101	Gross Investment - Poles	108,196
102	Gross Investment - Conduit	244,189
200	Accumulated Depreciation - Total Plant-in-Service	6,494,987
201	Accumulated Depreciation - Poles	105,230
202	Accumulated Depreciation - Conduit	118,800
301	Depreciation Rate - Poles	5.70
302	Depreciation Rate - Conduit	1.90
401	Net Current Deferred Operating Income Taxes - Poles	-
402	Net Current Deferred Operating Income Taxes - Conduit	-
403	Net Current Deferred Operating Income Taxes - Total	-
404	Net Non-Current Deferred Operating Income Taxes - Poles	2,343
405	Net Non-Current Deferred Operating Income Taxes - Conduit	5,288
406	Net Non-Current Deferred Operating Income Taxes - Total	173,460
501.1	Pole Maintenance Expense	2,449
501.2	Pole Rental Expense	15,030
501	Pole Expense	17,479
502.1	Conduit Maintenance Expense	1,109
502.2	Conduit Rental Expense	36
502	Conduit Expense	1,145
503	General & Administrative Expense	39,194
504	Operating Taxes	96,185
Operational Data (Whole numbers)		
601	Equivalent Number of Poles	235,763
602	Conduit System Trench Kilometers	2,732
603	Conduit System Duct Kilometers	15,842
700	Additional Rental Calculation Information	N/A

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Nov 06 2017

EXHIBIT WA-27

SagLine

PUBLIC

Thursday, November 02, 2017

Span Length (ft): 257

Circuit 1

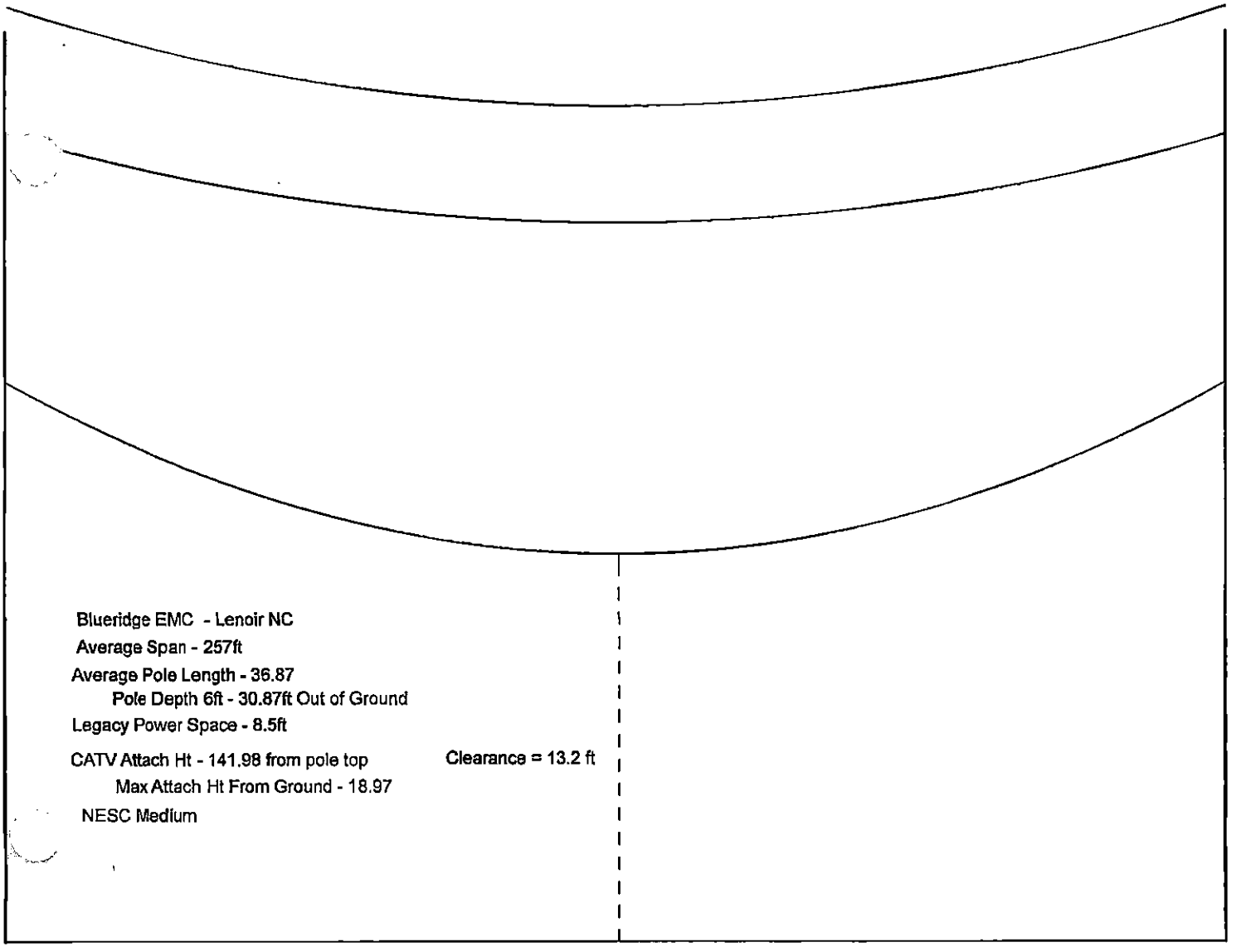
Primary Conductor: 4 ACSR (7/1) — Sag (in): 40 @ 167° F — Ruling Span (ft): 250

Neutral Conductor: 4 ACSR (7/1) — Sag (in): 35 @ 32° F — Ruling Span (ft): 250

Cable - 1 Sag (in): 69

ANS PL - Length (ft): 40 Setting Depth (Ft): 9.2 Elevation (ft): 0

ADJ PL - Length (ft): 40 Setting Depth (Ft): 9.2 Elevation (ft): 0



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MAY 08 2017

EXHIBIT WA-28

Reports of Joint General Committee

of

Edison Electric Institute

and

Bell Telephone System

on

Physical Relations Between Electrical Supply and Communication Systems

REISSUED
JULY 1945

Additional copies of this report may be obtained by Power Companies from the Edison Electric Institute (Publication No. M5) and by Associated Bell Companies from the Department of Operation and Engineering of the American Telephone and Telegraph Company.

REPORTS OF
JOINT GENERAL COMMITTEE
of
EDISON ELECTRIC INSTITUTE
and
BELL TELEPHONE SYSTEM

TABLE OF CONTENTS

PRINTED IN U. S. A.

JOINT GENERAL COMMITTEE

OF

EDISON ELECTRIC INSTITUTE

AND BELL TELEPHONE SYSTEM

New York, July 9, 1945.

MEMBER COMPANIES OF E.E.I.

ASSOCIATED COMPANIES OF BELL SYSTEM:

For a number of years the following reports of the Joint General Committee of the NELA and Bell Telephone System have formed a satisfactory basis for the coordination of the electrical facilities of electric supply companies and communication facilities of the Bell System.

Principles and Practices for the Inductive Coordination of Supply and Signal Systems — December 9, 1922.

Principles and Practices for the Joint Use of Wood Poles of Supply and Communication Companies — Feb. 15, 1926.

Allocation of Costs Between Supply and Communication Companies — October 15, 1926.

The supply of copies of the original issue of these reports has been exhausted and accordingly they have been reprinted. In this reissue the three reports have been included under a single cover. A few editorial changes have been made which involve no change in substance.

H. B. Bryans

W. H. Sammis

E. C. Stone

Edison Electric Institute Representatives

M. R. Sullivan

K. S. McHugh

Bell System Representatives

JOINT GENERAL COMMITTEE

The Principles and Practices which are now being reissued under a single cover have, during the past two decades, contributed greatly to the successful operations of the power and telephone industries, and because they have promoted cooperation between these industries, they have benefited the general public. It seems appropriate in connection with this reissue to review the development of these Principles and Practices however, for brevity, omitting mention of all but the original organization.

Previous to 1921, structural and inductive interference problems were giving rise to increasing numbers of controversies between Bell Telephone Companies and Power Companies throughout the country. Early in 1921, therefore, a group of power and telephone men met to discuss the possibilities of a basis for an engineering solution of the problems concerned. Mr. Owen D. Young presided at that meeting and there was formed the Joint General Committee of the National Electric Light Association and Bell Telephone System with the following membership:

Messrs. O. D. Young, *Chairman*,
General Electric Company,

R. H. Ballard,
Southern California Edison Company,

M. R. Bump,
H. L. Doherty & Company,

H. M. Byllesby, Represented by R. F. Pack,
H. M. Byllesby & Company,

J. J. Carty,
American Telephone and Telegraph Company,

Bancroft Gherardi,
American Telephone and Telegraph Company,

E. K. Hall,
American Telephone and Telegraph Company,

L. H. Kinnard,
The Bell Telephone Company of Pennsylvania,

Martin J. Insull,
Middle West Utilities Company,

Robert Lindsay,
Cleveland Electric Illuminating Company,

Ben S. Read,
The Mountain States Telephone and Telegraph Company,

Paul Spencer,
United Gas Improvement Company,

Guy E. Tripp,
Westinghouse Electric & Manufacturing Company,

M. H. Aylesworth, *Secretary*,
National Electric Light Association,

Messrs. Bump, Pack and Gherardi were designated as an Engi-

neering Subcommittee representing both interests with instructions to classify the types of situations in which engineering or technical conflicts were arising. They selected a committee of engineers whose instructions were to proceed with a classification of the types of problems concerned under two divisions (a) those for which a standard had been accepted by both parties and (b) those for which there were no existing standards. Their further instructions were to approach the various problems in the broadest possible spirit of cooperation, with the double objectives of the removal of causes of friction and the early development of mutually satisfactory practices. This committee of engineers consisted of Messrs. H. P. Charlesworth, S. P. Grace, H. S. Osborne and H. S. Warren, representing the Bell Telephone System and Messrs. W. J. Canada, A. E. Silver and F. H. Lane, representing the NELA. Mr. H. L. Wills later succeeded Mr. Canada.

The Engineering Subcommittee in its first report found that the National Electrical Safety Code provided an acceptable guide to practice for problems involving crossings, conflicting construction and jointly occupied poles, and recommended, as to parallel construction, general principles pointing the way to the satisfactory solution of specific cases. After further work the subcommittee prepared the more comprehensive reports which are generally known as the Principles and Practices, and which with minor editorial changes are reproduced in this booklet.

Early in its work the Engineering Subcommittee found that there was need for mutually acceptable technical data to aid in the solution of both electrical and structural coordination problems. Accordingly, the Joint Subcommittee on Development and Research was organized in 1923. Its factual reports have greatly facilitated the solution of coordination problems by the power and telephone companies and have enabled them to arrive at sound engineering answers to the new problems which have accompanied advances in the power and communication arts.

INDUCTIVE COORDINATION OF SUPPLY AND COMMUNICATION SYSTEMS

Scope.

These principles and practices are intended to apply to all new installations, extensions and reconstructions and to the maintenance, operation and changes of all communication and supply systems where inductive coordination may be required now or later to prevent interference with the rendering or providing of supply or communication service.

PRINCIPLES

Duty of Coordination.

(a) In order to meet the reasonable service needs of the public, all supply and communication circuits with their associated apparatus should be located, constructed, operated and maintained in conformity with general coordinated methods which maintain due regard to the prevention of interference with the rendering of either service. These methods should include limiting the inductive influence of the supply circuits or the inductive susceptiveness of the communication circuits or the inductive coupling between circuits or a combination of these, in the most convenient and economical manner.

(b) Where general coordinated methods will be insufficient, such specific coordinated methods suited to the situation should be applied to the systems of either or both kinds as will most conveniently and economically prevent interference, the methods to be based on the knowledge of the art.

Cooperation.

In order that full benefit may be derived from these principles and in order to facilitate their proper application, all utilities between whose facilities inductive coordination may now or later be necessary, should adequately cooperate along the following lines:

(a) Each utility should give to other utilities in the same general territory advance notice of any construction or change in construction or in operating conditions of its

facilities concerned, or likely to be concerned, in situations of proximity.

(b) If it appears to any utility concerned that further consideration is necessary, the utilities should confer and cooperate to secure inductive coordination in accordance with the principles set forth herein.

(c) To assist in promoting conformity with these principles, an arrangement should be set up between all utilities whose facilities occupy the same general territory, providing for the interchange of pertinent data and information including that relative to proposed and existing construction and changes in operating conditions concerned or likely to be concerned in situations of proximity.

Choice Between Specific Methods.

When specific coordinated methods are necessary and there is a choice between specific methods, those which provide the best engineering solution should be adopted.

(a) The specific methods selected should be such as to meet the service requirements of both systems in the most convenient and economical manner without regard to whether they apply to supply systems or communication systems or both.

(b) In determining what specific methods are most convenient and economical in any situation for preventing interference, all factors for all facilities concerned should be taken into consideration including present factors and those which can be reasonably foreseen.

(c) In determining whether specific methods, where necessary, shall be wholly by separation or partly by methods based on less separation, the choice should be such as to secure the greatest present and future economy and convenience in the rendering of both services.

Inductive Coordination for Existing Construction.

(a) Utilities operating supply or communication circuits should exercise due diligence in applying coordinated methods, as occasion may rise, in accordance with these princi[illegible] to existing construction.

(b) When supply or communication circuits are generally reconstructed, or when associated apparatus is rearranged or added, or when any change is made in the arrangement or characteristics of circuits, the new or changed parts should be brought into conformity with these principles.

Coordinated Locations for Lines.

Utilization of the highways is essential to the economical and efficient extension, operation and maintenance of supply and communication facilities. To avoid unduly increasing the number or difficulty of situations of inductive or other exposure incident to the use of the same highway by two different kinds of facilities, all lines should, in general, be located as follows:

(a) General Location.

(1) Where the conditions and character of the circuits permit, joint use of poles by communication and supply circuits is generally preferable to separate lines when justified by considerations of safety, economy and convenience, and presuming satisfactory agreement between the parties concerned as to terms and conditions.

(2) Where communication circuits and supply circuits on the same highway are not to occupy joint poles or where either kind of circuit is alone on a highway, all communication circuits should be placed on one side of the highway and all supply circuits should be placed on the other side, so that, as far as practicable, one side of any section of a highway will be available as the communication side and one side as the supply side.

(3) Unnecessary crossings from side to side of the highway should be avoided.

(b) Detailed Location.

(1) Local Communication Lines.

Where to be located on the same highway with local supply lines, joint use is generally preferable to separate lines, except sometimes in rural districts and except where the character of circuits involved makes separate lines on opposite sides of the highway more desirable.

Where to be located on the same highway with transmission lines, separate lines on opposite sides of the highway are generally preferable unless a large number of service wire crossings would be involved, in which case, joint use or other arrangements may be preferable.

(2) Toll or Through Communication Lines.

Where to be located on the same highway with local supply lines or lower voltage transmission supply lines, separate lines on opposite sides of the highway are generally preferable, unless a large number of service wire crossings would be involved, in which case, joint use or other arrangements may be preferable.

Where proposed for location on the same highway or to follow the same general direction with higher voltage transmission supply lines, cooperative consideration should determine whether such locations should be used, and if so, what specific coordinated methods are necessary. Where to be located on the same highway with higher voltage transmission supply lines, separate lines on opposite sides of the highway are preferable.

(3). Local Supply Lines.

Where to be located on the same highway with local communication lines, joint use is generally preferable to separate lines except sometimes in rural districts and except where the character of circuits involved makes separate lines on opposite sides of the highway more desirable.

Where to be located on the same highway with toll or through communication lines, separate lines on opposite sides of the highway are generally preferable, unless a large number of service wire crossings would be involved, in which case, joint use or other arrangements may be preferable.

(4) Transmission Supply Lines.

Where to be located on the same highway with local communication lines or shorter toll or shorter trunk communication lines, separate lines on opposite sides of the highway are generally preferable unless a large number of

service wire crossings would be involved, in which case, joint use or other arrangements may be preferable.

Where proposed for location on the same highway or to follow the same general direction with longer toll or through communication lines, cooperative consideration should determine whether such locations should be used and if so, what specific coordinated methods are necessary. Where to be located on the same highway with longer toll or through communication lines, separate lines on opposite sides of the highway are preferable.

(5) Avoidance of Overbuilding.

Overbuilding of one line by another should be avoided, where practicable. Where necessary for the two kinds of lines to occupy the same side of a highway, joint use is generally preferable to overbuilding.

(c) Other Rights of Way.

The foregoing principles, although specifically mentioning highways, should also, when applicable, govern situations involving private rights of way near to each other or to highways.

Deferred General Coordination.

While communication or supply lines when alone should conform to general coordinated methods, such lines, pending the incoming or development of the other kinds of lines, may, if deemed economically advantageous, occupy locations or use types of facilities, construction and operating methods other than those conforming to general coordinated methods. However, the location and character of such facilities should be altered when and as necessary to conform to these methods upon the incoming or development of another kind of facility conforming to general coordinated methods.

Special Location and Types.

When coordination of supply and communication lines of particular types cannot be technically and economically established under the methods of coordination covered by these principles, special cooperative consideration should be given to determining what location and type of construction should be established for each line of such type.

PRACTICES

INTRODUCTORY.

These recommended practices supplement, and are intended to be in accord with, the principles given in the foregoing. They are based on experience, and their application, in connection with the principles on "Coordinated Location of Lines" will effectively promote the inductive coordination of supply and communication systems.

In the development of these detailed practices, it has been found advisable to proceed step by step along two well defined subdivisions, namely, practices based on qualitative considerations, and those based on quantitative values. The practices given herewith cover qualitative considerations and form a basis for the later adoption of definite quantitative values where they may properly apply. It is recognized that in the growth and development of the respective utilities and as the development of the art progresses, other satisfactory methods will doubtless be devised. The fact that particular methods are specified herein does not preclude the use of other mutually satisfactory methods, nor their incorporation in these practices as they may be agreed upon.

In order that the above considerations may be carried out it is intended that the joint work on practices will be continued and that additional material will be issued from time to time as it becomes available. In the preparation of these practices, certain factors were encountered which, due to lack of complete information, could not be as fully covered at this time as their importance in inductive coordination merits. Among these factors are included certain features of the protection of communication systems, the selectivity of communication apparatus, the transposing of supply circuits outside of inductive exposures and the question of single versus multiple grounding in supply systems.

In order that the full intent of the principles may be carried out, the practices hereinafter specified as "General Coordinated Methods" should be applied to all communication and supply systems, except as deviations may be made under the principle of "Deferred Coordination." In cases of inductive exposure, where these general coordinated methods are insufficient, such of the practices hereinafter specified as "Specific Coordinated

Methods" should, in addition, be applied as will provide the best engineering solution.

MUTUALLY APPLICABLE PRACTICES

Notice and Cooperation.

Utilities between whose facilities inductive coordination is, or later may become, necessary should each give to the other advance notice of any construction or changes in construction or operation of their respective facilities. The utilities should cooperate in determining and carrying out those methods which provide the best engineering solution in each case, and to this end there should be complete interchange of information.

Limitation of Influence and Susceptiveness.

In designing, specifying or otherwise determining the location, construction and arrangement of supply or communication circuits or the quality, arrangement and suitability of materials or apparatus to be used in, or associated with, communication or supply circuits and in operating and maintaining lines and apparatus, all factors which would contribute to inductive influence or inductive susceptiveness during either normal or abnormal conditions should be limited in so far as is necessary and practicable.

Changes in Systems or Methods.

In changing systems or methods of operation, precaution should be taken to avoid increasing, and an effort made to decrease, if practicable, the influence or susceptiveness. Any abnormal condition which increases these factors should be promptly remedied. If the service requirements prevent a prompt remedy of such condition, effort should be made to reduce these effects by such other methods as are available.

Operating Instructions.

Communication companies should adopt operating instructions, specifically outlining the procedure for notification of supply companies when inductive disturbances arise on toll circuits that appear to be incidental to abnormal power influence and supply companies should adopt operating rules which outline the desirable procedure for their operators during times when a supply circuit is abnormally unbalanced.

Records.

A record should be kept by the communication companies of disturbances on communication circuits, and the supply companies should keep a record of accidental or transient conditions on supply circuits, so that a study of such disturbances which appear to be due to accidental or transient conditions will be facilitated.

Mechanical Construction.

The mechanical design and construction of communication and supply systems should conform to good modern practice.

Maintenance.

Efforts should be made to anticipate and forestall failure of lines or equipment. Defective equipment should not be continued in service and repairs or renewals should be promptly made.

Tree Trimming.

Trees should be trimmed as necessary, due consideration being given clearances to meet weather conditions. Due diligence should be exercised in obtaining permission to trim trees when such permission is needed and such trimming should be done in accordance with good modern practice.

Insulation.

Insulators and insulating material used on communication and supply circuits should be designed, constructed and maintained so as to provide adequate mechanical and electrical strength.

PRACTICES APPLICABLE TO COMMUNICATION SYSTEMS

General Coordinated Methods

The following practices should be applied to all communication systems, except as deviations may be made under the principle of deferred coordination.

Power Level and Sensitivity.

The power level and sensitivity of communication circuits should, so far as is practicable, be designed and maintained at the standard recommended for the class of service involved.

Protection.

Protective devices should be such that they will not interrupt the communication circuits by operating at unnecessarily low voltages or currents.

Protective devices should be, so far as practicable, so designed, constructed and installed as not to unbalance the communication circuits.

The same type of heat coil or fuse should be used in all wires of a circuit.

Reasonable care should be used in the maintenance of all protective apparatus to avoid conditions which will unbalance or interrupt the communication circuits.

Inspections.

Adequate field inspection and routine tests of lines and apparatus should be made with a view to maintaining the electrical balance and efficiency of the circuits.

Discontinuities.

Discontinuities should be limited to the number required by the conditions.

LINES.

In order to minimize line unbalances, the resistance, inductance, capacitance and leakage conductance of one side of a circuit, in each section thereof, should be equal respectively to the corresponding quantities in the other side of the same section of the circuit in so far as is necessary and practicable.

Some of the methods and means which should be followed for the purpose of minimizing unbalance in lines are as follows:

Transpositions.

The capacitances to earth of the two sides of a telephone circuit should be suitably balanced by transpositions. Before a communication line is placed in service, a check should be made to insure that the transpositions are properly installed and correctly located.

Excessive Spacing.

Excessive spacing of conductors should be avoided. This does not mean that the spacing should be less than that required by considerations of safety, service and the future requirements of the circuits.

Derived Circuits.

In the creation of circuits from one or more circuits without adding line conductors, due regard should be given to avoiding unnecessary increases in susceptiveness.

Phantom circuits should be created only from similar adjacent pairs. Branches connected to but one side of a phantom circuit should be avoided unless connected through isolating transformers.

If one side circuit of a phantom group is loaded, the other side should be loaded at the same loading points, such loading to have closely the same electrical characteristics.

Phantom circuits should in general be used only for toll or trunk circuits except in cases of long rural circuits.

Connections.

Effort should be made to prevent the introduction of unbalance by contact resistance.

All joints in toll cables should be soldered or welded. All joints in open-wire toll conductors should be made with sleeves or should be well soldered or welded.

All wires should be properly cleaned to secure good contact before the joints are made.

All test connections, terminal boxes and associated wiring should be designed, constructed, installed and maintained so as to minimize the unbalances of the conductors.

Conductors.

Conductors of the same material and commercial size should be used in the two sides of the circuit at any point.

Ground Return Circuits.

Ground return telephone circuits should not be employed.

Use of Cable.

Consideration should be given to placing circuits in cable at the time of rebuilding heavy open wire subscribers' lines.

APPARATUS.

All apparatus electrically connected to a communication circuit should be so designed, constructed, installed and maintained as to minimize, in so far as is necessary and practicable, unbalance of the series impedance and admittance to earth of the two sides of the circuit.

Some of the methods and means which should be followed for the purpose of minimizing unbalance in equipment are as follows:

Phantom Circuit Apparatus.

Balancing resistance or other compensating apparatus should be inserted in the through side of a phantom group at the point where the other side circuit is terminated.

If one circuit of a phantom group is equipped with composite sets or composite ringers, the other side should be similarly equipped and the sets or ringers used on the two sides of the phantom group at any given point should have closely the same impedance characteristics.

Series Apparatus.

Where series apparatus, such as series condensers of a composite set is applied to toll circuits, those parts inserted in each side of a circuit should have closely the same electrical characteristics.

Coils.

Loading coils should be so designed, constructed and installed as to insert closely equal impedance in each wire of a circuit. Loading coils should be located as nearly as practicable at neutral or balanced points of the transposition system. In the design, construction, installation and maintenance of loading coils, efforts should be made to secure permanency of characteristics.

The coils employed for phantoming, compositing, simplexing or sectionalizing communication circuits should be as closely balanced as practicable. If in any case unbalanced coils are necessary, they should be isolated by properly balanced repeating coils.

The windings of retardation coils connected to the two sides of the same metallic circuit should have closely equal self-impedances. The coils of the different circuits should be equipped with suitable cases or so installed as to have negligible mutual impedances.

Condensers.

The condensers employed in composite sets, signaling devices, etc., should have adequate balance of admittance to ground.

Ringing and Signaling Equipment.

The unbalance introduced by ringing or signaling equipment should be limited, in so far as is necessary and practicable.

Central Office Circuits.

Central office circuits are to be so designed, installed and maintained that any connection between toll circuits and subscribers' circuits may be made through repeating coils.

Attention should be given to the control of unbalance in cords and central office wiring.

Effort should be made to prevent the introduction of unbalance by contact resistance.

Ground Connections.

Ground connections, if employed on equipment connected to toll circuits, should be in the balanced or neutral position of the circuit.

Specific Coordinated Methods

The specific practices outlined here are to be used in addition to the general practices to supplement the latter in so far as may be necessary and practicable in cases where communication and supply lines are involved, or are about to be involved, in inductive exposures.

All of these practices are not required to be applied in any one specific case, but in each instance that practice or those practices in combination should be selected which will under the conditions afford the best engineering solution.

Power Level and Sensitivity.

Consideration should be given to maintaining in the communication circuits as high a power level and such a degree of sensitivity as is consistent with good economics.

Selective and Other Special Devices.

Consideration should be given to the use of such devices as neutralizing transformers, sectionalizing transformers, filters, resonant shunts or drainage coils in any case where they may offer benefit and the service requirements of the circuit will permit.

Rerouting Service.

If abnormal conditions should temporarily prevent the use of a certain line and the effect of the abnormal conditions can be

avoided only by temporarily rerouting the supply or communication service over a route not involved in the inductive exposure, consideration should be given to the adoption of this expedient. Where the rerouting of either service is impracticable, the choice as to which service is to be temporarily suspended should be governed by the relative importance to the public of the respective services affected.

Records.

Routine measurements of insulation, conductor resistance, balance and induction should be made on toll circuits involved in inductive exposures and records kept of the readings.

A record should be kept of abnormal conditions in toll circuits involved in inductive exposures where a study of such conditions is advisable. Such records should as fully as practicable include time, duration, circuit designation, location, probable cause and effect of the abnormal condition and how the circuits were cleared.

All the above records or a convenient summary thereof should be available for the purpose of analyzing causes and effects of disturbances.

LINES.

Configuration.

Where service requirements permit a choice of configuration of a communication circuit or a group of communication circuits consideration should be given to the selection of a configuration such as to limit susceptiveness.

Cable.

Consideration should be given to the use of cable within an inductive exposure.

Where communication circuits are carried in aerial cable, consideration should be given to the use of properly arranged and installed grounds on cable sheaths or other methods of shielding.

Coordinated Transpositions.

Consideration should be given to the use of transpositions in supply or communication circuits, or both, within inductive exposures, for the purpose of limiting the coupling. Such transpositions should be installed at suitable intervals, the location to be

such as the local conditions demand. Where transpositions are installed in both supply and communication circuits within inductive exposures, they should be properly coordinated.

NOTE: Care should be taken in the installation of transpositions that, so far as practicable, the transpositions are located nearest the theoretically correct point. In determining the most economical scheme of transpositions effort should be made to utilize as many as practicable of any existing transpositions. Where the transpositions required within an inductive exposure impair the general transposition scheme of communication or supply circuits outside the limits of inductive exposure, the necessary readjustment of transpositions should be made in the section or sections of line adjacent to inductive exposure. Uniformity of separation generally assists in the attainment of coordination. If discontinuities are of sufficient magnitude to substantially affect the coupling, sections between such points should be treated independently.

APPARATUS.

Party Line Ringers.

Consideration should be given to the use of high impedance substation party line ringers or their equivalent.

Central Office Equipment.

Consideration should be given to equipping toll circuits which may be switched to other toll circuits with repeating coils. In those cases where the design of a central office is such that there is a possibility that toll circuits may be switched directly to local circuits, consideration should be given to the use of repeating coils if their omission would contribute to interference.

Where series apparatus is applied to local communication circuits, consideration should be given to so arranging it that equal impedances are inserted in each side of the circuit where necessary and practicable.

Ground Connections.

Ground connections if employed on equipment connected to local communication circuits should so far as is practicable be at neutral or balanced points.

PRACTICES APPLICABLE TO SUPPLY SYSTEMS

GENERAL COORDINATED METHODS

The following practices should be applied to all supply systems except as deviations may be made under the principle of deferred coordination.

Residual Voltages and Currents.

Residual voltages and currents should be limited as far as is necessary and practicable.

Unsymmetrical loads between phases should be avoided in so far as is practicable where they would give rise to residual currents or voltages.

NOTE:—Circuit conditions may cause a residual voltage to appear on a three-phase system. If the neutral of the system is grounded at one point, residual current may flow and the residual voltage may be increased or decreased. In this case, the residual current may consist in part of current through the total direct admittance of the system to ground due to voltages impressed between the three conductors and ground. It may also consist in part of unbalanced charging current to ground due to voltages impressed upon unbalanced direct admittances of the three conductors to ground. The former will not be affected by transpositions while the latter may be reduced or eliminated by equalization of the conductor admittances to ground.

If the system is operated without a neutral ground, the residual voltage would be reduced by equalizing the admittances of the conductors to earth.

If the phases are not symmetrically loaded and two or more neutrals of the same electrically connected system are grounded, residual currents will flow. However, substantial residual currents due to unsymmetrical loads will not flow if the system has a single or no neutral ground.

Single phase taps from 3-phase circuits have inherently a residual voltage; such taps, if long, tend to appreciably unbalance the 3-phase circuit to which they are connected.

If the neutral of a system is grounded at two or more points, the residual voltage or the residual current may be increased or decreased. Whether the total influence of the system is increased or decreased will depend upon local conditions.

Discontinuities.

Discontinuities should be limited to the number required by the conditions.

Switching.

In all switching operations care should be taken to limit, so far as is practicable, the production of transient disturbance leading to excessive momentary influence.

Care should be taken to avoid repeatedly energizing at normal voltage a transmission supply circuit in order to locate a fault. It is sometimes practicable to locate such faults by means of lower voltage testing methods.

Maintenance.

In the maintenance of supply circuits, attention should be given to the prevention of mechanical or electrical failures which would lead to residual voltages or residual currents of substantial magnitude. When supply circuits become unbalanced, due to any

cause, every reasonable effort should be made to remedy the unbalanced condition promptly.

Contact Resistance.

Care should be taken to avoid contact resistance which would affect influence.

LINES.

In order to reasonably limit the residual current and voltages arising from line unbalances, the resistance, inductance, capacitance and leakage conductance of the several conductors in each section of a circuit should, so far as is necessary and practicable, be equal respectively to the corresponding quantities in any other conductor of the same section of the circuit.

Some of the methods and means for limiting unbalance in lines are described below.

Configuration.

Where there is a choice between two or more types of configuration, consideration should be given to use where practicable of such configuration of a supply circuit or a group of supply circuits as provides the superior balance.

Excessive Spacing.

Excessive spacing of conductors should be avoided. This does not mean that the spacing should be less than required by considerations of safety, service, and the future requirement of the circuits.

Transpositions.

Capacitances to earth of the conductors of transmission supply circuits should be suitably balanced by transpositions so far as is necessary and practicable.

Branch Circuits.

Where branches employing less than the total number of phase wires are to be used, they should be so planned as not to give rise to excessive residual voltages or currents on the three-phase system.

Series Lighting Circuits.

In the construction or rearrangement of series street lighting circuits, unbalances which materially contribute to inductive influence should be avoided.

Three-Phase, Four-Wire Systems.

If three-phase, four-wire grounded neutral supply circuits are used, the neutral wire should be continuous except in case of a three-phase branch which is either operated non-grounded or is grounded only at symmetrical load points.

Ground Return Circuits.

Ground return circuits or ground return branches of multi-wire supply circuits should not be employed. This does not apply to track return circuits.

APPARATUS.

NOTE: It is recognized as commercially impossible to build rotating machinery entirely free from harmonics. It is further recognized that some distortion of wave form—and consequent introduction of harmonics—is inherent with power transformers which must employ iron in their magnetic circuits. However, in both these cases the introduction of harmonics can, to a considerable extent, be controlled within the limits of commercial design and practice. So, the above provisions are intended to secure the attention which this matter deserves because of its basic importance and its reaction on the necessity for other methods.

Rotating Machinery.

Synchronous machines should be specified and selected so as to have a wave form in which the harmonic components are limited so far as necessary and practicable.

Induction motors and generators should be selected which cause the least practicable amount of harmonic voltages and currents on the system to which they are connected.

Transformers.

In order that the wave form of voltage and current may be affected as little as practicable by transformers, such apparatus should not be designed so as to operate at excessive magnetic densities. In the installation, connection, and operation of transformers, care should be taken to avoid excessive over-voltages or excessive magnetizing currents.

When star connected transformers or autotransformers are employed with a grounded neutral on the side connected to a line circuit, low impedance closely coupled tertiary windings or delta-connected secondary windings, or other suitable means for adequately limiting the triple harmonic components of residual current or voltages should be employed.

Where open delta transformer banks are used, they should be distributed symmetrically among the phases in so far as necessary and practicable.

Care should be taken that the individual units in each grounded neutral bank of transformers connected to a transmission supply circuit are substantially alike as to electrical characteristics and that they are similarly connected.

Switches.

Each switch controlling the supply of energy to transmission supply circuits should have all poles arranged for gang operation. So far as is practicable, these switches should be automatic for short circuits between phases and from phase to ground.

Protective Apparatus.

Protective apparatus should be such that it will not unnecessarily add to transient disturbance, and should so far as practicable forestall or limit such transient disturbances.

Routine inspection of lightning arresters should be provided, and the periodic charging, where such is required, should conform to good practice.

Arresters should be maintained in good condition. Arresters which have been temporarily withdrawn from service should not be replaced in service until they are in proper operating condition.

Where lightning arresters requiring periodic charging are employed on a supply system involved in an inductive exposure, they should be equipped with auxiliary resistances and contacts.

Routine inspection or tests should be made to determine whether or not adjustments in all protective apparatus are properly maintained.

Abnormal Conditions.

Reasonable means should be provided to prevent the continuation in operation of faulty apparatus or lines for such periods or under such conditions as lead to excessive influence.

Reliable indicating or recording devices should be installed at the source of transmission supply circuits to show abnormal operating conditions.

Series Lighting Circuits.

Consideration should be given to the use of types of equipment in series street lighting circuits which, so far as practicable, have a m[illegible]m distorting effect on the voltage and current wave

shape of the lighting circuit, both during times of normal operation and times of lamp outages.

Ground Connections.

Ground connections, if employed on apparatus connected to transmission supply circuits, should be made in the balanced or neutral position in the circuit. This precludes the use of grounded open star transformer connections.

Specific Coordinated Methods

The specific practices outlined herein are to be used in addition to the general practices to supplement the latter so far as may be necessary and practicable in cases where communication and supply lines are involved, or are about to be involved, in inductive exposures.

All of these practices are not required to be applied in any one specific case, but in each instance that practice or those practices in combination should be selected which will under the conditions afford the best engineering solution.

Lines.

Configuration.

Where physical and economic conditions permit a choice of configuration of supply circuits within inductive exposures the configuration should be selected so as to limit the influence.

Branch Circuits.

Consideration should be given to the isolation of branch circuits consisting of less than the total number of wires of the main circuit, resulting in substantial balance, by means of transformers when such main or branch circuits are involved in inductive exposures.

Consideration should be given to the isolation of loops of series lighting circuits.

Coordinated Transpositions.

Consideration should be given to the use of transpositions in supply or communication circuits, or both, within inductive exposures, for the purpose of limiting the coupling. Such transpositions should be installed at suitable intervals, the location to

be such as the local conditions demand. Where transpositions are installed in both supply and communication circuits within inductive exposures, they should be properly coordinated.

NOTE: Care should be taken in the installation of transpositions that where practicable the transpositions are located nearest the theoretically correct point. In general, transpositions may be omitted at the junction points of successive sections which are suitably balanced. In determining the most economical scheme of transpositions effort should be made to utilize as many as practicable of any existing transpositions. Where the transpositions required within an inductive exposure impair the general transposition scheme of communication or supply circuits outside the limits of inductive exposure, the necessary readjustment of transpositions should be made in the section or sections of line adjacent to inductive exposure. Uniformity of separation generally assists in the attainment of coordination. If discontinuities are of sufficient magnitude to substantially affect the coupling, sections between such points should be treated independently.

Rerouting Service.

If abnormal conditions should temporarily prevent the use of a certain line and the effect of the abnormal conditions can be avoided only by temporarily rerouting the supply or communication service over circuits not involved in the inductive exposure, consideration should be given to the adoption of this expedient. Where the rerouting of either service is impracticable the choice as to which service is to be temporarily suspended should be governed by the relative importance to the public of the respective services affected.

APPARATUS.

Wave Shape.

Where a ground connection used on the armature winding of an alternating current generator or motor electrically connected to supply circuits results in triple harmonics on circuits involved in inductive exposures, means should be employed to reduce the triple harmonics as far as may be necessary and practicable.

Rectifiers, arc furnaces and other apparatus which distort the voltage or current wave form of a supply circuit involved in an inductive exposure, should be equipped when and as necessary and practicable with suitable auxiliary apparatus to prevent such distortion.

Where the service conditions permit, consideration should be given to special means and devices for reducing the amplitude of harmonics on systems involved in inductive exposures.

Reasonable efforts should be made to promptly replace out-lamps on circuits equipped with individual transformers or bridged reactance coils.

Transformers.

Consideration should be given to the use of closed delta connection on main transformer supply banks or large distribution banks where necessary and practicable in preference to open delta.

Lightning Arresters.

Where, notwithstanding compliance with the paragraph regarding equipment of the arresters, interference arises at time of charging lightning arresters, charging should be done at such times as will result in minimum interference to both services.

Switches.

Consideration should be given to the installation of at least one oil-break switch, or its approved equivalent, to control the supply circuit involved in an inductive exposure.

Current Limiting Devices.

Consideration should be given to the use, so far as necessary and practicable, of current limiting devices in either the line wires or the neutral of transmission supply circuits.

Ground Connections.

Ground connections if employed on apparatus connected to local supply circuits should, so far as practicable, be made at the neutral or balanced point of the circuit.

Records.

A record should be kept of all abnormal conditions on transmission supply circuits involved in inductive exposures, where a study of such conditions is advisable. Such records should, as fully as practicable, include time and duration, circuit designation, location, probable causes and effect of abnormal conditions and how cleared.

All of the above records, or a convenient summary thereof, should be available for the purpose of analyzing cause and effect of disturbances.

DEFINITIONS

For the purpose of these principles and practices, the following terms are used with meanings as given in these definitions:

nductive Coordination.

The location, design, construction, operation and maintenance of supply and communication systems in conformity with harmoniously adjusted methods which will prevent inductive interference.

Jeneral Coordinated Methods.

Those methods reasonably available for general application to supply or communication systems, which contribute to inductive coordination without specific consideration to the requirements for individual inductive exposures.

Specific Coordinated Methods.

Those additional methods applicable to specific situations where general coordinated methods are inadequate.

nductive Interference.

An effect arising from the characteristics and inductive relations of supply and communication systems of such character and magnitude as would prevent the communication circuits from rendering service satisfactorily and economically if methods of inductive coordination were not applied.

nductive Exposure.

A situation of proximity between supply and communication circuits under such conditions that inductive interference must be considered.

nductive Susceptiveness.

Those characteristics of a communication circuit with its associated apparatus which determine, so far as such characteristics can determine, the extent to which it is capable of being adversely affected in giving service, by a given inductive field.

nductive Influence.

Those characteristics of a supply circuit with its associated apparatus that determine the character and intensity of the inductive field which it produces.

nductive Coupling.

The interrelation of neighboring supply and communication circuits by electric or magnetic induction or both.

Configuration.

The geometrical arrangement of the conductors of a circuit including the size of the wires and their relative positions with respect to other conductors and the earth.

Electrically Connected.

Connected by means of a conducting path or through a condenser as distinguished from connection merely through electromagnetic induction.

Transposition.

An interchange of position of conductors of a circuit between successive lengths.

Coordinated Transpositions.

Transpositions which are installed in either supply or communication circuits or in both for the purpose of reducing inductive coupling and which are located effectively with respect to the discontinuities in both the supply and communication circuits.

Discontinuity.

A point at which there is an abrupt change in the physical relations of supply and communication circuits or in electrical constants of either circuit which would materially affect the coupling.

Transpositions are not rated as discontinuities, although technically included in the definition, because of their application to coordination.

Residual Voltage.

The residual voltage of a supply circuit is the vector sum of the voltages to ground of the several wires. In a three-phase system it is in effect a single phase voltage equal to one-third of the residual voltage, impressed between the wires in multiple and the ground.

Residual Current.

The residual current of a supply circuit is the vector sum of the currents in the several wires and is equivalent to a single phase current having the wires in multiple as one and the ground as the other.

Power Level.

The level of the electrical power flowing in a communication circuit. At any point the power level depends on the conditions of input and of losses between the point of input and the designated point.

In telephone practice the power level of a circuit is usually referred to the power level in a given circuit assuming that the acoustic input into the circuit under consideration is of a given amount and the same as the input into the reference circuit.

Sensitivity.

The sensitivity of a telephone circuit or a part thereof is the ratio of the electrical or the acoustic output to the electrical input.

Selectivity.

That property of apparatus or a circuit which permits the transmission or conversion of currents of different frequencies in differing degrees.

INDUCTIVE COORDINATION
ALLOCATION OF COSTS
BETWEEN
SUPPLY AND COMMUNICATION COMPANIES

The Reports of the Joint General Committee on Principles and Practices for Inductive Coordination have established the broad basis for the solution of inductive coordination problems from a physical standpoint based on the present state of the art. From the start, however, it has been recognized that the question of allocation of costs enters into the problem in an important way and in this connection the letter transmitting the first report contained the following statement:

> "Your Committee, as soon as standards of construction and operation are adopted, will consider whether principles can be established to aid in the fair allocation of costs of coordinative measures. In the meantime, your Committee believes that with the cooperative spirit which now is evident a mutually equitable adjustment can and should be made in each specific case. It is understood that any adjustments made will not be considered as precedents by either party to the prejudice of future understandings."

It is understood that, generally speaking, the respective utilities have been handling the allocation of costs in specific cases along the above recommended lines. However, in some cases difficulty has been encountered in endeavoring to reach an equitable adjustment; in fact, negotiations regarding the allocation of costs have in some cases unduly influenced the technical work on the specific situations involved and have tended to retard or prevent agreement on the best engineering solution.

This question has received careful consideration for some time and as a result certain suggestions have been made which will be helpful to the supply utilities and communication utilities as a guide in arriving at an equitable apportionment of the costs of

methods of inductive coordination in situations where the two utilities have not already arrived at a mutually satisfactory plan for handling the allocation of costs.

In arriving at conclusions on this matter of allocation of costs, the following were carefully considered. The solution to the problem of inductive coordination should, of course, be based on the service needs of both parties and on the overall cost rather than on any consideration of in what plant the changes shall be made or how the costs are to be allocated. This is in accordance with the section on "Choice Between Specific Methods" contained in the Principles and Practices for the Inductive Coordination of Supply and Communication Systems and it is obvious that the approach to the problem should be such as to offer every incentive to obtaining the best engineering solution. It was the consideration of these facts that suggested the method herein outlined for the allocation of costs.

As has been stated in previous reports, each party should be the judge of its own service requirements but as covered in the Principles and Practices above referred to, each party also has a duty of coordination as shown by the following quotation:

> "In order to meet the reasonable service needs of the public, all supply and communication circuits with their associated apparatus should be located, constructed, operated and maintained in conformity with general coordinated methods which maintain due regard to the prevention of interference with the rendering of either service. These methods should include limiting the inductive influence of the supply circuits or the inductive susceptiveness of the communication circuits or the inductive coupling between circuits or a combination of these, in the most convenient and economical manner."

In other words, there are certain things indicated in connection with the classes of circuits covered in the Principles and Practices above referred to which each utility should do in its system in a general way which will promote inductive coordination.

These measures, however, cannot take account of the problems which arise in specific cases, and this was also recognized in the principles on Duty of Coordination already referred to as follows:

"Where general coordinated methods will be insufficient, such specific coordinated methods suited to the situation should be applied to the systems of either or both kinds as will most conveniently and economically prevent interference, the methods to be based on the knowledge of the art."

These specific methods cannot be embodied in the general design of either plant because their nature and the necessity of their application are contingent upon the conditions of the specific situations which may arise and which generally cannot be foreseen. It is the equitable apportionment of the cost of these latter items which has apparently given rise to such differences of opinion as have existed between representatives of the two industries on this subject.

Taking into account all the foregoing factors, the plan suggested for use in connection with new construction is as follows:

1. Each utility should at its own expense design, construct, operate and maintain its plant in accordance with general coordinated methods.

2. Specific methods of coordination should be paid for by such equitable apportionment of the costs as may be agreed to by the utilities affected. It may be found reasonable in some cases for each party to bear the costs of such specific methods of coordination as result in net capital additions in its own plant; care must be exercised, however, that this be not carried to a point where the best engineering solution is prejudiced. In cases where it is not clear as to what constitutes an equitable apportionment a fifty-fifty division of the costs may be found the most practicable solution.

3. All carrying charges, repair, operating or other current expenses incident to specific coordinated methods and all subsequent replacement costs arising after and due to the installation of specific coordinated methods should be borne by the utility on whose system the costs are incurred.

The above outlined plan has the advantage that it can in no way prejudice the application of the best engineering solution because it makes each party have a direct interest in reducing the

total cost of specific coordinated methods rather than in whether or not the expense is incurred in one plant or the other or both.

In applying this suggested general plan for the allocation of costs of specific methods of coordination, it is assumed the four following conditions will be met:

1. That each system has complied with the requirements for general coordination.
2. That the best engineering solution of the specific problem has been determined.
3. That the costs to be allocated are net costs and, therefore, exclude all items of betterment.
4. That the costs are computed on a uniform and mutually acceptable basis for both direct and indirect charges.

In situations involving extensions to existing systems or the cleaning up of existing exposures it is recognized that such existing systems may not comply entirely with general coordinated methods, and that the method suggested above for new construction may require some modification to adapt it to existing situations. Such problems involve consideration of whether or not both systems should be brought into compliance with general coordinated methods or whether some other plan is the best engineering solution. This point, together with the history of the case and any contemplated plans either party may have for changes in its system, will have a bearing on what constitutes an equitable apportionment of the costs.

PRINCIPLES AND PRACTICES FOR THE JOINT USE OF WOOD POLES BY SUPPLY AND COMMUNICATION COMPANIES

INTRODUCTORY

These Principles and Practices cover the general engineering and operating features involved in the joint use of wood poles and are intended to be in conformity with the broad principles heretofore mutually agreed upon by the Joint General Committee.

The Principles set forth in a broad and general manner the basic fundamentals involved in the intercompany relationships on joint use of poles. The two groups of utilities recognize their responsibility to serve the public safely, adequately and economically. It is therefore essential that any arrangement entered into be such as to best facilitate the present and future rendering of both classes of service.

Practices are recommendations which cover in a more specific way the general ground included in the Principles and are based on an analysis of practical operating experience with joint use of poles. It is recommended that they be used as a guide in the preparation of new agreements for the joint use of poles and in the modification of existing agreements where it is desired by either party to bring such existing agreements into conformity with these Principles and Practices.

PRINCIPLES

1. Duties.

Each party should:

Be the judge of the quality and requirements of its service, including the character and design of its own facilities.

(b) Provide and maintain facilities adequate to meet the service requirements including such future modifications in these facilities as changing conditions indicate to be necessary and proper.

(c) Determine the character of its own circuits and structures to be placed or continued in joint use, and determine the character of the circuits and structures of others with which it will enter into or continue in joint use.

(d) Cooperate with the other party so that in carrying out the foregoing duties, proper consideration will be given to the mutual problems which may arise and so that the parties can jointly determine the best engineering solution in situations where the facilities of both are involved.

2. Establishing, Maintaining and Terminating Joint Use.

Joint consideration by both parties of safety, service, economy, convenience and the trend toward higher distribution voltages should determine:

(a) When joint use should be employed, taking into account present conditions and those which can be reasonably foreseen, including the possibility of reverting to separate lines.

(b) The best engineering solution for the coordinated arrangement and design of facilities in joint use.

(c) The administrative methods for entering into, carrying on and terminating joint use.

3. Local Contact.

All parties at interest in a locality should maintain close cooperation and each notify the others of any intent to build new lines or to reconstruct existing lines, as an aid to orderly planning and the utilization of joint use where advantageous.

4. Contracts.

General contracts for joint use, if entered into, should define conditions for entering into joint use, for operating in joint use, for terminating joint use and for a practical procedure for modifying facilities in joint use from time to time.

In either general or specific contracts, any provisions treating of the character of circuits on poles for joint use should be so drawn as not to restrict changes in the character of the circuits of either party, except that it should be recognized that such changes may involve the modification or abandonment of joint use in specific cases.

Each specific instance of contemplated initial or modified joint use, whether embracing a single pole, a group of poles or an entire line, should be considered, as to acceptance, as a separate and distinct case, with the right of refusal by either party, and if accepted should be in writing.

Joint use now exists and gives satisfaction in many localities under one of two general plans, one a "Space Rental Plan" and the other a "Joint Ownership Plan." In addition, joint use is sometimes effected on an "Attachment" or "Contact Rental" basis, and sometimes under a "Permanent Rights" agreement, which is a modification of the "Joint Ownership Plan." The Joint Ownership Plan and the Space Rental Plan have in general proved the more simple and convenient working arrangements.

5. Costs.

The allocation of costs between the parties at interest should be prima facia, reasonable and equitable, taking into account all factors involved.

6. Legal Considerations.

Legal questions, including the sufficiency of right-of-way grants held by the parties and the protection of title or property of both parties in the case of mortgages, sales, mergers or consolidations entered into by either party should be given due consideration in the preparation of contracts.

In any terms of the contract dealing with liability for personal or property damage, care should be taken that such terms are not disadvantageous to either party.

7. Periodical Readjustment of Contracts.

Provision should be made for review and revision from time to time of those stipulations of a contract treating of conditions of a varying nature and particularly of items of expense to be apportioned between the parties, such as the cost of poles and rentals which are dependent on material and labor prices.

8. Construction and Inductive Coordination.

The construction and inductive coordination employed in joint use should be in accordance with mutually acceptable practices and in conformity with such recommendations of the Joint General Committee as are issued from time to time.

PRACTICES

1. Territory Covered by Agreement.

Agreements should preferably cover all existing wood poles of each of the parties and any other wood poles hereafter erected or acquired by either of them within a certain described territory, except those which carry circuits of a character that the parties wish to keep out of joint use.

NOTE: It is recognized that there are exceptional situations where it may not be desirable to make general agreements covering a given territory, as, for example, where the major portion of the poles of one of the parties carry circuits for which joint use is not generally advantageous. Such cases may be more satisfactorily handled by agreements covering a specific line or certain specific poles.

2. Types of Joint Use Agreements.

Joint use agreement should preferably be of a type under which each of the parties shares equitably in the cost of joint poles. This may be accomplished in either of the following ways:

(a) Space rental under which form of agreement the licensee rents space on the pole of the Owner and pays a rental per pole which is based on the amount of space reserved. A much used form of this is the so called "flat rental per pole" where the division is practically equal and the rental is approximately equal to one-half the average annual charges on a pole which is stipulated as the standard of reference.

(b) Joint ownership, under which form of agreement each of the parties owns a half interest in each joint pole and pays one-half the cost in place of the pole which is stipulated as the standard of reference.

NOTE: A permanent rights agreement is a modification of the joint ownership agreement which has been used occasionally under which each of the parties retains sole ownership of certain of the poles and the other party purchases a permanent right of occupancy. The other arrangements are the same as in a joint ownership agreement.

Rentals based on individual contacts or attachments are not generally recommended for joint pole agreements, as such a basis involves the expense and obligations arising from periodical inventories of the attachments. It is also difficult to establish rental rates for the many kinds of individual attachments which will continue to be equitable and mutually satisfactory. Furthermore, this basis does not have the advantage of providing a suitable space for the present and future requirements of each party. However, such a basis may sometimes be found satisfactory for an individual agreement where only a small number of poles is involved.

3. Conditions Relating to Joint Use of Poles.

It is recognized that there are very substantial advantages to both utilities in the employment of jointly occupied poles where the conditions and character of circuits permit. The conditions determining the necessity or desirability of joint use depends upon the service requirements to be met by both parties including considerations of safety and economy. Each party is the judge of what the character of its circuits should be to meet its service requirements and as to whether or not these service requirements can be properly met by the joint use of poles.

(a) It is recommended that joint use should be entered into in preference to separate pole lines on the same street or highway where the combination of circuits is such as to make further cooperative study of the problem unnecessary and in other cases where a cooperative study shows that joint use is economical and is the best engineering solution.

(b) Each party should retain the right to remain out of joint use with such of its pole lines as are necessary for its own sole use or in other cases where in its judgment the proper rendering of its service now or in the future requires separate lines.

(c) It is recognized that joint use is advisable but that it is necessary that when employed it should meet the service requirements of both parties and that any statement made as to conditions under which joint use is desirable is likely to change as time goes on and as service conditions and the state of the art change.

(d) Based upon the present state of the art, the Supply Utilities and the Communication Utilities have stated as to their respective circuits (See appendices 1 and 2) the present limitations within which each group recommends that joint use be entered into.

(e) In any case where it is necessary that the two kinds of lines occupy the same side of the highway joint use is generally preferable to overbuilding.

(f) It is recognized that situations will sometimes arise in rural districts where greater economy can be obtained with separate lines than with a joint line and without sacrificing safety or service. It is also recognized that a utility will find in some cases that it is necessary to construct a line which is to carry such number and weight of attachments that joint use would not be economical or desirable. In such cases it is not intended to recommend joint use of poles in preference to other arrangements which would be more advantageous.

4. Cooperation to Establish Joint Use.

(a) When any party to a joint use agreement is about to erect a new pole line or to extend or reconstruct an existing pole line within the territory covered by the agreement, notice in advance should be given to the other party to the agreement, such notice showing the proposed location and character of the new poles. The parties should then cooperate to determine whether or not joint use of the poles should be established.

(b) When any party to a joint use agreement desires to occupy space on any existing poles of the other party within the territory covered by the agreement, notice should be given the owner of said poles and the parties should then cooperate to determine whether or not joint use of poles should be established.

5. Avoidance of Conflicting Lines.

Where joint use of poles is not to be established or where in accordance with Section 6 of these Practices joint use is to be terminated, the parties should make every reasonable effort to avoid the establishment of conflicting lines.

6. Procedure When Character of Circuits Is Changed.

When either party desires to change the character of its circuits on jointly used poles it shall so notify the other party and the parties shall cooperate to determine whether or not joint use of the poles involved shall be continued. If it is not agreed to continue joint use of the said poles, the parties shall then cooperate to determine the most practical and economical method of effectively providing for separate lines. The party whose circuits are to be moved shall promptly carry out the necessary work and the parties shall cooperate to determine the equitable apportionment of the net expense involved in such relocation. In the event of a disagreement as to what constitutes an equitable apportionment of such expense the following arrangements are recommended:

(a) In the case of a space rental agreement, the licensee shall bear the said net expense.

(b) In the case of a joint ownership agreement the said net expense shall be divided equally between the parties.

Unless otherwise agreed by the parties, ownership of any new line constructed under the foregoing provision in a new location shall rest in the party for whose use it is constructed. The net cost of establishing service in the new location should be exclusive of any increased cost due to the substitution for the existing facilities of other facilities of a substantially new or improved type or of increased capacity, but should include the new pole line, the cost of removing attachments from the old poles to the new location and the cost of placing the attachments on the poles in the new location.

7. Ownership of Poles Under a Space Rental Agreement.

In any case where the parties to a space rental agreement shall conclude arrangements for the joint use of any new poles to be erected, the ownership of such new poles should be determined by mutual agreement. In case of failure to agree, the party then owning the smaller number of joint poles under the agreement should erect the poles and be the owner thereof.

NOTE: It has been found to be of advantage under this form of agreement to have each party own approximately one-half the total number of jointly used poles, as this tends to equalize the investment of the two parties. Furthermore, this has the advantage of reducing the intercompany billing and the exchange of money between the parties. This division of ownership should preferably be accomplished by each party [illegible] certain continuous lines rather than having the ownership of the [illegible] in a given line divided.

8. Joint Fundamental Plan.

An effective way of handling the proper development of joint pole lines in a given territory is through the full application of the principles on cooperation including advance notice, advance planning and the interchange of information. Experience has shown that this can be accomplished through a joint fundamental plan of the present and future developments of the overhead systems of the respective parties. Through such joint planning it will be generally found possible to avoid any difficult situations in locating the lines and the application of these Principles and Practices to both the present and future developments can be carried out in the most effective and economical manner.

9. Specifications for Joint Pole Construction.

It is intended that complete specifications covering recommended practices for joint use of poles under various conditions will be prepared as soon as practicable. Until such time as these specifications are issued, it is recommended that the National Electrical Safety Code be used as a guide to practice.

Existing joint pole construction should be brought into conformity with the recommended practices in an orderly and systematic manner. This may be accomplished by a provision in the agreement that a certain percentage of the existing construction be brought into conformity with the recommended practices each year.

10. Inductive Coordination for Circuits on Jointly Used Poles.

The "Principles and Practices for the Inductive Coordination of Supply and Communication Systems" as issued from time to time by the Joint General Committee should be followed.

APPENDIX 1

Supply Utilities Statement.

In the present state of the art and subject to the limitations of the Principles and Practices of which this is an appendix, the Supply Utilities are willing to enter into joint use of poles generally, irrespective of the character of the Communication Utilities circuits with the clear understanding that these Principles and Practices do not limit such changes to higher voltages as may be desirable in the future as the most advantageous means of serving their customers but provide for such changes in location or construction as may be necessary to meet the changed conditions.

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JOINT USE OF POLES IN RURAL AREAS

A Report of the Joint Subcommittee on Joint Use of Poles for Rural Power and Telephone Circuits Edison Electric Institute and Bell Telephone System

Summary

This is a final report of the Joint Subcommittee on Joint Use of Poles for Rural Power and Telephone Circuits. The first report consisted of a preliminary issue of Part 5 "Special Considerations for Long Span Joint Use" of the Joint Pole Practices. This report reviews the factors concerned in the relative economies of joint construction vs. separate power and telephone line construction in sparsely settled rural areas and makes recommendations concerning further joint work on rural joint use matters.

October 1951

Copies of this report may be obtained by Power Companies from the Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y. (Publication 51-19) and by Associated Bell Companies from the Department of Operation and Engineering of the American Telephone and Telegraph Company, 195 Broadway, New York 7, N. Y.

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JOINT USE OF POLES IN RURAL AREAS

Under date of October 29, 1945, the Joint Committee on Plant Coordination issued a report covering the construction and maintenance of jointly used pole lines carrying supply and communication circuits which was designated as "Joint Pole Practices." These Practices are divided into four parts intended for application under the various conditions which obtain generally in urban and suburban areas. Because of limited experience it was not practicable to include in the Joint Pole Practices requirements covering long span joint use such as obtains in rural areas. Provisions were, therefore, made for a Part 5 which could be added later to cover the clearance and other requirements involved in such joint use.

Early in 1946, the Subcommittee on Joint Use of Poles for Rural Power and Telephone Circuits was formed and instructed to study the factors involved in the joint use of poles for rural power and telephone circuits including the guidance of trial installations with the objective of developing:

(a) Suitable specifications for the construction of long span joint use.

(b) The economies of rural joint use as compared with separate lines.

(c) Sound and equitable principles and practices for guidance in negotiating administrative and contractual relations.

These instructions also included application of available methods of inductive coordination and electrical protection on the power and telephone circuits.

Specifications

Under date of April 10, 1946, the Subcommittee on Joint Use of Poles for Rural Power and Telephone Circuits submitted tentative specifications for long span joint construction. These specifications were prepared in the form of Part 5 of the Joint Pole Practices and were intended to be used in combination with such of the other requirements of the Joint Pole Practices as apply.

In line with the recommendations of the Subcommittee, the Joint Committee on Plant Coordination issued Part 5 for field trial on May 6, 1946, and copies were sent to Member Companies of the Edison Electric Institute and Associated Companies of the Bell Telephone System.

Basic Considerations

In its studies of long span joint use, the Subcommittee has found it convenient to group the factors concerned under three headings, namely, Structural Coordination, Electrical Protection and Inductive Coordination.

Structural Coordination

The important factors involving Structural Coordination in long span joint use are:

1. Separations between power and telephone wires at the pole and in the span.

2. Clearances of power and telephone wires above highways and above ground along highways and over ways generally.

3. Pole sizes to provide required strengths and wire clearances.

Minimum requirements covering these factors are contained in Part 2 of the 5th (Current) Edition of the National Electrical Safety Code. Joint use has been employed in urban and suburban areas for many years, and patterns of joint use have been developed which have proven generally satisfactory in such areas. With the development of relatively small, high strength power wires, the construction of power lines in span lengths 2 to 5 times longer than those normally used in urban areas, became practicable. Also, the development of improved high strength telephone wires made practicable the construction of correspondingly long span open wire telephone lines. Joint use with such wires in long spans was not contemplated in Part 2 of the Current Edition of the National Electrical Safety Code and the need of guides, particularly concerning separations between power and telephone wires at the pole and in the span, was indicated. Part 5 of the Joint Pole Practices referred to above, was intended for this purpose.

Electrical Protection

Previous to 1930 a large percentage of power distribution circuits involved in joint use ranged between 2300 and 4800 volts and adequate practices for such joint use had been developed based on experience. However, the situation was less clear where higher distribution voltages were involved, and the Joint Subcommittee on Development and Research consequently undertook a study of the problem, the results of which were given in Provisional Report 19, entitled "Joint Use of Poles - Telephone Circuits and 6.6 and 13.2 Kv Power Circuits - Safety Features." Out of these studies there developed the following basic concepts which facilitated the extension of joint use with power circuits in higher voltage categories.

1. Protection of telephone plant in joint use requires coordination of protective devices in both the power and telephone circuits.

2. Such coordination consists in essence of provision for positive deenergization of the power circuit in case of fault to ground, and limitation of the voltages on the telephone plant in case of accidental contact to the range of safe operating characteristics of telephone protective equipment. On open wire telephone circuits this involves the use of auxiliary protectors associated with telephone line wires which will (a) limit the voltage at the telephone station to the protective equipment operating range and (b) provide for impedance to ground low enough and with current carrying capacity high enough to assure the operation of power protective equipment in the event of accidental contact. On telephone cable and associated drop wire, the effective grounding of the telephone cable sheath -- in some cases bonding the sheath to the multi-grounded neutral of the power system -- provides suitable limitation of impressed voltage.

The auxiliary protector used on open wire telephone circuits where exposed to contact with higher voltage conductors, has been standardized and is known as the 99A protector. It consists of three carbon cylinders, each about 5/8 inch in diameter, and 1/2 inch long, inclosed in a mounting suitable for attachment to a pole or telephone crossarm. The carbon cylinders are spaced to give approximately 3000-volt gaps. Two of the cylinders are connected to the wires of the telephone circuit concerned and the third is grounded, where practicable to a grounding wire which is also connected to the multi-grounded neutral of the power system.

These methods of protection, developed primarily for application to joint use in urban and suburban areas, are equally applicable to joint use in rural areas where higher voltage multi-grounded neutral distribution circuits are employed. In rural areas, however, where telephone circuits may be involved in considerable lengths of joint use, the matter of electric or magnetic induced voltages on telephone wires may be of importance. To take care of this problem, there has been developed a drainage protector for use on open wire telephone circuits. This device is in two forms, one consisting of a resistor in series with a capacitor and the other of a reactor in series with a capacitor, the combination tuned to 60 cycles. Since these drainage devices are connected between each wire of a telephone circuit and ground, it is important that their bridging impedance be high so as not to cause high telephone transmission losses and low as regards impedance to ground, so as to limit induced voltages to ground. The device with resistors is known as the 104A telephone protector and the one with reactors is

known as the 108A telephone protector. The 104A is designed for electric induction only; the 108A, while designed primarily for electric induction, is also effective for magnetic induction if the impedance of the line to which it is connected is relatively high.

In urban and suburban areas, joint use largely involves telephone cables and relatively short extensions of open wire. Where these open wire extensions are joint with higher voltages, 99A protectors are usually employed but drainage protectors are seldom required. In rural areas, where open wire telephone circuits are usually relatively long, both types of protectors are indicated where higher voltage power circuits are involved. Where the power circuit operates at less than 3000 volts to ground, 99A protectors are not applicable but drainage protectors may be indicated.

Inductive Coordination

The principal problem of inductive coordination in rural joint use involves "noise induction" in open wire telephone circuits. Studies in this connection indicate the importance of the following:

1. That the power circuits concerned have reasonably low values of harmonics.

2. That the telephone circuits be well balanced as regards impedance to ground and that they be adequately transposed throughout the extent of joint use and other parallel construction.

Well balanced telephone equipment both at telephone central offices and at telephone stations are indicated where rural power and telephone circuits operate in the same territory in joint use or in parallel construction. A system of telephone circuit transpositions, known as the R System, has been developed which is applicable to open wire telephone circuits in either paralleling construction or joint use and has been found to be effective when employed in combination with well balanced equipment at the central office and at subscriber stations as referred to above. With this system of telephone transpositions, each telephone circuit is transposed at alternate poles if long span construction is used; with short span construction transpositions are made at about the same linear intervals, rather than at alternate poles. Where two or more circuits are involved, the transposition locations are staggered to minimize telephone cross-talk induction. An important feature of the system is the use of a tandem-type transposition bracket.

Trial Installations

During 1946, a number of trial installations of long span higher

voltage rural joint use were constructed. Data on five of these installations, three in the light and medium loading districts and two in the heavy loading district, were made the subject of a paper on Joint Use of Pole Lines for Rural Services presented at the 1947 Winter meeting of the American Institute of Electrical Engineers by Messrs J W Campbell of the American Telephone and Telegraph Company, L W Hill of the Carolina Telephone and Telegraph Company, L M Moore of the Rural Electrification Administration and H J Scholz of the Commonwealth and Southern Corporation. (Transactions of the American Institute of Electrical Engineers, Vol. 66, pp 519-524, 1947.) This paper described the means employed in the five installations for the coordination of construction, electrical protection and induction and gave the results of noise measurements on the telephone circuits in each instance. This paper indicated that the trials made up to that time had demonstrated the feasibility of higher voltage long span joint use in rural areas.

In many locations throughout the country, particularly surrounding larger cities, joint use has extended into rural areas with the same pattern of construction and the same power system voltage as employed in the urban areas. In more thinly populated rural areas, long span higher voltage joint use has been constructed in many instances. It is estimated that at present there are of the order of 2,000,000 poles jointly used in rural areas in the United States and that about 300,000 of these involve joint use of the long span higher voltage type.

Economies of Rural Joint Use as Compared with Separate Lines

In its studies of the relative economies of rural joint lines as compared with separate lines, the Subcommittee has confined its considerations primarily to situations such as obtain in thinly settled rural areas where higher voltage power circuits, long spans and long open wire telephone circuits are indicated. In considering the costs of joint lines as compared with separate lines in such situations, certain elements of cost are involved which are not present in the same degree in urban types of joint use. The procedure has, therefore, been to investigate the cost of separate rural power and telephone lines including in each case the cost of poles in place, the cost of rights-of-way, initial clearing, recurrent trimming, and added costs such as are involved where the lines cross each other. On joint lines there have been included the costs of poles in place, rights-of-way, initial clearing, recurrent trimming and additional electrical protection. For situations in which joint use is established on existing rural power lines there has also been included in the joint line costs, the added cost to the Telephone Company of stringing wire under energized power wires and the added cost of rearrangement of power facilities, added poles and pole replacements. Thus the effort has been to compare the over-all costs of separate rural power and telephone pole lines with the over-all costs of joint pole lines in the same territory.

These cost items vary considerably depending on the circumstances which obtain in different territories. For example, initial clearing and recurrent

trimming costs may be high in some localities and low in others. The cost of poles in place vary considerably in different parts of the country. In general, however, the factors which cause these variations apply to the lines built separately by the Power and Telephone Companies and to joint lines.

In addition to the factors reviewed above and to which dollar values can be assigned, there are also certain other items, important in the consideration of joint versus separate lines, but to which it is not practicable to assign dollar values.

In its studies of relative economies the Subcommittee has been guided by the following factors.

1. So far as the inductive influence of the power system and the inductive susceptiveness of the telephone system are concerned, these would equate to the same problem in joint use as in parallel construction on the opposite side of the highway. Therefore, joint use as of itself would not add to the cost of inductive coordination in joint construction.

2. As regards electrical protection, since the protective devices usually employed on the rural power system provide for de-energization at times of ground faults, and since the protective devices designed for use on telephone circuits result in ground impedances such as are usually employed by power companies in this connection, no additional expense on the power system pertinent to joint use would be involved. On the telephone system there would be involved the expense of a greater number of 99A protectors and drainage protectors than would be required for separate lines.

3. In constructing lines in rural areas there are usually involved rights-of-way, initial clearing and subsequent trimming costs. These costs would be applicable to separate lines and to joint lines.

4. In establishing new separate rural power and telephone lines, crossings of the two lines are involved at intervals, as for example at cross roads, service drops, etc. A certain amount of expense would be involved to provide the required strengths, clearances and electrical protection at many of these crossings. Such expense, assumed paid by the second comer, would be chargeable to the cost of separate lines.

5. The joint lines has been assumed to be a line suitable for both services without regard to height or class of poles, i.e., no normal joint pole.

6. In establishing joint use on existing lines, some rearrangement of existing facilities, replacement of poles, and provision of additional poles may be required. Such expense would be chargeable to the cost of the joint line.

7. The stringing of telephone wires under energized power conductors requires particular care to prevent contacts between the telephone wires and energized power wires which add to the cost of stringing telephone wires. In building new joint use lines, the work could be so planned as to avoid this added expense in connection with the telephone wires to be installed initially.

8. Since the number of poles per mile used by power and telephone companies on their normal separate line construction may differ, and since many of the cost items mentioned in the preceding can best be compared on a unit length of line basis, it is convenient to make cost comparisons on the basis of annual charges per mile. This permits the direct inclusion in the comparison of the annual cost of recurrent trimming where this item is of importance.

9. There is likely to be more costly damage and greater delay in clearing trouble due to storms when power and telephone wires are attached to the same poles. However, it was not practicable to arrive at a suitable valuation of this item.

With these factors considered, the studies of the Subcommittee have led to the conclusion that, in general, joint use in sparsely settled rural areas may offer opportunities for dollar economies. These opportunities for dollar economies are, of course, greatest where new joint lines are constructed. Where existing power lines are to be rearranged for joint use opportunities for dollar economies will be considerably reduced. Where existing rural telephone lines or existing rural power and telephone lines are involved, joint use, in general, offers no dollar economies but in some instances, may be the best engineering solution to specific problems.

Joint Use Arrangements in Rural Areas

The EEI-Bell System "Principles and Practices for the Joint Use of Wood Poles by Supply and Communication Companies" as issued by the Joint

General Committee in 1926 and reissued without change in 1945, has formed the basis for a large percentage of the more than 300 joint use agreements now in effect between power and telephone companies in the United States. These agreements have established general patterns as to form which are adaptable to the conditions obtaining primarily in urban and suburban areas. As affecting thinly settled rural areas, a sufficient number of agreements have not so far been executed to establish a general pattern for such specific joint use. However, it is believed that the first sentence of Item 2 of the EEI-Bell System Practices referred to above should form a reasonable basis for joint use arrangements in rural areas. This sentence is as follows: "Joint Use Agreement should preferably be of a type under which each of the parties shares equitably in the cost of joint poles."

Recommendations

In completing its assignments, the Subcommittee makes the following recommendations:

1. That this report be issued to the power and telephone companies as a Subcommittee Report.

2. That consideration be given to combining trial Part 5 covering long span joint construction, with the Joint Pole Practices and that in this connection, consideration also be given to such of the recommendations contained in Provisional Report No. 32 of the Joint Subcommittee on Development and Research entitled "Factors Which Influence Pole Height in the Rural Joint Use of Poles" as are mutually acceptable.

3. That work be continued through appropriate channels with the objective of promoting safety and economy in joint use.

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EXHIBIT WA-30.1

WA Exhibit No. 30.1 - APPA Rental Rate Calculation
Blue Ridge EMC
FY 2014 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Unusable Space	30.63	Calculation-Includes Safety Space
3	Unusable Space Factor	35.39%	Line 2 / Line 6 / Line 7
4	Usable Space	6.2	(Pole Height - Unusable)
5	Usable Space Factor	3.01%	(Line 1 / Line 4) x (Line 4 / Line 6)
6	Pole Height	36.83	Calculated with CPR Detail
7	Number of Attachers	2.35	Calculated using GIS data
8	**Attacher responsibility percentage**	**38.40%**	**Line 3 plus Line 5**
	Gross Cost of a Bare Pole		
9	Gross pole investment (Acct. 364)	49,295,043	
10	Appurtenance factor	87.00%	
11	Gross pole investment allocable to attachments	42,886,688	Line 9 x Line 10
12	Total number of poles	107,751	
13	**Gross cost of a bare pole**	**$398.02**	**Line 11/Line 12**
	Gross Carrying Charge		
14	Total general and administrative	10,164,119	
15	Total electric plant in service	425,883,764	
16	**Administrative carrying charge**	**2.39%**	**Line 14 / Line 15**
17	Maintenance expense for overhead lines	7,674,619	
18	Pole investment in Accts. 364, 365, & 369	158,218,973	
19	**Maintenance carrying charge**	**4.85%**	**Line 17 / Line 18**
20	Depreciation rate for gross pole investment	3.60%	
21	**Depreciation carrying charge**	**3.60%**	**Line 20**
22	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	2,160,782	
23	Total utility plant in service	425,883,764	
24	**Taxes carrying charge**	**0.51%**	**Line 22 / Line 23**
25	Applicable rate of return (default)	11.25%	Presumption
26	Gross Pole Investment	$ 49,295,043.19	Line 9
27	Net Pole Investment	$ 32,539,753.16	
28	**Return carrying charge**	**7.43%**	**(Line 25 x Line 26) / Line 27**
29	**Total carrying charges**	**18.77%**	**Line 16 + Line 19 + Line 21 + Line 24 + Line 28**
	RATE		
30	**Attacher responsibility percentage**	**38.40%**	**Line 8**
31	**Gross cost of a bare pole**	**$398.02**	**Line 13**
32	**Total carrying charges**	**18.77%**	**Line 29**
33	**Pole attachment rental rate**	**28.69**	**Line 30 x Line 31 x Line 32**

EXHIBIT WA-30.2

WA Exhibit No. 30.2 - APPA Rental Rate Calculation
Blue Ridge EMC
FY 2015 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Unusable Space	30.61	Calculation-Includes Safety Space
3	Unusable Space Factor	35.35%	Line 2 / Line 6 / Line 7
4	Usable Space	6.24	(Pole Height - Unusable)
5	Usable Space Factor	3.01%	(Line 1 / Line 4) x (Line 4 / Line 6)
6	Pole Height	36.85	Calculated with CPR Detail
7	Number of Attachers	2.35	Calculated using GIS data
8	**Attacher responsibility percentage**	**38.36%**	**Line 3 plus Line 5**
	Gross Cost of a Bare Pole		
9	Gross pole investment (Acct. 364)	50,390,546	
10	Appurtenance factor	87.29%	
11	Gross pole investment allocable to attachments	43,984,989	Line 9 x Line 10
12	Total number of poles	108,086	
13	**Gross cost of a bare pole**	**$406.94**	Line 11/Line 12
	Gross Carrying Charge		
14	Total general and administrative	9,870,339	
15	Total electric plant in service	440,866,858	
16	**Administrative carrying charge**	**2.24%**	Line 14 / Line 15
17	Maintenance expense for overhead lines	7,951,569	
18	Pole investment in Accts. 364, 365, & 369	164,546,374	
19	**Maintenance carrying charge**	**4.83%**	Line 17 / Line 18
20	Depreciation rate for gross pole investment	3.60%	
21	**Depreciation carrying charge**	**3.60%**	Line 20
22	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,477,001	
23	Total utility plant in service	440,866,858	
24	**Taxes carrying charge**	**0.34%**	Line 22 / Line 23
25	Applicable rate of return (default)	11.25%	Presumption
26	Gross Pole Investment	$ 50,390,545.70	Line 9
27	Net Pole Investment	$ 32,466,328.65	
28	**Return carrying charge**	**7.25%**	(Line 25 x Line 26) / Line 27
29	**Total carrying charges**	**18.25%**	Line 16 + Line 19 + Line 21 + Line 24 + Line 28
	RATE		
30	**Attacher responsibility percentage**	**38.36%**	Line 8
31	**Gross cost of a bare pole**	**$406.94**	Line 13
32	**Total carrying charges**	**18.25%**	Line 29
33	Pole attachment rental rate	**28.50**	Line 30 x Line 31 x Line 32

EXHIBIT WA-30.3

WA Exhibit No. 30.3 - APPA Rental Rate Calculation
Blue Ridge EMC
FY 2016 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Unusable Space	30.59	Calculation-Includes Safety Space
3	Unusable Space Factor	35.31%	Line 2 / Line 6 / Line 7
4	Usable Space	6.28	(Pole Height - Unusable)
5	Usable Space Factor	3.01%	(Line 1 / Line 4) x (Line 4 / Line 6)
6	Pole Height	36.87	Calculated with CPR Detail
7	Number of Attachers	2.35	Calculated using GIS data
8	**Attacher responsibility percentage**	**38.32%**	**Line 3 plus Line 5**
	Gross Cost of a Bare Pole		
9	Gross pole investment (Acct. 364)	51,209,182	
10	Appurtenance factor	87.41%	
11	Gross pole investment allocable to attachments	44,762,968	Line 9 x Line 10
12	Total number of poles	108,330	
13	**Gross cost of a bare pole**	**$413.21**	Line 11/Line 12
	Gross Carrying Charge		
14	Total general and administrative	9,666,925	
15	Total electric plant in service	454,916,323	
16	**Administrative carrying charge**	**2.12%**	Line 14 / Line 15
17	Maintenance expense for overhead lines	8,486,535	
18	Pole investment in Accts. 364, 365, & 369	168,093,587	
19	**Maintenance carrying charge**	**5.05%**	Line 17 / Line 18
20	Depreciation rate for gross pole Investment	3.60%	
21	**Depreciation carrying charge**	**3.60%**	Line 20
22	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,698,970	
23	Total utility plant in service	454,916,323	
24	**Taxes carrying charge**	**0.37%**	Line 22 / Line 23
25	Applicable rate of return (default)	11.00%	Presumption
26	Gross Pole Investment	$ 51,209,181.87	Line 9
27	Net Pole Investment	$ 32,011,587.29	
28	**Return carrying charge**	**6.88%**	(Line 25 x Line 26) / Line 27
29	**Total carrying charges**	**18.02%**	Line 16 + Line 19 + Line 21 + Line 24 + Line 28
	RATE		
30	**Attacher responsibility percentage**	**38.32%**	Line 8
31	**Gross cost of a bare pole**	**$413.21**	Line 13
32	**Total carrying charges**	**18.02%**	Line 29
33	Pole attachment rental rate	**28.54**	Line 30 x Line 31 x Line 32

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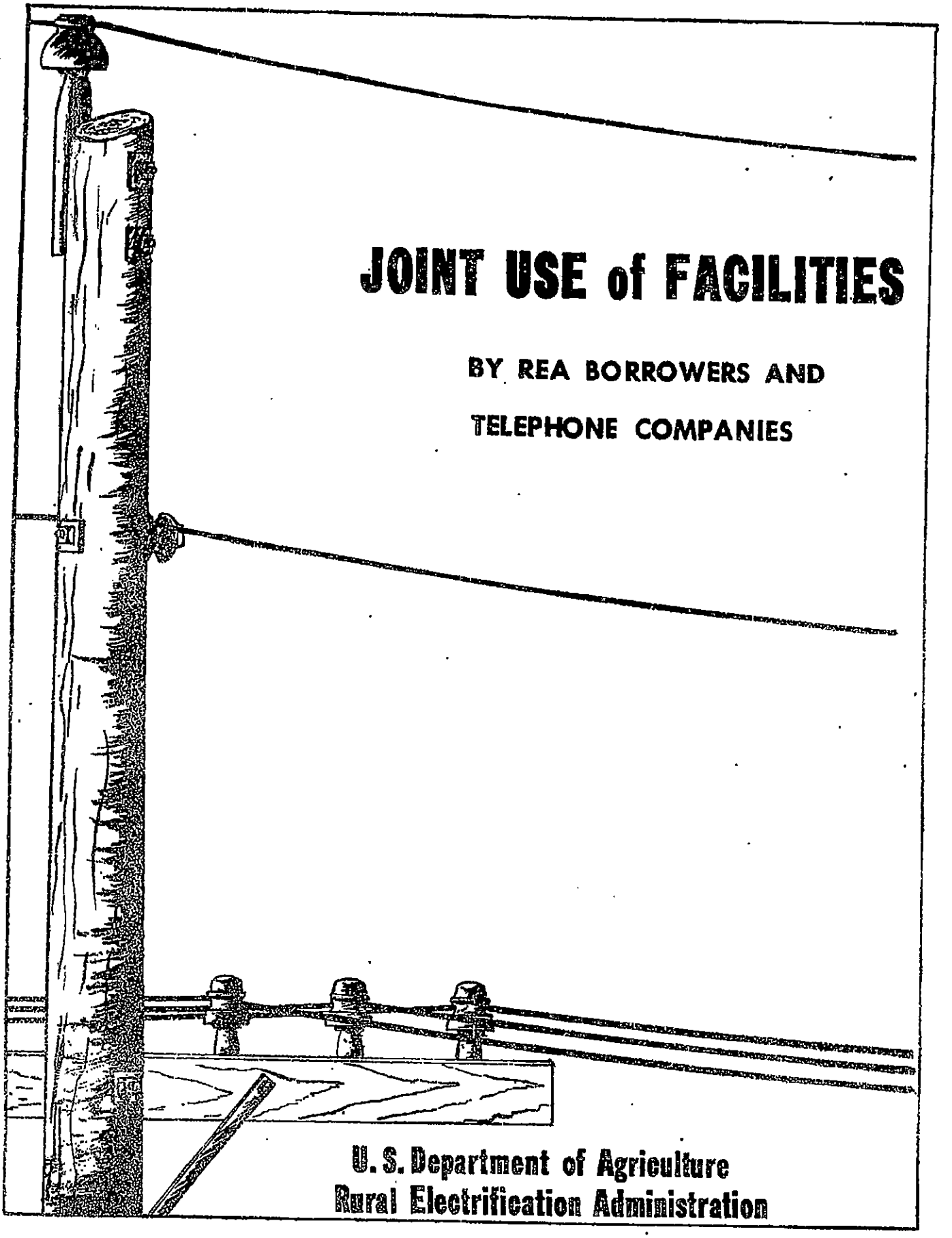
EXHIBIT WA-31



JOINT USE of FACILITIES

BY REA BORROWERS AND TELEPHONE COMPANIES

U. S. Department of Agriculture
Rural Electrification Administration

CONSIDERATIONS INVOLVED IN JOINT USE OF FACILITIES BY REA BORROWERS AND TELEPHONE COMPANIES

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CONSIDERATIONS INVOLVED IN JOINT USE OF FACILITIES BY REA BORROWERS AND TELEPHONE COMPANIES

Introduction

Joint use of facilities by power and telephone systems has been found to be feasible in rural areas with the development of high strength telephone wires that can match rural power line spans and the development of generally accepted construction standards and safety devices to minimize any possible hazards. The power line carrier telephone system, wherein the power wires act as guides for carrier radio waves, is another recent development having application in rural areas.

Joint use raises for REA borrowers questions of policy with respect to (1) protecting and advancing the interests of their members in connection with telephone rates and area coverage, (2) uniform relations with local telephone companies in their areas that may include mutuals, independents and members of the Bell Telephone System, and (3) development of engineering, construction and operating practices in cooperation with the local telephone companies that will make joint use an asset to all. Joint use raises for REA questions with respect to use of loan funds and protection of the Government's interests in borrowers' systems as they may be affected by joint use arrangements.

The joint use contract forms, copies of which were distributed to all borrowers with the Administrator's memorandum of July 3, 1947, were designed to include desirable legal, business and technical factors to provide adequate protection for REA borrowers and to establish a practical working framework for relations between REA borrowers and their local telephone companies when they wish to engage in joint use of facilities.

I. Objective of Joint Use of Facilities

The primary objective of joint use of facilities is to achieve savings in cost by eliminating one pole line. Elimination of structural conflicts as well as local regulations may also require or make joint use desirable.

The costs as well as the savings of joint use construction should be shared equitably by the power and telephone suppliers. Where the savings are appreciable, it can well mean that both services can be extended into areas where construction might not otherwise be economically feasible. Therefore, even though power system poles are already in place and can accommodate telephone facilities with little, if any, extra cost, telephone companies should be required to make payments representing their fair share of the costs of the poles so that savings can accrue to the consumers of electricity as well as to the telephone subscribers. In other words, the power consumers should not be asked to subsidize telephone subscribers.

II. REA Financing as Related to Joint Use Facilities

As a general rule, an REA borrower should not invest REA loan funds in joint use facilities in a given area to a greater extent than would have been required to provide facilities capable of rendering electric service alone in the same given area. This will raise no serious problem since the pole sizes in common use by REA borrowers are capable of accommodating certain telephone facilities and the contracts provide that the telephone companies shall pay any additional capital outlays required as well as rentals for the benefits they secure from the use of REA borrowers' poles and wires. Moreover, since telephone companies may also set and own joint use poles, an REA borrower should actually have a lesser investment in pole plant than would be required for separate line construction considering an area as a whole.

III. Telephone Company Qualifications

The sample forms of contracts and the recommended payments contained therein are predicated on the assumption that the telephone supplier is fully competent to carry its part of responsibility and that the REA borrower will not be put to any additional expense by reason of the telephone supplier's lack of knowledge or competence. Therefore, REA borrowers, before entering joint use agreements, should satisfy themselves that:

A. the telephone company concerned is a financially responsible organization which is fully capable of bearing its proper share of the costs and responsibilities for any possible hazards.

B. the telephone company has available a qualified engineering and construction force to assure that its facilities on joint use lines will be installed in accordance with accepted construction standards and safety practices.

C. the telephone company has a maintenance and operations force capable, where necessary, of maintaining its own facilities when installed jointly with power lines.

IV. Insurance

The contract forms have no clauses concerning insurance coverage on the assumption that each party will carry its usual insurance and that in the event of any claims, liability will be assessed according to the legal responsibility that is determined.

REA borrowers should satisfy themselves that the local telephone companies with which they share joint use facilities either

A. provide adequate reserves for insurance, or

B. carry adequate insurance policies.

The Bell Telephone System, for example, is self insured and sets aside reserves against losses. However, smaller telephone companies should be required to have liability insurance coverage comparable to that carried by REA borrowers.

V. Safety

It cannot be too strongly emphasized that proper precautions should be taken in joint use construction to minimize possible hazards to both telephone and power linemen as well as to consumers. Adequate standards of safety can be established by observation of the proper construction, maintenance and safety practices and installation of power and telephone protective devices. The telephone companies should be held completely responsible for installation and operation of their own facilities (except as otherwise provided for carrier telephone facilities) and borrowers who find it necessary to advise their local telephone companies on proper construction and safety practices would be best advised themselves not to engage in joint use construction with such companies in view of the risks and costs involved.

All wires and appurtenances on joint use poles should be treated as hot when performing line work.

VI. Description of Contracts

A. Power Line Carrier Facilities, REA Form DS-209.
The highlights of this form of contract are

1. The telephone company is given the right to transmit communications over the power lines at frequencies in the 150-500 KC band, but there is to be no interference with the use of frequencies by the REA borrower outside that band.

2. The telephone company is given the right to have attached to the power lines and poles such equipment as is necessary to provide for carrier telephone service. All such equipment is furnished or paid for by and remains the property of the telephone company but for safety reasons most installation and maintenance of equipment installed on power system facilities is to be performed by the REA borrower in behalf of the telephone company.

3. The telephone company will reimburse the REA borrower for all expenses incurred to accommodate the telephone facilities and will pay an annual fee for each pole on which telephone equipment is installed. To simplify billing, unit telephone equipment assemblies have been established and uniform telephone company payments for installation, removal and maintenance work performed by the REA borrower in connection with such units have been suggested in Exhibit B. These payments make allowance for average labor, material, transportation and overhead costs. If experience discloses that they vary too greatly from actual costs in any particular area, either party may request a revision annually.

The annual charge of $1.00 for each pole of the REA borrower upon which the telephone company has attachments amounts to a leasing fee. The fee of

$1.00 is purely nominal in view of the fact that there is no experience with the actual operation of carrier telephone systems on which there could be based an exact determination of any cost savings of this method of providing telephone service that might be shared between the telephone company and REA borrower.

Power consumption payments are based on estimates of the average power losses caused by the various types of telephone company equipment connected to or inserted in the power lines. The maintenance visit payment has been established to cover any work done by the Cooperative on any specific request from the Telephone Company. It is anticipated that maintenance jobs generally will involve single locations and that the work can be done in a single visit. The largest part of the cost of the maintenance visit is in travel time and motor vehicle expense, whether the trip involves replacement of a capacitor fuse or complete replacement of an isolating choke assembly.

4. If work is to be performed by the REA borrower on behalf of the telephone company that is not covered by the unit assemblies and costs set forth in

Exhibit B, additional reimbursement should be agreed upon. This would include, for example, replacement of poles or the initial installation of poles of greater height or class to accommodate the telephone company.

5. The contract term is 5 years and thereafter until terminated by 1 year's notice by either party.

6. All construction must be in accordance with the National Electrical Safety Code. The specifications and schematics of Exhibit A are illustrative only. A separate document entitled "CONSIDERATIONS OF MUTUAL INTEREST TO REA BORROWERS AND TELEPHONE COMPANIES IN INSTALLING AND MAINTAINING EQUIPMENT USED FOR CARRIER TELEPHONE SERVICE" is attached, dated July 9, 1947. This document provides installation drawings and engineering information that can be readily changed when justified without necessitating changes in the basic contract.

B. General Agreement for Joint Use of Wood Poles, REA Form DS-210.

This form of contract is intended to be used in areas where widespread joint use of facilities is contemplated to achieve savings in pole plant costs. This form of

contract provides that:

1. Each party may own joint use poles and license the other to make attachments thereto.

2. Each party reserves the right to exclude any of its facilities from joint use.

3. Each party is responsible for the installation and maintenance of its own facilities on the joint poles. The owner is to maintain its poles.

4. The owner will install a normal joint pole, as defined, which is suggested as a 35-foot, class 6 pole for new construction. If a pole of greater height and class than normal is required, the additional investment in excess of the cost of a normal pole is paid by the party requiring it. A shorter or lighter pole than normal may be installed by mutual agreement when suitable for specific locations.

   NOTE: Class 6 is the suggested strength for a normal pole on the assumption that the normal pole will carry the usual single-phase power circuit plus four (4) telephone wires.

5. Where existing poles must be replaced to make them suitable for joint use, the owner will set new normal poles and assume the cost of transferring its own facilities to the new poles. The licensee will pay the owner the value in place of the replaced poles, plus the cost of removal less salvage, as provided in Article VIII and Appendix A of the contract. If poles more costly than normal poles are required to meet the licensee's needs, the licensee will also pay the excess costs. In addition, where an existing pole must be replaced to accommodate the licensee's service drop, the licensee will also pay the owner the difference between the cost of the new pole and a new pole of the same size as the replaced pole. Appendix A of the contract establishes tables of costs to permit ready calculation of payments due.

6. When poles must be erected between existing poles to make a line suitable for joint use, they will be erected at the sole expense of the licensee but will be the property of the owner. Each party will install its own attachments to such poles.

7. The licensee will pay a standard annual rental fee per pole to the owner for the privilege of occupying joint poles. Poles used for the sole

purpose of providing clearance between the facilities of the two parties, such as secondaries and services, are not considered as joint poles and are not subject to rental fees. To simplify agreement on whether a pole provides clearance or support, the following interpretation is suggested. Where individual services of either party (secondaries for the REA borrower and service wires for the telephone company) are involved, single pole crossover attachments shall be treated as clearance attachments under the provisions of Article VIII without regard to any support which may be supplied by the crossing pole. The term "service wires" for the telephone company means a service to a single subscriber which may consist of either insulated or open wire conductors.

The fees suggested in Appendix B of the contract are designed to reflect and share the savings in cost realized by joint use of poles. The fees are based on average costs per mile of separate and joint pole lines in various sections of the country and make allowance for costs to the owner and licensee of modifying existing line to allow joint use, as well as making allowance for extra costs to the licensee of making arrangements to occupy joint poles.

The rental fees payable by REA borrowers to telephone companies are higher than those they receive because rural telephone systems ordinarily employ smaller poles than power lines and incur a larger increase in cost than power systems in supplying poles suitable for rural joint use. The rental fees may be adjusted by mutual agreement at any time after 5 years from the signing of the contract and at subsequent intervals of not less than 5 years.

8. The first page of Appendix B is self-explanatory in its description of the basic principles followed in arriving at the rental payments suggested in Appendix B. While the telephone cost figures employed were those appropriate to Bell System Companies, the same principles can be used for determining equitable rental payments for joint use with any telephone company.

The following example of rental calculations will illustrate the method utilized in arriving at the suggested payments in Appendix B:

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Sample Calculations of Telephone Company Rental Payment to REA Borrower

Separate rural telephone pole line (Note 1)	$350 per mile
Separate rural power pole line (Note 1)	$450 per mile
Sum of separate pole line costs	$800 per mile
Power System owned pole line suitable for joint use	$540 per mile
Added Telephone Company costs on joint line (Note 2)	$100 per mile
Added Power System costs on joint line (Note 3)	$ 10 per mile
Total	$650 per mile
Total Savings to both organizations $800 - $650	$150 per mile
Telephone Company's share of savings based on respective cost of separate lines: $\frac{350}{800}$ or 44% (Note 4)	$ 66 per mile
Assumed annual charge (Note 5)	10%

Tel. Rent per mile	Equals	Annual charge saved by Tel. Co. through not having to build a separate line	Less	Telephone Company's share	of	Total savings in annual charges
Tel. Rent per mile	Equals	10% of ($350-100)	Less	44%	of	10% of $150
Tel. Rent per mile	Equals	$25.00	Less	$6.60	Equals	$18.40

At 14 poles per mile, the rental payment is $\frac{\$18.40}{14}$ Equals approximately $1.30 per pole.

Note 1: Per mile costs are those of bare poles in place, including right-of-way, clearing, engineering and overhead in addition to direct installation labor and material costs. Such costs will be mutually agreed upon when joint use contract is executed.

Note 2: Includes such factors as:

(1) Allowance for Telephone Company's share of costs for additional poles (if required) for Telephone Company's benefit

(2) Allowance for additional cost of stringing telephone wire under energized power circuits

(3) Additional protection features (99A and 104A protectors) on telephone circuits

(4) Allowance for engineering and survey costs.

Note 3: Includes only item (2) of Note 7.

Note 4: An average value of 45% was used in the agreement form.

Note 5: No specific annual charge is fixed in the agreement. In the negotiations with the Bell System, a range of annual charges was considered as well as the appropriateness of a differential between the annual charges that apply to telephone company and REA borrower operations. However, the use of 10% results in rentals approximately equivalent to those in the agreed upon table in Appendix B of the contract form.

Note 6: Includes only item (3) of Note 2

Sample Calculations of REA Borrower Rental Payment to Telephone Company.

Separate rural telephone pole line	$350 per mile
Separate rural power pole line	$450 per mile
Sum of separate pole line costs	$800 per mile
Telephone Company owned pole line suitable for joint use	$540 per mile
Added Telephone Company costs on joint line (Note 6)	$ 20 per mile
Added Power System costs on joint line (Note 7)	$ 90 per mile
Total	$650 per mile
Total Savings to both organizations $800 - $650	$150 per mile
Power System share of savings based on respective cost of separate lines: $\frac{\$450}{\$800}$ or 56% (Note 8)	$ 84 per mile
Assumed annual charge (Note 5)	10%

Power System Rent per mile	Equals	Annual charge saved by Power System through not having to build a separate line	Less	Power System's share	of	Total savings in annual charges
Power System Rent per mile	Equals	10% of ($450-90)	Less	56%	of	10% of $150
Power System Rent per mile	Equals	$36.00	Less	$8.40	Equals	$27.60

At 14 poles per mile, the rental payment is $\frac{\$27.60}{14}$ Equals approximately $2.00 per pole.

Note 7: Includes such factors as:

(1) Allowance for additional cost of placing facilities over telephone wires

(2) Attachments on additional poles

(3) Allowance for engineering and survey costs.

Note 8: An average value of 55% was used in the agreement form.

9. The contract term is 25 years and thereafter until terminated by 3 years' notice by either party.

C. Application -- Permit for Joint Use of Poles, REA Form DS-211.

This form of contract was developed for use where widespread joint use of poles is not contemplated. It will find use in such cases as the elimination of structural difficulties that may arise at crossing points or when common occupancy of a few poles on one side of a highway is necessary. It is also a convenient means of recording those poles that are in joint use. This form of contract provides that:

1. The licensee shall reimburse the owner for any work necessary to make poles suitable for joint occupancy.

2. A nominal fee of $1.00 per pole is established as the annual rental. No differential in rental fees payable

by telephone companies and REA borrowers is warranted here since the owner is reimbursed at the outset for any extra costs.

3. No rental fee is payable for clearance attachments of service drops of either party.

4. The owner may revoke the attachment permit on 60 days' notice and the licensee may terminate the permit on 30 days' notice.

VII. Procedure for Executing Contracts

The contract forms for Power Line Carrier Facilities, Form DS-209, and for Joint Use of Wood Poles, Form DS-210, provide for approval by the Administrator of REA. In accordance with the usual procedures, three copies of a contract signed by the parties thereto should be forwarded to the Engineering Division of REA. Two approved copies will be returned to the borrower, one for the borrower's files and one for the telephone company. If an officer other than the President or Vice-President of a telephone company signs the contract, evidence of the officer's authorization to sign on behalf of the company should be attached unless otherwise filed with REA.

The form of Application-Permit for Joint Use of Specific Poles, Form DS-211, does not call for submission to REA for approval and will be subject only to review in the field by the Engineering Division.

Under the contracts for Power Line Carrier Facilities, Form DS-209, and for Joint Use of Wood Poles, Form DS-210, a specific request and authorization must be made each time it is desired to make attachments to poles and wires. The REA borrower and telephone company should establish procedures complementary to the contracts for establishing working relationships.

VIII. Construction Standards

Any type of joint use of poles should conform to the requirements of the National Electrical Safety Code except as the requirements of local authority may be more stringent.

1. For power line carrier installations, installation drawings and other engineering information are supplied in the attached document dated July 9, 1947, and entitled "Considerations of Mutual Interest to REA Borrowers and Telephone Companies in Installing and Maintaining Equipment Used for Carrier Telephone Service."

2. For joint use of poles, suggested standards based on the National Electrical Safety Code are contained in E.E.I. Publication No. M12, "Joint Pole Practices for Supply and Communication Circuits" and Part 5 thereof entitled "Special Considerations for Long Span Joint

Use." These are available from Bell System companies and from the Edison Electric Institute, 420 Lexington Avenue, New York 17, N. Y., at a price of $1.25.

IX. Billing and Accounting

Exhibit B of the agreement form for Power Line Carrier Facilities, REA Form DS-209, and Appendix A of the agreement form for Joint Use of Wood Poles, REA Form DS-210, are designed to simplify and expedite the billing procedures for amounts that may be due the owner from the licensee for work done to make facilities suitable for joint use. Any cost figures or values that are left blank in the sample forms should be supplied from locally applicable data. Thus, the billing for work to be done in modifying existing lines can be predetermined and differences of opinion with respect to the charges in individual cases can be minimized. On the average, billings should approximate actual costs even though individual cases may show wide differences.

The internal accounting of REA borrowers need not be complicated by the billing procedures established under the joint use contracts and should be undertaken in the usual manner to reflect actual costs as closely as is warranted.

A. Accounting for Changes in Plant

All changes in size or location of poles owned by REA cooperatives should be handled

for accounting purposes in accordance with the Manual of Work Order Procedure and Related Instructions. Thus, if a pole is removed and replaced, a retirement and construction work order should be prepared and cost recorded in the appropriate work in progress account in the usual manner. Amounts to be received from the telephone companies in accordance with the terms of the contracts are to be based on the costs as agreed upon in the contracts and will not, therefore, be the same costs as reflected on construction and retirement work orders. Any payments received from the telephone companies in connection with plant changes should be credited to Account 144, Retirement Work in Progress. If the amount received is more than sufficient to cover any balance in this account because of such charges, the difference should be debited to Account 144 and credited to Account 265.1/393, Donations in Aid of Construction.

B. Accounting for Revenues and Expenses

1. Telephone Company Rental Payments.

Revenues to be received from the telephone company for pole rentals should be credited

to Account 610, Rent from Electric Property and charged to Account 125.2, Other Accounts Receivable. The contract provisions dealing with rental payments require that a complete record be kept of all poles of either party which are in joint use; that any rentals to be billed shall be on a yearly basis according to the number of joint poles in use on the day preceding the specified billing date. The rent per pole will be in accordance with the contract appendices. Payments by borrowers for taxes and assessments on their own property should normally be charged to appropriate tax expense.

2. Installation and Maintenance Work for Telephone Companies.

All revenues and expenses involved in installation, repair or maintenance of the telephone company's attachments to poles, or for other work done for the telephone company on a reimbursable basis as provided for in the contracts, should be included in appropriate separate subaccounts of 520.1 and 520.2. Charges to telephone companies for maintenance service should be debited to Account 125.2, Other Accounts Receivable, when the credit to Account 520.1 is recorded.

3. Energy Sales.

Amounts to be received from the telephone company for electric energy consumed in connection with carrier service should be credited to Account 608, Other Electric Service, and charged to Account 125.2, Other Accounts Receivable.

4. Payments to Telephone Companies.

Payments to a telephone company for rental of its poles or for its plant changes necessitated because of the joint use agreement are to be charged to the appropriate rent expense account, namely, 776, Rents. Payments to telephone companies for tree trimming and other normal operating or maintenance work done by them for a borrower should be charged to appropriate expense accounts.

C. Capital Credits

Any revenues received as pole rentals or for electric energy losses in connection with carrier service should not be included in the base for patronage capital distribution.

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UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION
WASHINGTON 25, D. C.

September 1, 1950

To : All REA Borrowers

From : George W. Haggard, Deputy Administrator

Subject: Joint Use of Borrowers' Wood Poles by Telephone Systems
Requirement of REA Approval
Use of REA Form DS-211

Under date of July 3, 1947, there were transmitted to all REA borrowers sample forms of contracts covering joint-use arrangements with telephone companies. At the same time, a bulletin entitled "Joint Use of Facilities by REA Borrowers and Telephone Companies" was circulated. This bulletin describes the contract forms and their use and purpose in detail. On December 22, 1949, there was transmitted to all REA borrowers a memorandum relating to the joint-use arrangements and suggesting forms of amendments of the joint-use contracts to effectuate area coverage telephone service.

Forms DS-209 and DS-210, as amended to include area-coverage provisions, are the contract forms to be employed for joint-use arrangements which are entered into for the purpose of permitting use by telephone companies of REA-financed facilities to furnish subscriber telephone service. These forms require REA approval before they become effective. This requirement is imposed pursuant to the provisions of REA security documents in which borrowers agree not to enter into contracts for the use by others of any of their property without REA approval.

There have come to REA's attention numerous instances where joint-use contacts have been made by telephone companies for subscriber telephone service without proper authorization and approval. In some cases, such contacts have been made without authorization by the borrower; in others, upon oral authorization, or by written permission but not by contract on Form DS-209 or Form DS-210, or pursuant to contract on Form DS-209 or Form DS-210 but without REA approval, or by permit on Form DS-211. All such contacts made for subscriber telephone service must be considered unauthorized except where made pursuant to a properly executed and approved contract or a contract entered into by the predecessor owner of systems or facilities acquired by an REA borrower.

There appears to be some misunderstanding of the use and purpose of Form DS-211. Some borrowers have used this form to permit pole contacts on their systems by telephone companies for subscriber telephone service. Form DS-211 is not intended and should not be used for this purpose. As stated in the bulletin on "Joint Use of Facilities by REA Borrowers and

Telephone Companies" (p. 16) it is intended for use in such cases "as the elimination of structural difficulties that may arise at crossing points or when common occupancy of a few poles on one side of a highway is necessary." This permit form prescribes only a nominal rental fee since it contemplates reimbursement of the owner of the poles for costs involved in rearrangements, etc., required for the joint use.

A survey is now being conducted by the REA Engineering Division to determine the extent to which joint use is practiced and to appraise its usefulness and effectiveness. Reports already received show cases of unauthorized attachment, including many in which Form DS-211 was improperly employed instead of Form DS-210 which requires REA approval. This practice should be discontinued forthwith as it has resulted in the assumption by REA-financed systems, in some instances, of costs which would have been borne by the telephone system if the proper contract form had been used.

Borrowers which have improperly used Form DS-211 for joint use for subscriber telephone service, or where facilities have been contacted without authorization, should wherever possible negotiate a joint-use agreement on the appropriate form, Form DS-210, with the area-coverage amendment, submit it to REA for approval, and arrange for reimbursement by the telephone company involved of any expenditures incurred by the REA borrower in connection with joint use which would have been charged to the telephone company if the proper form of contract had been employed at the outset. It should be noted that the permits granted under Form DS-211 are revocable at any time upon 60 days' notice by the owner of the facilities.

It is recognized that joint-use arrangements properly entered into can effect economies which can be equitably shared and can contribute toward the conservation of materials and manpower which are so urgently needed today. However, the disadvantages and burdens which are entailed by improper joint-use agreements which do not provide for the equitable sharing of benefits and which do not assure telephone service to the widest practicable number of rural users, far outweigh the advantages. For this reason strict adherence to the principles which have been established for such arrangements is indicated.

The cooperation of all REA borrowers is solicited for the field engineers who are now conducting joint-use field surveys.

George W Haggard

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION
WASHINGTON 25, D. C.

May 14, 1951

To: REA Borrowers

From: George W. Haggard, Acting Administrator

Subject: Joint Use of Wood Poles by Power and Telephone Systems: Area Coverage

a. General

By memorandum dated December 22, 1949, REA imposed as a condition of its approval of joint-use contracts the inclusion of amendments designed to assure the availability of adequate telephone service to the widest practicable number of users of such service. This memorandum is issued to clarify several points as to the area-coverage requirement in connection with joint use of wood poles. It also furnishes an alternative form of amendment to Form DS-210 which may be used instead of the amendment appearing in the December 22, 1949 memorandum.

b. Borrower's Responsibility Regarding Joint Use

It is initially the borrower's responsibility, as owner of the electric system, to determine whether or not it desires to enter into a joint-use agreement. In making the decision, due consideration should be given to the following important factors:

1. Is joint use generally in the best interests of all of the member-owners of the electric system?

2. Do the economic benefits at least equal or exceed the additional costs incurred under the joint-use agreement?

3. Will the agreement actually result in an appreciable increase in telephone service in the area, without avoidable discrimination against some member-owners?

4. Will the economic benefits and increased telephone service justify the additional safety hazards to electric system personnel involved in maintenance and operation of jointly used facilities?

5. Will the economic and telephone service benefits justify the additional physical burden on the electrical facilities and the hazards of sleet and ice which may be multiplied by the addition of telephone circuits?

Once a decision is made by an electrical borrower to enter into a joint-use agreement, it must be submitted to REA for approval before becoming effective.

c. Situations Where the Area-Coverage Amendments Are Not Required

Area-coverage amendments need not be incorporated in agreements which have already been approved by REA or in agreements for joint use in special situations not involving telephone service to additional subscribers. Examples of such special situations are as follows:

1. Joint use on facilities specially constructed for service to telephone installations, such as to radio relay towers, repeater stations, etc.

2. Joint use required because of necessity for relocating a power or telephone line, or both, due to highway widening or relocation.

3. Joint use required by structural conflicts or where common occupancy of more than a few poles on one side of a highway is involved. (Form DS-211 is to be used where occupancy of only a few poles is involved.)

Joint use in such cases as these may be covered by a special form of agreement which will contain the terms agreed upon or by an appropriate adaptation of one of the present joint-use forms. In any case, the agreement should be restricted to the specific joint use and to the specific electric facilities involved, the location of which should be shown on a map or sketch attached to the agreement as an exhibit. Where appropriate, the existing situation should be shown as well as the changes covered by the agreement, including the type of telephone facilities to be installed. For this purpose, a detail map of the portion of the electric system involved may be used. Joint-use agreements covering these special situations shall be submitted to REA for approval.

d. Situations Where the Area-Coverage Amendments Are Required

The area-coverage amendments set forth in our December 22, 1949 memorandum or in paragraph "c" of this memorandum are required in all cases where the joint-use agreement:

1. Was not approved by REA prior to October 28, 1949, the effective date of Public Law 423, amending the Rural Electrification Act of 1936; and

2. Involves the furnishing of local telephone service to additional subscribers.

Borrowers wishing to assure themselves of a systematic program of area-coverage telephone service throughout the common service area should continue to insist on the area-coverage amendment and procedures established in the December 22, 1949 memorandum as a condition to joint use of their wood poles by a telephone company. A copy of the December 1949 amendment to the DS-210 agreement is attached hereto.

Borrowers wishing to permit the use of their poles by a telephone company on a project-by-project basis may use the DS-210 form of agreement with the amendment of Articles IV and V described in paragraph "e" hereof.

e. Alternative Form of Area-Coverage Amendment Which May be Used in Place of December 1949 Amendments

Where the parties do not wish to use the December 1949 amendment and procedure, and where borrowers are willing to permit the use of their wood poles by a telephone company on a project-by-project basis, the form of amendment of Articles IV and V of the DS-210 agreement attached to this memorandum may be used.

The procedure established herein for initiating joint use in the area to be included in a particular telephone company project involves two distinct steps for each such project. First, the telephone company submits a map showing generally the territorial limits of the proposed project together with a written request conforming to Appendix C (attached hereto) for permission to use the borrower's poles. These must be submitted to REA for approval, accompanied by the borrower's recommendation. The second step is the submission by the telephone company to the borrower, upon completion of the project canvass and the engineering work, of detailed construction plans and drawings together with a map showing the final territorial limits of the project.

Where the final map, submitted to the borrower as part of the second step, varies substantially from the map submitted as part of the first step, the telephone company's request (conforming to Appendix C) should be resubmitted to REA for approval, accompanied by the borrower's recommendation. In such cases, the reason for the change in the project limits should be stated.

While no specific type of map is required to be submitted by the telephone company in connection with its request on the Appendix C form, the area covered by the request and its relationship to the borrower's entire service area should be clearly shown. The borrower's system map may be used for this purpose. The map should show the entire common service area of the parties, i.e., the telephone company's service area to the extent it is included within the borrower's service area, and the specific portion of the common service area covered by the telephone company's request.

Where these forms and procedures are employed, the borrower shall, in each instance when submitting the telephone company's request on the Appendix C form, or any revision thereof, together with the map or maps, to REA for approval, include a statement which:

1. Sets forth the circumstances under which a portion only of the borrower's service area was selected for the joint-use program.

2. Establishes that the proposed joint use is consistent with and will not bar development of area-coverage telephone service in adjoining areas.

3. Where the joint-use proposal represents the first step in a program which will ultimately be extended throughout the borrower's service area, presents all available information on the entire program.

4. Recommends approval by REA of the telephone company request.

All documents and information, both of the telephone company and of the borrower, should be submitted in triplicate.

f. Procedure for Executed Joint-Use Agreements Not Approved by REA

A number of executed agreements covering joint use of wood poles (Form DS-210) which were under consideration by REA on October 28, 1949, or which were received after that date without the area-coverage amendment, were returned to borrowers without REA approval with a recommendation that the amendment be added and the agreements resubmitted to REA for approval.

Borrowers still holding such agreements may, at their option:

1. Insist on the December 1949 area-coverage amendment and submit the agreements when the amendment is executed.

2. Resubmit the agreements with the May 1951 amendment executed, either with or without requests of the telephone company for permission to undertake joint use on a particular project.

3. Where joint use on wood poles has already been accomplished under an unapproved joint-use agreement, or without an agreement but in contemplation of the execution and approval of an agreement, the borrower should attempt to work out with the telephone company an area-coverage telephone service program covering the areas in which joint use has been accomplished. The May 1951 amendment and procedure may be used for this purpose. Until the joint-use agreement, as amended, and the telephone company's request for permission to use borrowers' wood poles, are approved by REA, no additional joint use should be permitted. In all cases where joint use was undertaken without approved contracts, borrowers should collect all rentals due and unpaid since the pole contacts were initially made.

It is of the utmost importance in all cases (i) that all pole contacts be recorded; (ii) that additional pole contacts, if any may be made, be permitted only upon compliance with the requirements of Articles IV and V that written application be made and written permission be given; and (iii) that REA approval be obtained where required.

Borrowers having special joint-use problems which do not appear to be covered by this memorandum should present a full statement thereof, together with their recommendation, to the Engineering Division.

Attachments

George W Haggard

Amendment to
REA Form DS-210
(12-49)

JOINT USE OF FACILITIES

RURAL ELECTRIC POWER SYSTEMS

TELEPHONE SYSTEMS

AMENDMENT TO FORM OF GENERAL AGREEMENT FOR JOINT USE OF POLES

The Cooperative and the Telephone Company agree that the following amendments shall be a part of the Agreement between the parties dated _____, 19____:

1. Add a new subsection, lettered "(c)," to Article I, reading as follows:

"(c) It is the intention of the parties that adequate telephone service shall be made available to the widest practicable number of rural users in the above territory. Exhibits 1 and 2, attached hereto and made part hereof, state the present programs of the Telephone Company and of the Cooperative, respectively, for extending telephone and electric service in the above territory during the first five years of this agreement, and show the general location and number of persons to be served and the estimated dates when they will be served. If required to carry out the foregoing intention of the parties, additional five-year programs for extending telephone and electric service in the above territory shall be furnished by each party to the other at least ninety (90) days prior to the expiration of the programs then in effect under the provisions of this section, and shall be identified as supplements to Exhibits 1 and 2."

2. Add a new subsection, lettered "(c)," to Article XIII, reading as follows:

"(c) Failure of either party for a period of ____ months to comply substantially with its current program for extending telephone or electric service, as set forth in Exhibits 1 and 2, or supplements thereto, shall, at the election of the other party, and after due notice thereof in writing, constitute a default under Section (a) of this Article."

Executed on the _____ day of _____ 19____.

_____

(Seal) By _____

ATTEST:

_____

_____

(Seal) By _____

ATTEST:

_____

Amendment to
REA Form DS-210
(5-51)

JOINT USE OF FACILITIES

RURAL ELECTRIC POWER SYSTEMS

TELEPHONE SYSTEMS

AMENDMENT TO FORM OF GENERAL AGREEMENT FOR JOINT USE OF WOOD POLES

The Cooperative and the Telephone Company agree that the following amendments shall be a part of the Agreement between the parties dated _____, 19 ___:

1. Amend Article IV to read as follows:

ARTICLE IV

ESTABLISHING JOINT USE OF EXISTING POLES

(a) Before the Telephone Company shall make use of the poles of the Cooperative under this Agreement, it shall request permission therefor in writing on the form attached hereto and identified as Appendix C, and shall comply with the procedure set forth in said Appendix C. During any period in which the Cooperative is a borrower from the Rural Electrification Administration, the Cooperative shall, before granting its permission for such use, submit the Telephone Company's request, and any revisions thereof, to the Administrator of the Rural Electrification Administration for written approval, together with the Cooperative's recommendation. The right of the Telephone Company as licensee to use such poles in accordance with the terms of its request and of this Agreement shall be conditioned upon such approval by the Administrator of the Rural Electrification Administration.

(b) Whenever either party desires to reserve space for its attachments on any pole owned by the other party, either as initial space or additional space on such pole, it shall make written application therefor, specifying the location of the poles in question, the amount of space desired on each pole, and the number and character of the circuits to be placed thereon. If, in the judgment of the owner, the poles are necessary for its own sole use, or joint use under the circumstances is undesirable, the owner shall have the right to reject the application. In any event, within a reasonable period after the receipt of such application the owner shall notify the applicant in writing whether the application is approved or rejected. Rights of the Telephone Company as licensee hereunder shall be conditioned upon compliance by the parties with the provisions of Section (a) of this Article. Upon receipt of notice from the owner that the application has been approved, and after the completion of any transferring or rearranging which is required to permit the attaching of the applicant's circuits on such poles, including any necessary pole replacements, the applicant shall have the right as licensee hereunder to use such space in accordance with the terms of the application and of this Agreement.

(c) Whenever any jointly used pole or any pole about to be so used under the provisions of this Agreement is insufficient in height or strength for

the existing attachments and for the proposed additional attachments thereon, the owner shall promptly replace such pole with a new pole of the necessary height and strength and shall make such other changes in the existing pole line in which such pole is included as the conditions may then require.

(d) Each party shall place, transfer and rearrange its own attachments, place guys to sustain any unbalanced loads caused by its attachments, and perform any tree trimming or cutting incidental thereto. Each party shall at all times execute such work promptly and in such manner as not to interfere with the service of the other party.

(e) The cost of establishing the joint use of existing poles, including the making of any necessary pole replacements, shall be borne by the parties hereto in the manner provided in Article VIII--Division of Costs.

2. Amend Article V to read as follows:

ARTICLE V

ESTABLISHING JOINT USE OF NEW POLES

(a) Whenever either party hereto requires new pole facilities for an additional pole line, an extension of an existing pole line, or in connection with the reconstruction of an existing pole line, it shall promptly notify the other party to that effect in writing (verbal notice subsequently confirmed in writing may be given in cases of emergency), stating the proposed location and character of the new poles and the character of circuits it intends to use thereon and indicating whether or not such pole facilities will be, in the estimation of the party proposing to construct the new pole facilities, susceptible of joint use. Within a reasonable period after the receipt of such notice, the other party shall reply in writing, stating whether it does, or does not, desire space on the said poles and, if it does desire space thereon, the character of the circuits it desires to use and the amount of space it wishes to reserve. If such other party requests space on the proposed new poles and if the character and number of its circuits and attachments are such that the party proposing to construct the new pole facilities does not consider joint use undesirable, then it shall erect poles suitable for such joint use, subject, however, to the provisions of Section (b) of this Article, and subject further to the condition that requests by the Telephone Company for space on proposed new poles of the Cooperative under this Agreement shall be made in writing on the form attached hereto and identified as Appendix C, and shall comply with the procedure set forth in said Appendix C. During any period in which the Cooperative is a borrower from the Rural Electrification Administration, the Cooperative shall, before granting its permission for such use, submit the Telephone Company's request, and any revisions thereof, to the Administrator of the Rural Electrification Administration for written approval, together with the Cooperative's recommendation. The right of the Telephone Company as licensee to use such poles in accordance with the terms of its request and of this Agreement shall be conditioned upon such approval by the Administrator of the Rural Electrification Administration. The applicant for space on the poles shall be promptly notified in writing of the action taken on the application.

(b) In any case where the parties hereto shall conclude arrangements for the joint use of any new poles to be erected, and the party proposing to

construct the new pole facilities already owns more than its proportionate share of joint poles, the parties shall take into consideration the desirability of having the new pole facilities owned by the party owning less than its proportionate share of joint poles so as to work towards such a division of ownership of the joint poles that neither party shall be obligated to pay to the other any rentals because of their respective use of joint poles owned by the other.

(c) Each party shall place its own attachments on the new joint poles and place guys to sustain any unbalanced loads caused by its attachments. The owner shall, however, provide the initial clearing of the right-of-way, and tree trimming, which shall at least meet the requirements of the other party. Each party shall execute its work promptly and in such manner as not to interfere with the service of the other party.

(d) The cost of establishing the joint use of new poles including costs incurred in the retirement of existing poles shall be borne by the parties hereto in the manner provided in Article VIII--Division of Costs.

Executed on the _____ day of _____, 19 ___.

_____

(Seal)

By_____

ATTEST:

_____

_____

(Seal)

By_____

ATTEST:

_____

APPENDIX C

(Name of Telephone Company) (Location)

Request No. _____ (Date)

To (Name of Cooperative) (Location)

This is to request your permission for this Company to use jointly certain of your poles under the terms and conditions of the General Agreement for Joint Use of Wood Poles which has been executed by your Cooperative and this Company.

The poles for which this permission is requested are located generally within the limits of the extension-of-service project in the territory indicated by the attached map, which also bears the above date and Request Number.

If permission to use these poles is given by you, this Company intends to canvass fully the territory generally within the project limits and if construction of the project by use of your poles for our attachments is begun, will furnish telephone service to all establishments therein desiring service, subject to its tariff rates and regulations. Our present plan is to start the work involved in this project about _____ (Month-Year) and complete the work about _____ (Month-Year).

If permission to use these poles is given by you, this Company proposes to prepare and furnish to you detailed construction plans and drawings to indicate specifically your poles that we wish to use jointly, in accordance with the procedure provided in Article IV or V of the Agreement, as the case may be, together with a map showing the final project limits as determined after engineering is complete. If the final project limits vary substantially from the project limits shown on the map attached hereto, it is understood that this Company will request your further permission to use poles within the territory indicated on the final map.

If the joint use proposed is agreeable to your Cooperative please signify your approval on the second copy of this request in the space provided and return that copy to this Company.

(Name and Title of Telephone Company Employee making this request)

To _____ _____
(Name of Telephone Company) (Location)

This is to advise you that your Request No. _____, to use jointly certain poles of this Cooperative to furnish telephone service to rural users, as stated therein, is agreeable to this Cooperative and has been approved by the Administrator of the Rural Electrification Administration as indicated below. You may proceed with such joint use of poles on the terms and conditions of the General Agreement for Joint Use of Wood Poles now in effect between us, and under the conditions outlined in your request.

_____ _____
(Name of Cooperative) (Date)

_____
(Name and Title of Cooperative Representative)

- -

REA PROJECT _____

On the basis of the information submitted by the Telephone Company and the Cooperative, the granting of the above request by the Cooperative is hereby approved.

_____
For Claude R. Wickard, Administrator
Rural Electrification Administration

DATED _____

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL ELECTRIFICATION ADMINISTRATION
WASHINGTON 25, D. C.

May 14, 1951

To: REA Borrowers

From: George W. Haggard, Acting Administrator

Subject: Joint Use of Wood Poles by Power and Telephone Systems: Construction Practices

Article III of Form DS-210 establishes specifications for joint use of wood poles which provide adequate clearance and strength requirements for safety purposes. Recent consideration of these provisions indicates the need for clarifying the strength requirements.

The specifications referred to in Article III establish a margin of strength for assumed transverse storm loadings of 2 and require replacement of poles when a margin of strength of 1-1/3 is reached. However, it appears that the specifications are capable of being, and have been interpreted to permit the addition of wires so long as the margin of strength is not reduced below 1-1/3, the point at which pole replacement is required.

REA believes that, in general, the margin of strength to withstand assumed storm loading of its borrowers' poles should not be reduced below 2 through the attachment of additional wire circuits, whether the circuits added are electric or telephone circuits. This margin is determined in terms of the transverse load on the pole under assumed storm conditions related to the ultimate fiber stress of the kind of wood pole involved. Methods of calculating this margin are discussed in the National Electrical Safety Code. For the purpose of determination of this margin on an existing pole line of an REA borrower, the poles should be considered as having the same strength as when new.

The design of REA borrowers' pole lines in accordance with REA standards normally results in a factor of strength in the poles in excess of the minimum requirements of the National Electrical Safety Code to withstand the assumed storm loadings. Any additional wires attached to existing poles will increase the load on the pole and consequently decrease the margin of strength above that required to withstand assumed storm loadings. This is true, of course, whether the circuits added are secondaries, additional phase wires or telephone circuits. This was recognized throughout the discussions and considerations which resulted in REA approval of joint use of borrowers' wood poles.

Since the second paragraph of Article III contemplates agreements to construction practices supplementing the requirements of the National Electrical Safety Code, to be accepted in writing by both parties to the Form DS-210 contract, it is recommended that existing contracts be supplemented in writing by adoption of the "Agreement to Construction Practices Supplementing the

REA Borrowers

Provisions of Article III of General Agreement for Joint Use of Wood Poles", attached hereto. It should be noted that this supplement relates only to the establishment of joint use of wood poles in the future under joint-use agreements which have already been executed. However, where joint use has been accomplished in anticipation of, but prior to, the execution or approval of a DS-210 contract, this supplement may be used in submitting such contracts for REA approval in place of the amendment to Article III.

Joint-use contracts on Form DS-210 executed in the future should incorporate the "Amendment to Article III of General Agreement for Joint Use of Wood Poles" attached hereto.

Attachments

George W Haggard

Supplement to
REA Form DS-210
(5-51)

JOINT USE OF FACILITIES

RURAL ELECTRIC POWER SYSTEMS

TELEPHONE SYSTEMS

AGREEMENT TO CONSTRUCTION PRACTICES SUPPLEMENTING THE PROVISIONS OF

ARTICLE III OF GENERAL AGREEMENT FOR JOINT USE OF WOOD POLES

The parties to the General Agreement for Joint Use of Wood Poles, executed on _____, hereby agree, pursuant to Article III thereof, that the following construction practice shall govern the establishment of joint use of wood poles in the future, and shall be applicable both to poles installed new for joint use and poles installed initially for electric circuits alone:

The total transverse and vertical loads for all conductors attached to a pole jointly used under this agreement shall not, under the assumed storm loadings of the National Electrical Safety Code for the area in which the pole is located, exceed fifty (50) percent of the ultimate fiber stress of the supporting pole. In case of existing pole lines, the strength of the pole shall be assumed to be the same as when new.

Executed on the _____ day of _____ 19 ____.

_____

By_____

_____

By_____

Amendment to
REA Form DS-210
(5-51)

JOINT USE OF FACILITIES

RURAL ELECTRIC POWER SYSTEMS

TELEPHONE SYSTEMS

AMENDMENT TO ARTICLE III OF GENERAL AGREEMENT FOR JOINT USE OF

WOOD POLES

The Cooperative and the Telephone Company agree that the following amendment shall be a part of the Agreement between the parties dated _____, 19__.

Insert the following paragraph between the first and second paragraphs of Article III:

"In establishing joint use of wood poles whether installed new for joint use or installed initially for electric circuits alone, the total transverse and vertical loads for all conductors attached to a pole covered by this agreement shall not, under the assumed storm loadings of the National Electrical Safety Code for the area in which the pole is located, exceed fifty (50) percent of the ultimate fiber stress of the supporting pole. In the case of exis ting pole lines, the strength of the pole shall be assumed to be the same as when new."

Executed on the _____ day of _____ 19 ____.

_____

(Seal) By _____

ATTEST:

_____

_____

(Seal) By _____

ATTEST:

_____

UNITED STATES DEPARTMENT OF AGRICULTURE

RURAL ELECTRIFICATION ADMINISTRATION

WASHINGTON 25, D.C.

May 14, 1951

To: REA Borrowers

From: George W. Haggard, Acting Administrator

Subject: Joint Use of Wood Poles by Power and Telephone Systems: Determination of Rentals

Several inquiries have been received as to whether the provisions of Article XI(d) for establishing and adjusting pole rentals permit variations from the table of rentals appearing in Appendix B attached to Form DS-210. Paragraph 8 on page 12 of the REA document entitled "Joint Use of Facilities by REA Borrowers and Telephone Companies" specifically states as follows:

> "While the telephone cost figures employed (in arriving at the rental payments suggested in Appendix B) were those appropriate to Bell System Companies, the same principles can be used for determining equitable rental payments for joint use with any telephone company."

On pages 13 to 16 of this document appear sample calculations of telephone and cooperative rental payments.

While it is desirable that rental rates be kept uniform on a particular cooperative system, where it appears that the basic factors entering into determination of the rental rate vary from those which were used in establishing the table of rental payments appearing in Appendix B, which reflect telephone cost figures appropriate to Bell System Companies, the borrower and the telephone company seeking joint use are at liberty to make their own calculations using both electric and telephone cost figures appropriate to the particular systems involved. In making any variations from the table of rental payments appearing in Appendix B, borrowers are cautioned in making their calculations of rental payments to give effect to the principle of reflecting and sharing the savings in cost realized by joint use of poles. In submitting to REA for approval Form DS-210 contracts which provide rentals other than those appearing in the table in Appendix B, borrowers should supply the detailed calculations which produced the agreed rentals. In all cases, borrowers are urged to give careful consideration to the various factors involved in joint use of facilities as set forth in the above-mentioned document.

George W Haggard

JOINT USE OF FACILITIES
RURAL ELECTRIC POWER SYSTEMS
TELEPHONE SYSTEMS

35

FORM OF GENERAL AGREEMENT FOR
JOINT USE OF WOOD POLES

FORM OF APPLICATION PERMIT FOR
JOINT USE OF SPECIFIC POLES

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FORM OF GENERAL AGREEMENT FOR JOINT USE OF WOOD POLES, REA Form DS-210

A Form DS-210
6-47)

FORM OF GENERAL AGREEMENT FOR JOINT USE OF WOOD POLES

PREAMBLE

_____, a corporation organized under the laws of the State of _____, (hereinafter called the "Cooperative"), and _____, a corporation organized under the laws of the State of _____, (hereinafter called the "Telephone Company"), desiring to cooperate in the joint use of their respective poles, erected or to be erected within the areas in which both parties render service in the State(s) of _____, whenever and wherever such use shall, in the estimation of both parties, be compatible with their respective needs, do hereby, in consideration of the premises and the mutual covenants herein contained, covenant and agree for themselves and their respective successors and assigns as follows:

PREAMBLE

The Preamble describes the parties to the Agreement and designates the State in which each of the parties is organized. Moreover, for the sake of emphasis, the territorial limitations of the Agreement are set out in the Preamble even though Article I of the Agreement also describes it.

ARTICLE I

SCOPE OF AGREEMENT

(a) This Agreement shall be in effect in the areas in which both of the parties render service in the State(s) of _____, and shall cover all wood poles of the parties now existing or hereafter erected in the above territory when said poles are brought under this Agreement in accordance with the procedure hereinafter provided.

ARTICLE I

Article I is designed to set out at the inception of the contract the territorial limitation of the Agreement. It should describe the States in which the Cooperative already has distribution facilities or where it intends to have distribution facilities. It is intended that the Agreement will apply to the entire territory served in common by the Cooperative and the Telephone Company.

...y of its facilities from joint use.

should hav... he right to exclude from joint use any of its own facilities where joint use seems undesirable.

ARTICLE II

EXPLANATION OF TERMS

For the purpose of this agreement, the following terms shall have the following meanings:

1. A JOINT POLE is a pole jointly used by both parties.

2. A NORMAL JOINT POLE is a pole which is just tall enough to provide normal spaces, as normal space is hereinafter defined, for the respective parties and just strong enough to meet the requirements of the specifications mentioned in Article III for the attachments ordinarily placed by the parties in their respective normal spaces. Such pole for the purpose of this agreement shall be a _____ foot class _____ wood pole as classified by the pole classification tables of the American Standards Association.

3. SPACE is the linear portion of a joint pole parallel to its axis reserved for the exclusive use of one of the parties (subject only to the exceptions provided for by the specifications mentioned in Article III which in certain instances permit the making of cer-

ARTICLE II

Article II defines some of the words which are most commonly used in the agreement and which would seem to call for definitions in order to prevent any possible misunderstanding. Obviously, technical words are used throughout the agreement and there might be some question as to why all such words were not defined. The answer is that it must be taken for granted that some words have a general meaning and are clear to all parties so that an attempt to define them would be totally unnecessary.

Naturally, the type of pole that will be used to support the joint use will vary according to the locality and the exigencies of the situation. However, generally speaking, the normal joint pole will be a 35-foot class 6 pole.

It is believed that the definition of "space" is self-explanatory.

The specifications mentioned in this definition are the specifications of the National Electrical Safety Code or the requirements of public authorities.

tain attachments by one party in the space reserved for the other party).

4. NORMAL SPACE is the following described space:

a. For the Cooperative the uppermost _____ feet, measured from top of pole.

b. For the Telephone Company a space of _____ feet, at a sufficient distance below the space of the Cooperative to provide at all times the minimum clearance required by the specifications mentioned in Article III and at a sufficient height above ground to provide the proper vertical clearance above ground or track rails for the lowest horizontally run line wires or cables attached in such space.

The foregoing definition of "a normal joint pole" is not intended to preclude the use of joint poles shorter or of less strength than the normal joint pole in locations where such poles will meet the requirements of the parties hereto.

The above assignment of space is not intended to preclude the use of vertical runs or the mounting of such equipment

Presuming that a 35-foot class 6 pole is used, the normal space that a cooperative would occupy would be the uppermost 4 feet, whereas, the telephone company would occupy a space of 2 feet below the space of the cooperative. The distance between the space of the cooperative and the space of the telephone company would be determined by clearance requirements depending upon the voltage of the power line, span length, type of conductors, and the loading district. In actual cases this distance may be anything from the Code minimum of 40 inches to 6 or 8 feet or even more, depending on factors mentioned in the preceding sentence

The next to last paragraph of this Article is designed to permit a certain elasticity in the choice of poles and to pave a way for an agreement between the parties as to the use of poles shorter than the ones defined as normal joint poles. For example, on longer span lines 35-foot poles may be necessary to provide proper clearance above ground because of the greater sag in the conductors; on shorter span lines 30-foot poles would, in many cases, be adequate; also if poles are located

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...ers on the lower portions of the pole when mutually agreeable.

primarily along private property on the rear of residential lots, it may be possible to use 30 or even 25-foot poles to advantage.

ARTICLE III

SPECIFICATIONS

Except as otherwise provided in Section (e) of Article VII, referring to construction temporarily exempt from the application of the specifications mentioned herein, the joint use of the poles covered by this Agreement shall at all times be in conformity with accepted modern methods such as those suggested in Edison Electric Institute ...lication No. M12 and shall at all times conform to the requirements of the National Electrical Safety Code, Fifth Edition, and subsequent revisions thereof, except where the lawful requirements of public authorities may be more stringent, in which case the latter will govern.

Modifications of, additions to, or construction practices supplementing wholly or in part the requirements of the National Electrical Safety Code, shall, when accepted in writing by both parties hereto through their ...ts authorized to approve such changes, likewise govern the joint use of poles.

ARTICLE III

The construction and operation of the system should at all times be governed by the National Electrical Safety Code. In some cases, however, public rules and regulations make it necessary to go beyond the requirements of the Code. In this event, of course, the parties have no choice except to comply with the more strict rules and regulations. If the Code is more strict than the requirements of public laws, the Code should govern. In other words, it is always the more stringent requirement that applies.

The last paragraph in the Article was inserted to pave the way for agreements between the parties looking towards the adoption of practices necessitated by peculiar conditions which necessitate modifying and supplementing requirements of the Code.

ARTICLE IV

ESTABLISHING JOINT USE OF EXISTING POLES

(a) Whenever either party desires to reserve space for its attachments on any pole owned by the other party, either as initial space or additional space on such pole, it shall make written application therefor, specifying the location of the poles in question, the amount of space desired on each pole, and the number and character of the circuits to be placed thereon. If, in the judgement of the owner, the poles are necessary for its own sole use, or joint use under the circumstances is undesirable, the owner shall have the right to reject the application. In any event, within 10 days after the receipt of such application the owner shall notify the applicant in writing whether the application is approved or rejected. Upon receipt of notice from the owner that the application has been approved, and after the completion of any transferring or rearranging which is required to permit the attaching of the applicant's circuits on such poles, including any necessary pole replacements, the applicant shall have the right as licensee hereunder to use such space in accordance with the terms of the application and of this agreement.

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PUBLIC

ARTICLE IV

(a) In order to promote the keeping of accurate records, this contract provides that a written application to enter into joint use shall be made. Inasmuch as the parties are at liberty to refuse to use certain poles jointly, the party to which the application is addressed, that is the owner of the pole, has the right to reject the application and to refuse to enter into the joint use of the poles identified in such application. In order that the applicant may be assured of a definite answer, to enable it to make other plans in the event the application is rejected it is provided that the application must be considered and the applicant notified in writing within ten (10) days after its receipt. If the application is approved, the owner is obligated to rearrange its circuits in such a manner as to permit the joint use.

Whenever any jointly used pole or any pole about to be so used under the provision of this agreement is insufficient in height or strength for the existing attachments and for the proposed additional attachments thereon, the owner shall promptly replace such pole with a new pole of the necessary height and strength and shall make such other changes in the existing pole line in which such pole is included as the conditions may then require.

(c) Each party shall place, transfer and rearrange its own attachments, place guys to sustain any unbalanced loads caused by its attachments, and perform any tree trimming or cutting incidental thereto. Each party shall at all times execute such work promptly and in such manner as not to interfere with the service of the other party.

(d) The cost of establishing the joint use of existing poles, including the making of any necessary pole replacements, shall be borne by the parties hereto in the manner provided in Article VIII - Division of Costs.

ARTICLE V

ESTABLISHING JOINT USE OF NEW POLES

(a) Whenever either party hereto requires new pole facilities for an additional

(b) One of the first things that has to be done in order to permit joint use is to make certain that the poles which will support the joint use are adequate in height and strength. For that reason it is provided that the owner shall promptly replace any existing poles which do not have such adequate height or strength. The amount, if any, to be paid the owner for installing a new pole is covered in Article VIII.

(c) Inasmuch as the cooperative is best qualified to attach the electric circuits to the poles and the telephone company is best qualified to attach the telephone circuits, it is contemplated that each party will do the necessary rearranging and attaching of its circuits.

(d) This section is inserted for the purpose of making clear that Article IV does not relate to the apportionment of costs, but is concerned merely with the methods to be followed in establishing joint use of existing poles.

ARTICLE V

(a) Article IV presupposed that the poles that were contemplated for joint use were existing poles

pole line, an extension of an existing pole line, or in connection with the reconstruction of an existing pole line, it shall promptly notify the other party to that effect in writing (verbal notice subsequently confirmed in writing may be given in cases of emergency), stating the proposed location and character of the new poles and the character of circuits it intends to use thereon and indicating whether or not such pole facilities will be, in the estimation of the party proposing to construct the new pole facilities, susceptible of joint use. Within 10 days after the receipt of such notice, the other party shall reply in writing, stating whether it does, or does not, desire space on the said poles and, if it does desire space thereon, the character of the circuits it desires to use and the amount of space it wishes to reserve. If such other party requests space on the proposed new poles and if the character and number of its circuits and attachments are such that the party proposing to construct the new pole facilities does not consider joint use undesirable, then it shall erect poles suitable for such joint use, subject, however, to the provisions of Section (b)

forming a part of an existing line. Article V goes on to provide that whenever either party is considering the construction of new pole facilities (including new poles to replace existing ones), the question whether such new facilities should be made susceptible of joint use should be considered. Obviously, this has manifest advantages for if poles are to be jointly used by both parties, it is certainly to their best interest that they be erected with the joint use in view. Otherwise, it might be necessary to reconstruct an entire line after it had once been built, in order to permit the joint use of poles. As neither party is under an obligation to undertake joint use in any particular instance, the party constructing the new facilities may consider that the poles are not susceptible of joint use and so inform the other party. Such information should be supplied in all cases, for it might be that, in a particular instance, there would be a compelling reason for undertaking joint use which if brought to the attention of the party contemplating the construction of the lines, would make it change its opinion. If the poles are susceptible of joint use, the party proposing to construct the new facilities should notify the other party in sufficient time to

The applicant for space on the poles shall be promptly notified in writing of the action taken on the application.

permit such other party to consider the desirability of joint use. In order that the party proposing to construct or reconstruct the line may not be delayed, the agreement provides that the prospective licensee reply within ten (10) days after receiving notice of the proposed new construction whether it does or does not desire to use the new pole.

(b) In any case where the parties hereto shall conclude arrangements for the joint use of any new poles to be erected, and the party proposing to construct the new pole facilities already owns more than its proportionate share of joint poles, the parties shall take into consideration the desirability of having the new pole facilities owned by the party owning less than its proportionate share of joint poles so as to work towards such a division of ownership of the joint poles that neither party shall be obligated to pay to the other any rentals because of their respective use of joint poles owned by the other.

(b) This section is intended to lay the foundation for an agreement. However, it does not impose an obligation on either party. In view of the possibility that a cooperative might not be in a position to construct a new line at any given time, as such construction necessarily depends upon the availability of funds and prior approval by REA, it would be inadvisable to obligate either of the parties in this respect.

(c) Each party shall place its own attachments on the new joint poles and place guys to sustain any unbalanced loads caused by its attachments. The owner shall, however, provide the initial clearing of the right-of-way, and tree trimming, which shall at least meet the requirements of the other party. Each party shall execute its work promptly and in such manner as not to interfere with the service of the other party.

(c) This provision is the same as section (c) of Article IV. Except that as to new joint poles the initial right-of-way clearing and tree trimming is to be done by the owner. Thereafter it is to be done by the party requiring it.

(d) The costs of establishing the joint use of new poles including costs incurred in the retirement of existing poles shall be borne by the parties hereto in the manner provided in Article VIII - Division of Costs.

(d) This provision was inserted for the same reason as section (d) of Article IV was inserted -- namely, to make it clear that this Article provided a method for establishing joint use and did not deal with allocation of costs.

ARTICLE VI

RIGHT OF WAY FOR LICENSEE'S ATTACHMENTS

While the owner and licensee will cooperate as far as may be practicable in obtaining rights-of-way for both parties on joint poles, the owner does not warrant or assure to the licensee any right-of-way privileges or easements on, over or across streets, alleys and public thoroughfares, and private or publicly owned property, and if the licensee shall at any time be prevented from placing or maintaining its attachments on the owner's poles, no liability on account thereof shall attach to the owner of the poles.

ARTICLE VI

Considering that the cooperative is often granted easements by private land owners without charge, for the sole reason that the cooperative is a non-profit undertaking, the cooperative would not be in a position to license or assign the use of the right of way obtained by it to a utility, such as the telephone company, as that might constitute a breach of faith on its part. Hence, the cooperative, if it permits the telephone company to use its poles cannot guarantee the adequacy or legal sufficiency of the right of way.

Notwithstanding the foregoing cooperation between the telephone company and the cooperative in solving mutual right-of-way problems is not only desirable but imperative. However, methods by which this cooperation can be achieved will differ so much from place to place and time to time as to make it impossible to set them out in an agreement of this nature

ARTICLE VII

MAINTENANCE OF POLES AND ATTACHMENTS

(a) The owner shall maintain its joint poles in a safe and serviceable condition and in

ARTICLE VII

(a) It seems clear that the owner of the poles should have the duty of maintaining such poles in a serviceable condition and section (a) so provides.

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the specifications mentioned in Article III and shall replace, reinforce or repair such of these poles as become defective.

(b) When replacing a jointly used pole carrying terminals of aerial cable, underground connection, or transformer equipment, the new pole shall be set in the same hole which the replaced pole occupied unless special conditions make it necessary or mutually desirable to set it in a different location.

(b) Where a pole that has to be replaced carries terminals of aerial cable, underground connection or transformer equipment it may be necessary to make alterations in the facilities if the pole is moved to another location, which would not have been necessary had the pole not been relocated. Therefore, it is provided that if a pole carrying terminals of aerial cables, underground connection or transformer equipment is replaced, the new pole generally should be set in the same hole.

(c) Whenever it is necessary to replace or relocate a jointly used pole, the owner shall, before making such replacement or relocation, give notice thereof in writing (except in case of emergency, when verbal notice will be given and subsequently confirmed in writing) to the licensee, specifying in such notice the time of such proposed replacement or relocation and the licensee shall at the time so specified transfer its attachments to the new or relocated joint pole.

(c) As has been heretofore pointed out, the cooperative is best qualified to install, rearrange or transfer its own attachments and the telephone company to do likewise with its facilities. For that reason it is provided that when a pole is to be replaced or relocated, the licensee is to be notified so as to have an opportunity to perform the work required in transferring its attachments to the new or relocated pole.

(d) Except as otherwise provided in Section (e) of this Article, each party shall at all times maintain all of its attachments,

(d) The reason for the inclusion of this provision is evident and therefore no comment is necessary.

and perform any necessary tree trimming or cutting incidental thereto, in accordance with the specifications mentioned in Article III and shall keep them in safe condition and in thorough repair. Nothing in the foregoing shall preclude the parties hereto from making any mutually agreeable arrangement for jointly contracting for or otherwise providing for maintenance trimming.

(e) Any existing joint use construction of the parties hereto which does not conform to the specifications mentioned in Article III shall be brought into conformity therewith as soon as practicable.

When such existing construction shall have been brought into conformity with said specification, it shall at all times thereafter be maintained as provided in Sections (a) and (d) of this Article.

(f) The cost of maintaining poles and attachments and of bringing existing joint use construction into conformity with said specifications shall be borne by the parties hereto in the manner provided in Article VIII - Division of Costs.

(e) Sometimes, in connecti with the acquisition of facilitie it is found that the lines acquir have not been maintained and oper ated in accordance with the stric specifications mentioned in Artic III. Naturally any dangerous condition should be remedied at once. It is often impossible, however, to remedy all of the deficiencies and to bring the construction up to Code standards immediately. Nevertheless it is clear that as soon as it is practicable the lines should be rehabilitated to meet the applicabl specifications.

(f) This section is inserted to show that this Article deals with methods of maintenance rather than with the apportionment of costs.

ARTICLE VIII

DIVISION OF COSTS

(a) The cost of erecting new joint poles coming under this agreement, to construct

ARTICLE VIII

(a) Subsection 1. No comment is needed as it is clear that the owner should pay for the

to make extensions to existing pole lines, or to replace existing poles, shall be borne by the parties as follows:

1. A normal joint pole, or joint pole smaller than the normal, shall be erected at the sole expense of the owner.

2. A pole larger than the normal, the extra height or strength of which is due wholly to the owner's requirements, including requirements as to keeping the owner's wires clear of trees, shall be erected at the sole expense of the owner.

3. In the case of a pole larger than the normal, the extra height or strength of which is due wholly to the licensee's requirements, including requirements as to keeping the licensee's wires clear of trees, the licensee shall pay to the owner a sum equal to the difference between the cost in place of such pole and the cost in place of a normal joint pole, the rest of the cost of erecting such pole to be borne by the owner, except in so far as otherwise provided in Section (c) of this Article.

construction of a normal joint pole.

Subsection 2. It is likewise clear that the owner should pay the entire cost of a pole, the extra height or strength of which is due wholly to its own requirements.

Subsection 3. If the extra height or strength of a pole is owing entirely to the licensee's requirements, it is only equitable that the licensee shall pay the owner the extra cost of installing such a pole. It should be noted that the differences calculated between the cost in place of a pole and the cost in place of a normal joint pole takes into consideration the labor costs involved in installation. For example, if it becomes necessary to use a 45-foot class 6 pole which costs $20 in place, whereas a normal joint pole costs $15, the licensee would pay the owner $5.

4. In the case of a pole larger than the normal, the extra height or strength which is due to the requirements of both parties or the requirements of public authorities or of property owners, (other than requirements with regard to keeping the wires of one party only clear of trees,) the difference between the cost in place of such pole and the cost in place of a normal joint pole shall be shared in the ratio of fifty five percent by the Co-operative and forty five percent by the Telephone Company, the rest of the cost of erecting such pole to be borne by the owner.

5. A pole erected between existing poles to provide sufficient clearance and furnish adequate strength to support the circuits of both the owner and licensee, which it would have been unnecessary to erect if joint use had not been undertaken, shall be erected at the sole expense of the licensee.

From a comparison of su
Section 3 of section (a) wi
section (c), it will be seen
that subsection 3 contemplat
the erection of a new pole m
necessary by the needs of th
owner and licensee jointly.
Section (c), as will be seen
later, deals with the replac
of existing poles to serve th
convenience of the licensee.

Subsection 4. It is equ
able that where the extra he
or strength of the pole is d
to the requirements of both p
ties or of third parties, bo
parties should share the extr
cost involved.

Subsection 5. To provide for the support of the facilit of the licensee, it may become necessary to install so-called "intermediate" poles. If such poles would not have been necessary for the operation of th owner's facilities there is no reason why the licensee should not pay the entire cost of installing such poles. This subsection provides for such a co tingency.

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(b) Any payments for poles made by a licensee under any foregoing provisions of this Article shall not entitle the licensee to the ownership of any part of said poles for which it has contributed in whole or in part.

(c) Where an existing jointly used pole or a non-joint pole is prematurely replaced by a new one solely for the benefit of the licensee, the cost of the new pole shall be divided as specified in Section (a) of this Article and the licensee shall also pay its owner the value in place of the replaced pole, plus the cost of removal less the salvage value of such pole. The replaced pole shall be removed and retained by its owner.

(b) This provision makes it clear that the payments made by the licensee will not entitle it to the ownership of any pole.

(c) It may sometimes happen that one party will apply for the joint use of poles already in the ground which are perfectly serviceable from the owner's standpoint, and that such joint use will necessitate the replacement of such poles with poles of greater height and strength. In such cases if the pole in place still was in good condition and its replacement would not have been necessary, the owner should not be called upon to bear the entire cost of removal and installation. Hence, this section provides a formula whereby the cost can be equitably apportioned. How this formula works can best be shown by way of illustration. Let us suppose that the owner has installed a normal joint pole with a life expectancy of 20 years. Let us further suppose that, in order to meet the licensee's needs, it will be necessary to install a 45-foot class 6 pole, the same type of pole as was considered in the comment on subsection (a) 3. Let us further suppose that the salvage value of the existing pole is $5 and that the value in place of the existing pole is $10 (the reason that $10 is assigned as its

(d) Each party shall place, maintain, rearrange, transfer and remove its own attachments at its own expense except as otherwise expressly provided.

(e) The expense of maintaining joint poles shall be borne by the owner thereof except that the cost of replacing poles shall be borne by the parties hereto in the manner provided in Sections (a) and (c) of this Article.

(f) Where service drops of one party crossing over or under lines of the other party are attached to the other party's poles, either directly or by means of a pole top extension fixture, the cost shall be borne as follows:

(1) Pole top extension fixtures shall be provided and installed at the sole expense of the party using them.

(2) Where an existing pole is replaced with a taller one to provide the necessary clearance the party owning the service drop

...e in place rather than $15 mentioned in the comment on subsection (a) 3, is that we are presuming that the pole has depreciated in value). Let us further suppose that the cost of removal is $5. With these figures in mind, the amounts due by the licensee to the owner would be calculated as follows: $5 (the excess cost of a new pole as specified in section (e plus $10, plus $5, minus $5. Th means that the licensee would pay the owner $15.

(d) This language is included to make certain that the shall be no misunderstanding that the installation and maintenance of the attachments is a duty incumbent upon each party.

(e) It is desirable to make it clear that the owner must carry the burden of maintaining the poles.

(f) Subdivisions 1 and 2 In some cases it is advisable, in order to maintain proper cl ances, for a service drop of one party to be attached to th pole of another party. In a sense that is a form of joint use, and therefore, the provisions of this agreement should when not inconsistent, apply. Naturally, if in order to make such attachments possible, the owner of a pole has to replace it, the cost of making such re placement should be shared by the licensee.

pay to the party owning the pole a sum equal to the difference in cost in place between the new pole and a new pole of the same size as the replaced pole, together with a sum representing the value in place of the replaced pole plus the cost of removal less the salvage value of such pole, the owner of the pole to remove and retain such pole.

(g) When, in order to improve an existing condition considered undesirable by both parties, existing poles of one of the parties are abandoned in favor of combining lines on poles of the other party, the then value in place of the abandoned poles plus the cost of removal less the salvage value of such poles shall be shared in the ratio of fifty five percent by the Cooperative and forty five percent by the Telephone Company.

(h) Payments made by either party to the other under the provisions of this Article shall be based on the table of values listed in Appendix A.

ARTICLE IX

PROCEDURE WHEN CHARACTER OF CIRCUITS IS CHANGED

When either party desires to change the character of its circuits on jointly used poles, such party shall give _____ days' notice to the other party of such contemplated change and in the event that the party agrees in writing to joint use with

ARTICLE IX

It sometimes happens that the owner of the line or the licensee desires to change the character of the circuits. There are so many types of situations that might arise that it is impossible to try to provide for procedures by which each of the situations

such changed circuits then the joint use of such poles shall be continued with such changes in construction as may be required to meet the terms of the specifications mentioned in Article III for the character of circuits involved and such other changes as may be agreed upon. The parties shall cooperate to determine the equitable apportionment of the net expense of such changes. In the event, however, that the other party fails within _____ days from receipt of such notice to agree in writing to such change in character of circuits, then both parties shall cooperate in accordance with the following plan:

1. The parties hereto shall determine the most practical and economical method of effectively providing for separate lines, either overhead or underground, and the party whose circuits are to be moved shall promptly carry out the necessary work.

2. The net cost of re-establishing such circuits in the new location as are necessary to furnish the same business facilities that existed in the joint use section at the time such change was decided upon, shall be borne by the licensee; provided, however, that the owner shall bear an

should be met in an agreement of this type. Therefore, about the most that can be done is to stipulate that the parties shall cooperate in an effort to determine the equitable apportionment of the expense incident to the changes.

In some cases it may be utterly impossible to continue the joint use in view of the proposed change of character of the circuits. When this is the case, of course, it will be necessary to construct separate lines. Inasmuch as the licensee's rights are subordinate to those of the owner, cost of re-establishing the circuits in a new location should in most instances be assumed by the licensee. However, there may be cases where the assumption of the entire cost by thelicensee will work a hardship upon it. For exampl let us suppose that the owner allowed the licensee, at considerable cost, to install circuits on a given line, and then, within two months' time the owner decides to change the character of its circuits so as to make it impossible t maintain the joint use. In such a case the licensee, in addition to being faced with the cost of constructing new lines and relocating its faci ties on them, might lose completely the investment it mad in undertaking joint use, suc as the payments it made to th owner pursuant to Article VII Hence, it is only just that in such cases the owner shoul assume an equitable portion of the expense. In view of the varying circumstances that are likely to be met, it is manifestly impossible to provide any formula whereby the amount could be calculated. Therefore, all that

able share of such cost wherever the change was occasioned by the necessities of the owner and the licensee would suffer a hardship in having to assume the entire burden of the cost of reestablishing the circuits.

can be done is to provide that the owner shall bear an equitable share and trust to the good will of the parties to effect a solution.

Unless otherwise agreed by the parties, ownership of any new line or underground facilities constructed under the foregoing provisions in a new location shall vest in the party for whose use it is constructed.

ARTICLE X

ABANDONMENT OF JOINTLY USED POLES

(a) If the owner desires at any time to abandon any jointly used pole, it shall give the licensee notice in writing to that effect at least _____ days prior to the date on which it intends to abandon such pole. If at the expiration of said period the owner shall have no attachments on such pole but the licensee shall not have removed all of the attachments therefrom, such pole shall thereupon become the property of the licensee, and the licensee shall save harmless the former owner of such pole from all obligation, liability, damages, cost, expenses or charges incurred thereafter, and not arising out of anything theretofore occurring, because of, or arising out of, the presence or condition of such

ARTICLE X

(a) The time may come when the owner of a section of joint use line may wish to abandon the operation of its circuits on that line. However, to take the poles down might work a hardship on the licensee as it may need the poles for the operation of its own circuits. For that reason, Article X has been drafted so as to permit the licensee to acquire the poles upon their abandonment by the Owner.

pole or of any attachments thereon; and shall pay the owner the then value in place of the pole to the licensee but in no case an amount less than the net salavage value of the pole to the owner as provided in Appendix A attached hereto. The former owner shall further evidence transfer of title to the pole by means of a bill of sale. Credit shall be allowed for any payments which the licensee may have made under the provisions of Article VIII - Division of Costs, when the pole was originally set.

(b) The licensee may at any time abandon the use of a joint pole by giving due notice thereof in writing to the owner and by removing therefrom any and all attachments it may have thereon. The licensee shall in such case pay to the owner the full rental for said pole for the then current year.

(b) Conversely, the licensee may wish at some time to abandon the use of a joint pole for its circuits. However, inasmuch as the owner will still retain possession of the line, the owner will not be prejudiced by such abandonment so long as the owner is appropriately advised.

ARTICLE XI

RENTALS

(a) On or about____ of each year the parties acting in cooperation shall, subject to the provisions of Section (b) of this Article, tabulate the total number of joint poles in use as of the preceding day, and the number of poles on which either party as licensee removed all of its attachments during the twelve preceding

ARTICLE XI

(a) It would be manifestly desirable to have the telephone compa and the Cooperative each own a proportionate number of joint poles so that the payment of rental would be unnecess and the use of one set o poles would balance the of the other. However, will probably be impossi to achieve such a propor tionate distribution

tabulation shall indicate the number of poles which each party owns on which rentals are to be paid by the other party.

(b) For the purpose of such tabulation, any pole used by the licensee for the sole purpose of attaching wires or cables thereto, either directly or by means of a pole top extension fixture, in order to provide clearance between the facilities of the two parties as distinguished from providing support for such wires or cables, shall not be considered as a joint pole.

(c) If there is provision under a separate agreement between the Telephone Company and the Cooperative for facilities associated with power line carrier systems, the rental provisions of the agreement of which this article forms a part shall apply for poles on which both types of facilities are present, and no other rentals shall apply. The rental provisions of this agreement shall not apply however, where only those facilities directly associated with power line carrier systems are involved.

(d) The rentals per pole due from either party as licensee to the other party as owner shall be based on the equitable sharing of the economies of joint use as provided for in Appendix B. Subject

and for that reason a tabulation should be made to determine which of the two parties owns more than its proportionate share of poles used jointly. Theoretically, it might be desirable to make such tabulation as of January 1 so as to make the rentals coincide with the calendar year. However, the spring season is the season in which the greatest bulk of the changes is made and for that reason, July 1 is, from the practical standpoint, the more desirable date to adopt for the making of a tabulation.

(d) The amount of rental that should be paid for each pole will necessarily vary according to circumstances. In most cases a rental per pole will probably be equitable.

to the provisions of Article XII, $___ per annum shall be paid by the Cooperative for each jointly used pole owned by the Telephone Company and $____ per annum shall be paid by the Telephone Company for each jointly used pole owned by the Cooperative. The smaller total sum shall be deducted from the larger and the Cooperative or the Telephone Company, as the case may be, shall pay to the other the difference between such amounts.. The rental herein provided for shall be paid within 10 days after the bill has been submitted.

ARTICLE XII

PERIODICAL ADJUSTMENT OF RENTALS

(a) At any time after 5 years from the date of this agreement and at intervals of not less than 5 years thereafter, the rentals applicable under this agreement shall be subject to joint review and adjustment as provided for under Section (b) of this Article upon the written request of either party. In case of adjustment of rentals as herein provided, the new rentals agreed upon shall apply starting with the annual bill next rendered and continuing until again adjusted.

ARTICLE XII

At some future time, it may become advisable to reconsider the rentals paid and to arrange for a change in the amount of rentals. Article XII is mean to pave the way for such reconsideratio and to bring any changed rentals aut matically within th terms of the contra

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All adjustments of rentals shall be in accord with the provisions of Appendix B, and any changes shall take into account the cost factors originally involved in all joint use existing at that time under this agreement.

ARTICLE XIII

DEFAULTS

(a) If either party shall default in any of its obligations under this agreement and such default continues thirty (30) days after due notice thereof in writing by the other party, the party not in default may suspend the rights of the party in default in so far as concerns the granting of future joint use and if such default shall continue for a period of _____ days after such suspension, the party not in default may forthwith terminate this agreement as far as concerns the future granting of joint use.

(b) If either party shall make default in the performance of any work it is obligated to do under this agreement at its sole expense, the other party may elect to do such work, and the party in default shall reimburse the other party for the cost thereof. Failure on the part of the defaulting party to make such payment within _____ days upon presentation of bills therefor, shall, at the election of the other party, constitute a default under Section (a) of this Article.

ARTICLE XIII

(a) It is to be supposed that neither party will ever default in its obligations under the contract. As there is a possibility of such defaults occurring, however, the contingency should be provided for in the agreement. Therefore, section (a) of Article XIII has been drafted to protect the party who has lived up to its obligations by allowing it to suspend and eventually terminate the agreement in so far as the granting of future joint use is concerned.

(b) One of the particular defaults that might occur is one resulting from failure of one of the parties to perform any work which it is obligated to perform at its own expense. Rather than invoking the remedies provided for by the preceding section, which might work a hardship on the defaulting party not commensurate with the breach of its

obligations, section (
provides that one of t
parties may perform th
work itself and then b
the defaulting party.
Naturally, the party n
in default should be e
tremely careful in exe
cising this privilege
and should exercise it
only as the last re-
source for the telepho
company may not be
qualified to perform
on the electric line
the cooperative may n
be qualified to perfo
work on the telephone
line.

ARTICLE XIV

EXISTING RIGHTS OF OTHER PARTIES

(a) If either of the parties hereto has, prior to the execution of this agreement, conferred upon others, not parties to this agreement, by contract or otherwise, rights or privileges to use any poles covered by this agreement, nothing herein contained shall be construed as affecting such rights or privileges, and either party hereto shall have the right, by contract or otherwise, to continue and extend such existing rights or privileges, it being expressly understood, however, that for the purpose of this agreement, the attachments of any such outside party, except those of a municipality or other public authority, shall be treated as attachments belonging to the grantor, and the rights, obligations, and liabilities hereunder of

ARTICLE XIV

(a) At the time
agreement is entered i
one of the parties ma
have already obligated
itself to permit the
of the joint poles by
some third party, and
may be necessary or d
sirable to extend or
tinue that permission
even after the date o
the agreement. In or
to protect the other
party to the agreemen
section (a) provides
the facilities of the
third party shall be
sidered as those of t
party having granted
privilege.

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respect to such attachments shall be the same as if it were the actual owner thereof.

(b) Where municipal regulations require either party to allow the use of its poles for fire alarm, police, or other like signal systems, such use shall be permitted under the terms of this Article, provided attachments of such parties are placed and maintained in accordance with the specifications mentioned in Article III.

(b) The purpose of this section is so clear as not to need any comment.

ARTICLE XV

ASSIGNMENT OF RIGHTS

Except as otherwise provided in this agreement, neither party hereto shall assign or otherwise dispose of this agreement or any of its rights or interests hereunder, or in any of the jointly used poles, or the attachments or rights of way covered by this agreement, to any firm, corporation or individual, without the written consent of the other party except to the United States of America or any agency thereof; provided, however, that nothing herein contained shall prevent or limit the right of either party to mortgage any or all of its property, rights, privileges, and franchises, or lease or transfer any of them to another corporation organized for the purpose of conducting a business of the same general character as that of such party, or to enter into any merger or consolidation; and, in case of the foreclosure of such mortgage; or in case of such lease, transfer,

ARTICLE XV

The preparation of the paragraph in regard to the assignment of rights is necessarily difficult in a situation such as this. An absolute prohibition against the assignment of the rights conferred by the contract without the written consent of the other party might work a considerable hardship on the party who is desirous of making such an assignment as it might limit the disposition of its properties. However, it is equally true that allowing a party to assign its rights under the contract to a third party without the consent of the other party to the contract might work a considerable hardship on the latter inasmuch as it might be faced with the prospect of attempting to maintain joint use with an

merger, or consolidation, its rights and obligations hereunder shall pass to, and be acquired and assumed by, the purchaser on foreclosure, the transferee, lessee, assignee, merging or consolidating company, as the case may be; and provided, further, that subject to all of the terms and conditions of this agreement, either party may permit any corporation conducting a business of the same general character as that of such party, and owned, operated, leased and controlled by it, or associated or affiliated with it in interest, or connecting with it, the use of all or any part of the space reserved hereunder on any pole covered by this agreement for the attachments used by such party in the conduct of its said business; and for the purpose of this agreement, all such attachments maintained on any such pole by the permission as aforesaid of either party hereto shall be considered as the attachments of the party granting such permission, and the rights, obligations and liabilities of such party under this agreement, with respect to such attachments, shall be the same as if itwere the actual owner thereof.

PUBLIC irresponsible organization with whom it would not have entered into a contract originally. Hence, this Article has been drafted with the thought of attempting to permit the assignment under certain circumstances, that is where the organization assuming the rights assigned will be a responsible organization conducting a business of the same general character as that of its predecessor.

ARTICLE XVI

WAIVER OF TERMS OR CONDITIONS

The failure of either party to enforce or insist upon compliance with any of the terms or conditions of this agreement shall not constitute a general waiver or relinquishment of any such terms or conditions, but the same shall be and remain at all times in full force and effect.

ARTICLE XVI

This Article XVI is inserted to make certain that if one of the parties, in the interest of harmony and in view of the particular situation, waives a condition in the agreement, such waiver will not be considered as a general waiver applicable to all similar situations in the future.

ARTICLE XVII

PAYMENT OF TAXES

Each party shall pay all taxes and assessments lawfully levied on its own property upon said jointly used poles, and the taxes and the assessments which are levied on said joint poles shall be paid by the owner thereof, but any tax, fee, or charge levied on owner's poles solely because of their use by the licensee shall be paid by the licensee.

ARTICLE XVII

The purpose of this Article is so obvious as not to need any comments.

ARTICLE XVIII

BILLS AND PAYMENT FOR WORK

Upon the completion of work performed hereunder by either party, the expense of which is to be borne wholly or in part by the other party, the party performing the work shall present to the other party within _____ days after the completion of such work an itemized statement of

ARTICLE XVIII

This Article is inserted to insure business relationships in the payment of reimbursable items. The number of days that should be inserted in the blanks will vary according to circumstances. Probably the insertion of the number 10 in the blanks would provide a suitable time.

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the costs and such other party shall within _____ days after such statement is presented pay to the party doing the work such other party's proportion of the cost of said work.

ARTICLE XIX

SERVICE OF NOTICES

Whenever in this agreement notice is provided to be given by either party hereto to the other, such notice shall be in writing and given by letter mailed, or by personal delivery, to the Cooperative at its office at _____ _____, or to the Telephone Company at its office at _____ _____, as the case may be, or to such other address as either party may from time to time designate in writing for that purpose.

ARTICLE XIX

This Article is inserted to make certain that there will not be any dispute as to the proper place for the service of notice.

ARTICLE XX

TERM OF AGREEMENT

Subject to the provisions of Article XIII, Defaults, herein, this Agreement shall remain in effect until terminated at the end of 25 years from the date hereof or thereafter upon the giving of written notice to the other party not less than three years prior to the date of termination.

ARTICLE XX

The Agreement made to run for 25 and as long thereaf as the parties may sire. The type of arrangement contem in the contract is that involves long range planning and vestment and there does not lend itse to a short term.

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ARTICLE XXI

EXISTING CONTRACTS

All existing agreements between the parties hereto for the joint use of poles are by mutual consent hereby abrogated and superseded by this Agreement.

Nothing in the foregoing shall preclude the parties to this agreement from preparing such supplemental operating routines or working practices as they mutually agree to be necessary or desirable to effectively administer the provisions of this agreement.

ARTICLE XXII

APPROVAL OF ADMINISTRATOR

This Agreement, and any amendment thereof, shall be effective subject to the condition that, during any period in which the Cooperative is a borrower from the Rural Electrification Administration, the agreement and any amendment thereof shall have the approval in writing of the Administrator of the Rural Electrification Administration.

ARTICLE XXI.

This Agreement is intended to cover the entire arrangement between the parties. Therefore, this Article provides that any existing agreements between the parties with respect to the joint use of poles are ended and this Agreement takes their place.

In witness whereof, the parties hereto, have caused these presents to be executed in triplicate, and their corporate seals to be affixed thereto by their respective officers thereunto duly uauthorized, on the _____ day of _____, 19 .

_____

By_____

(Seal)

Attest:

_____

_____

By_____

(Seal)

Attest:

_____

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APPENDIX A

This Appendix contains tables of pole values to be used in dividing costs as provided under Article VIII. It also outlines the steps for adjusting such values to determine any payments that the licensee must make to the owner to defray costs of premature replacement of poles to accommodate the licensee.

A. Tabulation of New Pole Costs.

The following tabulation shall list mutually agreed upon average costs in place of new poles of all kinds of timber, including only such cost items as are repetitive when poles are replaced.

Table 1

Height \ Class	1	2	3	4	5	6	7	8	9	10
20'										
22'										
25'										
30'										
35'										
40'										
45'										
50'										
55'										
60'										

B. Age Factors for Modifying Values of Poles.

1. The following table of age factors shall be used in adjusting pole costs in Table 1 to arrive at current values in place of existing poles coming under the provisions of this agreement.

Table 2

Age of Pole	0-3 years	4-9 years	10-15 years	16-21 years	22-27 years	over 27 years
Factor	1.0	.8	.6	.4	.2	0

C. Cost Level Factor.

1. The values obtained from B are to be modified further by the following factors to allow for periodic variation in pole cost levels.

Table 3

For poles set prior to Jan. 1, 1937	.5
For poles set between Jan. 1, 1937 and Jan. 1, 1945.	.7
For poles set between Jan. 1, 1945 and	1.0
For poles set between and	

2. It is intended that additional factors will be added to cover future long term changes in costs.

D. Salvage Value of Poles.

1. A figure of 70% of current material costs shall be used for computing salvage values of poles which have been installed not exceeding 10 years. Average values for all kinds of timber shall be used. The follow-

ing table sets forth mutually agreed upon salvage values.

Table 4

Height \ Class	1	2	3	4	5	6	7	8	9	10
20'										
22'										
25'										
30'										
35'										
40'										
45'										
50'										
55'										
60'										

2. For poles installed longer than 10 years it shall be assumed that the salvage value is equal to the cost of removal.

Note: This is based on assumption that owner should bear an increasing portion of cost of removal as poles age.

1. The following table sets forth mutually agreed upon total costs of removing poles.

Table 5

Height	Cost of Removal
25' or less	
30'	
35'	
40'	
45'	
50'	
55'	

Note:
Annual variations in costs of removal neglected.

F. Anchors.

1. The cost in place of all anchors regardless of size, type or number of thimbles shall be deemed to be ____ for use in applying the provisions of this agreement.

APPENDIX B

This appendix describes the basic principles and guides which have been used under this agreement in setting the rents specified in Article XI and which are to be used in making periodical adjustments of rentals as provided for in Article XII.

Under these principles the rentals are intended, in so far as it is practicable, to result in a sharing of the economies realized by the joint use of pole plant in proportion to the relative costs of separate pole line construction.

The procedures outlined herein take into account the following objectives:

1. An equitable division of savings regardless of the number of jointly used poles owned by each party.

2. Rental rates applicable universally in the area covered by the agreement regardless of whether the pole lines involved are initially constructed with joint use in view or are existing lines modified for joint use.

3. Appropriate allowance in the rental rates for additional costs incurred by each party in supplying 'normal joint poles', as defined in the agreement, and the costs of other items required in the joint use of poles which would not be incurred in separate line construction.

4. Rentals based on the costs of "typical miles" of separate lines, of newly constructed joint lines and of existing lines modified to make them suitable for joint use. The 'per mile' value of rentals are then reduced to 'per pole' values for purposes of simplifying tabulations and to provide for the joint use of scattered poles.

The rentals are the dollar values resulting from the licensee paying to the owner as annual rental, an amount representing the annual charge on a separate line for the licensee less the sum of (a) the annual charges on the additional costs incurred by the licensee in establishing joint use and (b) the licensee's share of

savings. This share is the ratio of the licensee's typical separate line costs to the sum of the typical separate line costs of each of the parties.

The annual rent payable can also be stated as follows:

Licensee's annual rent	Equals	Annual charges saved by licensee through not having to build a separate line	Less	Licensee's appropriate percentage	Of	Total savings in annual charges realized through joint use

The cost in place of a line of poles is made up of a number of factors including such items as right-of-way solicitation, clearing, staking, direct labor and material costs of bare poles in place and pro rata shares of construction supervision and overhead. These costs, for a specific area, may differ considerably from corresponding costs in other parts of the country. These variations in pole line costs will, however, affect both power and telephone lines to about the same degree.

The parties to this contract will mutually agree on the average cost of a typical mile of 35 foot, class 6 poles in place in their common area. Below are tabulated appropriate rentals over a range of typical mile costs. From this tabulation the parties shall use the rental payments associated with the value nearest to the agreed upon average cost.

RENTAL PAYMENTS

Where the mutually agreed upon average cost per mile of 35 foot class 6 poles in place approximates	The telephone company's annual rental payment per pole to the cooperative will be	The cooperative's annual rental payment per pole to the telephone company will be
$350*	$1.00	$1.70
$410	1.10	1.80
$470	1.20	1.90
$530	1.30	2.00
$590	1.40	2.10
$650	1.50	2.20
$710	1.60	2.30
$770**	1.70	2.40

*Rentals associated with this amount are minimum and applicable for all lower costs.
**If average costs are substantially higher than this value, appropriate rentals should be determined by agreement.

Form of
Application---Permit
For Joint Use of Poles.

No.....

To..... hereinafter referred to as the Licensor; the applicant hereunder being hereinafter referred to as the Licensee.

.....

.....

The following application is made for the use of your pole plant located as follows:

.....

No. of Poles	Pole Numbers	Type of Attachments	Annual Rental

Pole locations and work to be performed are shown on the above diagram.

Licensee's initial payment, if any$_____

The joint occupancy herein provided for and the work to be done hereunder shall be subject to the terms and conditions on the reverse side hereof, which shall constitute a specified agreement in connection herewith and shall supersede, except as to matters not covered herein, any provisions in other contracts, if any, heretofore entered into between the parties hereto or their predecessor companies.

Recommended by:_____ Application made_____ 19__, By

Approved by:_____ _____

By_____
Title

THE ABOVE APPLICATION IS ACCEPTED AND THE PERMIT REQUESTED IS HEREBY GRANTED

_____ 19__, By

Approved by:_____ By_____

TERMS AND CONDITIONS

1. CONSIDERATION. In consideration of the right to attach and maintain at its sole expense, attachments on the poles of the Licensor, the Licensee promises and agrees to pay the initial payment, if any, shown on the face hereof, within 30 days of its receipt of the Licensor's bill therefor; and likewise promises and agrees to pay the Licensor annually upon the 31st day of December the yearly rental(s) specified on the face of this agreement.

These rentals shall be based on the following:

a. For attachments of facilities owned by the Telephone Company to poles owned by the Cooperative. 1.00 per pole

b. For attachments of facilities owned by the Cooperative to poles owned by the Telephone Company. 1.00 per pole
(There will be no charge for clearance attachments of service drops of either party.)

Yearly payments hereunder shall be made on December 31st of each year in which this permit is exercised; rental charges being based upon the Licensee's occupation of the Licensor's pole as of July 1st in said calendar year.

All payments for rental under this agreement shall be based upon a minimum period of one year except that should the Licensor revoke this permit before the expiration of any calendar year, then and not otherwise, the Licensor shall reduce the yearly rental by an amount proportionate to the interval from the last day of the month in which attachments were discontinued to the end of the said year.

2. SPECIFICATIONS. Attachments shall at all times be in conformity with accepted modern methods such as those suggested in Edison Electric Institute Publication No. M12 and shall at all times conform to the requirements of the National Electrical Safety Code, Fifth Edition and subsequent revisions thereof, except where the lawful requirements of public authorities may be more stringent, in which case the latter will govern.

3. LICENSEE'S RIGHT TO TERMINATE. This agreement may be terminated by the Licensee upon thirty days' notice to the Licensor. All obligations of the Licensee, hereunder, shall continue until its attachments are completely removed.

4. LICENSOR'S RIGHT TO REVOKE. The Licensor may revoke this permit at any time upon written notice, and the Licensee shall remove its wires and other attachments from said pole(s) within sixty days from the date of said notice.

5. LICENSOR'S RIGHT TO ABANDON. The Licensor may abandon any said pole at any time upon written notice to the Licensee. The Licensee shall, within sixty days after such notice, either purchase the pole from the Licensor or remove its attachments therefrom, and the failure of the Licensee to remove its attachments within said sixty days shall be deemed an election to purchase the pole at a price equal to its then value in place.

6. DEFAULT. If the Licensee shall make default in any of its obligations under this contract, and such default continues for thirty days after written notice thereof from the Licensor, all rights of the Licensee hereunder, including its right to occupy said poles, shall be suspended until such default has been remedied.

7. ASSIONMENT. Licensee shall not assign, transfer or sub-let any of the privileges described in this agreement without the written consent of the Licensor.

8. LICENSOR'S RESPONSIBILITY. The Licensor shall not be liable to the Licensee for any interruption to, nor interference with the operations of the wires of the Licensee on said poles caused by the operations of the Licensor; nor shall the Licensor be responsible for any loss or damage caused by objection to the stringing of said wires, by any corporation or person owning property which, or abutting upon which, said pole line or fixtures thereon, or any part of, is located, or because of interference with said pole line, wires or fixtures thereon by any third person, or because of the objections or interference of any public authorities. It is expressly agreed that the Licensor is not obligated to secure or guarantee any right-of-way or franchise for the Licensee, and no use, however extended, of the Licensor's poles under this agreement shall be taken as creating or vesting in the Licensee any right, title or interest to said poles, or any right, title and interest in any franchise right or easement which the Licensor may possess.

REA Form DS-210
(8-47)

GENERAL AGREEMENT

FOR

JOINT USE OF WOOD POLES

BETWEEN

AND

Date _____

TABLE OF CONTENTS

REA Form DS-210
(8-47)

GENERAL AGREEMENT FOR JOINT USE OF WOOD POLES

PREAMBLE

....., a corporation organized under the laws of the State of ....., (hereinafter called the "Cooperative"), and ...., a corporation organized under the laws of the State of ....., (hereinafter called the "Telephone Company"), desiring to cooperate in the joint use of their respective poles, erected or to be erected within the areas in which both parties render service in the State(s) of ....., whenever and wherever such use shall, in the estimation of both parties, be compatible with their respective needs, do hereby, in consideration of the premises and the mutual covenants herein contained, covenant and agree for themselves and their respective successors and assigns as follows:

ARTICLE I

SCOPE OF AGREEMENT

(a) This Agreement shall be in effect in the areas in which both of the parties render service in the State(s) of....., and shall cover all wood poles of the parties now existing or hereafter erected in the above territory when said poles are brought under this Agreement in accordance with the procedure hereinafter provided.

(b) Each party reserves the right to exclude any of its facilities from joint use.

ARTICLE II

EXPLANATION OF TERMS

For the purpose of this Agreement, the following terms shall have the following meanings:

1. A JOINT POLE is a pole jointly used by both parties.

2. A NORMAL JOINT POLE is a pole which is just tall enough to provide normal spaces, as normal space is hereinafter defined, for the respective parties and just strong enough to meet the requirements of the specifications mentioned in Article III for the attachments ordinarily placed by the parties in their respective normal spaces. Such pole for the purpose of this Agreement shall be a ..... foot class ..... wood pole as classified by the pole classification tables of the American Standards Association.

3. SPACE is the linear portion of a joint pole parallel to its axis reserved for the exclusive use of one of the parties (subject only to the exceptions provided for by the specifications mentioned in Article III which in certain instances permit the making of certain attachments by one party in the space reserved for the other party).

4. NORMAL SPACE is the following described space:

a. For the Cooperative the uppermost ..... feet, measured from top of pole.

b. For the Telephone Company a space of ..... feet, at a sufficient distance below the space of the Cooperative to provide at all times the minimum clearance required by the specifications mentioned in Article III and at a sufficient height above ground to provide the proper vertical clearance above ground or track rails for the lowest horizontally run line wires or cables attached in such space.

The foregoing definition of "a normal joint pole" is not intended to preclude the use of joint poles shorter or of less strength than the normal joint pole in locations where such poles will meet the requirements of the parties hereto.

The above assignment of space is not intended to preclude the use of vertical runs or the mounting of such equipment as terminals or meters on the lower portions of the pole when mutually agreeable.

ARTICLE III

SPECIFICATIONS

Except as otherwise provided in Section (e) of Article VII, referring to construction temporarily exempt from the application of the specifications mentioned herein, the joint use of the poles covered by this Agreement shall at all times be in conformity with accepted modern methods such as those suggested in Edison Electric Institute Publication No. M12 and shall at all times conform to the requirements of the National Electrical Safety Code, Fifth Edition, and subsequent revisions thereof, except where the lawful requirements of public authorities may be more stringent, in which case the latter will govern.

Modifications of, additions to, or construction practices supplementing wholly or in part the requirements of the National Electrical Safety Code, shall, when accepted in writing by both parties hereto through their agents authorized to approve such changes, likewise govern the joint use of poles.

ARTICLE IV

ESTABLISHING JOINT USE OF EXISTING POLES

(a) Whenever either party desires to reserve space for its attachments on any pole owned by the other party, either as initial space or additional space on such pole, it shall make written application therefor, specifying the location of the poles in question, the amount of space desired on each pole, and the number and character of the circuits to be placed thereon. If, in the judgment of the owner, the poles are necessary for its own sole use, or joint use under the circumstances is undesirable, the owner shall have the right to reject the application. In any event, within 10 days after the receipt of such application the owner shall notify the applicant in writing whether the application is approved or rejected. Upon receipt of notice from the owner that the application has been approved, and after the completion of any transferring or rearranging which is required to permit the attaching of the applicant's circuits on such poles, including any necessary pole replacements, the applicant shall have the right as licensee hereunder to use such space in accordance with the terms of the application and of this Agreement.

(b) Whenever any jointly used pole or any pole about to be so used under the provision of this Agreement is insufficient in height or strength for the existing attachments and for the proposed additional attachments thereon, the owner shall promptly replace such pole with a new pole of the necessary height and strength and shall make such other changes in the existing pole line in which such pole is included as the conditions may then require.

(c) Each party shall place, transfer and rearrange its own attachments, place guys to sustain any unbalanced loads caused by its attachments, and perform any tree trimming or cutting incidental thereto. Each party shall at all times execute such work promptly and in such manner as not to interfere with the service of the other party.

(d) The cost of establishing the joint use of existing poles, including the making of any necessary pole replacements, shall be borne by the parties hereto in the manner provided in Article VIII—Division of Costs.

ARTICLE V

ESTABLISHING JOINT USE OF NEW POLES

(a) Whenever either party hereto requires new pole facilities for an additional pole line, an extension of an existing pole line, or in connection with the reconstruction of an existing pole line, it shall promptly notify the other party to that effect in writing (verbal notice subsequently confirmed in writing may be given in cases of emergency), stating the proposed location and character of the new poles and the character of circuits it intends to use thereon and indicating whether or not such pole facilities will be, in the estimation of the party proposing to construct the new pole facilities, susceptible of joint use. Within 10 days after the receipt of such notice, the other party shall reply in writing, stating whether it does, or does not, desire space on the said poles and, if it does desire space thereon, the character of the circuits it desires to

use and the amount of space it wishes to reserve. If such other party requests space on the proposed new poles and if the character and number of its circuits and attachments are such that the party proposing to construct the new pole facilities does not consider joint use undesirable, then it shall erect poles suitable for such joint use, subject, however, to the provisions of Section (b) of this Article. The applicant for space on the poles shall be promptly notified in writing of the action taken on the application.

(b) In any case where the parties hereto shall conclude arrangements for the joint use of any new poles to be erected, and the party proposing to construct the new pole facilities already owns more than its proportionate share of joint poles, the parties shall take into consideration the desirability of having the new pole facilities owned by the party owning less than its proportionate share of joint poles so as to work towards such a division of ownership of the joint poles that neither party shall be obligated to pay to the other any rentals because of their respective use of joint poles owned by the other.

(c) Each party shall place its own attachments on the new joint poles and place guys to sustain any unbalanced loads caused by its attachments. The owner shall, however, provide the initial clearing of the right-of-way, and tree trimming, which shall at least meet the requirements of the other party. Each party shall execute its work promptly and in such manner as not to interfere with the service of the other party.

(d) The cost of establishing the joint use of new poles including costs incurred in the retirement of existing poles shall be borne by the parties hereto in the manner provided in Article VIII—Division of Costs.

ARTICLE VI

RIGHT OF WAY FOR LICENSEE'S ATTACHMENTS

While the owner and licensee will cooperate as far as may be practicable in obtaining rights-of-way for both parties on joint poles, the owner does not warrant or assure to the licensee any right-of-way privileges or easements on, over or across streets, alleys and public thoroughfares, and private or publicly owned property, and if the licensee shall at any time be prevented from placing or maintaining its attachments on the owner's poles, no liability on account thereof shall attach to the owner of the poles.

ARTICLE VII

MAINTENANCE OF POLES AND ATTACHMENTS

(a) The owner shall maintain its joint poles in a safe and serviceable condition and in accordance with the specifications mentioned in Article III and shall replace, reinforce or repair such of these poles as become defective.

(b) When replacing a jointly used pole carrying terminals of aerial cable, underground connection, or transformer equipment, the new pole shall be set in the same hole which the replaced pole occupied unless special conditions make it necessary or mutually desirable to set it in a different location.

(c) Whenever it is necessary to replace or relocate a jointly used pole, the owner shall, before making such replacement or relocation, give notice thereof in writing (except in case of emergency, when verbal notice will be given and subsequently confirmed in writing) to the licensee, specifying in such notice the time of such proposed replacement or relocation and the licensee shall at the time so specified transfer its attachments to the new or relocated joint pole.

(d) Except as otherwise provided in Section (e) of this Article, each party shall at all times maintain all of its attachments, and perform any necessary tree trimming or cutting incidental thereto, in accordance with the specifications mentioned in Article III and shall keep them in safe condition and in thorough repair. Nothing in the foregoing shall preclude the parties hereto from making any mutually agreeable arrangement for jointly contracting for or otherwise providing for maintenance trimming.

(e) Any existing joint use construction of the parties hereto which does not conform to the specifications mentioned in Article III shall be brought into conformity therewith as soon as practicable.

When such existing construction shall have been brought into conformity with said specification, it shall at all times thereafter be maintained as provided in Sections (a) and (d) of this Article.

(f) The cost of maintaining poles and attachments and of bringing existing joint use construction into conformity with said specifications shall be borne by the parties hereto in the manner provided in Article VIII—Division of Costs.

ARTICLE VIII

DIVISION OF COSTS

(a) The cost of erecting new joint poles coming under this Agreement, to construct new pole lines, to make extensions to existing pole lines, or to replace existing poles, shall be borne by the parties as follows:

1. A normal joint pole, or joint pole smaller than the normal, shall be erected at the sole expense of the owner.

2. A pole larger than the normal, the extra height or strength of which is due wholly to the owner's requirements, including requirements as to keeping the owner's wires clear of trees, shall be erected at the sole expense of the owner.

3. In the case of a pole larger than the normal, the extra height or strength of which is due wholly to the licensee's requirements, including requirements as to keeping the licensee's wires clear of trees, the licensee shall pay to the owner a sum equal to the difference between the cost in place of such pole and the cost in place of a normal joint pole, the rest of the cost of erecting such pole to be borne by the owner, except in so far as otherwise provided in Section (c) of this Article.

4. In the case of a pole larger than the normal, the extra height or strength which is due to the requirements of both parties or the requirements of public authorities or of property owners, (other than requirements with regard to keeping the wires of one party only clear of trees), the difference between the cost in place of such pole and the cost in place of a normal joint pole shall be shared in the ratio of fifty five percent by the Cooperative and forty five percent by the Telephone Company, the rest of the cost of erecting such pole to be borne by the owner.

5. A pole erected between existing poles to provide sufficient clearance and furnish adequate strength to support the circuits of both the owner and licensee, which it would have been unnecessary to erect if joint use had not been undertaken, shall be erected at the sole expense of the licensee.

(b) Any payments for poles made by the licensee under any foregoing provisions of this Article shall not entitle the licensee to the ownership of any part of said poles for which it has contributed in whole or in part.

(c) Where an existing jointly used pole or a non-joint pole is prematurely replaced by a new one solely for the benefit of the licensee, the cost of the new pole shall be divided as specified in Section (a) of this Article and the licensee shall also pay its owner the value in place of the replaced pole, plus the cost of removal less the salvage value of such pole. The replaced pole shall be removed and retained by its owner.

(d) Each party shall place, maintain, rearrange, transfer and remove its own attachments at its own expense except as otherwise expressly provided.

(e) The expense of maintaining joint poles shall be borne by the owner thereof except that the cost of replacing poles shall be borne by the parties hereto in the manner provided in Sections (a) and (c) of this Article.

(f) Where service drops of one party crossing over or under lines of the other party are attached to the other party's poles, either directly or by means of a pole top extension fixture, the cost shall be borne as follows:

(1) Pole top extension fixtures shall be provided and installed at the sole expense of the party using them.

(2) Where an existing pole is replaced with a taller one to provide the necessary clearance the party owning the service drop shall pay to the party owning the pole a sum equal to the difference in cost in place between the new pole and a new pole of the same size as the replaced pole, together with a sum representing the value in place of the replaced pole plus the cost of removal less the salvage value of such pole, the owner of the pole to remove and retain such pole.

(g) When, in order to improve an existing condition considered undesirable by both parties, existing poles of one of the parties are abandoned in favor of combining lines on poles of the other party, the then value in place of the abandoned poles plus the cost of removal less the salvage value of such poles shall be shared in the ratio of fifty five percent by the Cooperative and forty five percent by the Telephone Company.

(h) Payments made by either party to the other under the provisions of this Article shall be based on the table of values listed in Appendix A.

ARTICLE IX

PROCEDURE WHEN CHARACTER OF CIRCUITS IS CHANGED

When either party desires to change the character of its circuits on jointly used poles, such party shall give.....days notice to the other party of such contemplated change and in the event that the party agrees in writing to joint use with such changed circuits, then the joint use of such poles shall be continued with such changes in construction as may be required to meet the terms of the specifications mentioned in Article III for the character of circuits involved and such other changes as may be agreed upon. The parties shall cooperate to determine the equitable apportionment of the net expense of such changes. In the event, however, that the other party fails within..... days from receipt of such notice to agree in writing to such change in character of circuits, then both parties shall cooperate in accordance with the following plan:

1. The parties hereto shall determine the most practical and economical method of effectively providing for separate lines, either overhead or underground, and the party whose circuits are to be moved shall promptly carry out the necessary work.

2. The net cost of re-establishing such circuits in the new location as are necessary to furnish the same business facilities that existed in the joint use section at the time such change was decided upon, shall be borne by the licensee; provided, however, that the owner shall bear an equitable share of such cost wherever the change was occasioned by the necessities of the owner and the licensee would suffer a hardship in having to assume the entire burden of the cost of re-establishing the circuits.

Unless otherwise agreed by the parties, ownership of any new line or underground facilities constructed under the foregoing provisions in a new location shall vest in the party for whose use it is constructed.

ARTICLE X

ABANDONMENT OF JOINTLY USED POLES

(a) If the owner desires at any time to abandon any jointly used pole, it shall give the licensee notice in writing to that effect at least.....days prior to the date on which it intends to abandon such pole. If at the expiration of said period the owner shall have no attachments on such pole but the licensee shall not have removed all of the attachments therefrom, such pole shall thereupon become the property of the licensee, and the licensee shall save harmless the former owner of such pole from all obligation, liability, damages, cost, expenses or charges incurred thereafter, and not arising out of anything theretofore occurring, because of, or arising out of, the presence or condition of such pole or of any attachments thereon; and shall pay the owner the then value in place of the pole to the licensee but in no case an amount less than the net salvage value of the pole to the owner as provided in Appendix A attached hereto. The former owner shall further evidence transfer of title to the pole by means of a bill of sale. Credit shall be allowed for any payments which the licensee may have made under the provisions of Article VIII—Division of Costs, when the pole was originally set.

(b) The licensee may at any time abandon the use of a joint pole by giving due notice thereof in writing to the owner and by removing therefrom any and all attachments it may have thereon. The licensee shall in such case pay to the owner the full rental for said pole for the then current year.

ARTICLE XI

RENTALS

(a) On or about..... of each year the parties acting in cooperation shall, subject to the provisions of Section (b) of this Article, tabulate the total number of joint poles in use as of the preceding day, and the number of poles on which either party as licensee removed all of its attachments during the twelve preceding months, which tabulation shall indicate the number of poles which each party owns on which rentals are to be paid by the other party.

(b) For the purpose of such tabulation, any pole used by the licensee for the sole purpose of attaching wires or cables thereto, either directly or by means of a pole

top extension fixture, in order to provide clearance between the facilities of the two parties as distinguished from providing support for such wires or cables, shall not be considered as a joint pole.

(c) If there is provision under a separate agreement between the Telephone Company and the Cooperative for facilities associated with power line carrier systems, the rental provisions of the Agreement of which this article forms a part shall apply for poles on which both types of facilities are present, and no other rentals shall apply. The rental provisions of this Agreement shall not apply however, where only those facilities directly associated with the power line carrier systems are involved.

(d) The rentals per pole due from either party as licensee to the other party as owner shall be based on the equitable sharing of the economies of joint use as provided for in Appendix B. Subject to the provisions of Article XII, $.....per annum shall be paid by the Cooperative for each jointly used pole owned by the Telephone Company and $.....per annum shall be paid by the Telephone Company for each jointly used pole owned by the Cooperative. The smaller total sum shall be deducted from the larger and the Cooperative or the Telephone Company, as the case may be, shall pay to the other the difference between such amounts. The rental herein provided for shall be paid within 10 days after the bill has been submitted.

ARTICLE XII

PERIODICAL ADJUSTMENT OF RENTALS

(a) At any time after 5 years from the date of this Agreement and at intervals of not less than 5 years thereafter, the rentals applicable under this Agreement shall be subject to joint review and adjustment as provided for under Section (b) of this Article upon the written request of either party. In case of adjustment of rentals as herein provided, the new rentals agreed upon shall apply starting with the annual bill next rendered and continuing until again adjusted.

(b) All adjustments of rental shall be in accord with the provisions of Appendix B, and any changes shall take into account the cost factors originally involved in all joint use existing at that time under this Agreement.

ARTICLE XIII

DEFAULTS

(a) If either party shall default in any of its obligations under this Agreement and such default continues thirty (30) days after due notice thereof in writing by the other party, the party not in default may suspend the rights of the party in default in so far as concerns the granting of future joint use and if such default shall continue for a period of..... .....days after such suspension, the party not in default may forthwith terminate this Agreement as far as concerns the future granting of joint use.

(b) If either party shall make default in the performance of any work it is obligated to do under this Agreement at its sole expense, the other party may elect to do such work, and the party in default shall reimburse the other party for the cost thereof. Failure on the part of the defaulting party to make such payment within ..... days upon presentation of bills therefor shall, at the election of the other party, constitute a default under Section (a) of this Article.

ARTICLE XIV

EXISTING RIGHTS OF OTHER PARTIES

(a) If either of the parties hereto has, prior to the execution of this Agreement, conferred upon others, not parties to this Agreement, by contract or otherwise, rights or privileges to use any poles covered by this Agreement, nothing herein contained shall be construed as affecting such rights or privileges, and either party hereto shall have the right, by contract or otherwise, to continue and extend such existing rights or privileges, it being expressly understood, however, that for the purpose of this Agreement, the attachments of any such outside party, except those of a municipality or other public authority, shall be treated as attachments belonging to the grantor, and the rights, obligations, and liabilities hereunder of the grantor in respect to such attachments shall be the same as if it were the actual owner thereof.

(b) Where municipal regulations require either party to allow the use of its poles for fire alarm, police, or other like signal systems, such use shall be permitted under the terms of this Article, provided attachments of such parties are placed and maintained in accordance with the specifications mentioned in Article III.

ARTICLE XV

ASSIGNMENT OF RIGHTS

Except as otherwise provided in this Agreement, neither party hereto shall assign or otherwise dispose of this Agreement or any of its rights or interests hereunder, or in any of the jointly used poles, or the attachments or rights of way covered by this Agreement, to any firm, corporation or individual, without the written consent of the other party, except to the United States of America or any agency thereof; provided, however, that nothing herein contained shall prevent or limit the right of either party to mortgage any or all of its property, rights, privileges, and franchises, or lease or transfer any of them to another corporation organized for the purpose of conducting a business of the same general character as that of such party, or to enter into any merger or consolidation; and, in case of the foreclosure of such mortgage; or in case of such lease, transfer, merger, or consolidation, its rights and obligations hereunder shall pass to, and be acquired and assumed by, the purchaser on foreclosure, the transferee, lessee, assignee, merging or consolidating company, as the case may be; and provided, further, that subject to all of the terms and conditions of this Agreement, either party may permit any corporation conducting a business of the same general character as that of such party, and owned, operated, leased and controlled by it, or associated or affiliated with it in interest, or connecting with it, the use of all or any part of the space reserved hereunder on any pole covered by this Agreement for the attachments used by such party in the conduct of its said business; and for the purpose of this Agreement, all such attachments maintained on any such pole by the permission as aforesaid of either party hereto shall be considered as the attachments of the party granting such permission, and the rights, obligations and liabilities of such party under this Agreement, with respect to such attachments, shall be the same as if it were the actual owner thereof.

ARTICLE XVI

WAIVER OF TERMS OR CONDITIONS

The failure of either party to enforce or insist upon compliance with any of the terms or conditions of this Agreement shall not constitute a general waiver or relinquishment of any such terms or conditions, but the same shall be and remain at all times in full force and effect.

ARTICLE XVII

PAYMENT OF TAXES

Each party shall pay all taxes and assessments lawfully levied on its own property upon said jointly used poles, and the taxes and the assessments which are levied on said joint poles shall be paid by the owner thereof, but any tax, fee, or charge levied on owner's poles solely because of their use by the licensee shall be paid by the licensee.

ARTICLE XVIII

BILLS AND PAYMENT FOR WORK

Upon the completion of work performed hereunder by either party, the expense of which is to be borne wholly or in part by the other party, the party performing the work shall present to the other party within.....days after the completion of such work an itemized statement of the costs and such other party shall within.....days after such statement is presented pay to the party doing the work such other party's proportion of the cost of said work.

ARTICLE XIX

SERVICE OF NOTICES

Whenever in this Agreement notice is provided to be given by either party hereto to the other, such notice shall be in writing and given by letter mailed, or by personal delivery, to the Cooperative at its office at .....

....., or to the Telephone Company at its office at

.....,

as the case may be, or to such other address as either party may from time to time designate in writing for that purpose.

ARTICLE XX

TERM OF AGREEMENT

Subject to the provisions of Article XIII, Defaults, herein, this Agreement shall remain in effect until terminated at the end of 25 years from the date hereof or thereafter upon the giving of written notice to the other party not less than three years prior to the date of termination.

ARTICLE XXI

EXISTING CONTRACTS

All existing agreements between the parties hereto for the joint use of poles are by mutual consent hereby abrogated and superseded by this Agreement.

Nothing in the foregoing shall preclude the parties to this Agreement from preparing such supplemental operating routines or working practices as they mutually agree to be necessary or desirable to effectively administer the provisions of this Agreement.

ARTICLE XXII

APPROVAL OF ADMINISTRATOR

This Agreement, and any amendment thereof, shall be effective subject to the condition that, during any period in which the Cooperative is a borrower from the Rural Electrification Administration, the Agreement and any amendment thereof shall have the approval in writing of the Administrator of the Rural Electrification Administration.

In witness whereof, the parties hereto, have caused these presents to be executed in triplicate, and their corporate seals to be affixed thereto by their respective officers thereunto duly authorized, on the.....day of....., 19....

.....

(Seal) By.....

Attest:

.....

.....

(Seal) By.....

Attest:

.....

APPENDIX A

This Appendix contains tables of pole values to be used in dividing costs as provided under Article VIII. It also outlines the steps for adjusting such values to determine any payments that the licensee must make to the owner to defray costs of premature replacement of poles to accommodate the licensee.

A. Tabulation of New Pole Costs.

The following tabulation shall list mutually agreed upon average costs in place of new poles of all kinds of timber, including only such cost items as are repetitive when poles are replaced.

Table 1

Height	CLASS									
	1	2	3	4	5	6	7	8	9	10
20'										
22'										
25'										
30'										
35'										
40'										
45'										
50'										
55'										
60'										

B. Age Factor for Modifying Values of Poles.

1. The following table of age factors shall be used in adjusting pole costs in Table 1 to arrive at current values in place of existing poles coming under the provisions of this Agreement.

Table 2

Age of Pole	0-3 years	4-9 years	10-15 years	16-21 years	22-27 years	over 27 years
Factor	1.0	.8	.6	.4	.2	0

C. Cost Level Factor.

1. The values obtained from B are to be modified further by the following factors to allow for periodic variation in pole cost levels.

Table 3

For poles set prior to Jan. 1, 1937		
For poles set between Jan. 1, 1937	and Jan. 1, 1945	.5
For poles set between Jan. 1, 1945	and	.7
For poles set between	and	1.0

2. It is intended that additional factors will be added to cover future long term changes in costs.

D. Salvage Value of Poles.

1. A figure of 70% of current material costs shall be used for computing salvage values of poles which have been installed not exceeding 10 years. Average values for all kinds of timber shall be used. The following table sets forth mutually agreed upon salvage values.

Table 4

Height	CLASS									
	1	2	3	4	5	6	7	8	9	10
20'										
22'										
25'										
30'										
35'										
40'										
45'										
50'										
55'										
60'										

2. For poles installed longer than 10 years it shall be assumed that the salvage value is equal to the cost of removal.

Note: This is based on assumption that owner should bear an increasing portion of cost of removal as poles age.

E. Cost of Removal.

1. The following table sets forth mutually agreed upon total costs of removing poles.

Table 5

Height	Cost of Removal
25' or less	
30'	
35'	
40'	
45'	
50'	
55'	

Note:
Annual variations in costs of removal neglected.

F. Anchors.

1. The cost in place of all anchors regardless of size, type or number of thimbles shall be deemed to be.....for use in applying the provisions of this Agreement.

APPENDIX B

This Appendix describes the basic principles and guides which have been used under this Agreement in setting the rents specified in Article XI and which are to be used in making periodical adjustments of rentals as provided for in Article XII.

Under these principles the rentals are intended, in so far as it is practicable, to result in a sharing of the economies realized by the joint use of pole plant in proportion to the relative costs of separate pole line construction.

The procedures outlined herein take into account the following objectives:

1. An equitable division of savings regardless of the number of jointly used poles owned by each party.

2. Rental rates applicable universally in the area covered by the Agreement regardless of whether the pole lines involved are initially constructed with joint use in view or are existing lines modified for joint use.

3. Appropriate allowance in the rental rates for additional costs incurred by each party in supplying 'normal joint poles', as defined in the Agreement, and the costs of other items required in the joint use of poles which would not be incurred in separate line construction.

4. Rentals based on the costs of "typical miles" of separate lines, of newly constructed joint lines and of existing lines modified to make them suitable for joint use. The 'per mile' values of rentals are then reduced to 'per pole' values for purposes of simplifying tabulations and to provide for the joint use of scattered poles.

The rentals are the dollar values resulting from the licensee paying to the owner, as annual rental, an amount representing the annual charge on a separate line for the licensee less the sum of (a) the annual charges on the additional costs incurred by the licensee in establishing joint use and (b) the licensee's share of the total annual savings. This share is the ratio of the Licensee's typical separate line costs to the sum of the typical separate line costs of each of the parties.

The annual rent payable can also be stated as follows:

Licensee's annual rent	Equals	Annual charges saved by licensee through not having to build a separate line	Less	Licensee's appropriate percentage	Of	Total savings in annual charges realized through joint use

The cost in place of a line of poles is made up of a number of factors including such items as right-of-way solicitation, clearing, staking, direct labor and material costs of bare poles in place and pro rata shares of construction supervision and overhead. These costs, for a specific area, may differ considerably from corresponding costs in other parts of the country. These variations in pole line costs will, however, affect both power and telephone lines to about the same degree.

The parties to this contract will mutually agree on the average cost of a typical mile of 35 foot, class 6 poles in place in their common area. Below are tabulated appropriate rentals over a range of typical mile costs. From this tabulation the parties shall use the rental payments associated with the value nearest to the agreed upon average cost.

RENTAL PAYMENTS

Where the mutually agreed upon average cost per mile of 35 foot class 6 poles in place approximates	The Telephone Company's annual rental payment per pole to the Cooperative will be	The Cooperative's annual rental payment per pole to the Telephone Company will be
$350*	$1.00	$1.70
410	1.10	1.80
470	1.20	1.90
530	1.30	2.00
590	1.40	2.10
650	1.50	2.20
710	1.60	2.30
770**	1.70	2.40

* Rentals associated with this amount are minimum and applicable for all lower costs.
** If average costs are substantially higher than this value, appropriate rentals should be determined by agreement.

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T/A
v2/v3

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EXHIBIT WA-32

the utility's pole-related costs are allocated to a given attaching entity. These three components are multiplied in a simple straightforward manner.

Expressed as an equation, the FCC Cable Rate formula is as follows:

> ***Cable Rate Formula =***
>
> *Net Bare Pole Cost (NBP) x Carrying Charge Factor (CCF) x Space Allocation Factor (SAF)*
>
> *Where the SAF = Space Occupied by Attacher / Usable Space on Pole*

Using the widely accepted FCC presumptions of a 37.5-foot joint use pole, with 13.5 feet of usable space, 24 feet of unusable space,[21] and 1 foot of space occupied by the attacher, the cost allocation factor—applicable to the costs of the entire pole—is 1/13.5 share or 7.41%.[22] As with any presumptive value in the formula, to the extent there is actual (or statistically significant) utility or attacher specific data to support the use of alternative space presumptions those can be used in lieu of the FCC's established space presumptions subject to Commission oversight. So, for example, if actual data exists to support use of a 35-foot joint use pole with 11 feet of usable space and 24 feet of unusable space, the space allocation factor would be 1/11 share or 9.09%. The allocation of the costs of the entire pole under the Cable Rate using FCC space presumptions is illustrated graphically in Exhibit PDK-3 to this testimony.

V. ECONOMIC RATIONALE FOR THE CABLE RATE'S PROPORTIONAL COST ALLOCATOR

Q. The defining feature of the Cable Rate methodology is its third component, i.e., the space allocation factor used to allocate the annual costs attributable

[21] This corresponds to 18 feet above ground clearance and 6 feet of below ground support.
[22] *See* 47 C.F.R. § 1.1418.

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V2/V3

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Blue[illegible] EMC
Rental Rate [illegible]a Comparison
FY 2014, 2015, 2016

	APSC			TVA			APPA			FCC Telecom Plus			FCC Cable Only		
	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016	2014	2015	2016
Space Allocation:															
Space occupied by attacher	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
Safety Space				3.33	3.33	3.33									
Usable Space							6.20	6.24	6.28				9.53	9.57	9.61
Usable Space Factor							3.01%	3.01%	3.01%						
Unusable space (Support)	30.63	30.61	30.59	27.30	27.28	27.26	30.63	30.61	30.59	27.30	27.28	27.26			
Unusable Space Allocation Factor	66.67%	66.67%	66.67%				35.39%	35.35%	35.31%	1.00	1.00	1.00			
Number of attaching entities	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35			
Pole height	36.83	36.85	36.87	36.83	36.85	36.87	36.83	36.85	36.87	36.83	36.85	36.87			
Space Allocation % - Licensee	**26.61%**	**26.58%**	**26.55%**	**41.25%**	**41.21%**	**41.16%**	**38.40%**	**38.36%**	**38.32%**	**34.56%**	**34.51%**	**34.47%**	**11.65%**	**11.60%**	**11.55%**
Net Cost of Bare Pole	**$262.73**	**$262.19**	**$258.30**	**$262.73**	**$262.19**	**$258.30**	**$398.02**	**$406.94**	**$413.21**	**$262.73**	**$262.19**	**$258.30**	**$262.73**	**$262.19**	**$258.30**
Carrying Charges:															
Administrative	3.49%	3.33%	3.24%	3.49%	3.33%	3.24%	2.39%	2.24%	2.12%	3.49%	3.33%	3.24%	3.49%	3.33%	3.24%
Maintenance	6.81%	6.84%	7.30%	6.80%	6.83%	6.91%	4.85%	4.83%	5.05%	6.81%	6.84%	7.30%	6.81%	6.84%	7.30%
Depreciation	5.45%	5.59%	5.76%	5.45%	5.59%	5.76%	3.60%	3.60%	3.60%	5.45%	5.59%	5.76%	5.45%	5.59%	5.76%
Taxes	0.74%	0.50%	0.57%	0.74%	0.50%	0.57%	0.51%	0.34%	0.37%	0.74%	0.50%	0.57%	0.74%	0.50%	0.57%
Return on Investment	8.00%	8.00%	8.00%	8.50%	8.50%	8.50%	7.43%	7.25%	6.88%	11.25%	11.25%	11.00%	11.25%	11.25%	11.00%
Total Carrying Charges	**24.49%**	**24.26%**	**24.87%**	**24.99%**	**24.76%**	**24.98%**	**18.77%**	**18.25%**	**18.02%**	**27.74%**	**27.51%**	**27.87%**	**27.74%**	**27.51%**	**27.87%**
Rate	**$17.12**	**$16.91**	**$17.05**	**$27.08**	**$26.75**	**$26.56**	**$28.69**	**$28.50**	**$28.54**	**$25.19**	**$24.90**	**$24.81**	**$8.49**	**$8.37**	**$8.31**

FCC CABLE-ONLY RATE
Blue Ridge EMC
FY 2014 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Total usable space	9.53	Calculation-includes Safety Space
3	**Attacher responsibility percentage**	**11.65%**	Line 1/Line 2
	Net Cost of a Bare Pole		
4	Gross pole investment (Acct. 364)	49,295,043	
5	Accumulated depreciation for poles	16,755,290	
6	Accumulated deferred income taxes	0	
7	Net pole investment	32,539,753	Line 4 - Line 5 - Line 6
8	Appurtenance factor	87.00%	
9	Net pole investment allocable to attachments	28,309,585	Line 7 x Line 8
10	Total number of poles	107,751	
11	**Net cost of a bare pole**	**$262.73**	Line 9/Line 10
	Carrying Charge		
12	Total general and administrative	10,164,119	
13	Total electric plant in service	425,883,764	
14	Total electric plant accumulated depreciation	134,648,942	
15	Total electric plant accumulated deferred income taxes	0	
16	**Administrative carrying charge**	**3.49%**	Line 12/(Line 13 - Line 14 - Line 15)
17	Maintenance expense for overhead lines	7,674,619	
18	Pole investment in Accts. 364, 365, & 369	158,218,973	
19	Depreciation (poles) related to Accts. 364, 365, & 369	45,505,682	
20	Accumulated deferred income taxes for 364, 365, & 369	0	
21	**Maintenance carrying charge**	**6.81%**	Line 17/(Line 18 - Line 19 - Line 20)
22	Gross pole investment (Acct. 364)	49,295,043	
23	Net pole investment	32,539,753	Line 7
24	Depreciation rate for gross pole investment	3.60%	
25	**Depreciation carrying charge**	**5.45%**	(Line 22/Line 23) x Line 24
26	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	2,160,782	
27	Total utility plant in service	425,883,764	
28	Total company accumulated depreciation	134,648,942	
29	Total company accumulated deferred income taxes	0	
30	**Taxes carrying charge**	**0.74%**	Line 26/(Line 27 - Line 28 - Line 29)
31	Applicable rate of return (default)	11.25%	Presumption
32	**Return carrying charge**	**11.25%**	
33	**Total carrying charges**	**27.74%**	Line 16 + Line 21 + Line 25 + Line 30 + Line 32
	RATE		
34	**Attacher responsibility percentage**	**11.65%**	Line 3
35	**Net cost of a bare pole**	**$262.73**	Line 11
36	**Total carrying charges**	**27.74%**	Line 33
37	**Pole attachment rate for cable-only**	**8.49**	Line 34 x Line 35 x Line 36

FCC CABLE-ONLY RATE
Blue Ridge EMC
FY 2015 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per audit
2	Total usable space	9.57	Calculation-includes Safety Space
3	**Attacher responsibility percentage**	**11.60%**	Line 1/Line 2
	Net Cost of a Bare Pole		
4	Gross pole investment (Acct. 364)	50,390,546	
5	Accumulated depreciation for poles	17,924,217	
6	Accumulated deferred income taxes	0	
7	Net pole investment	32,466,329	Line 4 - Line 5 - Line 6
8	Appurtenance factor	87.29%	
9	Net pole investment allocable to attachments	28,339,266	Line 7 x Line 8
10	Total number of poles	108,086	
11	**Net cost of a bare pole**	**$262.19**	Line 9/Line 10
	Carrying Charge		
12	Total general and administrative	9,870,339	
13	Total electric plant in service	440,866,858	
14	Total electric plant accumulated depreciation	144,871,920	
15	Total electric plant accumulated deferred income taxes	0	
16	**Administrative carrying charge**	**3.33%**	Line 12/(Line 13 - Line 14 - Line 15)
17	Maintenance expense for overhead lines	7,951,569	
18	Pole investment in Accts. 364, 365, & 369	164,546,374	
19	Depreciation (poles) related to Accts. 364, 365, & 369	48,323,315	
20	Accumulated deferred income taxes for 364, 365, & 369	0	
21	**Maintenance carrying charge**	**6.84%**	Line 17/(Line 18 - Line 19 - Line 20)
22	Gross pole investment (Acct. 364)	50,390,546	
23	Net pole investment	32,466,329	Line 7
24	Depreciation rate for gross pole Investment	3.60%	
25	**Depreciation carrying charge**	**5.59%**	(Line 22/Line 23) x Line 24
26	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,477,001	
27	Total utility plant in service	440,866,858	
28	Total company accumulated depreciation	144,871,920	
29	Total company accumulated deferred income taxes	0	
30	**Taxes carrying charge**	**0.50%**	Line 26/(Line 27 - Line 28 - Line 29)
31	Applicable rate of return (default)	11.25%	Presumption
32	**Return carrying charge**	**11.25%**	
33	**Total carrying charges**	**27.51%**	Line 16 + Line 21 + Line 25 + Line 30 + Line 32
	RATE		
34	**Attacher responsibility percentage**	**11.60%**	Line 3
35	**Net cost of a bare pole**	**$262.19**	Line 11
36	**Total carrying charges**	**27.51%**	Line 33
37	**Pole attachment rate for cable-only**	**8.37**	Line 34 x Line 35 x Line 36

FCC CABLE-ONLY RATE
Blue Ridge EMC
FY 2016 Data

Line #	Description	Amount	Definition
	Attacher Responsibility Percentage		
1	Space occupied	1.11	Per Audit
2	Total usable space	9.61	Calculated - Includes Safety Space
3	**Attacher responsibility percentage**	**11.55%**	Line 1/Line 2
	Net Cost of a Bare Pole		
4	Gross pole investment (Acct. 364)	51,209,182	
5	Accumulated depreciation for poles	19,197,595	
6	Accumulated deferred income taxes	0	
7	Net pole investment	32,011,587	Line 4 - Line 5 - Line 6
8	Appurtenance factor	87.41%	
9	Net pole investment allocable to attachments	27,981,967	Line 7 x Line 8
10	Total number of poles	108,330	
11	**Net cost of a bare pole**	**$258.30**	Line 9/Line 10
	Carrying Charge		
12	Total general and administrative	9,666,925	
13	Total electric plant in service	454,916,323	
14	Total electric plant accumulated depreciation	156,430,349	
15	Total electric plant accumulated deferred income taxes	0	
16	**Administrative carrying charge**	**3.24%**	Line 12/(Line 13 - Line 14 - Line 15)
17	Maintenance expense for overhead lines	8,486,535	
18	Pole investment in Accts. 364, 365, & 369	168,093,587	
19	Depreciation (poles) related to Accts. 364, 365, & 369	51,825,495	
20	Accumulated deferred income taxes for 364, 365, & 369	0	
21	**Maintenance carrying charge**	**7.30%**	Line 17/(Line 18 - Line 19 - Line 20)
22	Gross pole investment (Acct. 364)	51,209,182	
23	Net pole investment	32,011,587	Line 7
24	Depreciation rate for gross pole investment	3.60%	
25	**Depreciation carrying charge**	**5.76%**	(Line 22/Line 23) x Line 24
26	Taxes (Accts. 408.1 + 409.1 + 410.1 + 411.4 - 411.1)	1,698,970	
27	Total utility plant in service	454,916,323	
28	Total company accumulated depreciation	156,430,349	
29	Total company accumulated deferred income taxes	0	
30	**Taxes carrying charge**	**0.57%**	Line 26/(Line 27 - Line 28 - Line 29)
31	Applicable rate of return (default)	11.00%	Presumption
32	**Return carrying charge**	**11.00%**	
33	**Total carrying charges**	**27.87%**	Line 16 + Line 21 + Line 25 + Line 30 + Line 32
	RATE		
34	**Attacher responsibility percentage**	**11.55%**	Line 3
35	**Net cost of a bare pole**	**$258.30**	Line 11
36	**Total carrying charges**	**27.87%**	Line 33
37	**Pole attachment rate for cable-only**	**8.31**	Line 34 x Line 35 x Line 36

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I/A
v2/v3

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EXHIBIT WA-34

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EXHIBIT WA-35

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July 23, 1998

Ms. Roberta D. Purcell
Assistant Administrator
Program Accounting and Regulatory Analysis
USDA-RUS, Room 4063
14th & Independence Ave., SW
Washington, D.C. 20250

Dear Ms. Purcell:

As we previously discussed, the Georgia cooperatives are negotiating a joint use agreement with BellSouth.

BellSouth has stated "Booked cost is the only acceptable cost for calculation of joint use rental" (Exhibit A). The cooperatives disagree with this position based on the following:

- Cooperatives have used average historical cost for retirements. This is the method of retirement provided for in RUS Bulletin 1767B-2, 8.4.4 (Exhibit B). This method has been consistently applied by all the cooperatives and has resulted in plant being retired at a value higher than the original cost. The effect is to understate gross plant, accumulated depreciation expense and depreciation rates.

- The Investor-Owned Utilities (IOUs) in Georgia utilize vintage retirement rather than average historical cost.

- Based on data obtained from FERC Form 1, pole costs for IOUs in Georgia range from approximately $485 (Exhibit C) to $525 (Exhibit D) per pole. Pole cost utilizing book values for Georgia cooperatives is approximately $210 per pole (Exhibit E). The cooperatives and IOUs to a great degree utilize common suppliers and contractors to obtain, install and remove poles. The conclusion is the methodology for retiring plant is the primary cause of the significantly lower book costs for the cooperatives.

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- The cooperative's do not have vintage retirement unit costs, so in order to establish the cost of poles currently in place, we utilized the following alternative costing methodology. Costing methodology was to:

  - Select 3 cooperatives (urban, suburban, rural) representing approximately 20% of the joint use poles.
  - Determine 1997 pole cost.
  - Obtain additions and retirement data for over 30 years for selected cooperatives.
  - Have an independent statistician apply the additions and retirements to the Iowa survivor curve in a program maintained by the Interstate Commerce Commission (Exhibit F).
  - Utilize the Iowa survivor curve data to determine the number of surviving poles by year installed.
  - Utilize the Handy Whitman Index for wooden utility poles (see attachment) in the South Atlantic Region to determine post cost for years prior to 1997 (Exhibit G).

- The result indicated the average pole cost for the cooperatives in the sample, exclusive of anchor and guys, was $233 for poles 35' and under and $412 for 40' poles (Exhibit H).

Based on the information provided, would you let me know if RUS recognizes the cost discrepancies which result from utilizing historical average costing for retirement purposes and recognizes that vintage retirement provides better cost data and your opinion as to whether our alternative approach based on data available provides better costing data than the utilization of average historical cost for retirements. In addition, would you recommend cooperatives convert from the current method to vintage retirement and if so, what data is necessary from RUS's perspective in order to convert. Please give me a call if you have any questions or need any additional information.

Respectfully,

J. Randolph Nichols

JRN/lja

Enclosures

cc: Tim Clower (Enclosures)
Will Arnett (Enclosures)
Mike Whiteside
Hugh Richardson

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Will Arrive

USDA

United States Department of Agriculture
Rural Development

Rural Business-Cooperative Service • Rural Housing Service • Rural Utilities Service
Washington, DC 20250

AUG -4 1998

Mr. J. Randolph Nichols
McNair, McLemore, Middlebrooks & Co., LLP
P.O. Box 1
Macon, Georgia 31202

Dear Mr. Nichols:

We have reviewed the information included in your letter dated July 23, 1998, and offer the following comments.

The Uniform System of Accounts as set forth in 7 CFR Part 1767, Accounting Requirements for RUS Electric Borrowers, establishes the requirement that all Rural Utilities Service (RUS) electric borrowers establish continuing property records (CPRs). The Uniform System of Accounts does not, however, specify a method for establishing and maintaining those records. In the 1930s, 1940s, and 1950s, when many of the RUS electric cooperatives were founded, plant costs were relatively stable from year to year and inflationary trends were nonexistent. Because the RUS systems were small with few employees, RUS developed an average-cost CPR system that required a minimal amount of recordkeeping. Each time a unit was added to plant, its cost was factored into the average cost of all units within that CPR category. When a unit was retired, it was retired at the then-current, average cost of the units within the CPR.

As indicated in your letter, RUS Bulletin 1767 B-2, Work Order Procedure (Electric), still provides for the use of the average cost method. During times of rising costs, however, the average cost method materially understates plant values. Typically, it is the older, lower cost units that are first retired on a system. When these units are retired at an inflated average cost, one that is more reflective of current-day prices, the system value is inappropriately reduced. For example, a pole originally recorded on a cooperative's books and records at $100 may be retired at an average cost of $300. In so doing, plant is understated by $200 as a result of that one retirement.

It is for this reason that RUS is actively encouraging its borrowers to adopt vintage year property records. Under a vintage-year property record system, all plant items within a CPR that are placed in service in a single year are considered to be a distinct group for depreciation purposes (e.g. all poles placed in service in 1995 would represent one vintage while poles placed in service in 1996 would represent another). When a unit is retired, it is retired at the vintage's average cost thereby more accurately reflecting its actual cost.

Studies have shown that any RUS cooperative utilizing an average-cost CPR system will have an undervalued system. Systems in areas that have experienced significant growth during the last 20 years will be materially undervalued. When RUS borrowers have performed system-wide inventories to establish vintage year property records, recorded plant values have ranged from between 50 and 65 percent of their actual original cost.

As indicated in your letter, vintage-year property values can be established utilizing the Iowa survivor curves. With the information available from a borrower's records, the number of units and dollars installed each year as well as the number and dollar balances at year's end can be determined. We can also determine the total number of units retired; however, we will not know in which year the unit retired was first placed into service (vintage year). From this information, simulated vintage-year plant records can be developed through a type of regression analysis. By taking the known additions and ending balance for each year, we can "simulate" the vintage retirements that would occur under the retirement pattern of each of the Iowa curves. Each simulated curve is then matched against actual data to determine the best curve fit.

Based upon the information provided with your letter, it appears that the Georgia cooperatives have performed a similar procedure in determining their pole values. The data presented is consistent with the data and conclusions that have been drawn from depreciation studies performed by RUS cooperatives throughout the country. If you have any questions or if we can be of any further assistance, please contact us.

Sincerely,

Roberta D Purcell

ROBERTA D. PURCELL
Assistant Administrator
Program Accounting and
Regulatory Analysis