

BIDDING DOCUMENTS

FOR

LIME HILL SUBSTATION – 12.47 KV TERRYTOWN
CIRCUIT LINE UPGRADE

FOR

CLAVERACK REC

WYSOX, PENNSYLVANIA

JOB NO.: 352034

OWNER:

CLAVERACK REC
32750 ROUTE 6
WYSOX, PA 18854
PHONE: 570-265-2167
FAX: 570-265-6019

BID DATE: AUGUST 6th, 2021

NOTICE TO BIDDERS

CLAVERACK RURAL ELECTRIC COOPERATIVE

Job # 352034

NOTICE IS HEREBY GIVEN that sealed bids will be received by Claverack Rural Electric Cooperative for the following:

12.47 KV Terrytown Line Upgrade – Unit Pricing

Bids are to be received by the Director of Engineering and Operations, Claverack Rural Electric Cooperative, 32750 Route 6, Wysox, Pennsylvania 18854 on or before 3:00 p.m. prevailing time on August 6th, 2021. Bid will be awarded on August 20th, 2021.

Bids must be enclosed in a sealed envelope bearing on the outside the name and address of the bidder and marked **“12.47 KV Terrytown Line Upgrade – Unit Pricing”**.

Electronic copies of the bid documents are available at no cost. No paper copies of the bid documents will be furnished.

Bids shall be irrevocable for a period of sixty (60) days after the date of the bid opening and bidders may not withdraw their bids during that period.

A mandatory pre-bid conference will be held on July 22nd, 2021 at 1:00 pm. The pre-bid conference will be conducted virtually via Zoom. All Bidders are required to participate in the Zoom Pre-Bid meeting. Failure to participate will result in disqualification of bid.

Questions pertaining to the project, specifications, or drawings will be accepted up to August 1st, 2021. This date shall be considered the cutoff date for questions, comments, and clarifications.

Claverack Rural Electric Cooperative reserves the right to accept or reject any or all bids and to waive technicalities and informalities in any bid for the best interest of the Cooperative and to consider the competency and responsibility of the Bidders in awarding the contract.

Nick Berger, Director of Engineering and Operations

TABLE OF CONTENTS

BIDDING REQUIREMENTS

Notice to Bidders
Instructions to Bidders
Bid Form
Bidders Qualifications
Standard Form of Agreement
Special Conditions
General Conditions
Supplementary Conditions
Notice of Award
Notice to Proceed

SUPPLEMENTAL CONTRACT FORMS

Contractor's Bond – RUS Form 168b
Certificate of Contractor – RUS Form 231
Certificate of Completion – Contract Construction – RUS Form 187
Waiver and Release of Lien – RUS Form 224
Certificate of Contractor and Indemnity Agreement – RUS Form 792b
Lobbying and Debarment Form – RUS Form AD 1048

DRAWINGS

Staking Sheets – Job 352034

UNIT ASSEMBLIES AND SPECIFICATIONS

RUS Bulletin 1728F-804
RUS Bulletin 1728F-806
Claverack Specific Non-Standard 15KV Construction Units

INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

- A. *Bidder*—The individual or entity who submits a Bid directly to OWNER.
- B. *Issuing Office*—The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.
- C. *Successful Bidder*—The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents shall be issued to each Bidder in electronic format.
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; OWNER assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 OWNER, in making copies of the Bidding Documents available on the above terms, does so only for the purpose of obtaining Bids for the Work and does not confer a license or grant for any other use.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 *Underground Facilities*

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to OWNER by owners of such Underground Facilities, including OWNER, or others.

4.02 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidders deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.03 It is the responsibility of each Bidder before submitting a Bid to:

- A. examine and carefully study the Bidding Documents, including all Addenda and the other related data identified in the Bidding Documents;
- B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
- C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

E. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

F. become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

G. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

H. promptly give OWNER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by OWNER is acceptable to Bidder; and

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.04 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given OWNER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by OWNER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 – PRE-BID CONFERENCE

5.01 A mandatory pre-bid conference will be held at the time and location described in the Notice to Bidders. Representatives of OWNER will be present to discuss the Project. It is mandatory that all Bidders attend and participate in the conference. OWNER will transmit to all prospective Bidders of record such Addenda as OWNER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 – SITE AND OTHER AREAS

6.01 The Sites are identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to OWNER in writing. Interpretations or clarifications considered necessary by OWNER in response to questions will be issued by Addenda mailed or delivered to all parties recorded by OWNER as having received the Bidding Documents. Questions received less than five (5) days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER.

ARTICLE 8 – NOT USED

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. If OWNER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the contract award.

12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER subject to revocation of such acceptance after the Effective Date of the Agreement.

12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from OWNER.

13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each section, listed therein, or the words “No Bid,” “No Change,” or “Not Applicable” entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. The corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

13.06 A Bid by an individual shall show the Bidder’s name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

13.10 The address and telephone number for communications regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder’s authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder’s state contractor license number for the state of the Project, if any, shall also be shown on the Bid form.

ARTICLE 14 – BASIS OF BID; EVALUATION OF BIDS

14.01 *Unit Prices*

- A. Bidders shall submit a Bid based upon the sum total of unit prices as set forth in the Bid form. Attached thereto, the Bid Form shall also include all tables containing individual unit prices.

ARTICLE 15 – SUBMITTAL OF BID

15.01 Each prospective Bidder is furnished an electronic copy of the Bidding Documents. The Bid form is to be printed, completed, and submitted with the following data:

A. Certificate of Insurance.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), along with the name and address of Bidder. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED."

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened at the discretion of the OWNER and will not be read aloud publicly. It shall be at the sole discretion of the OWNER whether or not to disclose a summary of the bids to Bidders.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but OWNER may, in its sole discretion, release any Bid prior to the end of this period.

ARTICLE 19 – AWARD OF CONTRACT

19.01 OWNER reserves the right to reject any or all bids, including without limitation, nonconforming, non-responsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER may also reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with Successful bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, OWNER will consider qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for

those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals or entities to perform the Work in accordance with the contract Documents.

19.06 If the Contract is to be awarded, OWNER will award the Contract to the Bidder whose Bid is in the best interests of the Project.

ARTICLE 20 – NOT USED

ARTICLE 21 – SIGNING OF AGREEMENT

When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER. Within ten days thereafter, OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of Drawings with appropriate identification.

ARTICLE 22 – SALES AND USE TAXES

22.01 OWNER is exempt from sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Bid.

ARTICLE 23 – RETAINAGE

23.01 Provisions concerning CONTRACTOR's rights to deposit securities in lieu of retainage are set forth in the Agreement.

ARTICLE 24 – STATUTES AND ORDINANCES

24.01 All applicable Federal, State and Local statutes and ordinances shall be adhered to by the contractor.

BID FORM

CONTRACT IDENTIFICATION: CLAVERACK RURAL ELECTRIC COOPERATIVE
12.47 KV TERRYTOWN LINE UPGRADE – UNIT
PRICING

THIS BID IS SUBMITTED TO: Claverack Rural Electric Cooperative, Inc.
32750 Route 6
Wysox, PA 18854

1. The undersigned Bidder proposes and agrees, if this Bid is accepted by Owner, to enter into an Agreement with Owner in the form included in the Bidding Documents, to complete all Work as specified or indicated in the Bidding Documents for the Contract Unit Prices and within the Contract Time indicated in this Bid and in strict accordance with the Bidding Documents.

2. Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders. This Bid will remain open for sixty (60) days after the day of Bid Opening, or for such longer periods of time that the Bidder may agree to in writing upon request by the Owner. Bidder will sign the Agreement and other documents required by the Contract Documents within fifteen (15) days after the date of Owner's Notice of Award.

3. In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that:

- (a) Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged:

<u>Addendum No.</u>	<u>Addendum Date</u>
_____	_____
_____	_____
_____	_____
_____	_____

- (b) Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.
- (c) Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.
- (d) Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- (e) Bidder is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.
- (f) Bidder has correlated with information known to Bidder, information and

observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

- (g) Bidder has given OWNER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by OWNER is acceptable to Bidder.
- (h) The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

4. Bidder further represents that this Bid is genuine and not made in interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

5. Bidder will complete the Work in accordance with the Contract Documents for the following price(s).

A. **UNIT PRICE BASE BID:**

- 1. Bidder shall complete the work on a Unit Price Basis. Bidder understands and acknowledges that the Unit Price Base Bid is for evaluation purposes only. This base bid shall include all pole line work as indicated on the Staking Sheets and in accordance with RUS Bulletin 1728F-804 "Specifications and Drawings for 12.47 / 7.2 KV Line Construction".
- 2. Bidder understands that the Total Base Bid shall be the sum of the extensions of the Unit Prices and Quantities as submitted below. The prices submitted in the tables below will also be used to determine the cost of additions and deletions from the specified Work.

Total Unit Price Base Bid Amount _____
(Figure)

(_____)
(Written amount)

6. Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified above, which shall be stated in the Agreement.

7. The following documents are attached to and made a condition of this Bid:

- A. Bidder Qualifications;

- B. A tabulation of Subcontractors, Suppliers and other individuals and entities required to be identified in this Bid;

SUBMITTED ON _____, 20____.

State Contractor License No. _____. (If applicable)

BIDDER IS:

An Individual

By _____ (SEAL)
(Individual's Name)

doing business as _____

Business Address: _____

Phone No.: _____

A Partnership

By _____ (SEAL)
(Firm Name)

(General Partner)

Business Address: _____

Phone No.: _____

A Corporation

By _____
(Corporation Name)

(State of Incorporation)

By _____
(Name of Person Authorized to Sign)

(Title)

A Joint Venture

By _____
(Name)

(Address)

By _____
(Name)

(Address)

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above).

Subcontractors to be used on Project (All inclusive – Use additional sheets if necessary)

1. _____
(Company Name)

(Project Role)

2. _____
(Company Name)

(Project Role)

3. _____
(Company Name)

(Project Role)

4. _____
(Company Name)

(Project Role)

5. _____
(Company Name)

(Project Role)

6. _____
(Company Name)

(Project Role)

PROJECT SUMMARY

DISTRIBUTION LINE CONSTRUCTION

Section 1 – Pole Units	\$ _____
Section 2 – Pole Top Assembly Units	\$ _____
Section 2a – Conductor Assembly Units	\$ _____
Section 3 – Guying Assembly Units	\$ _____
Section 4 – Anchor Assembly Units	\$ _____
Section 5 – Transformer Assembly Units	\$ _____
Section 6 – Grounding Assembly Units	\$ _____
Section 7 – Service Assembly Units	\$ _____
Section 8 – Miscellaneous Assembly Units	\$ _____
Section 9 – Protection Assembly Units	\$ _____
Section 10 – Metering Assembly Units	\$ _____
Section 11 – Reclosing Assembly Units	\$ _____
Section 12 – Sectionalizing Assembly Units	\$ _____
Section 13 – Underground Assembly Units	\$ _____
Total	\$ _____

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING

Section 1 – Pole Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
30-6	3	3							
35-5		2							
35-6		16							
40-4	2	6							
40-5		21							
45-3	7								
45-4	54	2							
45-5		2							
50-2	17								
Rock Adder for Poles (per foot)									
Off Road Adder for Poles (30 – 45 feet)									
Off Road Adder for Poles (50 feet and over)									
Totals:									
Total, Section 1:									

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING (Continued)

Section 2 – Pole Top Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
A1.1 (A1)		26							
A2.1 (A1-1)		4							
A2.21 (A9)		2							
A2.3	1	9							
A3.1 (A3)	1	6							
A5.1 (A5)	5	15							
A5.2 (A5-2)	13	2							
A6.1 (A6)		1							
AP1 (243AWA)		1							
AP4 (243AWA)		1							
AP5 (243AWA)		1							
AP5-2 (243AWA)	1	3							
C1.11L (C1-2)	43								
C1.9N	1								
C2.21L (C1-3)	9								
C2.52L (C2-2)	15								
C3.1 (C3)	11								
C4.2G	1								
C5.21 (C7)		1							
C5.31 (C7-1)	1								
C6.21 (C8)									
C6.21L	1								
Totals:									
Total, Section 2:									

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING *(Continued)*

Section 2a – Conductor Assembly Units									
Unit	Evaluation Quantity (1,000 ft)			Unit Price (\$ / 1,000 ft)			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
8A CWC		0.648							
6A CWC		29.448							
243 AWA		0.432							
#2 ACSR	0.252	0.86							
1/0 ACSR	18.953	4.844							
336.4 MCM									
ACSR	55.449								
#2 TPX	0.456	0.134							
1/0 TPX	0.166	0.099							
3/0 TPX		0.072							
Totals:									
Total, Section 2a:									

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING *(Continued)*

Section 3 – Guying Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
E1.1 (E1-2)	6	34							
E1.2 (E3-3)	85								
E1.4 (E2-2)		1							
E1.5	4								
E4-3	1								
Totals:									
Total, Section 3:									

Section 4 – Anchor Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
F2.8 (F1-2S)	90	34							
Off Road Adder for Anchors (Each)									
Rock Adder for Anchors (Per foot)									
Totals:									
Total, Section 4:									

Section 5 – Transformer Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
G1.2 (G105)	11	9							
G1.3 (G106)	1	2							
10 KVA SP OH	2								
Totals:									
Total, Section 5:									

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING *(Continued)*

Section 6 – Grounding Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
H1.1 (M2-11)	33	15							
H5.1 (M2-12)	49	27							
Totals:									
Total, Section 6:									

Section 7 – Service Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
K10T (House Knob and Wedge Clamp)	2	1							
K13T (Eye Bolt and Wedge Clamp)	15	10							
Totals:									
Total, Section 7:									

Section 8 – Miscellaneous Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
M5-20		2							
M63 (Area Light)	3	3							
Totals:									
Total, Section 8:									

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING *(Continued)*

Section 9 – Protection Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
P1.01 (M5-6)		13							
Totals:									
Total, Section 9:									

Section 10 – Metering Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
Q1.1 (M8)		2							
Totals:									
Total, Section 10:									

Section 11 – Reclosing Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
R1.1 (M3-10)		1							
R3.2 (M3-25A)	1	1							
Totals:									
Total, Section 11:									

Section 12 – Sectionalizing Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
S1.02 (M5-10)	7								
S2.32 (M3-15)	2								
Totals:									
Total, Section 12:									

DISTRIBUTION ASSEMBLY UNITS – UNIT PRICING (Continued)

Section 13 – Underground Assembly Units									
Unit	Evaluation Quantity			Unit Price			Extended Price		
	Install	Retire	Transfer	Install	Retire	Transfer	Install	Retire	Transfer
UGT (UG Riser)	1	1							
UM5	4	6							
Totals:									
Total, Section 13:									

BIDDER QUALIFICATION FORM:

Due to the nature of the project, the Cooperative is requesting that all Bidders provide financial and qualification statements demonstrating their ability to perform the required work. The Bidder qualification statement must be attached to the Bid Form. It is the Cooperative's intent to evaluate all bids on the basis of cost and qualifications and to award the project to the lowest responsible Bidder. After the bid is awarded, all qualification statements will be returned. The following information must be submitted with the Bid:

1. Financial statements for 2019. Financial statements must indicate revenues and expenses.
2. Current available work force.
3. Provide statement of present workload and the firm's ability to meet the project deadlines.
4. Past performance. List at least three (3) projects that demonstrate the Bidders (and subcontractor's) ability and experience on similar type and voltage projects. Provide project name, location, a brief project description, owner's contact person and telephone number.
5. Current safety record statement.
6. Current insurance availability limits.
7. List all pending legal action against the firm.
8. Has firm ever failed to complete any work awarded to it? If yes, explain.
9. Has recovery been made on any performance or payment bond covering the firm? If yes, explain.

Each Bidder is required to respond to all items. Failure to respond to all items **COULD** result in disqualification of bid.

**STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
ON THE BASIS OF UNIT PRICING**

THIS AGREEMENT is by and between Claverack Rural Electric Cooperative, Inc.

(hereinafter called OWNER) and _____

(hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 – WORK

1.01 CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

12.47 KV TERRYTOWN LINE UPGRADE

ARTICLE 2 – THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

12.47 KV TERRYTOWN LINE UPGRADE

ARTICLE 3 – OWNER/DESIGNER

3.01 The Project has been designed by **CLAVERACK RURAL ELECTRIC COOPERATIVE, INC.**
32750 ROUTE 6
WYSOX, PA 18854

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Days for Substantial Completion and Final Payment*

A. The Work will be substantially completed within the period specified under special conditions SC-3.

4.03 Maximum term

- A. The maximum term of this contract shall be twelve (12) months from the date of its initial execution for the validity of unit prices.

4.04 *Liquidated Damages*

A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 4.02 above. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay OWNER \$250.00 for each day that expires after the time specified in paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER \$500.00 for each day that expires after the time specified in paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work on a Unit Price basis in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 5.01.A and 5.02 below:

- A. For all Work, a Unit Price Sum of:

	(\$ _____)
(use words)	(figure)

5.02 CONTRACTOR has submitted Unit Prices for Labor and Equipment for the unit assemblies to perform the work necessary to complete the project. OWNER and CONTRACTOR both understand unit additions and deletions will be necessary to complete the work. The prices attached in the tables below will be used to determine the cost of additions and deletions from the specified Work and adjustments will be made to the price written above when the Work has been completed.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payment*

A. CONTRACTOR shall submit invoices monthly based upon the sum of the amount of work completed on a Unit basis. Invoices will be processed by OWNER within thirty (30) days of receipt of invoice.

6.02 *Progress Payments; Retainage*

A. OWNER shall make progress payments on account of the Contract price on the basis of CONTRACTOR's Application for Payment on or about the last day of each month during performance of the Work as provided in paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established in paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedules of values, as provided in the General Requirements:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions.

- a. 90% of Work completed (with the balance being retainage). If the Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER

and ENGINEER, OWNER, on recommendation of ENGINEER, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no retainage on account of Work subsequently completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed less the aggregate of payments previously made; and

b. 90% of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 90% of the Work completed, less such amounts as ENGINEER shall determine in accordance with paragraph 14.02.B.5 of the General Conditions and less 25% of ENGINEER's estimate of the value of Work to be completed or corrected as shown on the tentative list of items to be completed or corrected attached to the certificate of Substantial Completion.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 7 – INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 5.0% per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce OWNER to enter in to the Agreement CONTRACTOR makes the following representations:

A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto.

E. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

F. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

G. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigation, explorations, tests, studies, and data with the Contract Documents.

H. CONTRACTOR has given OWNER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by OWNER is acceptable to CONTRACTOR.

I. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement
2. Special Conditions
3. General Conditions
4. Supplementary Conditions
5. Staking Sheets and Drawings, with each sheet bearing the Staking Sheet Job Number: 352034.
6. RUS Specifications and Drawings
7. Certificate of Insurance.
8. Contractor's Bond
9. Lobbying and Debarment Form
10. Exhibits to this Agreement (enumerated as follows):
 - a. Notice to Proceed
 - b. CONTRACTOR's Bid Form including Unit Price Sheets
11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Written Amendments;
 - b. Work Change Directives;
 - c. Change Order(s).

B. The documents listed in paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.05 of the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings indicated in the General Conditions.

10.02 *Assignment of Contract*

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

A. Any provision or part of the contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in duplicate. One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or on their behalf.

NOTE TO USER

1. See I-21 and correlate procedures for format and signing between the two documents.

This Agreement will be effective on _____, ____ (which is the Effective Date of the Agreement).

OWNER:

CONTRACTOR:

By: _____

By: _____

[CORPORATE SEAL]

[CORPORATE SEAL]

Attest _____

Attest _____

Address for giving notices:

Address for giving notices:

(If OWNER is a corporation, attach evidence of authority to sign. If OWNER is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of OWNER-CONTRACTOR Agreement.)

License No. _____
(Where applicable)

Agent for service of process: _____

(If CONTRACTOR is a corporation or a partnership, attach evidence of authority to sign.)

Designated Representative:

Designated Representative:

Name: _____

Name: _____

Title: _____

Title: _____

Address: _____

Address: _____

Phone: _____

Phone: _____

Facsimile: _____

Facsimile: _____

SPECIAL CONDITIONS

SC-1 SCOPE OF WORK

The project involves the conversion of approximately 3.5 miles of single phase 1/0 AWG ASCR, 243 AWA, and 6A CWC to three phase 336.4 MCM ACSR to the 12.47 KV Terrytown circuit out of Lime Hill substation.

All work shall be performed to minimize outages to Cooperative members. Shutdowns shall be limited to cut-over only and must be scheduled with the Cooperative Engineering Department no less than 24 hours in advance. Outages will be limited to four (4) hours and shall occur during normal working hours.

All pole line material, including poles, transformers, transformer racks, insulators (dead-end & pin), cross-arms, fiberglass standoff arms, primary conductors, secondary conductors, guy wires, guy anchors, pre-form grips, automatic dead-ends, guy guards, dead-end shoes, lightning arresters, switches, gang operated air break switches, reclosers, fuse cut- outs, fuses, braces, tie-wire, links, nuts, bolts, washers, clevises, ground rods, ground wire, staples, wire connectors, secondary attachment hardware shall be furnished by the Cooperative.

The contractor shall be responsible for providing all other material items required to complete the project.

The contractor shall also be responsible for furnishing all manpower, trucks, tools, material handling including loading, transport and off-loading, public and employee safety equipment (PPE), project security, work and access permits, traffic and pedestrian control and miscellaneous related services.

All material that is furnished by the Cooperative that is turned over to the Contractor shall become the property of the Contractor. Loss, theft or damage to Cooperative furnished material shall be replaced by the contractor with like material at no cost to the Cooperative. The Cooperative shall inventory all material furnished to the Contractor. The Contractor will be given only the material that is needed for this project. The Cooperative will furnish the material in sufficient quantity to perform the required work.

Specific Contract Work:

1. Removal and replacement of selected poles.
2. Removal of reclosers, transformers, brackets, crossarms, insulators, fuse cut-outs, lightning arresters, guy assemblies, other equipment and hardware as indicated.
3. Removal of primary conductors including 1/0 AWG ACSR, #2 ACSR, 243 AWA, and 6A CWC overhead wire.
4. Removal of secondary conductors and service drops.

5. Installation of group operated switches and switch operators at selected location.
6. Installation of transformers, brackets, crossarms, insulators, fuse cut-outs, lightning arresters, guy assemblies, other equipment and hardware as indicated.
7. Installation of 336.4 MCM ACSR aerial conductors.
8. Installation of new secondary conductors and service drops.
9. Transfer of selected transformers, secondary conductors, secondary service drops, etc. to new poles as indicated.
10. Return all removed material, hardware, and equipment to the Cooperative.
11. Pick-up and load all materials at Cooperative district warehouse and deliver to the work locations.
12. Coordinate all shutdowns with Cooperative Engineering Department.
13. Provide traffic and pedestrian control and barriers in accordance with local and state requirements.
14. Miscellaneous related work.

SC-2 All work shall be done in strict accordance with the contract Documents.

SC-3 TIME FOR PROJECT START-UP AND COMPLETION

It is imperative that this project is completed by the end of calendar year 2021. While the Cooperative would like to have the successful Bidder mobilize its workforce and begin construction in September, the Cooperative will allow an alternative start date to be submitted with the Bid. Should no alternative date be submitted with the bid and agreed upon by the Cooperative, the start date shall remain as stated below.

Work shall commence no later than **September 14, 2021**. Project substantial completion shall be **December 6, 2021**. Project completion shall be **December 31, 2021**.

SC-4 LIQUIDATED DAMAGES

If the Contractor fails to complete all of the required construction work under this Contract in the time limit specified in Article SC-3 "TIME FOR COMPLETION", the Contractor and his sureties shall be liable for liquidated damages per Section 4.03 of the Standard Form of Agreement.

Additionally, the Contractor shall be liable for any and all unplanned outages caused by the contractor during the project. Each forced outage which occurs

due to the contractor's negligence shall be assessed at five-hundred dollars (\$500.00).

SC-5 ISSUING DRAWINGS AND SPECIFICATIONS FOR CONSTRUCTION

Electronic copies of the Staking Sheets/Drawings and Specifications will be given to the successful Contractor at the time of award of the Contract.

SC-6 WORK PROGRESS

The Contractor shall furnish such forces, construction plant and equipment and shall work such hours as shall be necessary to insure the prosecution of the work in accordance with the approved progress schedule.

If, in the opinion of the Owner, the Contractor is falling behind in his progress as scheduled, the Contractor shall take all necessary steps to improve his progress or should it become necessary at any time during construction to accelerate the work or any part of it. The Contractor shall direct and concentrate his work at any location as may be directed by the Owner in order to complete that phase of this Contract.

Failure of the Contractor to comply with a request from the Owner to take necessary steps to complete the project within the time scheduled will be grounds for the Owner to determine that the Contractor is not prosecuting the work with diligence necessary to insure the completion of the entire project within the time specified. The Owner may then terminate the Contractor's rights to proceed with the work or any portion thereof upon written notice of same, setting forth the date of termination.

SC-7 MATERIALS AND EQUIPMENT, STANDARDS OF QUALITY

Materials and equipment as specified shall in all cases be understood as the quality standard for base bidding. Where trade name, manufacturer's name or catalog reference is listed in the specifications or on the drawings, such designations have been made to establish a minimum quality required by the Contract Documents.

SC-8 BLASTING

Blasting will not be permitted on this Project.

SC-9 STANDARD SPECIFICATIONS AND CODES

Where mentioned herein, standard specifications and codes refer to latest issues available and in effect at the bid date, including current addenda.

Whenever any product is specified in accordance with a Federal Specification, an ASTM Standard, or other Association Standard, the Contractor shall, upon request, present an affidavit from the manufacturer certifying that the product complies with the respective standard specification. Where specified or requested, supporting test data shall be submitted to substantiate compliance.

SC-10 SAFETY PRECAUTIONS

(a) The Contractor shall comply with all Owner and OSHA safety requirements while working in or around energized equipment.

(b) The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site which occur as a result of his execution of the work. The safety provisions of the Occupational Safety and Health Act and other applicable building and construction codes shall be observed and the Contractor shall take or cause to be taken such additional safety and health measures as the Owner may determine to be reasonably necessary. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws.

(c) The Contractor shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract. The Contractor shall promptly furnish the Owner and Engineer with copies of the reports concerning these matters.

(d) The Contractor shall indemnify and save harmless the Owner and Engineer from any claims for property damage, damages resulting from personal injury and/or death suffered or alleged to have been suffered by any person or persons as a result of any work conducted under this Contract.

SC-11 DEVIATION FROM CONTRACT DOCUMENTS

Any proposed changes or deviations from the Contract Documents during the Construction Phase of this Project must be submitted to the Owner in writing and his written approval obtained prior to the execution of a proposed change. The Contractor proceeding without receipt of this approval does so at his own risk.

SC-12 CARE OF WORK

(a) The Contractor shall be responsible for all damages to persons or property that occur as a result of his fault of negligence in connection with the prosecution of the work and shall be responsible for the proper care and protection of all materials delivered and work performed until completion and final acceptance whether or not the same has been covered in whole or in part by payments made by the Owner. The Contractor shall remove work damaged by failure to provide protection and replace with new work without extra cost to the Owner.

(b) In an emergency affecting the safety of life or property, including adjoining property, the Contractor, without special instructions or authorization from the Owner, is authorized to act at Contractor's discretion to prevent such threatened loss or injury, and Contractor shall so act. Contractor shall likewise act as instructed to do so by the Owner. Claims for compensation filed by the Contractor

on account of such emergency work will be determined by the Owner and Engineer for fairness and reasonableness.

- (c) The Contractor shall shore up, brace, underpin, secure and protect as may be necessary, all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be in any way affected by the excavations or other operations connected with the construction of the improvements embraced in this Contract. The Contractor shall be responsible for the giving of any and all required notices to any adjoining or adjacent property owner or other party before the commencement of any work. The Contractor shall indemnify and save harmless, the Owner from any damages on account of settlements or the loss of lateral support of the adjoining property and from all loss or expense and all damages for which the Owner may otherwise become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

SC-13 PROTECTION OF SURFACES, STRUCTURES, AND VEGETATION TO REMAIN

All surfaces, structures, and vegetation in the vicinity of the work which are to remain shall be protected, and if injured shall be repaired or replaced at the Contractor's expense. All surfaces shall be cleaned and restored to acceptable condition.

SC-14 ACCESS AND PROTECTION

- (a) The Contractor shall coordinate and schedule his construction work so as to not obstruct overnight and weekend access to any of the residences or daily access to residences or business establishments in the various areas of construction.

- (b) A traffic pattern approved by the Owner and State of Pennsylvania with suitable and sufficient barricades, warning lights and signs shall be placed and maintained by the Contractor to insure the protection and safety of the public and prevent any unnecessary inconvenience. Warning lights shall be maintained from sunset to sunrise. Flagmen shall be provided as required to insure the safe prosecution of the work.

- (c) The Contractor shall be responsible and assume all costs for the controlling of dust, potholes and muddy conditions and the overall deterioration of all streets having construction activity, all to the satisfaction of the Owner and State of Pennsylvania.

SC-15 COMMUNICATIONS

- (a) All notices, demands, requests, instructions, approvals, proposals, and claims must be in writing.

- (b) Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the work site or at the office of the Contractor stated on the signature page of the Agreement (or at such other office as the Contractor may from time to time designate in writing to the Owner).

(c) All papers required to be delivered to the Owner shall, unless otherwise specified in writing to the Contractor, be delivered to the Owner and any notice to or demand upon the Owner shall be sufficiently given if so delivered.

(d) Any such notice shall be deemed to have been given as of the time of actual delivery.

SC-16 REMOVAL OF DEBRIS AND CLEANING

The Contractor shall, periodically or as directed during the progress of the work, remove and legally dispose of all surplus material and debris and keep the Project Area and public rights-of-way reasonably clear. Upon completion of the work, Contractor shall remove all temporary construction facilities, debris and unused materials provided for the work, and put the whole site of the work and public rights-of-way in a neat and clean condition. Trash burning on the site will not be permitted.

SC-17 ADDITIONAL FORMS

Additional forms, other than those enclosed within the specifications, may have to be filled out by the Contractor as the job progresses. It shall become the responsibility of the Contractor to comply with the request of the Owner regarding this matter.

SC-18 TEMPORARY ELECTRICAL POWER

The Contractor shall be responsible for the providing of all temporary electric power required for the performance of Contractor's work.

SC-19 GUARANTEE

The period of guarantee stipulated in the General Conditions shall not begin to run until the date of final acceptance of all work which the Contractor is required to construct under this contract.

SC-20 INSPECTION AND / OR TESTING

(a) All materials and workmanship shall be subject to inspection, examination, or test by the Owner and the Engineer at any and all times during construction. The Owner shall have the right to reject defective material and workmanship or require its correction. Unacceptable workmanship shall be satisfactorily corrected. Rejected material shall be promptly segregated and removed from the Project Area and replaced with material of specified quality without charge therefor. If the Contractor fails to proceed at once with the correction of rejected workmanship or defective material, the Owner may, by contract or otherwise, have the defects remedied or rejected materials removed from the Project Area and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

(b) The Contractor shall furnish promptly all materials reasonably necessary for any tests which may be required. All tests by the Owner will be performed in such manner as not to delay the work unnecessarily.

(c) The Contractor shall notify the Owner sufficiently in advance of backfilling or concealing any facilities to permit proper inspection. If any facilities are covered or concealed prior to inspection, the Contractor shall uncover for inspection and recover such facilities all at his expense, when so requested by the Owner.

(d) Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed, the Contractor shall furnish all necessary facilities, labor and material. If such work is found to be defective in any important or essential respect, due to fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction.

(e) Neither inspection, testing, approval nor acceptance of the work in whole or in part by the Owner or its agents shall relieve the Contractor or his sureties of full responsibility for materials furnished or work performed not in strict accordance with the Contract.

SC-21 DESIGN MODIFICATIONS / "DOWN TIME"

Whenever modifications to original designs may be required to suit actual job conditions, these shall promptly be provided by the Owner. The Contractor shall not be allowed additional compensation or extension of time for "Down Time" resulting from time required by Owner to provide design modifications.

SC-22 MISCELLANEOUS REQUIREMENTS

Any required incidentals such as, but not limited to, project identifications signs, mobilization, project photographs, job office, dust control, traffic control, sedimentation and erosion control, removing obstacles from construction areas, and other general required incidental work, shall not be paid for under separate items but shall be included in the lump sum for this project.

SC-23 EXTENSION AND REDUCTION OF WORK

The Owner may expand or reduce the work shown or may delete items of work shown to benefit the project. All additions, reductions, or deletions shall be adjusted on a unit price basis.

SC-24 SOIL EROSION AND SEDIMENT CONTROL

All construction work and erosion control measures to be performed in accordance with the regulations of the Owner, County and State of Pennsylvania.

SC-25 EXISTING UTILITIES

The Contractor shall be required to coordinate his work with all utility companies including, but not limited to, gas, water, telephone, electric, steam, television cable, storm and sanitary sewer. This shall include the verification of all underground

locations of such utilities as well as any others affecting the work of this Contract. The Contractor shall contact Pennsylvania One Call system prior to any excavation work.

The Contractor shall be responsible for all costs of replacement looping, relocation or repair of all underground utility lines or poles which become necessary in order to implement the work of this Contract.

In the event that matters regarding utility company line conflicts become apparent during the course of the work, the Contractor shall be responsible for immediately notifying the utility company involved and the Owner.

SC-26 CONSTRUCTION COORDINATION

Contractor shall coordinate all construction activity with the Cooperative's Engineering Department.

SC-27 REPLACING DEFECTIVE MATERIAL OR EQUIPMENT

The replacing of defective material or equipment shall only apply to material or equipment furnished by the Contractor or Owner furnished equipment damaged during receiving, handling, storage or installation by the Contractor. Any Owner furnished material found to be defective when received shall be brought to the attention of the Owner's representative and shall not be installed. The Contractor shall replace any Owner furnished material, exclusive of material costs, which were installed after being received defective at no additional cost to the Owner.

SC-28 OUTAGES

All work shall be performed to minimize outages to Cooperative members. Shutdowns shall be limited to cut-over only and must be scheduled with the Cooperative no less than 24 hours in advance. Outages will be limited to four (4) hours and shall occur during normal working hours.

See paragraph SC-4 for Forced Outage penalty.

SC-29 SUPPLEMENTAL CONTRACT FORMS

A listing of supplemental contract forms made part of this document is listed below along with their respective execution times.

The following forms must be executed by the successful Bidder prior to commencing work on the project.

1. Contractor's Bond (RUS Form 168b)
2. Lobbying and Debarment (RUS AD 1048)

The following forms must be executed by the successful Bidder upon completion of all project work.

1. Certificate of Contractor (RUS Form 231)

2. Certificate of Completion – Contract Construction (RUS Form 187)
3. Waiver and Release of Lien (RUS Form 224)
4. Certificate of Contractor and Indemnity Agreement (RUS Form 792b)

GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda* — Written or graphic instruments issued prior to the openings of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement* — The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment* — The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos* — Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid* — The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents* — The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements* — The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds* — Performance and payment bonds and other instruments of security.

9. *Change Order* — A document recommended by ENGINEER which is signed by CONTRACTOR and owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim* — A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract* — The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents* — The Contract Documents established the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Special Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price* — The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times* — The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by

engineer's written recommendation of final payment.

15. *CONTRACTOR* — The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work* — See paragraph 11.01 A for definition.

17. *Drawing* — That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement* — The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER* — The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant* — An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order* — A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements* — Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition* — The presence at the Site of Asbestos, PCB's, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste* — The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations* — Any and all applicable laws, rules,

regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens* — Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone* — A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award* — A written notice by owner to the apparent successful bidder stating that upon timely compliance by apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed* — A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *Owner* — The individual entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization* — Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCB's*—Polychlorinated biphenyls.

33. *Petroleum* — Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project* — The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual* — The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material* — Source, special nuclear, or byproduct material as defined by Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative* — The authorized representative of engineer who may be assigned to the Site or any part thereof.

38. *Samples* — Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings* — All drawings, diagrams, illustrations, schedules, and other data or information, which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site* — Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by owner which are designated for the use of CONTRACTOR.

41. *Specifications* — That part of the Contract Documents consisting of written technical descriptions of workmanship as applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor* — An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion* — The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and substantially complete” as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Condition* — That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier* — A manufacturer, fabricator, supplier, distributor, materialman, or vendor having

a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities* — All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work* — Work to be paid for on the basis of unit prices.

48. *Work* — The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to product such construction, and furnishing, installing, and incorporating all material and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive* — A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment* — A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

1.01 Terminology

A. Intent of Certain Terms of Adjectives

1. Whenever in the Contract Documents the terms “as allowed,” “as approved,” or terms of like effect or import are used, or the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory.” Or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. Day

1. The word “day” shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. Defective

1. The word “defective” when modifying the word “Work” refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, referenced standard, test, or approval referred to in the Contract’s Documents, or has been damaged prior to ENGINEER’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by owner at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. Furnish, Install, Perform, Provide

1. The word “furnish” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word “install” when used in connection with services, materials, or equipment shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide” when used in connection with services, materials, or

equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of contractor, “provide” is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, contractor shall also deliver to owner such Bonds as CONTRACTOR may be required to furnish.

2.02 *Copies of Documents*

A. Owner shall furnish contractor up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *CONTRACTOR’s Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to

ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including project Milestones.

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05 B, procedures for handling Shop Drawings and other submittals, processing, Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05 B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

3.02 *Reference Standards*

A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference to be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provisions of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provisions or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. If during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to engineer in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16 A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents): or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways: (I) a Written Amendment (ii) a Change Order; or (iii) a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways, (I) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample, or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (I) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – AVAILABILITY OF LANDS;
SUBSURFACE AND PHYSICAL CONDITIONS;
REFERENCE POINTS

4.01 *Availability of Lands*

A. OWNER shall furnish the Site. Owner shall notify CONTRACTOR of any encumbrances or restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely

upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures or construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from condition ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16 A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the necessity of owner's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition caused an increase or decrease in *CONTRACTOR*'s cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03

2. *CONTRACTOR* shall not be entitled to any adjustment in the Contract Price or contract Times if:

a. *CONTRACTOR* knew of the existence of such conditions at the time *CONTRACTOR* made a final commitment to *OWNER* in respect of Contract Price and Contract Times by submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous area required by the Bidding Requirements or Contract Documents to be conducted by or for *CONTRACTOR* prior to *CONTRACTOR*'s making such final commitment; or

c. *CONTRACTOR* failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If *OWNER* and *CONTRACTOR* are unable to agree on entitlement to or on the amount of extent, if any of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, *OWNER*, *ENGINEER*, and *ENGINEER*'s Consultant shall not be liable to *CONTRACTOR* for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by *CONTRACTOR* on or in connection with any other project or anticipated project.

4.04 Underground Facilities

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to *OWNER* or *ENGINEER* by the owners of such Underground Facilities, including *OWNER*, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. *OWNER* and *ENGINEER* shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and contractor shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities, including *OWNER*, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, *CONTRACTOR* shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to *OWNER* and *ENGINEER*. *ENGINEER* will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time the *CONTRACTOR* shall be responsible for the safety and protection of such Underground Facility.

2. If *ENGINEER* concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such

consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a claim therefor as provided in paragraph 10.05.

4.05 *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in engineer's judgement are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data" CONTRACTOR may rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by

CONTRACTOR and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretations of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition shall immediately; (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, or any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If owner and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, owner shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulation, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 1.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in the Circular (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraph 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to owner, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which

CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which owner is required to purchase and maintain.

5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under worker's compensation, disability benefits, and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;
3. claims for damages because of bodily injury sickness or disease, or death of any person other than CONTRACTOR's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reasons;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership; maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraphs 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional

liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insured shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provides in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07 and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense owner's own liability insurance as will protect OWNER against claims which

may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each

other additional insured to whom a certificate of insurance has been issued.

B. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by Supplementary Conditions or Laws and Regulations which will include the interest of OWNER, CONTRACTOR, Subcontractor, ENGINEER, ENGINEER's consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. All policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraphs 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraphs 5.07.

D. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraphs 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extend of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraphs 5.06, owner shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

5.07 *Waiver of Rights*

A. OWNER and contractor intend that all policies purchased in accordance with paragraphs 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of

them) in such policies and will provide primary coverage for all losses and damages caused by perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work: and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof, caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07 B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners,

employees, agents, and other consultants and subcontractors of each and any of them.

5.08 Receipt and Application of Insurance Proceeds

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08 B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest may reach. OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

5.09 Acceptance of Bonds and Insurance; Option to Replace

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interest at the expense of the party who was required such coverage, and a Change

Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgement of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion of portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract

Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work on the performance of Work on Saturday, Sunday, or any legal holiday without OWNER'S written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified, or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run the benefit of owner. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraphs 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgement ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will be reliability perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items*

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1 it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from the specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER.

CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05 A and 6.05 B. ENGINEER will be sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluation substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 AND 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified

date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR, shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, not shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individual or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds

the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when

necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any work knowing or having reason to know that it is contrary to Laws or Regulations. CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of such adjustment, a Claim may be made therefor as provided in paragraph 10.05

6.10 *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to

the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specification, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to ENGINEER for OWNER.

6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of DRAWINGS or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's

Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them.) CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER, and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to make available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If ENGINEER determines that a change in the Contract Document is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to

enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligation under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1.

F. *Resubmittal Procedures*

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultant that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;

2. recommendations by ENGINEER or payment by OWNER of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;

4. use of occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER.

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier, or other individual or entity under worker's compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligates of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors or each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, design, or Specifications; or

2. giving direction or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 – OTHER WORK

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, IF OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work

performed by others under this Article 7, CONTRACTOR shall inspect such work and promptly report to ENGINEER in writing and delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05 Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspection, Test, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsibility for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that

financial arrangements have been made to satisfy OWNER's obligation under the Contract Documents, OWNER's responsibility in respect thereof will be set forth in the Supplementary Conditions.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *OWNER's Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR's to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 *Authorized Variations in Work*

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as

provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10,11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or

by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owned by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time

or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraphs 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.18.A.

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered, to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.02 B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16: or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing

party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing with the time stated in paragraph 10.05 B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Cost Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in the amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and

retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all material and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR shall deliver such bids to OWNER, who will then determine, with the advice of the ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether

rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, and Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required

by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Cost due to the negligence of CONTRACTOR, any subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and

submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include or all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determination of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C)

C. *CONTRACTOR's Fee:* The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;
 - b. for costs incurred under the paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2 is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor.
 - d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones)

will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work with the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety, for or employee or agent or any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR: or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to

compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof)

specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. if any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the

Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones) or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount of extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

13.05 *OWNER May Stop the Work*

A. If the work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not

defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled

to an appropriate decrease in the Contract Price, reflecting the diminished value of work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 OWNER May Correct Defective Work

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professional and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER MAY MAKE A Claim therefor as provided in paragraph 10.05. such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones)

because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 Progress Payments

A. Applications for Payments

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment

and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections, and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in a Application for Payment will constitute a representation by ENGINEER to OWNER, based on Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that (i) inspections made to check the quality or the exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; of (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto,

or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2 ENGINEER may also refuse to recommend any such payment or, because of subsequently inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

C. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02) become due, and when due will be paid by OWNER to CONTRACTOR.

D. Reduction in Payment

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has

delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to

make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for

that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER shall make an inspection of that part of the Work to determine its status part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will promptly make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective., CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract

Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against Lien.

B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due, and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *OWNER May Suspend Work*

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of money due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the CONTRACT. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professional and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided

OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When period of time is referred to in the Contract documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

SUPPLEMENTARY CONDITIONS

The following Supplementary Conditions, along with General Conditions shall be equally applicable to the project as a whole and the Contractor with whom the Owner enters into contract to complete the work stated herein, and any subcontractors employed by said Contractor. All Supplementary Conditions used in conjunction with the General Conditions shall take precedence and modify the General Conditions only to the extent thereof modified. Unaltered provisions of the General Conditions shall remain in effect.

ARTICLE 1 - DEFINITIONS

To the definition of Engineer add the following "Where ENGINEER appears on the Contract Documents or Drawings, it shall carry the same meaning as ARCHITECT, and vice versa."

ARTICLE 2 - PRELIMINARY MATTERS

2.02 Change "up to ten copies" to "electronic copies" and remove the sentence "Additional copies will be furnished upon request at the cost of reproduction."

ARTICLE 3 - CONTRACT DOCUMENTS; INTENT, AMENDING, REUSE

3.01 Add the following statements:

"In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. The Agreement.
 2. Addenda, with those of later date having precedence over those of earlier date.
 3. The Supplementary Conditions.
 4. The Standard General Conditions of the Construction Contract.
 5. RUS Specifications and Drawings.
- In the case of an inconsistency between Drawings and Specifications, or within either document, not clarified by an Addendum, the better quality or greater quantity of work shall be provided in accordance with Engineer/Owner's interpretation."

ARTICLE 5 - BONDS AND INSURANCE

5.01 Delete the first sentence and replace with the following: "Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising there under. Bonds may be obtained through the Contractor's usual source, and the cost thereof shall be included in the Contract price. The amount of each bond shall be equal to 100 percent of the Contract price."

Add the following: "The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the work, submit evidence satisfactory to the Owner that such bonds will be furnished. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power of Attorney.

5.04.A Add the following at the end of 5.04.A: "The insurance required by this paragraph shall be written for not less than the following or greater if required by law:

For the duration of the Contract, the Contractor and each Subcontractor shall, at their own expense, purchase and maintain in a company or companies licensed to do business in the State of Pennsylvania, Statutory Workmen's Compensation including Occupation Disease as required by the laws of the State of Pennsylvania and also Employer's Liability Insurance with limits not less than the following:

Statutory - Amounts and coverage as required by the laws of the State of Pennsylvania.

Employer's Liability - \$500,000 each accident.

For the duration of this Contract, the Contractor and each Subcontractor shall, at their own expense, purchase and maintain in a company or companies licensed to do business in the State of Pennsylvania, Personal Injury Liability Insurance, including coverage for False Arrest, Libel, and Wrongful Eviction, with limits not less than the following:

Personal Injury Liability - \$1,000,000 each occurrence;
\$1,000,000 aggregate.

For the duration of this Contract, the Contractor and each Subcontractor shall, at their own expense, purchase and maintain in a company or companies licensed to do business in the State of Pennsylvania, Comprehensive Automobile Liability Insurance, including coverage for accidents related to operation of motor vehicles owned, non-owned, or leased, with limits not less than the following:

Bodily Injury Liability - \$1,000,000 each person;
\$1,000,000 each occurrence.
Property Damage Liability - \$1,000,000 each occurrence.

For the duration of this Contract, the Contractor and each Subcontractor shall, at their own expense, purchase and maintain in a company or companies licensed to do business in the State of Pennsylvania, Public Liability Insurance coverage for direct operations, sublet work and contractual liability with limits not less than the following:

Bodily Injury Liability - \$1,000,000 each person;
\$1,000,000 each occurrence.

Property Damage Liability - \$1,000,000 each person;
\$1,000,000 each aggregate.
Contractual Liability - Same limits as above.

The Public Liability Insurance shall be maintained with the following extensions:

Broad Form Property Damage Liability - to include "XCU" coverage.

Completed Operations Products Liability - Same limits as above and continue coverage in force for two (2) years after issuance of final Certificate of Payment.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

- 6.10 Add the following sentence: "Purchases by certain entities are not subject to any State Sales of Federal Excise Tax and are exempt by law."

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

Review of Applications for Progress Payment.

- 14.02 Unless otherwise stated in the Agreement, Owner will retain, until final payment, ten (10%) percent of the amount due Contractor on account of Progress Payments.

NOTICE OF AWARD

Dated _____

TO: _____
(BIDDER)

ADDRESS: _____

Contract: _____
(Insert name of Contract as it appears in the Bidding Documents)

Project: _____

OWNER's Contract No. _____

You are notified that your Bid dated _____ for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for _____
(Indicate total Work, alternates or sections or Work awarded)

The Contract Price of your Contract is _____

_____ Dollars (\$_____).

_____ copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. _____ sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within fifteen days of the date of the Notice of Award, that is by _____.

1. Deliver to the Owner _____ fully executed counterparts of the Contract Documents. [Each of the Contract Documents must bear signature on ()].

2. Deliver with the executed Contract Documents the Contract security (Bonds) as specified in the Instruction to Bidders (Article 20), [and] General Conditions (paragraph 5.01) [and Supplementary Conditions (paragraph SC-5.01).]

[illegible]

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

By:

(TITLE)

2 of 2

NOTICE TO PROCEED

Dated _____

TO: _____
(CONTRACTOR)

ADDRESS¹: _____

Contract: _____
(Insert name of Contract as it appears in the Contract Documents)

Project: _____

OWNER'S CONTRACT NO: _____

You are notified that the Contract Times under the above contract will commence to run on _____. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement the date of Substantial Completion is _____ and the date of readiness for final payment is _____.

Before you may start any Work at the Site, paragraph 2.05.C of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds) certificates of insurance with each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must (add other requirements)

By:

(OWNER)

(AUTHORIZED SIGNATURE)

(TITLE)

Copy to ENGINEER

U.S. Department of Agriculture
Rural Utilities Service

CONTRACTOR'S BOND

(Use only when contract is less than \$1 million and Surety has accepted a SBA Guarantee)*

1. Know all persons that we, _____, as
Principal, and _____, as Surety,
are held and firmly bound unto Claverack Rural Electric Cooperative, Inc.
(hereinafter called the "Owner") and unto the United States of America (hereinafter called the "Government")
and unto all persons, firms and corporations who or which may furnish materials for or perform labor on a
Rural Utilities Service project known as 12.47 KV Terrytown Line Upgrade
and to their successors and assigns, in the penal sum of One Hundred Thousand
dollars (\$ 100,000.00), as hereinafter set forth and for the payment of which sum well
and truly to be made we bind ourselves, our executors, administrators, successors and assigns jointly and
severally by these presents. Said project is described in a certain construction contract (hereinafter called the
"Construction Contract") between the Owner and the Principal, dated _____, 20 21,
pursuant and subject to a certain loan contract (hereinafter called the "Loan Contract") between the Owner
and the Government, acting through the Administrator of the Rural Utilities Service (hereinafter called the
"Administrator").
2. The condition of this obligation is such that if the Principal shall well and truly perform and fulfill all the
undertakings, covenants, terms, conditions and agreements of the Construction Contract and any amendments
thereto, whether such amendments are for additions, decreases, or changes in materials, their quantity, kind or
price, labor costs, mileage, routing or any other purpose whatsoever, and whether such amendments are made
with or without notice to the Surety, and shall fully indemnify and save harmless the Owner and the
Government from all costs and damages which they, or either of them, shall suffer or incur by reason of any
failure so to do, and shall fully reimburse and repay the Owner and the Government for all outlay and expense
which they, or either of them shall incur in making good any such failure of performance on the part of the
Principal, and shall promptly make payment to all persons working on or supplying labor or materials for use
in the construction of the project contemplated in the Construction Contract and any amendments thereto, in
respect of such labor or materials furnished and used therein, to the full extent thereof, and in respect of such
labor or materials furnished but not so used, to the extent of the quantities estimated in the Construction
Contract and any amendments thereto to be required for the construction of the project, and shall well and
truly reimburse the Owner and the Government, as their respective interests may appear, for any excess in cost
of construction of said project over the cost of such construction as provided in the Construction Contract and
any amendments thereto, occasioned by any default of the Principal under the Construction Contract and any
amendments thereto, then this obligation shall be null and void, but otherwise shall remain in full force and
effect.
3. Provided, that the liability of the Principal and Surety hereunder to the Government shall be subject to the
same limitations and defenses as may be available to them against a claim hereunder by the Owner, provided,
however, that the Government may, at its option, perform any obligations of the Owner required by the
contract.
4. It is expressly agreed that this bond shall be deemed amended automatically and immediately, without formal
and separate amendments hereto, upon any amendment to the Construction Contract, so as to bind the
Principal and the Surety to the full and faithful performance of the Construction Contract as so amended,

* Small Business Administration

provided only that the total amount of all increases in the cost of construction shall not exceed 20 percent of the amount of the maximum price set forth in the Construction Contract. The term "Amendment," wherever used in this bond, and whether referring to this bond, the Construction Contract or the Loan Contract shall include any alteration, addition, extension, modification, amendment, rescission, waiver, release or annulment, of any character whatsoever.

5. It is expressly agreed that any amendment which may be made by agreement or otherwise between the Principal and the Owner in the terms, provisions, covenants and conditions of the Construction Contract, or in the terms, provisions, covenants and conditions of the Loan Contract (including, without limitation, the granting by the Administrator to the Owner of any extension of time for the performance of the obligations of the Owner under the Loan Contract or the granting by the Administrator or the Owner to the Principal of any extension of time for the performance of the obligations of the Principal under the Construction Contract, or the failure or refusal of the Administrator or the Owner to take any action, proceeding or step to enforce any remedy or exercise any right under either the Construction Contract or the Loan Contract, or the taking of any action, proceeding or step by the Administrator or the Owner, acting in good faith upon the belief that the same is permitted by the provisions of the Construction Contract or the Loan Contract) shall not in any way release the Principal and the Surety, or either of them or their respective executors, administrators, successors or assigns, from liability hereunder. The Surety hereby acknowledges receipt of notice of any amendment, indulgence or forbearance, made, granted or permitted.
6. This bond is made for the benefit of all persons, firms and corporations who or which may furnish any materials or perform any labor for or on account of the construction to be performed under the Construction Contract and any amendments thereto, and they, and each of them, are hereby made obligees hereunder with the same force and effect as if their names were written herein as such, and they and each of them may sue hereon.
7. Provided, further, that no suit or action shall be commenced hereunder by any person, firm, or corporation who performed work or labor or who furnished materials for the project: (a) Unless such person, firm, or corporation, other one having a direct contract with the Principal (or with the Government in the event the Government is performing the obligation of the Owner), shall have given detailed written notice of claim to: The Principal, and the Owner, within ninety (90) days after such person, firm, or corporation did or performed the last of the work or labor, or furnished the last of the materials for which such claim is made. (b) After the expiration of one (1) year following the date on which Principal ceased work on said contract, it being understood, however, that if any limitation embodied in the Bond is prohibited by any law controlling the construction hereof, such limitation shall be deemed to be amended so as to equal to the minimum period of limitation permitted by such law.

In witness whereof, the undersigned have caused this instrument to be executed and their respective corporate seals to be affixed and attested by their duly authorized representatives this

_____ day of _____, 20__21__.

(Seal)

Principal

Attest:

By _____

Secretary

Attest:

Secretary

Surety (Seal)
By _____

Address of Surety's Home Office

By _____
Resident Agent of Surety

Signatures: The Contractor's Bond must be signed with the full name of the Contractor. If the Contractor is a partnership the Contractor's Bond must be signed in the partnership name by a partner. If the Contractor is a corporation the Contractor's Bond must be signed in the corporate name by a duly authorized officer and the corporate seal affixed and attested by the Secretary of the corporation. A typewritten copy of all such names and signatures shall be appended.

Power of Attorney: The Contractor's Bond must be accompanied by a power of attorney authorizing execution on behalf of the Surety and, in jurisdictions so requiring should be countersigned by a duly authorized resident agent of the Surety.

U.S. Department of Agriculture
Rural Utilities Service
CERTIFICATE OF CONTRACTOR

_____ certifies that he/she is the

_____ of _____,
TITLE NAME OF CONTRACTOR

the Contractor, in a Construction Contract No. 12.47 KV Terrytown Line Upgrade,

dated _____, 20 21, entered into between the Contractor and

Claverack Rural Electric Cooperative, Inc., RUS designation PA0015,
NAME OF RUS BORROWER

the Owner, and that he or she is authorized to and does make this certification on behalf of said Contractor in order to induce the Owner to make payment to the Contractor, in accordance with the provisions of said Construction Contract.

Undersigned further says that all persons who have furnished labor in connection with said construction have been paid in full, that the names of manufacturers, material suppliers, and subcontractors that furnished material or services or both in connection with such construction and the kind or kinds of material or services or both so furnished are:

NAME

KIND OF MATERIAL AND SERVICE

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

and that the releases of liens executed by all such manufacturer material suppliers and subcontractors have been furnished the Owner.

_____ Date _____ By _____ President

This Certificate must be signed with the full name of the Contractor. If the Contractor is a partnership, this Certificate must be signed in the partnership name by a partner. If the Contractor is a corporation, this Certificate must be signed in the corporate name by a duly authorized officer.

U.S. Department of Agriculture
Rural Utilities Service

CERTIFICATE OF COMPLETION - CONTRACT CONSTRUCTION

I, the undersigned Architect or Engineer of the following Rural Utilities Service project, do hereby certify that:

1. The construction provided for pursuant to Construction Contract No. 12.47 KV Terrytown Line Upgrade ,
dated _____ , 20 21 , including all approved amendments, between
Claverack Rural Electric Cooperative, Inc. , RUS designation PA0015 ("Owner")
and _____ ("Contractor")
has been completed as of _____ , 20____ , and is in compliance with the
provisions of the Construction Contract, including all plans, specifications, maps, and drawings and all
modifications thereof.
2. Payment in full has been made to all persons who have furnished labor for the project.
3. The Contractor has obtained valid releases of lien from all manufacturers, material suppliers, and
subcontractors furnishing services or materials which were employed by the Contractor in the performance of
the Construction Contract, and that such releases have been delivered by the Contractor to the Owner.
4. If applicable, the Final Inventory attached hereto and made a part hereof is a complete and accurate summary
of all units of construction in the project and of all work performed in accordance with the Construction
Contract.
5. If applicable, the staking sheets and tabulation of staking sheets upon which the Final Inventory is based show
the accurate location, number, and kind of all units of construction of the project and show all work performed
in accordance with the Construction Contract.
6. All defects in workmanship and materials reported during the period of construction of the project have been
corrected.
7. The total cost of the project as completed is _____ dollars
(\$ _____).

Dated this _____ day of _____ , 20____.

_____ Date	_____ Name of Architect or Engineer
	By _____
	_____ Title

CERTIFICATE OF COMPLETION CONTRACT CONSTRUCTION

(continued)

We, the undersigned Owner and Contractor, do hereby certify that:

- 1. The project has been completed in accordance with the provisions of the Construction Contract, dated*

_____, 20____, provided, however, that acceptance of the project by the Owner shall not be deemed to relieve the Contractor of its obligations contained in the Construction Contract with respect to defective workmanship or, materials discovered within one year after the date of completion.

- 2. If applicable, the Final Inventory attached hereto and made a part hereof is a complete and accurate summary of all units of construction in the project and of work performed in accordance with the Construction Contract.*

Owner

By _____

President

Date

Name of Contractor

By _____

Date

Title

U.S. Department of Agriculture
Rural Utilities Service

WAIVER AND RELEASE OF LIEN

WHEREAS the undersigned, _____
NAME OF MANUFACTURER, MATERIAL SUPPLIER OR SUBCONTRACTOR

has furnished to _____ the following:
NAME OF CONTRACTOR

_____ for
KIND OF MATERIAL AND SERVICES FURNISHED

use in the construction of a project belonging to Claverack Rural Electric Cooperative, Inc.
NAME OF BORROWER

and designated the Rural Utilities Service as PA0015
RUS DESIGNATION

NOW, THEREFORE, the undersigned, _____
NAME OF MANUFACTURER, MATERIAL SUPPLIER, OR SUBCONTRACTOR

for and in consideration of \$ _____ and other good and valuable consideration, the receipt whereof is hereby acknowledged, do(es) hereby waive and release any and all liens, or right to or claim of lien, on the above described project and premises, under any law, common or statutory, on account of labor or materials, or both, heretofore or hereafter furnished by the undersigned to or for the account of said _____ for said project .
NAME OF CONTRACTOR

Given under my (our) hand(s) and seal(s) this _____ day of _____, 20____.

Name of Manufacturer, Material Supplier, or Subcontractor

By _____
President

This Waiver and Release of Lien must be signed with the full name of the Manufacturer, Material Supplier, or Subcontractor. If the Manufacturer, Material Supplier, or Subcontractor is a partnership, this Waiver and Release of Lien must be signed in the partnership name by a partner. If the Manufacturer, Material Supplier, or Subcontractor is a corporation, this Waiver and Release of Lien must be signed in the corporate name by a duly authorized officer and the corporate seal affixed and attested by the Secretary of the Corporation.

U.S. Department of Agriculture
Rural Utilities Service

CERTIFICATE OF CONTRACTOR AND INDEMNITY AGREEMENT (Line Extensions)

_____ certifies that he or she is the

_____ of _____
TITLE NAME OF CONTRACTOR

the Contractor, in a Construction Contract No. 12.47 KV Terrytown Line Upgrade,

dated _____, 2021, entered into between the Contractor and

Claverack Rural Electric Cooperative, Inc., RUS designation PA0015,
NAME OF RUS BORROWER

the Owner, and that he or she is authorized to and does make this Certificate and Indemnity Agreement on behalf of said Contractor in order to induce the Owner to make payment to the Contractor, in accordance with the provisions of the said contract.

The undersigned further says that all persons who have furnished labor in connection with the Section of the project represented by the inventory dated _____, 20_____, in the

amount of \$ _____, have been paid in full; that all manufacturers, material suppliers, and subcontractors which furnished any materials or services, or both, for the said Section of the project have been paid in full; that no lien has been filed against the project and no person has any right to claim any lien against the project.

The undersigned further says that if the Owner pays the Contractor the contract price for the said Section of the project the Contractor will indemnify and hold harmless and does hereby undertake and agree to indemnify and hold harmless the Owner from any claim or lien arising out of the negligence or other fault of the Contractor in respect of the performance of the contract which may have been or may be filed against the Owner.

_____ By _____
Date President

This Certificate must be signed with the full name of the Contractor. If the Contractor is a partnership, this Certificate must be signed in the partnership name by a partner. If the Contractor is a corporation, this Certificate must be signed in the corporate name by a duly authorized officer.



Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion Lower Tier Covered Transactions

AD-1048

The following statement is made in accordance with the Privacy Act of 1974 (5 U.S.C. § 552a, as amended). This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, and 2 C.F.R. §§ 180.300, 180.335, Participants' responsibilities. The regulations were amended and published on August 31, 2005, in 70 Fed. Reg. 51865-51880. Copies of the regulations may be obtained by contacting the Department of Agriculture agency offering the proposed covered transaction.

According to the Paperwork Reduction Act of 1995 an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0027. The time required to complete this information collection is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The provisions of appropriate criminal and civil fraud privacy, and other statutes may be applicable to the information provided.

(Read instructions on page two before completing certification.)

- A. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;
- B. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

ORGANIZATION NAME	PR/AWARD NUMBER OR PROJECT NAME
NAME(S) AND TITLE(S) OF AUTHORIZED REPRESENTATIVE(S)	
SIGNATURE(S)	DATE

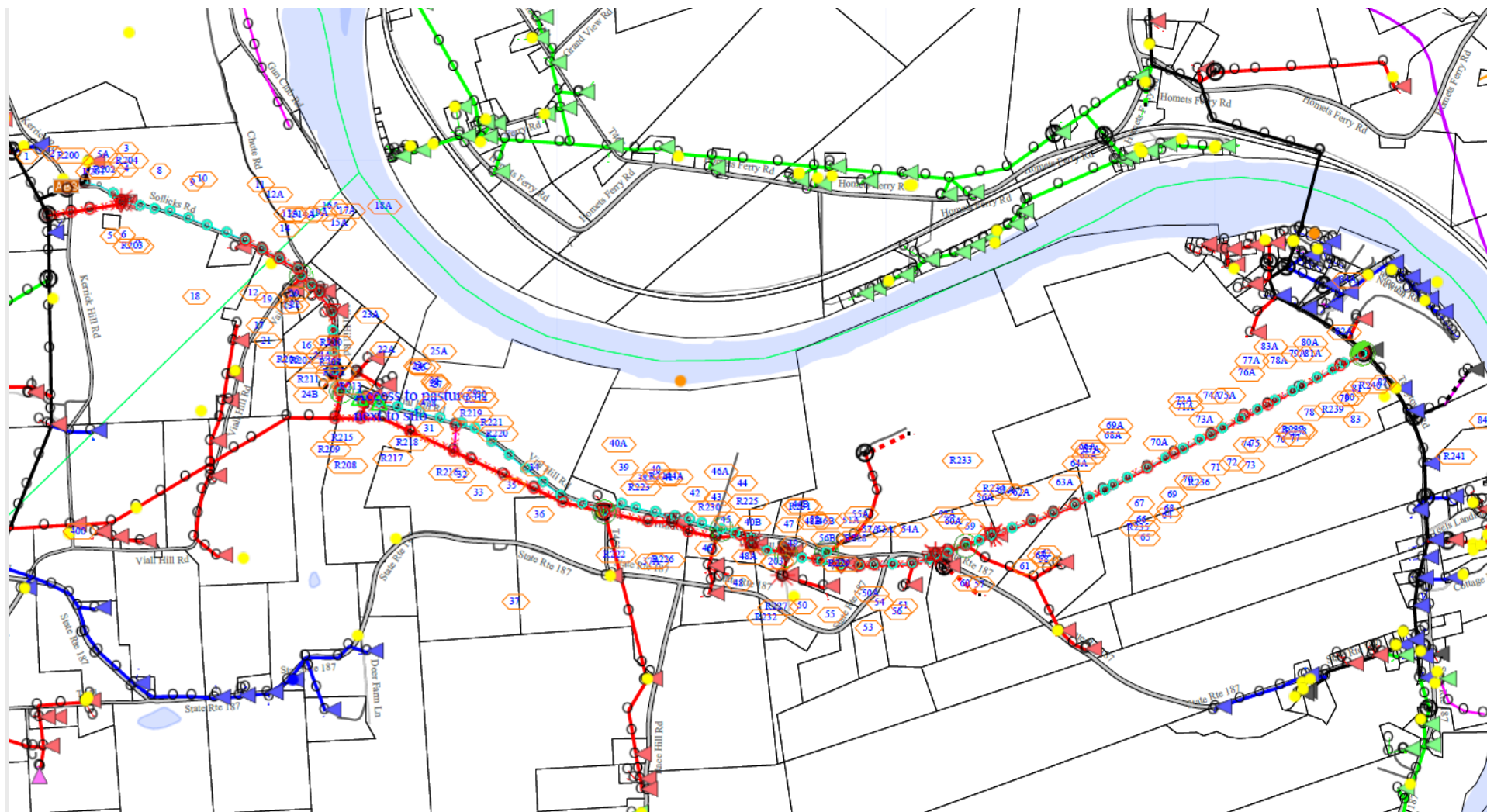
In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint \(https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer\)](https://www.ascr.usda.gov/filing-program-discrimination-complaint-usda-customer) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442.

Instructions for Certification

- (1) By signing and submitting this form, the prospective lower tier participant is providing the certification set out on page 1 in accordance with these instructions.
- (2) The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension or debarment.
- (3) The prospective lower tier participant shall provide immediate written notice to the person(s) to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- (4) The terms "covered transaction," "debarred," "suspended," "ineligible," "lower tier covered transaction," "participant," "person," "primary covered transaction," "principal," "proposal," and "voluntarily excluded," as used in this clause, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549, at 2 C.F.R. Parts 180 and 417. You may contact the department or agency to which this proposal is being submitted for assistance in obtaining a copy of those regulations.
- (5) The prospective lower tier participant agrees by submitting this form that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- (6) The prospective lower tier participant further agrees by submitting this form that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion - Lower Tier Covered Transactions," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions.
- (7) A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the System for Award Management (SAM) database.
- (8) Nothing contained in the foregoing shall be construed to require establishment of a system of records to render in good faith the certification required by this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- (9) Except for transactions authorized under paragraph (5) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.





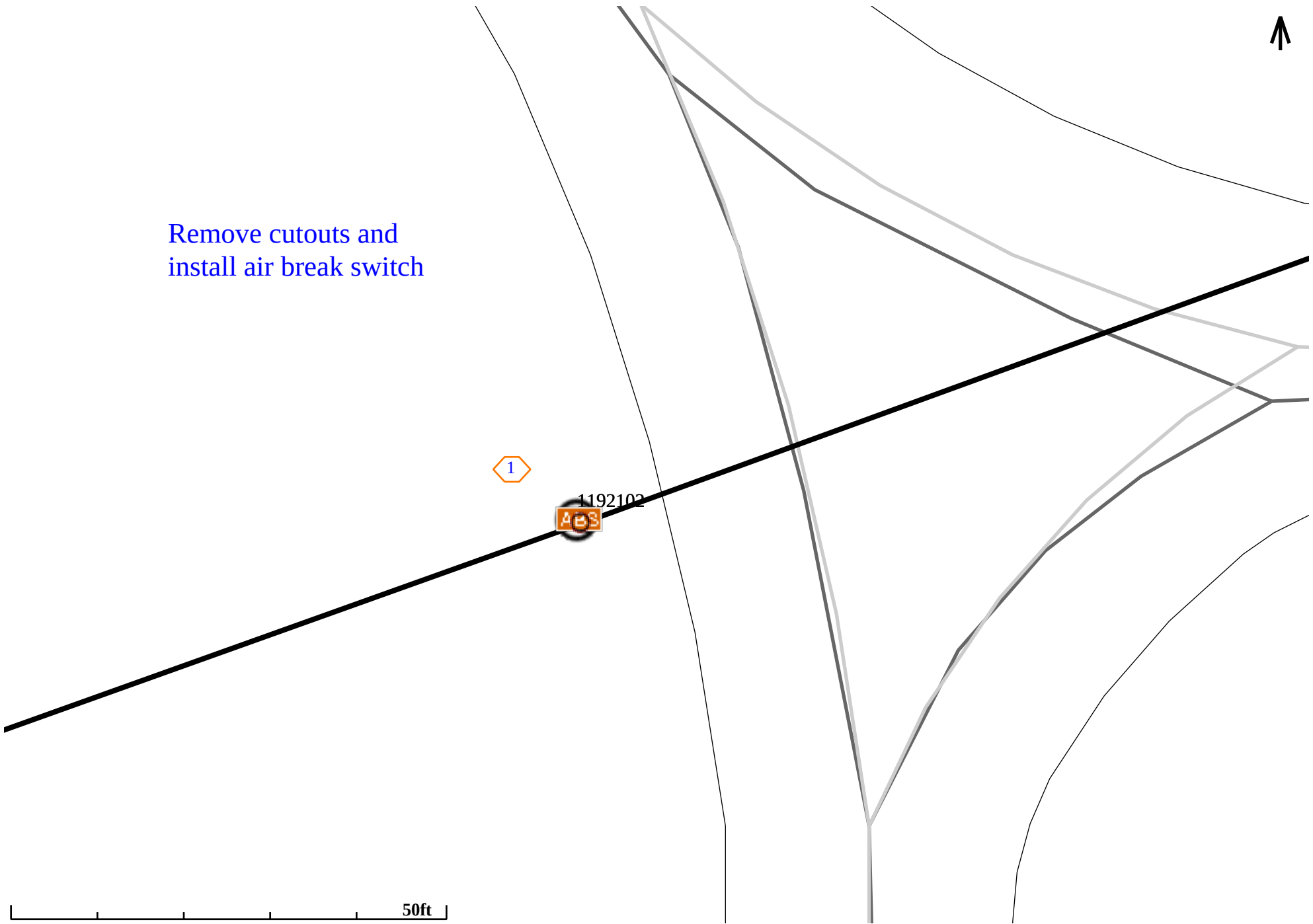
Remove cutouts and
install air break switch

1

AB3

1192102

50ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

1 ExistingOH 0 feet

Source: none

Comments:

Pole #: 1192102

Existing (1) 40-4

Existing (1) C6.21L (C8-2)

New (1) H1.1 (M2-1)

New (1) S2.32 (M3-15)

Retire (1) H5.1 (M2-2)

Retire (3) P1.01 (M5-6)

CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



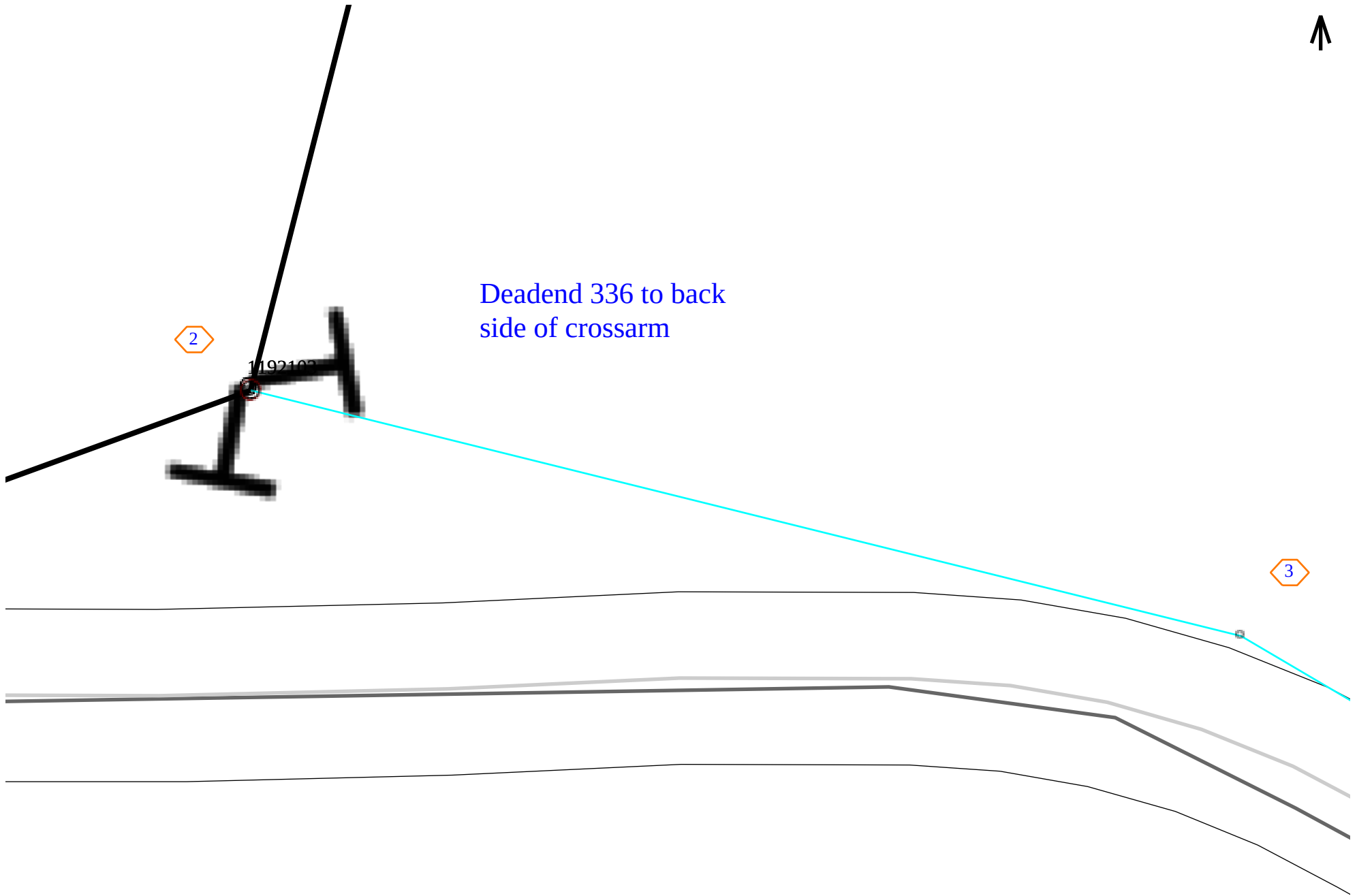
Deadend 336 to back
side of crossarm

2

17192103

3

50ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

2 ExistingOH 0 feet Source: none Comments: Pole #: 1192103 Existing (1) 45-4 Existing (2) C5.31 (C7-1) Existing (6) E1.1 (E1-2) Existing (4) F2.8 (F1-2S) Existing (1) H5.1 (M2-2) New (3) A5.1 (A5 A5-1) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S)	3 NewOH 195 feet Source: 2 Comments: Pole #: New (195) 1/0 ACSR New (585) 336.4 MCM ACSR New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

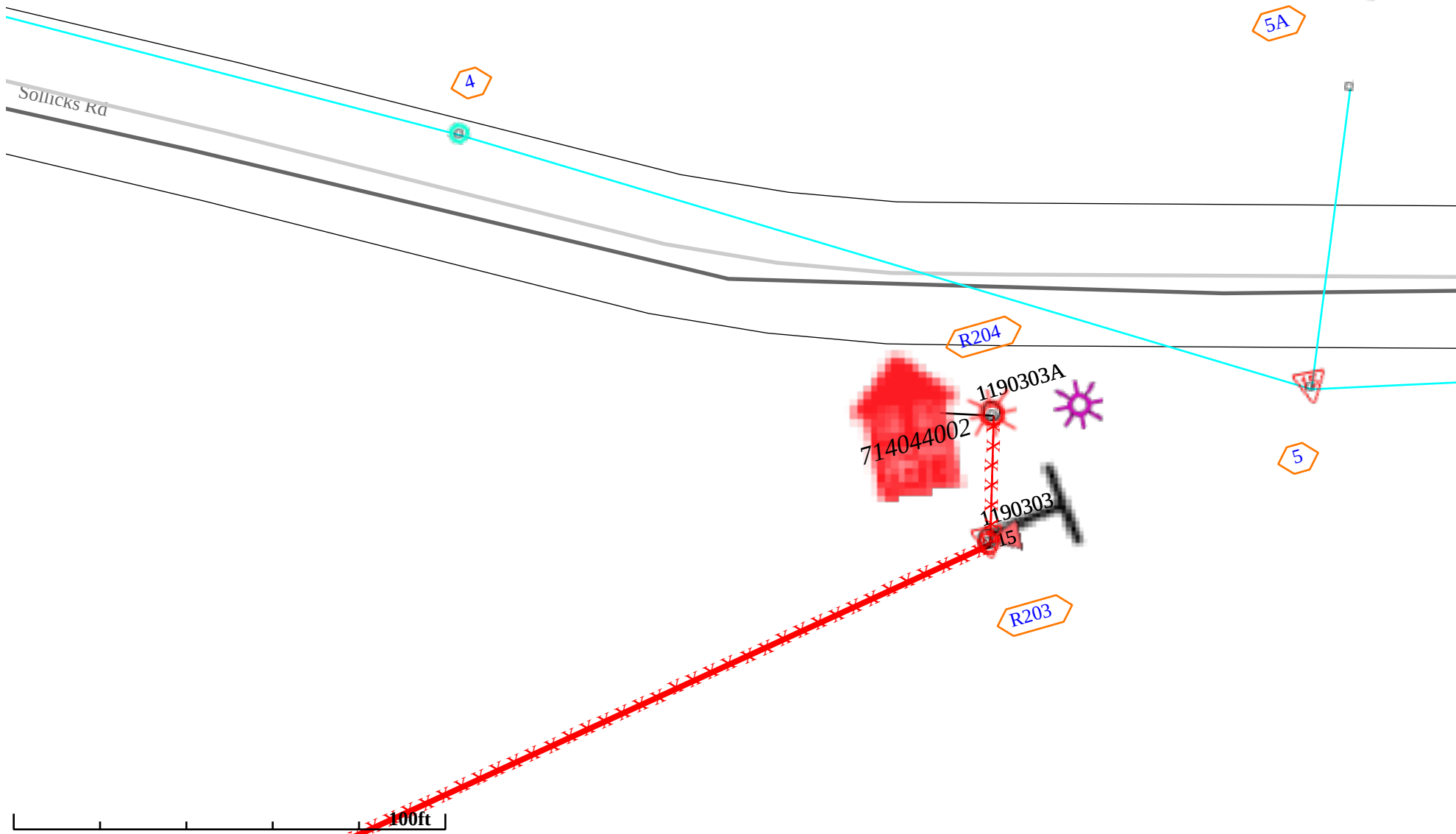
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

4 NewOH 200 feet Source: 3 Comments: Pole #: New (200) 1/0 ACSR New (600) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	5 NewOH 206 feet Source: 4 Comments: Use XFMR from location R203 Pole #: Existing (1) 15 KVA SP OH New (206) 1/0 ACSR New (618) 336.4 MCM ACSR New (1) C3.1 (C3) New (4) E1.2 (E3-3) New (4) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T	5A NewOH 70 feet Source: 5 Comments: Pole #: New (70) 1/0 TPX New (1) SDROP 1/0 TPX	R203 RetireOH 396 feet Source: R202 Comments: Move XFMR to Location 5 Pole #: 1190303 Existing (1) 15 KVA SP OH <i>Retire (1) 45-5</i> <i>Retire (792) 6 ACWC</i> <i>Retire (1) A5.1 (A5 A5-1)</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i> <i>Retire (1) G1.3 (G106)</i> <i>Retire (1) H1.1 (M2-1)</i> <i>Retire (1) K13T</i>
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R204 RetireOH 30 feet

Source: R203

Comments:

Pole #: 1190303A

Retire (30) 1/0 TPX
Retire (1) 30-6
Retire (1) H1.1 (M2-1)
Retire (1) K13T
Retire (1) M63
Retire (1) Q1.1 (M8)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

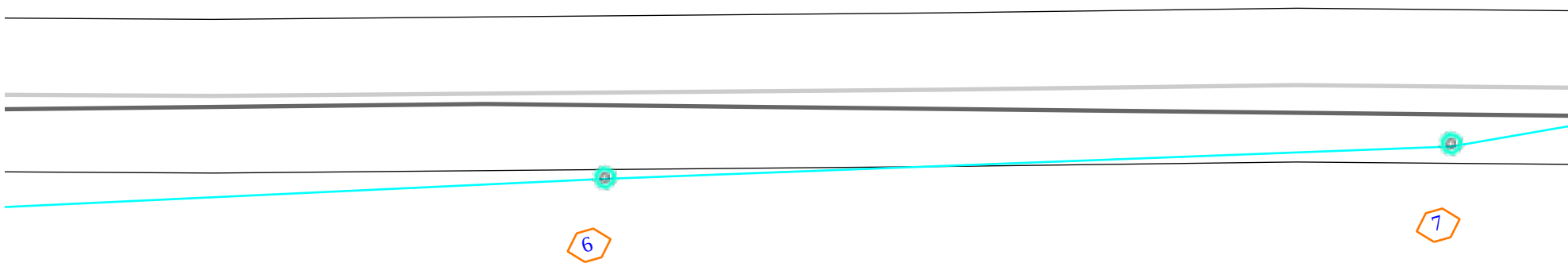
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



100ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

6 NewOH 170 feet Source: 5 Comments: Pole #: New (170) 1/0 ACSR New (510) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	7 NewOH 182 feet Source: 6 Comments: Pole #: New (182) 1/0 ACSR New (546) 336.4 MCM ACSR New (1) 45-4 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



8



Sollicks Rd

100ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

8 NewOH 194 feet

Source: 7

Comments:

Pole #:

New (194) 1/0 ACSR

New (582) 336.4 MCM ACSR

New (1) 45-4

New (1) C2.52L (C2-2)

New (2) E1.2 (E3-3)

New (2) F2.8 (F1-2S)

New (1) H5.1 (M2-2)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

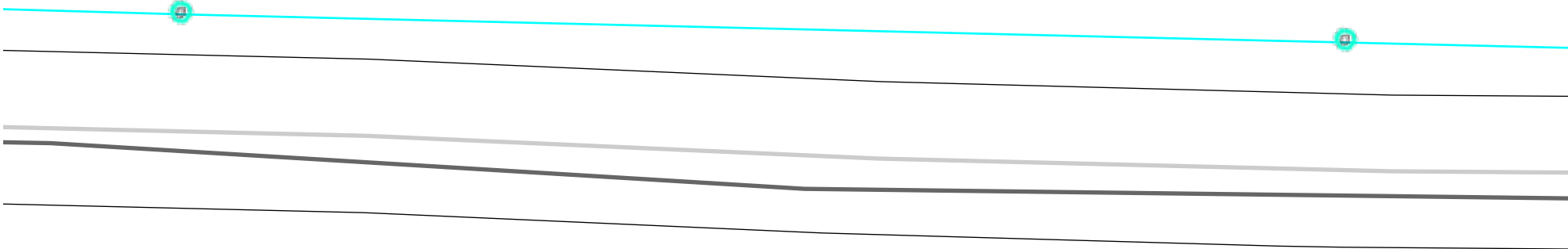
BY: _____

COMMENTS: _____



9

10



100ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

9 NewOH 250 feet Source: 8 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR New (1) 50-2 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	10 NewOH 250 feet Source: 9 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



11

12A

1176104

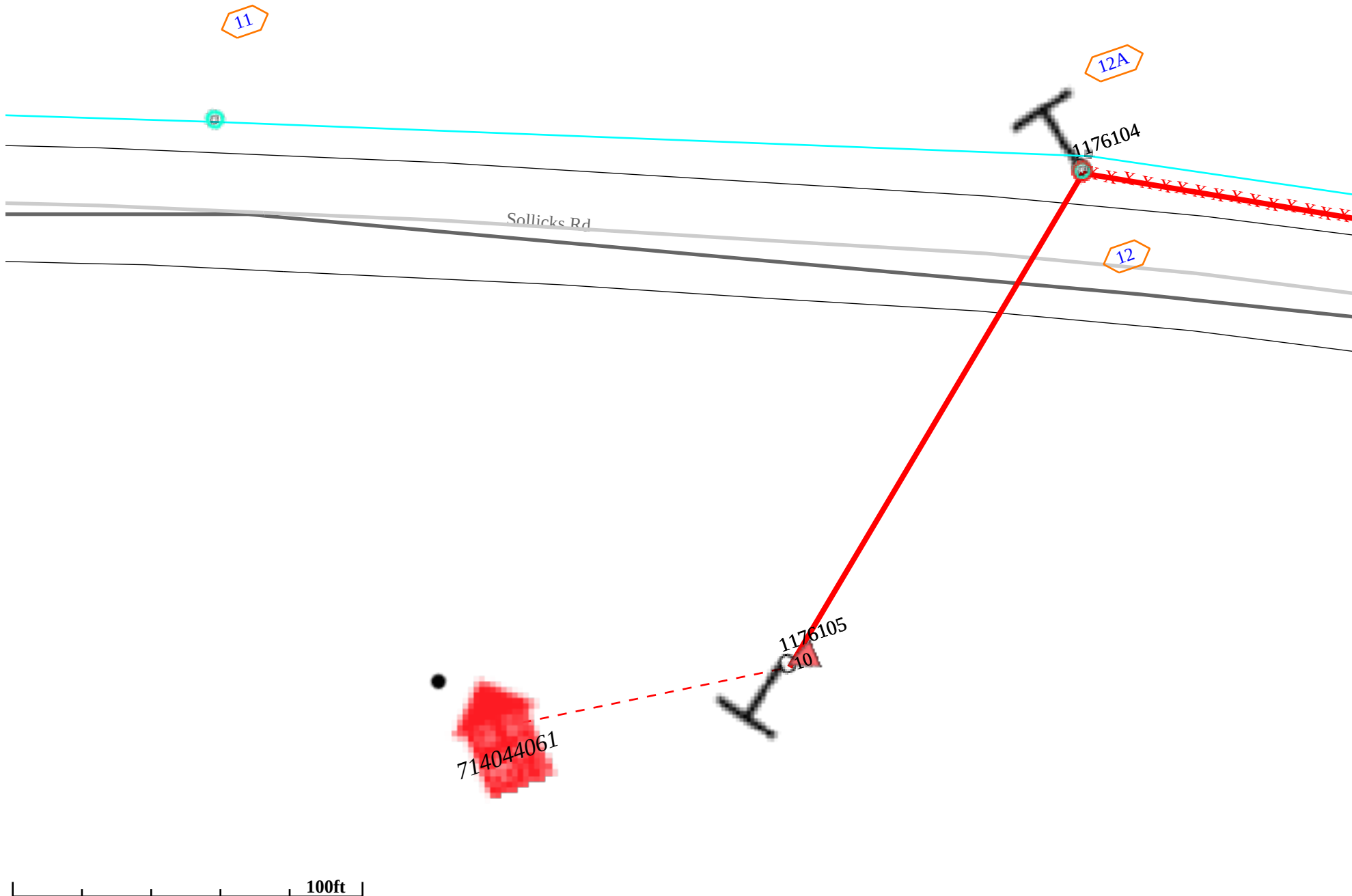
12

Sollicks Rd

1176105

714044061

100ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

11 NewOH 250 feet Source: 10 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	12 RetireOH 243 feet Source: 13 Comments: Pole #: 1176104 New (1) 45-4 New (1) A5.2 (A5-2) New (1) C2.52L (C2-2) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2) Retire (486) 1/0 ACSR Retire (1) 40-4 Retire (1) A3.1 (A3) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	12A NewOH 250 feet Source: 11 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR	
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:

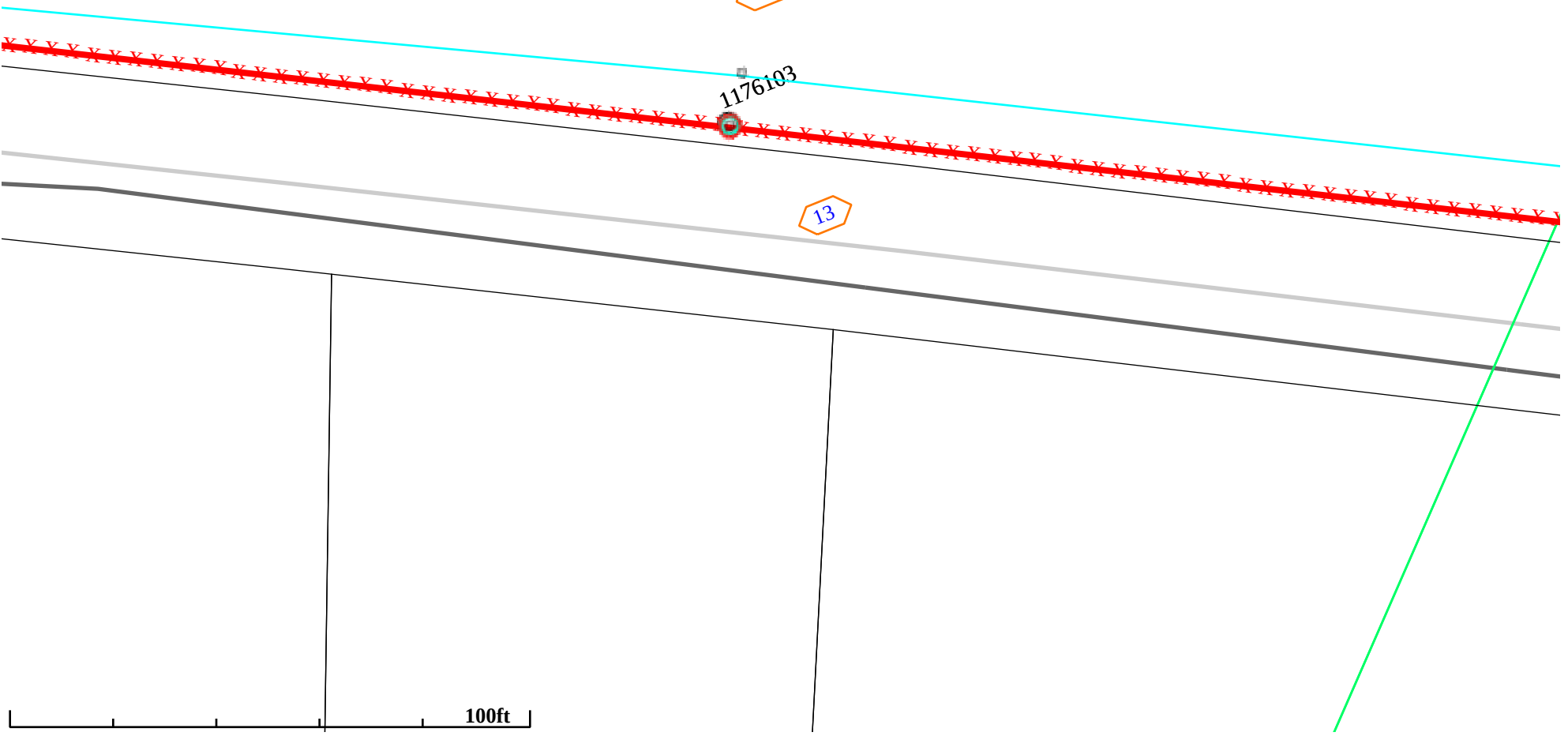


13A

1176103

13

100ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

13 RetireOH 251 feet Source: 14 Comments: Pole #: 1176103 New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1) Retire (502) 1/0 ACSR Retire (1) 40-4 Retire (1) A2.1 (A1-1) Retire (1) H5.1 (M2-2)	13A NewOH 243 feet Source: 12A Comments: Pole #: New (243) 1/0 ACSR New (729) 336.4 MCM ACSR	
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

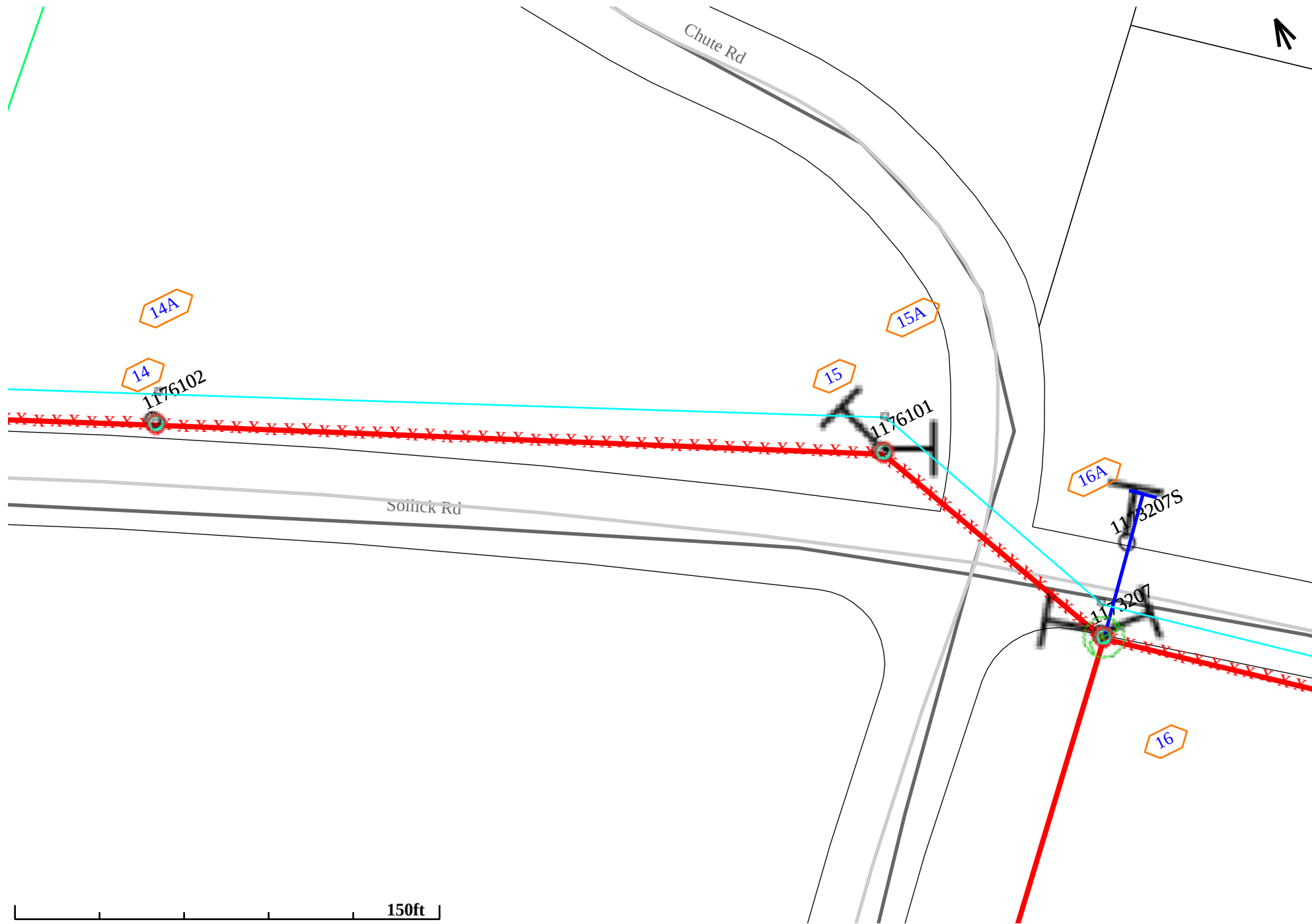
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

14 RetireOH 257 feet Source: 15 Comments: Pole #: 1176102 New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2) Retire (514) 1/0 ACSR Retire (1) 40-4 Retire (1) A1.1 (A1) Retire (1) H5.1 (M2-2)	14A NewOH 250 feet Source: 13A Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR	15 RetireOH 102 feet Source: 16 Comments: Pole #: 1176101 New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2) Retire (102) 1/0 ACSR Retire (102) 243 AWA Retire (1) 40-4 Retire (1) A5.1 (A5 A5-1) Retire (1) AP5 Retire (2) E1.1 (E1-2) Retire (2) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	15A NewOH 257 feet Source: 14A Comments: Pole #: New (257) 1/0 ACSR New (771) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

16 RetireOH 163 feet Source: 17 Comments: Pole #: 1173207 New (1) 50-2 New (1) A5.2 (A5-2) New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (1) E1.5 New (1) E4-3 New (3) F2.8 (F1-2S) New (1) H1.1 (M2-1) New (1) S1.02 (M5-10) Retire (163) 243 AWA Retire (163) 2 ACSR Retire (1) 40-5 Retire (1) AP4 Retire (1) AP5-2 Retire (1) E1.1 (E1-2) Retire (1) E1.4 (E2-2) Retire (1) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	16A NewOH 101 feet Source: 15A Comments: Pole #: New (101) 1/0 ACSR New (303) 336.4 MCM ACSR	
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

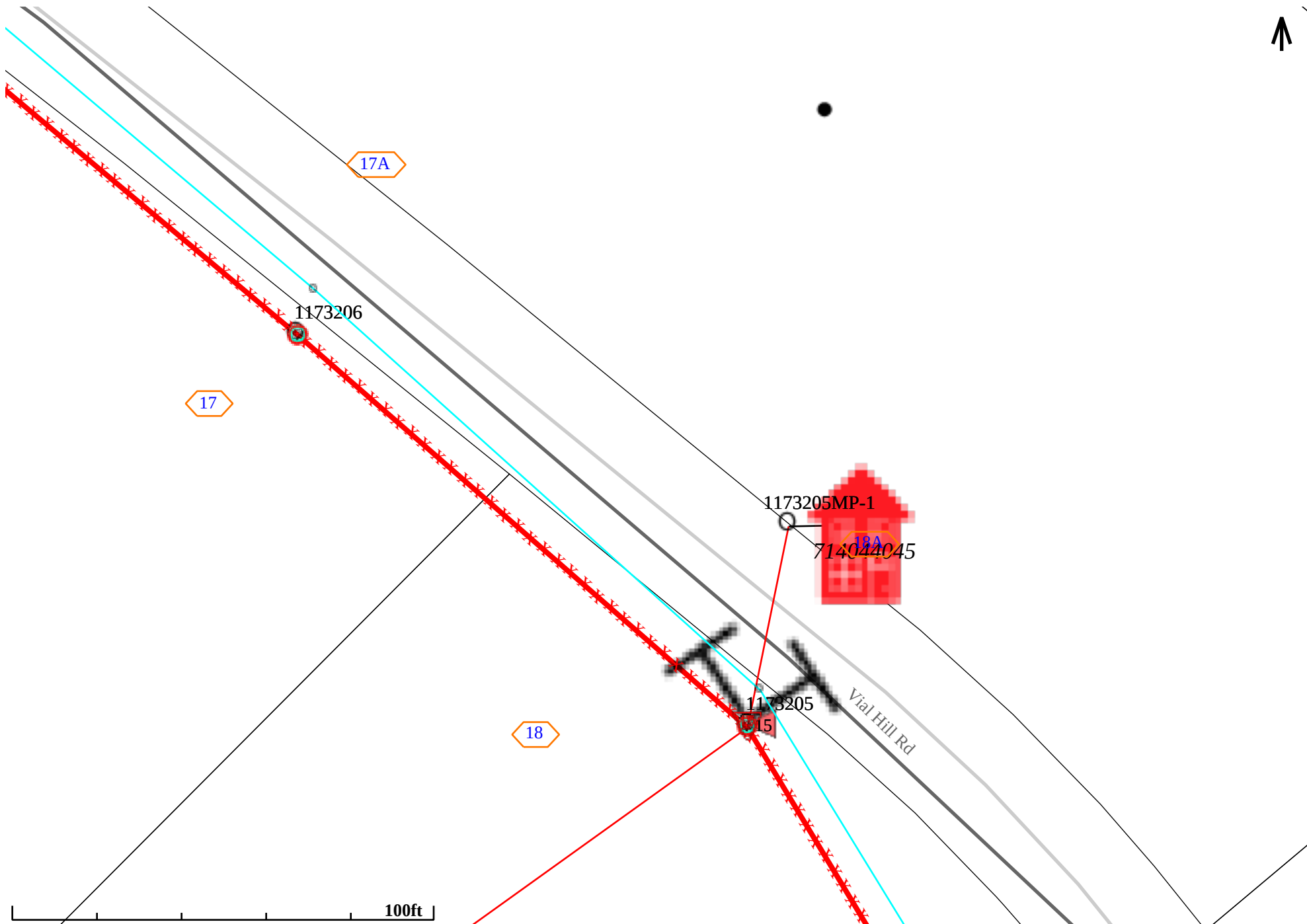
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

17 RetireOH 142 feet Source: 18 Comments: Pole #: 1173206 New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2) Retire (142) 243 AWA Retire (142) 2 ACSR Retire (1) 40-5 Retire (1) AP1 Retire (1) H5.1 (M2-2)	17A NewOH 163 feet Source: 16A Comments: Pole #: New (163) 1/0 ACSR New (489) 336.4 MCM ACSR	18 RetireOH 288 feet Source: 19 Comments: Pole #: 1173205 Existing (1) 15 KVA SP OH New (1) 45-3 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (2) K13T Retire (576) 1/0 ACSR Retire (1) 40-5 Retire (1) A5.1 (A5 A5-1) Retire (1) AP5-2 Retire (2) E1.1 (E1-2) Retire (2) F2.8 (F1-2S) Retire (1) G1.2 (G105 G136) Retire (1) H1.1 (M2-1) Retire (2) K13T	18A NewOH 142 feet Source: 17A Comments: Pole #: New (142) 1/0 ACSR New (426) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

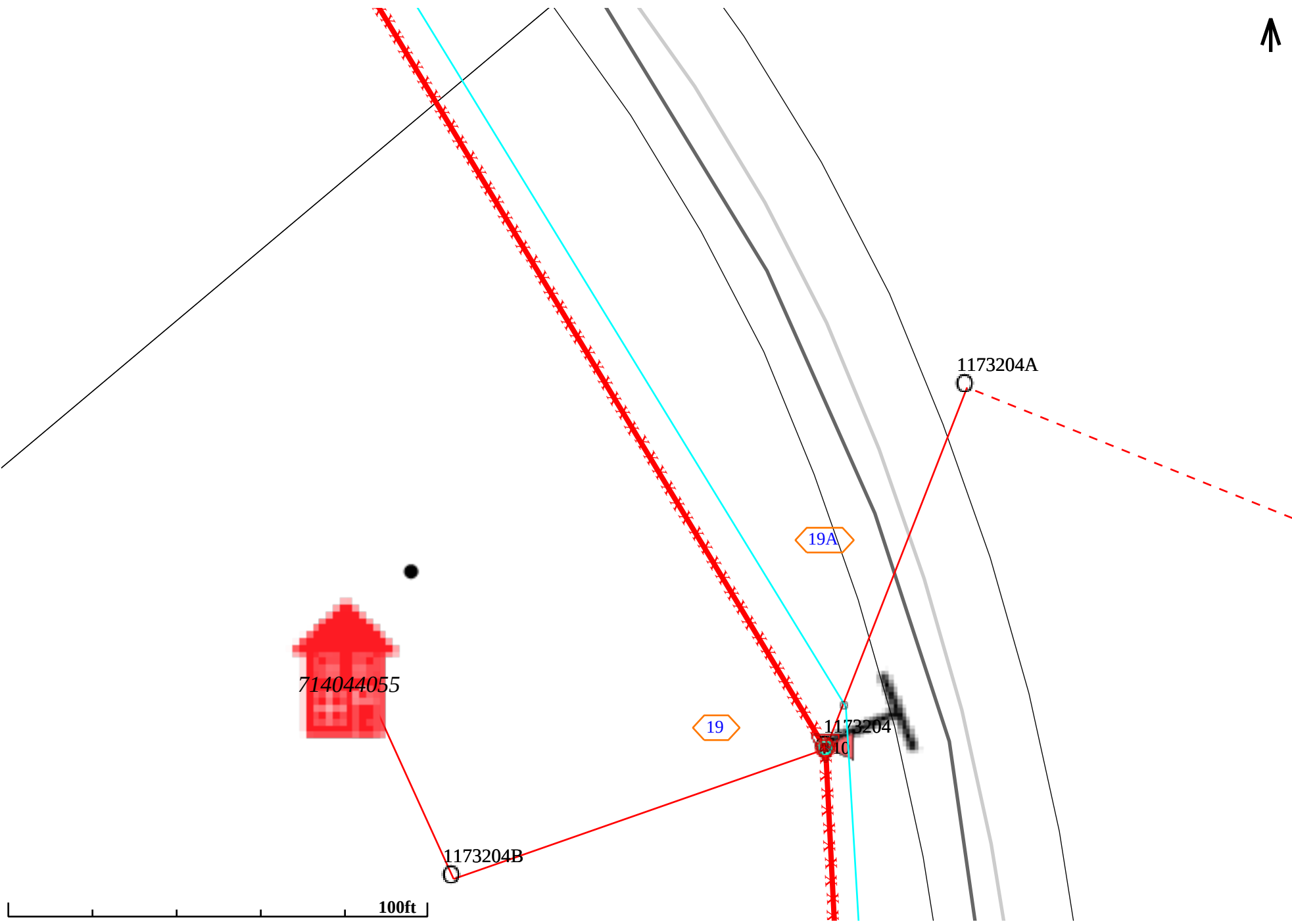
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



1173204A

19A

19

1173204

1173204B

714044055

100ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

19 RetireOH 358 feet Source: R205 Comments: Pole #: 1173204 Existing (1) 10 KVA SP OH New (1) 45-3 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (2) K13T Retire (716) 1/0 ACSR Retire (1) 35-6 Retire (1) A2.3 (A2) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) G1.2 (G105 G136) Retire (1) H1.1 (M2-1) Retire (1) K13T	19A NewOH 288 feet Source: 18A Comments: Pole #: New (288) 1/0 ACSR New (864) 336.4 MCM ACSR	
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



20

R205

173203

173203





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

20 NewOH 243 feet Source: 19A Comments: Pole #: New (243) 1/0 ACSR New (729) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	R205 RetireOH 372 feet Source: 22 Comments: Pole #: 1173203 Retire (744) 1/0 ACSR Retire (1) 40-5 Retire (1) A2.1 (A1-1) Retire (1) H5.1 (M2-2)	
--	--	--

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

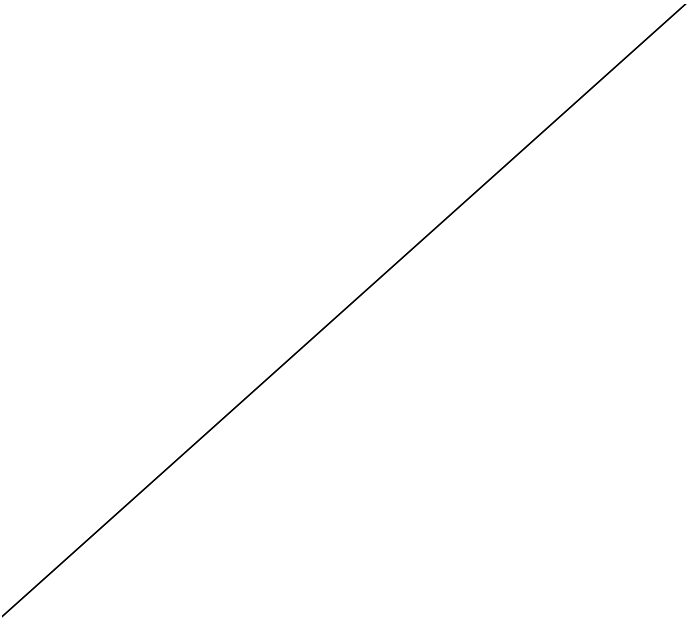
RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____

100ft



21



Vial Hill Rd





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

21 NewOH 249 feet

Source: 20

Comments:

Pole #:

New (249) 1/0 ACSR

New (747) 336.4 MCM ACSR

New (1) 45-4

New (1) C1.11L (C1-2)

New (1) H5.1 (M2-2)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

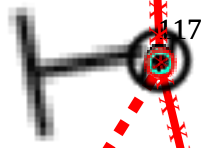
COMMENTS: _____



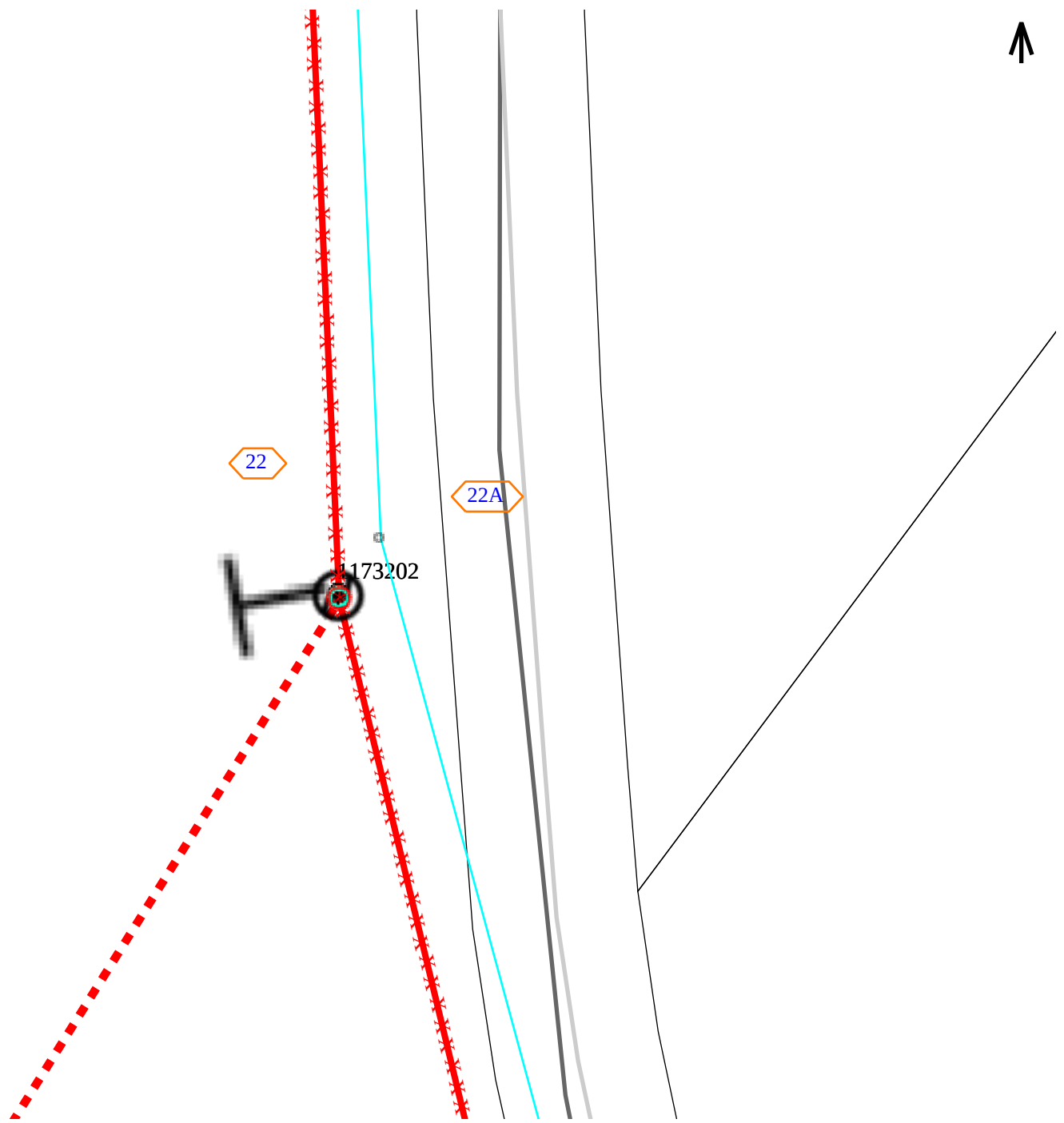
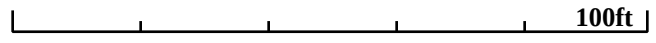
22

22A

173202



100ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

22 RetireOH 265 feet Source: R206 Comments: Pole #: 1173202 Existing (1) CONDUIT - RISER PIPE New (1) 45-4 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) UGT Retire (530) 1/0 ACSR Retire (1) 40-5 Retire (1) A2.3 (A2) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) H1.1 (M2-1) Retire (2) P1.01 (M5-6) Retire (1) UGT	22A NewOH 236 feet Source: 21 Comments: Pole #: New (236) 1/0 ACSR New (708) 336.4 MCM ACSR	
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

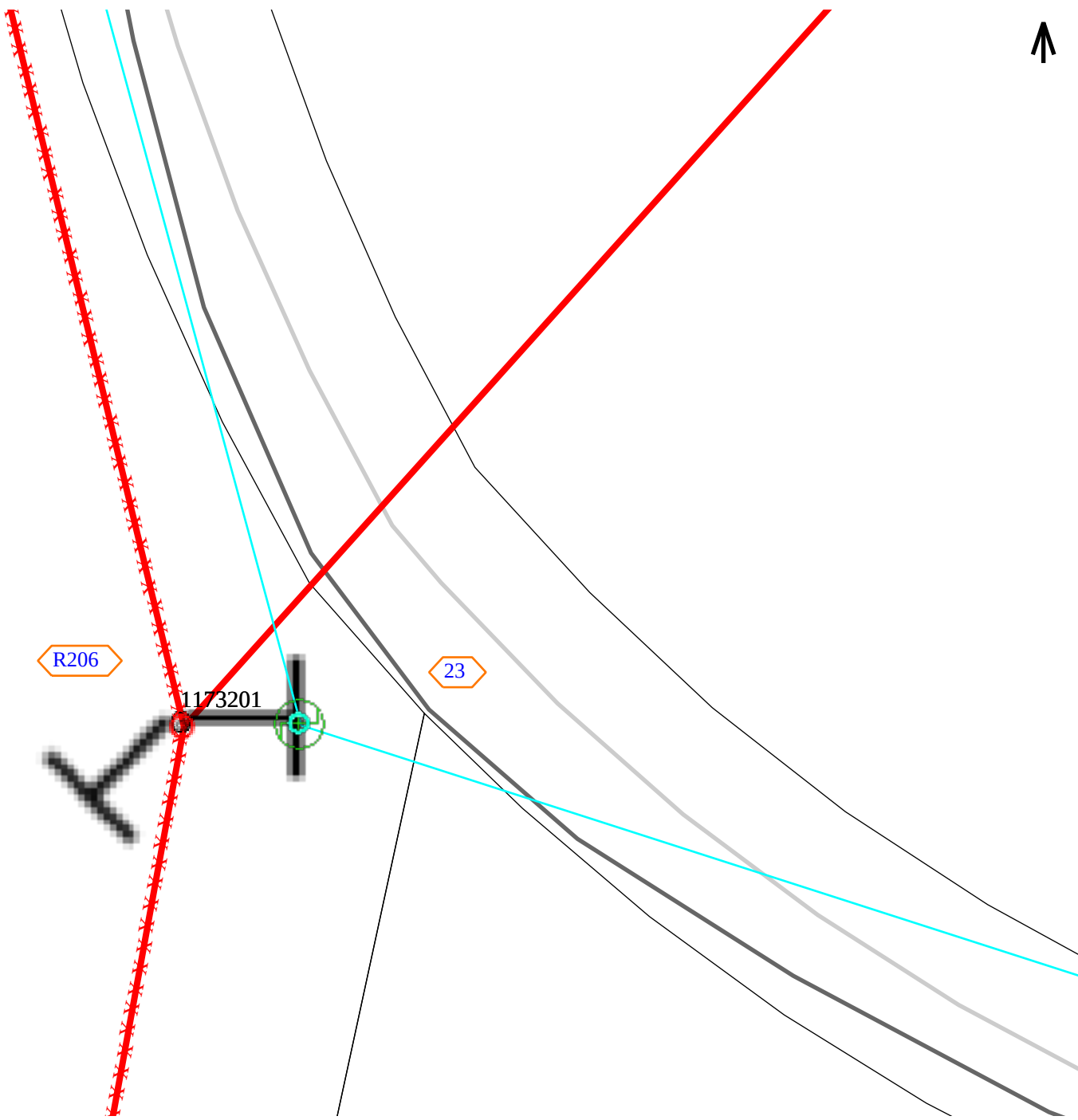
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

23 NewOH 279 feet Source: 22A Comments: Pole #: New (279) 1/0 ACSR New (837) 336.4 MCM ACSR New (1) 50-2 New (1) A5.2 (A5-2) New (1) C4.2G (C6) New (7) E1.2 (E3-3) New (7) F2.8 (F1-2S) New (1) H1.1 (M2-1) New (1) S1.02 (M5-10)	R206 RetireOH 337 feet Source: R211 Comments: Pole #: 1173201 Retire (674) 1/0 ACSR Retire (1) 40-5 Retire (1) A3.1 (A3) Retire (1) A5.1 (A5 A5-1) Retire (2) E1.1 (E1-2) Retire (2) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

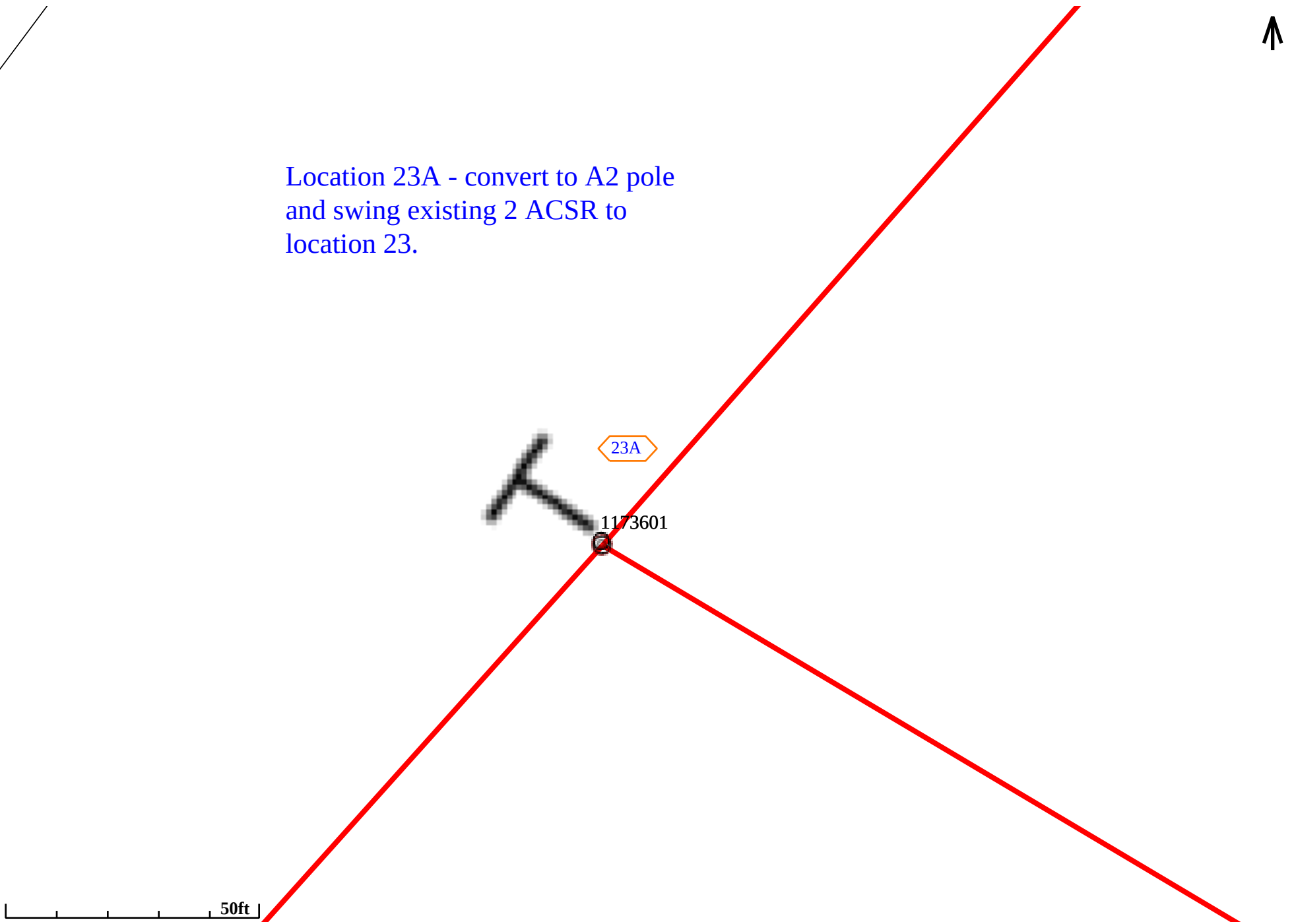
RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____

Location 23A - convert to A2 pole
and swing existing 2 ACSR to
location 23.





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

23A ExistingOH 0 feet

Source: none

Comments:

Pole #: 1173601

Existing (1) 40-5

Existing (1) A5.1 (A5 A5-1)

Existing (1) E1.1 (E1-2)

Existing (1) F2.8 (F1-2S)

Existing (1) H5.1 (M2-2)

New (1) A2.3 (A2)

Retire (1) A1.1 (A1)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

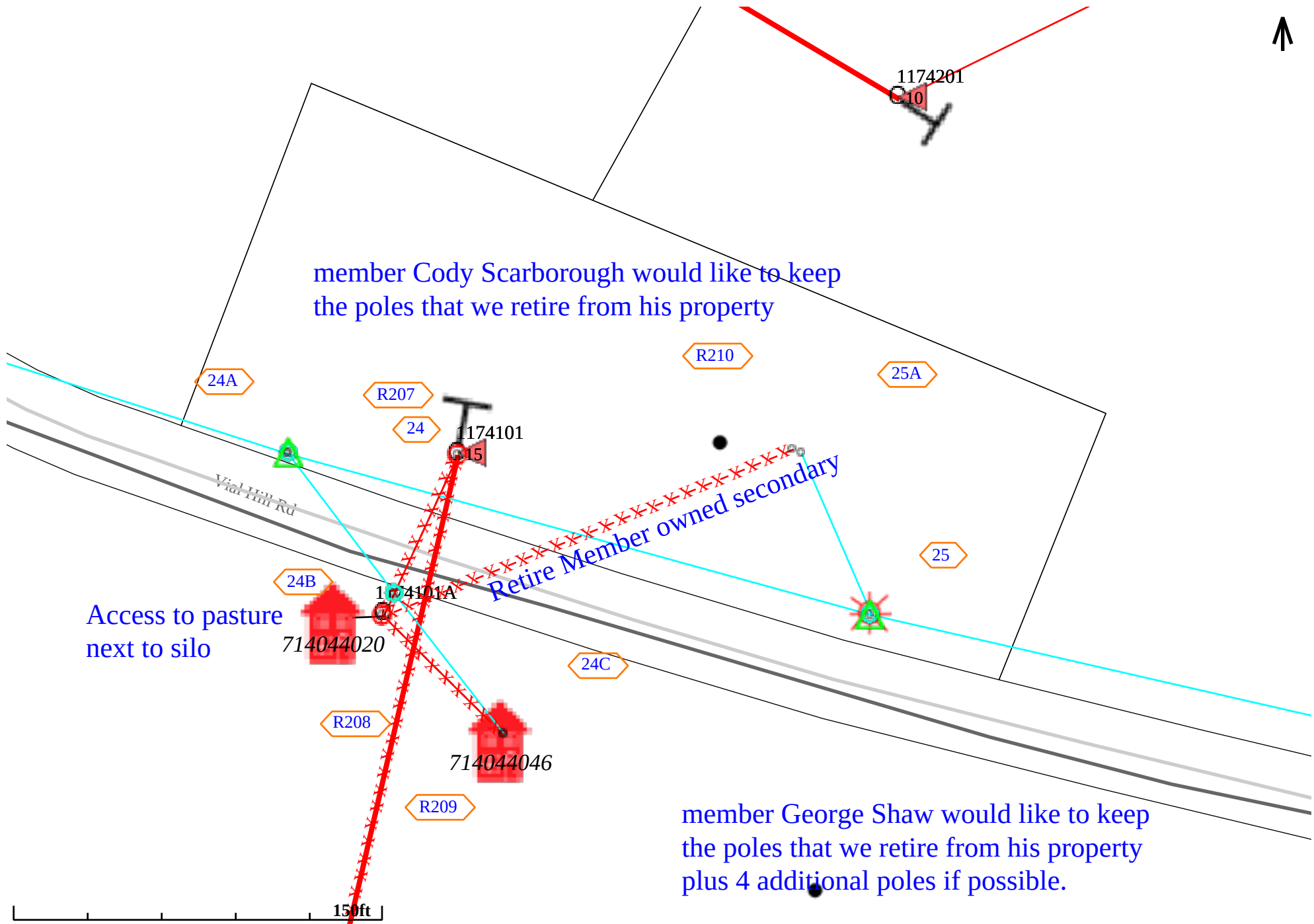
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

24 NewOH 246 feet Source: 25 Comments: Pole #: New (246) 1/0 ACSR New (1) 10 KVA SP OH New (738) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T	24A NewOH 250 feet Source: 23 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR	24B NewOH 72 feet Source: 24 Comments: Pole #: New (72) 2 TPX New (1) 30-6 New (1) K13T	24C NewOH 72 feet Source: 24B Comments: Pole #: New (72) 2 TPX New (1) SDROP 2 TPX <i>Retire (1) SDROP 1/0 TPX</i>
25 NewOH 232 feet Source: 26 Comments: Pole #: New (232) 1/0 ACSR New (1) 10 KVA SP OH New (696) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T New (1) M63	25A NewOH 72 feet Source: 25 Comments: Pole #: New (72) 2 TPX New (1) K10T New (1) SDROP 2 TPX	R207 RetireOH 265 feet Source: R212 Comments: Pole #: 1174101 <i>Retire (530) 2 ACSR Retire (1) 40-5 Retire (1) A5.1 (A5 A5-1) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) G1.3 (G106) Retire (1) H1.1 (M2-1) Retire (1) K13T</i>	R208 RetireOH 72 feet Source: R207 Comments: Pole #: 1174101A <i>Retire (72) 3/0 TPX Retire (1) 30-6 Retire (1) H1.1 (M2-1) Retire (1) K13T Retire (1) Q1.1 (M8)</i>

CONSTRUCTION COMMENTS:

METER #:_____ **PHASE:**_____ **NEW TRANSFORMER #:**_____

SET READ:_____ **RET. TRANSFORMER #:**_____

CONNECT DATE:_____ **BY:**_____

COMMENTS:_____



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R209 RetireOH 69 feet

Source: R208

Comments:

Pole #:

Retire (69) 1/0 TPX

R210 RetireOH 180 feet

Source: R208

Comments:

Pole #:

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



R211

1170111X



50ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R211 RetireOH 327 feet

Source: R212

Comments:

Pole #: 1170111X

Retire (1) 40-5
Retire (654) 6 ACWC
Retire (1) A1.1 (A1)
Retire (1) A5.1 (A5 A5-1)
Retire (1) E1.1 (E1-2)
Retire (1) F2.8 (F1-2S)
Retire (1) H5.1 (M2-2)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

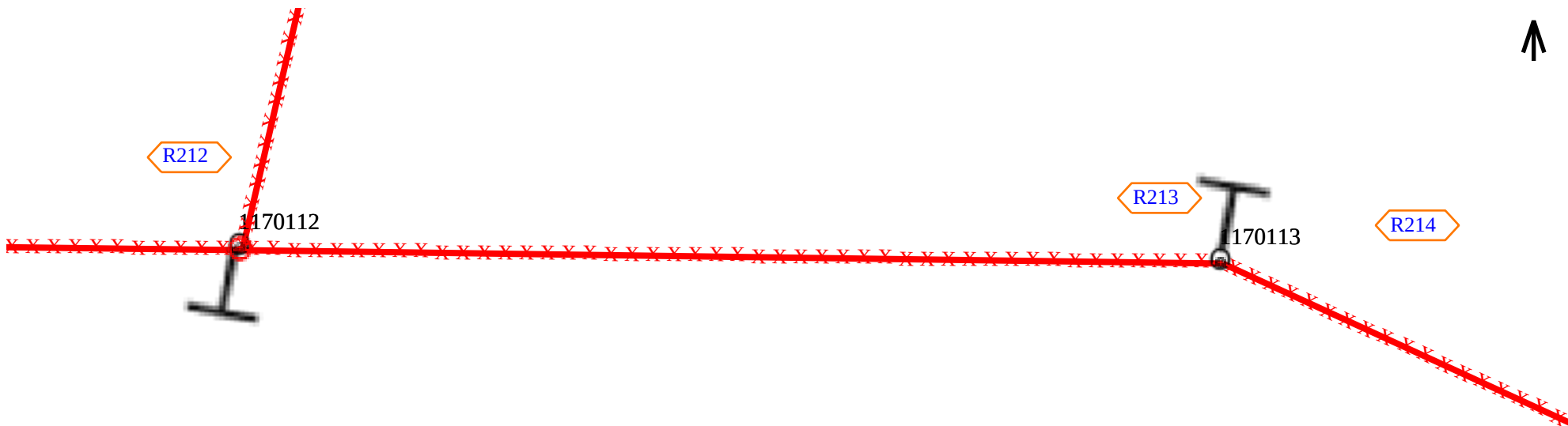
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R212 RetireOH 270 feet Source: R213 Comments: Pole #: 1170112 <i>Retire (1) 40-5</i> <i>Retire (540) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i> <i>Retire (1) A5.1 (A5 A5-1)</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i> <i>Retire (1) H5.1 (M2-2)</i>	R213 RetireOH 376 feet Source: R215 Comments: Pole #: 1170113 <i>Retire (752) 6 ACWC</i>	R214 ExistingOH 0 feet Source: none Comments: Pole #: 1170113 <i>Retire (1) A2.3 (A2)</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i>	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



26

27

28

Vial Hill Rd

1170114

R215

R216

150ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

26 NewOH 279 feet Source: 27 Comments: Pole #: New (279) 1/0 ACSR New (837) 336.4 MCM ACSR New (1) 45-4 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) H5.1 (M2-2)	27 NewOH 269 feet Source: 28 Comments: Pole #: New (269) 1/0 ACSR New (807) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	28 NewOH 277 feet Source: 29 Comments: Pole #: New (277) 1/0 ACSR New (831) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	R215 RetireOH 594 feet Source: R217 Comments: Pole #: 1170114 Retire (1) 40-5 Retire (1188) 6 ACWC
R216 ExistingOH 0 feet Source: none Comments: Pole #: 1170114 Retire (1) 40-5 Retire (1) A1.1 (A1) Retire (1) A5.1 (A5 A5-1) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) H1.1 (M2-1) Retire (1) P1.01 (M5-6)			

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

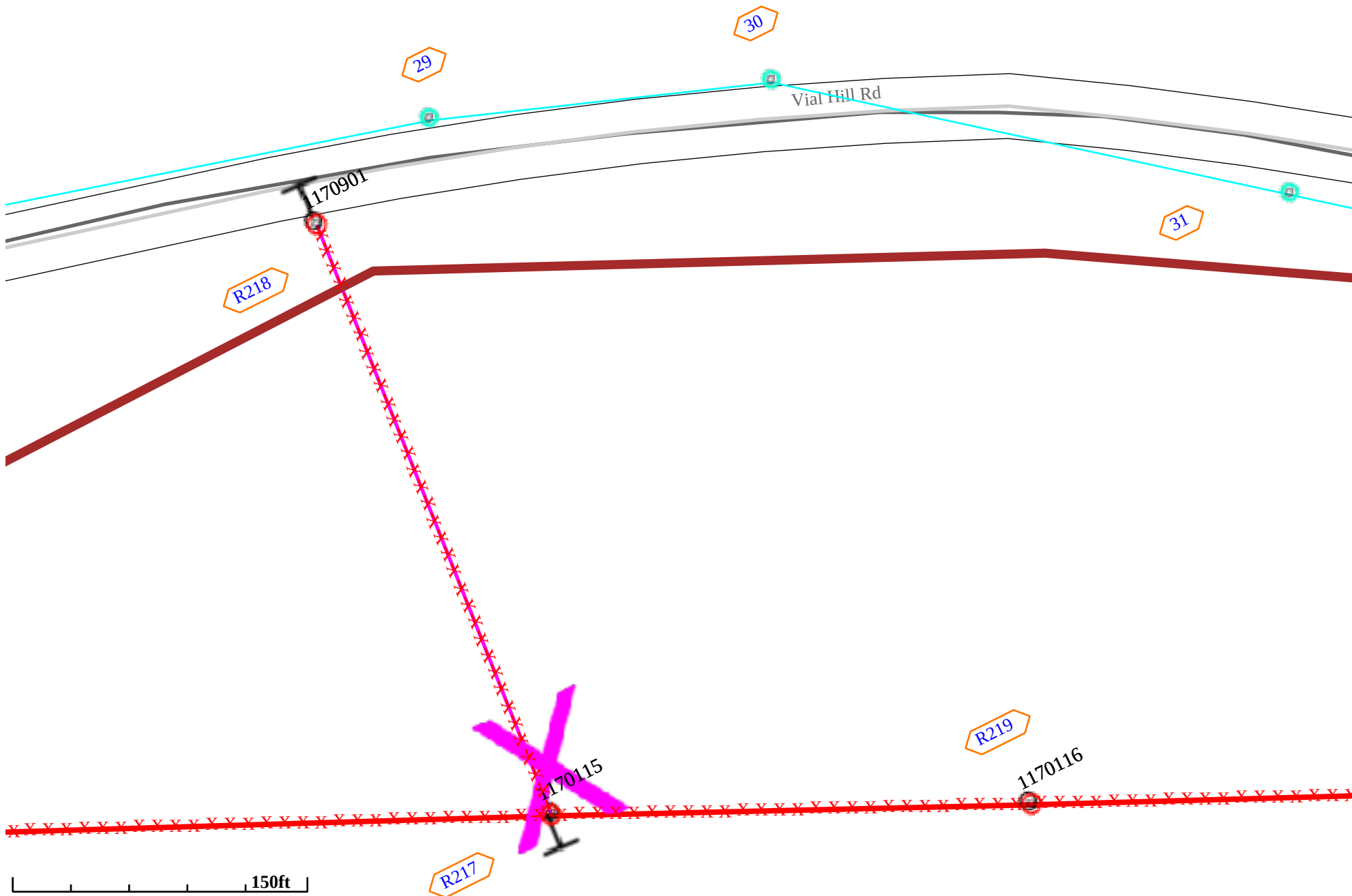
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

29 NewOH 175 feet Source: 30 Comments: Pole #: New (175) 1/0 ACSR New (525) 336.4 MCM ACSR New (1) 45-4 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) H1.1 (M2-1)	30 NewOH 270 feet Source: 31 Comments: Pole #: New (270) 1/0 ACSR New (810) 336.4 MCM ACSR New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2)	31 NewOH 271 feet Source: 32 Comments: Pole #: New (271) 1/0 ACSR New (813) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	R217 RetireOH 244 feet Source: R219 Comments: Pole #: 1170115 Retire (1) 35-6 Retire (488) 6 ACWC Retire (1) A1.1 (A1) Retire (1) A5.1 (A5 A5-1) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S)
--	--	---	--

CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R218 RetireOH 324 feet Source: R217 Comments: Pole #: 1170901 <i>Retire (1) 35-6</i> <i>Retire (648) 8 ACWC</i> <i>Retire (1) A5.1 (A5 A5-1)</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i> <i>Retire (1) H1.1 (M2-1)</i>	R219 RetireOH 445 feet Source: R220 Comments: Pole #: 1170116 <i>Retire (1) 40-5</i> <i>Retire (890) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i>	
--	--	--

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



Vial Hill Rd

32

33

34

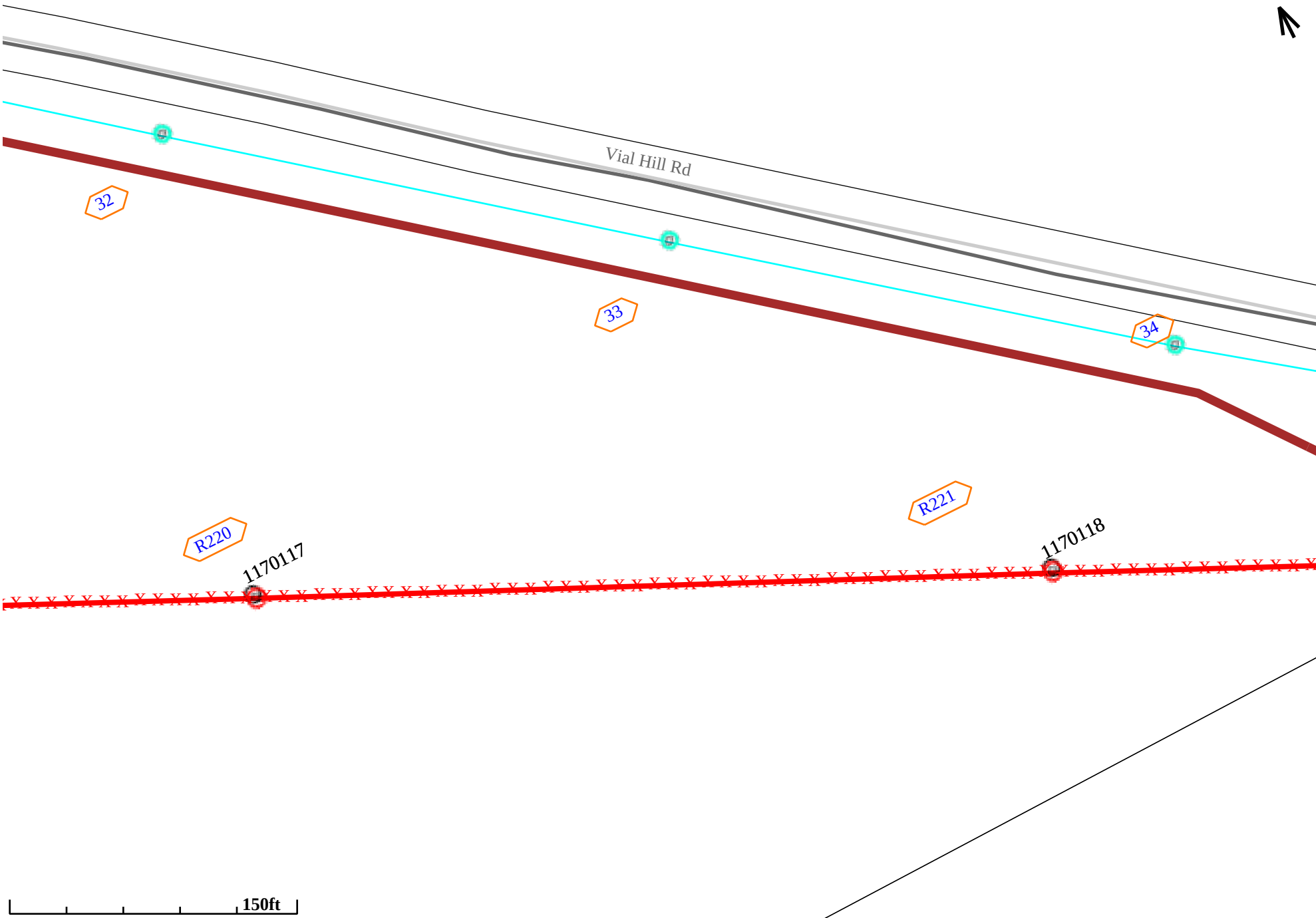
R220

R221

1170117

1170118

150ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

32 NewOH 270 feet Source: 33 Comments: Pole #: New (270) 1/0 ACSR New (810) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	33 NewOH 270 feet Source: 34 Comments: Pole #: New (270) 1/0 ACSR New (810) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	34 NewOH 271 feet Source: 35 Comments: Pole #: New (271) 1/0 ACSR New (813) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	R220 RetireOH 417 feet Source: R221 Comments: Pole #: 1170117 Retire (1) 35-6 Retire (834) 6 ACWC Retire (1) A1.1 (A1) Retire (1) H5.1 (M2-2)
R221 RetireOH 396 feet Source: R222 Comments: Pole #: 1170118 Retire (1) 35-6 Retire (792) 6 ACWC Retire (1) A1.1 (A1)			

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

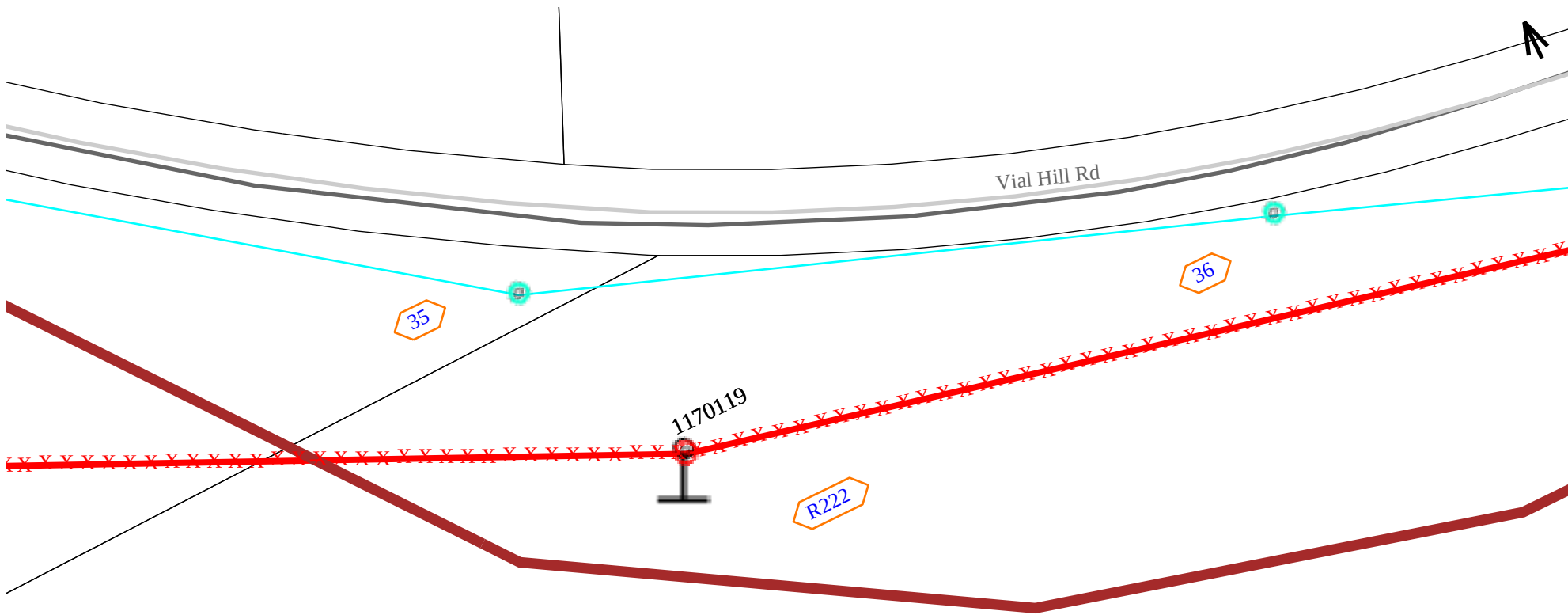
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



150ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

35 NewOH 292 feet Source: 36 Comments: Pole #: New (292) 1/0 ACSR New (876) 336.4 MCM ACSR New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2)	36 NewOH 291 feet Source: 37A Comments: Pole #: New (291) 1/0 ACSR New (873) 336.4 MCM ACSR New (1) 50-2 New (1) C1PS New (1) H5.1 (M2-2)	R222 RetireOH 529 feet Source: 37A Comments: Pole #: 1170119 Retire (1) 40-5 Retire (1058) 6 ACWC Retire (1) A2.3 (A2) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

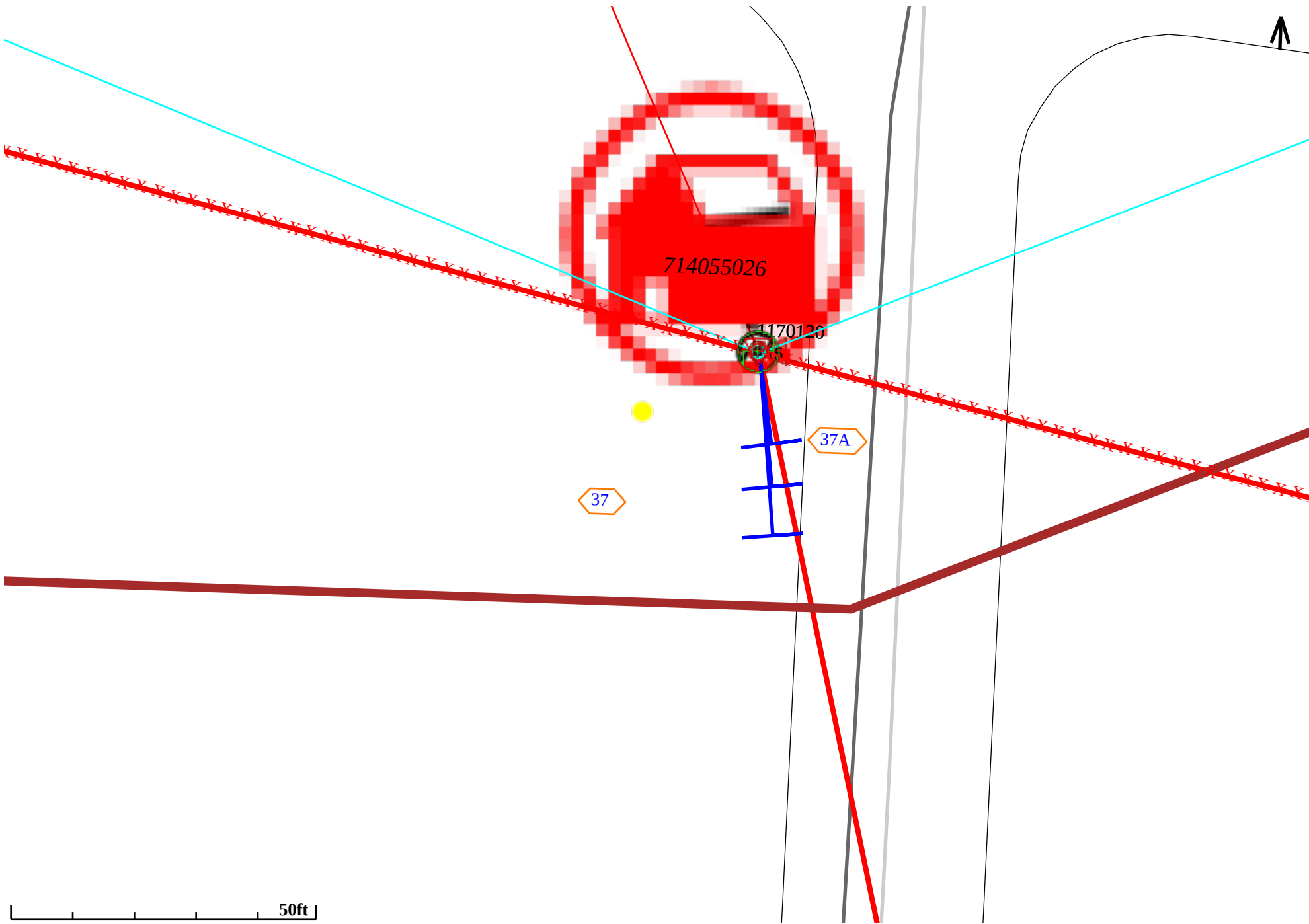
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

37 ExistingOH 0 feet Source: none Comments: Pole #: 1170120 Existing (1) 15 KVA SP OH Existing (30) CONDUIT - RISER PIPE New (1) 50-2 New (1) A5.2 (A5-2) New (1) C3.1 (C3) New (4) E1.2 (E3-3) New (3) E1.5 New (4) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T New (1) S1.02 (M5-10) New (1) UM5 Retire (1) 45-5 Retire (1) A2.1 (A1-1) Retire (1) A5.1 (A5 A5-1) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) G1.2 (G105 G136) Retire (1) H1.1 (M2-1) Retire (1) K13T Retire (1) M5-20 Retire (1) P1.01 (M5-6) Retire (1) UM5	37A RetireOH 562 feet Source: R223 Comments: Pole #: 1170120 Retire (1124) 6 ACWC	
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



38

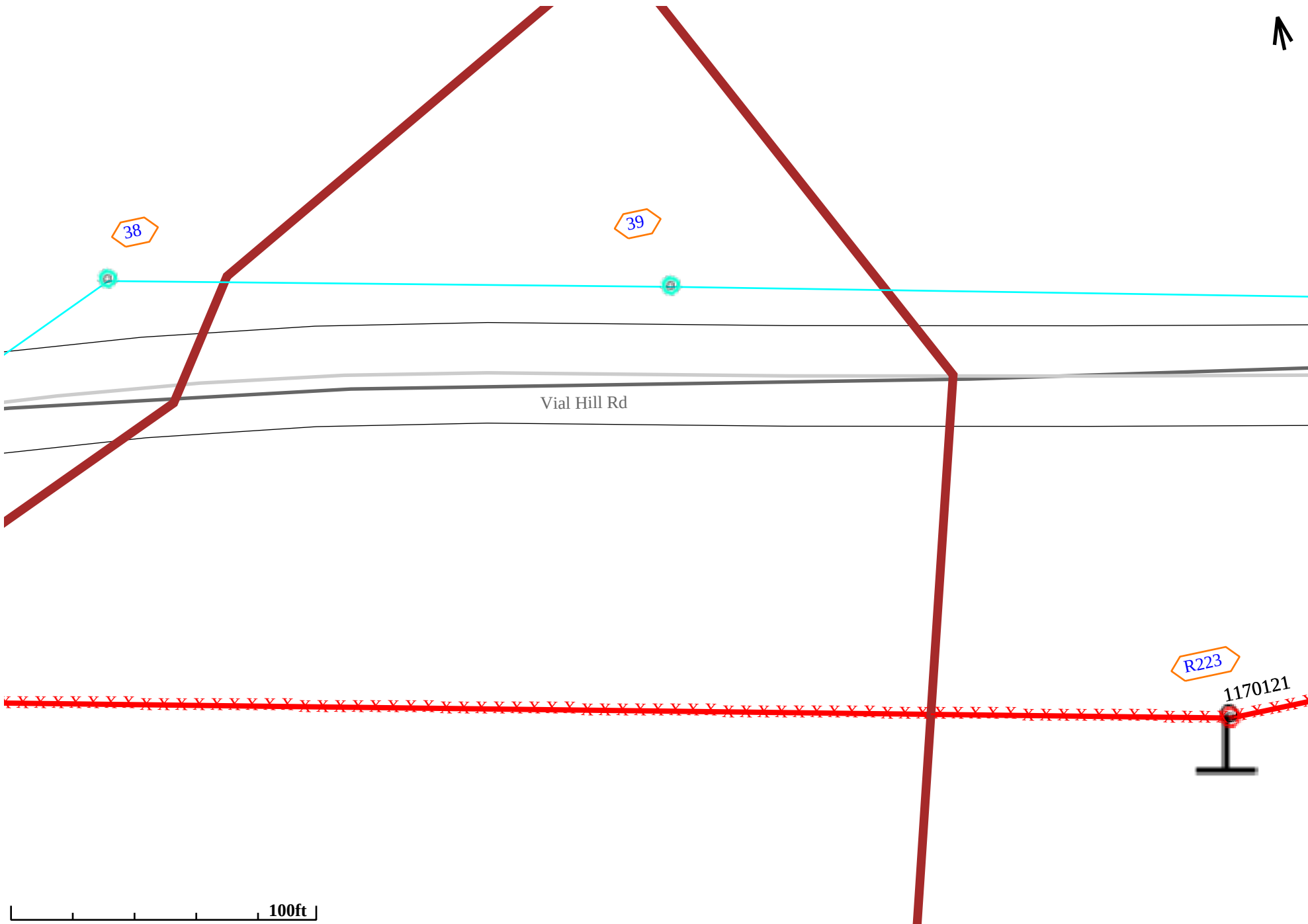
39

Vial Hill Rd

R223

1170121

100ft





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

38 NewOH 236 feet Source: 37 Comments: Pole #: New (236) 1/0 ACSR New (708) 336.4 MCM ACSR New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2)	39 NewOH 185 feet Source: 38 Comments: Pole #: New (185) 1/0 ACSR New (555) 336.4 MCM ACSR New (1) 50-2 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	R223 RetireOH 294 feet Source: 40A Comments: Pole #: 1170121 Retire (1) 40-5 Retire (588) 6 ACWC Retire (1) A2.3 (A2) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

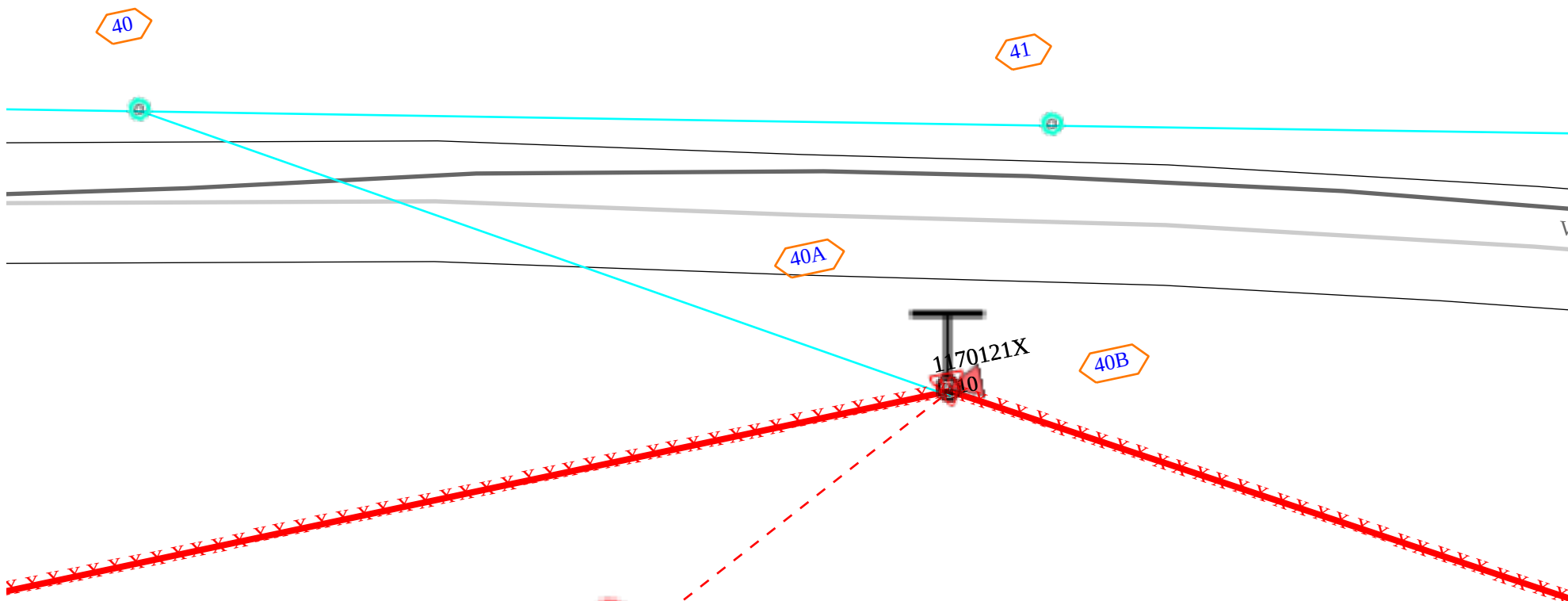
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

40 NewOH 250 feet Source: 39 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR New (1) 45-4 New (1) A5.2 (A5-2) New (1) C1.11L (C1-2) New (1) E1.2 (E3-3) New (1) F2.8 (F1-2S) New (1) H1.1 (M2-1)	40A RetireOH 237 feet Source: R225 Comments: Pole #: 1170121X Existing (1) 10 KVA SP OH Existing (1) 40-5 Existing (30) CONDUIT - RISER PIPE Existing (1) H1.1 (M2-1) New (1) A5.1 (A5 A5-1) New (1) E1.1 (E1-2) New (1) F2.8 (F1-2S) New (1) G1.3 (G106) New (1) UM5 Retire (474) 6 ACWC Retire (1) A3.1 (A3) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) G1.2 (G105 G136) Retire (1) UM5	40B NewOH 235 feet Source: 40 Comments: Pole #: New (470) 1/0 ACSR	41 NewOH 250 feet Source: 40 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

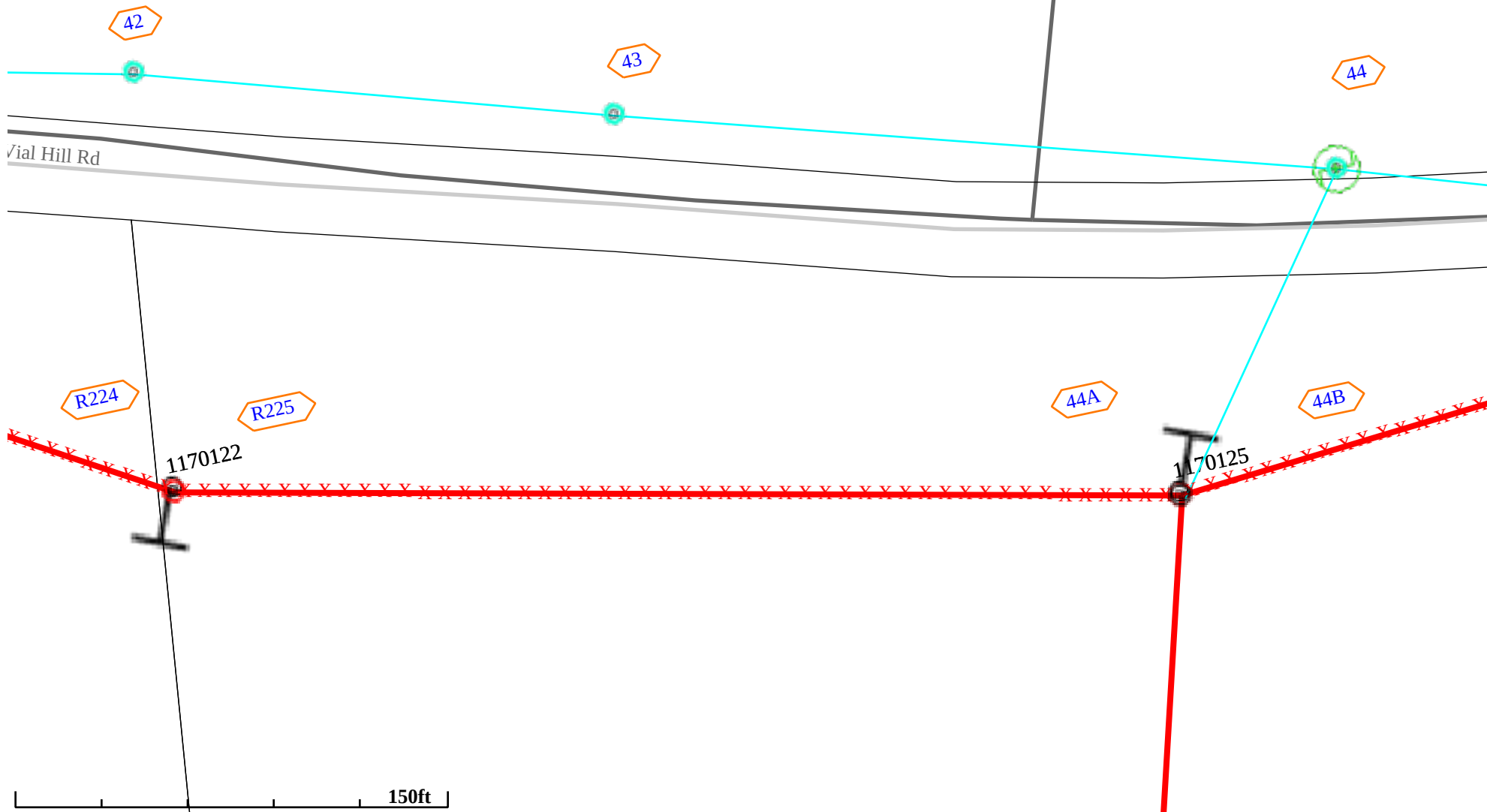
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

42 NewOH 182 feet Source: 41 Comments: Pole #: New (182) 1/0 ACSR New (546) 336.4 MCM ACSR New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H1.1 (M2-1)	43 NewOH 168 feet Source: 42 Comments: Pole #: New (168) 1/0 ACSR New (504) 336.4 MCM ACSR New (1) 40-4 New (1) C2.21L (C1-3) New (1) H5.1 (M2-2)	44 NewOH 251 feet Source: 43 Comments: Pole #: New (251) 1/0 ACSR New (753) 336.4 MCM ACSR New (1) 45-4 New (1) A5.2 (A5-2) New (1) C2.52L (C2-2) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H1.1 (M2-1) New (1) S1.02 (M5-10)	44A NewOH 126 feet Source: 44 Comments: Pole #: New (252) 2 ACSR
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

44B RetireOH 309 feet Source: R227 Comments: Pole #: 1170125 Existing (1) 40-5 Existing (1) A5.1 (A5 A5-1) Existing (1) F2.8 (F1-2S) Existing (1) H5.1 (M2-2) New (1) A5.1 (A5 A5-1) New (2) E1.1 (E1-2) New (1) F2.8 (F1-2S) <i>Retire (618) 6 ACWC</i> <i>Retire (1) A3.1 (A3)</i>	R224 ExistingOH 0 feet Source: none Comments: Pole #: 1170122 <i>Retire (1) 40-5</i> <i>Retire (1) A2.3 (A2)</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i> <i>Retire (1) H5.1 (M2-2)</i>	R225 RetireOH 349 feet Source: 44B Comments: Pole #: 1170122 <i>Retire (698) 6 ACWC</i>	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

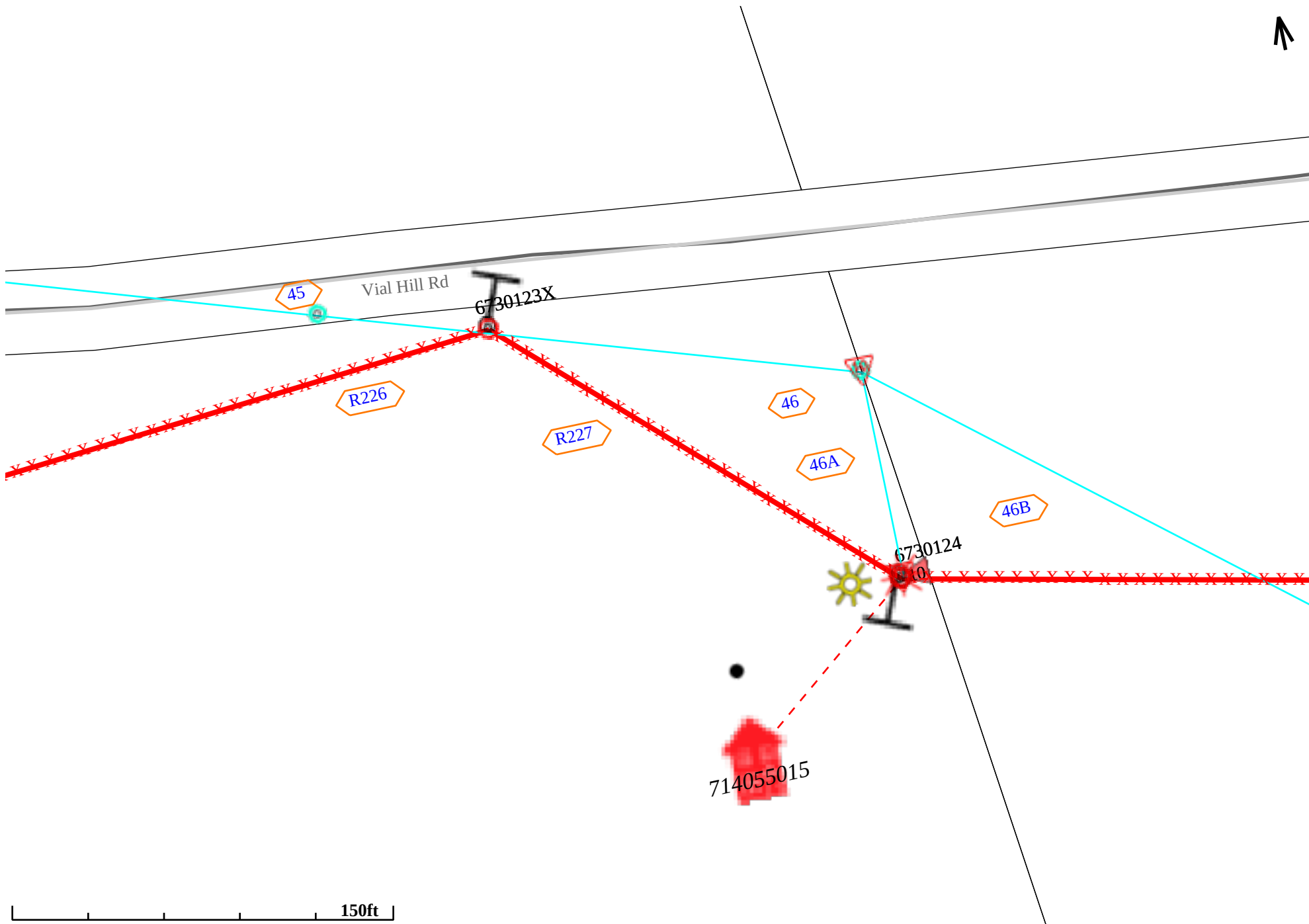
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

45 NewOH 176 feet Source: 44 Comments: Pole #: New (176) 1/0 ACSR New (528) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	46 NewOH 215 feet Source: 45 Comments: Use XFMR from location 46B Pole #: Existing (1) 10 KVA SP OH New (215) 1/0 ACSR New (645) 336.4 MCM ACSR New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T	46A NewOH 82 feet Source: 46 Comments: Pole #: New (82) 2 TPX	46B RetireOH 447 feet Source: R228 Comments: Move XFMR to Location 46 Pole #: 6730124 Existing (1) 10 KVA SP OH Existing (1) 30-6 Existing (30) CONDUIT - RISER PIPE Existing (1) M63 New (1) K13T <i>Retire (1) 40-5</i> <i>Retire (894) 6 ACWC</i> <i>Retire (1) A3.1 (A3)</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i> <i>Retire (1) G1.2 (G105 G136)</i> <i>Retire (1) H1.1 (M2-1)</i> <i>Retire (1) UM5</i>
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R226 RetireOH 190 feet

Source: 46B

Comments:

Pole #: 6730123X

Retire (380) 6 ACWC

R227 ExistingOH 0 feet

Source: none

Comments:

Pole #: 6730123X

Retire (1) 40-5

Retire (1) A3.1 (A3)

Retire (1) E1.1 (E1-2)

Retire (1) F2.8 (F1-2S)

Retire (1) H5.1 (M2-2)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

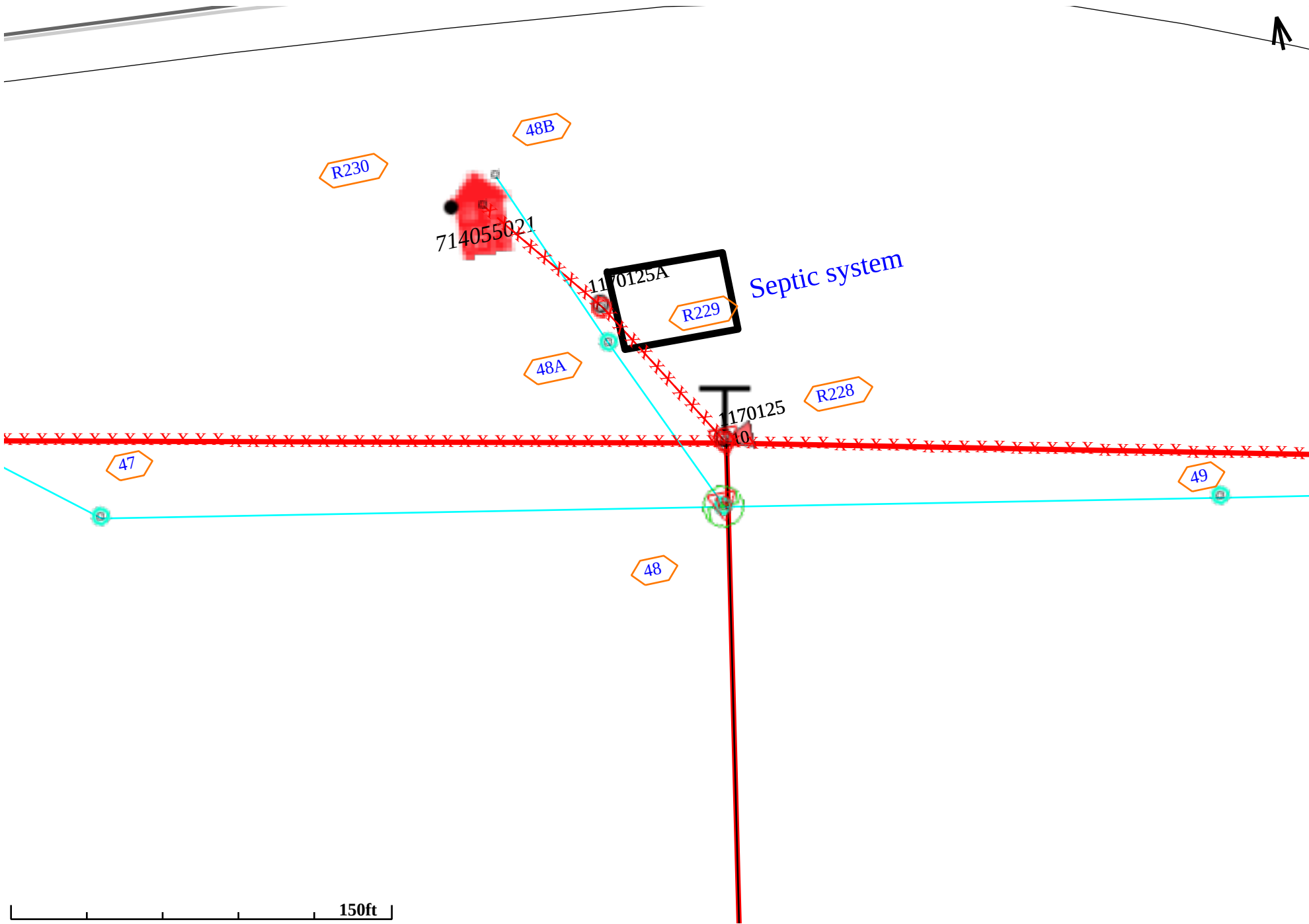
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

47 NewOH 244 feet Source: 46 Comments: Pole #: New (244) 1/0 ACSR New (732) 336.4 MCM ACSR New (1) 50-2 New (1) C3.1 (C3) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H5.1 (M2-2)	48 NewOH 245 feet Source: 47 Comments: Use XFMR form location R228 Pole #: Existing (1) 10 KVA SP OH New (245) 1/0 ACSR New (735) 336.4 MCM ACSR New (1) 45-4 New (1) A5.2 (A5-2) New (1) C2.21L (C1-3) New (1) E1.1 (E1-2) New (1) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T New (1) S1.02 (M5-10)	48A NewOH 79 feet Source: 48 Comments: Pole #: New (79) 2 TPX New (1) 30-6 New (1) K13T	48B NewOH 79 feet Source: 48A Comments: Pole #: Existing (1) SDROP 2 TPX New (79) 2 TPX New (1) K10T
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

49 NewOH 196 feet Source: 48 Comments: Pole #: New (196) 1/0 ACSR New (588) 336.4 MCM ACSR New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	R228 RetireOH 399 feet Source: R231 Comments: Move XFMR to Location 48 Pole #: 1170125 Existing (1) 10 KVA SP OH Retire (1) 40-5 Retire (798) 6 ACWC Retire (1) A2.1 (A1-1) Retire (1) A5.1 (A5 A5-1) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) G1.2 (G105 G136) Retire (1) H1.1 (M2-1) Retire (1) K13T	R229 RetireOH 72 feet Source: R228 Comments: Pole #: 1170125A Retire (72) 2 TPX Retire (1) 30-6 Retire (1) K13T	R230 RetireOH 62 feet Source: R229 Comments: Pole #: Existing (1) SDROP 2 TPX Retire (62) 2 TPX Retire (1) K10T
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

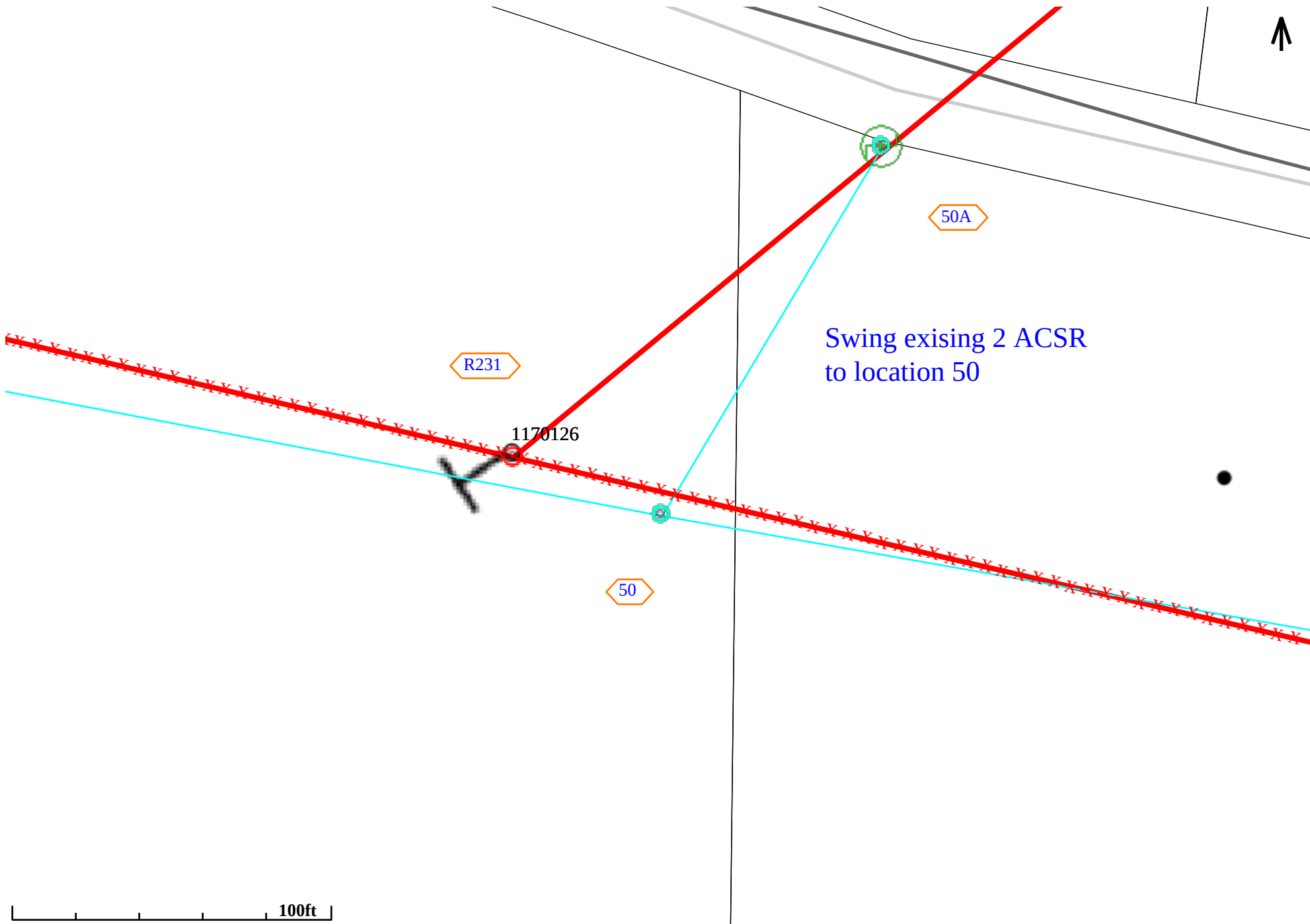
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

50 NewOH 253 feet Source: 49 Comments: Pole #: New (253) 1/0 ACSR New (759) 336.4 MCM ACSR New (1) 45-4 New (1) A5.2 (A5-2) New (1) C1.11L (C1-2) New (1) E1.2 (E3-3) New (1) F2.8 (F1-2S) New (1) H5.1 (M2-2)	50A NewOH 134 feet Source: 50 Comments: Pole #: Existing (268) 2 ACSR New (1) 40-4 New (1) A3.1 (A3) New (1) E1.1 (E1-2) New (1) F2.8 (F1-2S) New (1) H1.1 (M2-1) New (1) S1.02 (M5-10)	R231 RetireOH 299 feet Source: 51 Comments: Pole #: 1170126 Retire (1) 45-4 Retire (598) 6 ACWC Retire (1) A1.1 (A1) Retire (1) A5.1 (A5 A5-1) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

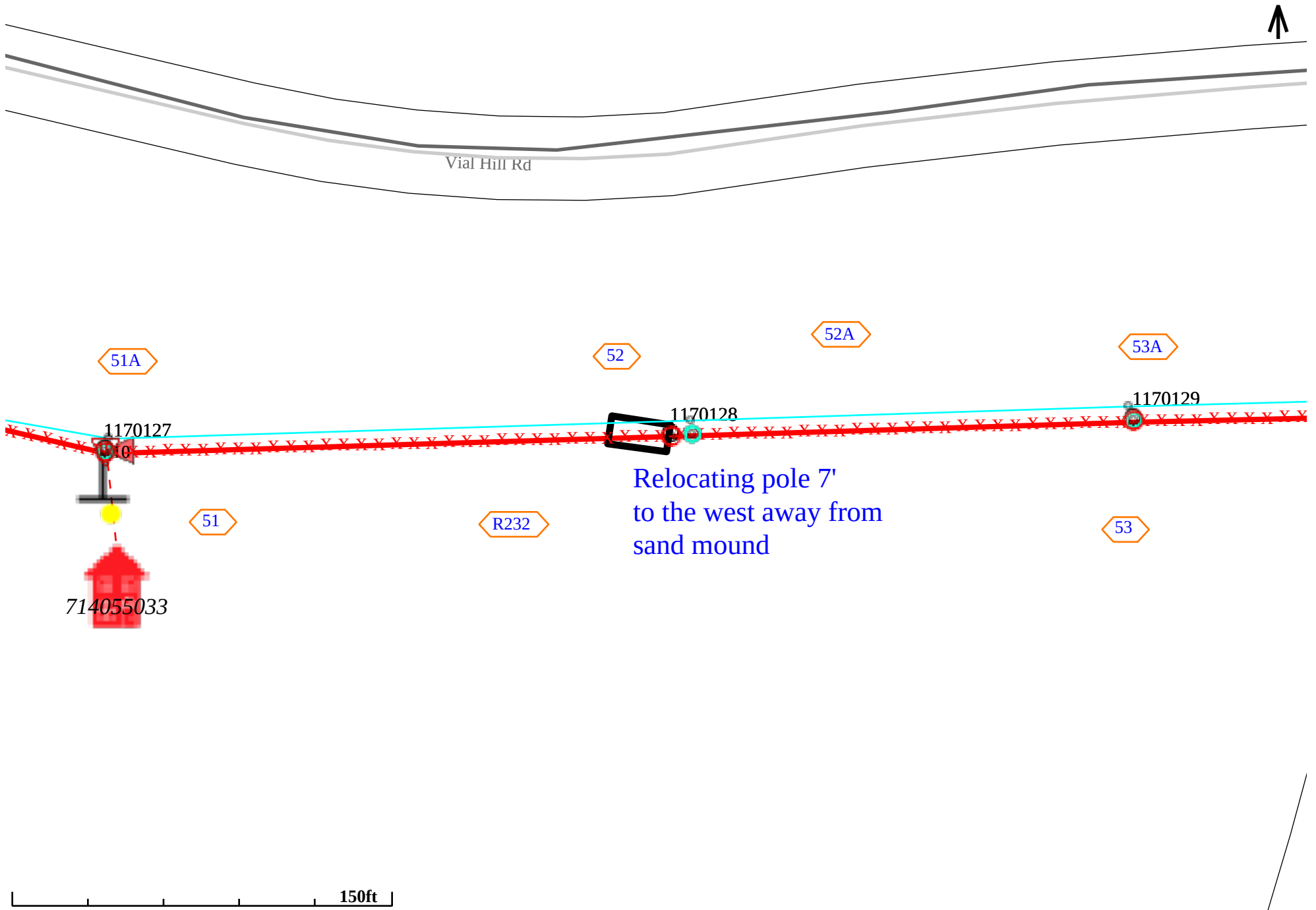
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

51 RetireOH 224 feet Source: R232 Comments: Pole #: 1170127 Existing (1) 10 KVA SP OH Existing (30) CONDUIT - RISER PIPE New (1) 45-4 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) UM5 Retire (1) 40-4 Retire (448) 6 ACWC Retire (1) A2.3 (A2) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S) Retire (1) G1.2 (G105 G136) Retire (1) H1.1 (M2-1) Retire (1) UM5	51A NewOH 250 feet Source: 50 Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR	52 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	52A NewOH 230 feet Source: 51A Comments: Pole #: New (230) 1/0 ACSR New (690) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

53 RetireOH 479 feet Source: 55 Comments: Pole #: 1170129 New (1) 45-4 New (1) C2.21L (C1-3) New (1) H5.1 (M2-2) Retire (1) 35-5 Retire (958) 6 ACWC Retire (1) A2.21 (A9) Retire (1) H5.1 (M2-2)	53A NewOH 173 feet Source: 52A Comments: Pole #: New (173) 1/0 ACSR New (519) 336.4 MCM ACSR	R232 RetireOH 183 feet Source: 53 Comments: Pole #: 1170128 Retire (1) 45-4 Retire (366) 6 ACWC Retire (1) A2.21 (A9)	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

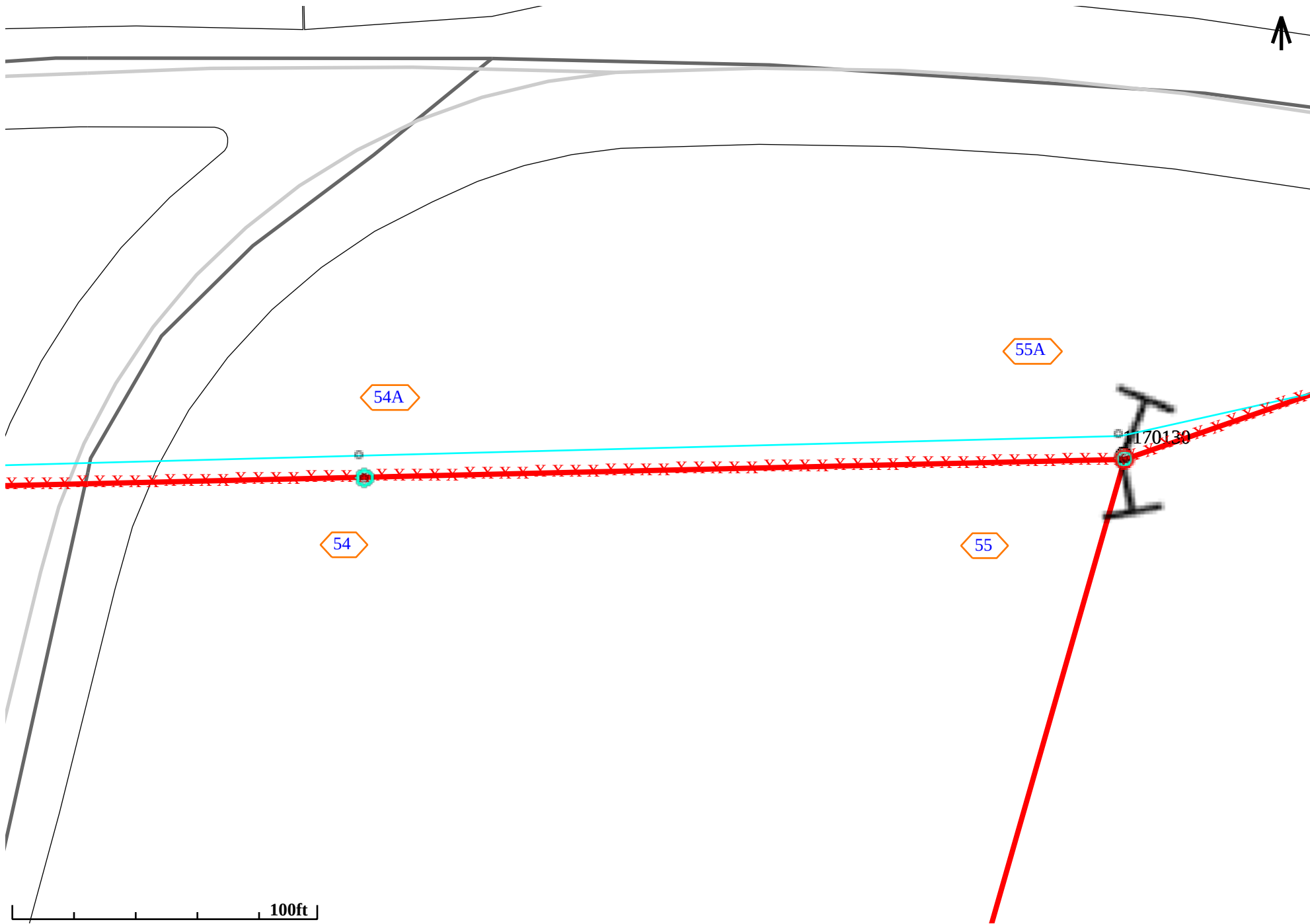
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

54 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	54A NewOH 230 feet Source: 53A Comments: Pole #: New (230) 1/0 ACSR New (690) 336.4 MCM ACSR	55 RetireOH 315 feet Source: 56A Comments: Pole #: 1170130 New (1) 50-2 New (1) A5.2 (A5-2) New (1) C2.52L (C2-2) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H1.1 (M2-1) Retire (1) 35-5 Retire (630) 6 ACWC Retire (1) A2.3 (A2) Retire (1) A5.1 (A5 A5-1) Retire (2) E1.1 (E1-2) Retire (2) F2.8 (F1-2S) Retire (1) H5.1 (M2-2)	55A NewOH 250 feet Source: 54A Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

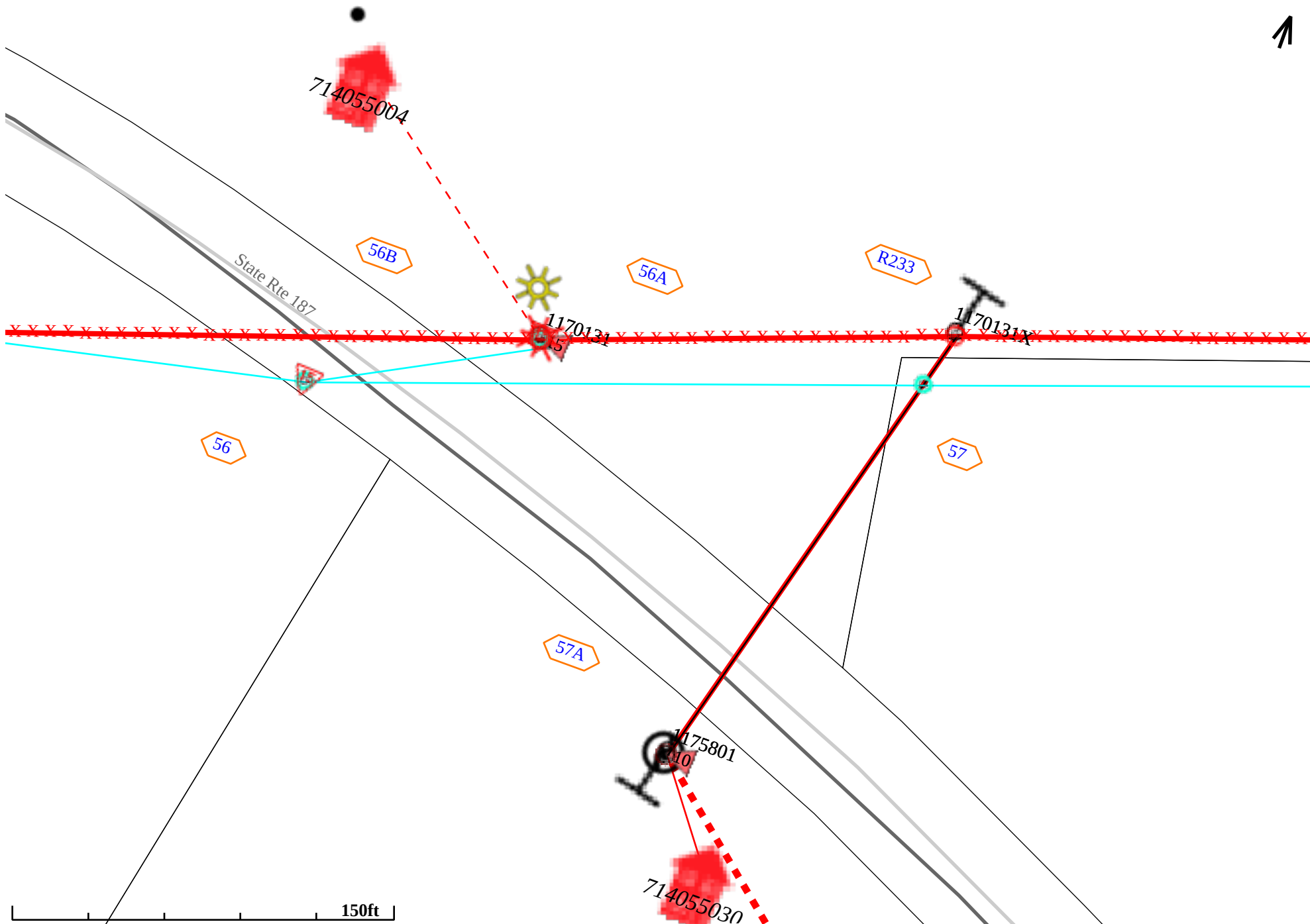
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

56 NewOH 223 feet Source: 55A Comments: Use XFMR from location 56A Pole #: Existing (1) 15 KVA SP OH New (223) 1/0 ACSR New (669) 336.4 MCM ACSR New (1) 45-4 New (1) C2.52L (C2-2) New (1) E1.1 (E1-2) New (2) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) K13T	56A RetireOH 163 feet Source: R233 Comments: Move XFMR to location 56 Pole #: 1170131 Existing (1) 15 KVA SP OH Existing (1) CONDUIT - RISER PIPE Existing (1) H1.1 (M2-1) New (1) 30-6 New (1) K13T New (1) M63 Retire (1) 40-5 Retire (326) 6 ACWC Retire (1) A1.1 (A1) Retire (1) G1.2 (G105 G136) Retire (1) M5-20 Retire (1) M63 Retire (1) UM5	56B NewOH 96 feet Source: 56 Comments: Pole #: New (96) 1/0 TPX	57 NewOH 243 feet Source: 56 Comments: Pole #: New (243) 1/0 ACSR New (729) 336.4 MCM ACSR New (1) 45-4 New (1) AP5-2 New (1) C1.11L (C1-2) New (1) E1.2 (E3-3) New (1) F2.8 (F1-2S) New (1) H5.1 (M2-2)
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

57A ExistingOH 200 feet Source: R233 Comments: Pole #: 1175801 Existing (200) 243 AWA Existing (200) 2 ACSR Existing (1) 40-4 Existing (1) AP5 Existing (1) E1.1 (E1-2) Existing (1) F2.8 (F1-2S) Existing (1) G1.2 (G105 G136) Existing (1) H1.1 (M2-1) Existing (1) K13T Existing (1) P1.01 (M5-6) Existing (1) UGT <i>Retire (25) 243 AWA</i> <i>Retire (25) 2 ACSR</i>	R233 RetireOH 231 feet Source: R234 Comments: Pole #: 1170131X <i>Retire (1) 40-4</i> <i>Retire (462) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i> <i>Retire (1) AP5-2</i> <i>Retire (1) E1.1 (E1-2)</i> <i>Retire (1) F2.8 (F1-2S)</i> <i>Retire (1) H5.1 (M2-2)</i>	
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

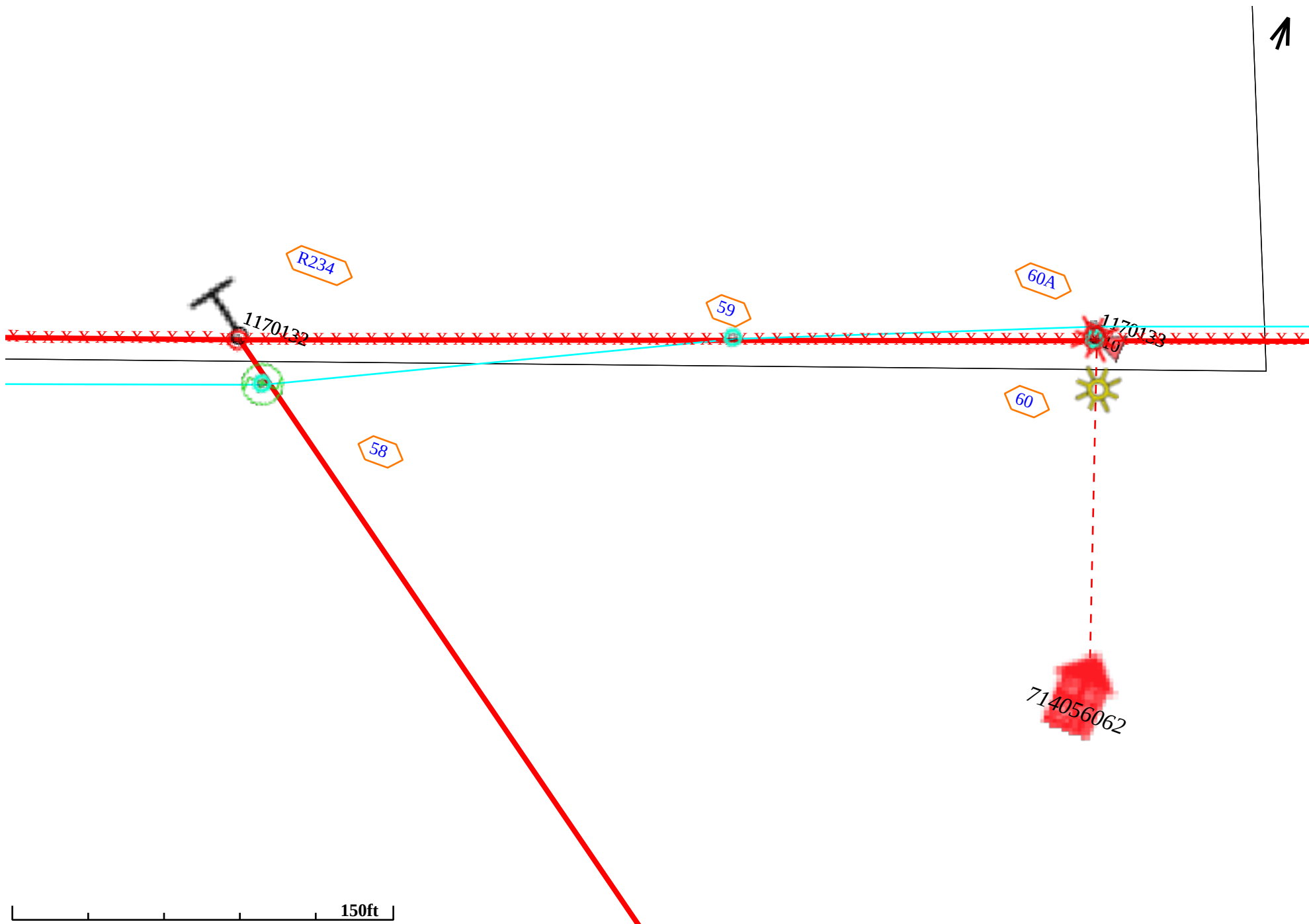
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

58 NewOH 253 feet Source: 57 Comments: Pole #: New (253) 1/0 ACSR New (759) 336.4 MCM ACSR New (1) 45-4 New (1) A5.2 (A5-2) New (1) C2.52L (C2-2) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) New (1) H1.1 (M2-1) New (1) S1.02 (M5-10)	59 NewOH 186 feet Source: 58 Comments: Pole #: New (186) 1/0 ACSR New (558) 336.4 MCM ACSR New (1) 45-4 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) H5.1 (M2-2)	60 RetireOH 535 feet Source: 62 Comments: Pole #: 1170133 Existing (1) 10 KVA SP OH Existing (30) CONDUIT - RISER PIPE New (1) 45-4 New (1) C1.11L (C1-2) New (1) G1.2 (G105 G136) New (1) H1.1 (M2-1) New (1) M63 New (1) UM5 Retire (1070) 6 ACWC Retire (1) A1.1 (A1) Retire (1) G1.2 (G105 G136) Retire (1) H1.1 (M2-1) Retire (1) M63 Retire (1) UM5	60A NewOH 143 feet Source: 59 Comments: Pole #: New (143) 1/0 ACSR New (429) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R234 RetireOH 337 feet

Source: 60

Comments:

Pole #: 1170132

Retire (1) 35-6

Retire (674) 6 ACWC

Retire (1) A1.1 (A1)

Retire (1) A5.1 (A5 A5-1)

Retire (1) E1.1 (E1-2)

Retire (1) F2.8 (F1-2S)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

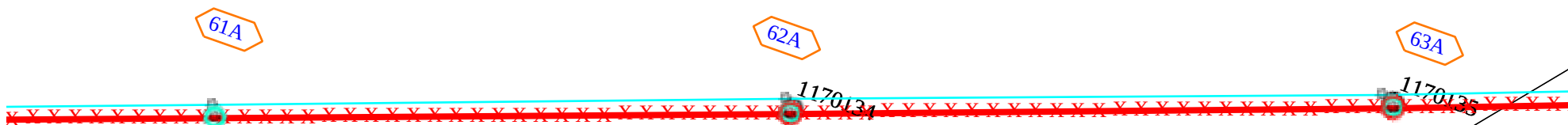
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

61 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	61A NewOH 267 feet Source: 60A Comments: Pole #: New (267) 1/0 ACSR New (801) 336.4 MCM ACSR	62 RetireOH 280 feet Source: 63 Comments: Pole #: 1170134 New (1) 45-3 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2) <i>Retire (1) 35-6</i> <i>Retire (560) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i>	62A NewOH 267 feet Source: 61A Comments: Pole #: New (267) 1/0 ACSR New (801) 336.4 MCM ACSR
63 RetireOH 292 feet Source: 64 Comments: Pole #: 1170135 New (1) 45-3 New (1) C2.21L (C1-3) New (1) H5.1 (M2-2) <i>Retire (1) 35-6</i> <i>Retire (584) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i> <i>Retire (1) H5.1 (M2-2)</i>	63A NewOH 278 feet Source: 62A Comments: Pole #: New (278) 1/0 ACSR New (834) 336.4 MCM ACSR		

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

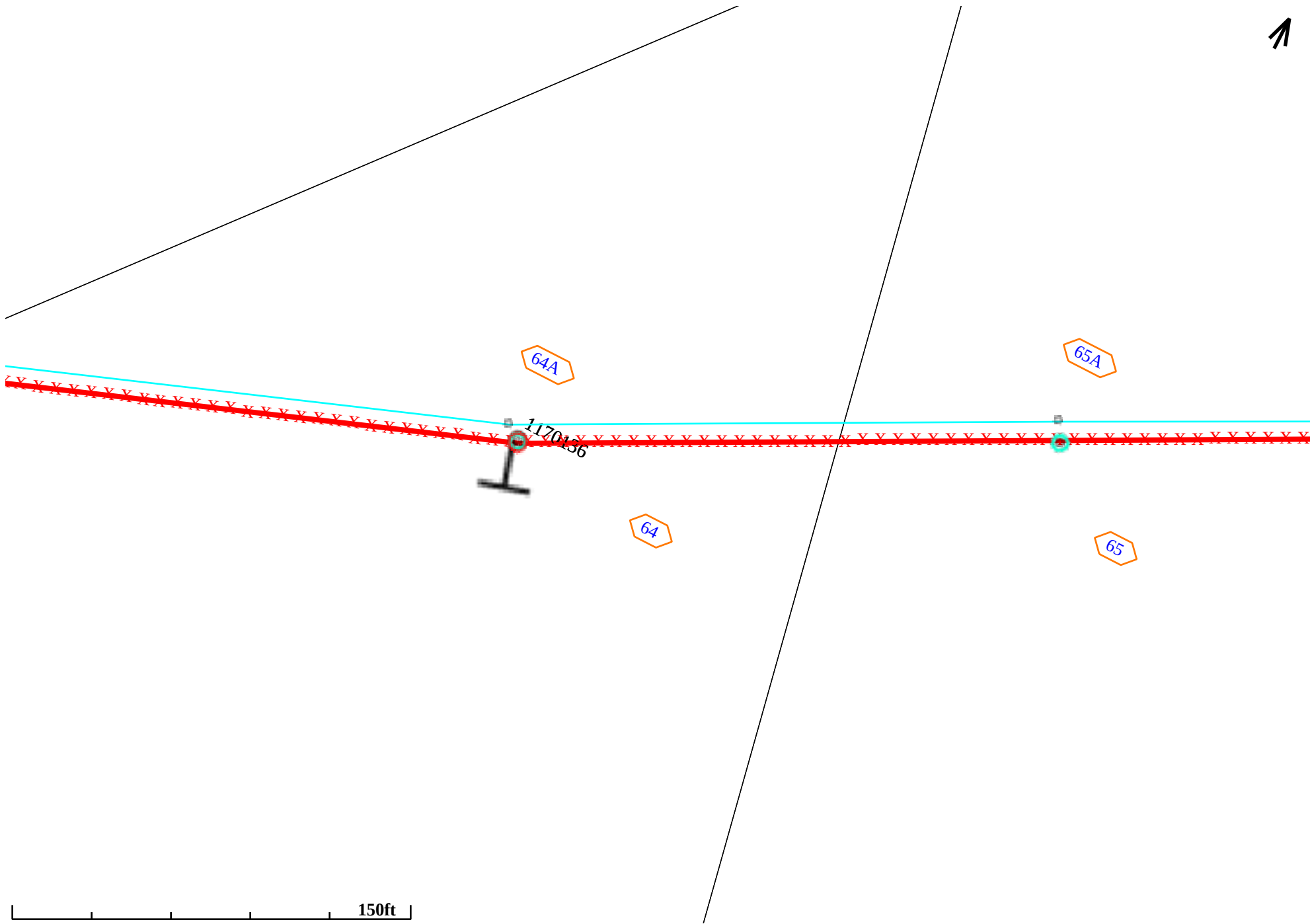
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

64 RetireOH 387 feet Source: R235 Comments: Pole #: 1170136 New (1) 45-3 New (1) C2.52L (C2-2) New (2) E1.2 (E3-3) New (2) F2.8 (F1-2S) New (1) H1.1 (M2-1) Retire (1) 35-6 Retire (774) 6 ACWC Retire (1) A2.3 (A2) Retire (1) E1.1 (E1-2) Retire (1) F2.8 (F1-2S)	64A NewOH 292 feet Source: 63A Comments: Pole #: New (292) 1/0 ACSR New (876) 336.4 MCM ACSR	65 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 50-2 New (1) C2.21L (C1-3) New (1) H5.1 (M2-2)	65A NewOH 208 feet Source: 64A Comments: Pole #: New (208) 1/0 ACSR New (624) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

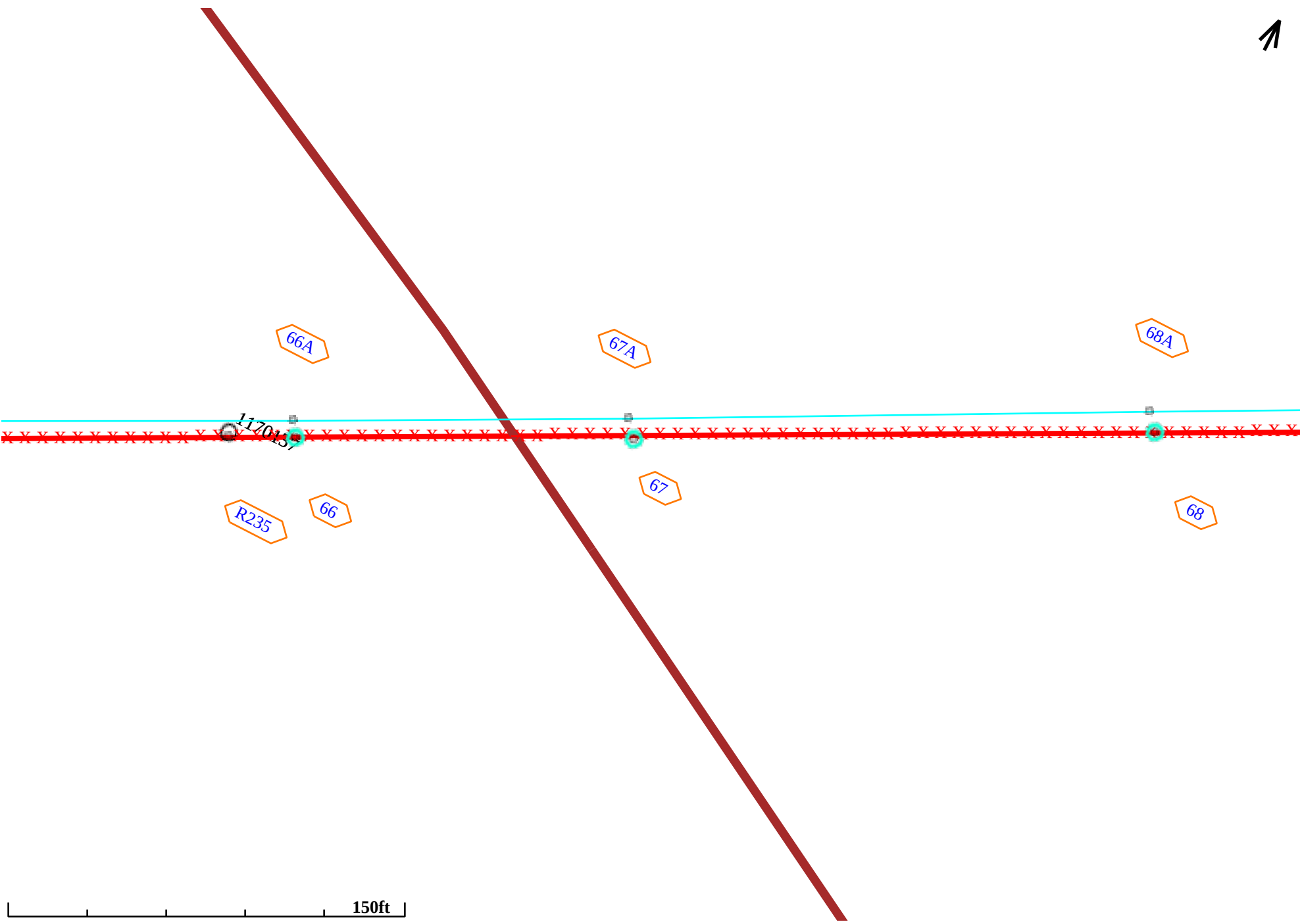
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



150ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

66 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	66A NewOH 208 feet Source: 65A Comments: Pole #: New (208) 1/0 ACSR New (624) 336.4 MCM ACSR	67 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	67A NewOH 127 feet Source: 66A Comments: Pole #: New (127) 1/0 ACSR New (381) 336.4 MCM ACSR
68 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-3 New (1) C2.21L (C1-3) New (1) H1.1 (M2-1)	68A NewOH 198 feet Source: 67A Comments: Pole #: New (198) 1/0 ACSR New (594) 336.4 MCM ACSR	R235 RetireOH 625 feet Source: 69 Comments: Pole #: 1170137 Retire (1250) 6 ACWC Retire (1) A1.1 (A1) Retire (1) H5.1 (M2-2)	

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

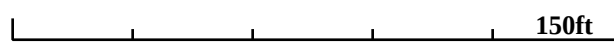
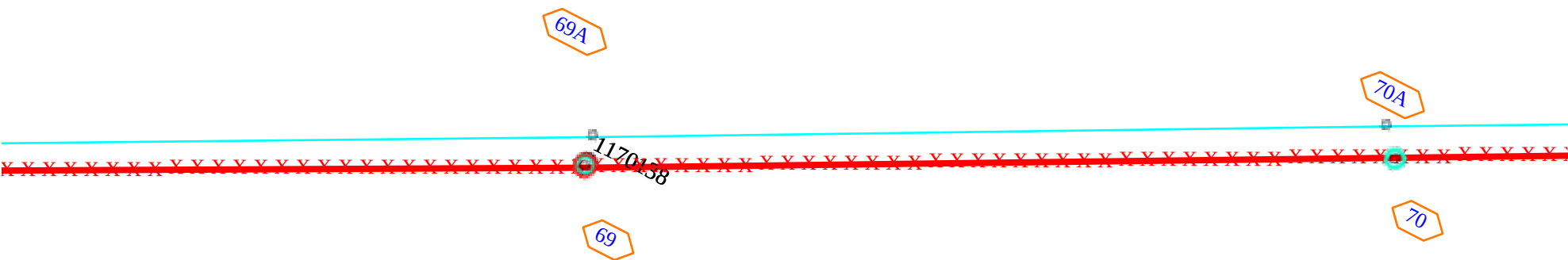
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

69 RetireOH 375 feet Source: R236 Comments: Pole #: 1170138 New (1) 45-3 New (1) C2.21L (C1-3) New (1) H5.1 (M2-2) <i>Retire (1) 35-6</i> <i>Retire (750) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i>	69A NewOH 278 feet Source: 68A Comments: Pole #: New (278) 1/0 ACSR New (834) 336.4 MCM ACSR	70 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C2.21L (C1-3) New (1) H5.1 (M2-2)	70A NewOH 250 feet Source: 69A Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR
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CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

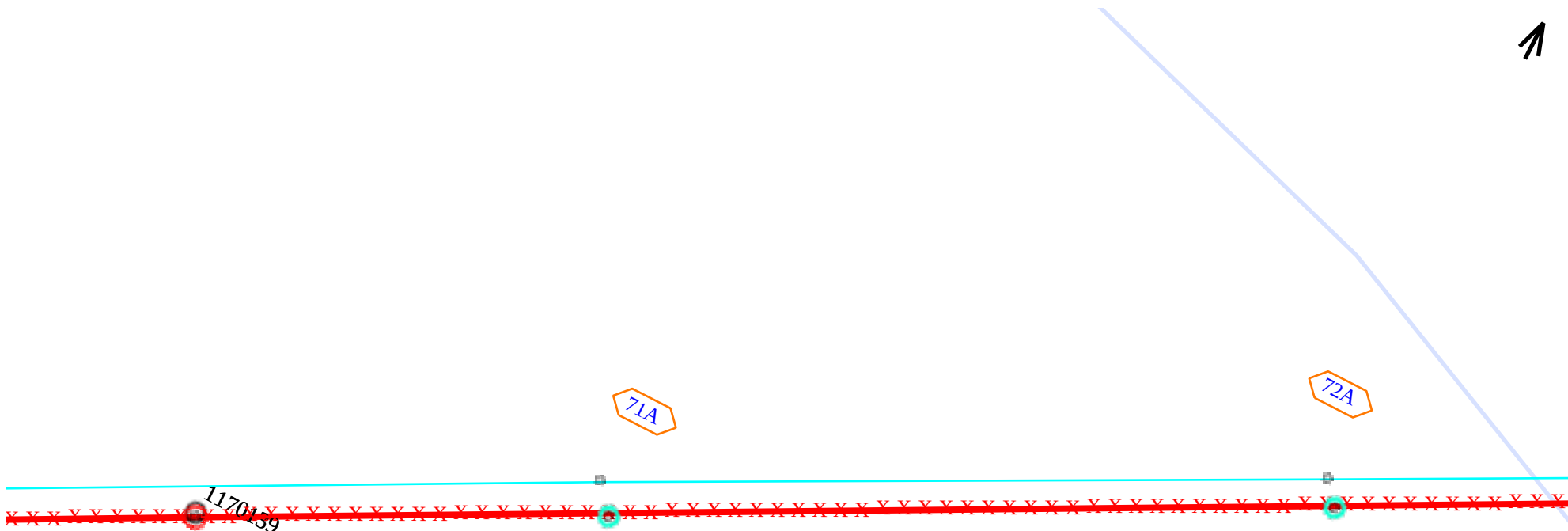
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

71 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	71A NewOH 250 feet Source: 70A Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR	72 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C2.21L (C1-3) New (1) H1.1 (M2-1)	72A NewOH 230 feet Source: 71A Comments: Pole #: New (230) 1/0 ACSR New (690) 336.4 MCM ACSR
R236 RetireOH 518 feet Source: 73 Comments: Pole #: 1170139 Retire (1) 40-5 Retire (1036) 6 ACWC Retire (1) A1.1 (A1) Retire (1) H5.1 (M2-2)			

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

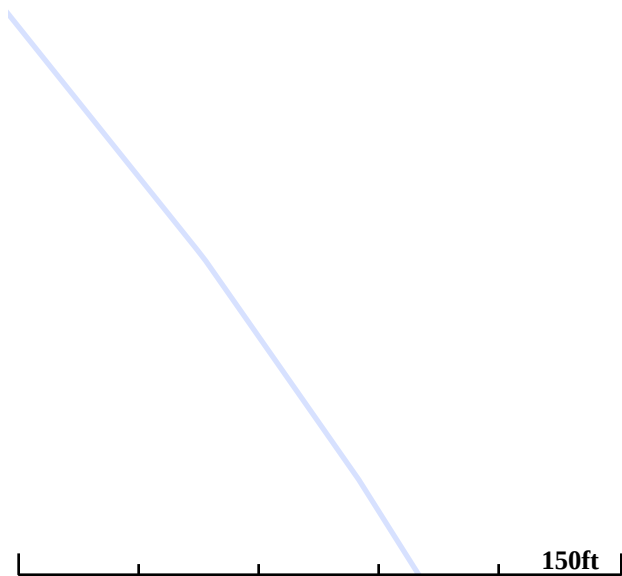
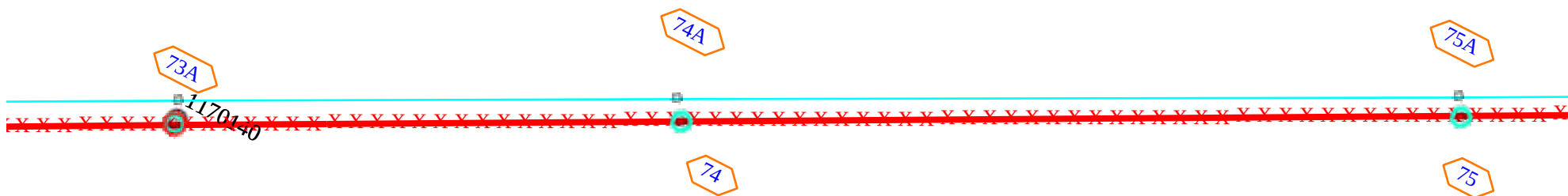
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

73 RetireOH 476 feet Source: R237 Comments: Pole #: 1170140 New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2) <i>Retire (1) 35-6</i> <i>Retire (952) 6 ACWC</i> <i>Retire (1) A1.1 (A1)</i> <i>Retire (1) H5.1 (M2-2)</i>	73A NewOH 162 feet Source: 72A Comments: Pole #: New (162) 1/0 ACSR New (486) 336.4 MCM ACSR	74 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	74A NewOH 157 feet Source: 73A Comments: Pole #: New (157) 1/0 ACSR New (471) 336.4 MCM ACSR
75 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	75A NewOH 246 feet Source: 74A Comments: Pole #: New (246) 1/0 ACSR New (738) 336.4 MCM ACSR		

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

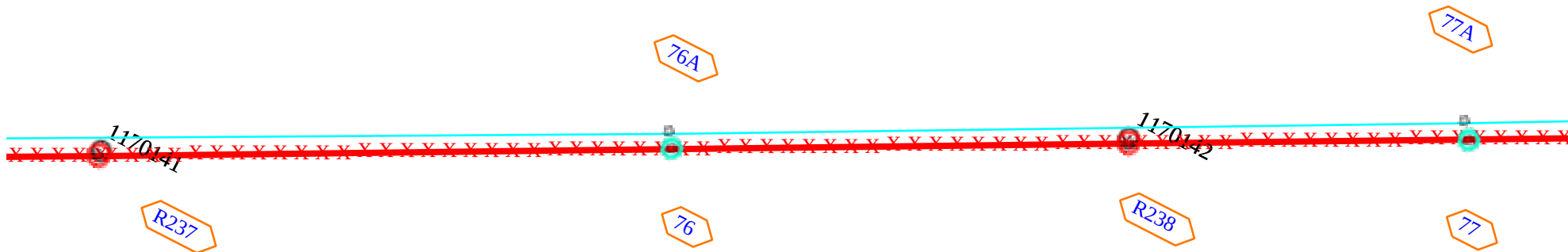
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



150ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

76 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	76A NewOH 251 feet Source: 75A Comments: Pole #: New (251) 1/0 ACSR New (753) 336.4 MCM ACSR	77 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	77A NewOH 250 feet Source: 76A Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR
R237 RetireOH 324 feet Source: R238 Comments: Pole #: 1170141 Retire (1) 35-6 Retire (648) 6 ACWC Retire (1) A1.1 (A1) Retire (1) H5.1 (M2-2)	R238 RetireOH 436 feet Source: R239 Comments: Pole #: 1170142 Retire (1) 35-6 Retire (872) 6 ACWC Retire (1) A1.1 (A1)		

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

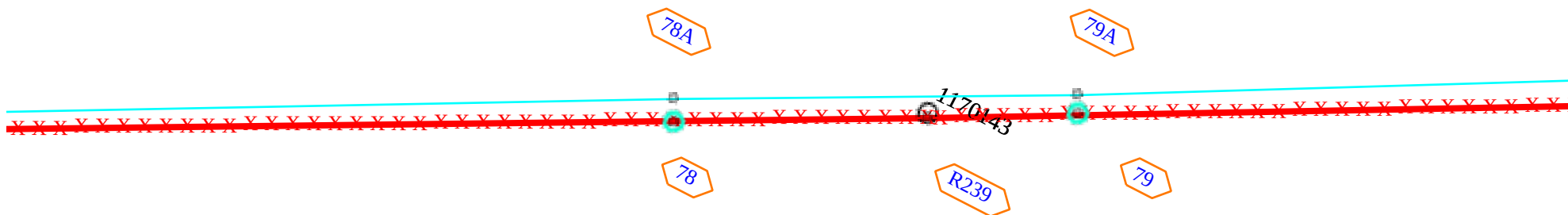
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



150ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

78 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	78A NewOH 250 feet Source: 77A Comments: Pole #: New (250) 1/0 ACSR New (750) 336.4 MCM ACSR	79 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H1.1 (M2-1)	79A NewOH 127 feet Source: 78A Comments: Pole #: New (127) 1/0 ACSR New (381) 336.4 MCM ACSR
R239 RetireOH 579 feet Source: R240 Comments: Pole #: 1170143 Retire (1158) 6 ACWC Retire (1) A1.1 (A1) Retire (1) H5.1 (M2-2)			

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

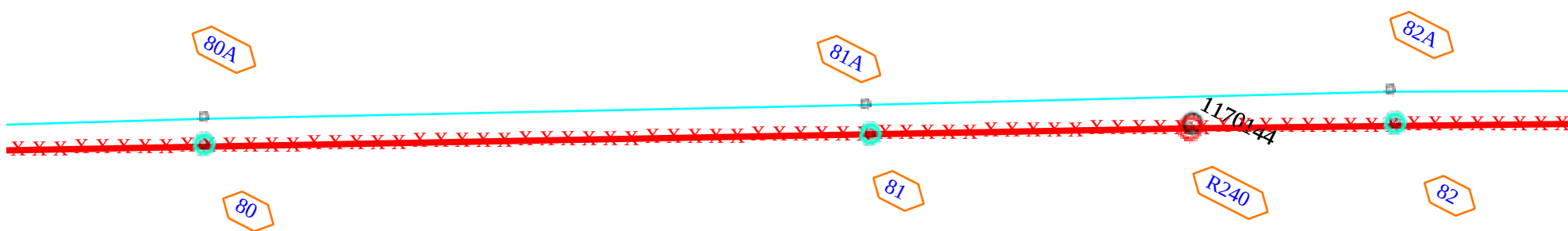
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____



150ft



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

80 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 50-2 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	80A NewOH 221 feet Source: 79A Comments: Pole #: New (221) 1/0 ACSR New (663) 336.4 MCM ACSR	81 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 50-2 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	81A NewOH 209 feet Source: 80A Comments: Pole #: New (209) 1/0 ACSR New (627) 336.4 MCM ACSR
82 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C1.11L (C1-2) New (1) H5.1 (M2-2)	82A NewOH 165 feet Source: 81A Comments: Pole #: New (165) 1/0 ACSR New (495) 336.4 MCM ACSR	R240 RetireOH 344 feet Source: R241 Comments: Pole #: 1170144 Retire (1) 35-6 Retire (688) 6 ACWC Retire (1) A1.1 (A1)	

CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

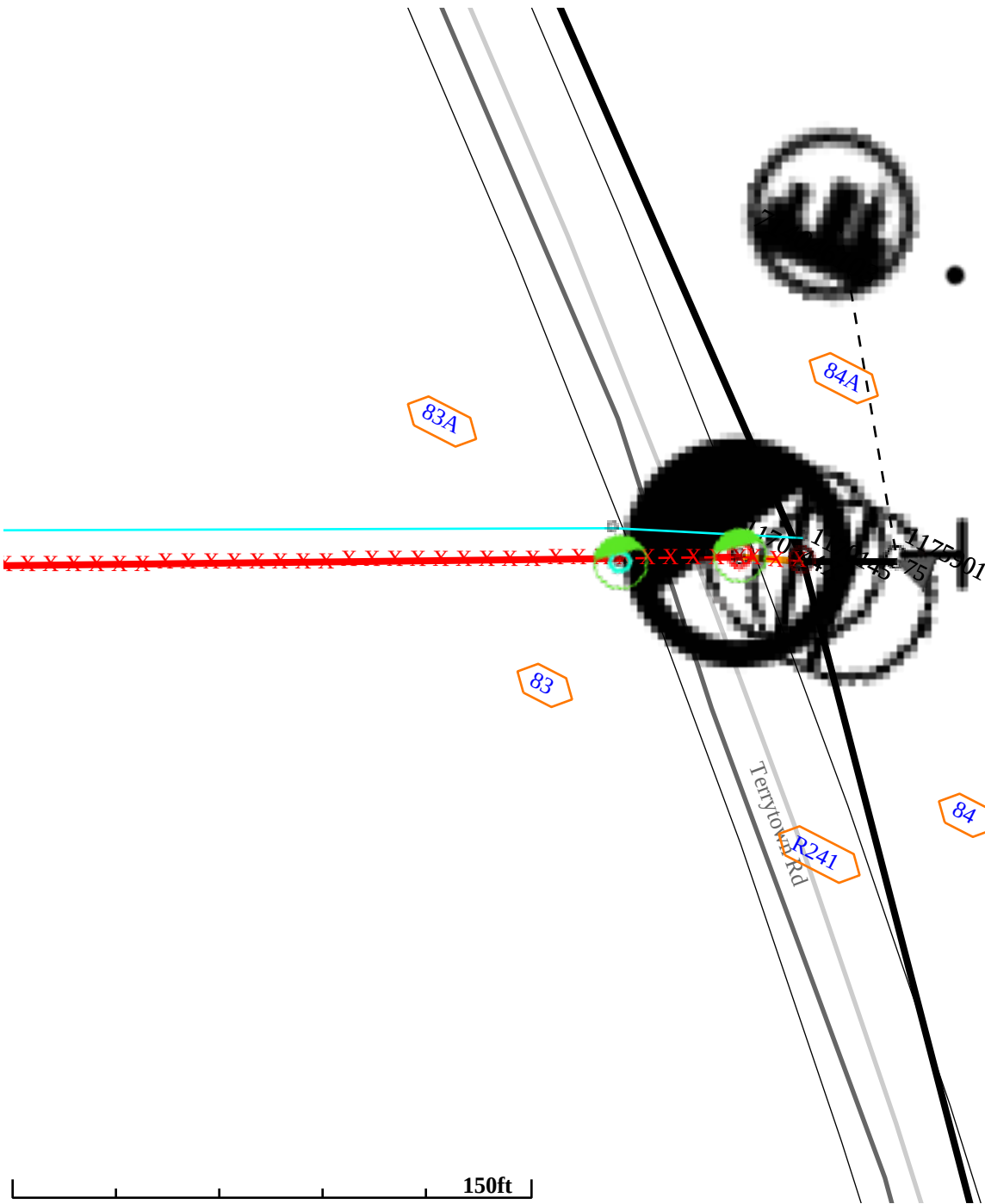
SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



Deadend 336 to back
side of crossarm



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

83 ExistingOH 0 feet Source: none Comments: Pole #: New (1) 45-4 New (1) C6.21L (C8-2) New (1) H1.1 (M2-1) New (1) R3.2 (M3-25A)	83A NewOH 244 feet Source: 82A Comments: Pole #: New (244) 1/0 ACSR New (732) 336.4 MCM ACSR	84 ExistingOH 0 feet Source: none Comments: Pole #: 1170145 Existing (1) 45-4 Existing (1) C6.21 (C8) Existing (1) H1.1 (M2-1) Existing (3) P1.01 (M5-6) New (3) A5.2 (A5-2) New (1) C5.31 (C7-1) New (3) E1.2 (E3-3) New (3) F2.8 (F1-2S) Retire (1) A5.2 (A5-2) Retire (1) C5.21 (C7)	84A NewOH 55 feet Source: 83A Comments: Pole #: New (55) 1/0 ACSR New (165) 336.4 MCM ACSR
---	---	--	---

CONSTRUCTION COMMENTS:

METER #:

PHASE:

NEW TRANSFORMER #:

SET READ:

RET. TRANSFORMER #:

CONNECT DATE:

BY:

COMMENTS:



**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

R241 RetireOH 18 feet

Source: 84

Comments:

Pole #: 1170144X

Retire (1) 40-5
Retire (36) 6 ACWC
Retire (1) A6.1 (A6)
Retire (1) H1.1 (M2-1)
Retire (1) P1.01 (M5-6)
Retire (1) R1.2 (M3-23A)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

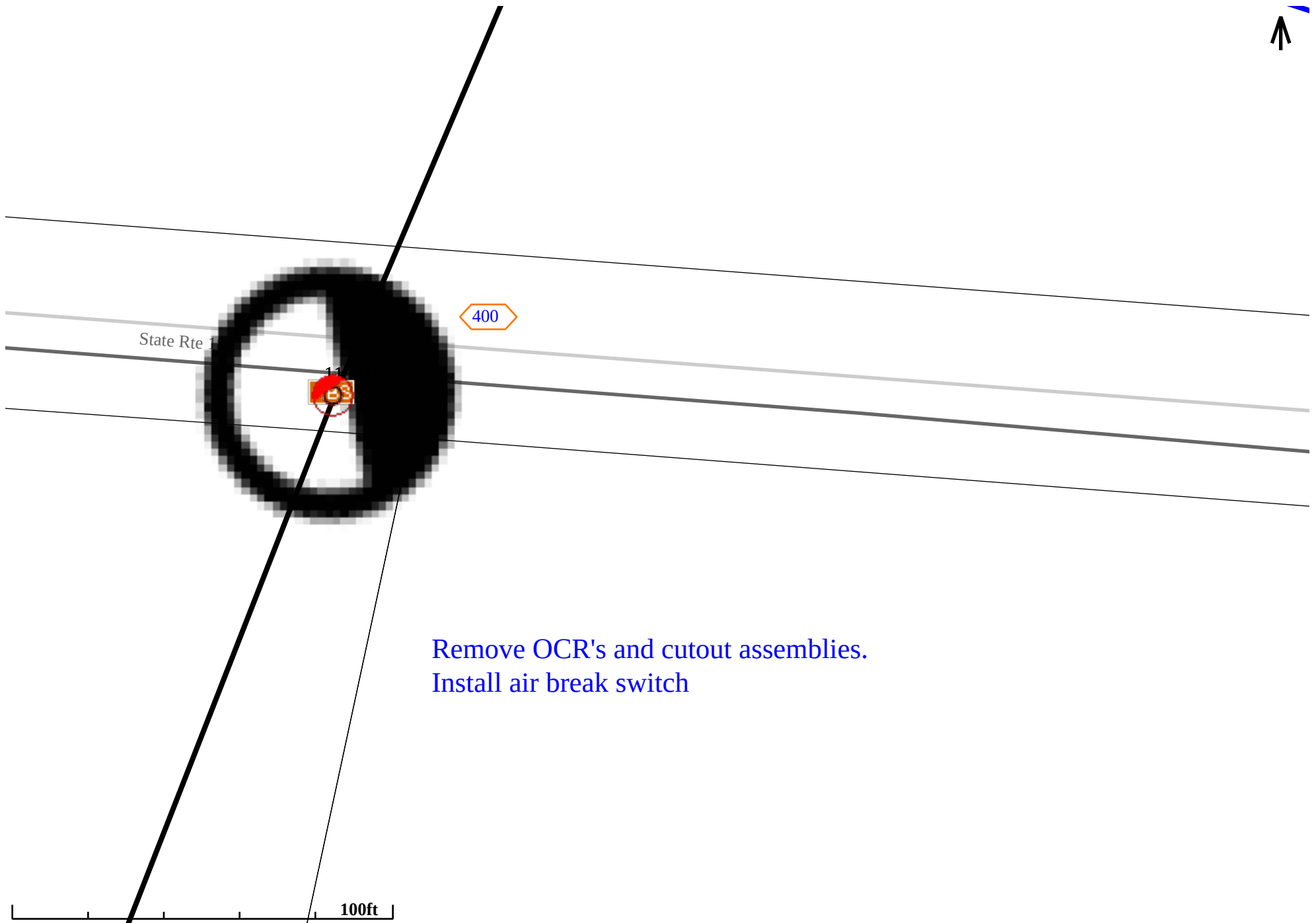
SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____





**Claverack Rural
Electric Cooperative, Inc.**
"Powered by Excellence"

Staking Sheet for Job 352034

Customer Name: LIME HILL
SUBSTATION (6)
Account No.: 2002600030
Home Phone:
Work Phone:
Cell Phone:

Map Number: 714026000
County: 1 - Bradford
District: 1 - Wysox
Sub: Lime Hill
Feeder: 3

Staked Date: 2020-01-03
Staked By: Steve Huston
Nearest Map #: 714044060
Nearest Pole #: 1192103
Type of Service:

400 ExistingOH 0 feet

Source: none

Comments:

Pole #: 1150109Y

Existing (1) 40-4

Existing (1) C6.21 (C8)

Existing (1) H1.1 (M2-1)

New (1) S2.32 (M3-15)

Retire (3) P1.01 (M5-6)

Retire (1) R3.2 (M3-25A)

CONSTRUCTION COMMENTS:

METER #: _____

PHASE: _____

NEW TRANSFORMER #: _____

SET READ: _____

RET. TRANSFORMER #: _____

CONNECT DATE: _____

BY: _____

COMMENTS: _____

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

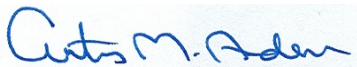
FILING INSTRUCTIONS: This bulletin is a revision of previous RUS Bulletin 50-3 (D-804), (dated May 9, 1983) "Specifications and Drawings for 12.5/7.2 kV Line Construction" and has been renumbered, renamed and updated as RUS Bulletin 1728F-804, "Specifications and Drawings for 12.47/7.2 kV Line Construction."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

<u>SECTION</u>	<u>CATEGORY DESCRIPTIONS</u>
1-a	<i>General Construction Specifications</i>
1-b	<i>Conductor Installation Specifications</i>
1-c	<i>Construction Specifications for Pole Top Assemblies</i>
1-d	<i>Narrow Profile Assemblies Grouped by Bracket Configuration</i>
A	<u>SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS</u> Index A Single-Phase Primary Pole Top Construction Drawings
B	<u>TWO-PHASE PRIMARY POLE TOP ASSEMBLY UNITS</u> Index B Two-Phase Primary Pole Top Construction Drawings
C	<u>THREE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS</u> Index C Three-Phase Primary Pole Top Construction Drawings
D	<u>DOUBLE-CIRCUIT PRIMARY POLE TOP ASSEMBLY UNITS</u> Index D Double-Circuit Primary Pole Top Construction Drawings
E	<u>GUYING ASSEMBLY UNITS</u> Index E <i>Construction Specifications for Guys</i> Guying Construction Drawings
F	<u>ANCHOR ASSEMBLY UNITS</u> Index F <i>Construction Specifications for Anchoring</i> <i>Soil Classifications (Table)</i> Anchor Construction Drawings
G	<u>TRANSFORMER ASSEMBLY UNITS</u> Index G <i>Construction Specifications for Transformers</i> Transformer Construction Drawings
H	<u>GROUNDING ASSEMBLY UNITS</u> Index H <i>Construction Specifications for Grounding</i> Grounding Construction Drawings

BULLETIN 1728F-804: INDEX

(Continued)

<u>SECTION</u>	<u>CATEGORY DESCRIPTIONS</u>
J	<u>SECONDARY ASSEMBLY UNITS</u> Index J <i>Construction Specifications for Secondary Conductors and Services</i> Secondary Construction Drawings
K	<u>SERVICE ASSEMBLY UNITS</u> Index K Service Construction Drawings
L	<u>TYING ASSEMBLY UNITS</u> Index L <i>Construction Specifications for Connectors, Stirrups, Clamps, Taps and Jumpers</i> Tying Guide Drawings
M	<u>MISCELLANEOUS ASSEMBLY UNITS AND GUIDES</u> Index M <i>Right-of-Way Clearing Specifications</i> Miscellaneous Construction Drawings and Guides
N	<u>NEUTRAL ASSEMBLY UNITS</u> Index N Neutral Construction Drawings
P	<u>PROTECTION ASSEMBLY UNITS</u> Index P <i>Construction Specifications for Raptor Protection</i> Protection Construction Drawings
Q	<u>METERING ASSEMBLY UNITS</u> Index Q Metering Construction Drawings
R	<u>OIL CIRCUIT RECLOSER ASSEMBLY UNITS</u> Index R Oil Circuit Recloser Construction Drawings
S	<u>SECTIONALIZING ASSEMBLY UNITS</u> Index S Sectionalizing Construction Drawings

BULLETIN 1728F-804: INDEX

(Continued)

<u>SECTION</u>	<u>CATEGORY DESCRIPTIONS</u>
W	<u>WOOD POLES, CROSSARMS AND BRACES</u> Index W <i>Construction Specifications for Poles and Crossarms</i> <i>Pole Setting Depths (Table)</i> Pole and Crossarm Guides and Assembly Drawings
Y	<u>VOLTAGE ALTERATION EQUIPMENT ASSEMBLY UNITS</u> Index Y Voltage Alteration Equipment Construction Drawings
<u>EXHIBITS</u>	
1	<u>CALCULATIONS AND TABLES OF MAXIMUM LINE ANGLES</u> Calculation of Maximum Line Angles Table I: Maximum Line Angles (Pin Insulators) - 500 lbs./Conductor Table II: Maximum Line Angles (Pin Insulators) - 750 lbs./Conductor Table III: Maximum Line Angles (Pin Insulators) - 1,000 lbs./Conductor Table IV: Maximum Line Angles (Pin Insulators) - 1,500 lbs./Conductor Table V: Maximum Line Angles (Pin Insulators) - 2,000 lbs./Conductor Table VI: Maximum Line Angles (Spool Insulators) - 1,500 lbs./Conductor Table VII: Maximum Line Angles (Spool Insulators) - 2,250 lbs./Conductor
2	<u>LONGITUDINAL LOADING ON CROSSARM ASSEMBLIES</u> TABLE A: Permitted Unbalanced Conductor Tension - (1 phase/side of pole) TABLE B: Permitted Unbalanced Conductor Tension - (2 phases/side of pole)
3	<u>DISPOSITION OF ASSEMBLIES IN BULLETIN 50-3 (D 804)</u>
4	<u>NEW ASSEMBLIES AND GUIDE DRAWINGS IN BULLETIN 1728F-804</u>
5	<u>RUS STANDARD FORMAT AND MEANING OF OVERHEAD DISTRIBUTION ASSEMBLY NUMBERS</u>
6	<u>TABLE OF SELECTED SI TO METRIC CONVERSIONS</u>

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.

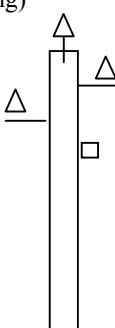
RUS categorizes conductor sizes as follows:

- **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.

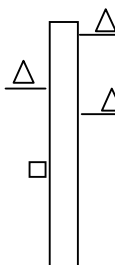
Primary pole top assemblies identified as “large conductors” in the drawing titles shall be used to support large and extra large conductors. Large conductor assemblies may also be used for small conductors. Furthermore, large and extra large conductors may be installed on assemblies not designated as 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

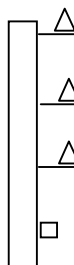
"STANDARD" ASSEMBLIES (1-foot, 9-inch spacing)			
(APPLICATIONS: Convert existing standard 1-phase; Standard pole framing)			
<u>MAX. LINE ANGLES</u>	<u>1-PHASE</u>	<u>2-PHASE</u>	<u>3-PHASE</u>
Tangent	A1.1, A1.2	B1.1N, B1.2N	C1.1N, C1.2N
"	A1.1P, A1.2P	B1.1NP, B1.2NP	C1.1NP, C1.2NP
" (NESC Grade B)	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)			
<u>MAX. LINE ANGLES</u>	<u>1-PHASE</u>	<u>2-PHASE</u>	<u>3-PHASE</u>
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)			
<u>MAX. LINE ANGLES</u>	<u>1-PHASE</u>	<u>2-PHASE</u>	<u>3-PHASE</u>
Tangent		B1.7N, B1.8N	C1.7N, C1.8N
"		B1.7NP, B1.8NP	C1.7NP, C1.8NP
" (NESC Grade B)	(Same as "Staggered" Assemblies)	B2.7N, B2.8N	C2.7N, C2.8N
" (NESC Grade B)		B2.7NP, B2.8NP	C2.7NP, C2.8NP
Table II		B1.9N	C1.9N
Table II		B1.9NP	C1.9NP
Table IV		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.

INDEX A

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

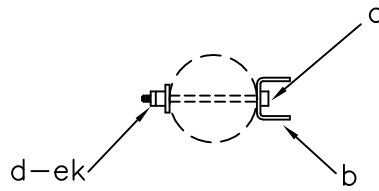
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804	Bulletin 50-3	
(New)	(Old)	
A1.01	(M5-2)	SINGLE SUPPORT - PRIMARY
A1.01P	(M5-18)	
A1.011	(M5-5)	
A1.011P	(M5-7)	
A1.011L		
A1.04N		SINGLE SUPPORT – NARROW PROFILE
A1.04NP		
A1.1	(A1)	SINGLE SUPPORT (TANGENT)
A1.2	(A1A)	
A1.1P	(A1P)	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

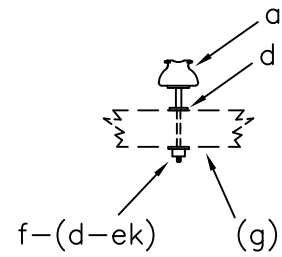
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
A2.1P A2.2P	(A1-1P) (A1-1AP)	DOUBLE SUPPORT (TANGENT) (POST INSULATORS)
A2.3	(A2)	DOUBLE SUPPORT
A2.3P	(A2P)	DOUBLE SUPPORT (POST INSULATORS)
A2.4N A2.5N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
A2.4NP A2.5NP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

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

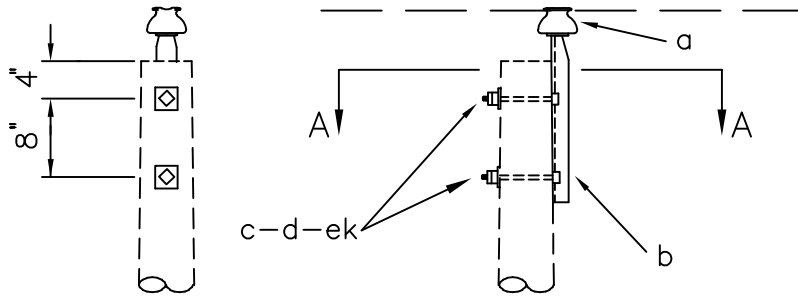
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
A5.4		SINGLE DEADENDS
A5.5		
A5.6		
A5.7		
A5.8		
A5.9		
A5.2G		SINGLE PHASE TAP GUIDE
A5.3NG		SINGLE PHASE TAP GUIDE – NARROW PROFILE
A5.4NG		SINGLE PHASE TAP GUIDE – NARROW PROFILE (WITH CUTOUT AND ARRESTER)
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)



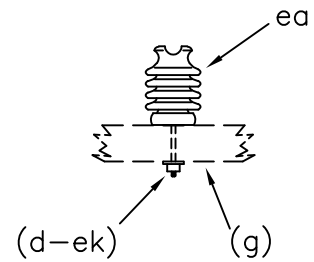
SECTION A-A



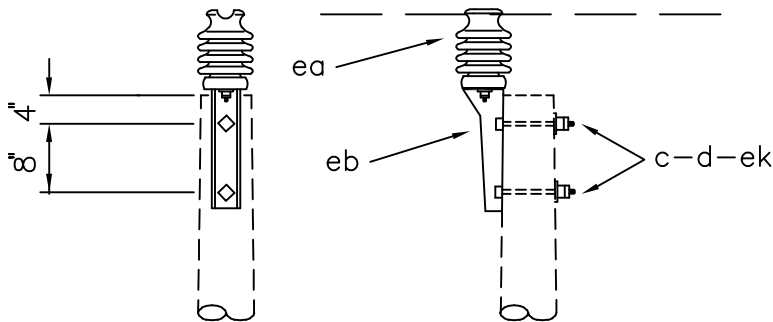
A1.011



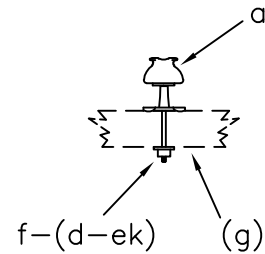
A1.01



A1.011P



A1.01P



A1.011L

ASSEMBLY: A1.

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

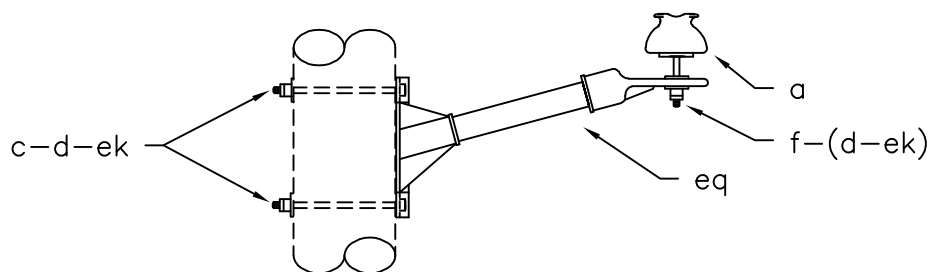
SINGLE SUPPORT-PRIMARY

APRIL 2005

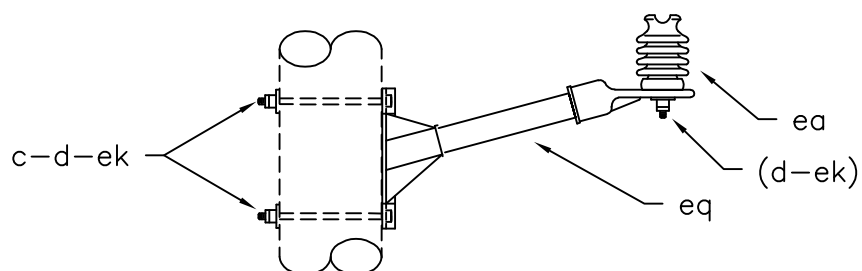
RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.01,A1.01P
A1.011,A1.011P
A1.011L



A1.04N



A1.04NP

ASSEMBLY: A1.			
ITEM	MATERIAL	04N QTY	04NP 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

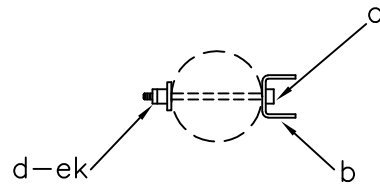
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

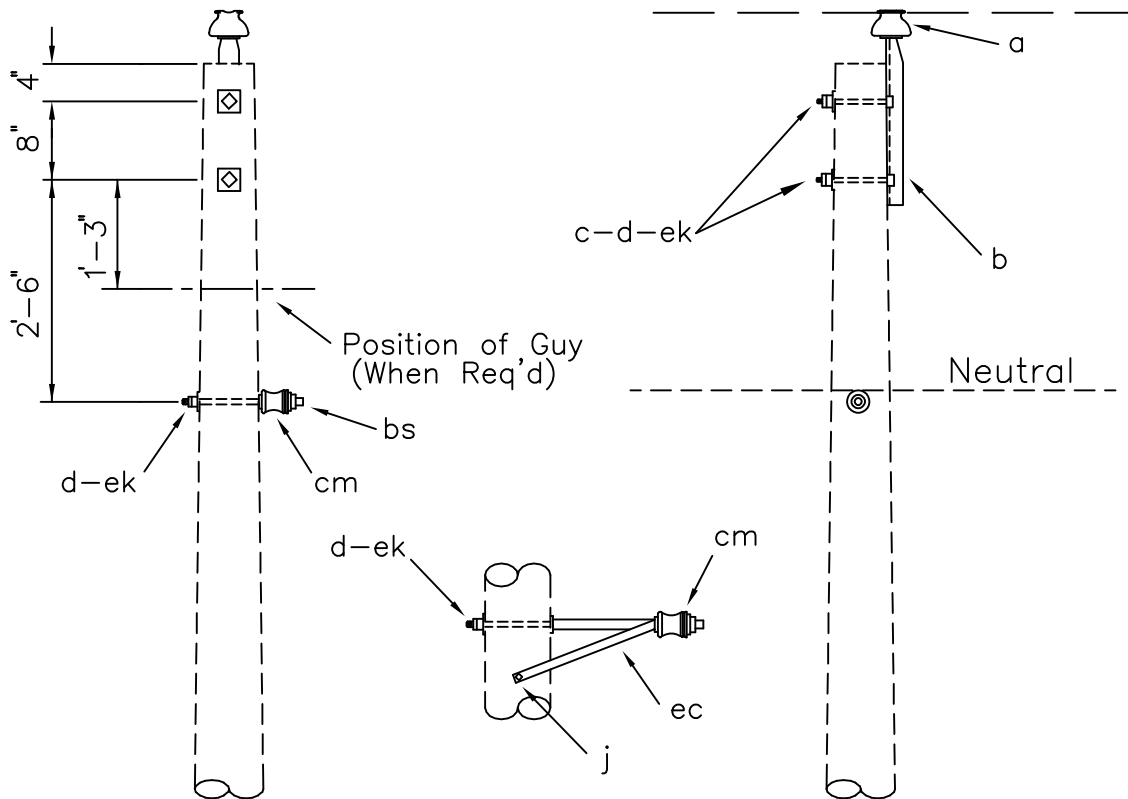
RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.04N
A1.04NP



PLAN



Specify A1.2 for
offset neutral assembly

ASSEMBLY:

ITEM	MATERIAL	A1.1	A1.2
		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

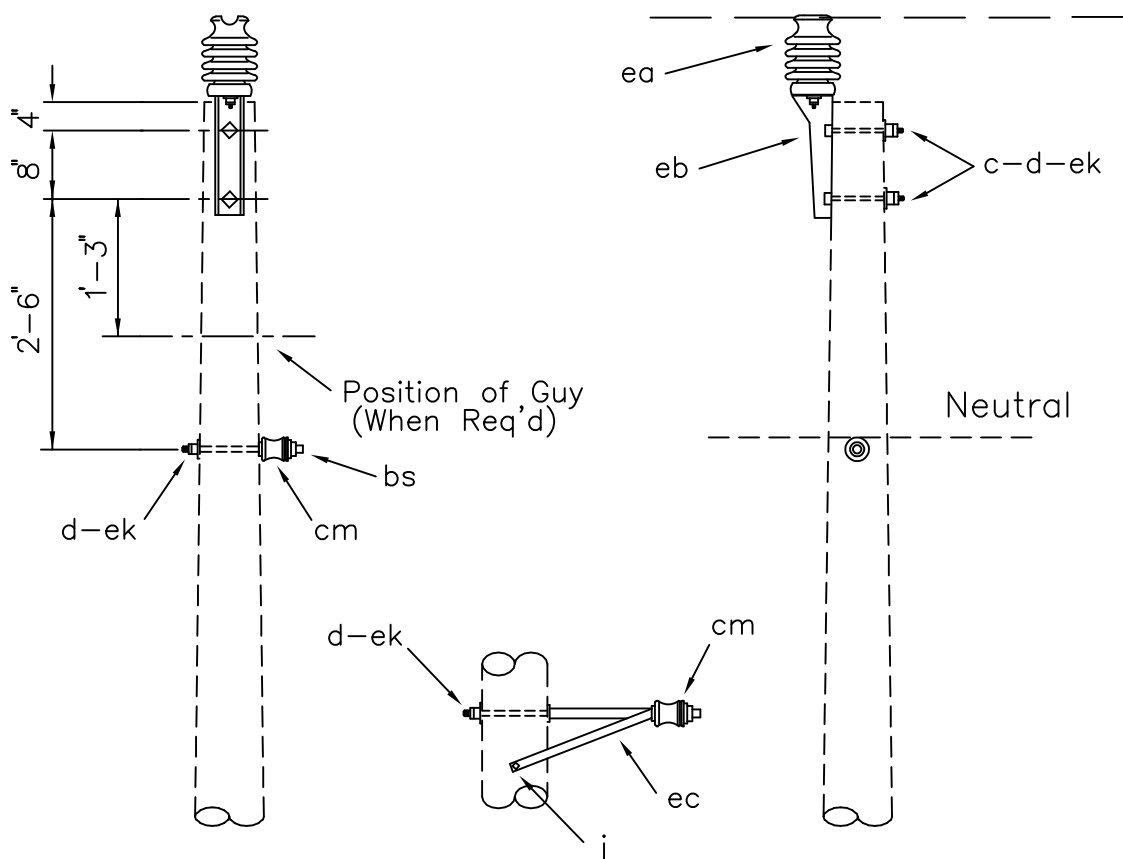
SINGLE SUPPORT
(TANGENT)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.1 (A1)
A1.2 (A1A)



Specify A1.2P for
offset neutral assembly

ASSEMBLY: A1

ITEM	MATERIAL	.1P	.2P
		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

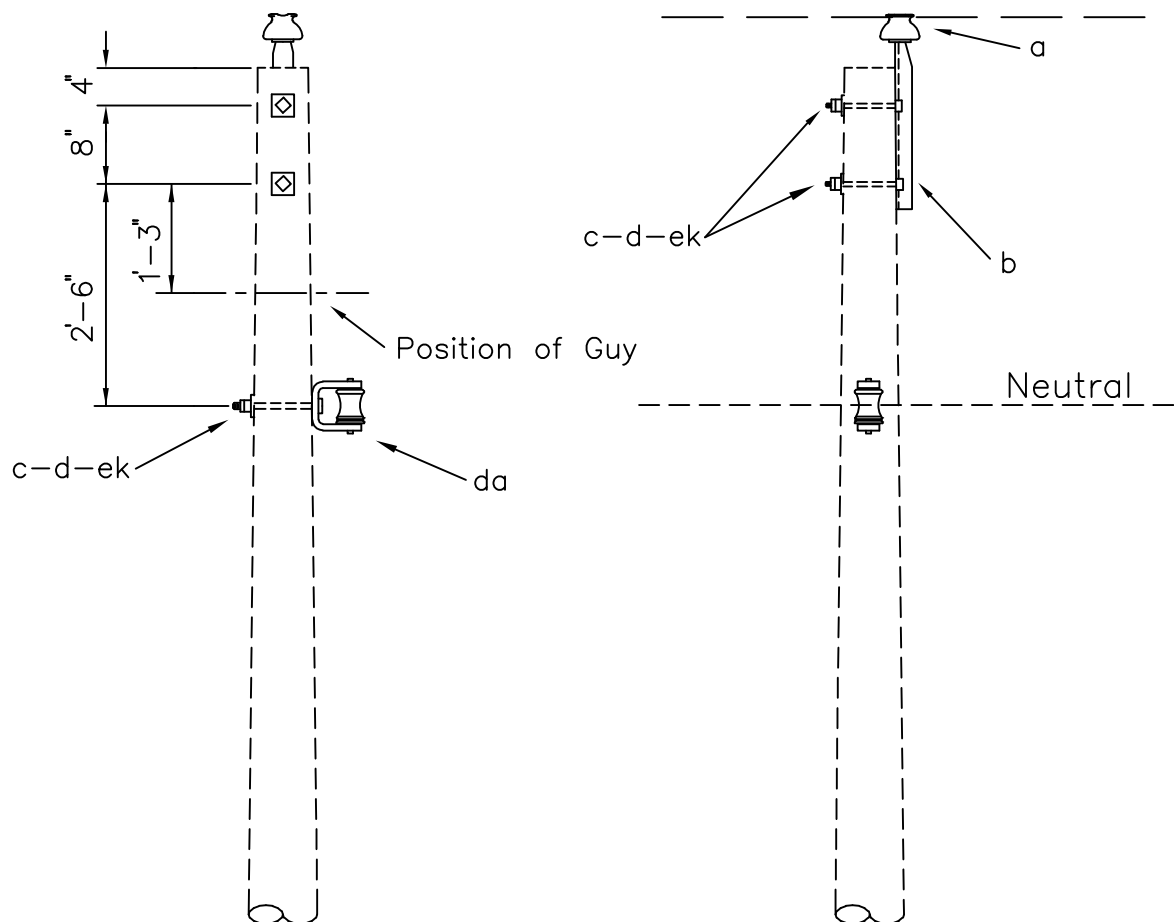
SINGLE SUPPORT (TANGENT)
(POST INSULATORS)

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

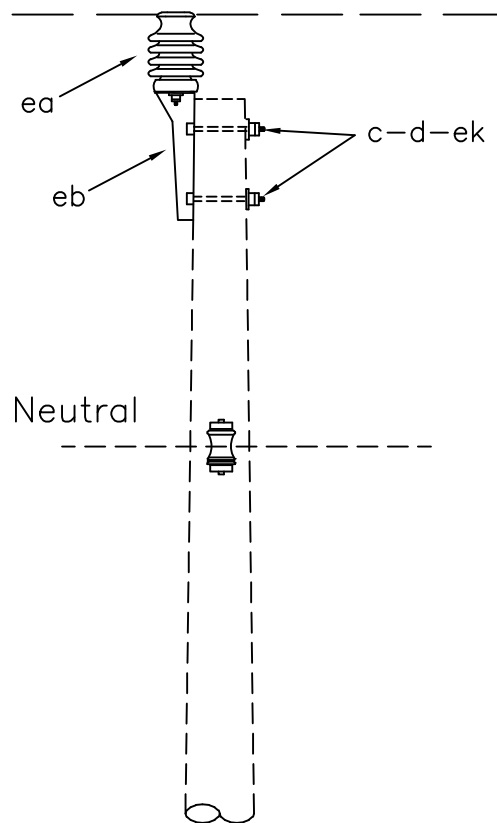
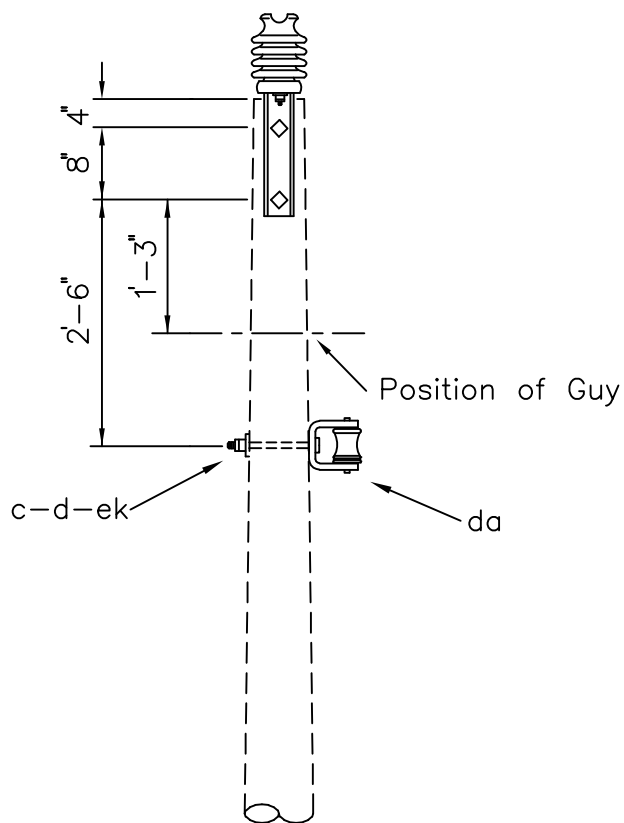
SINGLE SUPPORT

APRIL 2005

RUS

1 - PHASE PRIMARY
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

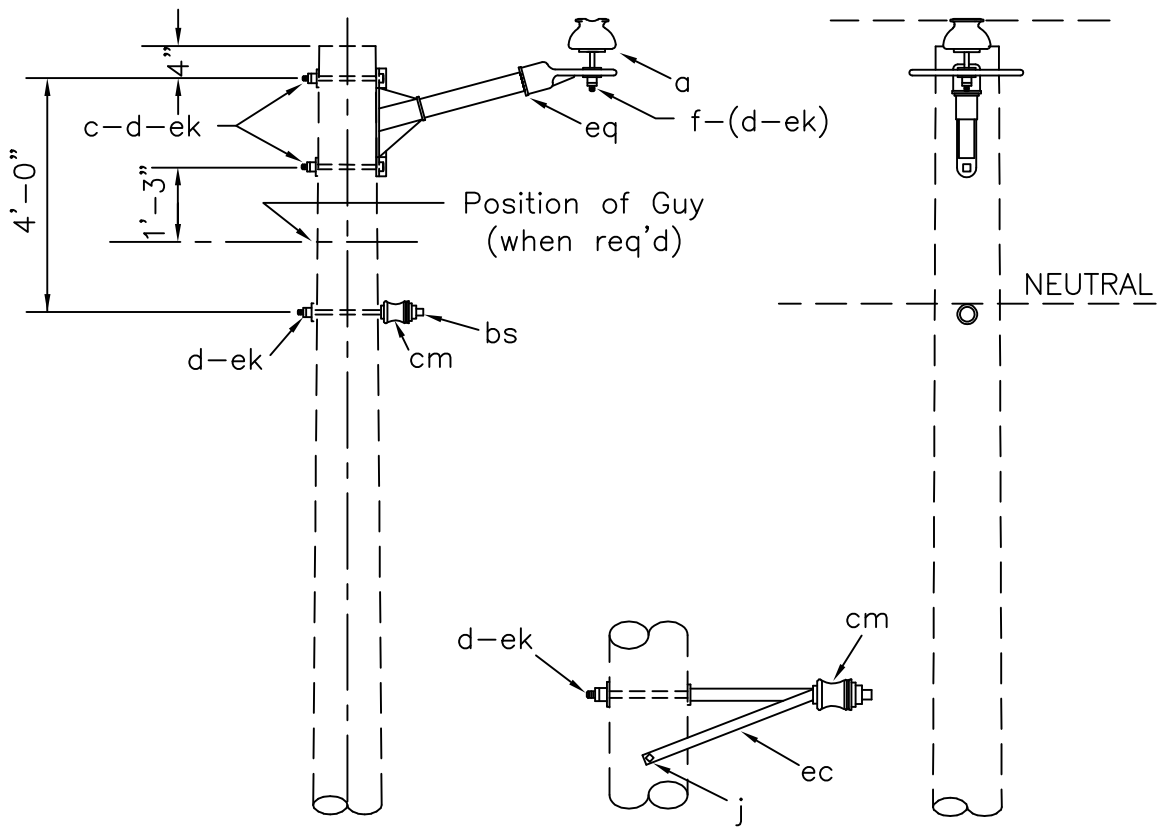
SINGLE SUPPORT
(POST INSULATORS)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.3P



Specify A1.5N for
offset neutral assembly

Assembly: A1.		4N	5N
ITEM	MATERIAL	QTY	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)
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

(If req'd)

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

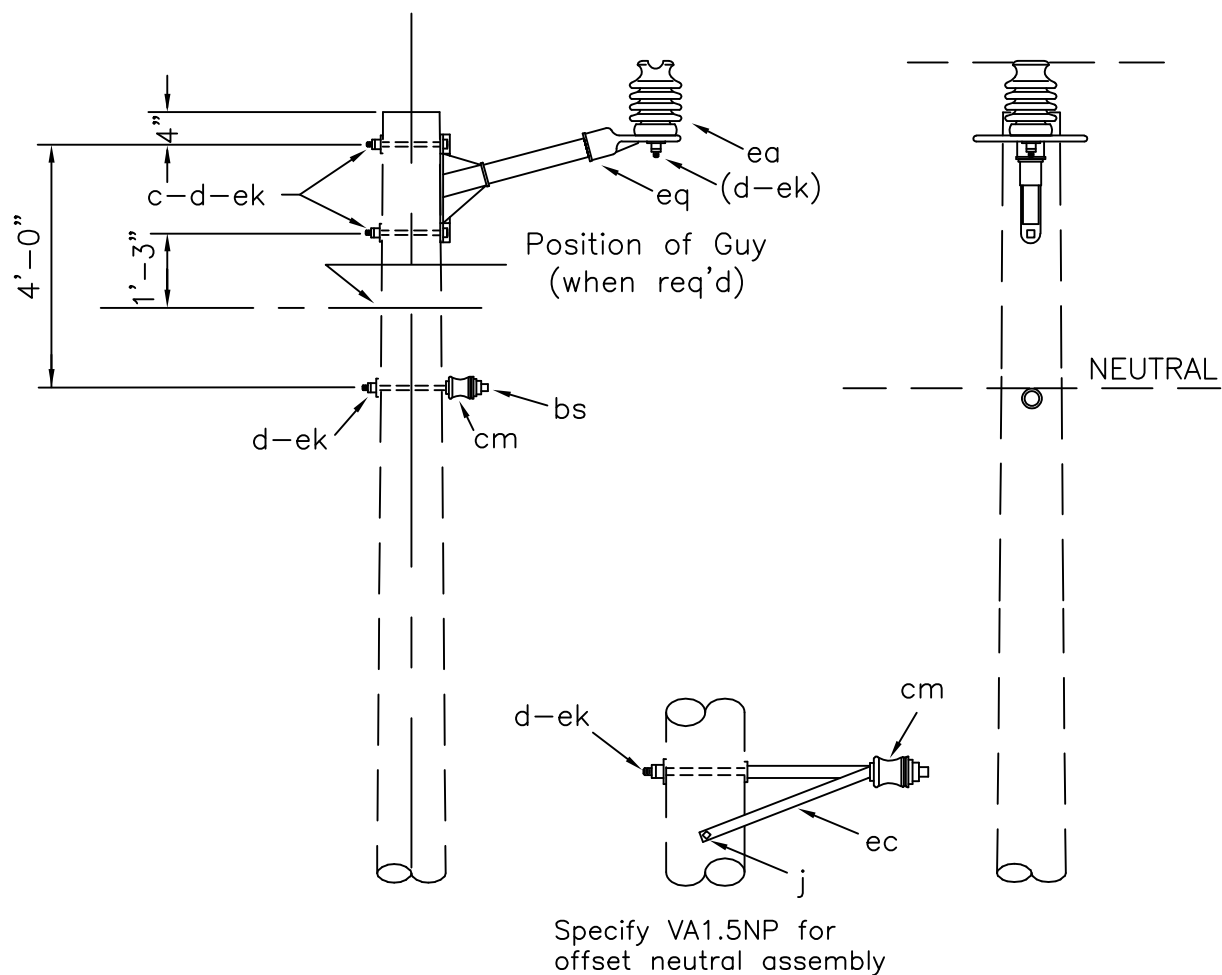
SINGLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.4N
A1.5N



Assembly: VA1.4NP5NP

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

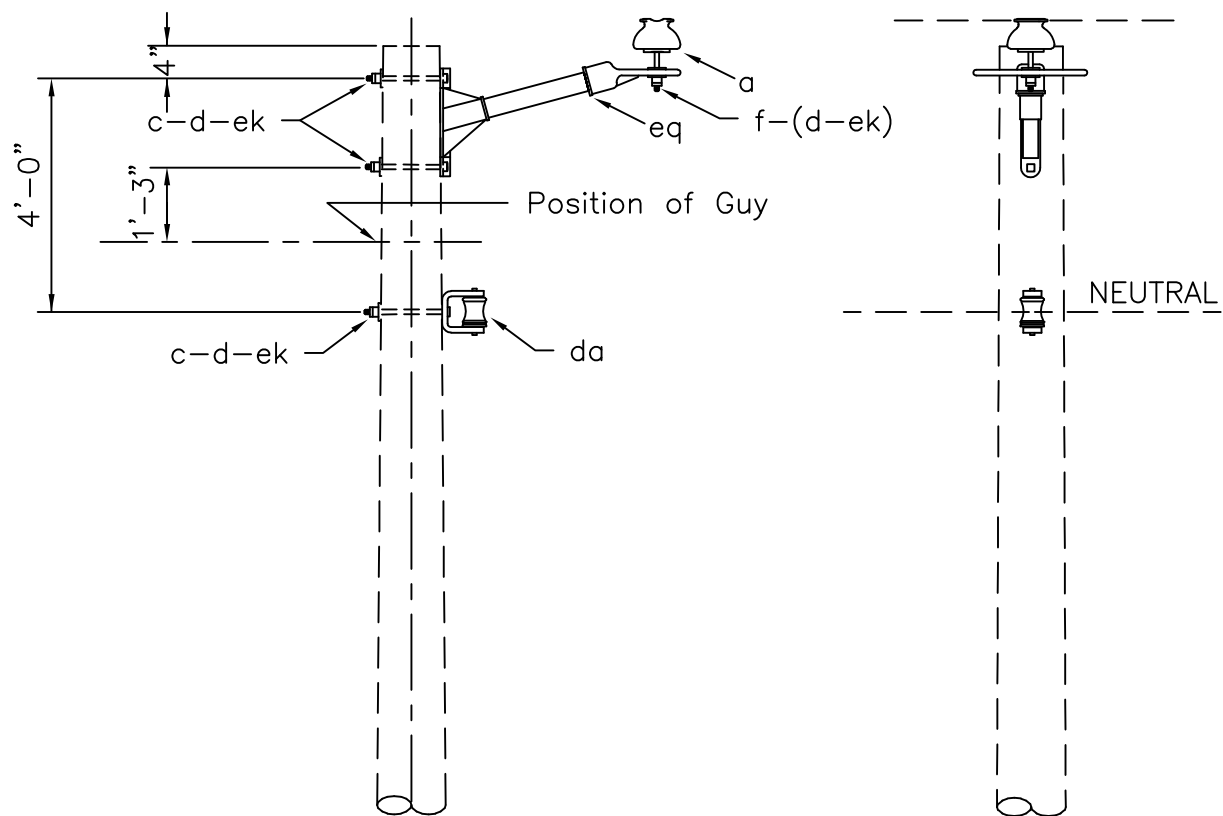
SINGLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

1 - PHASE PRIMARY
12.47/7.2 kV

A1.4NP
A1.5NP

RUS



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

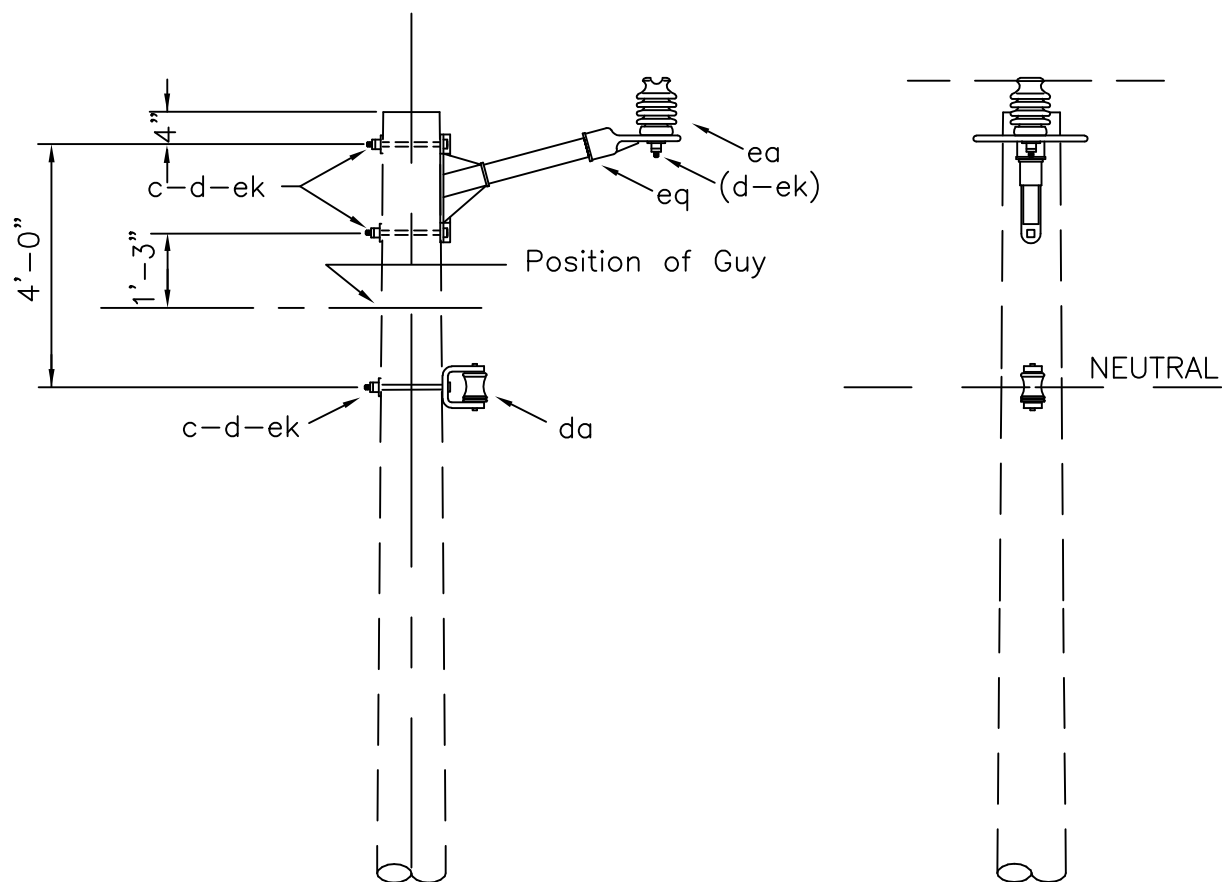
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

1 - PHASE PRIMARY
12.47/7.2 kV

RUS

A1.6N



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

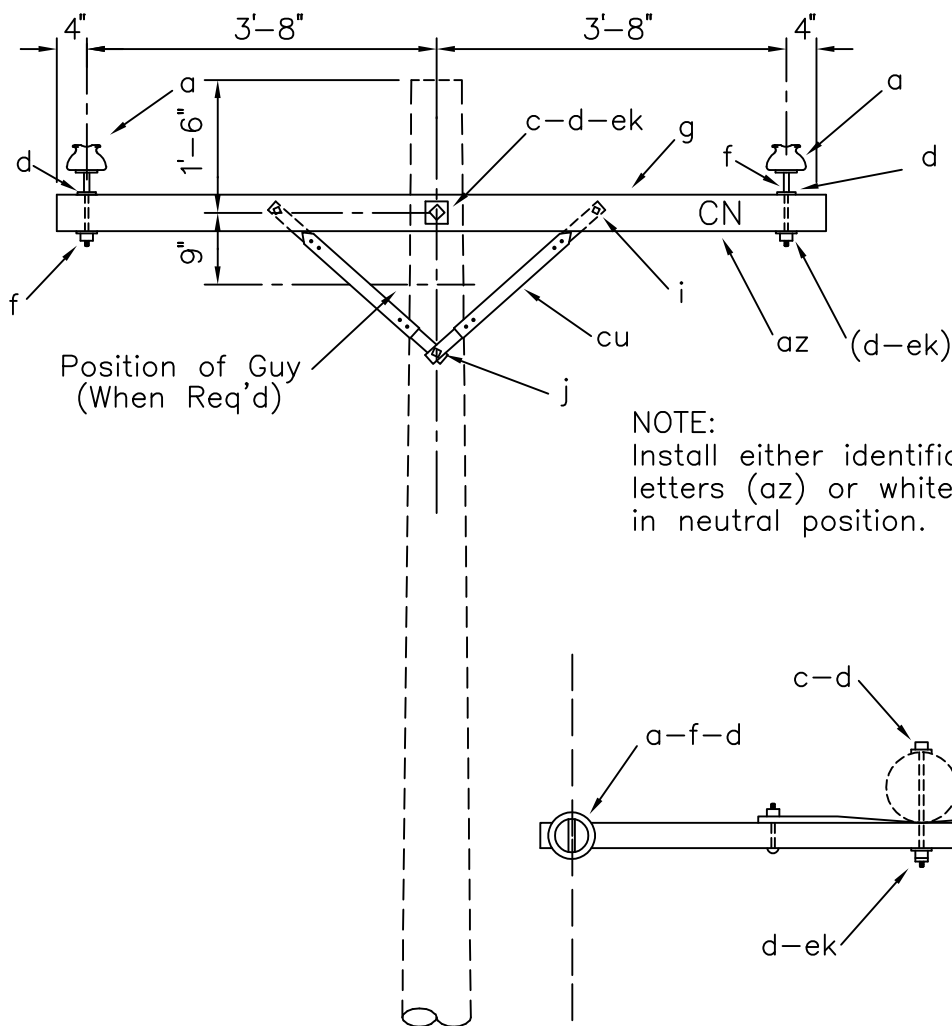
SINGLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.6NP



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

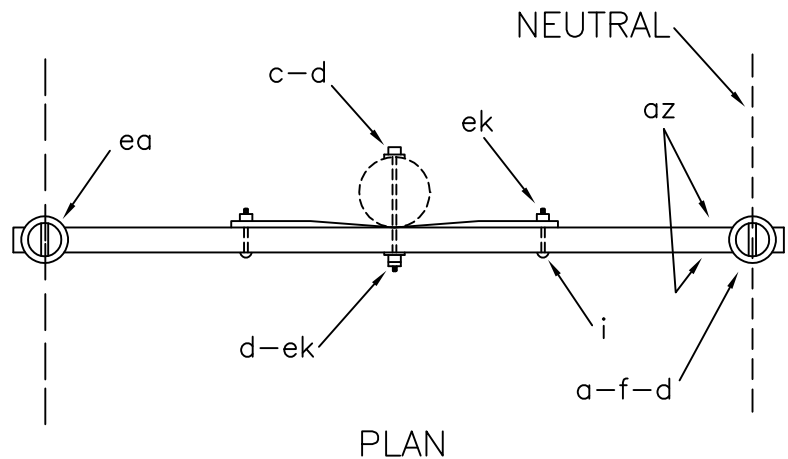
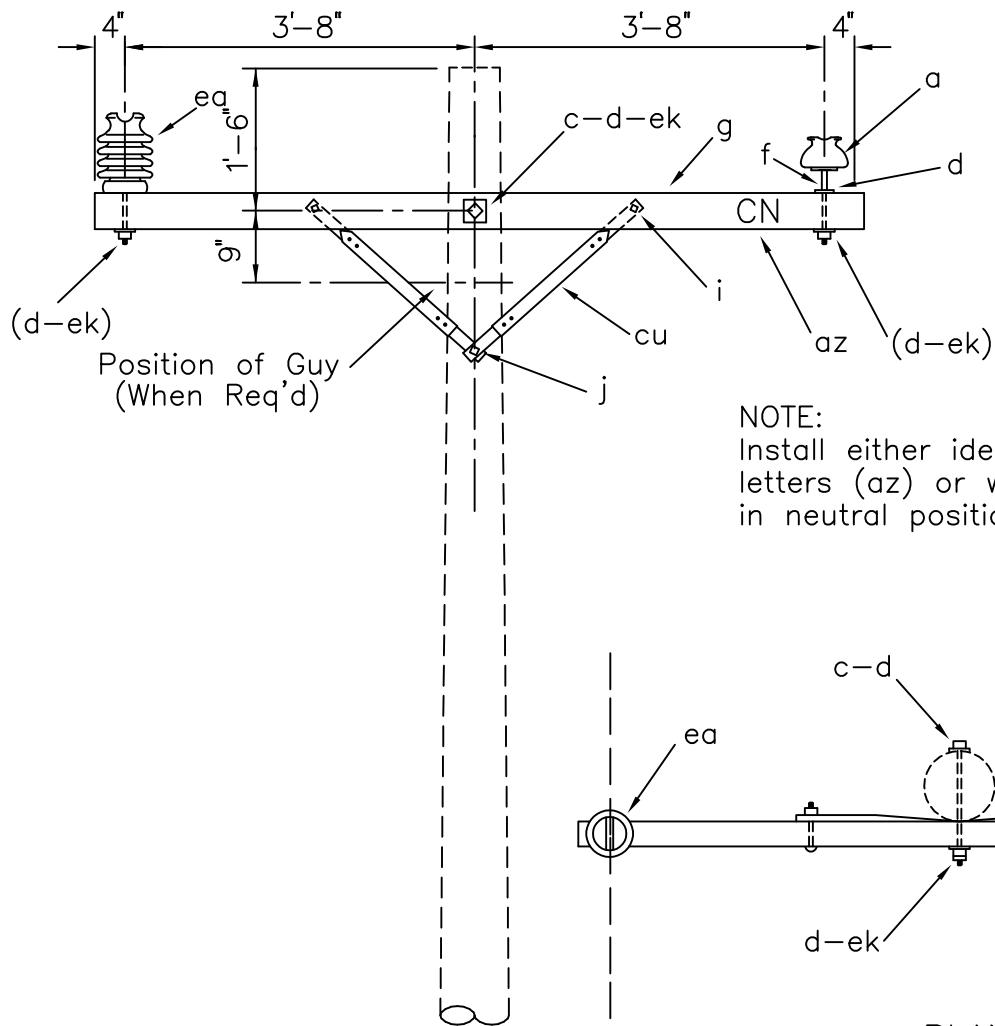
SINGLE SUPPORT ON CROSSARM

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.11 (A9-1)



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

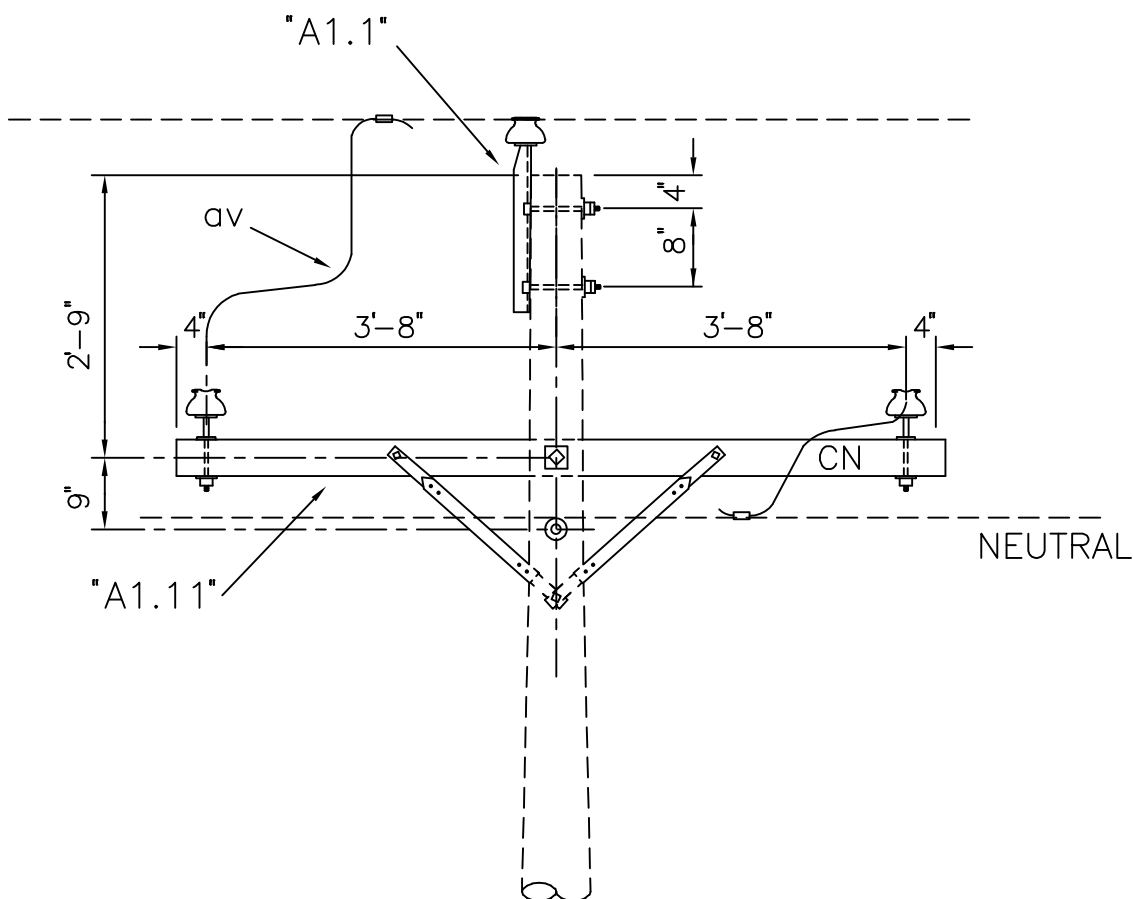
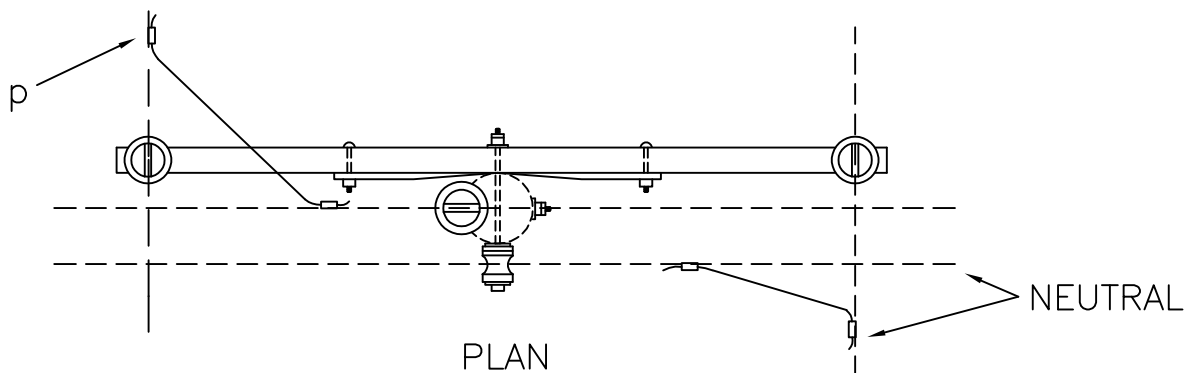
SINGLE SUPPORT ON CROSSARM
(POST INSULATORS)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A1.11P (A9-1P)



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"

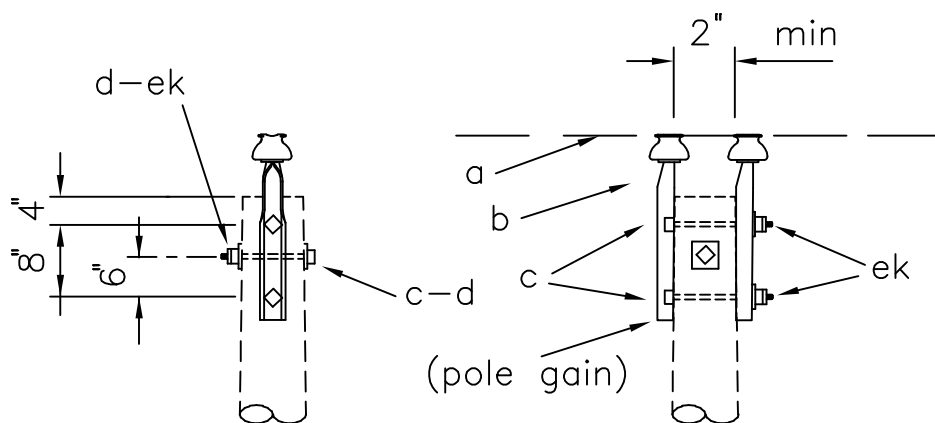
SINGLE PHASE JUNCTION GUIDE

APRIL 2005

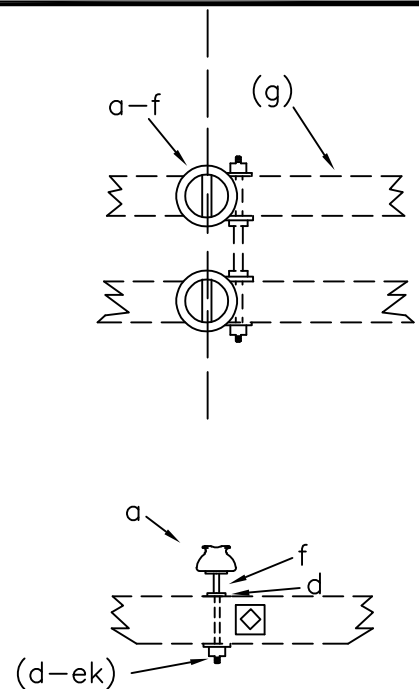
RUS

1 - PHASE PRIMARY
12.47/7.2 kV

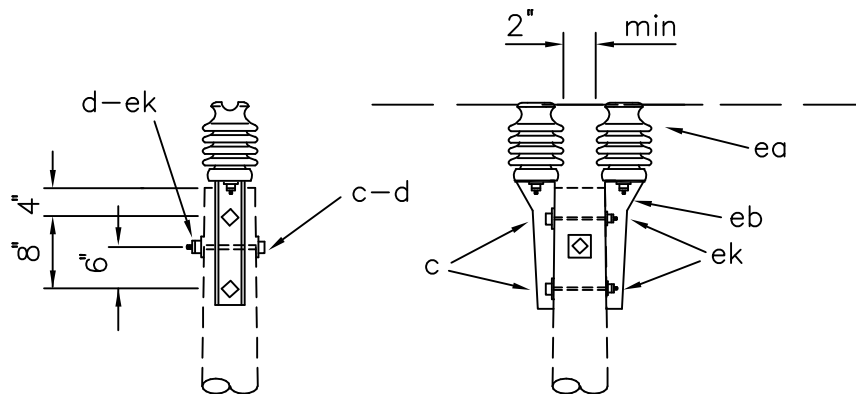
A1.12G



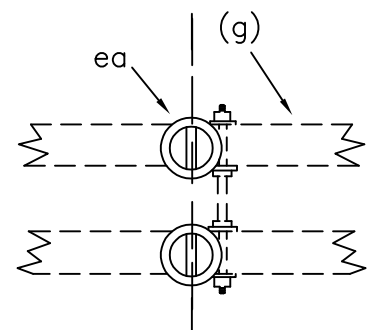
A2.01



A2.021



A2.01P



A2.021P

ASSEMBLY: A2.

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

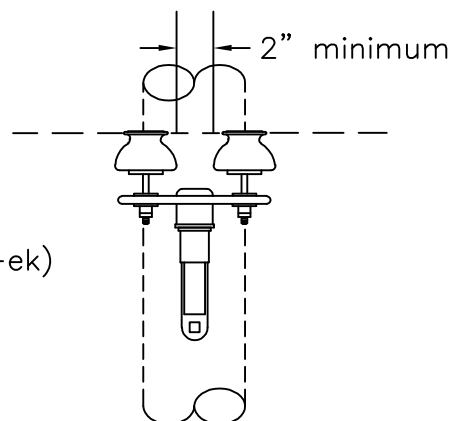
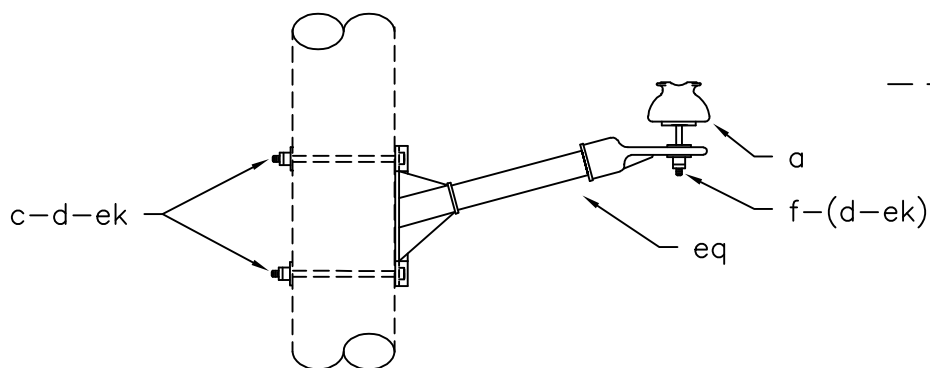
DOUBLE SUPPORT-PRIMARY

APRIL 2005

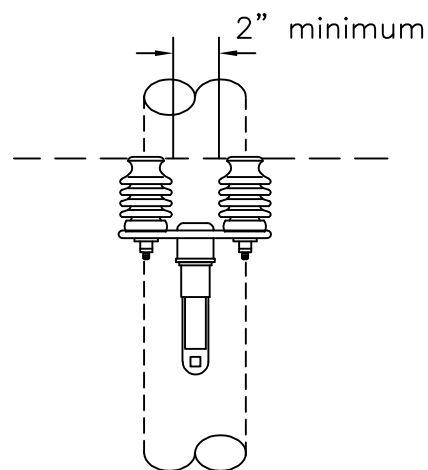
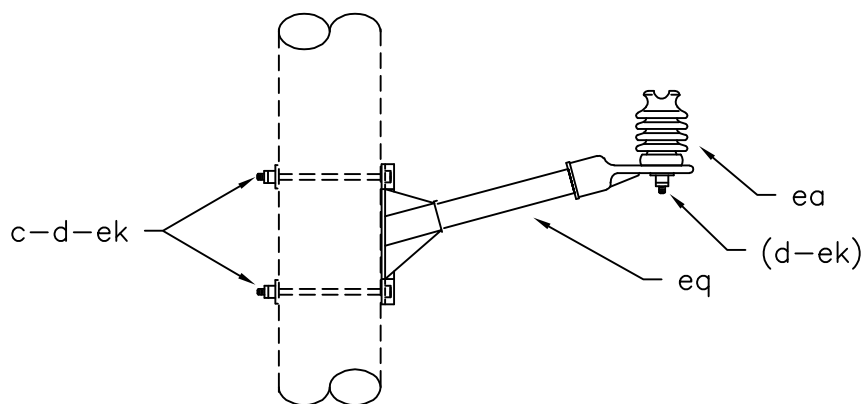
RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A2.01,A2.01P
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

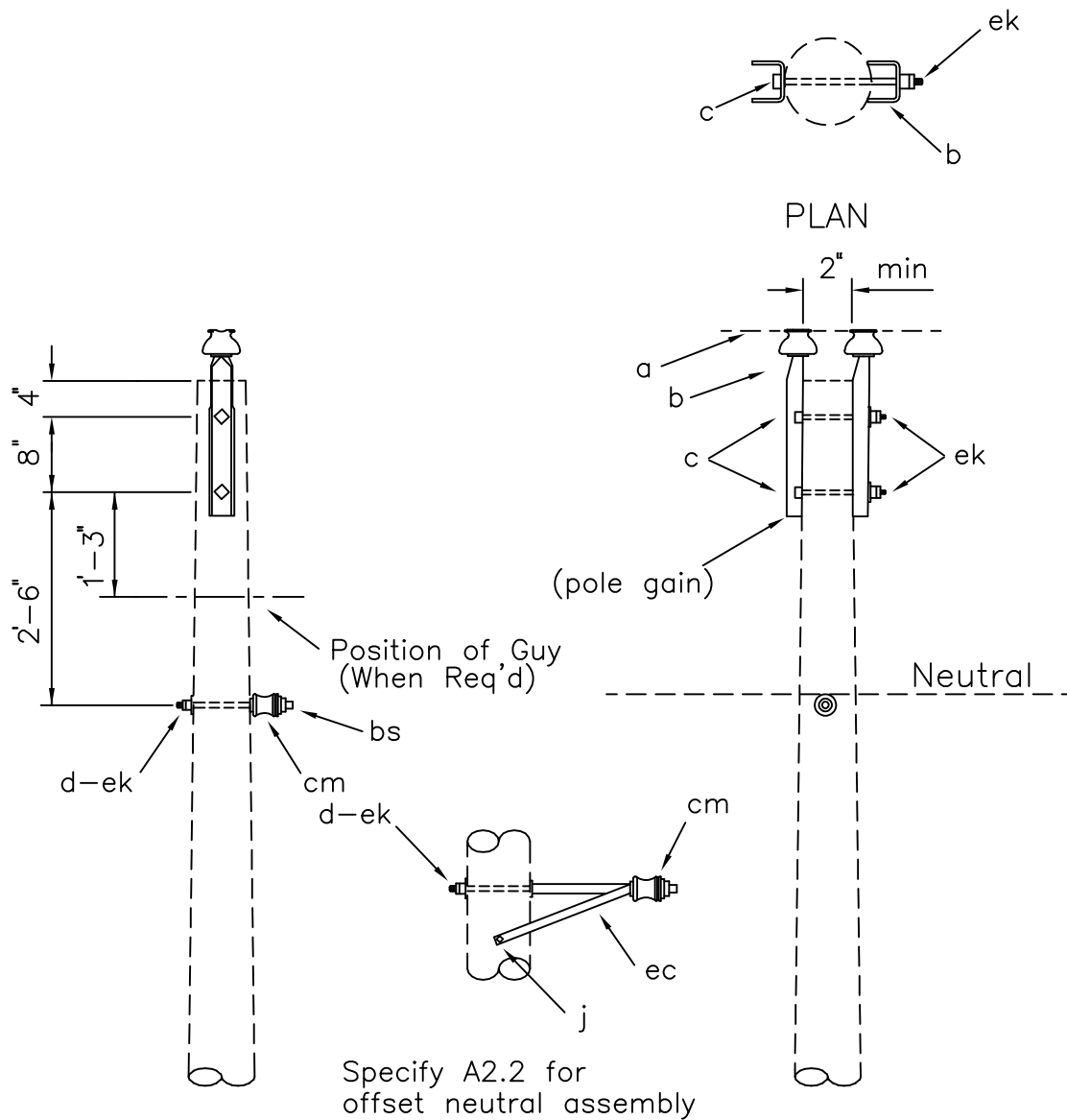
DOUBLE SUPPORT-NARROW PROFILE

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A2.04N
A2.04NP



NOTE: These assemblies used for NESC Grade B construction.

ASSEMBLY:

ITEM	MATERIAL	A2.1	A2.2
		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

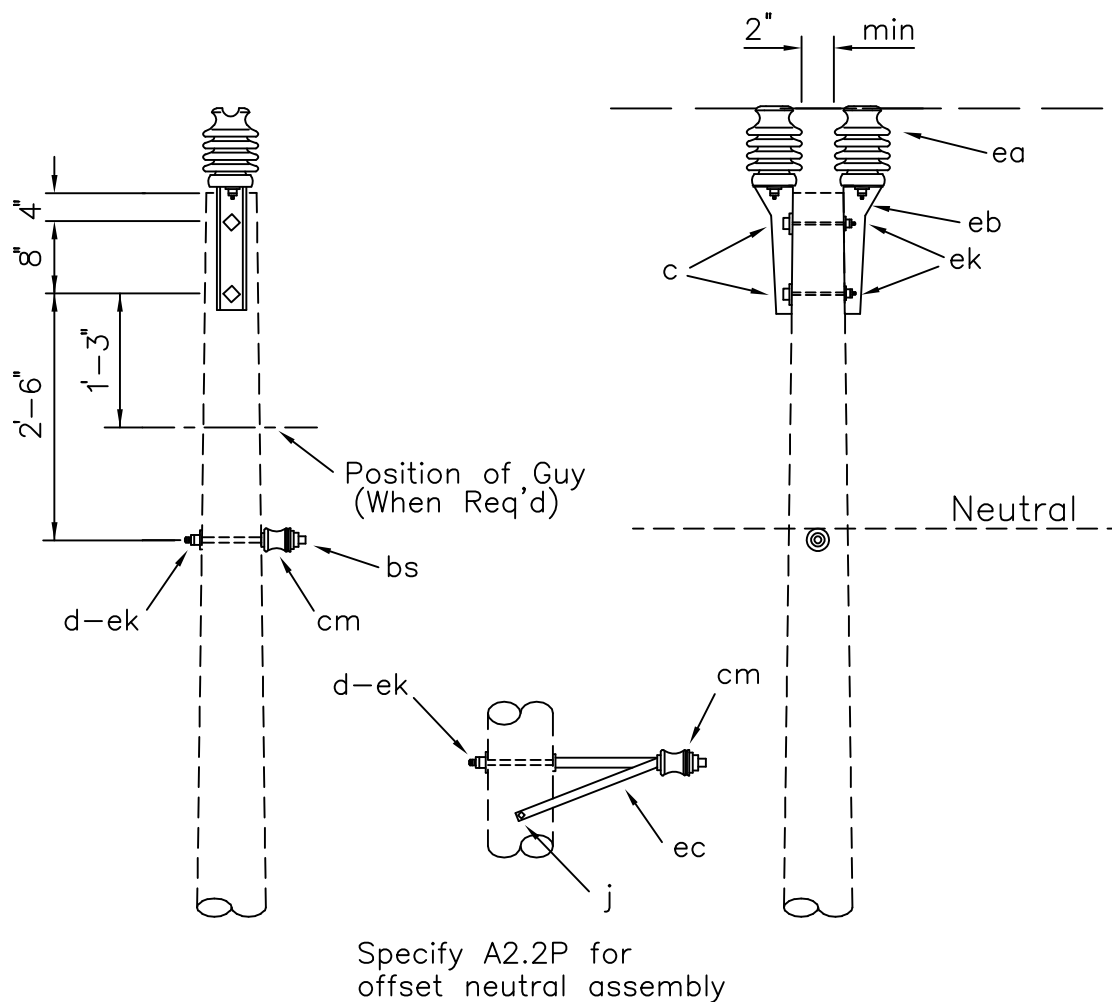
DOUBLE SUPPORT
(TANGENT)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A2.1 (A1-1)
A2.2 (A1-1A)



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

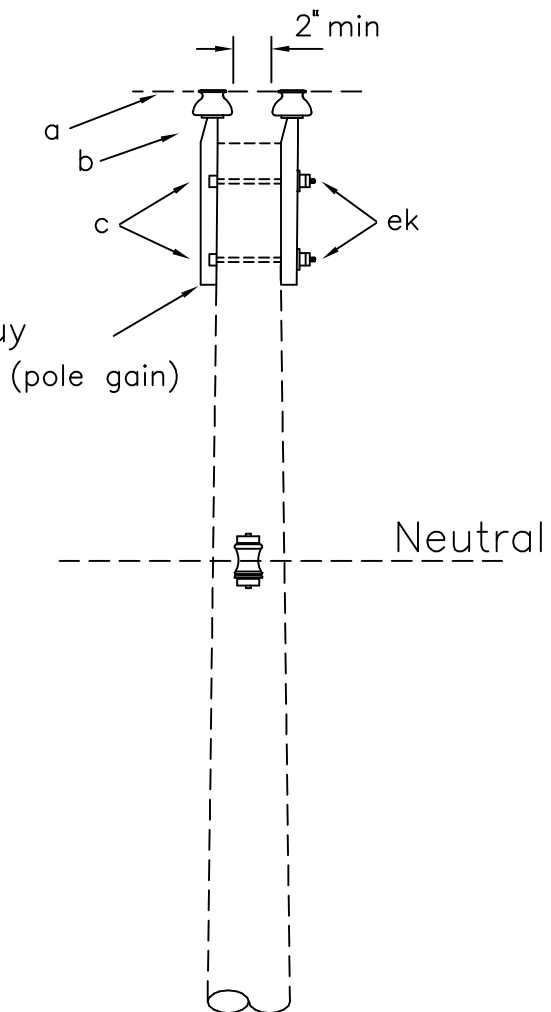
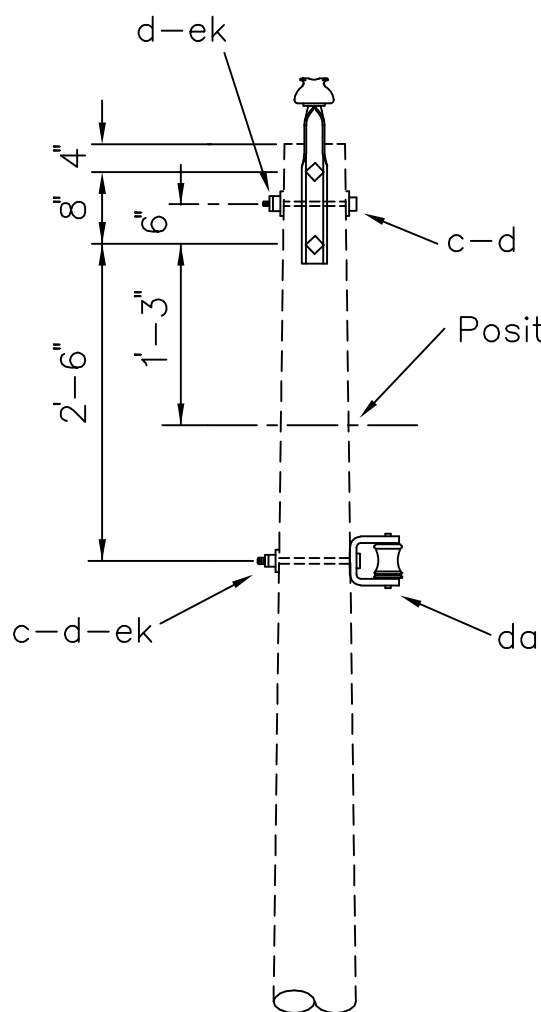
DOUBLE SUPPORT - (TANGENT)
(POST INSULATORS)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A2.1P (A1-1P)
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

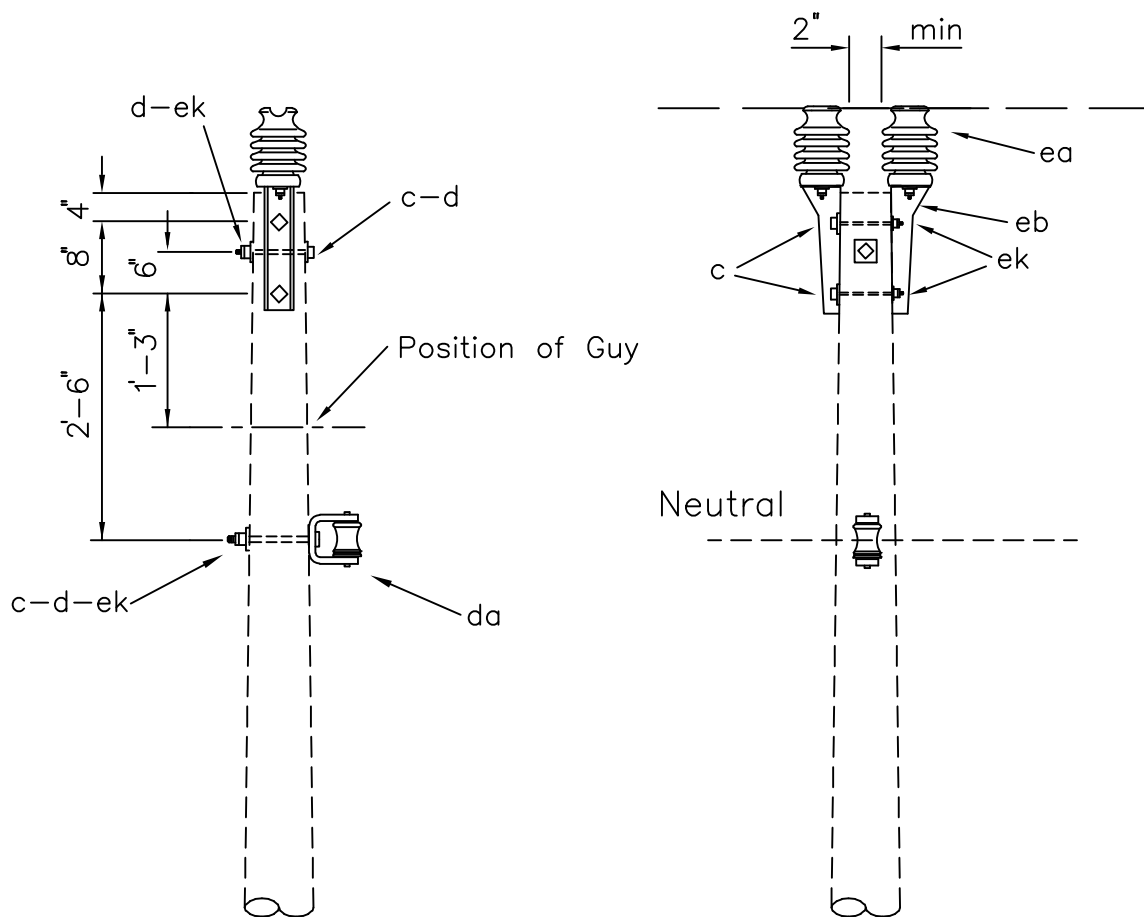
DOUBLE SUPPORT

APRIL 2005

RUS

1 - PHASE PRIMARY
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

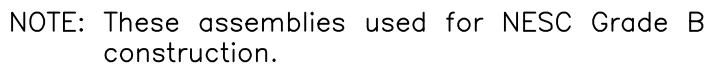
DOUBLE SUPPORT
(POST INSULATORS)

APRIL 2005

RUS

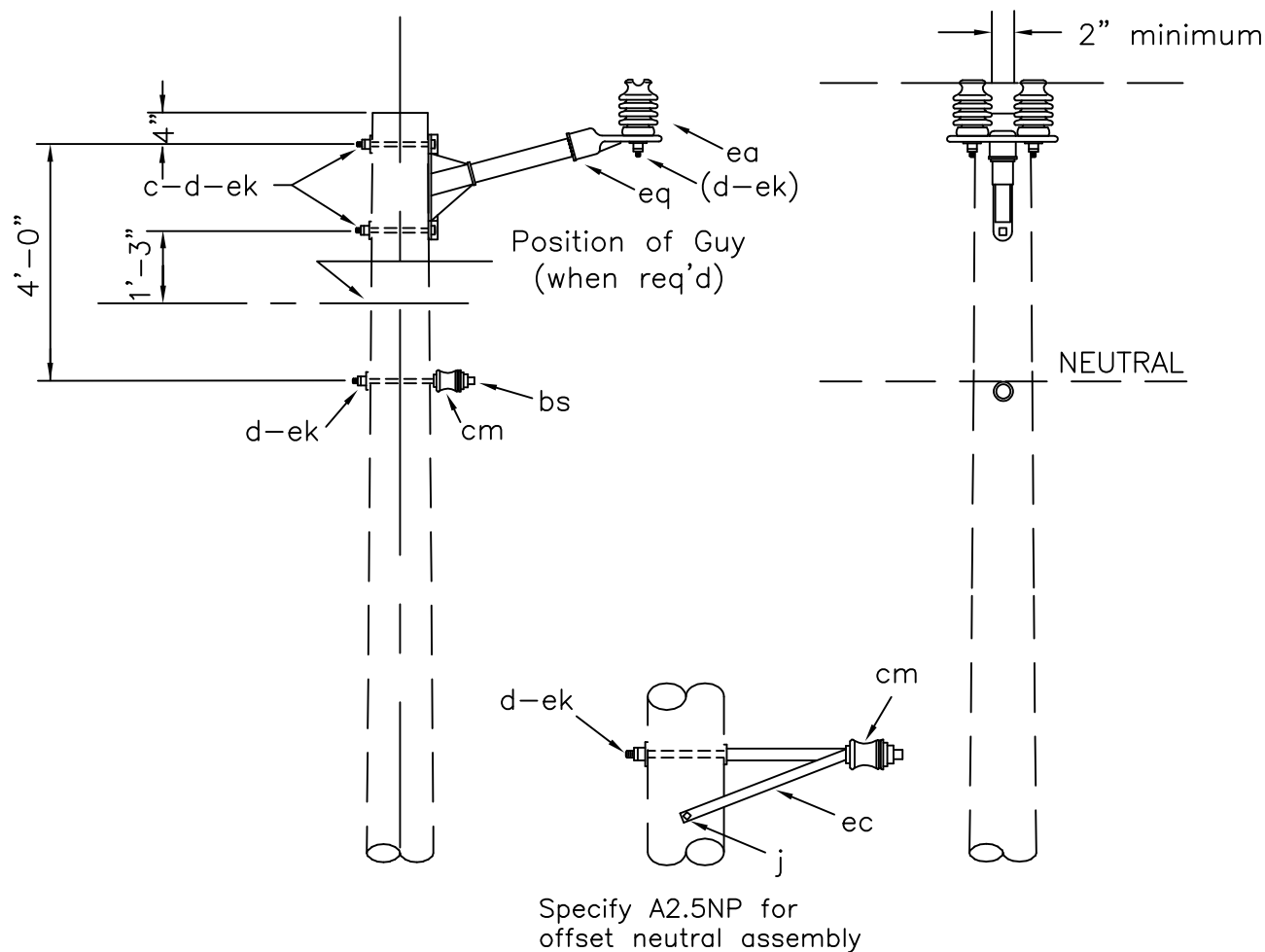
1 - PHASE PRIMARY
12.47/7.2 kV

A2.3P (A2P)



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

A2.4N
A2.5N



NOTE: These assemblies used for NESC Grade B construction.

Assembly: A2.		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)	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

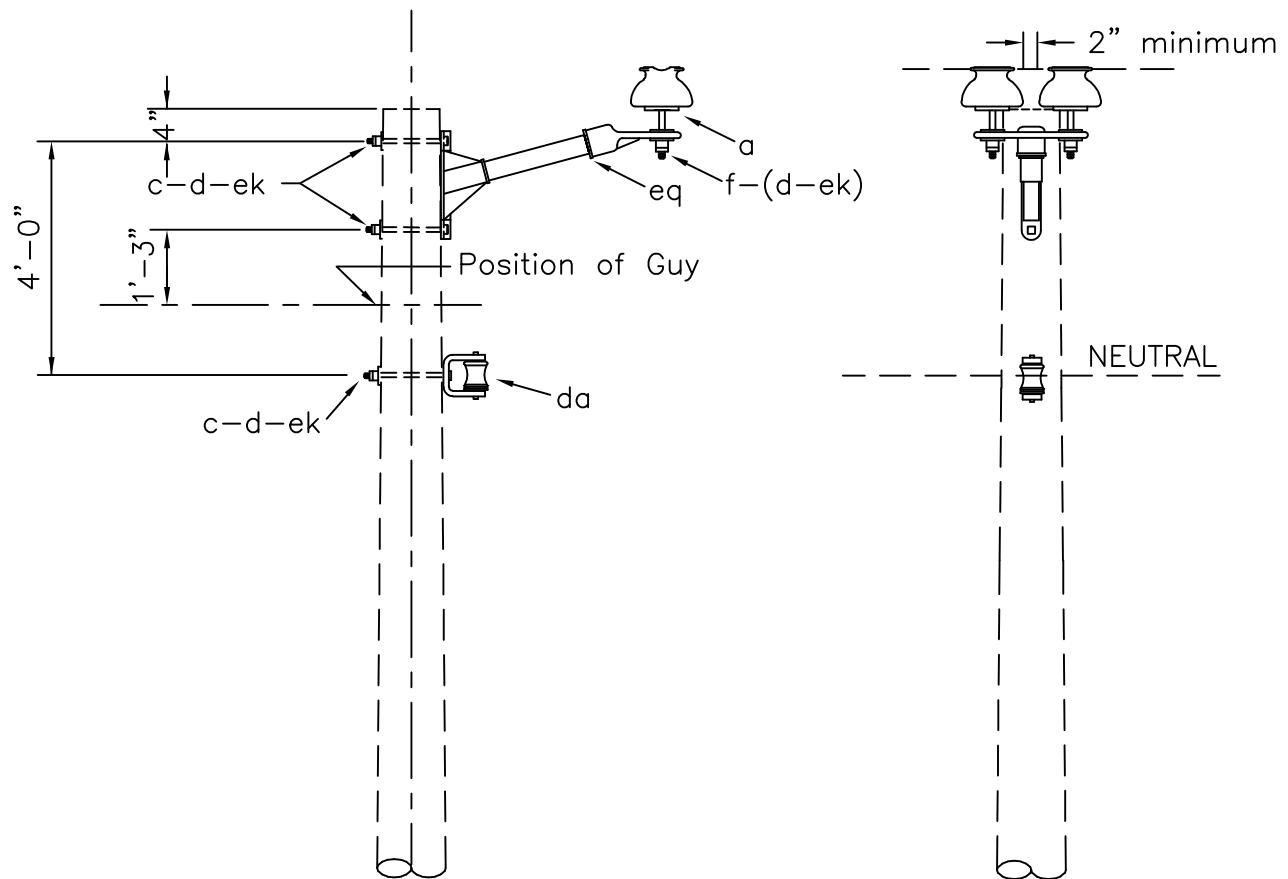
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A2.4NP
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

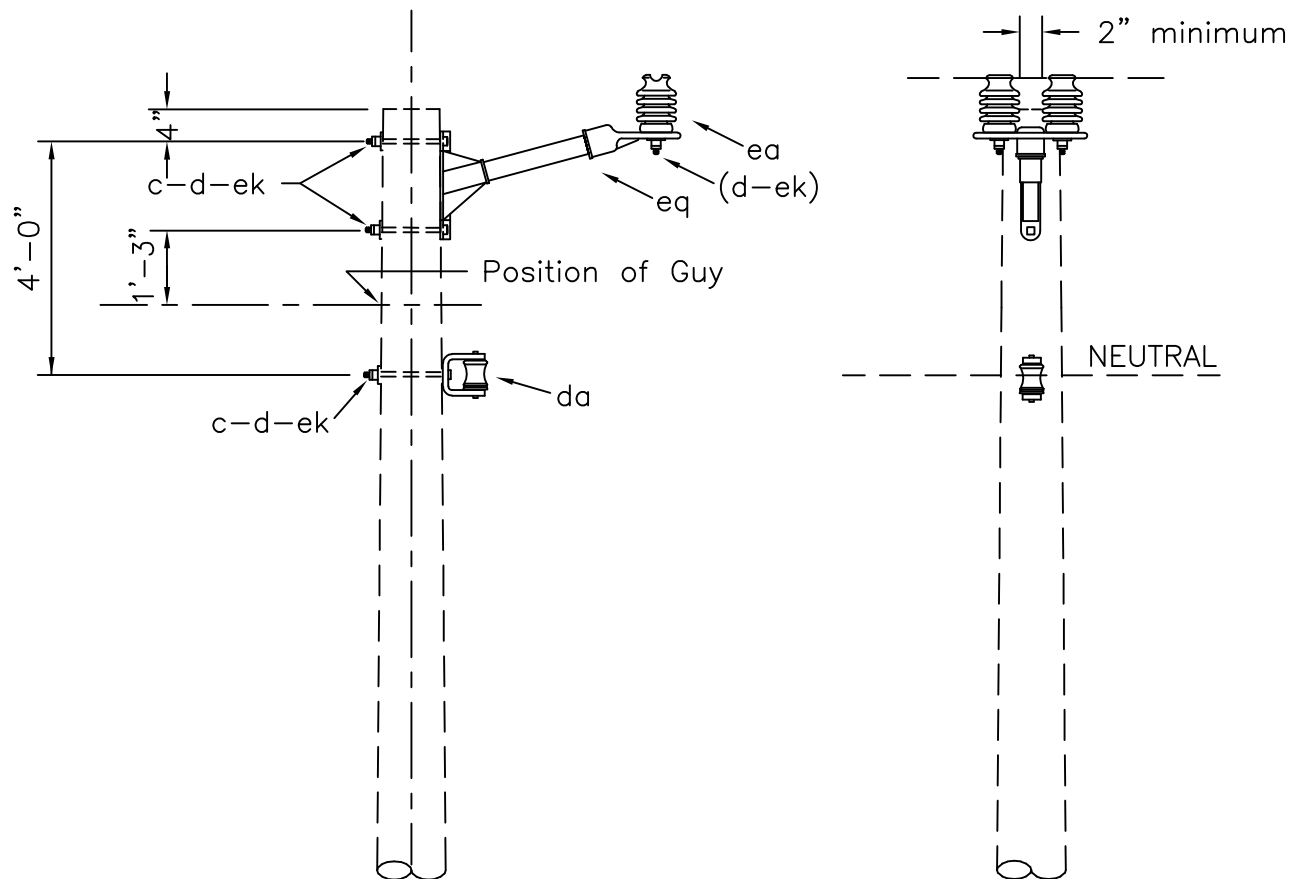
DOUBLE SUPPORT-NARROW PROFILE

APRIL 2005

1 - PHASE PRIMARY
12.47/7.2 kV

RUS

A2.6N



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

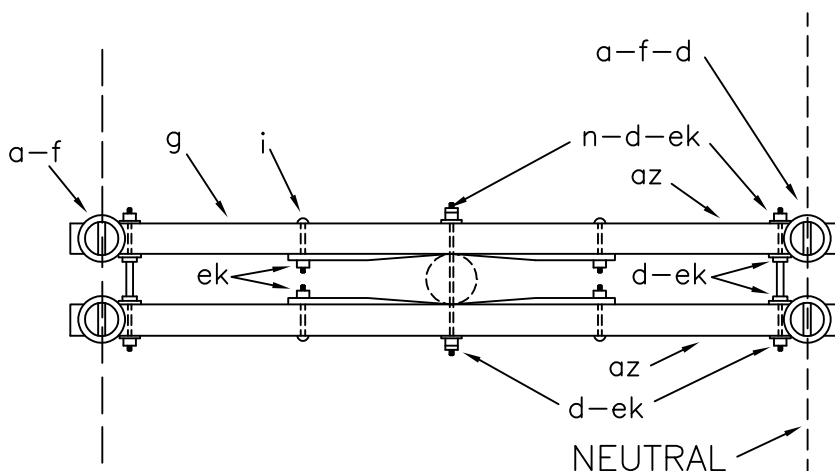
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

1 - PHASE PRIMARY
12.47/7.2 kV

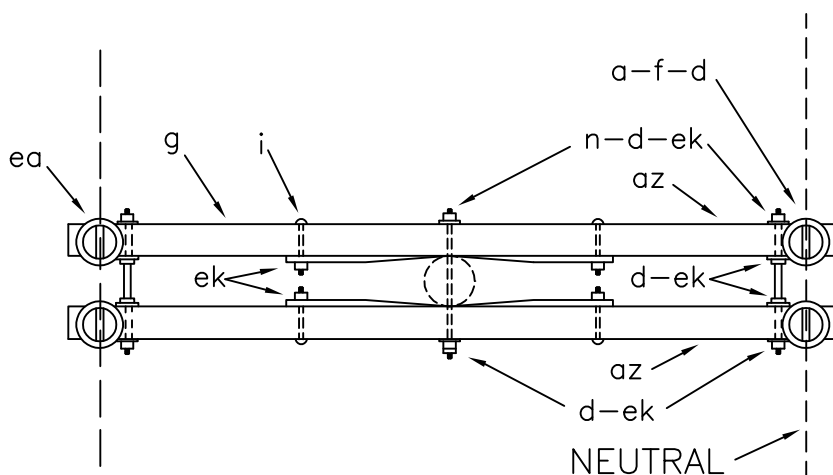
RUS

A2.6NP



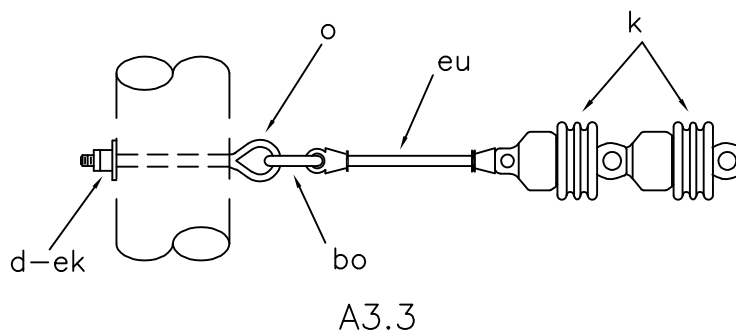
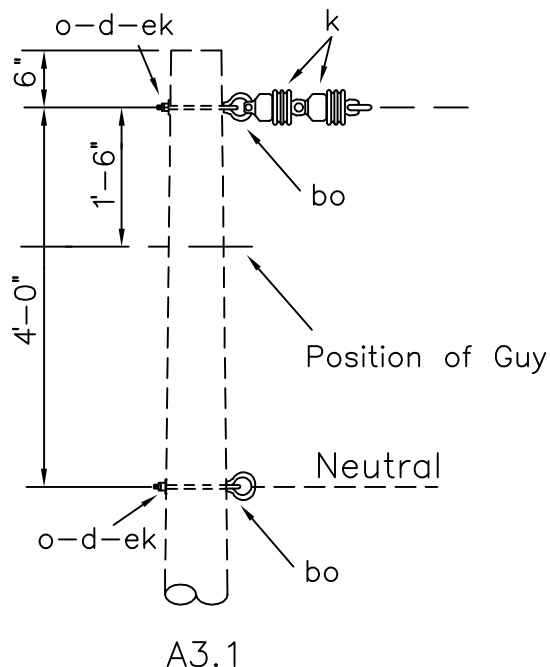
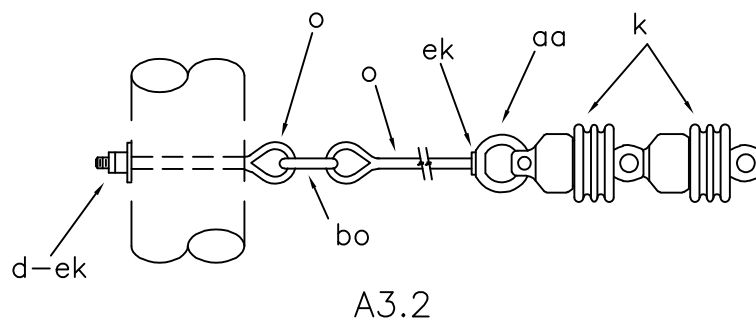
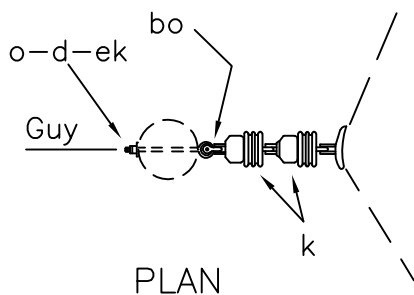
NOTE:
Install either identification
letters (az) or white insulators
in neutral position.

A2.21 (A9)



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

A2.21P (A9P)



ASSEMBLY: A3

ITEM	MATERIAL	.1 QTY	.2 QTY	.3 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	Link, extension, insulated			1
(du)	(Link, extension) - (optional)			(1)

DESIGN PARAMETERS:

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

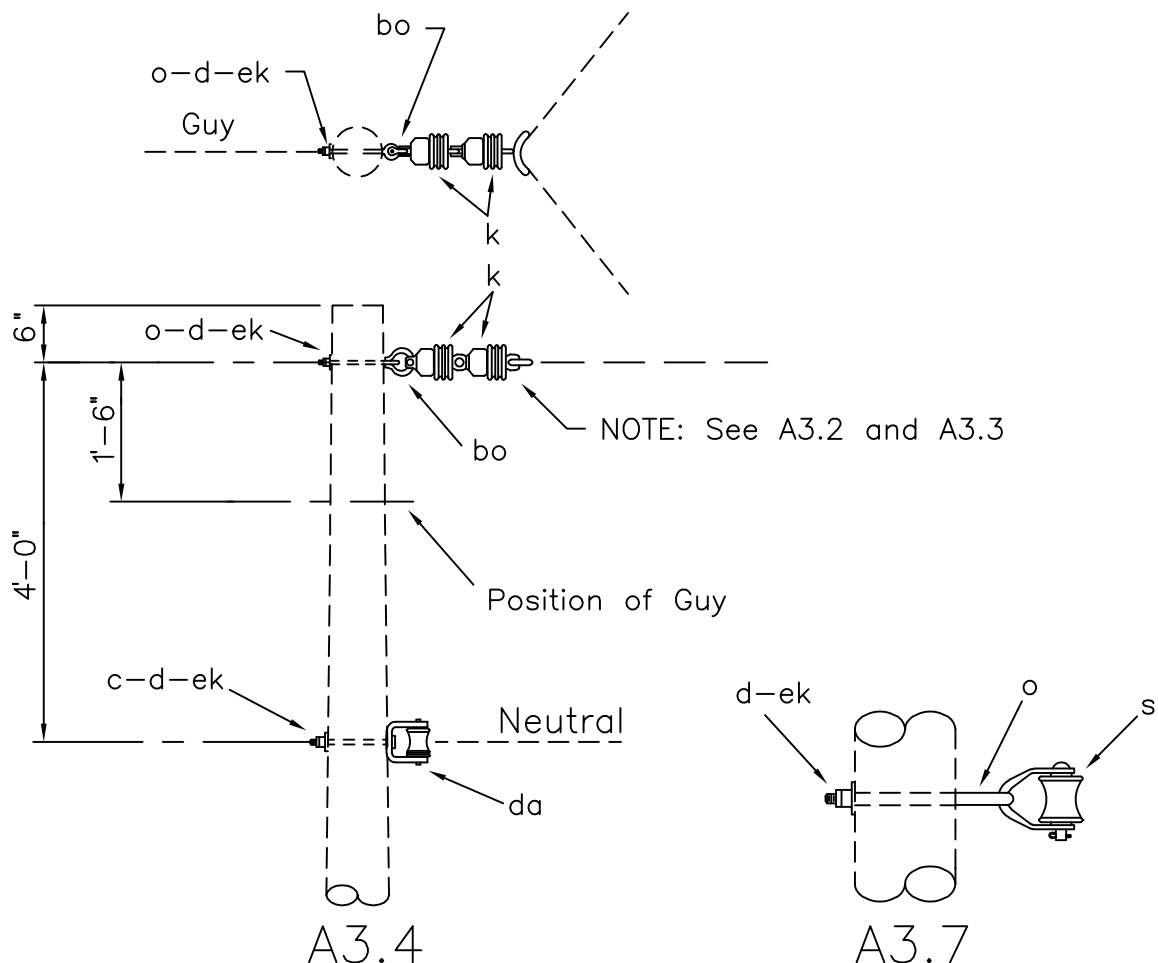
SUSPENSION ANGLE

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A3.1,A3.2,A3.3
(A3)



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	Bracket, insulated	1	1	1			
ek	Locknuts	2	3	2	2	3	2
eu	Link, extension, insulated			1			1
(du)	(Link, extension) – (optional)			(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

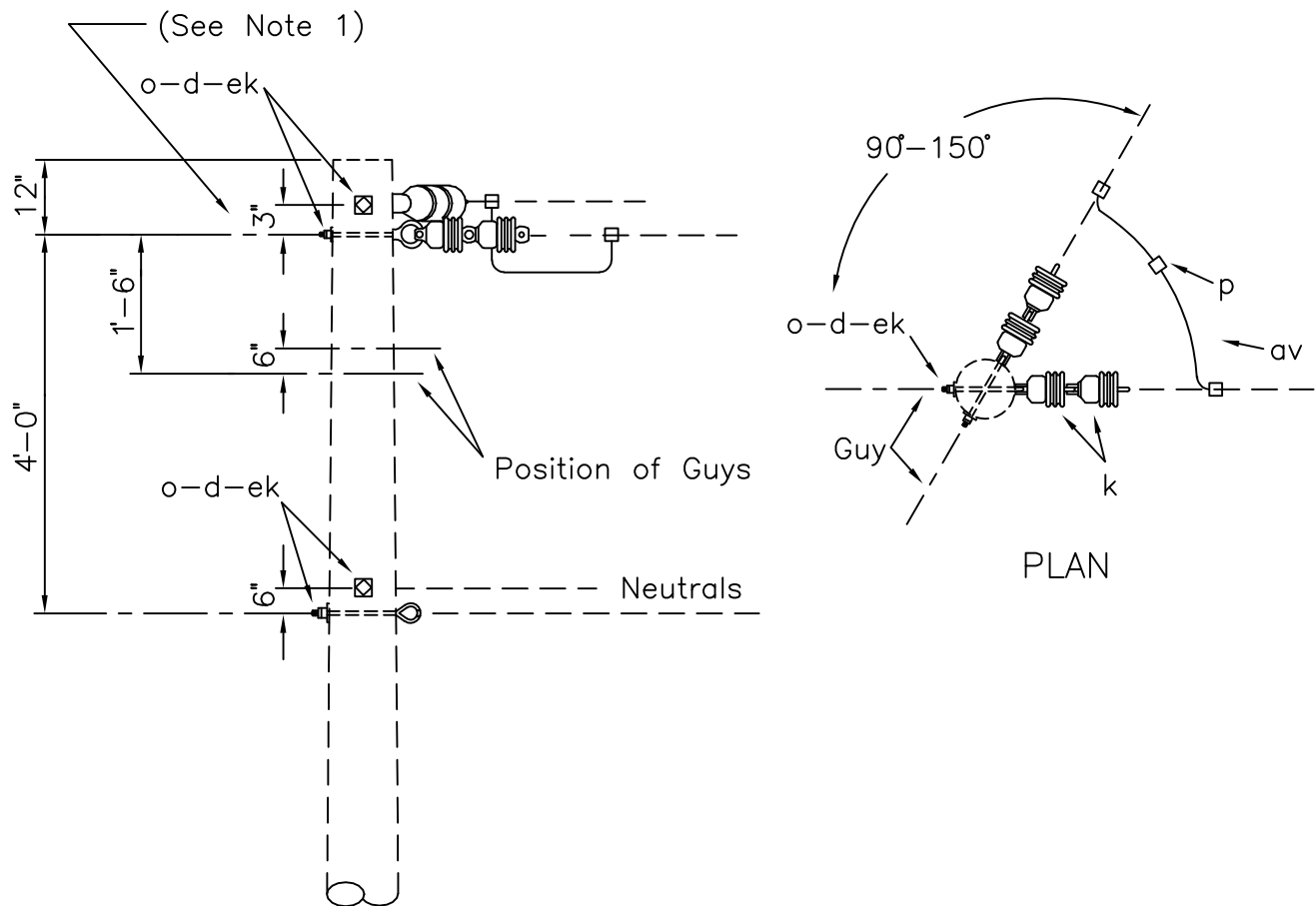
SUSPENSION ANGLE

APRIL 2005

RUS

1 – PHASE PRIMARY
12.47/7.2 kV

A3.4 – A3.9



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

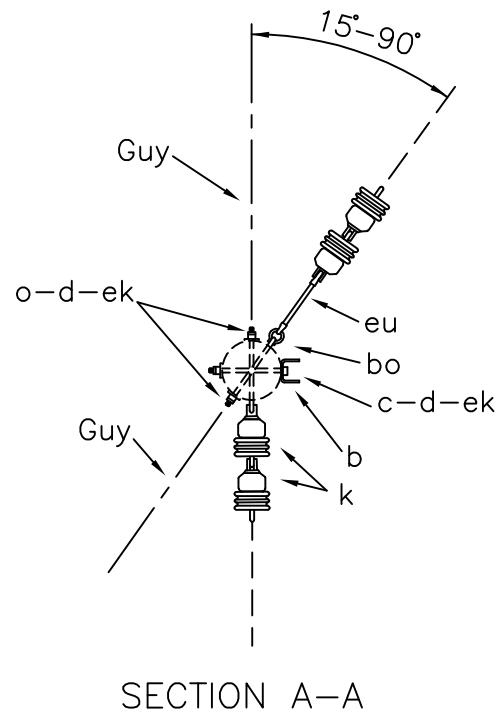
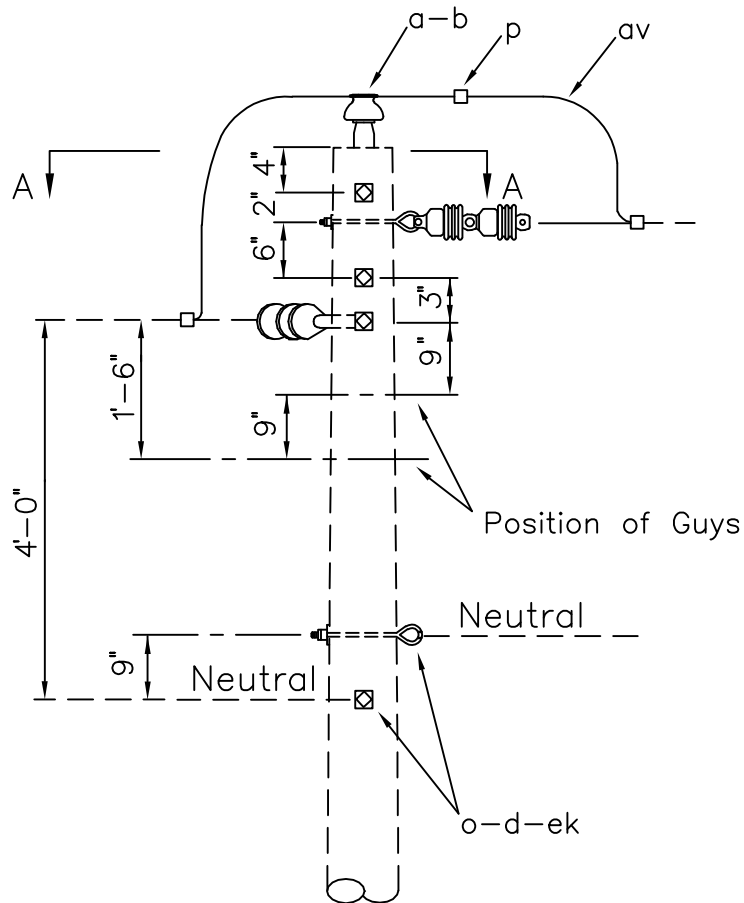
DEADEND ANGLE (90°-150°)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A4.1 (A4)



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	1	Link, extension, insulated
(du)	(1)	(Link, Extension)(Optional)

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL
LOAD = 5000 lbs./Conductor

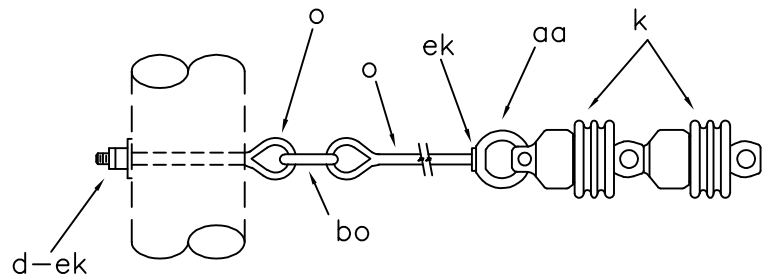
DEADEND ANGLE (15°-90°)

APRIL 2005

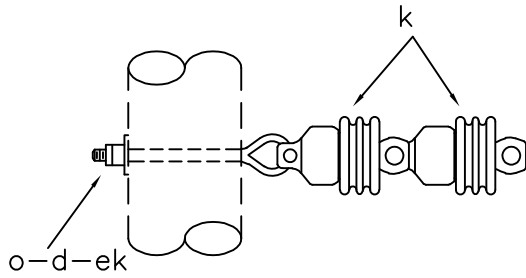
RUS

1 - PHASE PRIMARY
12.47/7.2 kV

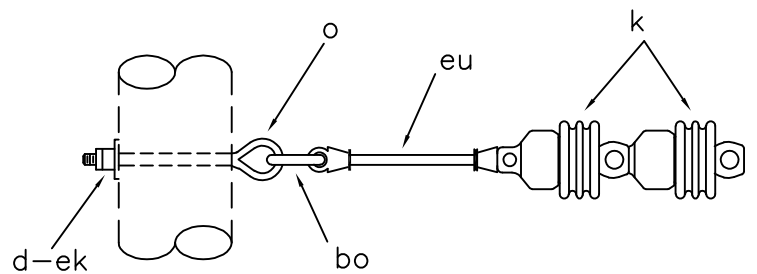
A4.2



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".

ASSEMBLY: A5		.01	.02	.03
ITEM	MATERIAL	QTY	QTY	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	Link, extension, insulated			1
(du)	(Link, extension) - (optional)			(1)

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

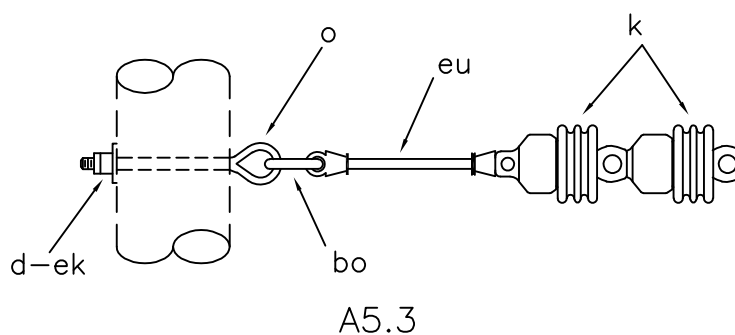
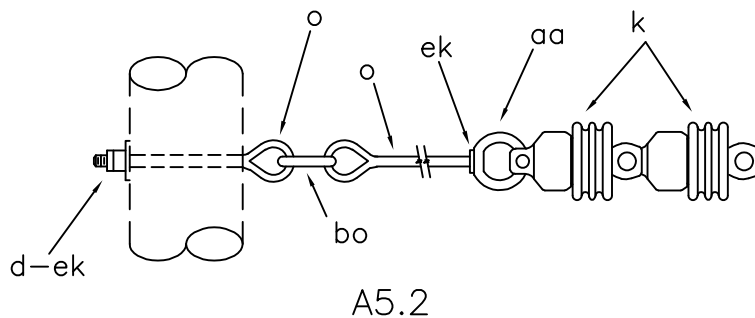
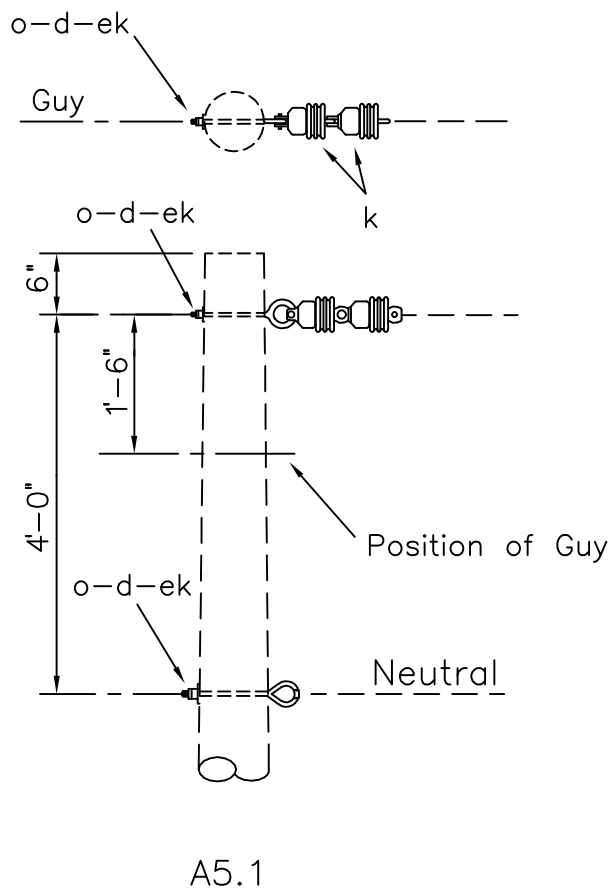
SINGLE DEADENDS

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A5.01,A5.02,A5.03
(M5-24),(M5-8)



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	Link, extension, insulated			1
(du)	(Link, extension) - (optional)			(1)

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

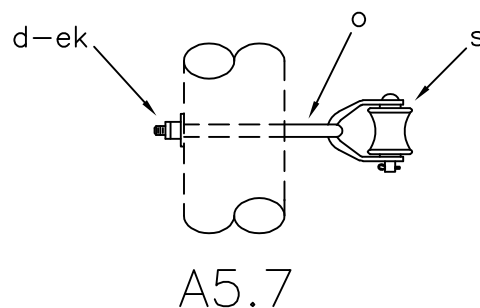
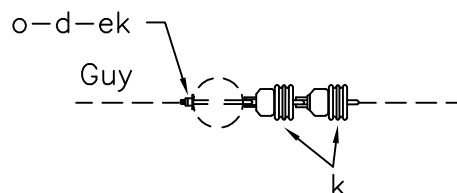
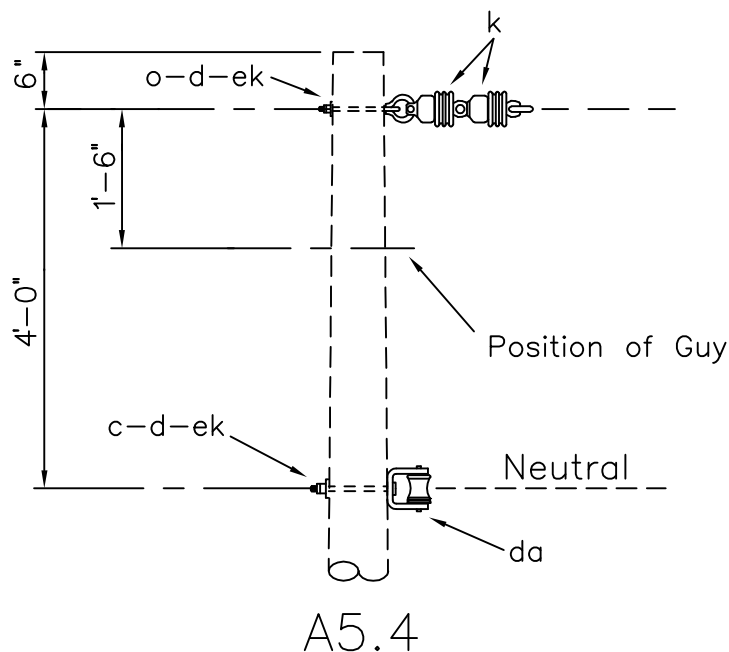
SINGLE DEADENDS

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A5.1,A5.2,A5.3
(A5),(A5-2)



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	Link, extension, insulated			1			1
(du)	(Link, extension) - (optional)			(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

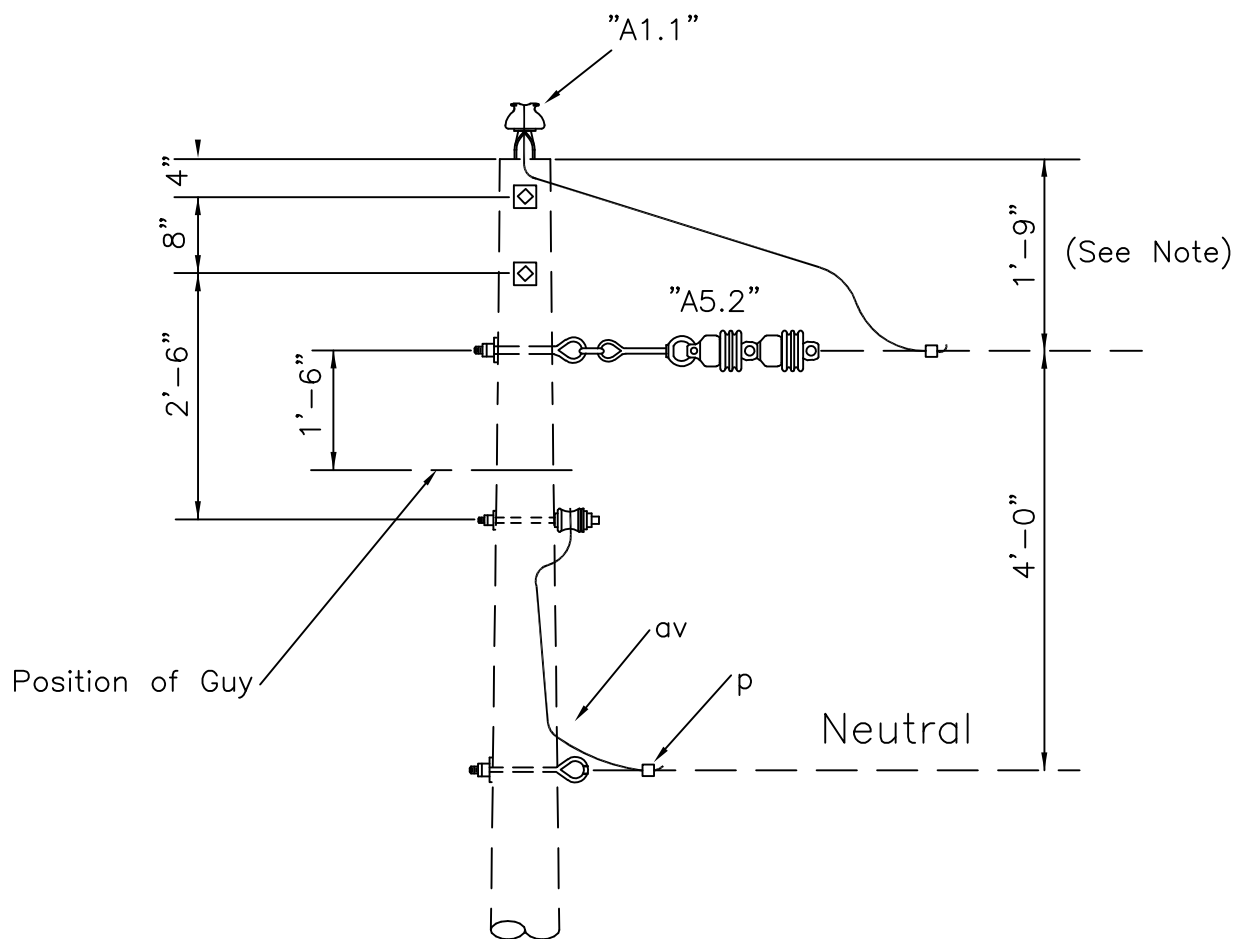
SINGLE DEADENDS

APRIL 2005

RUS

1 - PHASE PRIMARY
 12.47/7.2 kV

A5.4 - A5.9



NOTES:

1. Tap assembly may be installed 6" from top of pole when perpendicular to line. Raise neutral and guy attachment 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

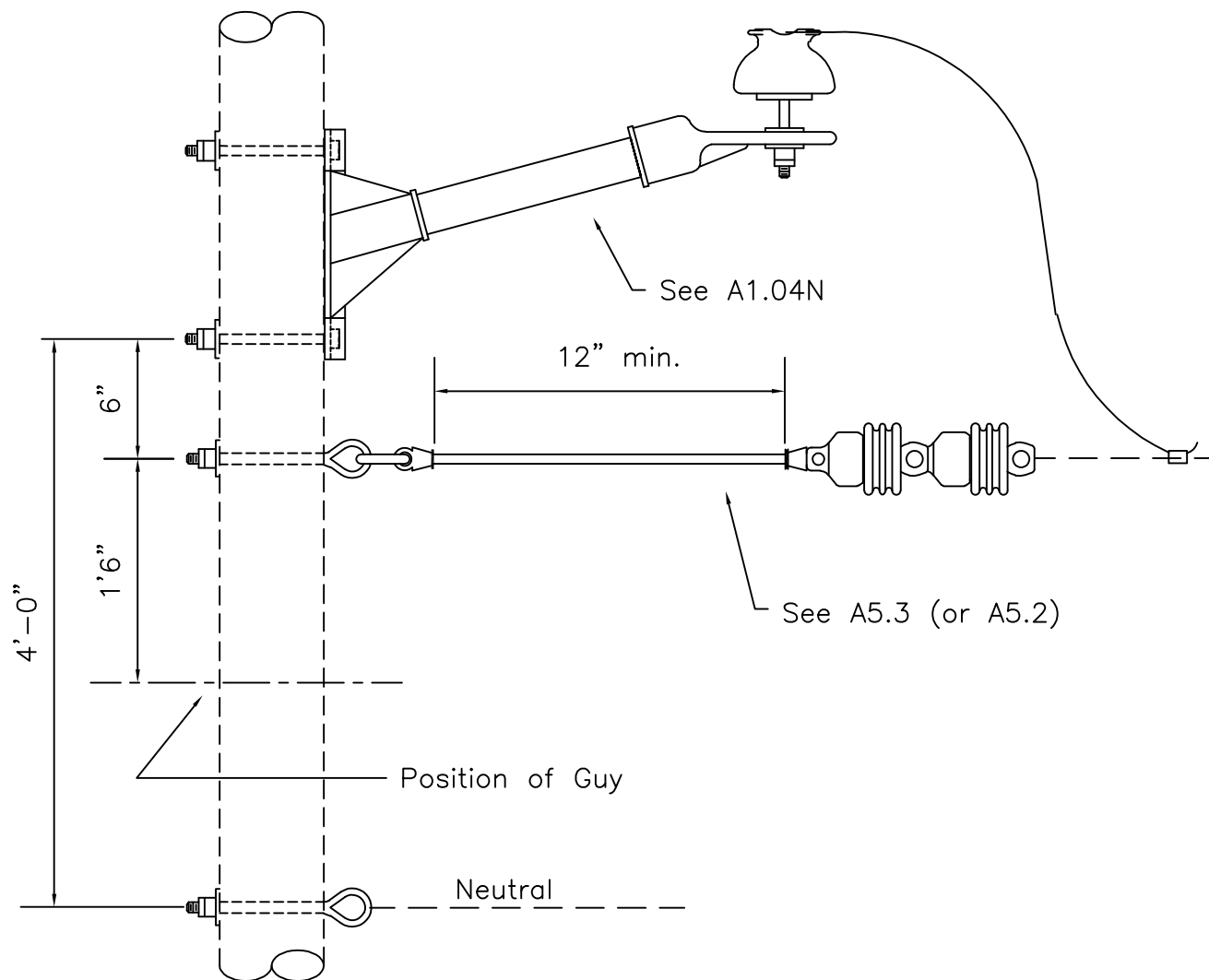
SINGLE PHASE TAP GUIDE

APRIL 2005

RUS

1 - PHASE PRIMARY
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

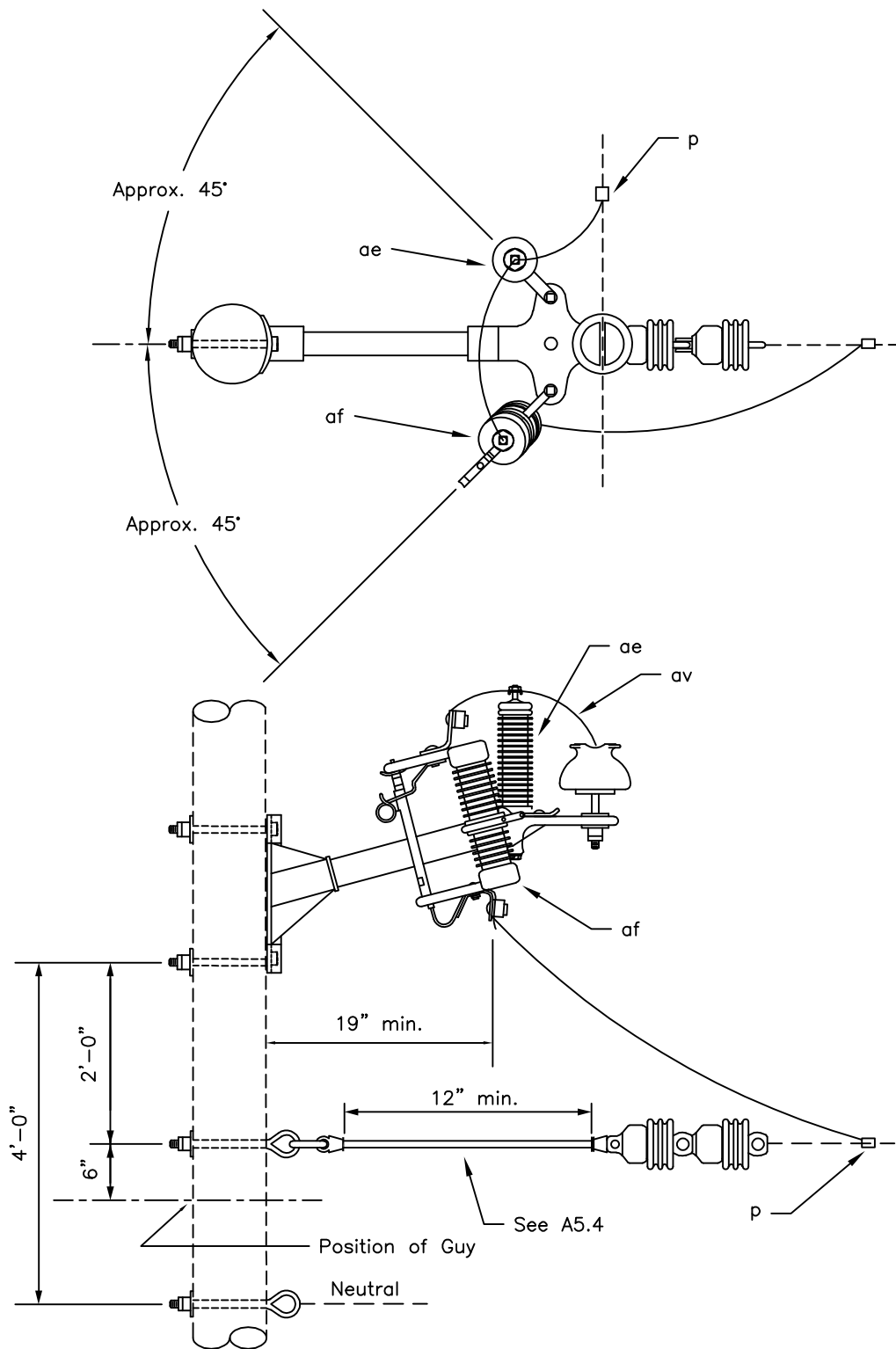
SINGLE PHASE TAP GUIDE

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

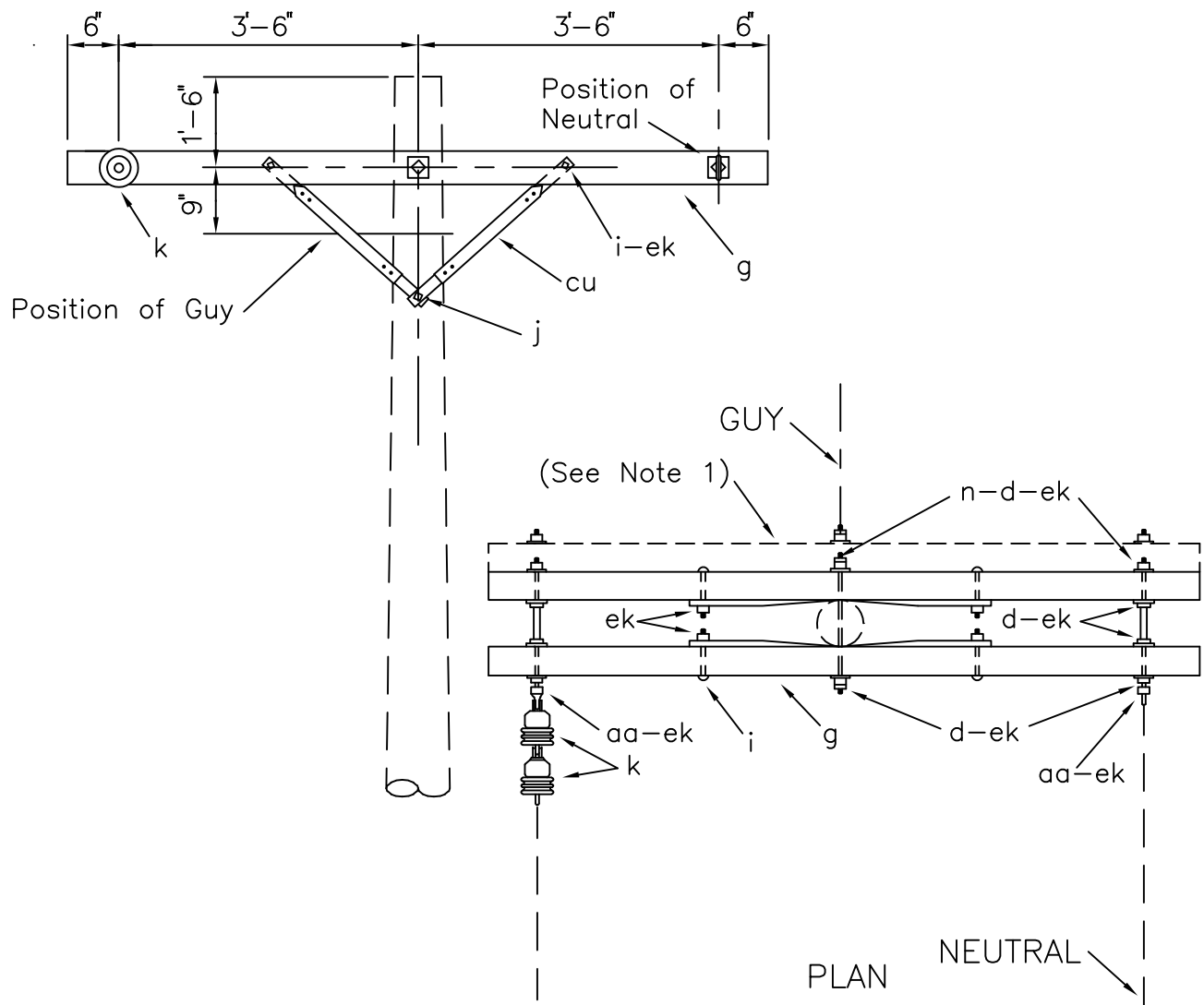
SINGLE PHASE TAP GUIDE – NARROW PROFILE
(WITH CUTOUT AND ARRESTER)

APRIL 2005

RUS

1 – PHASE PRIMARY
12.47/7.2 kV

A5.4NG



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)

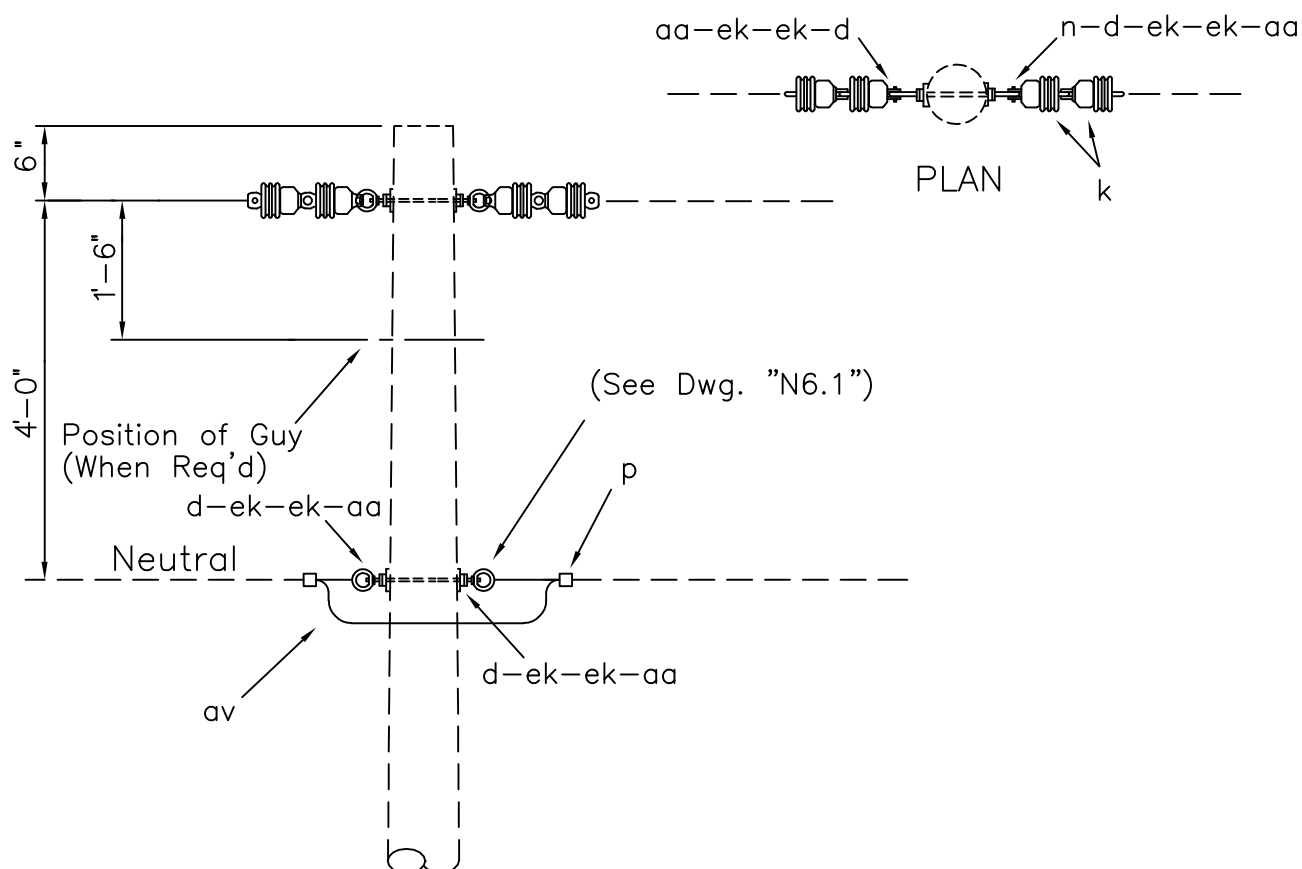
SINGLE DEADEND ON CROSSARMS

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 shackles, 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)

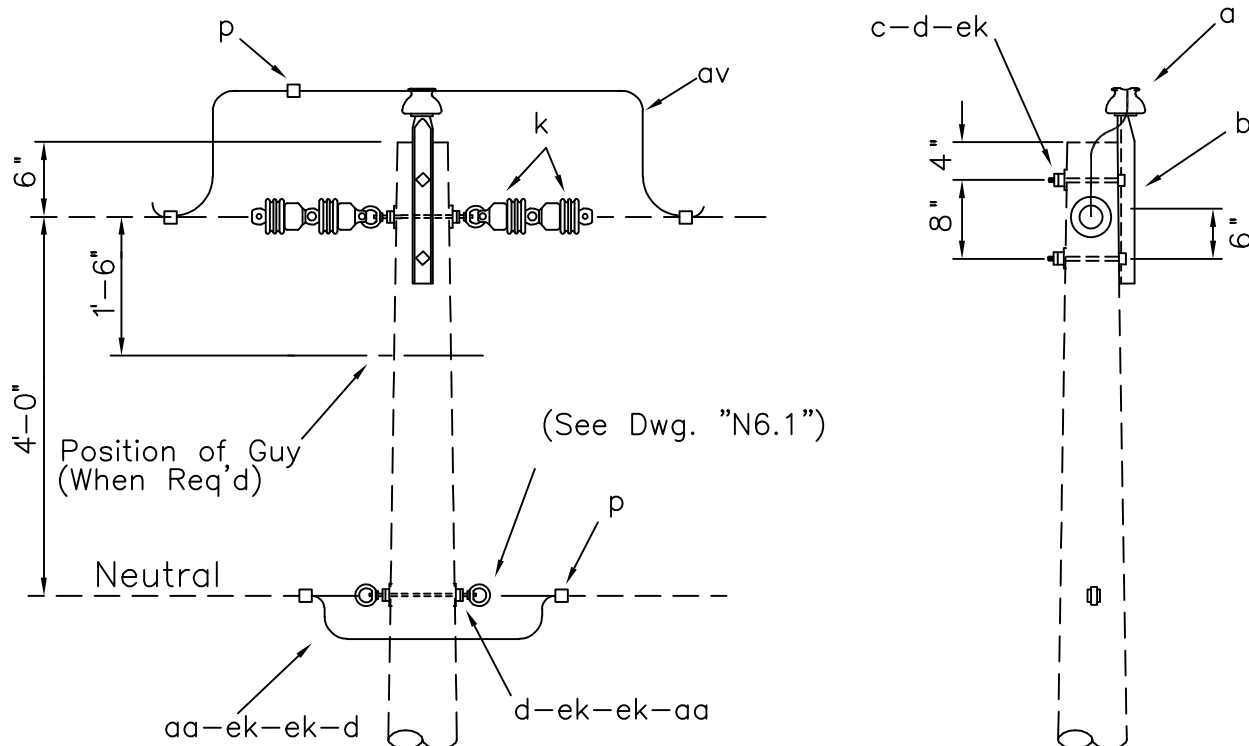
DOUBLE DEADEND (STRAIGHT)

APRIL 2005

RUS

1 – PHASE PRIMARY
12.47/7.2 kV

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 shackles, 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)

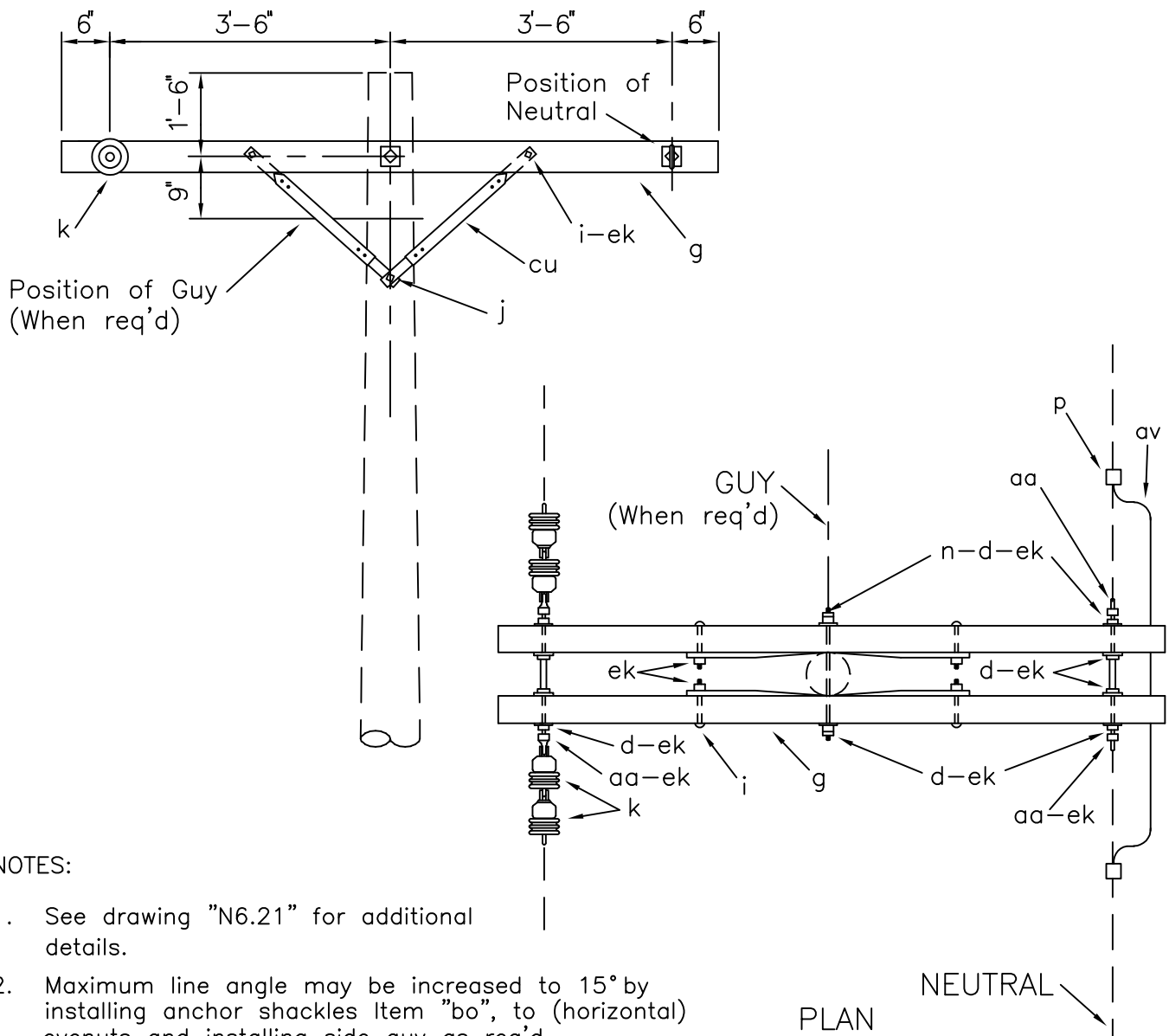
DOUBLE DEADEND
(FEED THROUGH)

APRIL 2005

RUS

1 – PHASE PRIMARY
12.47/7.2 kV

A6.2



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)

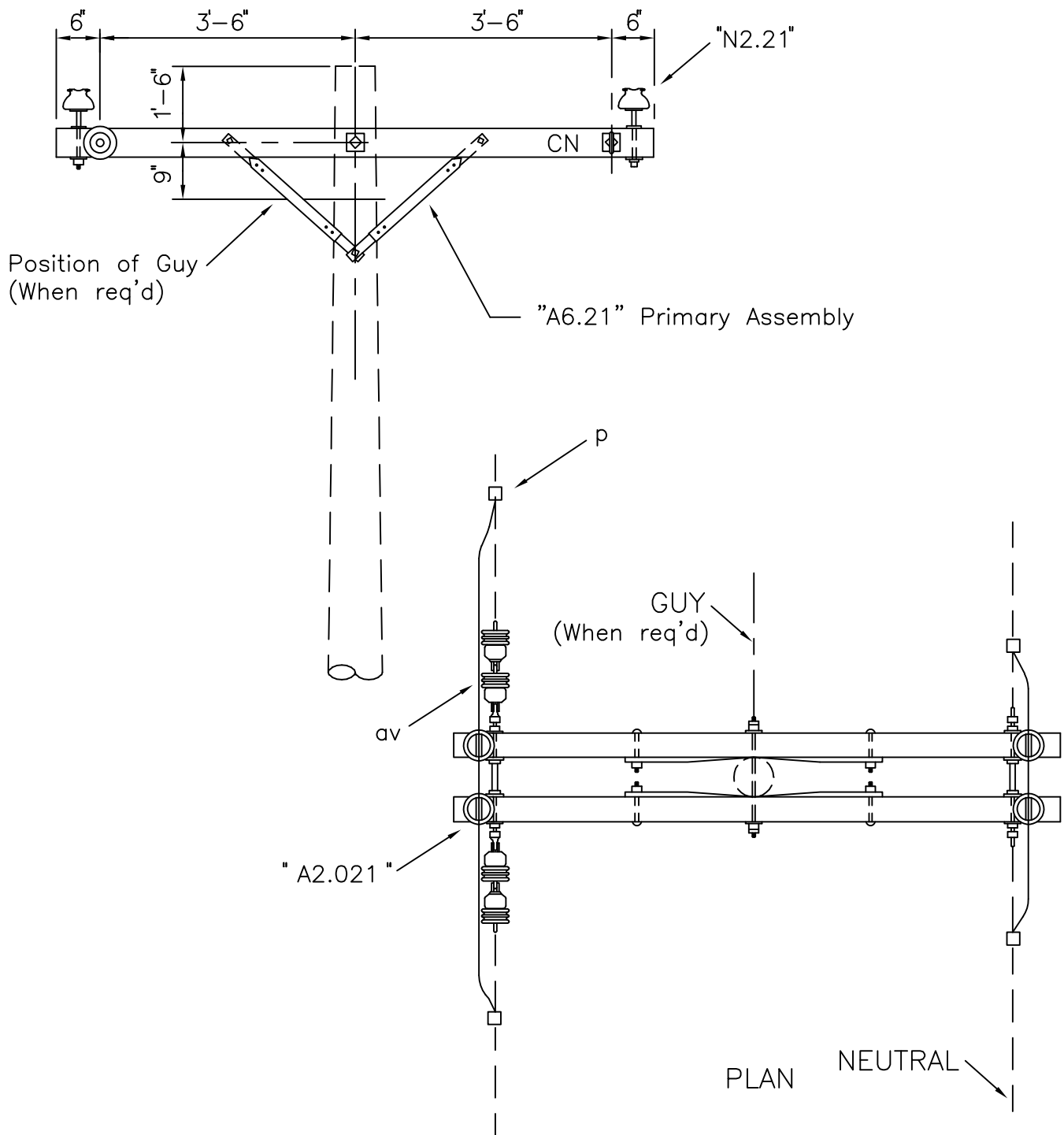
DOUBLE DEADEND ON CROSSARMS

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

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

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

A6.22G

INDEX B

TWO-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

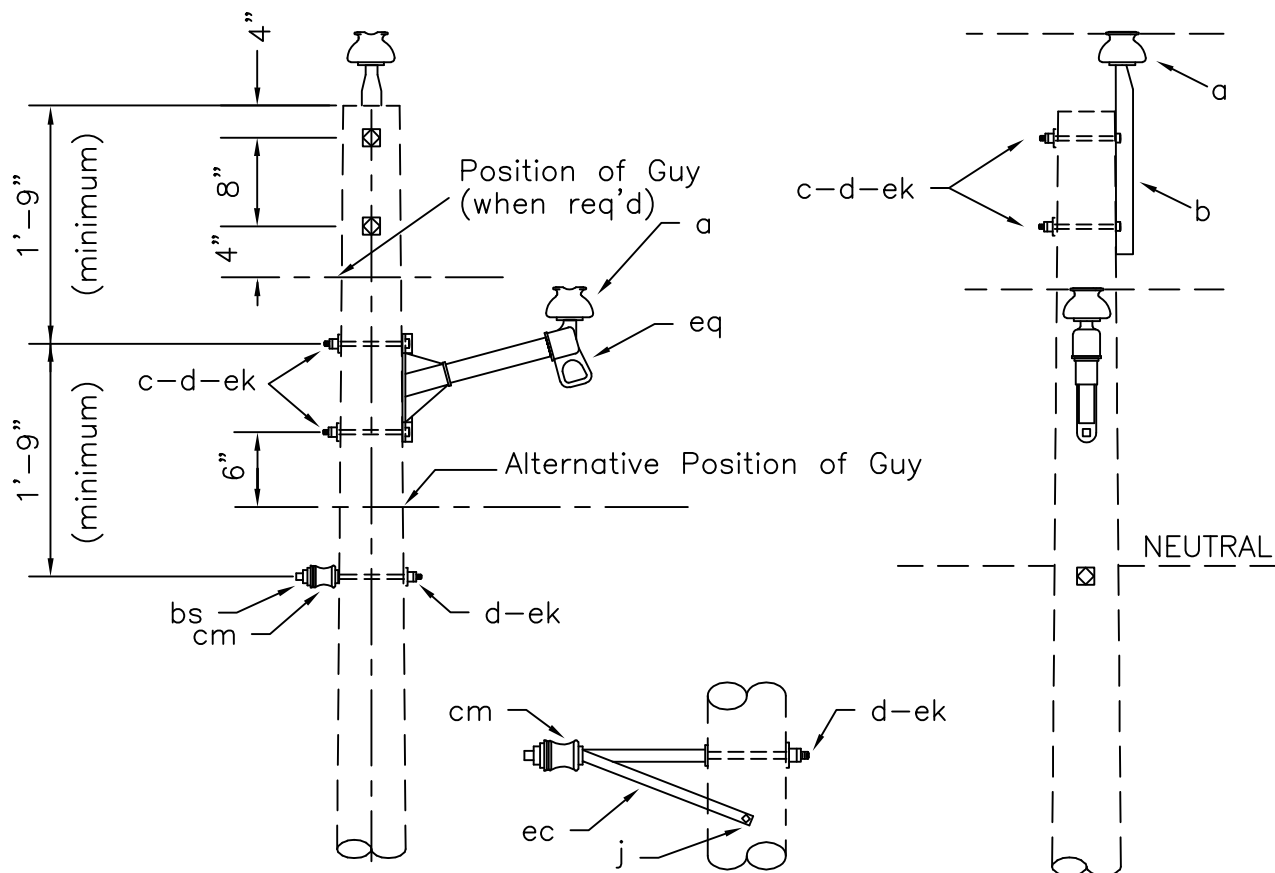
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
B1.1N B1.2N		SINGLE SUPPORT – NARROW PROFILE (TANGENT)
B1.1NP B1.2NP		SINGLE SUPPORT – NARROW PROFILE (TANGENT) (POST INSULATORS)
B1.3N		SINGLE SUPPORT – NARROW PROFILE
B1.3NP		SINGLE SUPPORT – NARROW PROFILE (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

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
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

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



ASSEMBLY: B1.

ITEM	MATERIAL	1N	2N
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)
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

(If req'd)

Design Parameters:

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

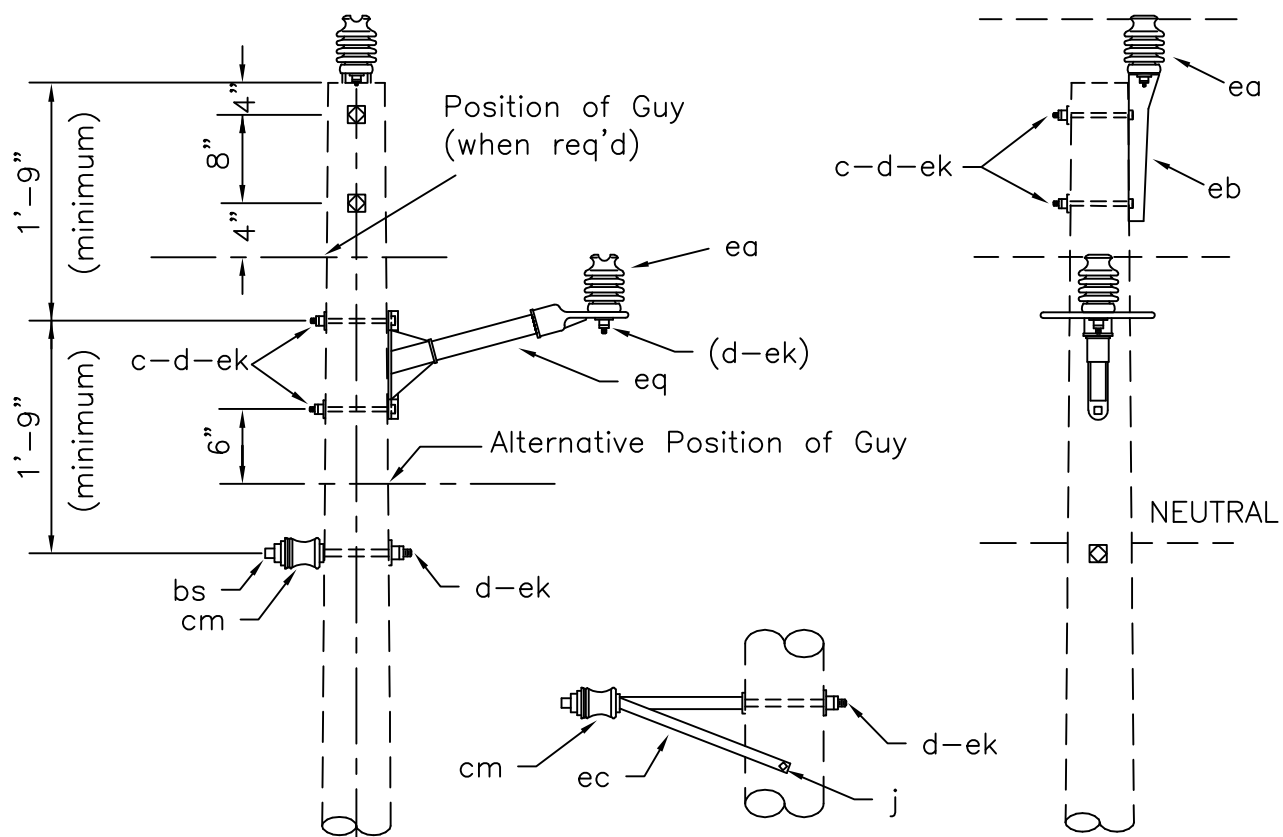
SINGLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.1N
B1.2N



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

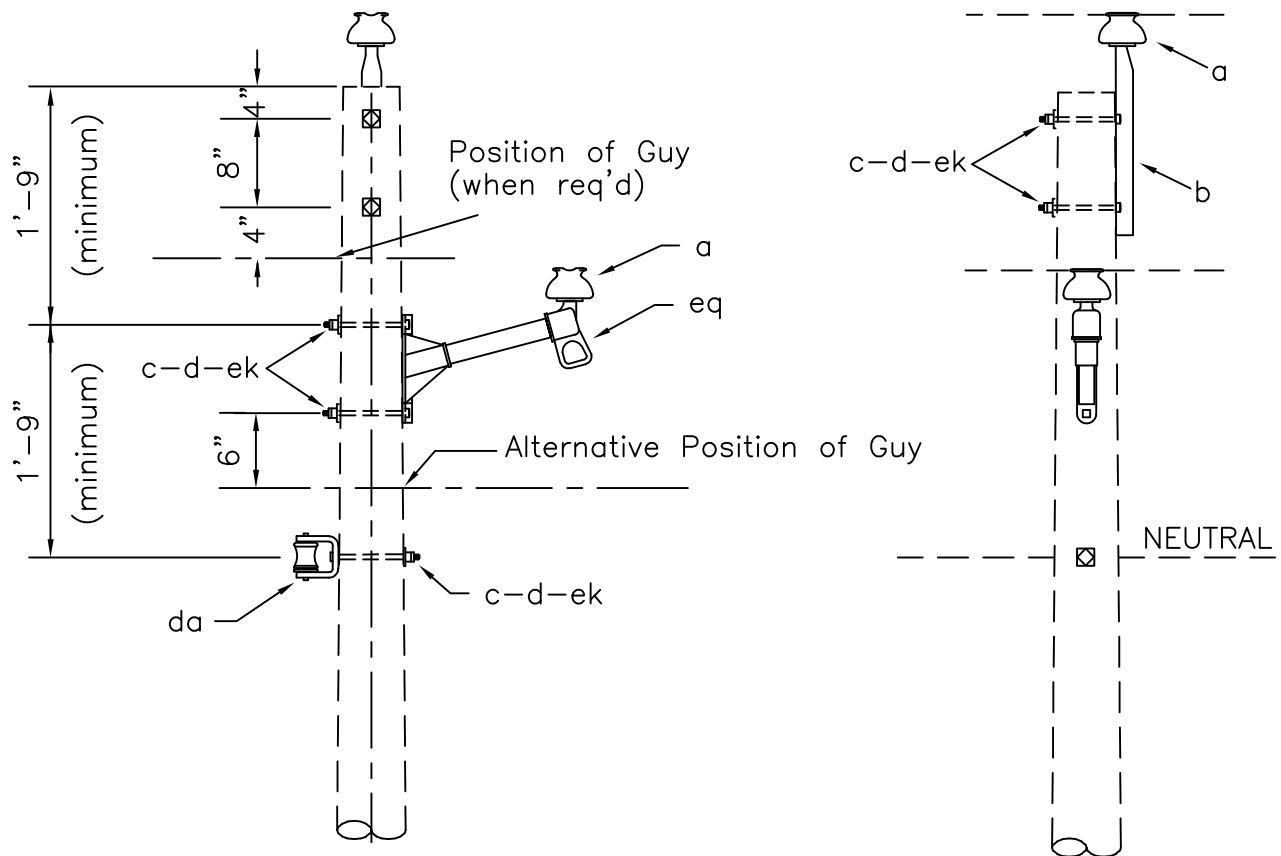
SINGLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.1NP
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

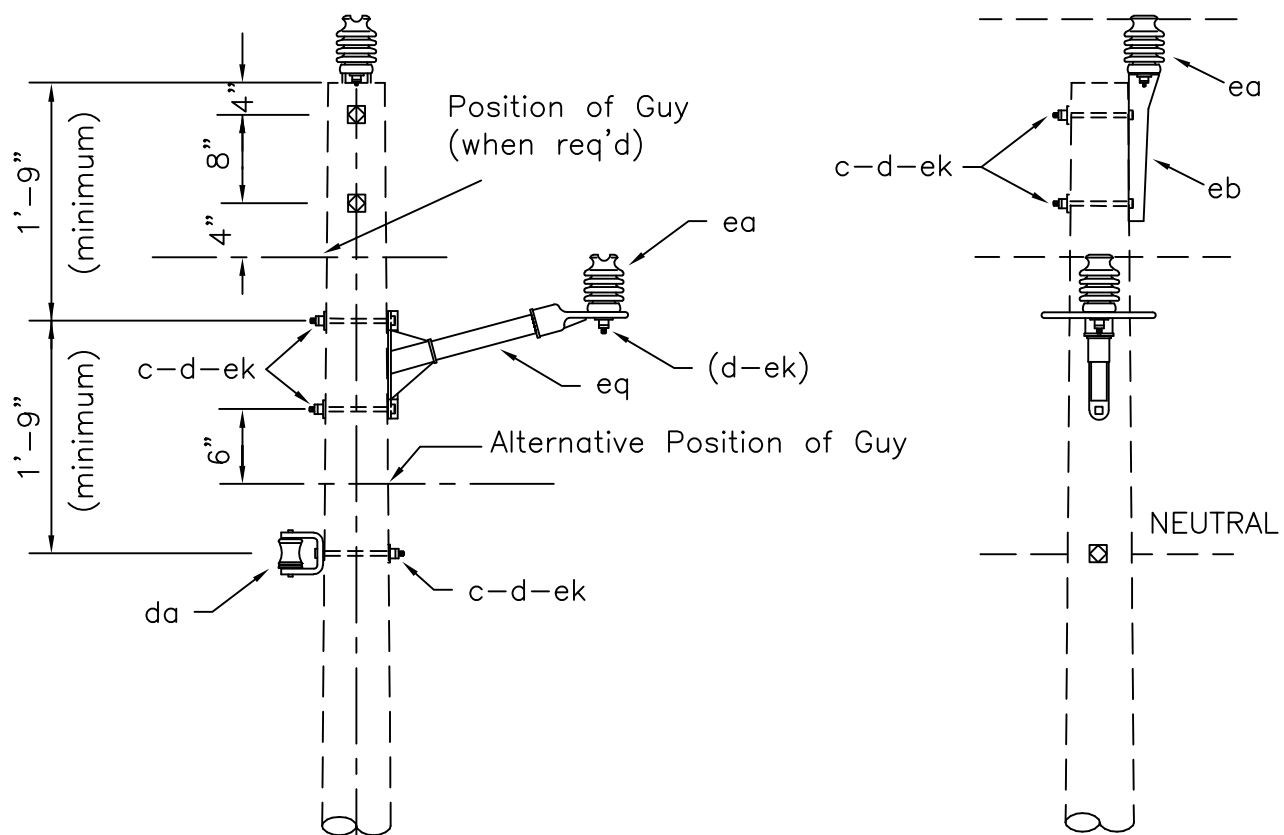
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.3N



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

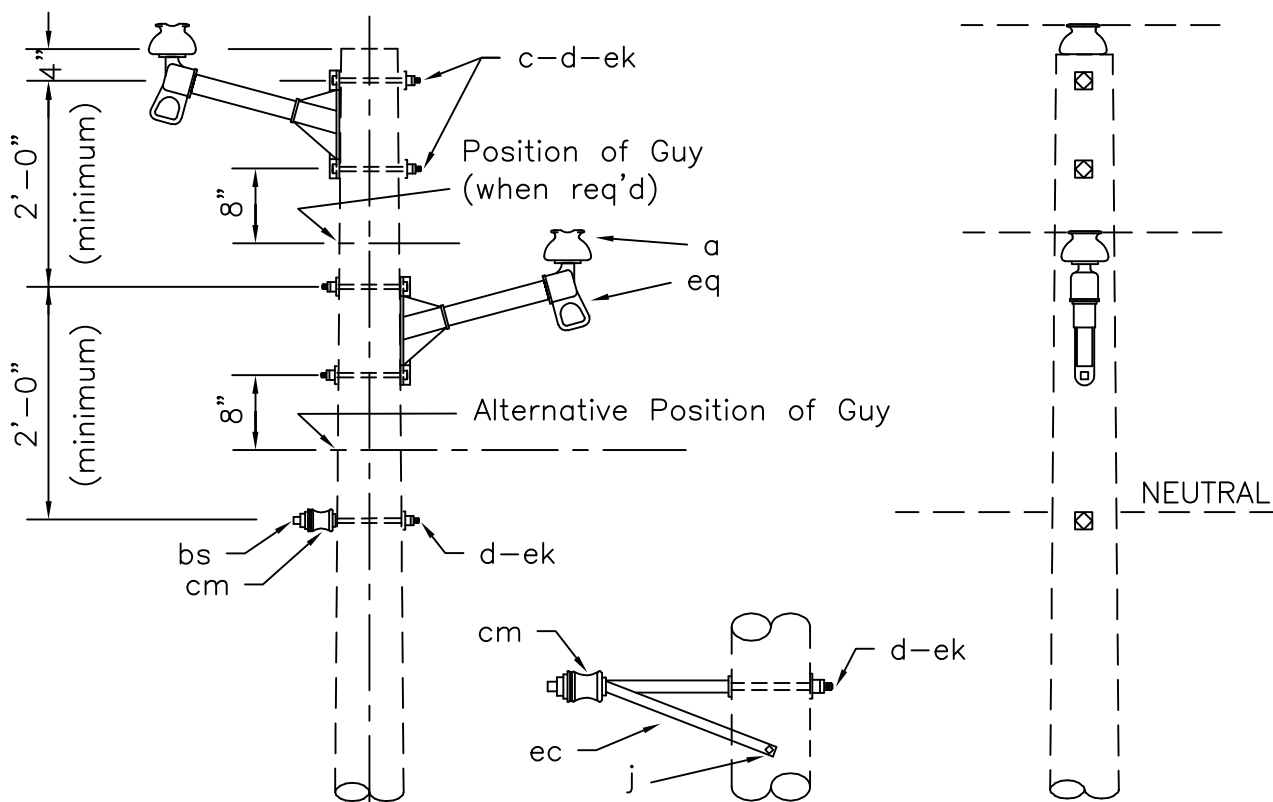
SINGLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.3NP



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)
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

(If req'd)

Design Parameters:

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

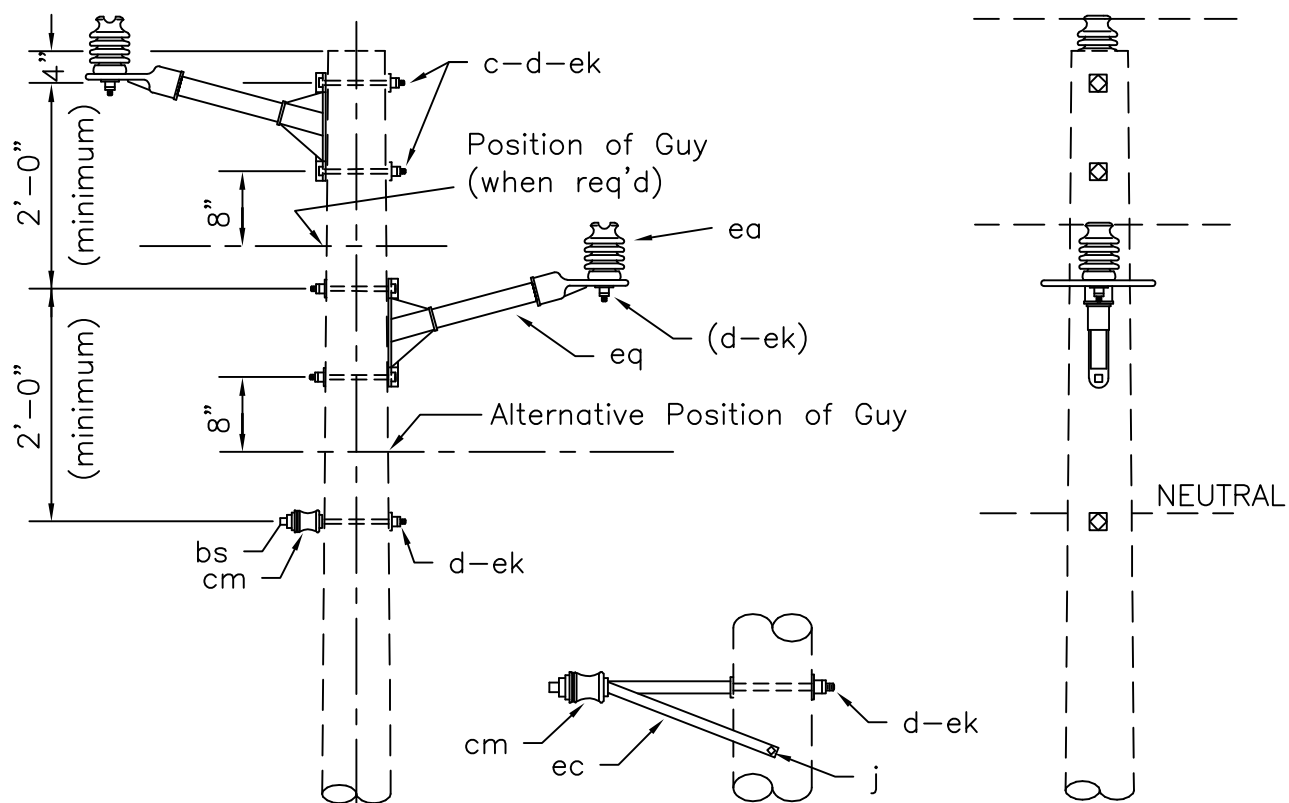
SINGLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.4N
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

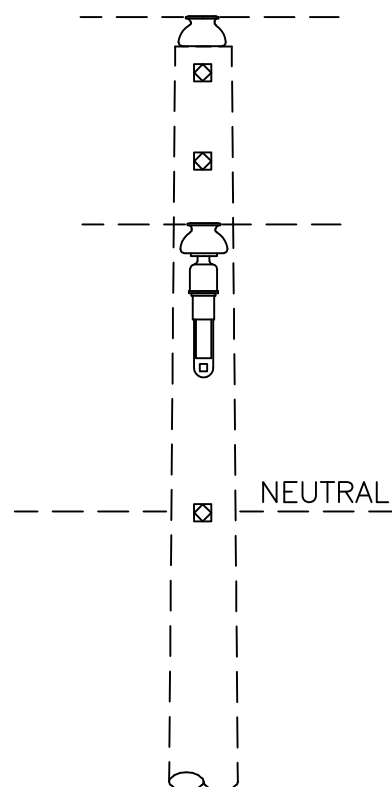
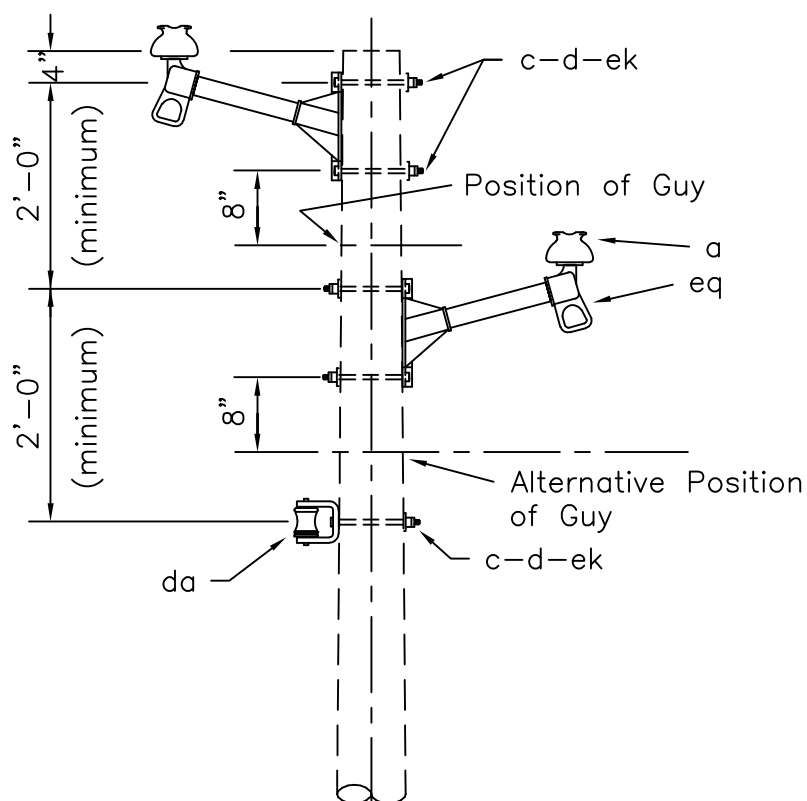
SINGLE SUPPORT—NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

2 — PHASE PRIMARY
12.47/7.2 kV

B1.4NP
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

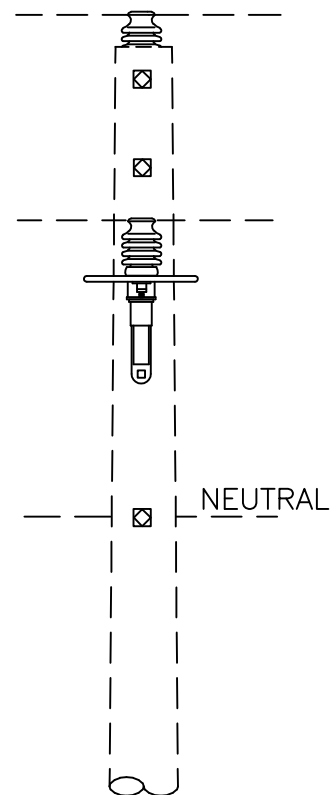
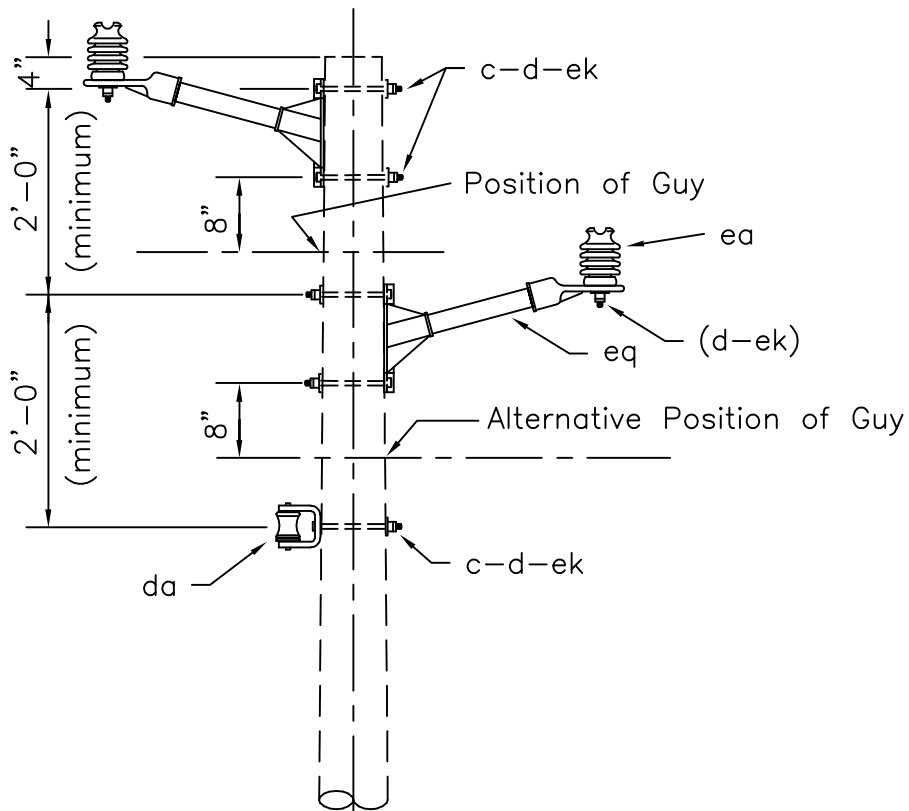
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.6N



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

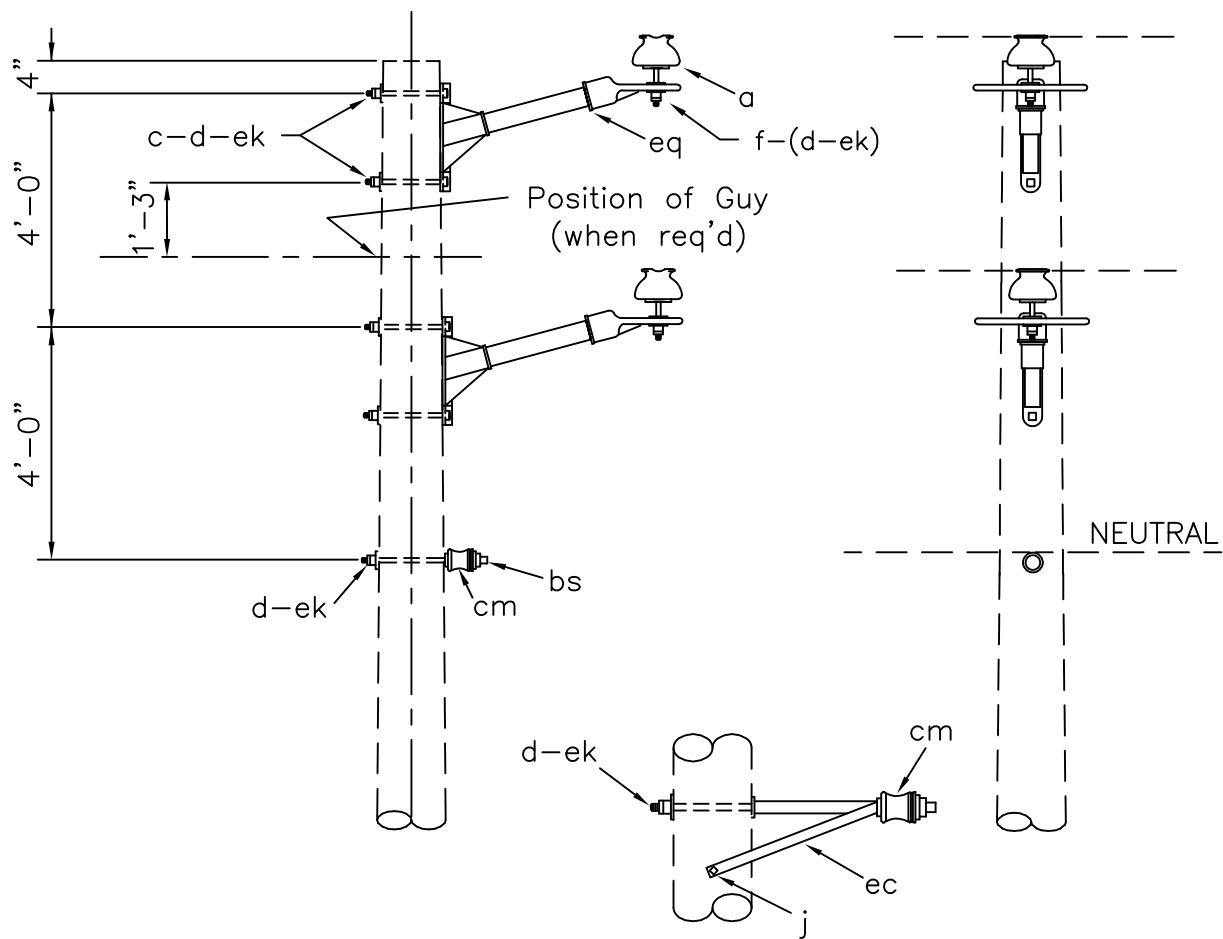
SINGLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.6NP



Specify B1.8N for
offset neutral assembly

Assembly: B1.		7N	8N
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

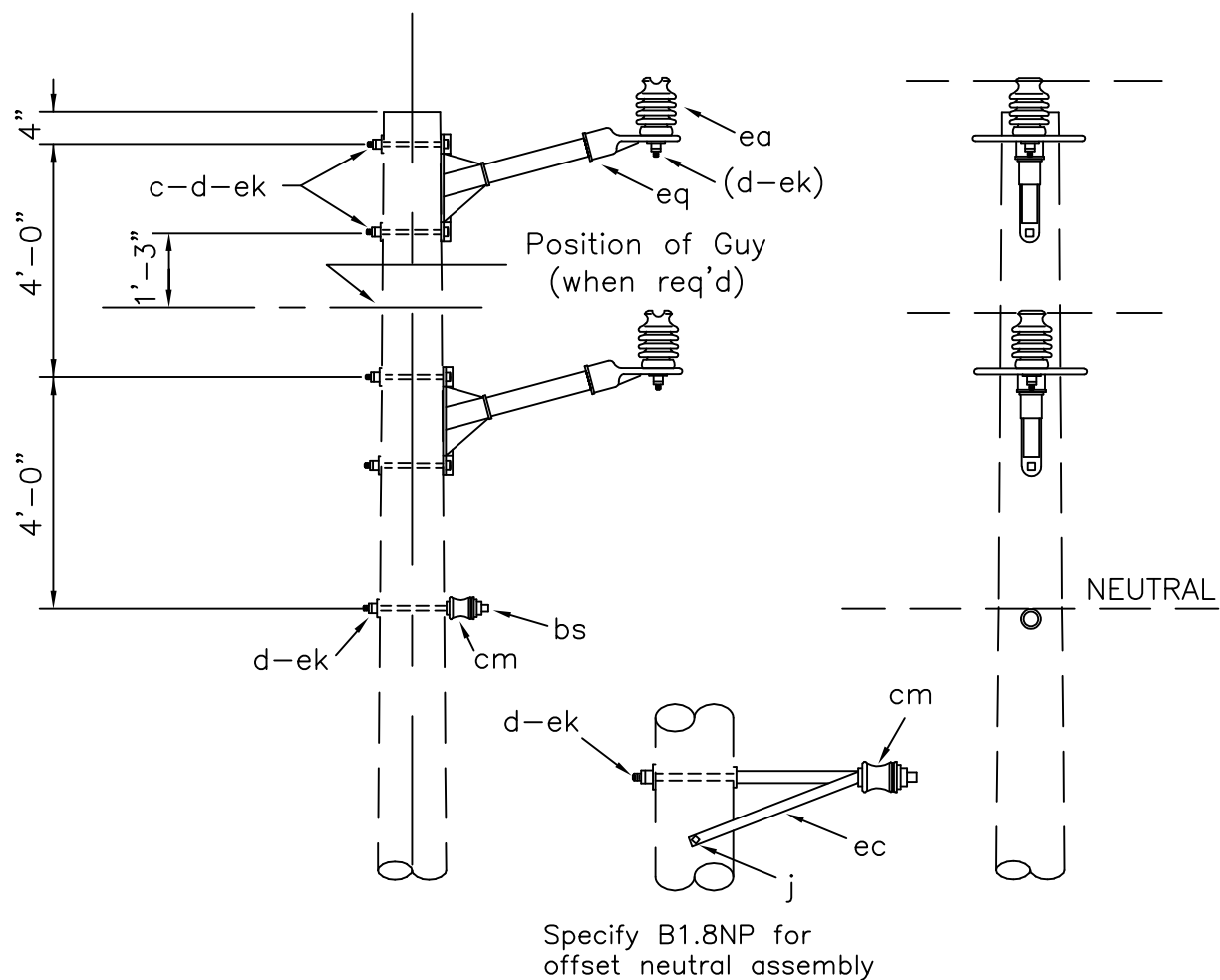
SINGLE SUPPORT-NARROW PROFILE (TANGENT)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.7N
B1.8N



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

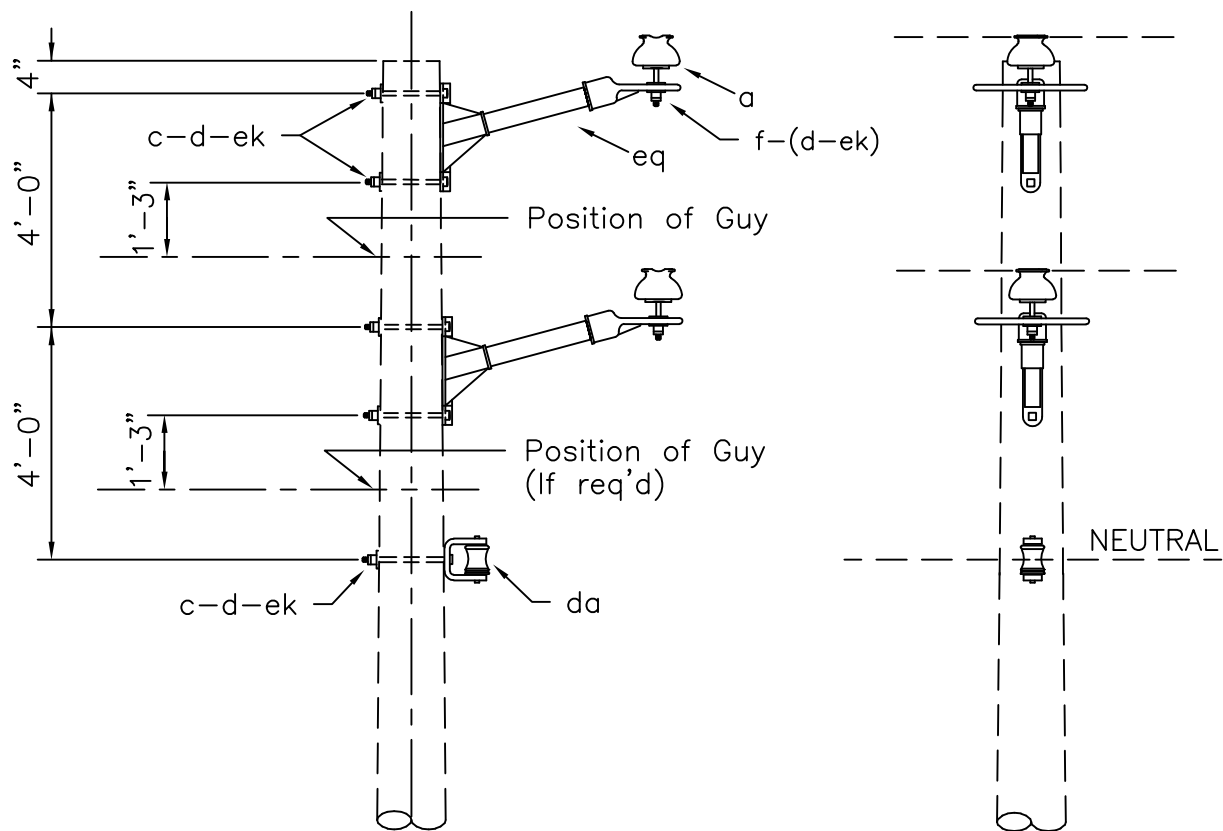
SINGLE SUPPORT-NARROW PROFILE
 (TANGENT) (POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
 12.47/7.2 kV

B1.7NP
 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

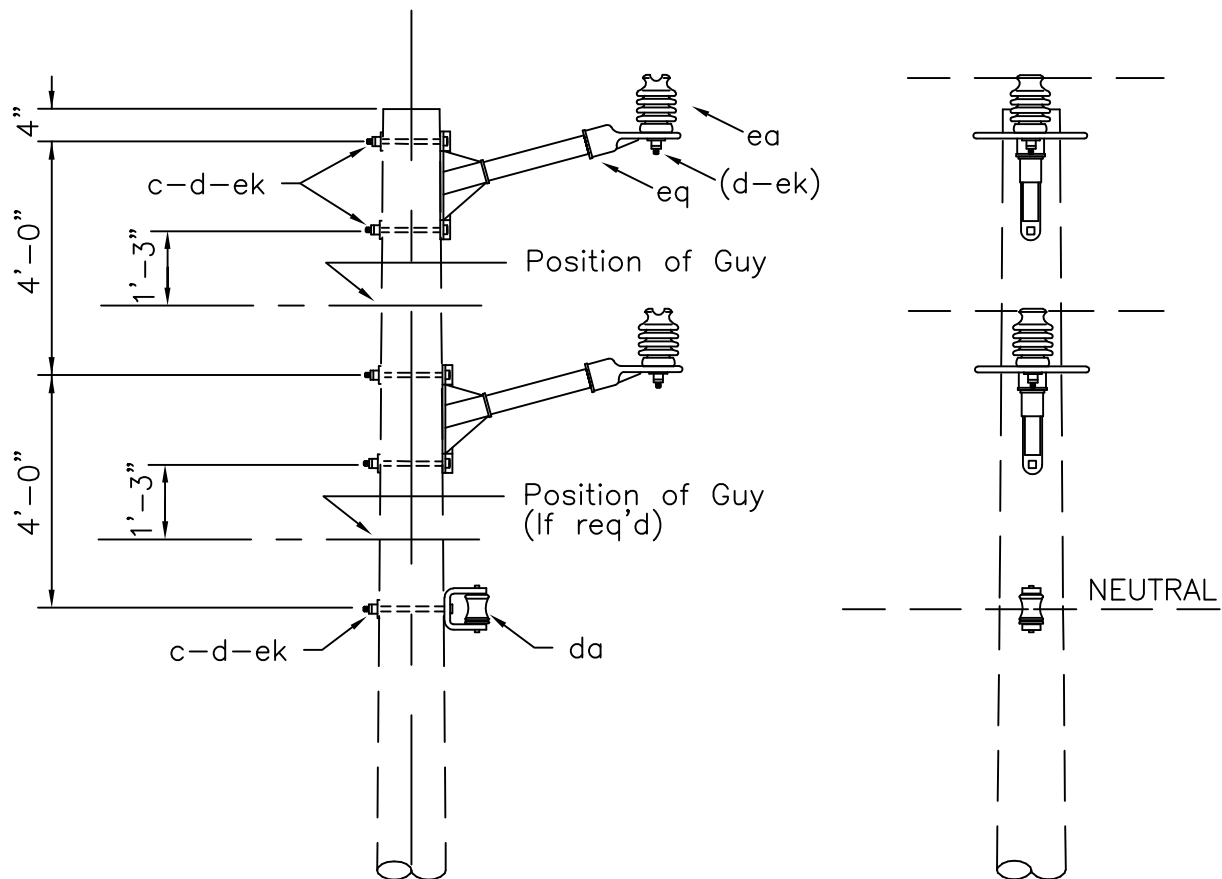
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

2 - PHASE PRIMARY
12.47/7.2 kV

RUS

B1.9N



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

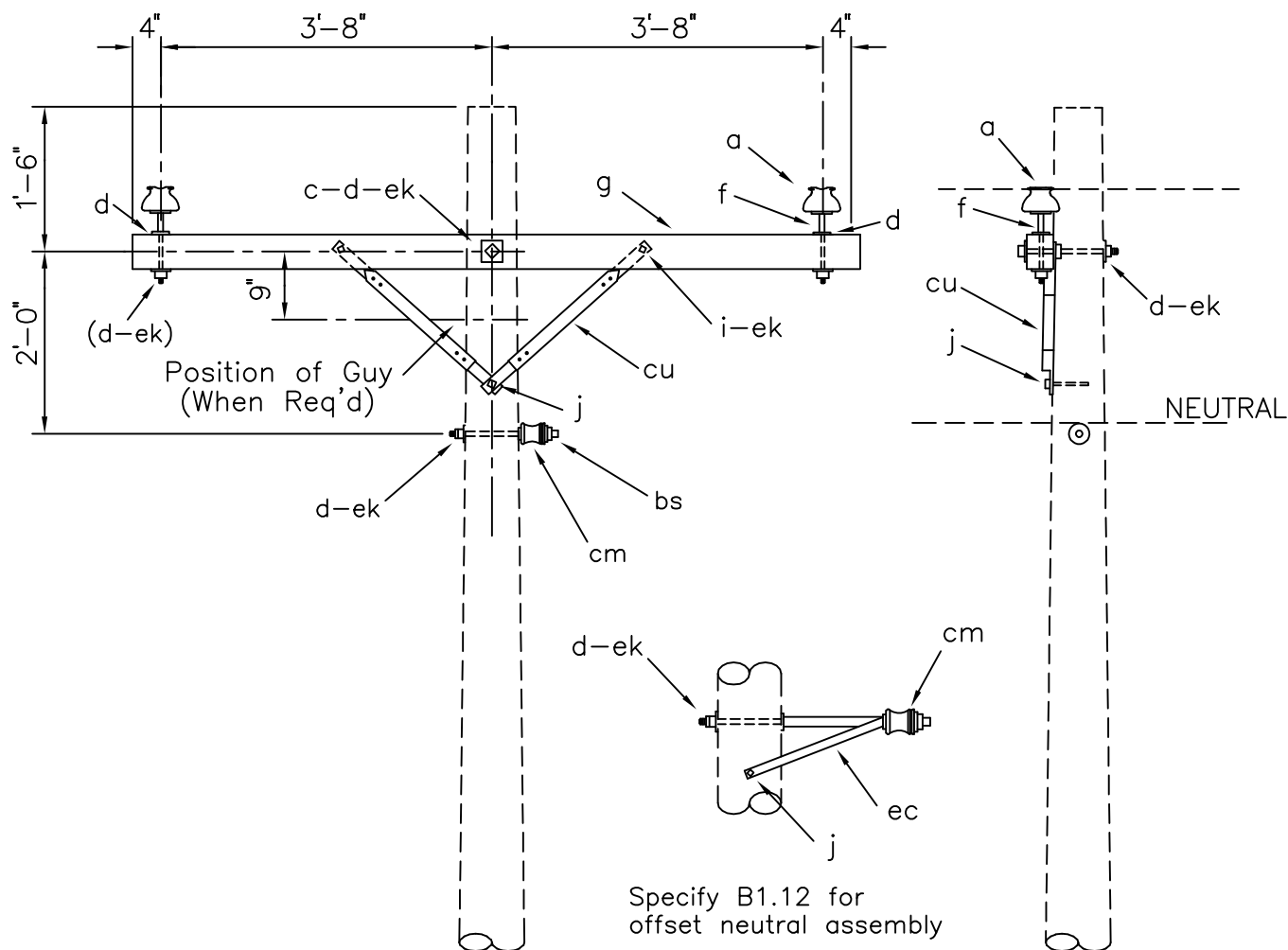
SINGLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.9NP



ASSEMBLY: B1.

ITEM	MATERIAL	11 QTY	12 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)

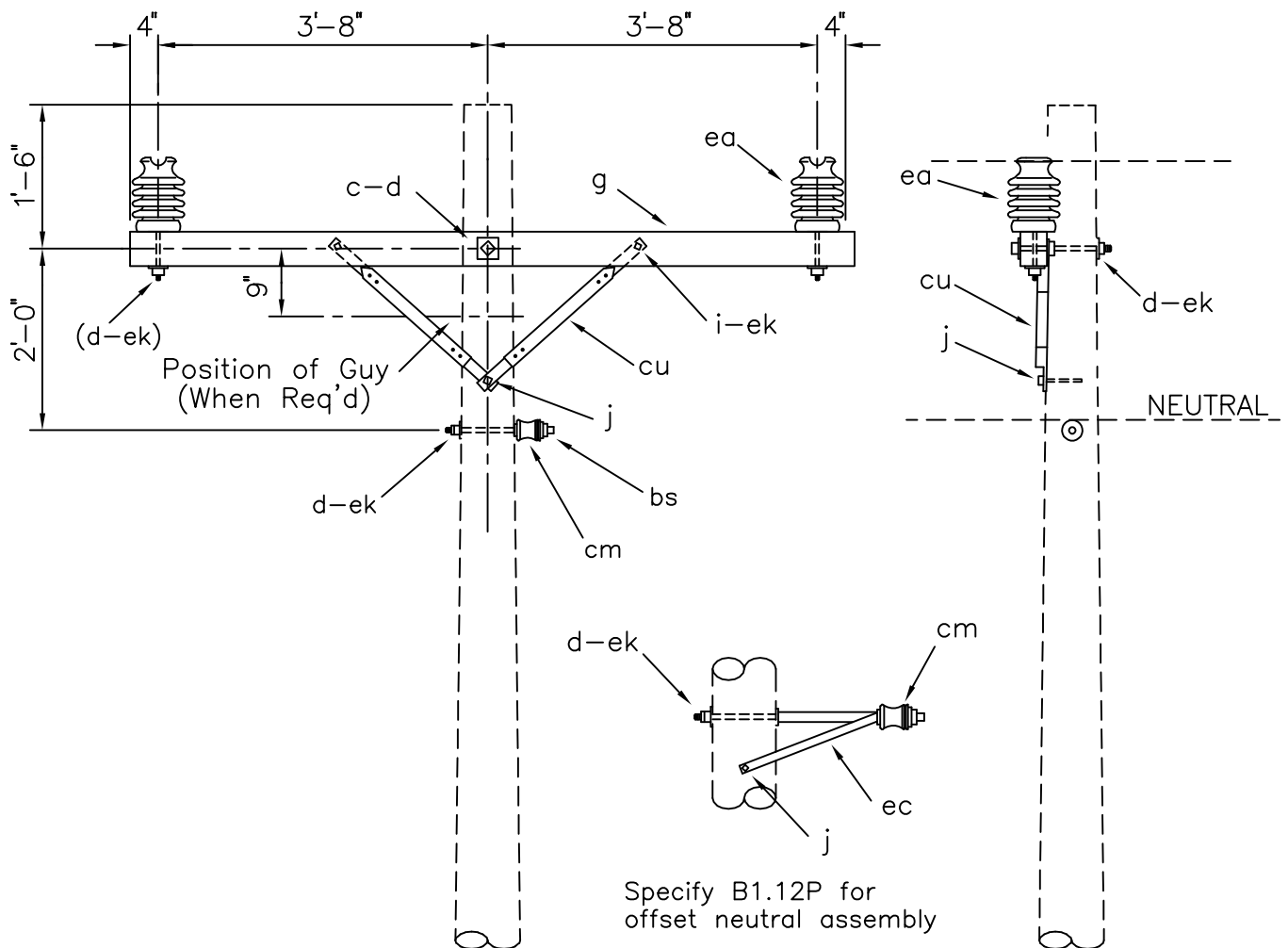
APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.11 (B1)

B1.12 (B1A)



ASSEMBLY: B1.

ITEM	MATERIAL	11P QTY	12P 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

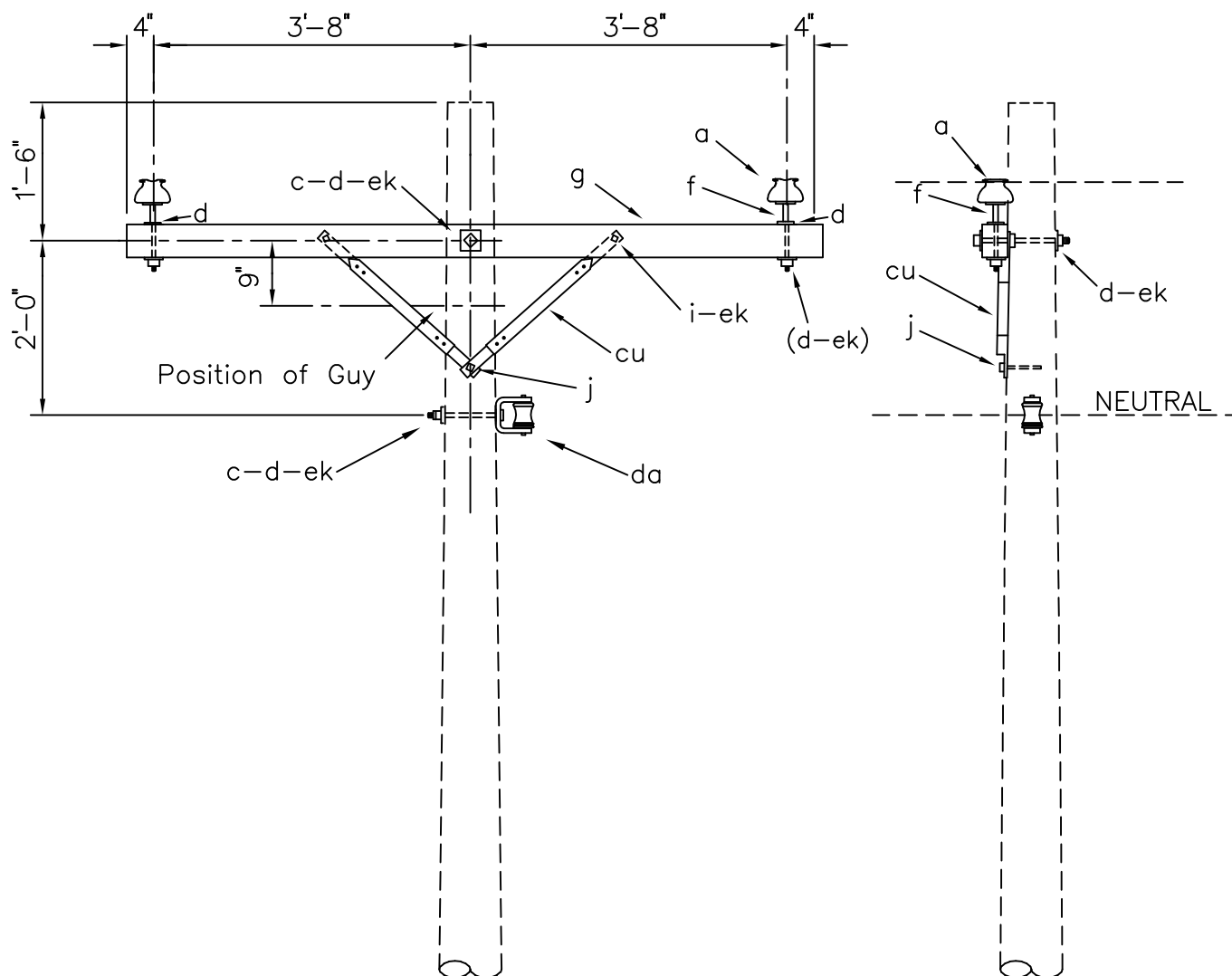
SINGLE SUPPORT ON CROSSARM
 (TANGENT) (POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
 12.47/7.2 kV

B1.11P (B1P)
 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

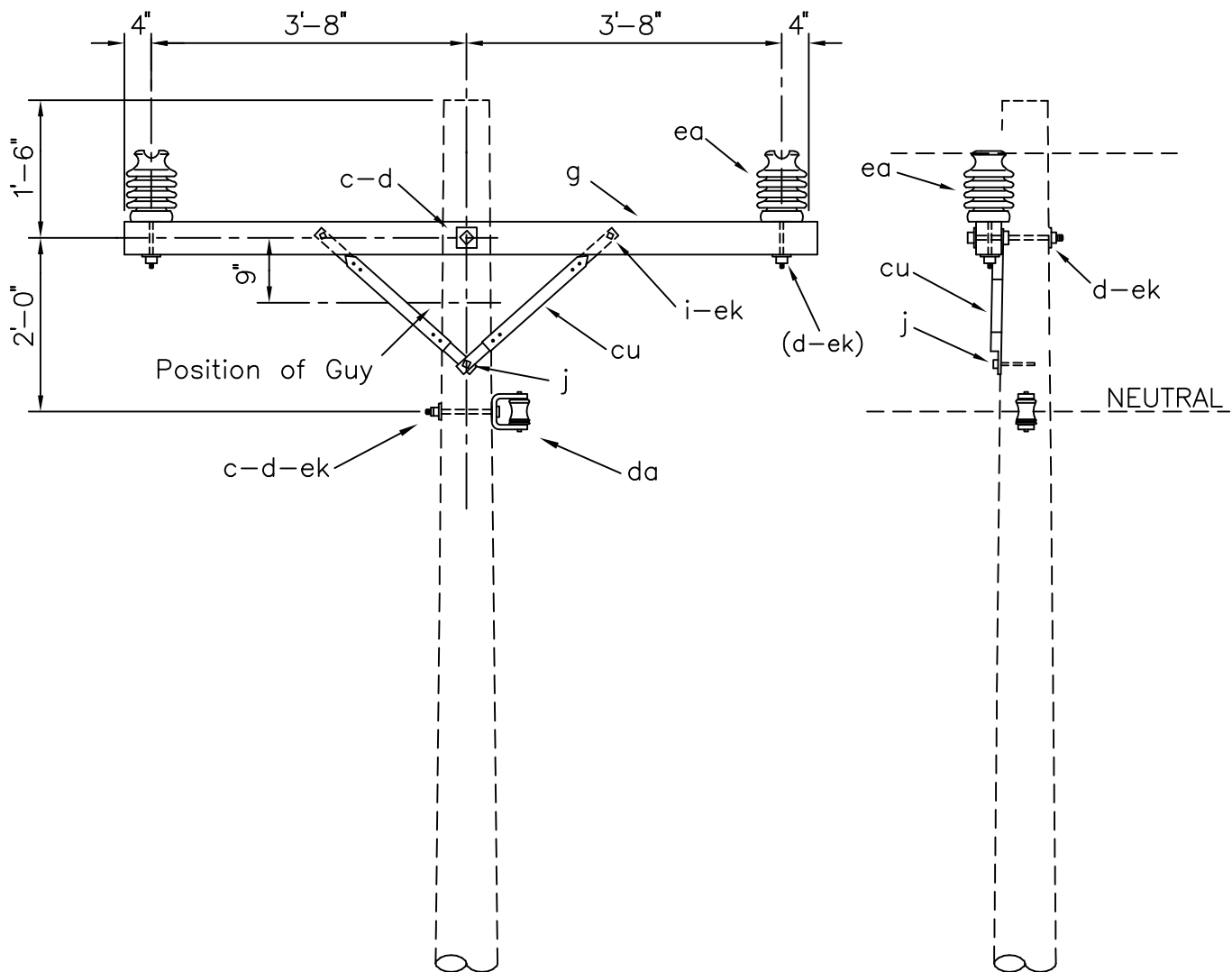
SINGLE SUPPORT ON CROSSARM

APRIL 2005

RUS

2 - PHASE PRIMARY
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

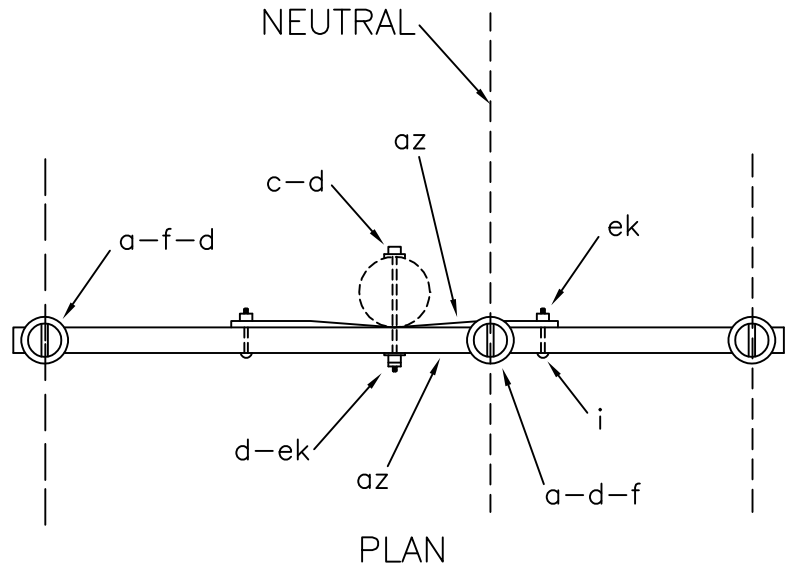
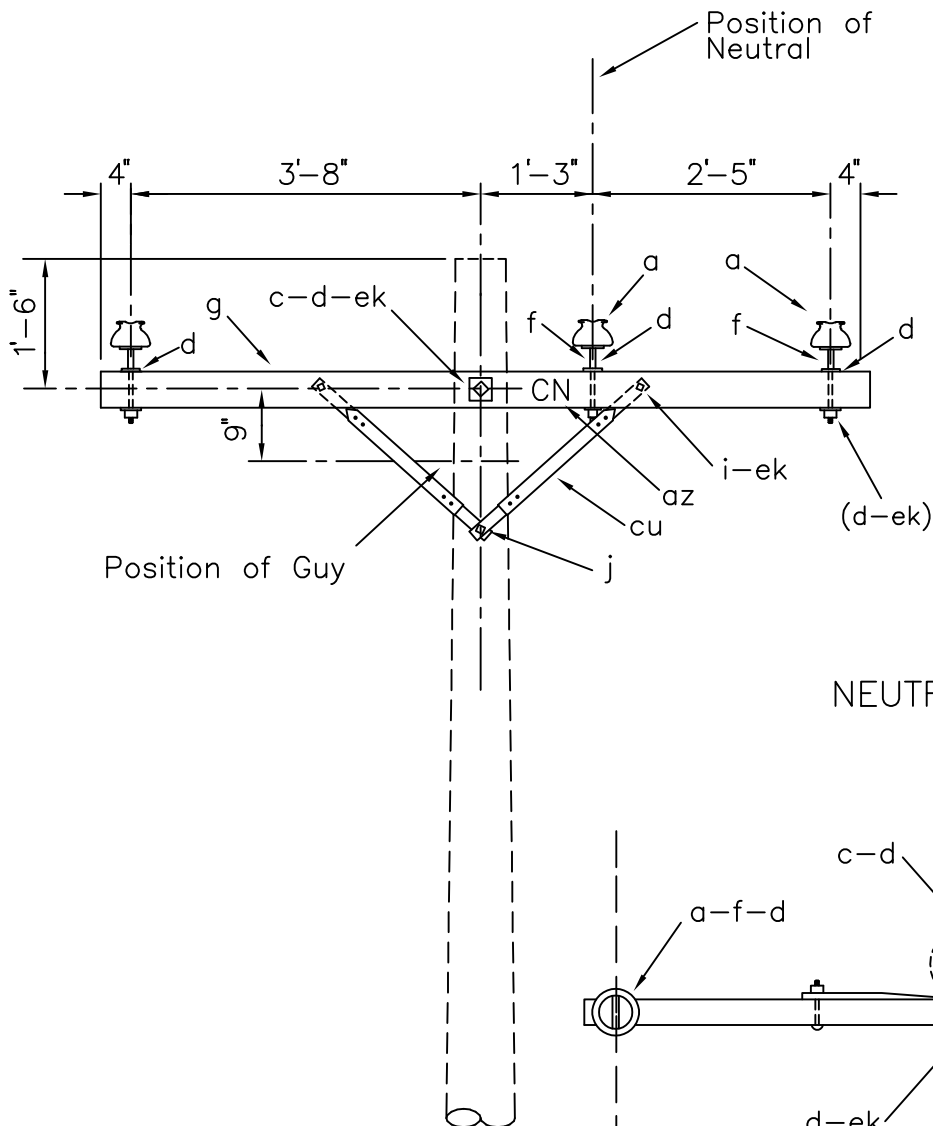
SINGLE SUPPORT ON CROSSARM
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.13P



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

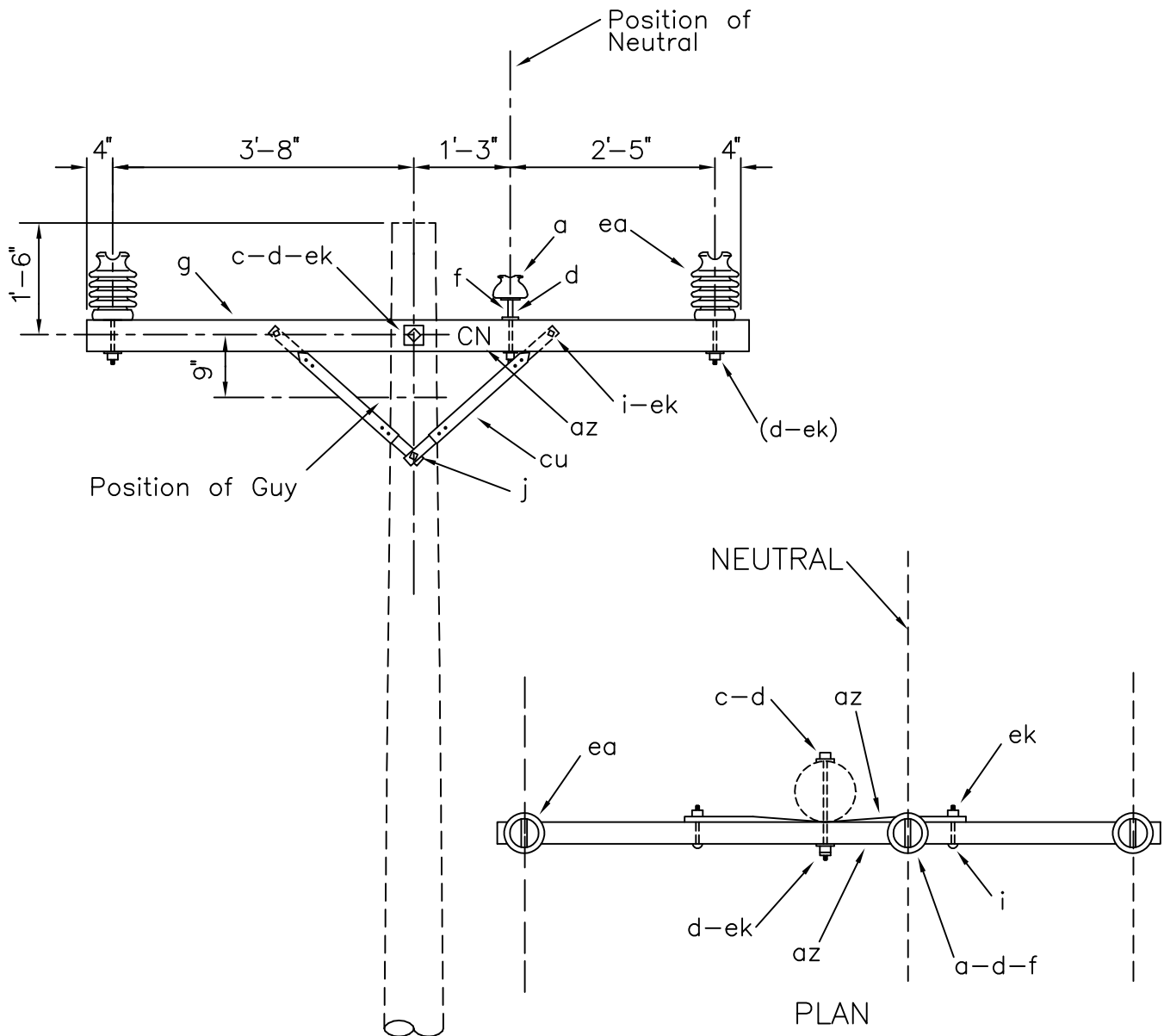
SINGLE SUPPORT, NEUTRAL ON CROSSARM

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.14
(B9-1)



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

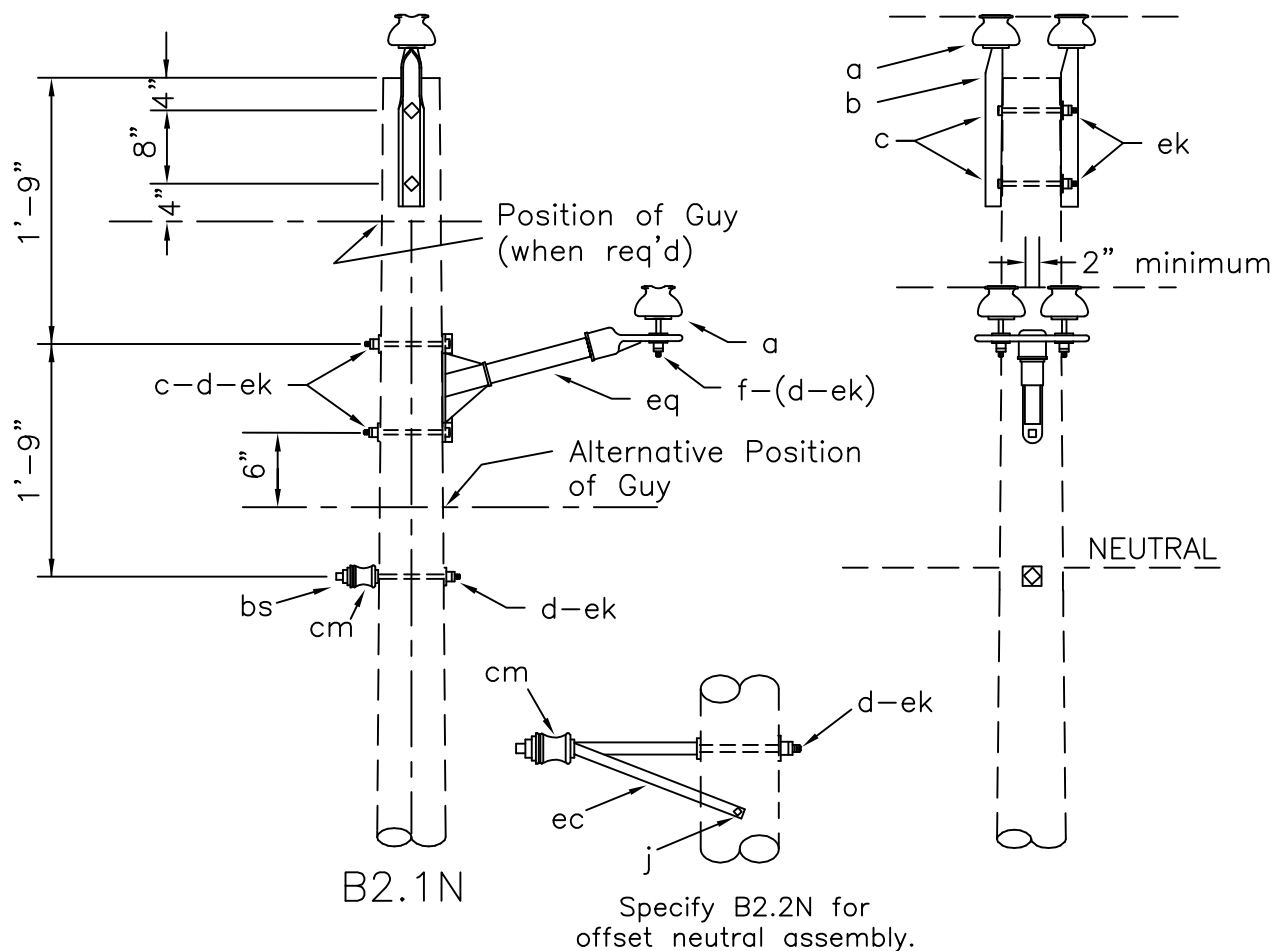
**SINGLE SUPPORT, NEUTRAL ON CROSSARM
(POST INSULATORS)**

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B1.14P
(B9-1P)



NOTE: These assemblies used for NESC Grade B construction.

ASSEMBLY: B2.		1N	2N
ITEM	MATERIAL	QTY	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

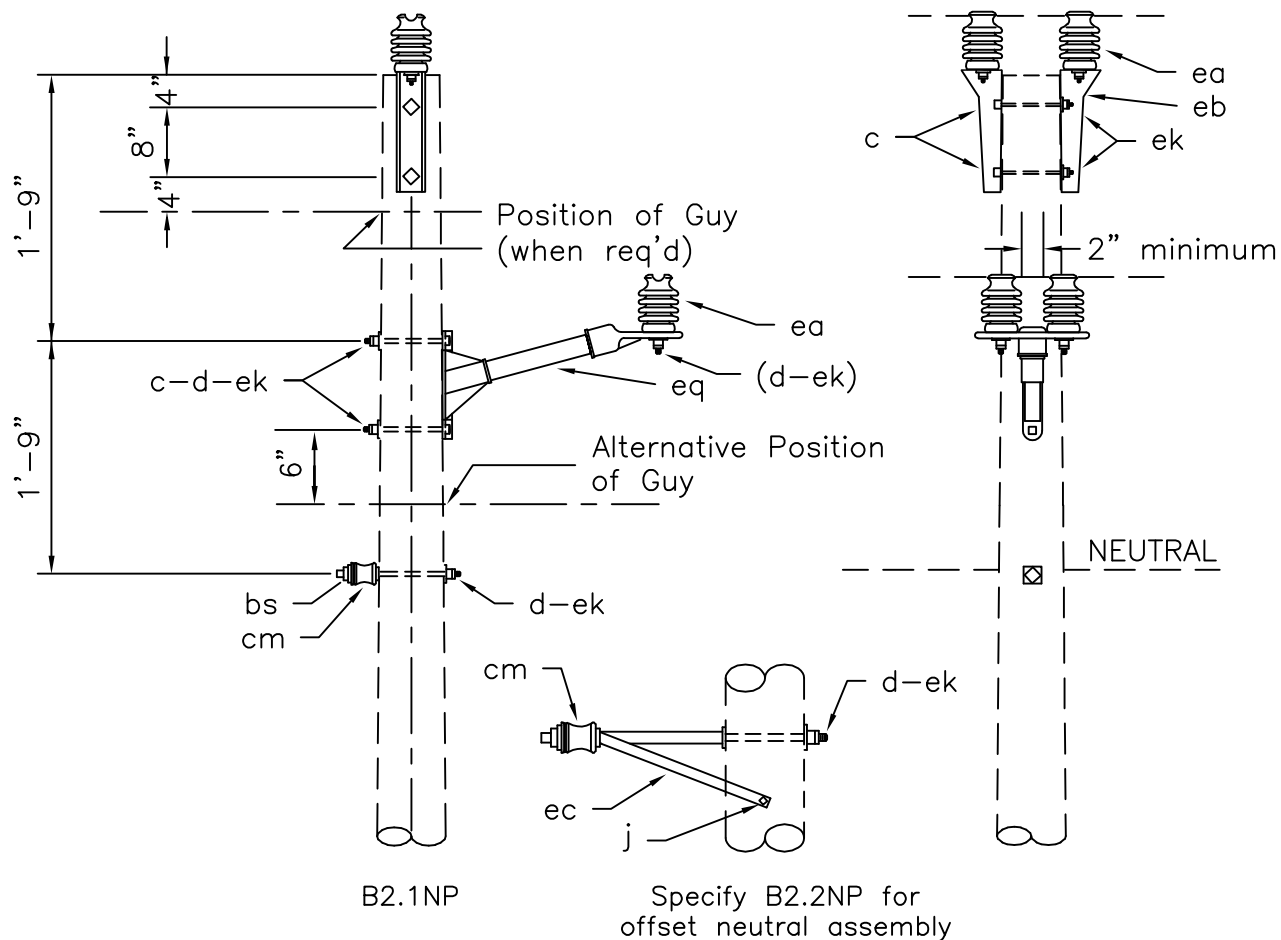
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.1N
B2.2N



NOTE: These assemblies used for NESC Grade B construction.

ASSEMBLY: B2.		1NP	2NP
ITEM	MATERIAL	QTY	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

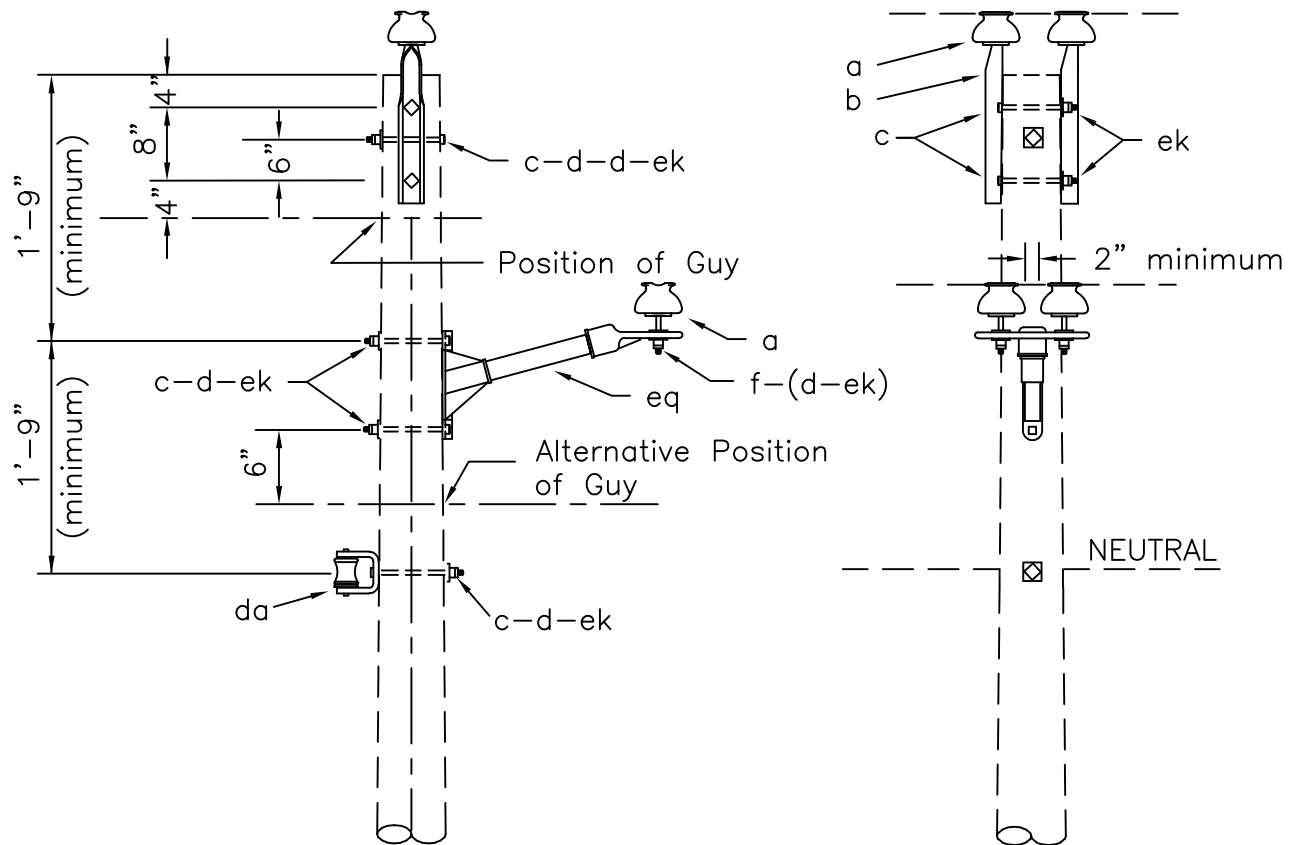
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.1NP
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

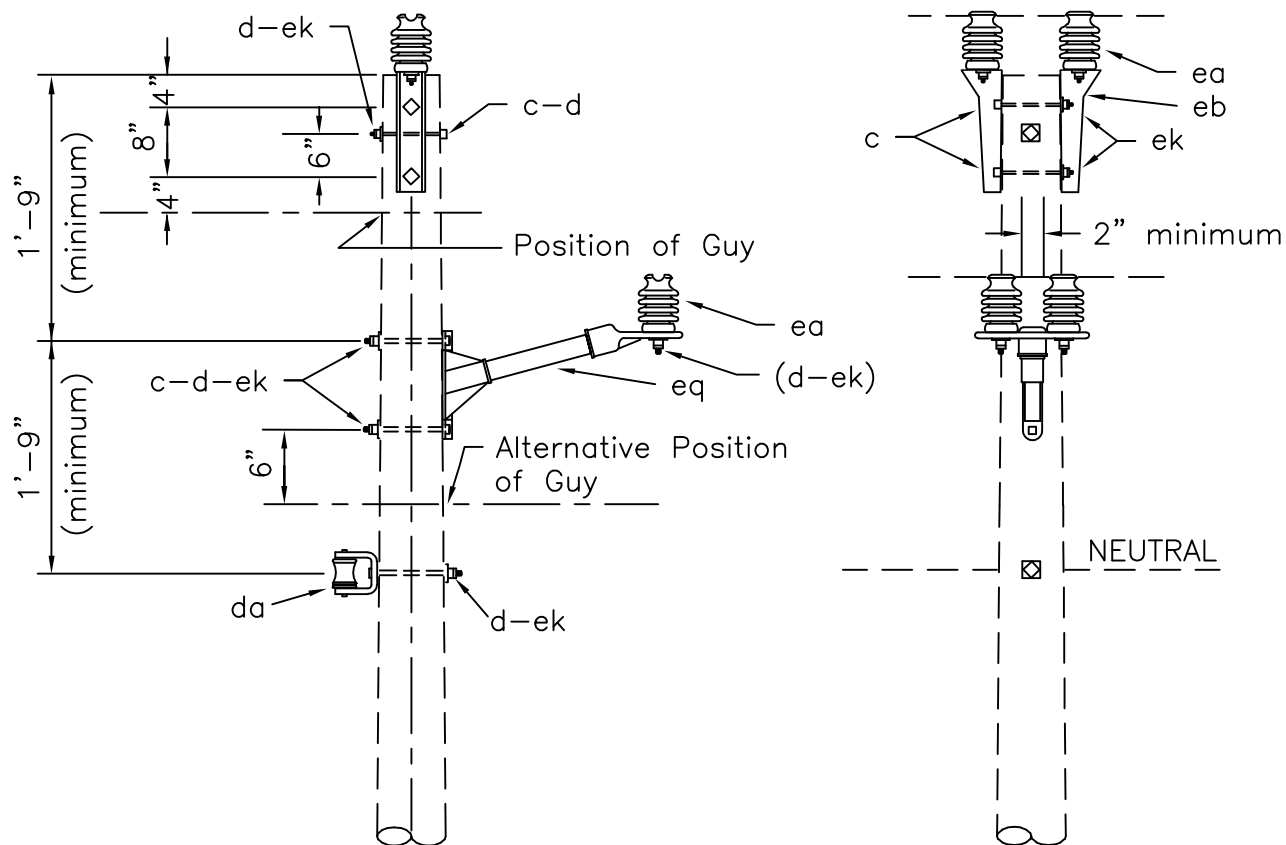
DOUBLE SUPPORT—NARROW PROFILE

APRIL 2005

RUS

2 — PHASE PRIMARY
12.47/7.2 kV

B2.3N



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

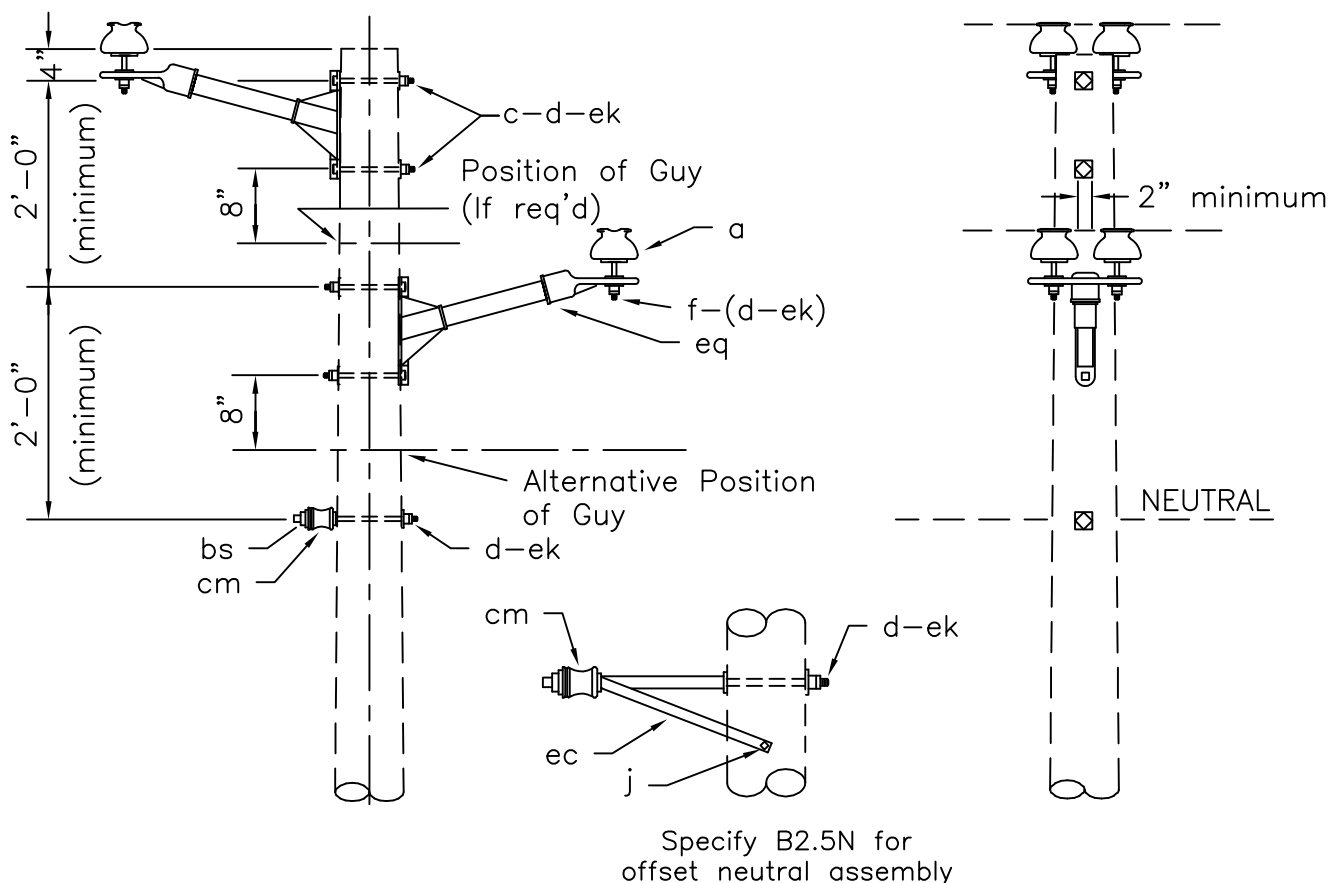
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.3NP



NOTE: Use these assemblies for NESC Grade B construction.

ASSEMBLY: B2.		4N	5N
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

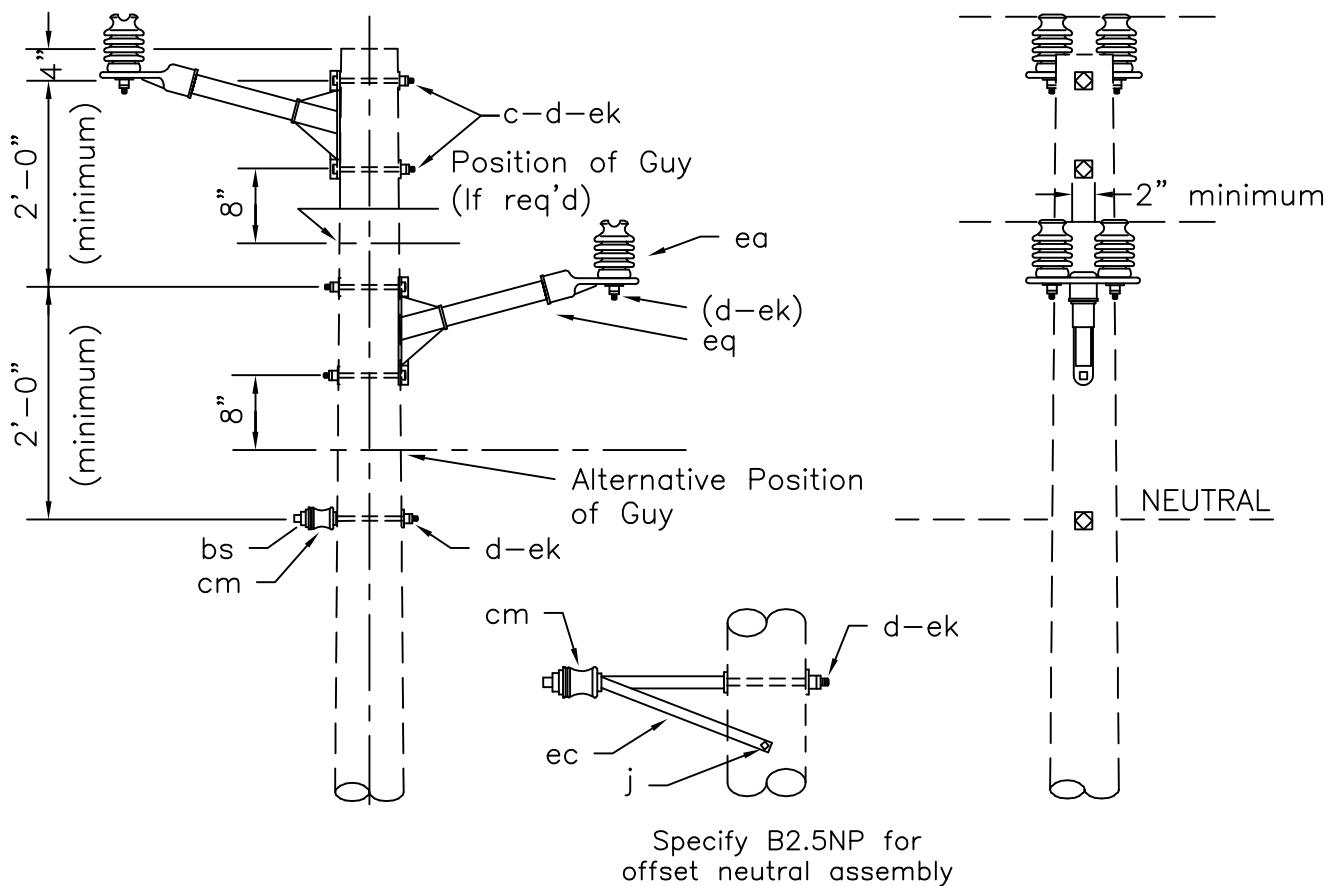
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.4N
B2.5N



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

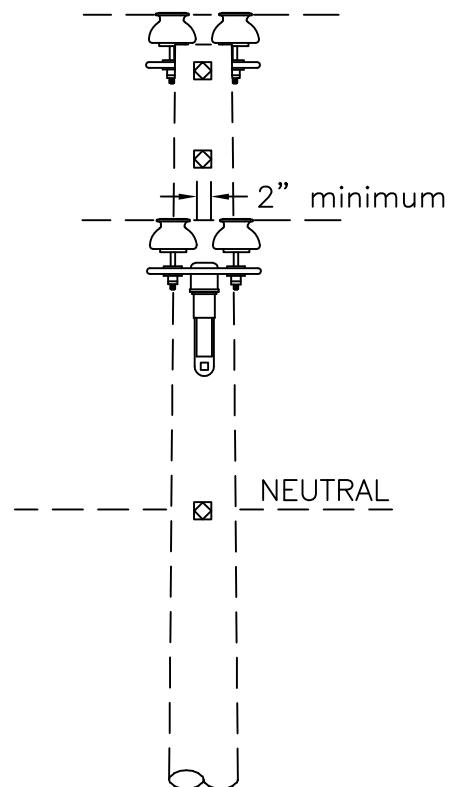
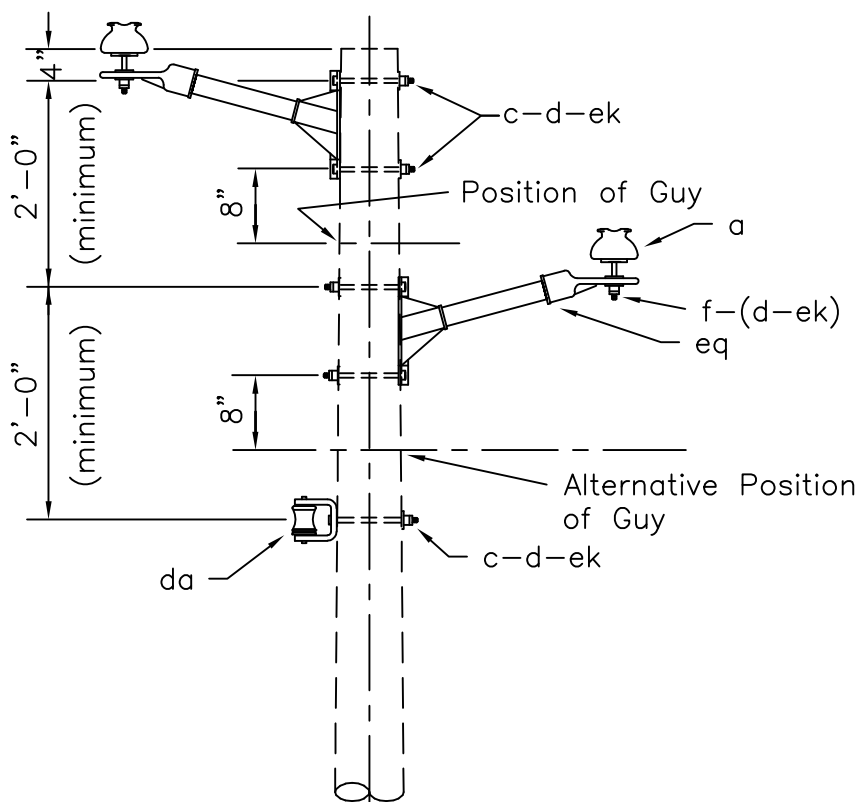
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT)(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kv

B2.4NP
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

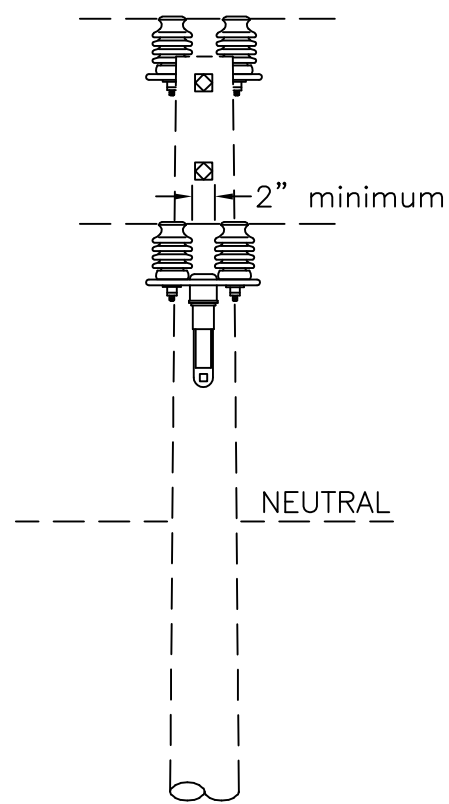
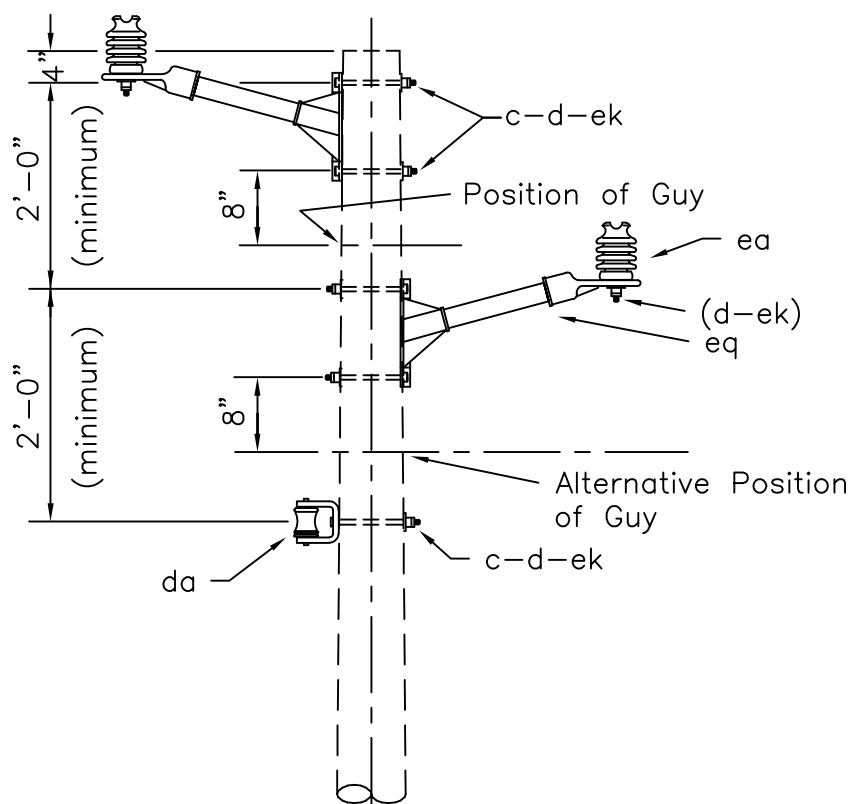
DOUBLE SUPPORT—NARROW PROFILE

APRIL 2005

RUS

2 — PHASE PRIMARY
12.47/7.2 kV

B2.6N



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

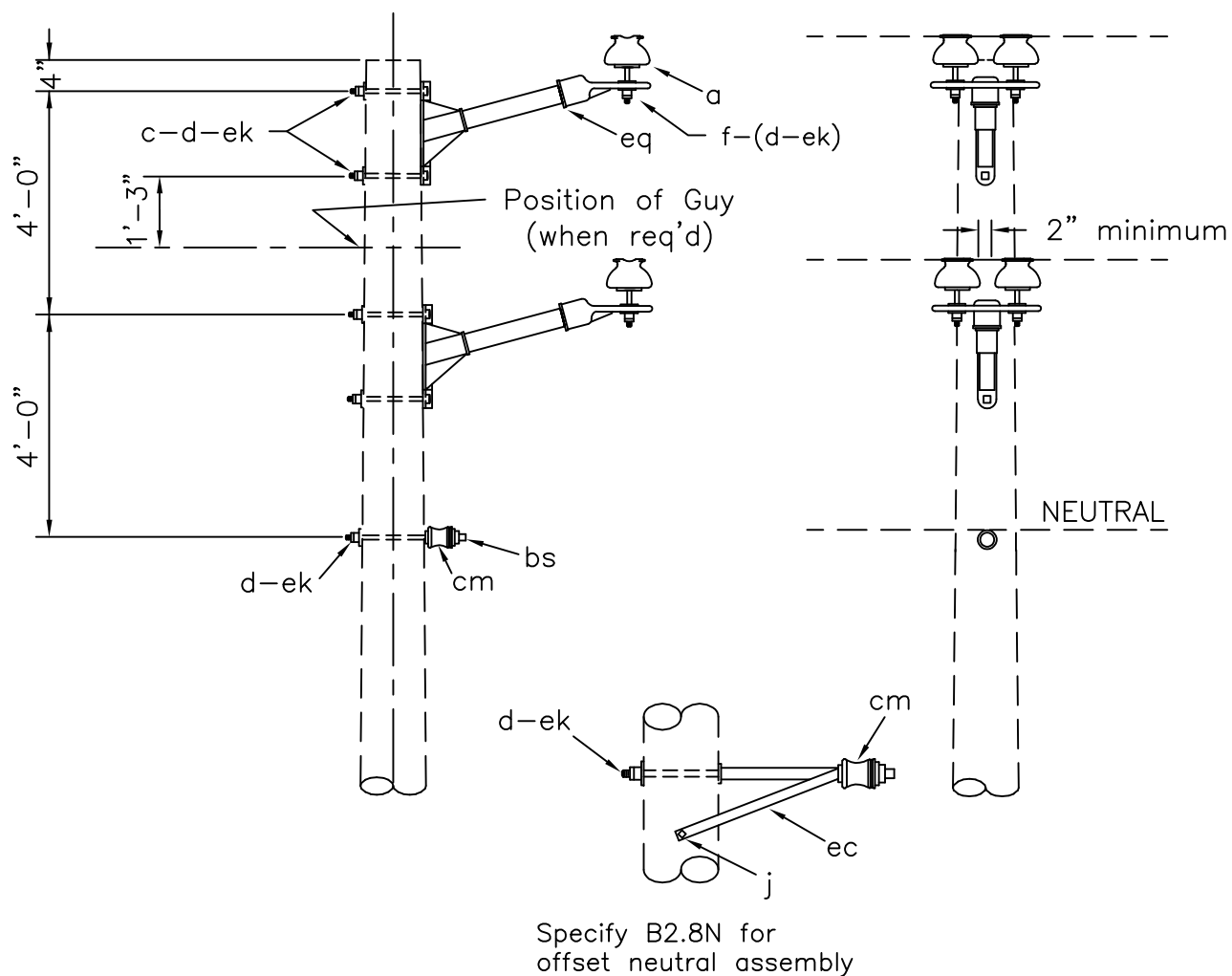
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.6NP



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

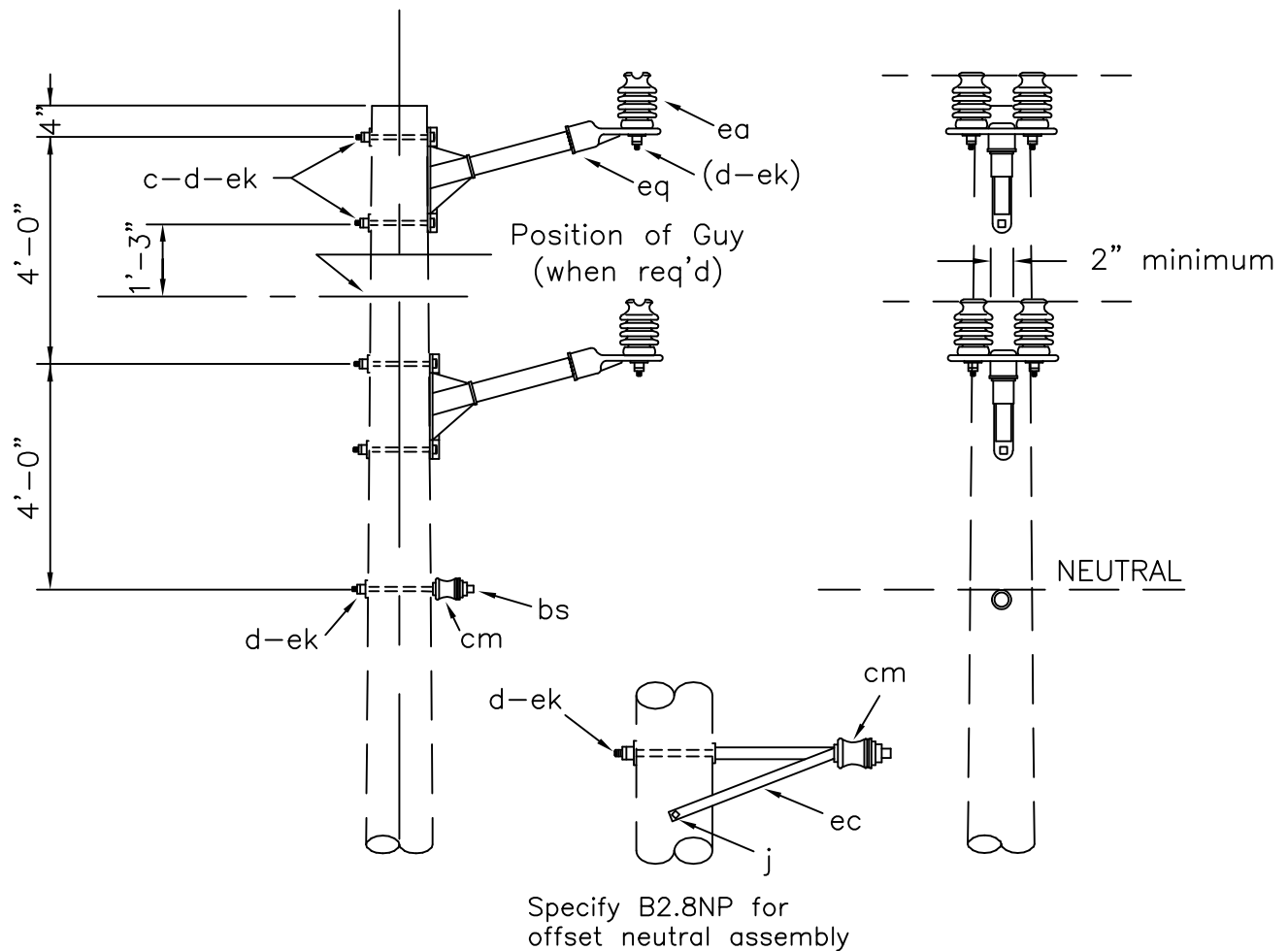
DOUBLE SUPPORT-NARROW PROFILE (TANGENT)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.7N
B2.8N



NOTE: These assemblies used for NESC Grade B construction.

Assembly: B2.		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 (12.47/7.2 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

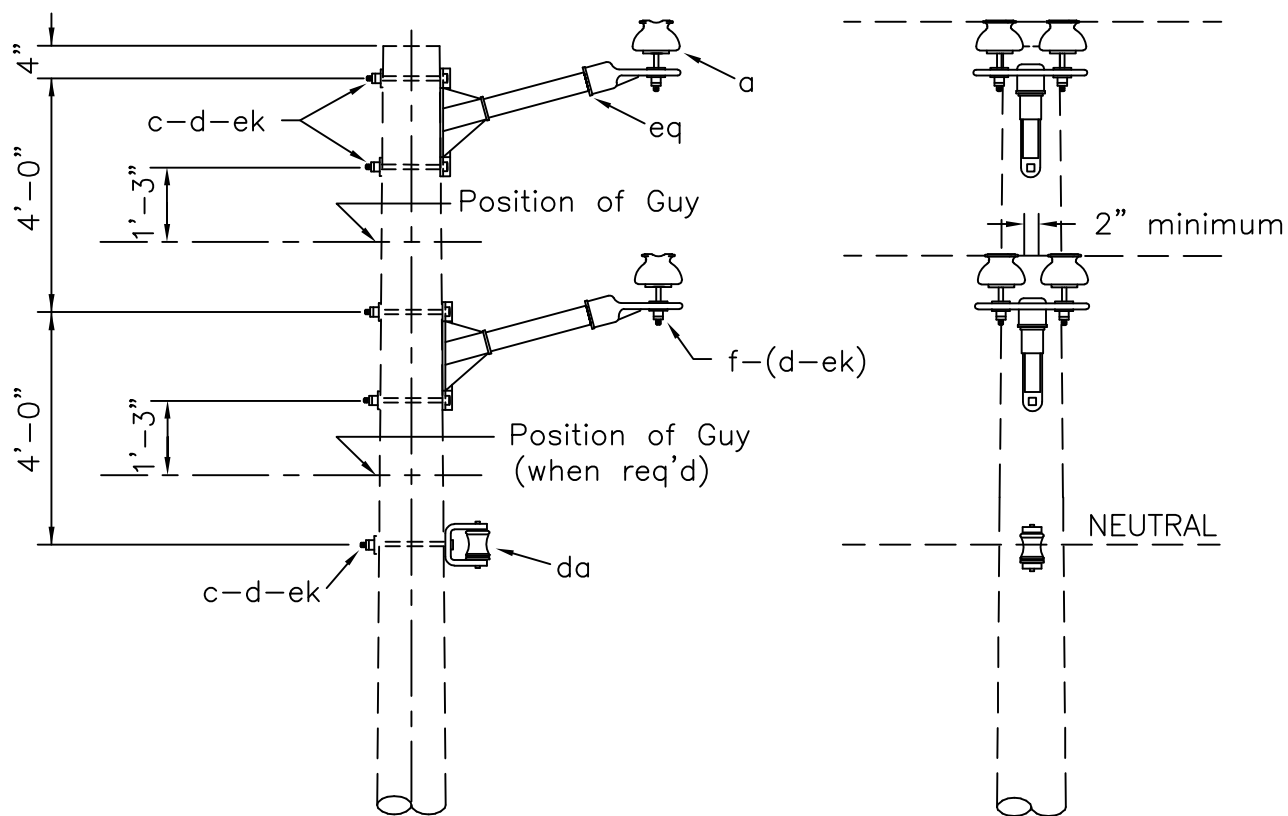
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.7NP
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

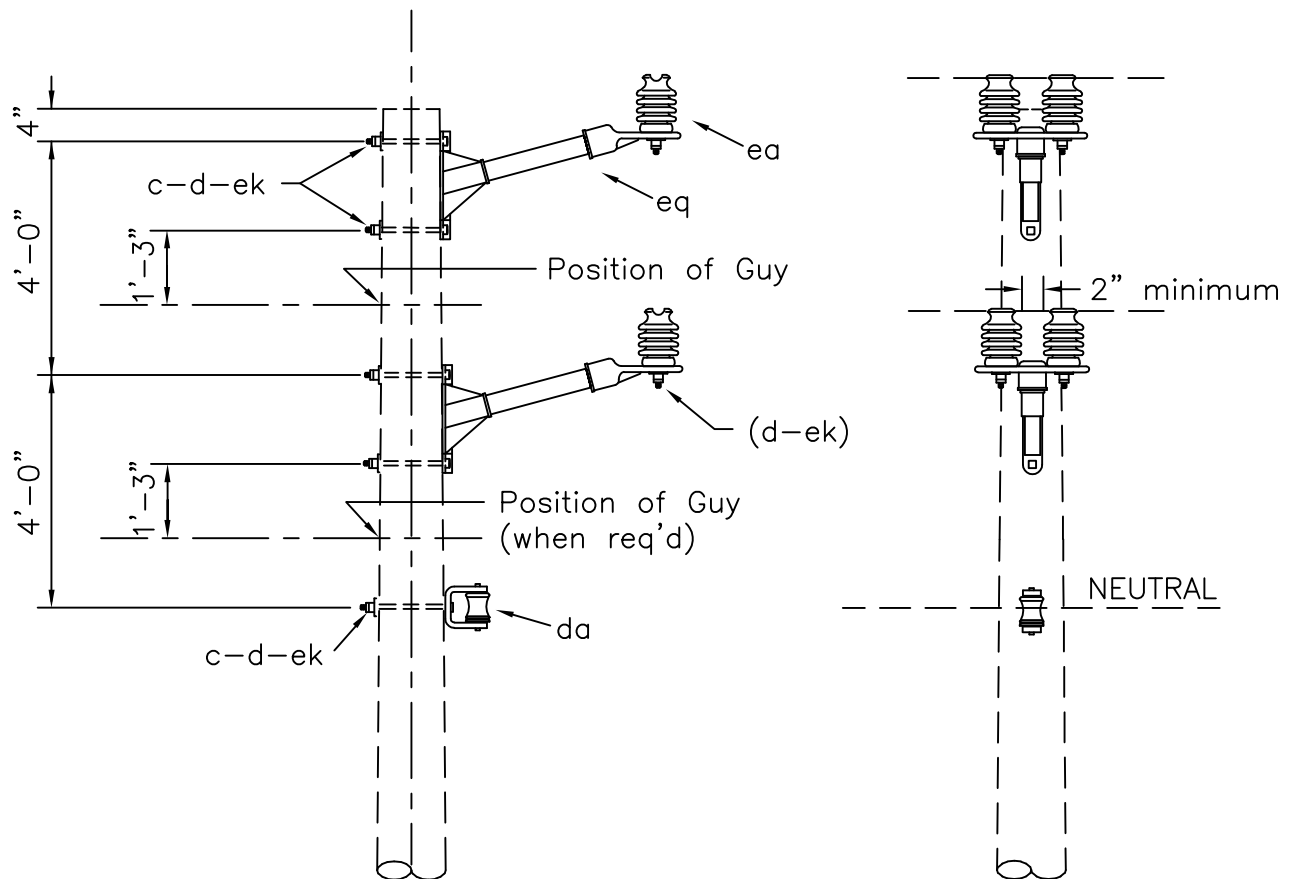
DOUBLE SUPPORT-NARROW PROFILE

APRIL 2005

2 - PHASE PRIMARY
12.47/7.2 kV

RUS

B2.9N



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

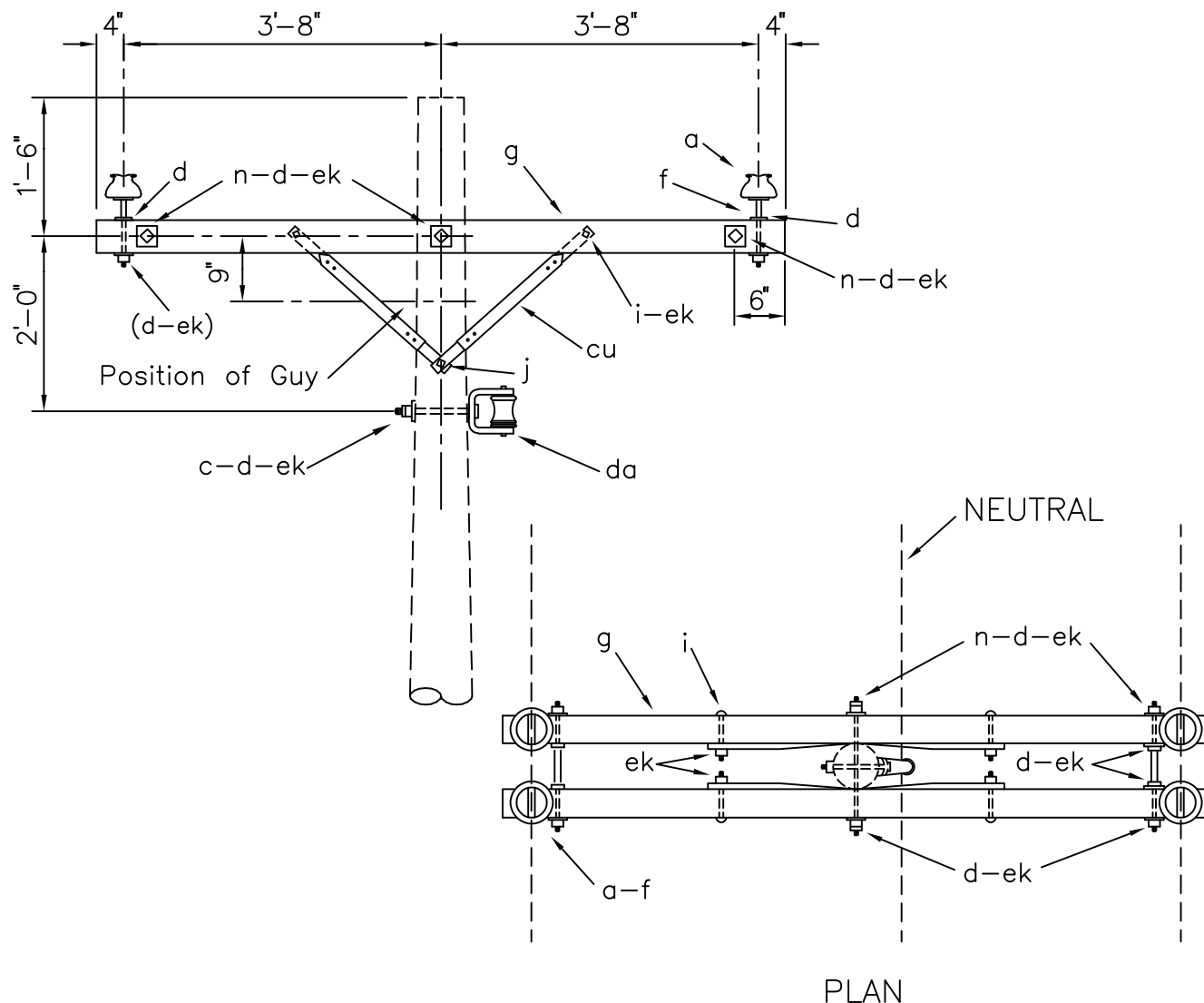
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

2 - PHASE PRIMARY
12.47/7.2 kV

RUS

B2.9NP



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

RUS

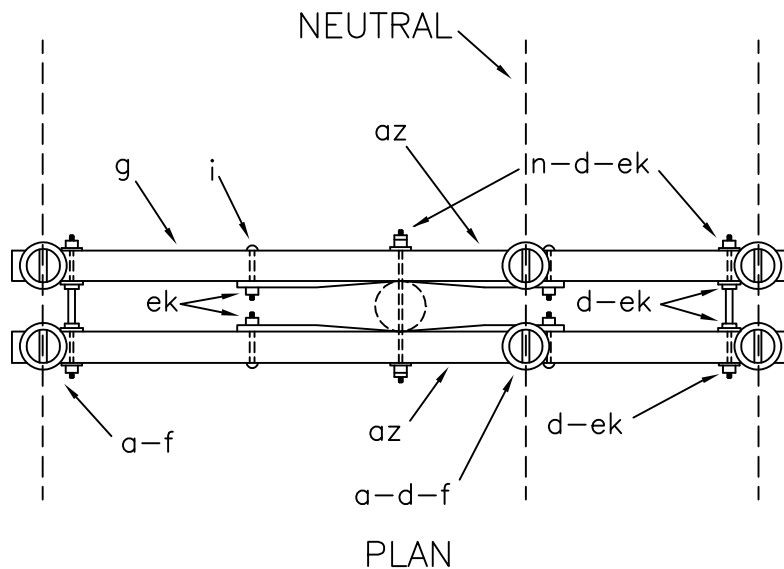
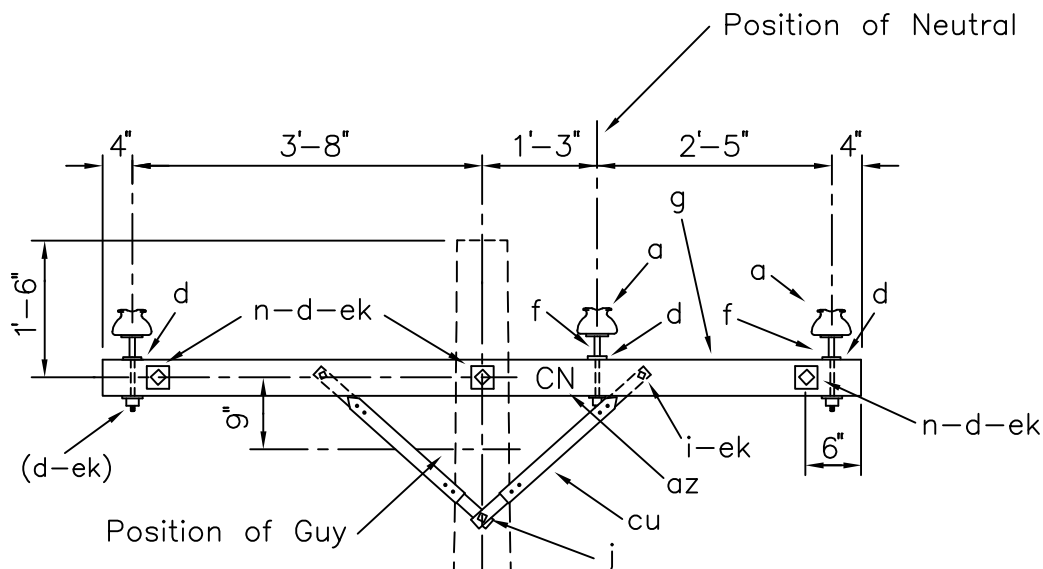
2 - PHASE PRIMARY
12.47/7.2 kV

B2.21
(B2)



DESIGN PARAMETERS:
See TABLE IV

B2.21P
(B2P)



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

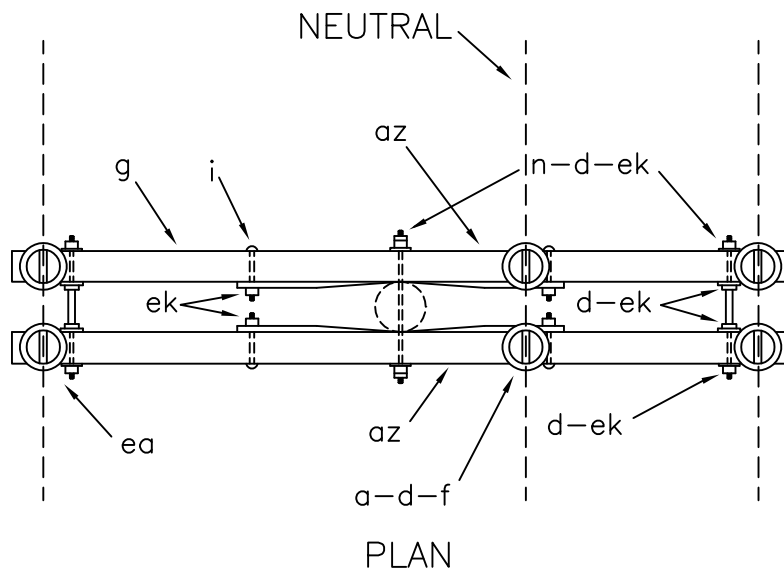
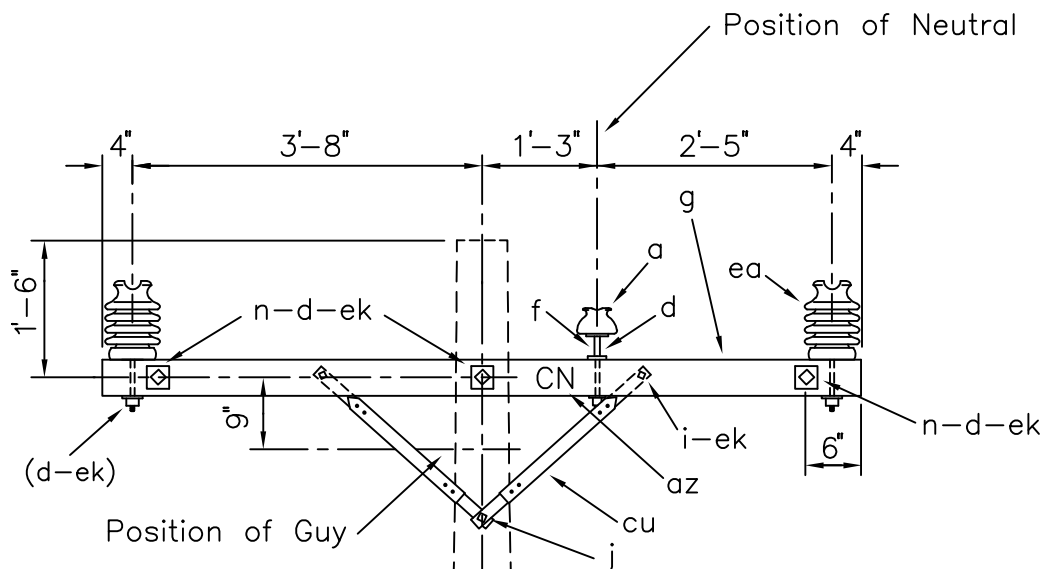
DOUBLE SUPPORT, NEUTRAL ON CROSSARMS

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.22
(B9)



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

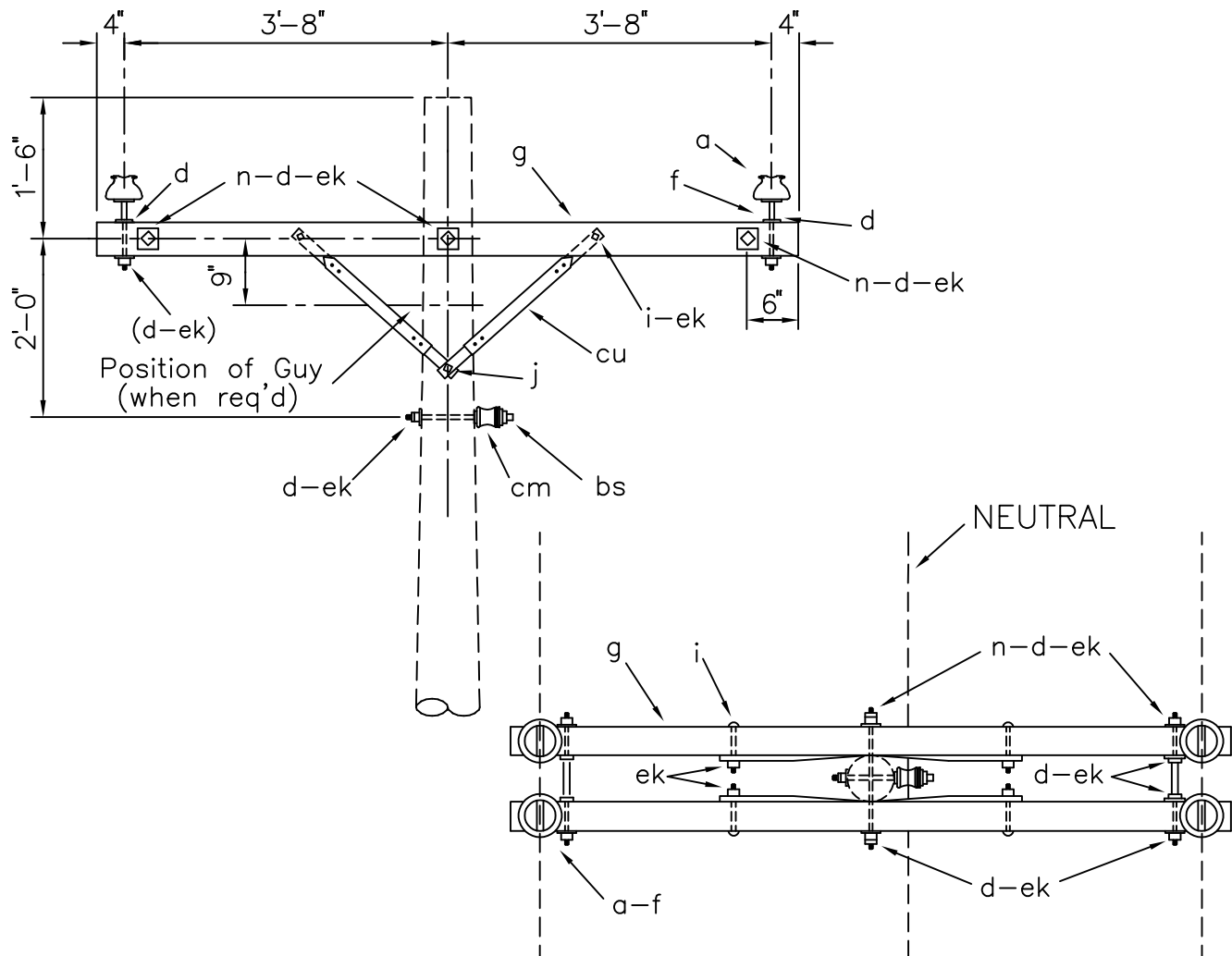
DOUBLE SUPPORT, NEUTRAL ON CROSSARMS
(POST INSULATORS)

APRIL 2005

RUS

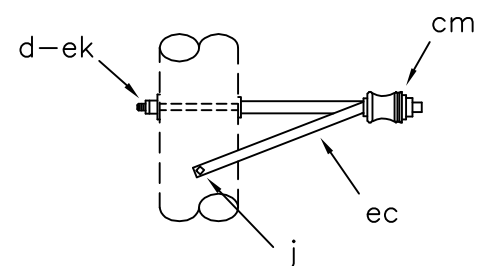
2 - PHASE PRIMARY
12.47/7.2 kV

B2.22P
(B9P)



NOTE: These assemblies used for
NESC Grade B construction.

PLAN



Specify B2.25 for
offset neutral assembly

ASSEMBLY: B2.

ITEM	MATERIAL	24 QTY	25 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

DESIGN PARAMETERS:

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

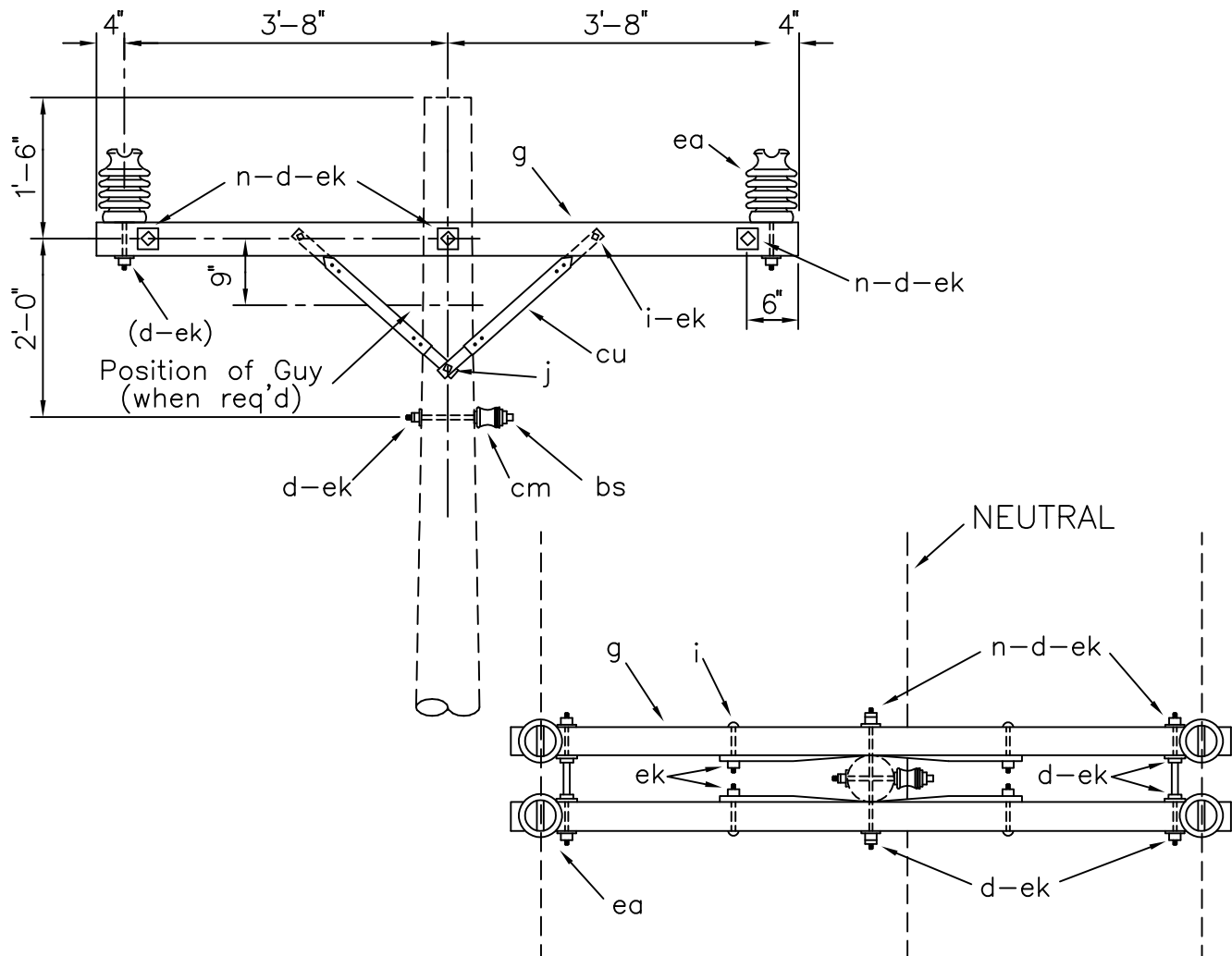
DOUBLE SUPPORT ON CROSSARMS—TANGENT

APRIL 2005

RUS

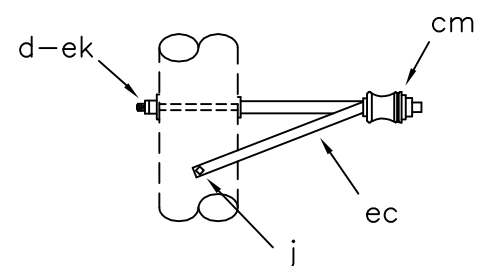
2 — PHASE PRIMARY
12.47/7.2 kV

B2.24,B2.25
(B1-1,B1-1A)



NOTE: These assemblies used for
NESC Grade B construction.

PLAN



Specify B2.25P for
offset neutral assembly

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

DESIGN PARAMETERS:

MAXIMUM LINE ANGLES:

5°-Small Conductors

2°-Larger than #1/0

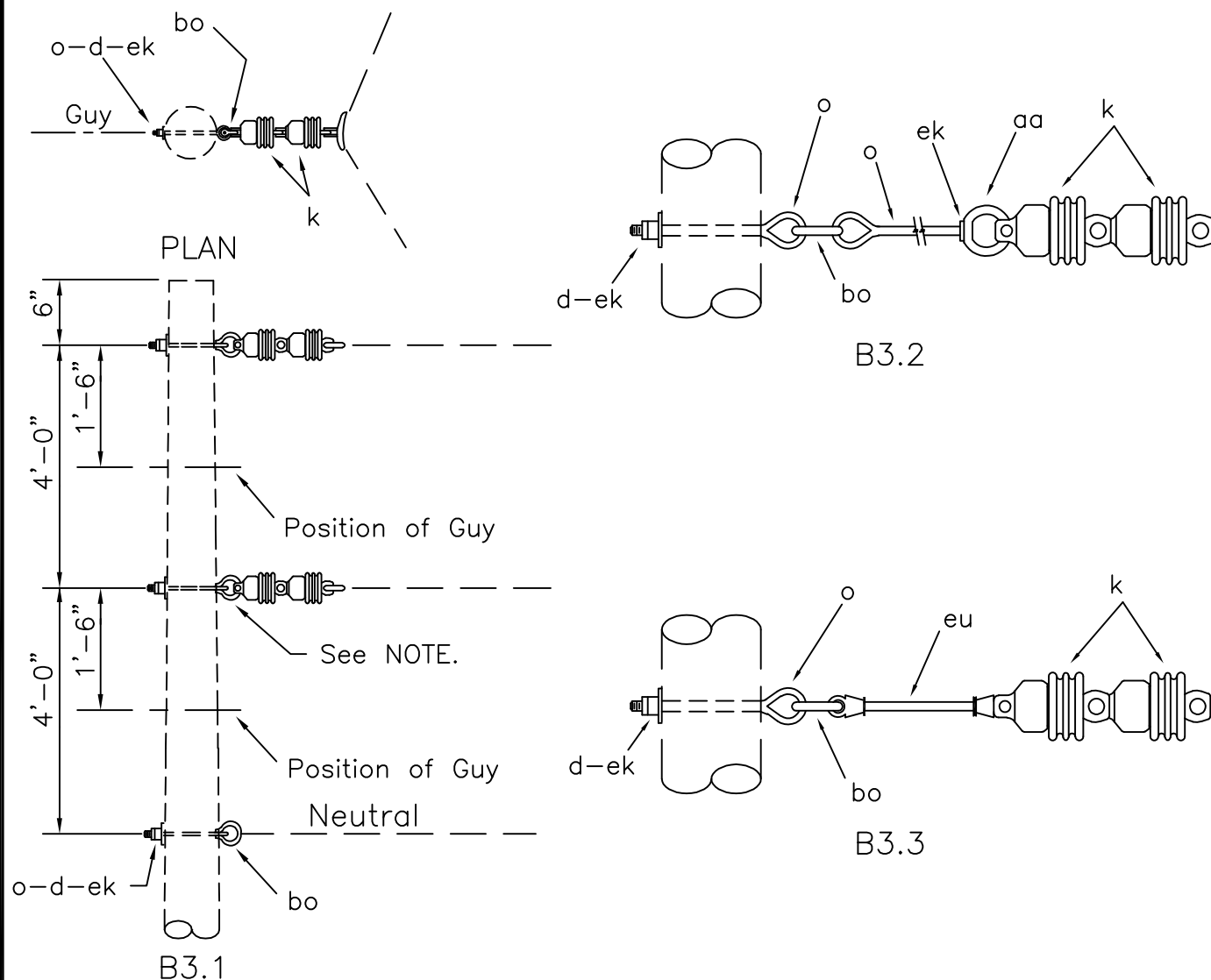
DOUBLE SUPPORT ON CROSSARMS-TANGENT
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B2.24P,B2.25P
(B1-1P,B1-1AP)



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	Link, extension, insulated			2
(du)	(Link, extension) - (optional)			(2)

DESIGN PARAMETERS:

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

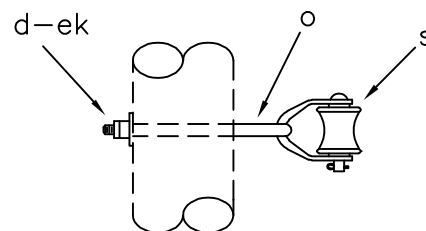
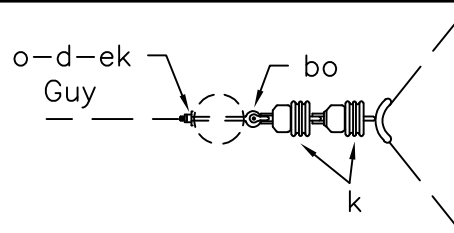
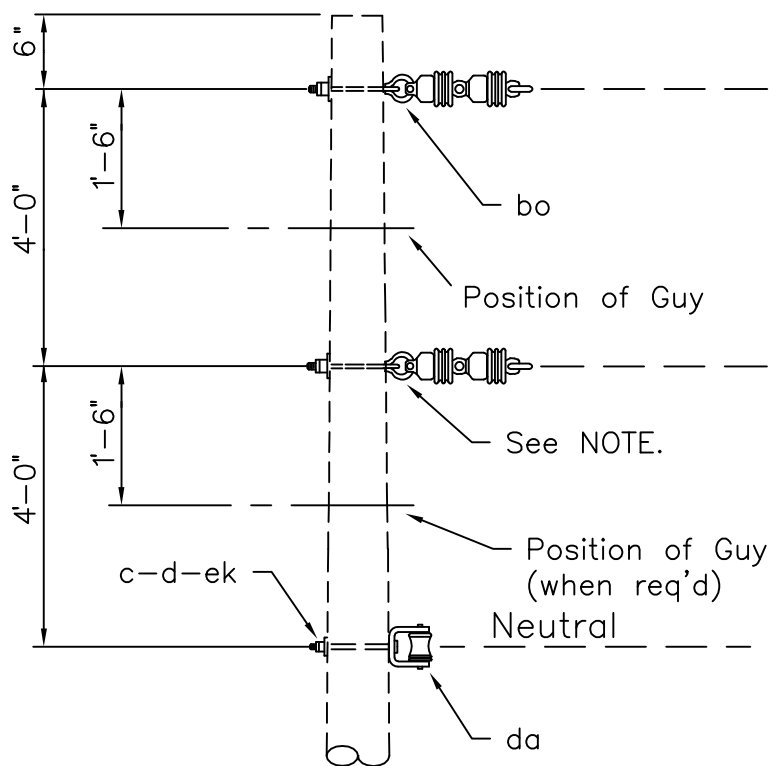
SUSPENSION ANGLE

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B3.1,B3.2,B3.3
(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	Link, extension, insulated			2			2
(du)	(Link, extension) – (optional)			(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

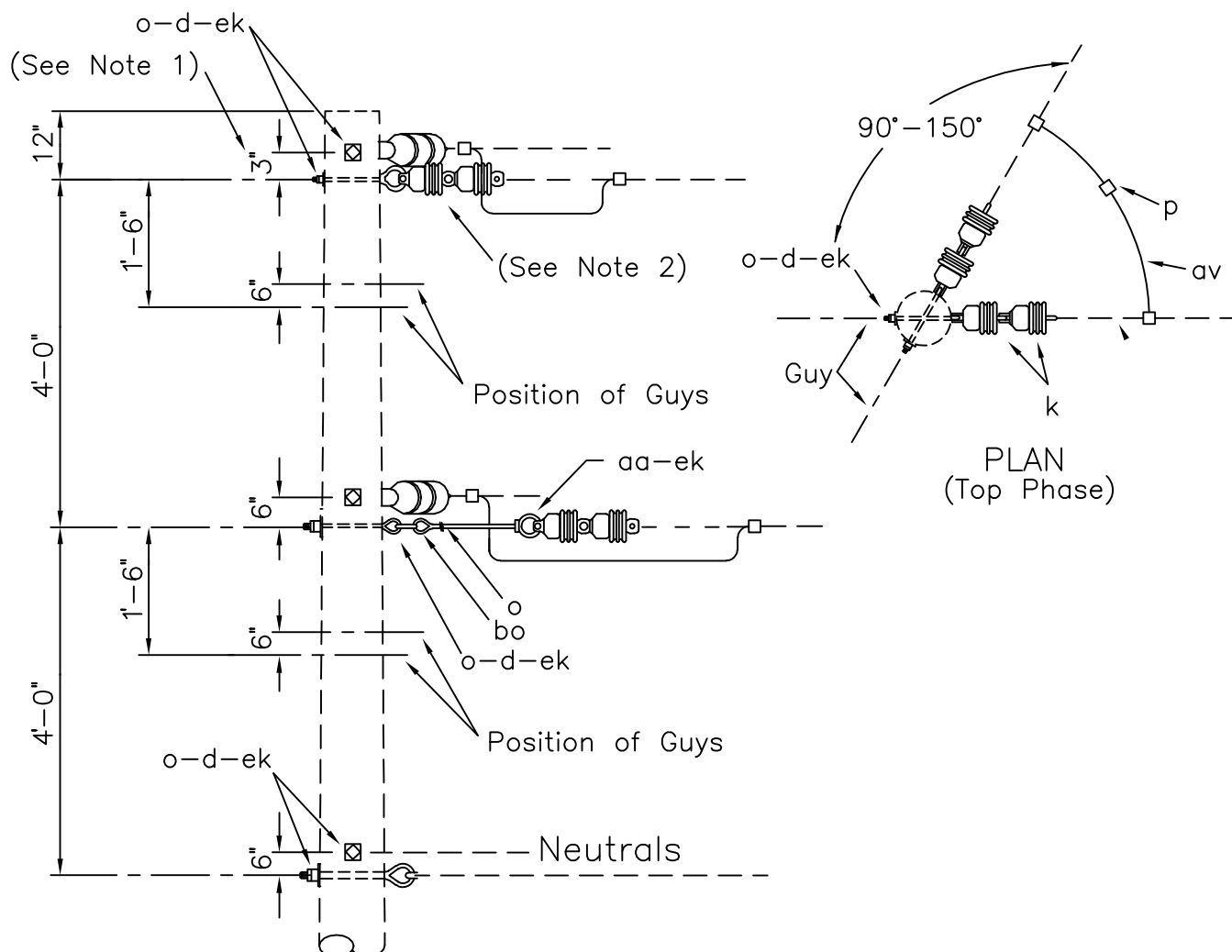
SUSPENSION ANGLE

APRIL 2005

RUS

2 – PHASE PRIMARY
 12.47/7.2 kV

B3.4 – B3.9



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

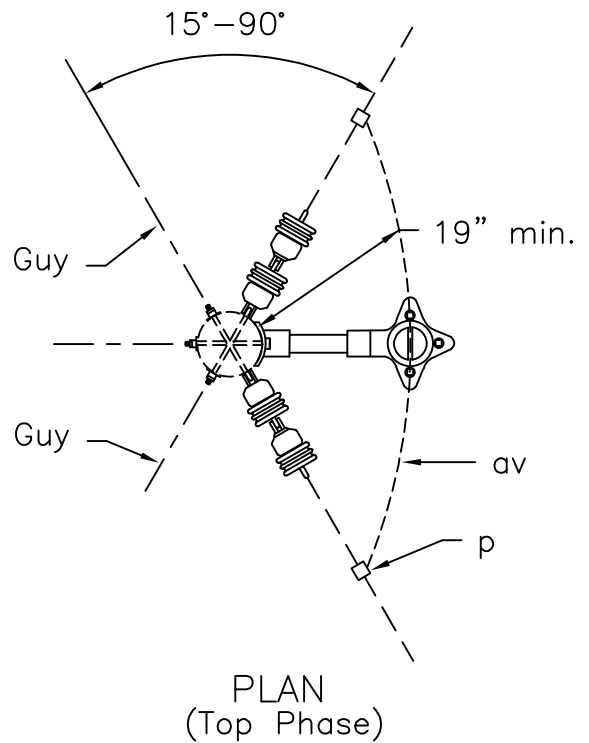
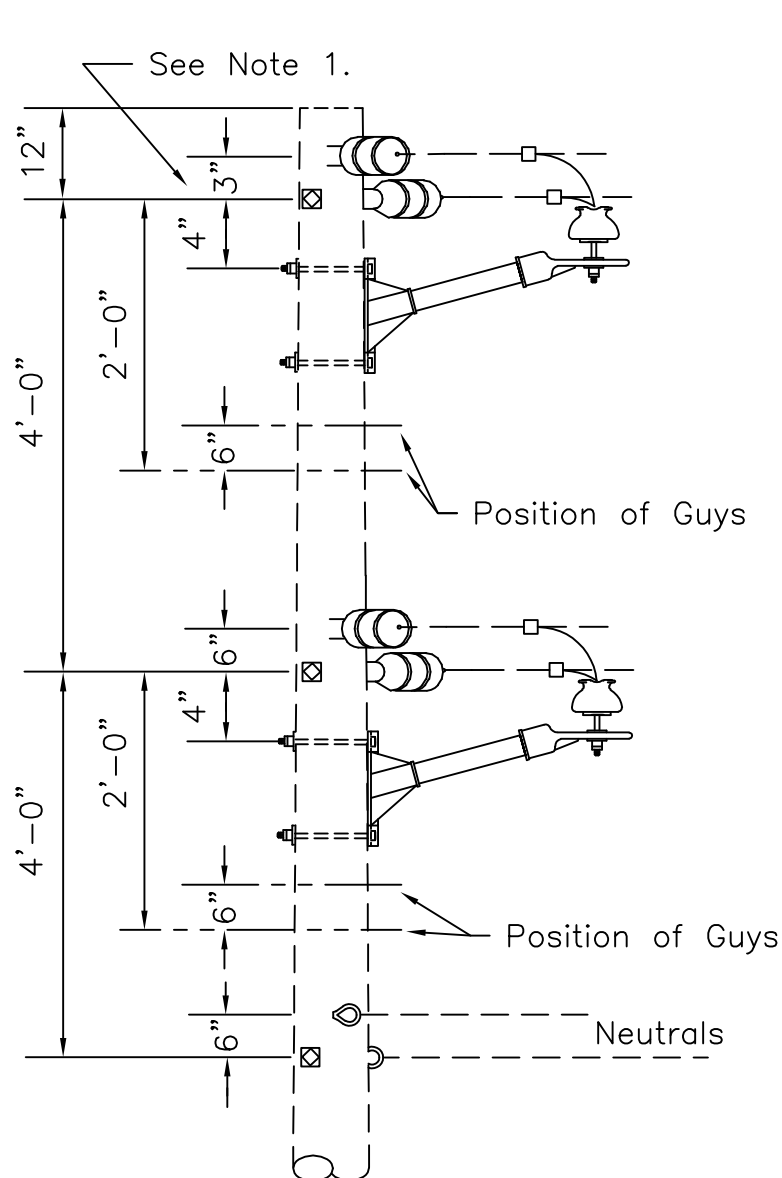
DEADEND ANGLE GUIDE (90°–150°)

APRIL 2005

RUS

2 – PHASE PRIMARY
12.47/7.2 kV

B4.1G
(B4–1)



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

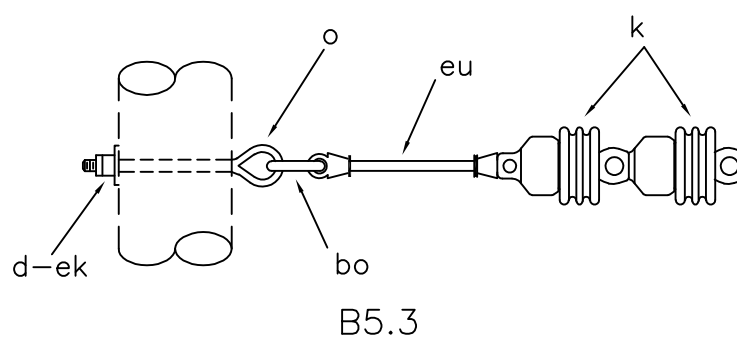
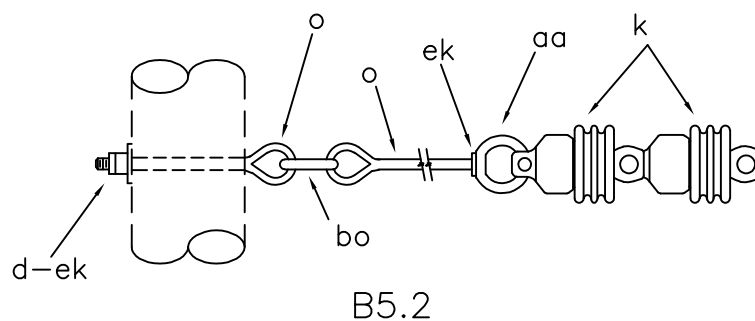
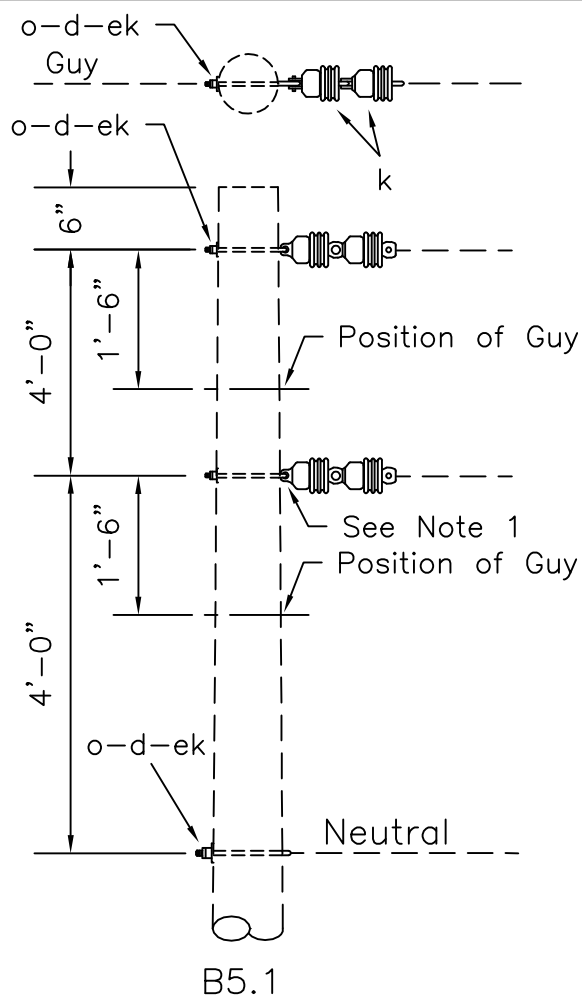
DEADEND ANGLE GUIDE (15°-90°)

APRIL 2005

RUS

2 – PHASE PRIMARY
12.47/7.2 kV

B4.2G



- 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	Link, extension, insulated			2
(du)	(Link, extension) - (optional)			(2)

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

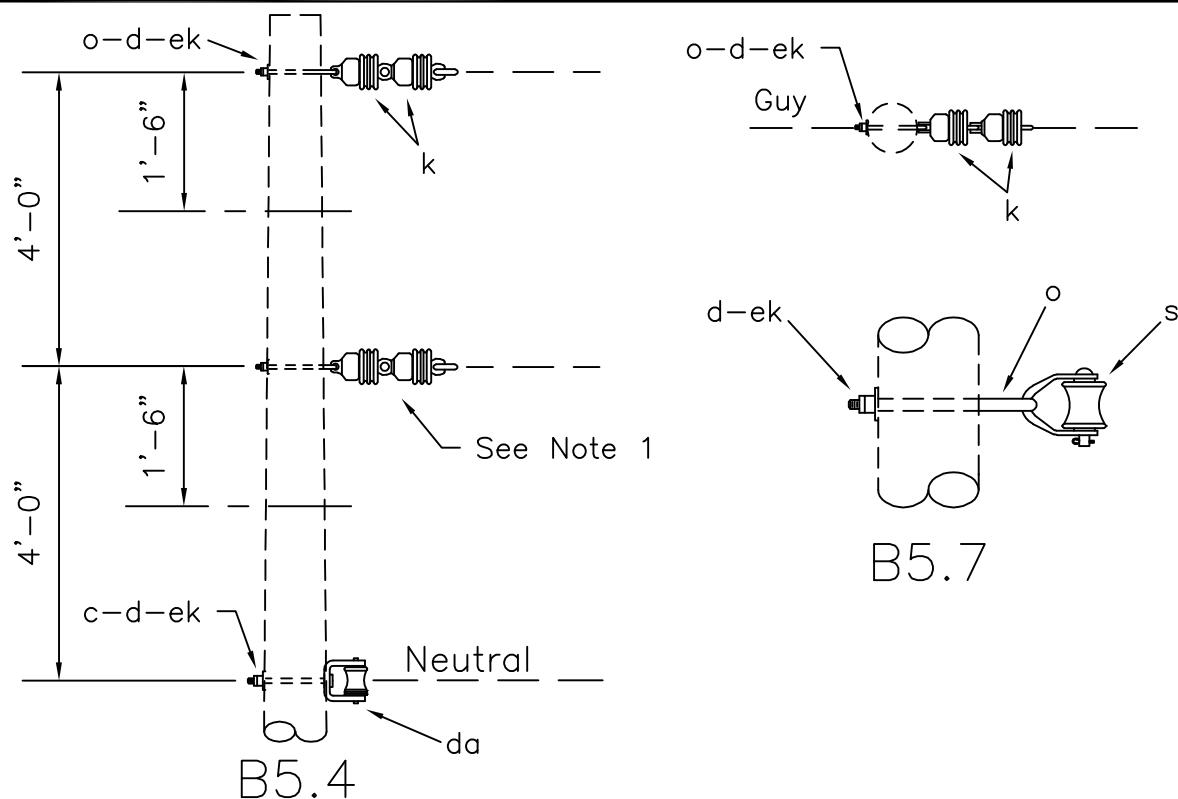
SINGLE DEADENDS

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B5.1,B5.2,B5.3
(B5-1)



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 subassembly "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	Link, extension, insulated			2			2
(du)	(Link, extension) – (optional)			(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

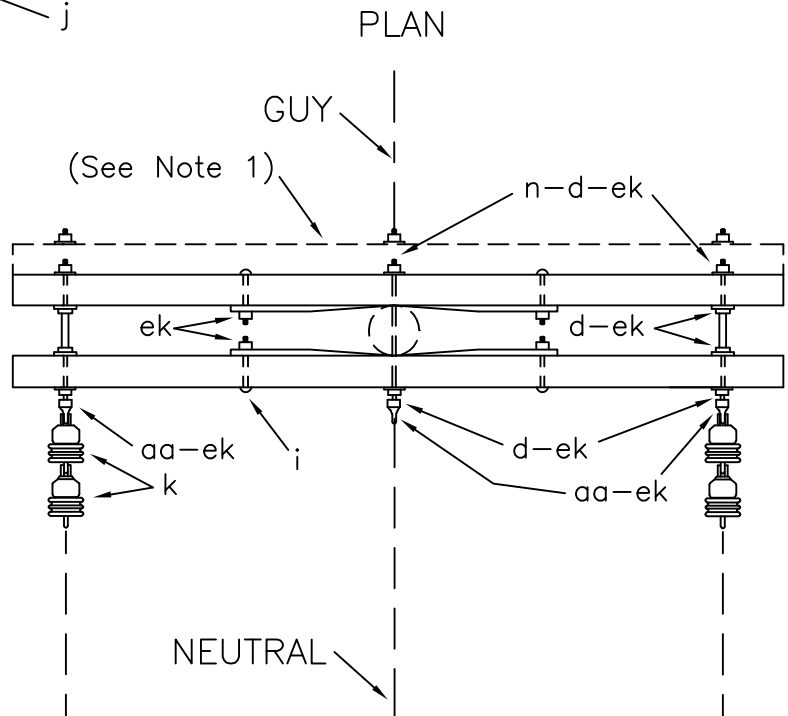
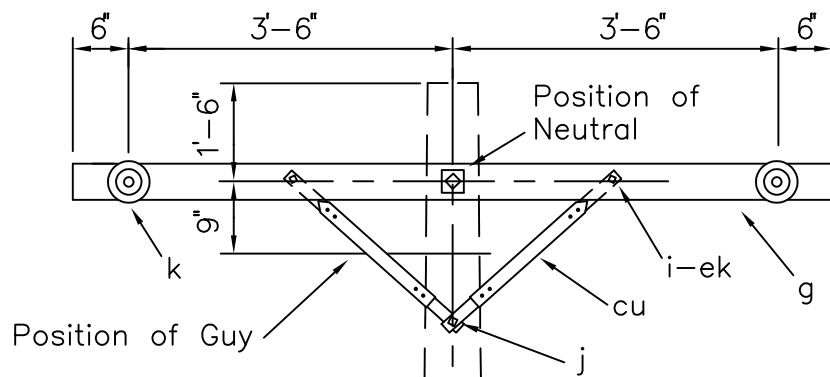
SINGLE DEADENDS

APRIL 2005

RUS

2 – PHASE PRIMARY
 12.47/7.2 kV

B5.4 – B5.9



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)

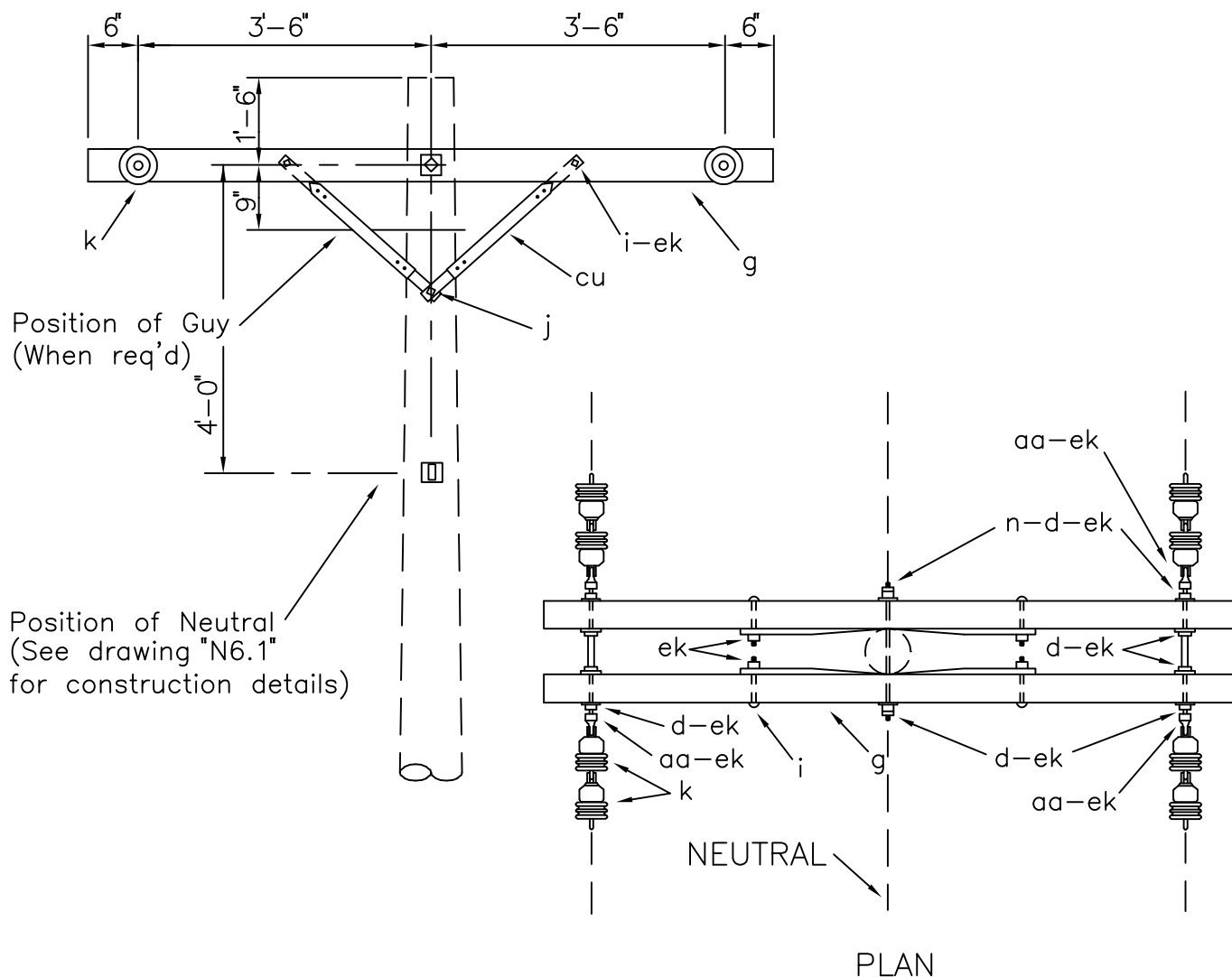
SINGLE DEADEND ON CROSSARMS

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B5.21 (B7)
B5.31 (B7-1)



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

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

B6.21 (B8)

INDEX C

THREE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
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

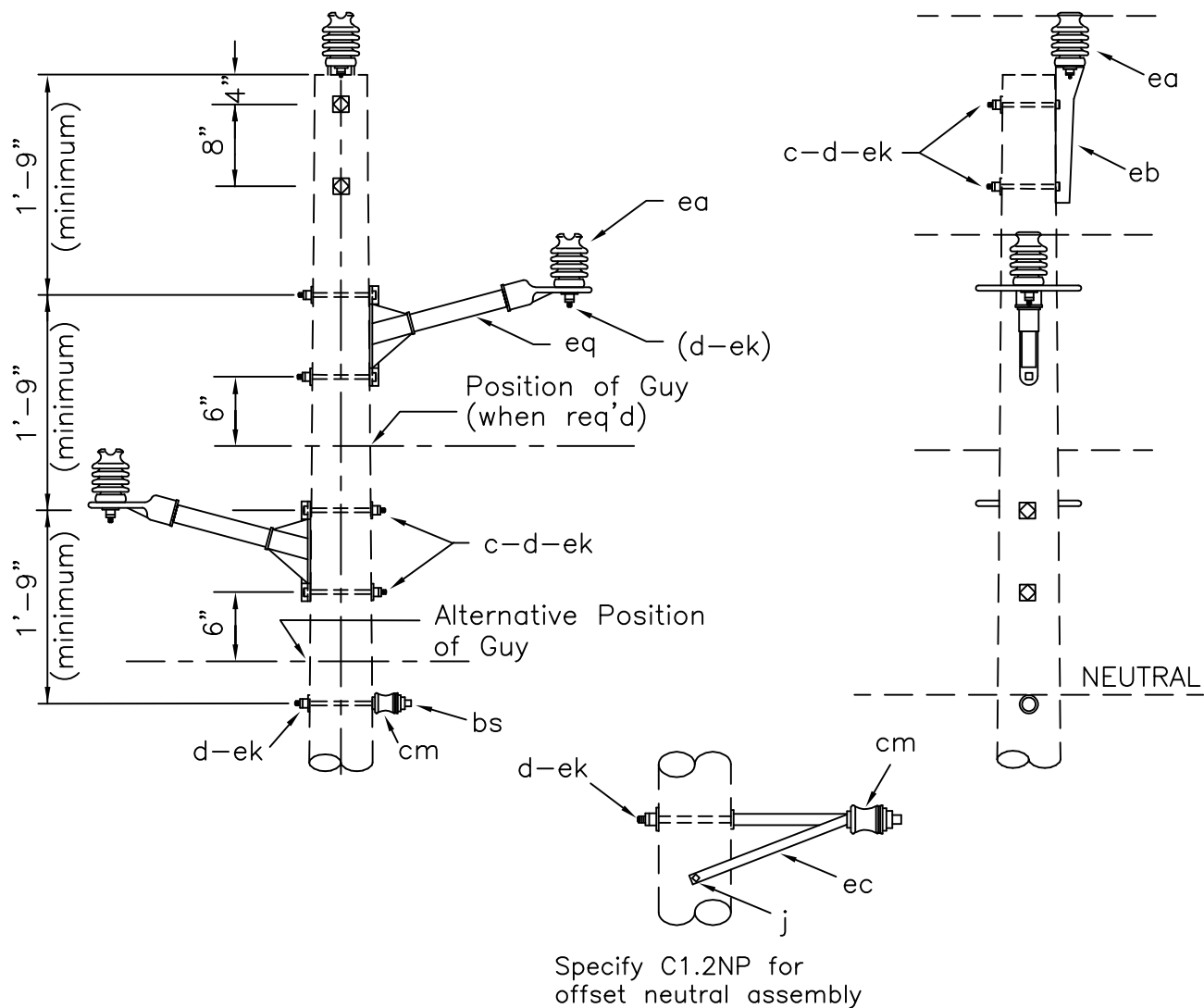
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
C1.41	(C9-1)	SINGLE SUPPORT, NEUTRAL ON CROSSARM
C1.41L	(C9-3)	SINGLE SUPPORT, NEUTRAL ON CROSSARM (LARGE CONDUCTORS)
C1.41P	(C9-1P)	SINGLE SUPPORT, NEUTRAL ON CROSSARM (POST INSULATORS)
C1.81G		THREE-PHASE 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

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
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

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
C4.1G	((C4-1))	DEADEND GUIDE (90° – 150°)
C4.2G		DEADEND GUIDE (15° – 90°)
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



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

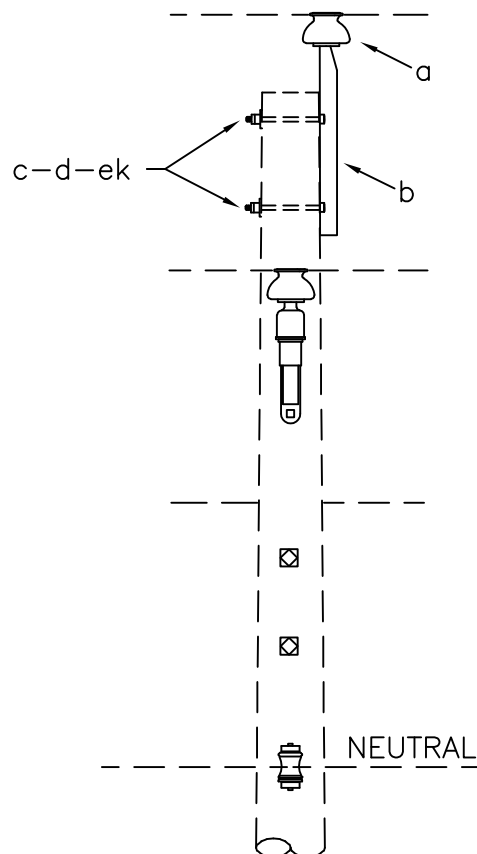
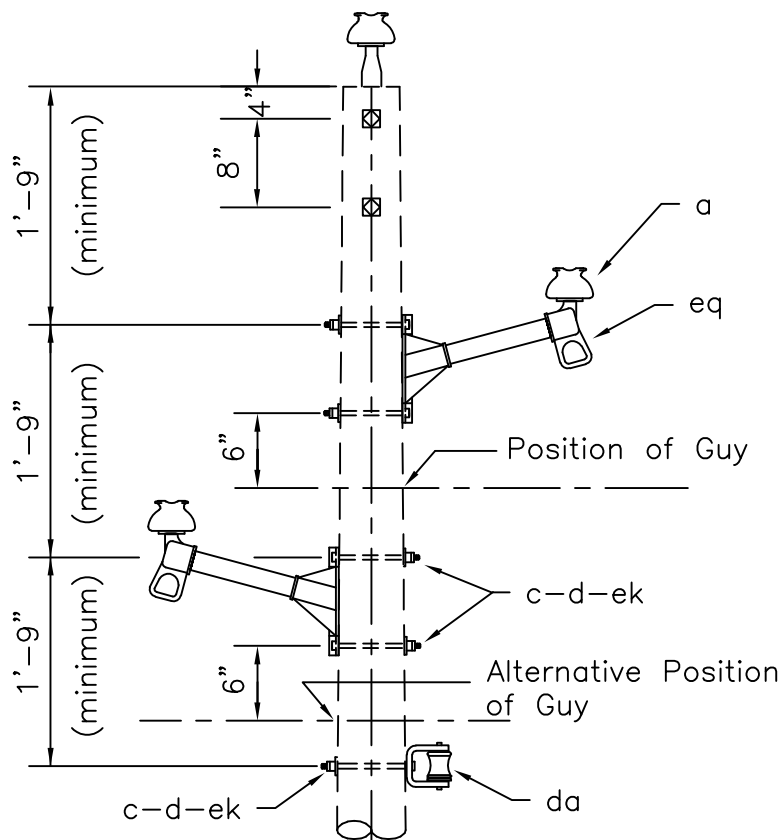
SINGLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.1NP
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

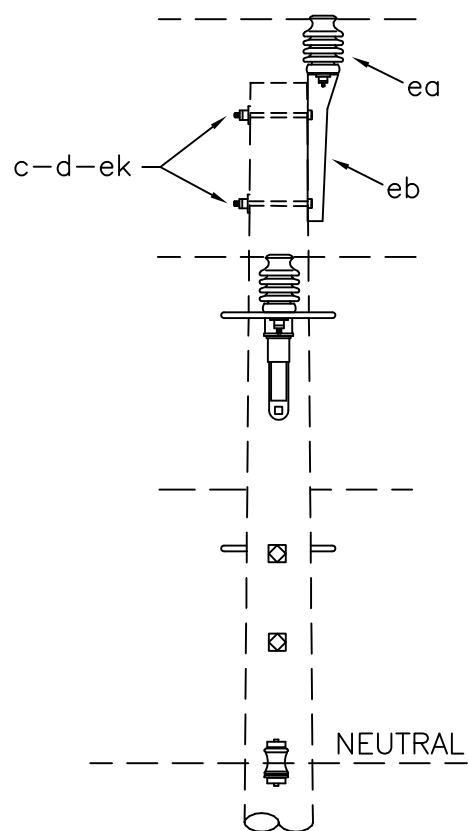
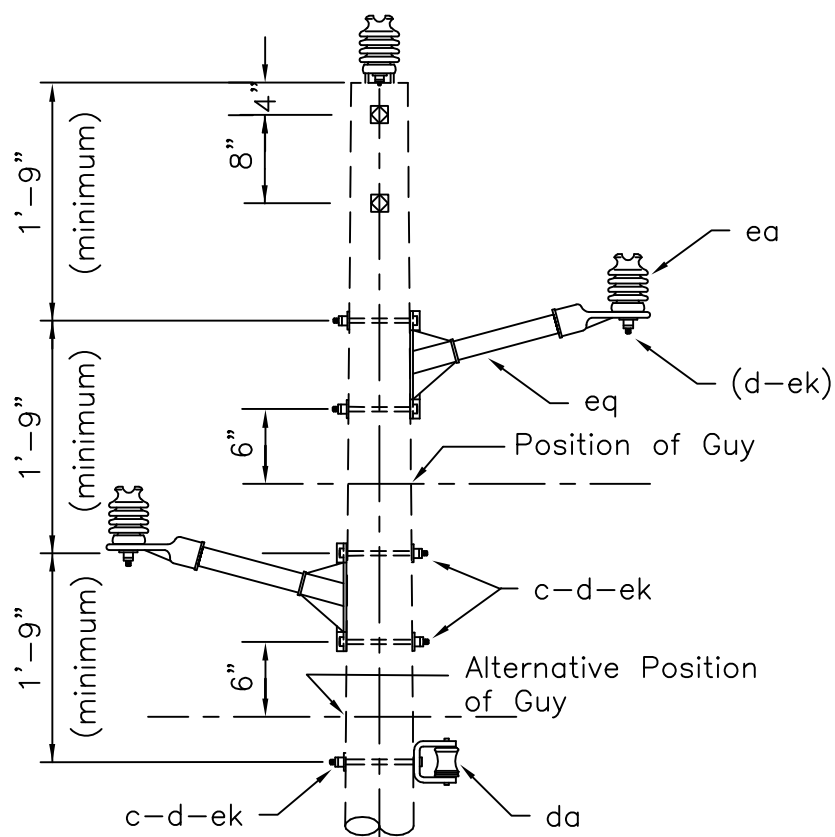
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.3N



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

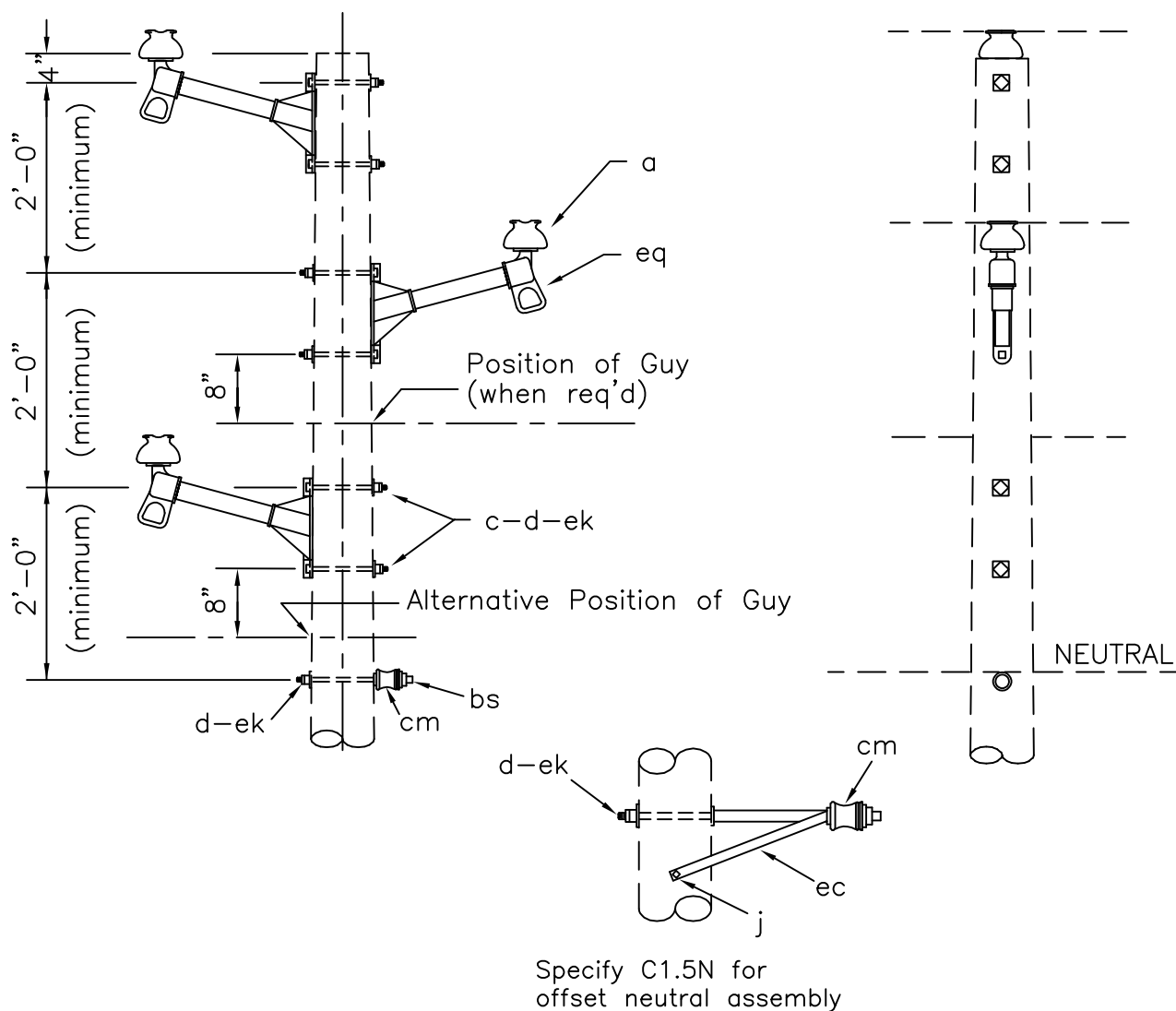
SINGLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.3NP



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)
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

(If req'd)

Design Parameters:

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

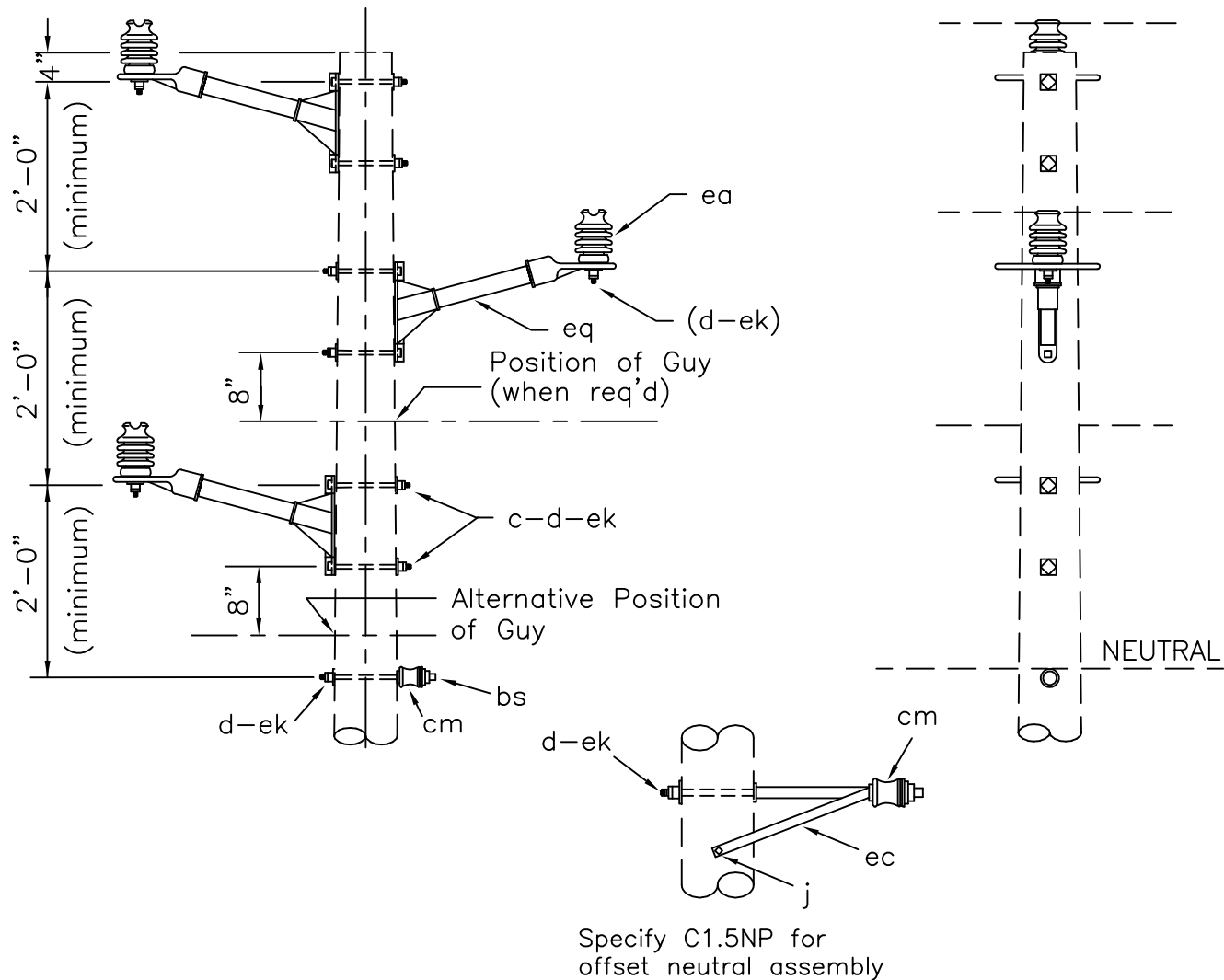
SINGLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.4N
C1.5N



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

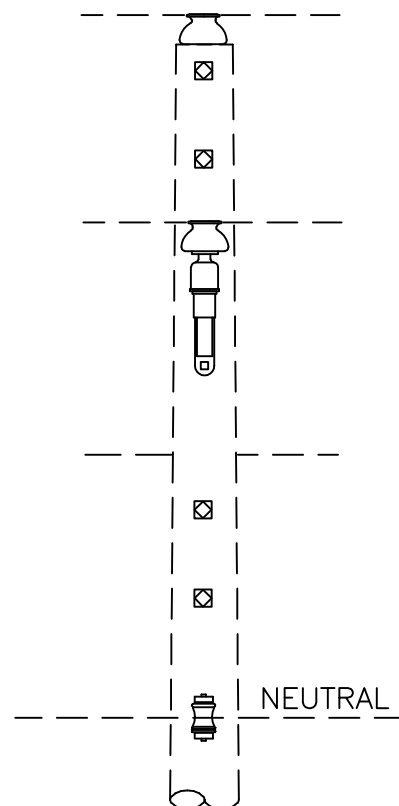
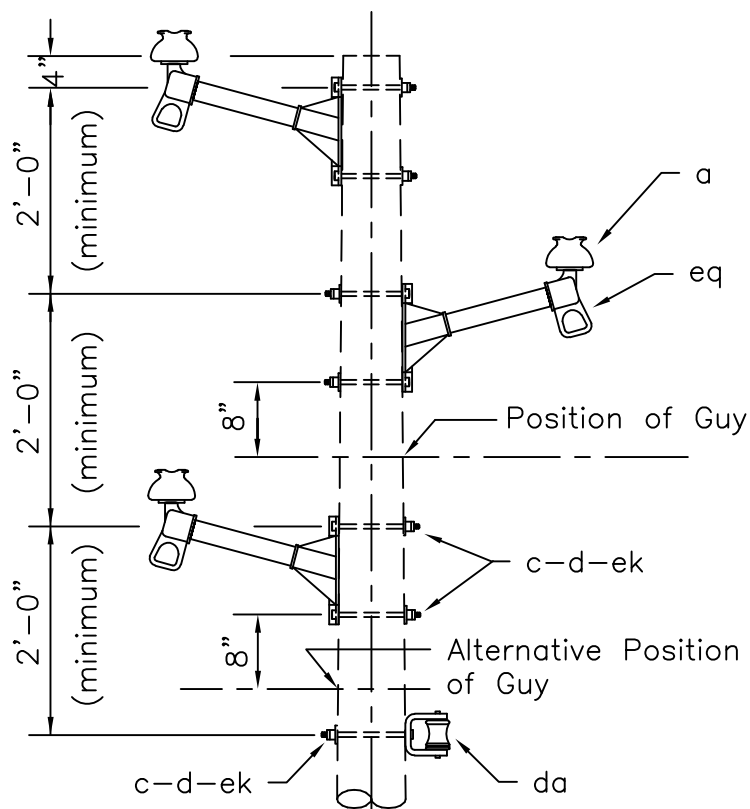
SINGLE SUPPORT—NARROW PROFILE
 (TANGENT) (POST INSULATORS)

APRIL 2005

RUS

3 — PHASE PRIMARY
 12.47/7.2 kV

C1.4NP
 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

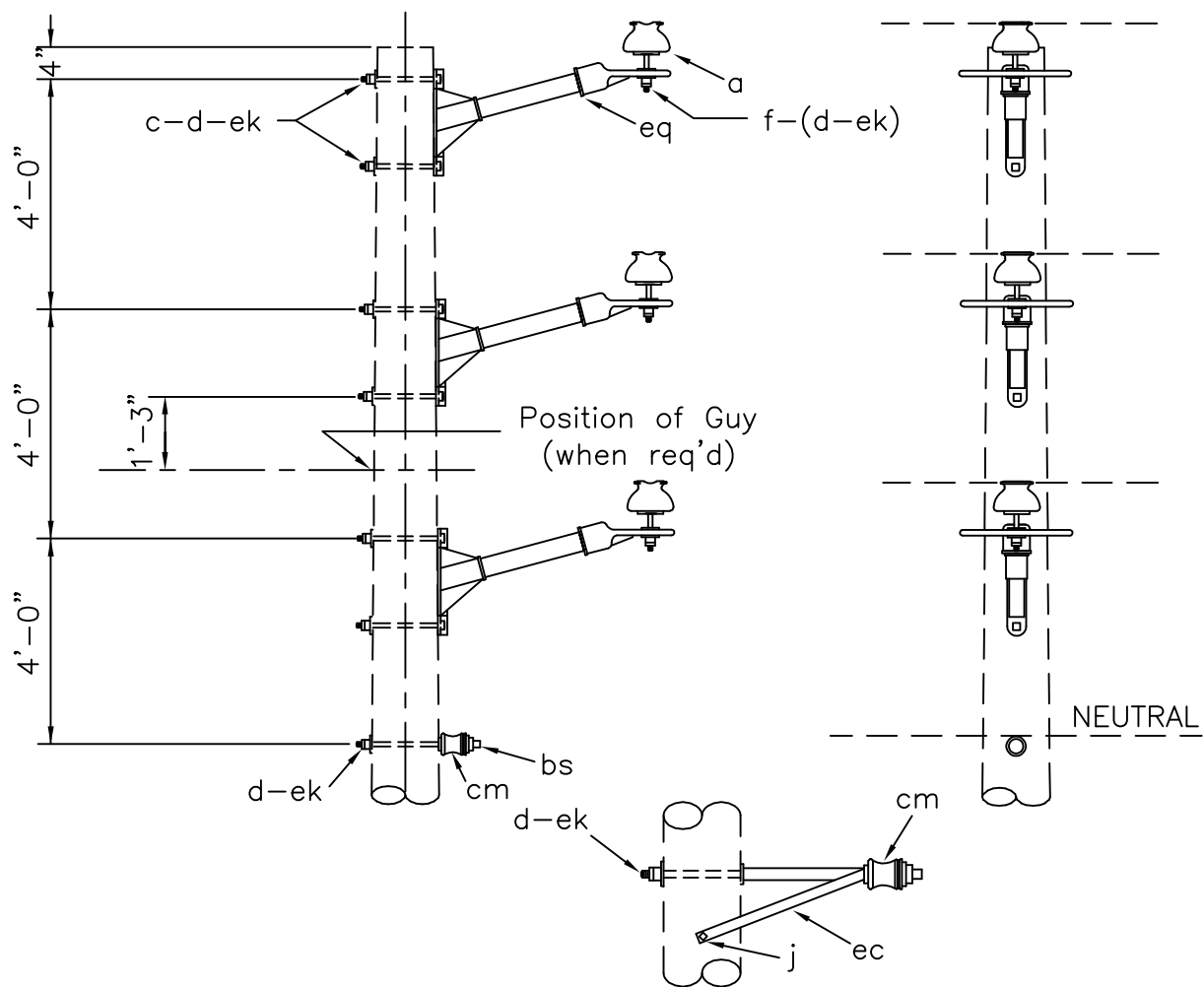
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

3 - PHASE PRIMARY
12.47/7.2 kV

RUS

C1.6N



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)
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

(If req'd)

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

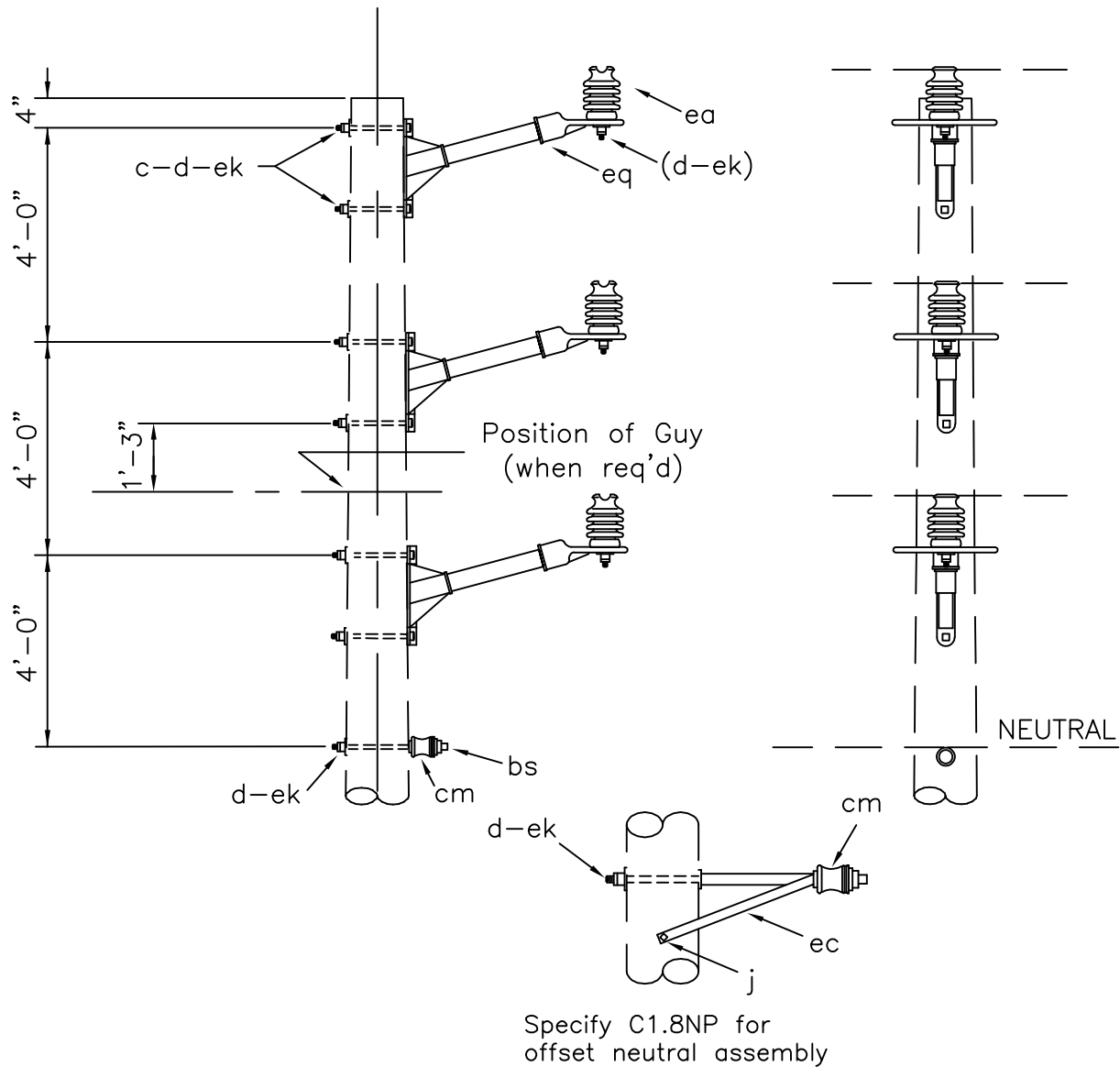
SINGLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.7N
C1.8N



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

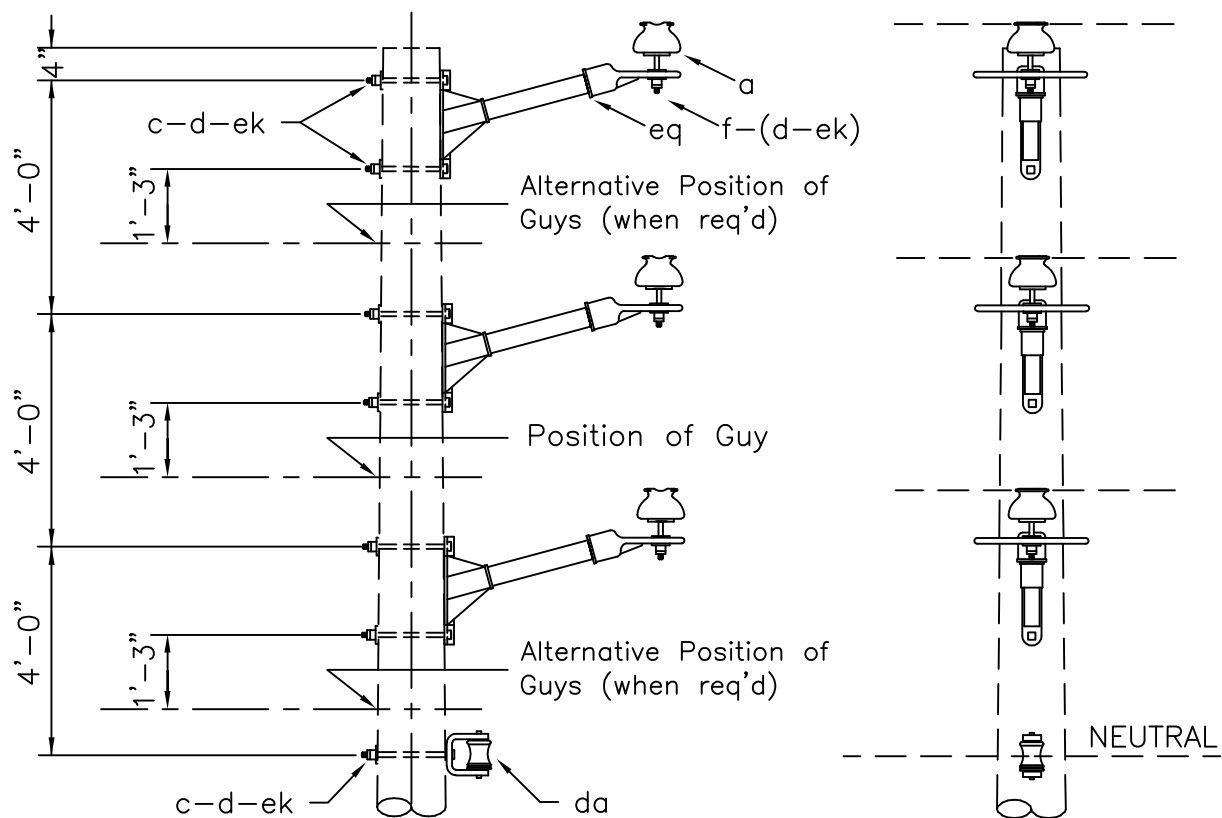
SINGLE SUPPORT-NARROW PROFILE (TANGENT) (POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.7NP
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

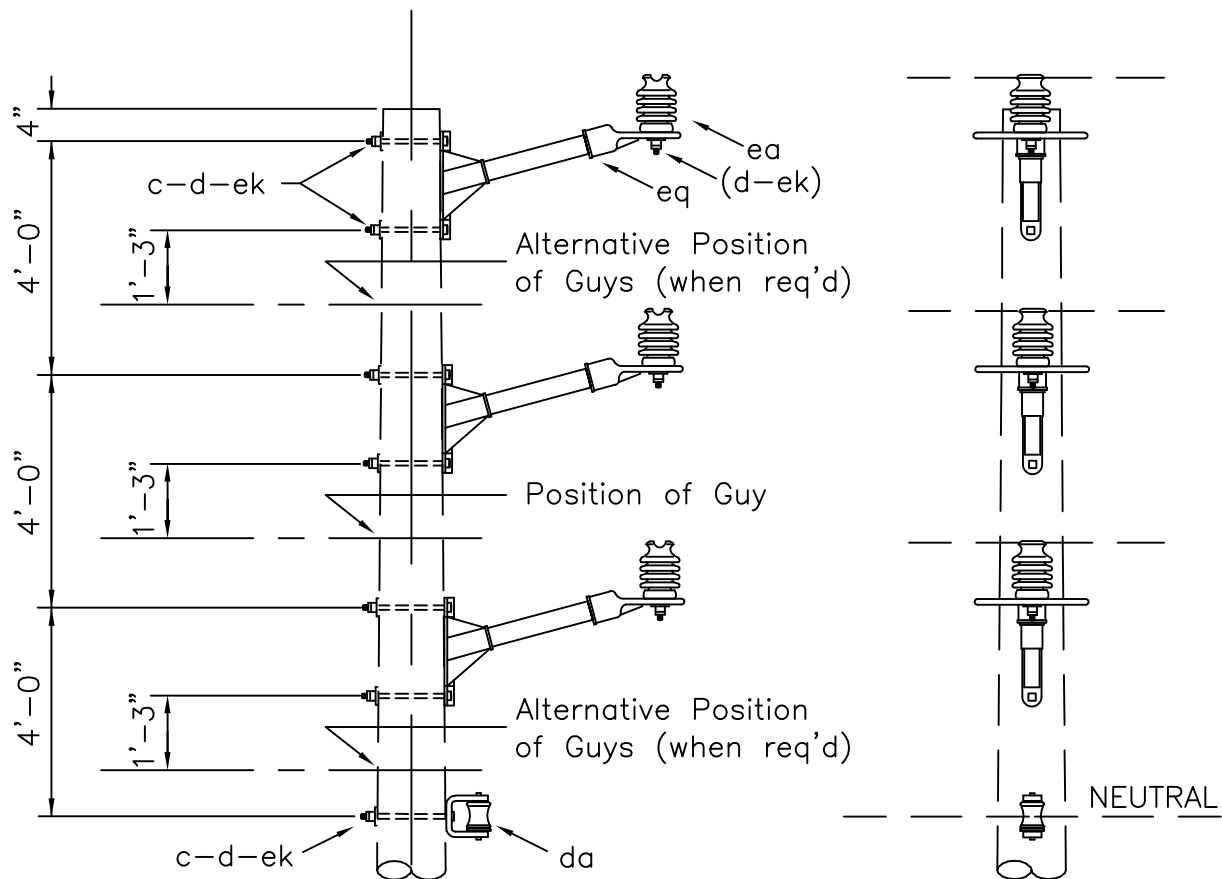
SINGLE SUPPORT-NARROW PROFILE

APRIL 2005

3 - PHASE PRIMARY
12.47/7.2 kV

RUS

C1.9N



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

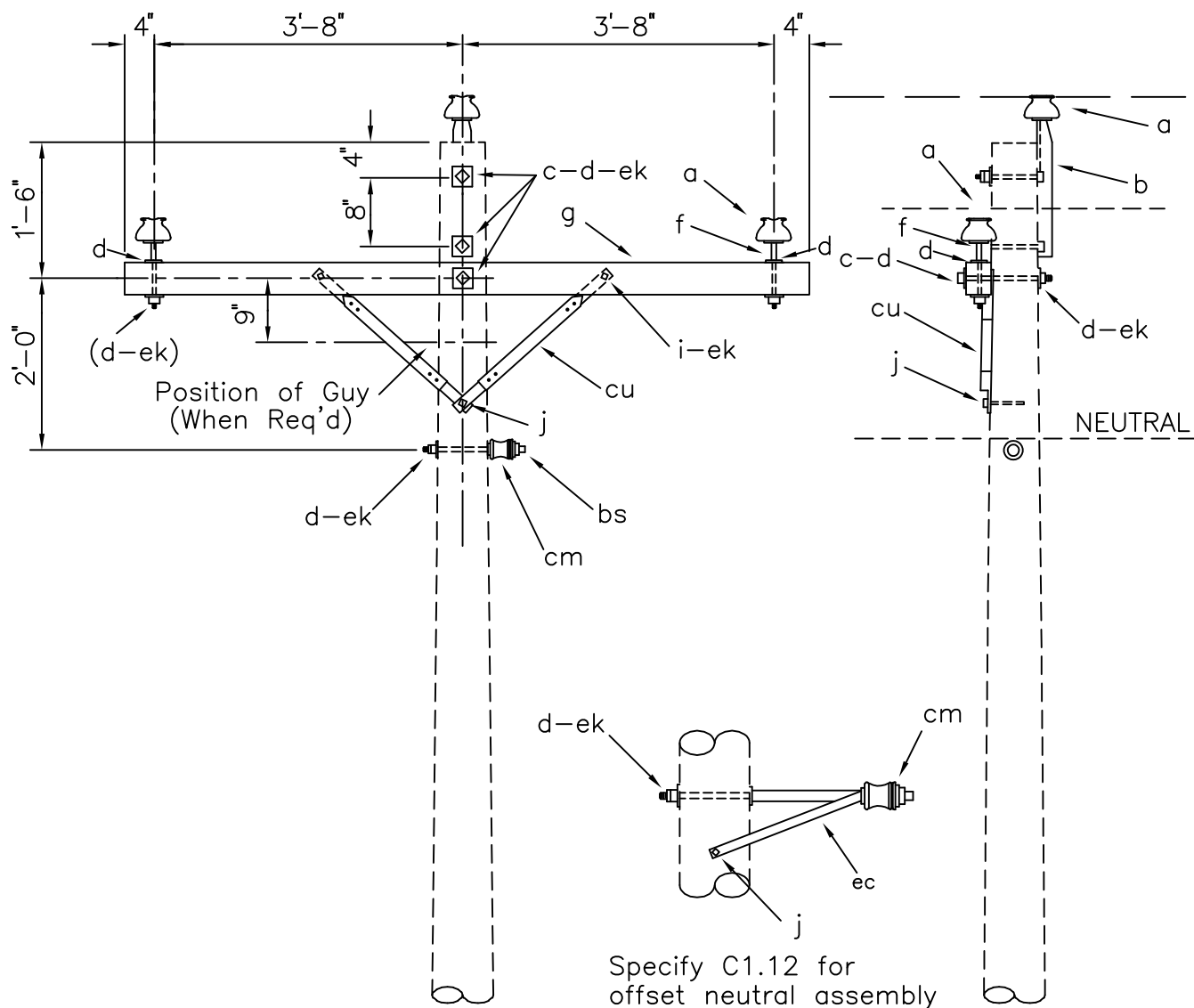
SINGLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.9NP



ASSEMBLY: C1.

ITEM	MATERIAL	11 QTY	12 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

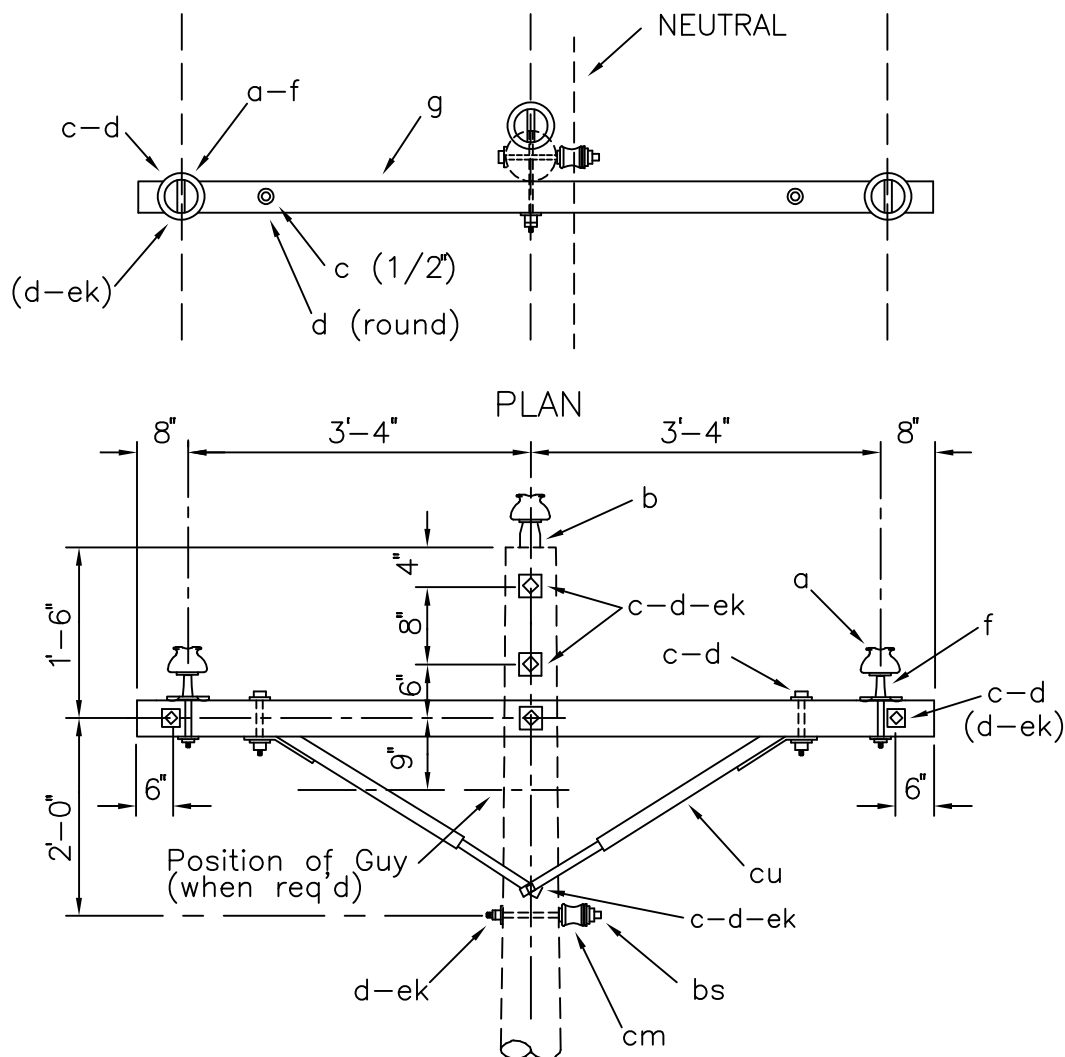
SINGLE SUPPORT ON CROSSARM
(TANGENT)

APRIL 2005

RUS

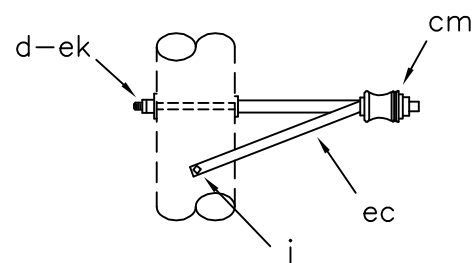
3 - PHASE PRIMARY
12.47/7.2 kV

C1.11 (C1)
C1.12 (C1A)



ASSEMBLY: C1.

ITEM	MATERIAL	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

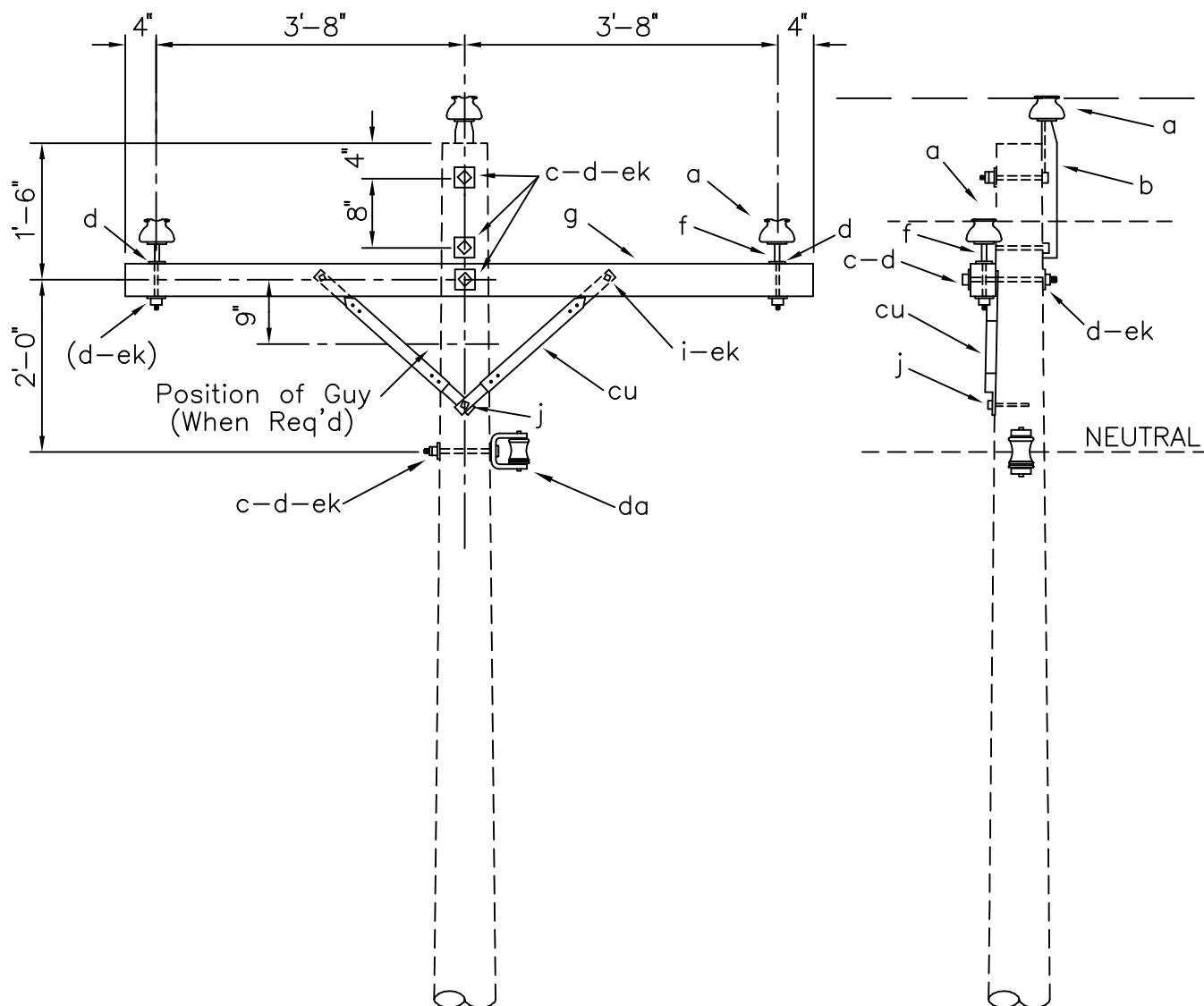
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.11L (C1-2)
C1.12L



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

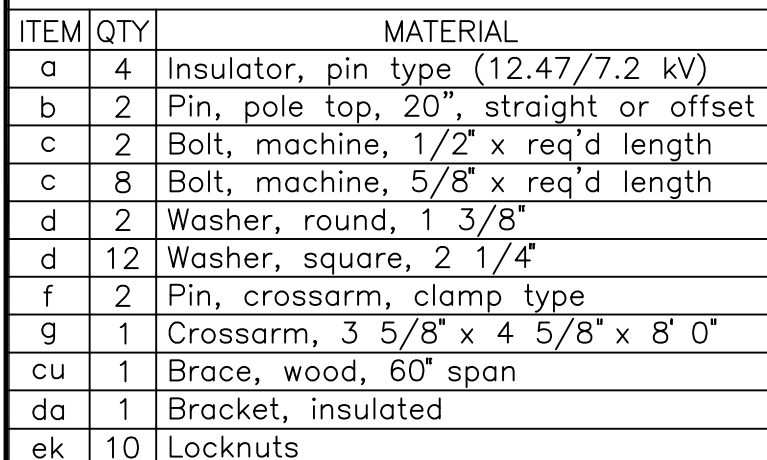
SINGLE SUPPORT ON CROSSARM

APRIL 2005

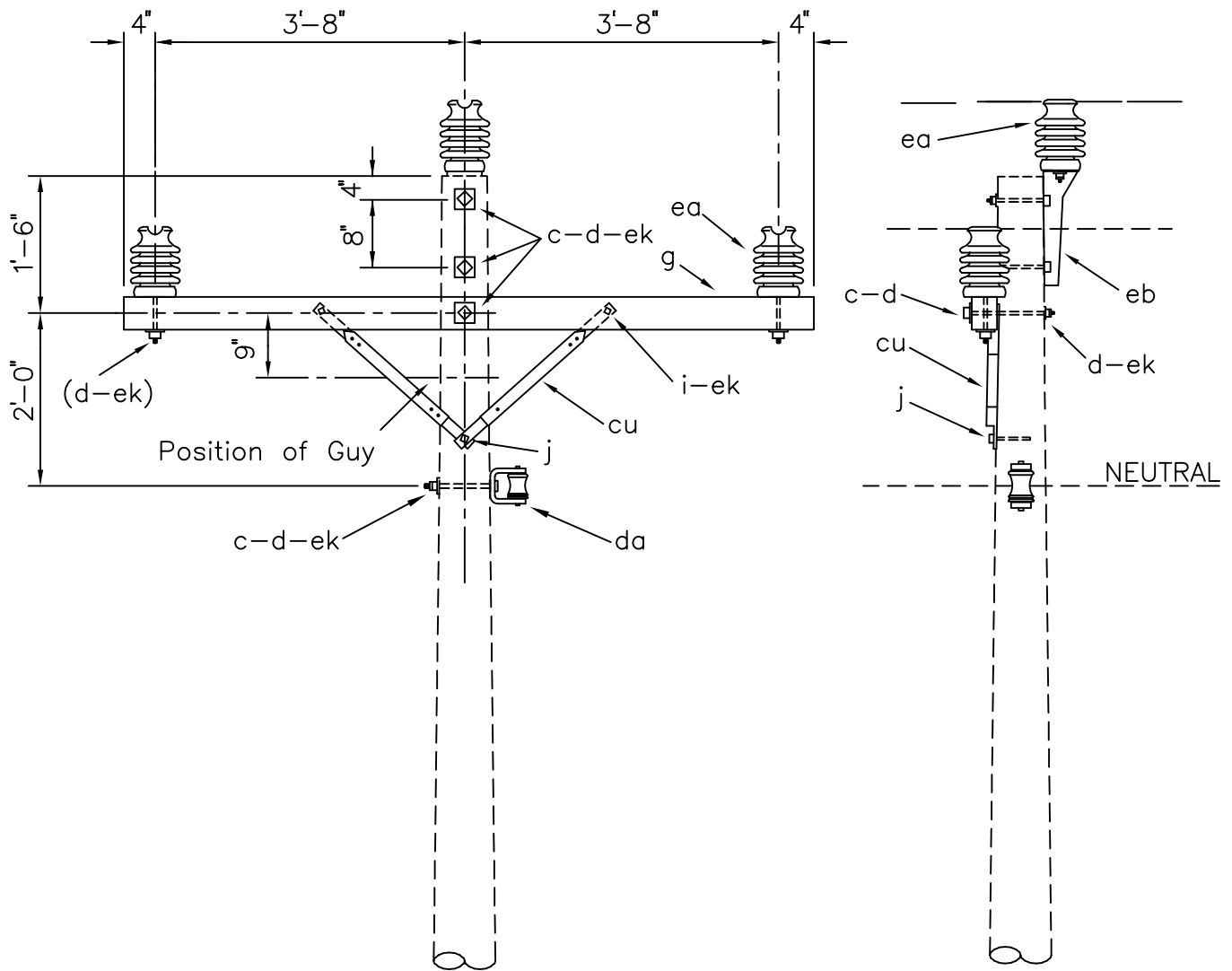
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.13



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

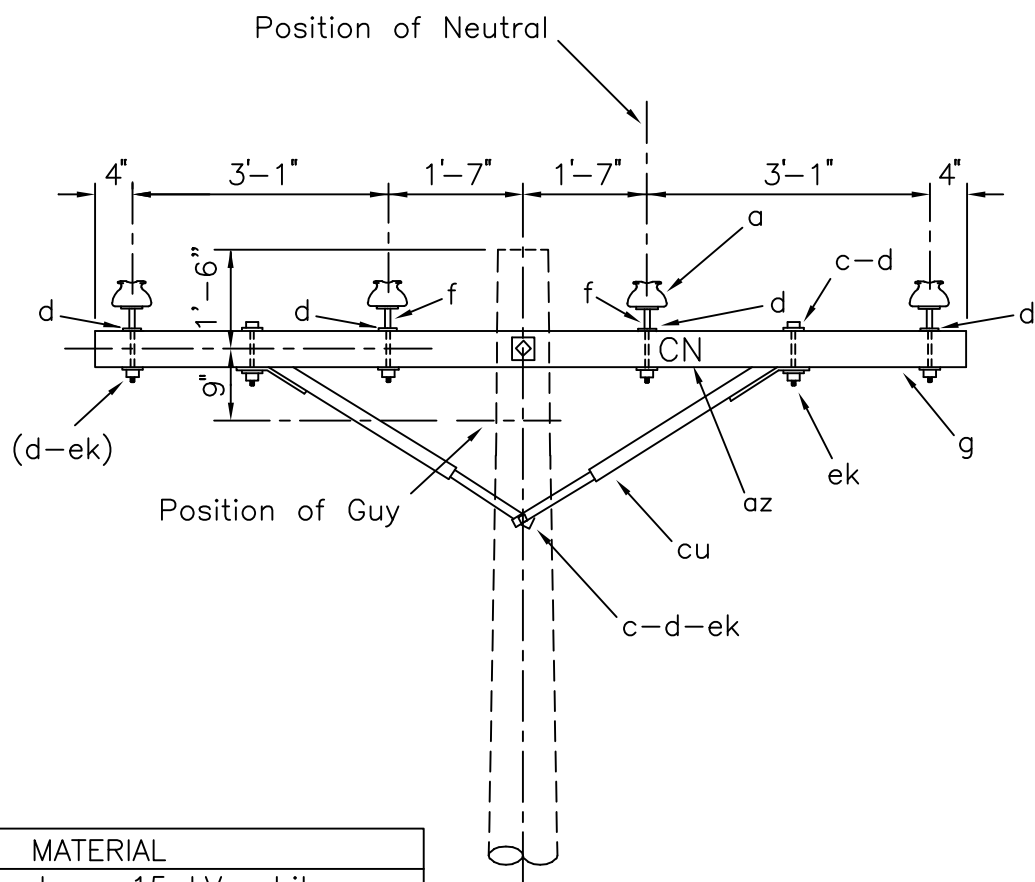
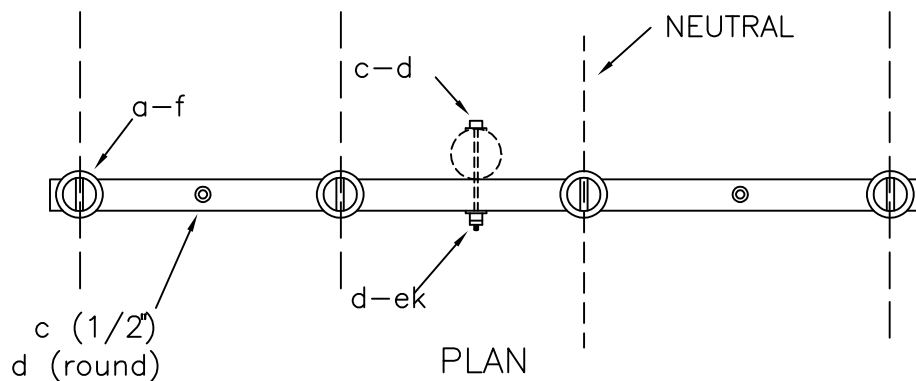
SINGLE SUPPORT ON CROSSARM
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.13P



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

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

DESIGN PARAMETERS:

See TABLE II

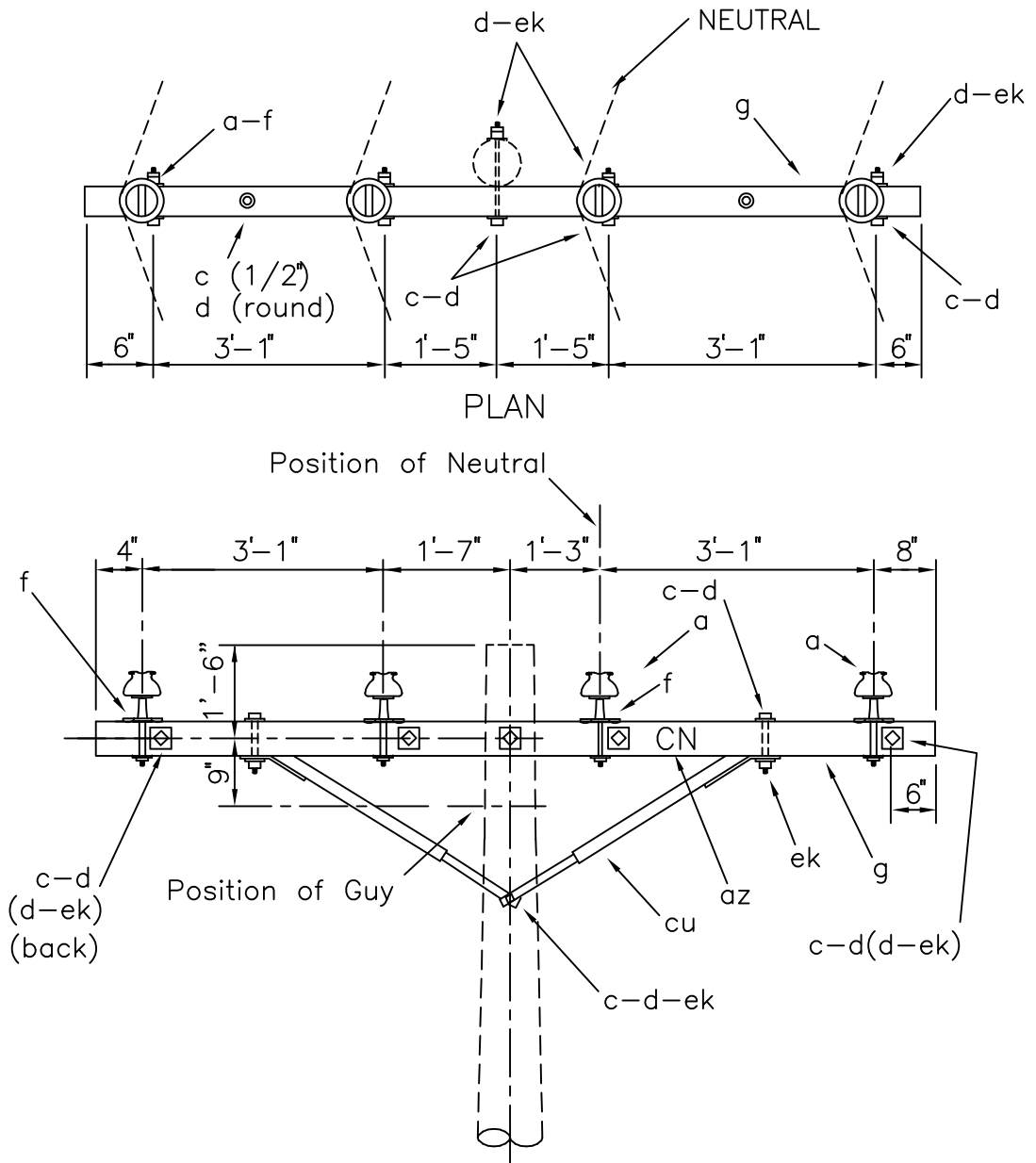
SINGLE SUPPORT, NEUTRAL ON CROSSARM

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.41
(C9-1)



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

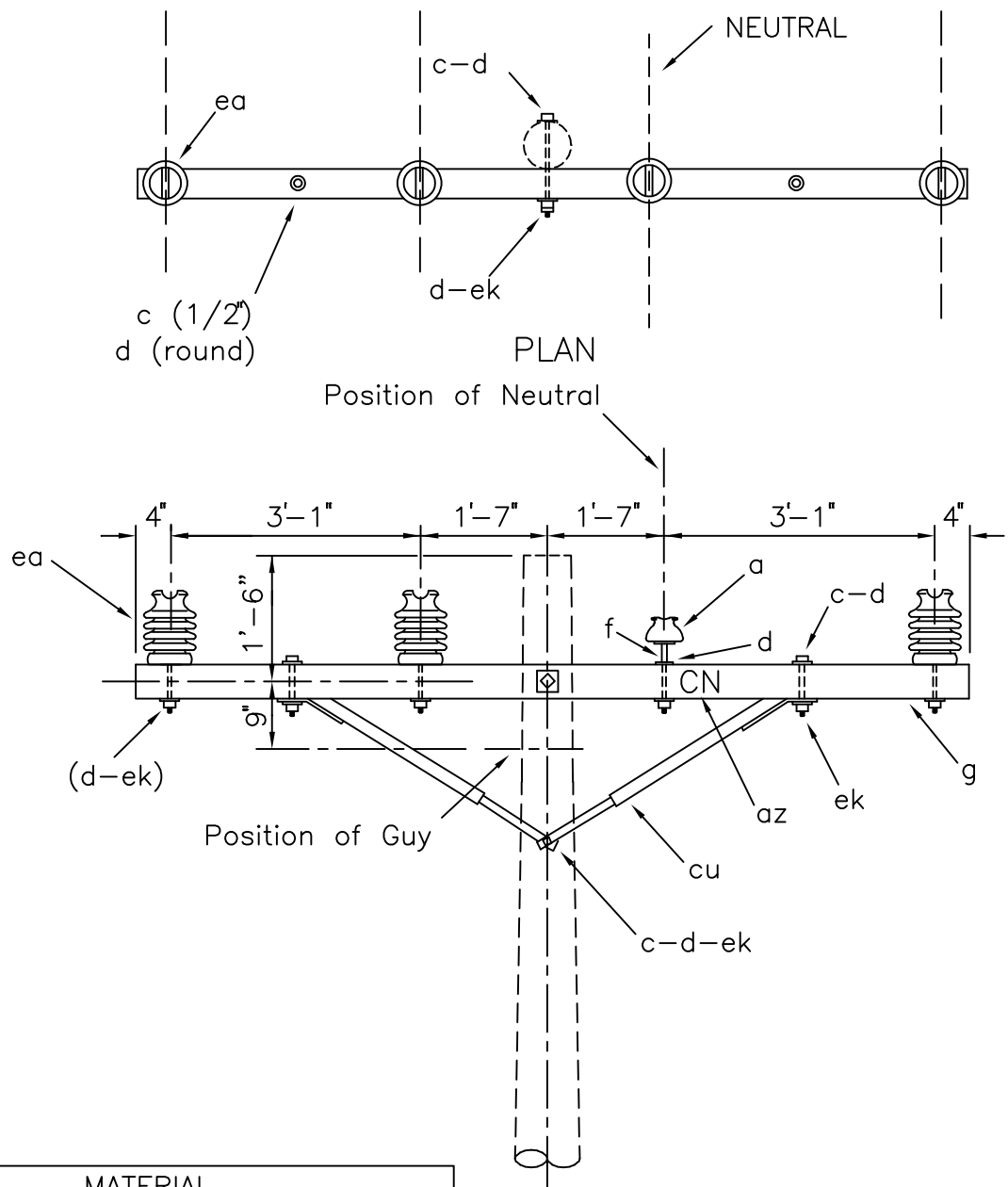
SINGLE SUPPORT, NEUTRAL ON CROSSARM
(LARGE CONDUCTORS)

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

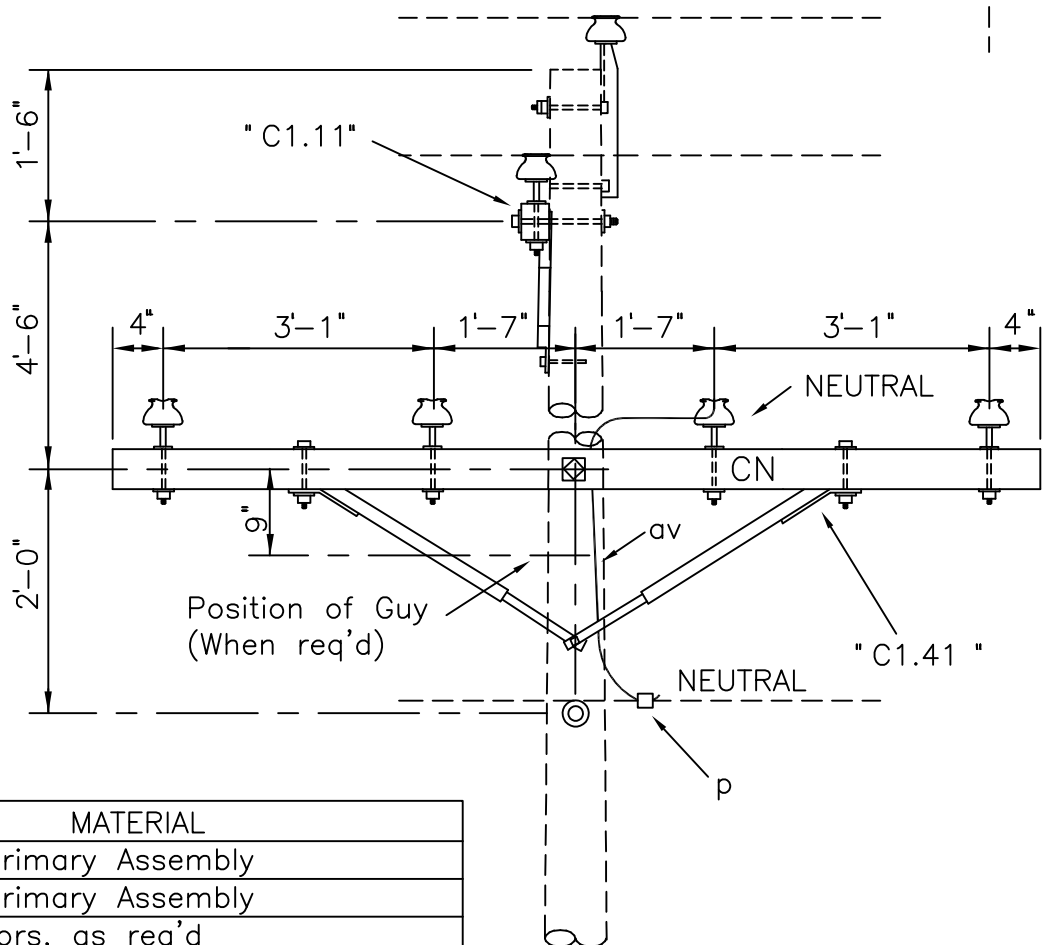
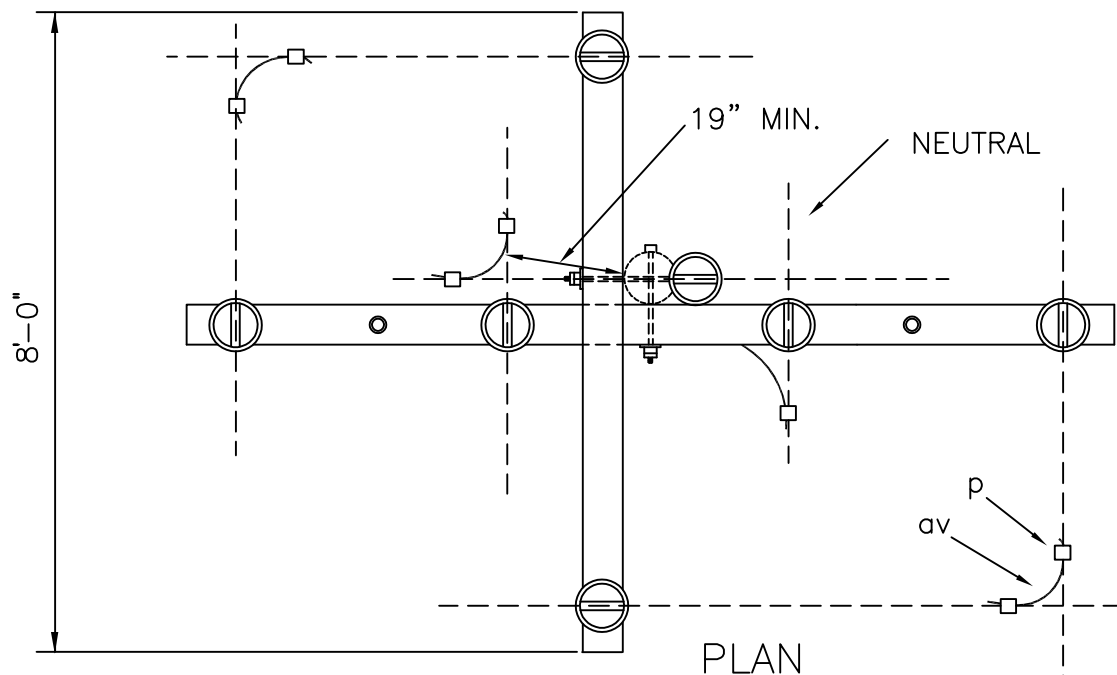
SINGLE SUPPORT, NEUTRAL ON CROSSARM
(POST INSULATORS)

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

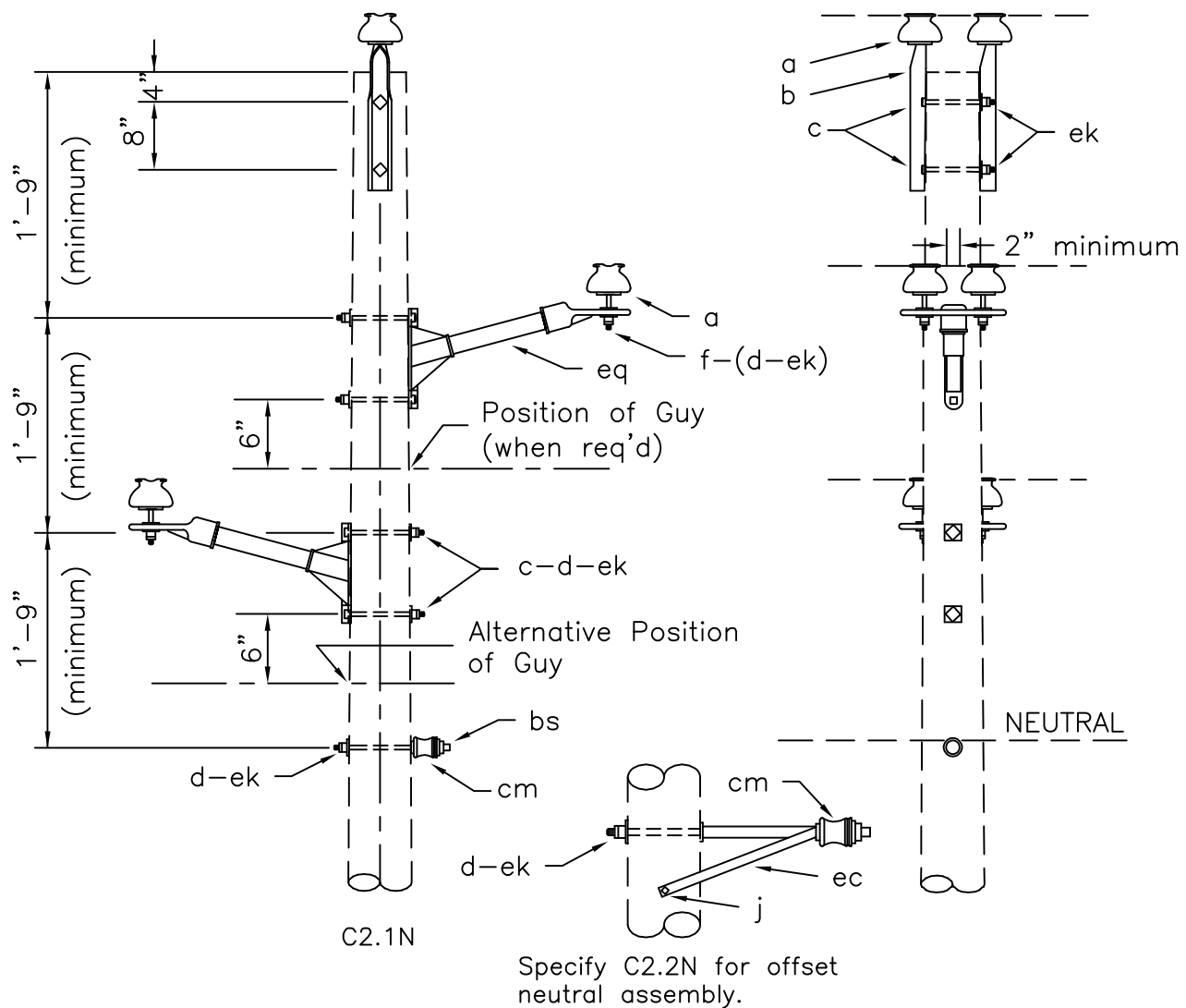
THREE PHASE JUNCTION GUIDE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C1.81G



NOTES: These assemblies used for NESC Grade B construction.

ASSEMBLY: C2.		1N	2N
ITEM	MATERIAL	QTY	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

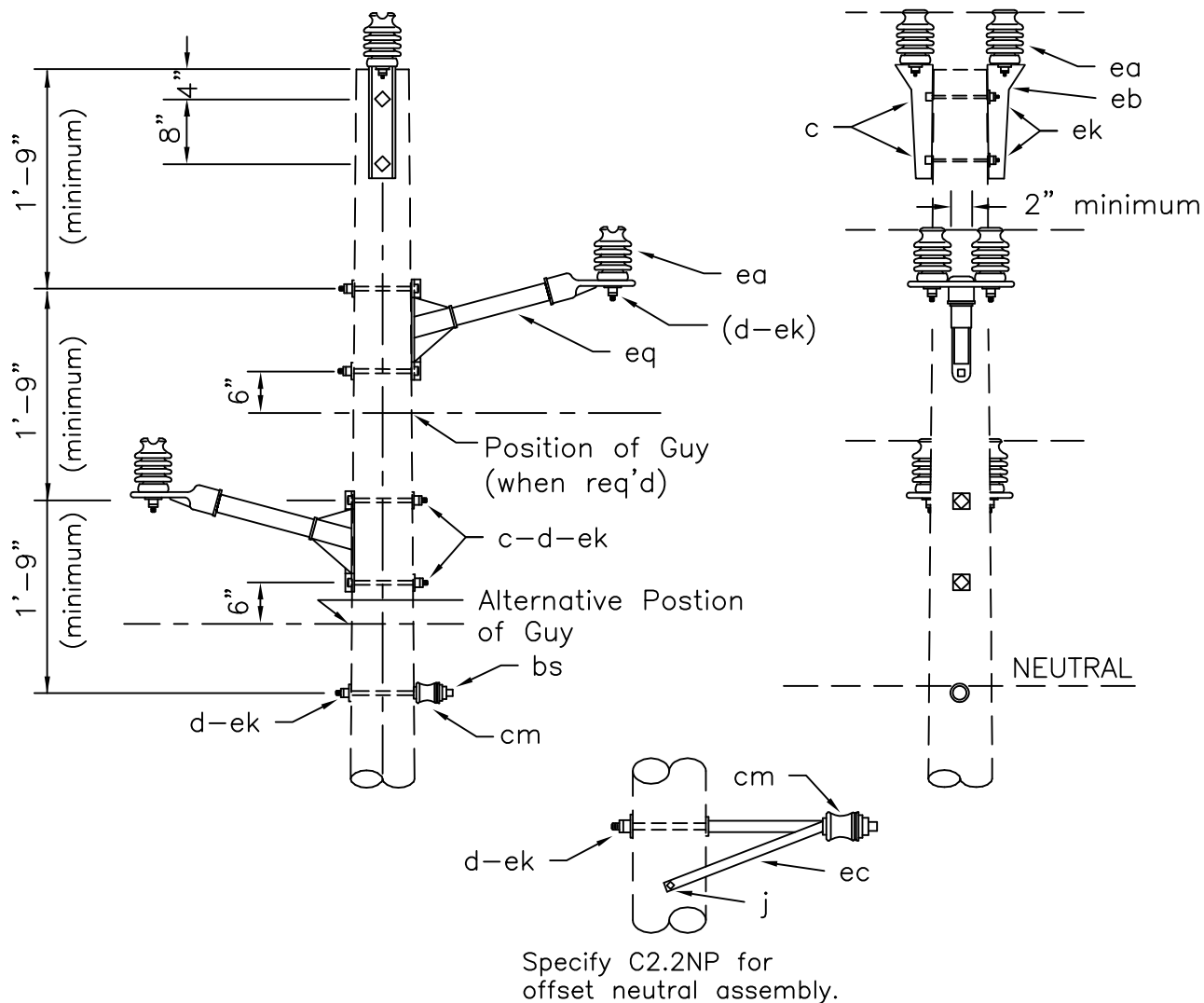
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.1N
C2.2N



NOTES: These assemblies used for NESC Grade B construction.

ASSEMBLY: C2.		1NP	2NP
ITEM	MATERIAL	QTY	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

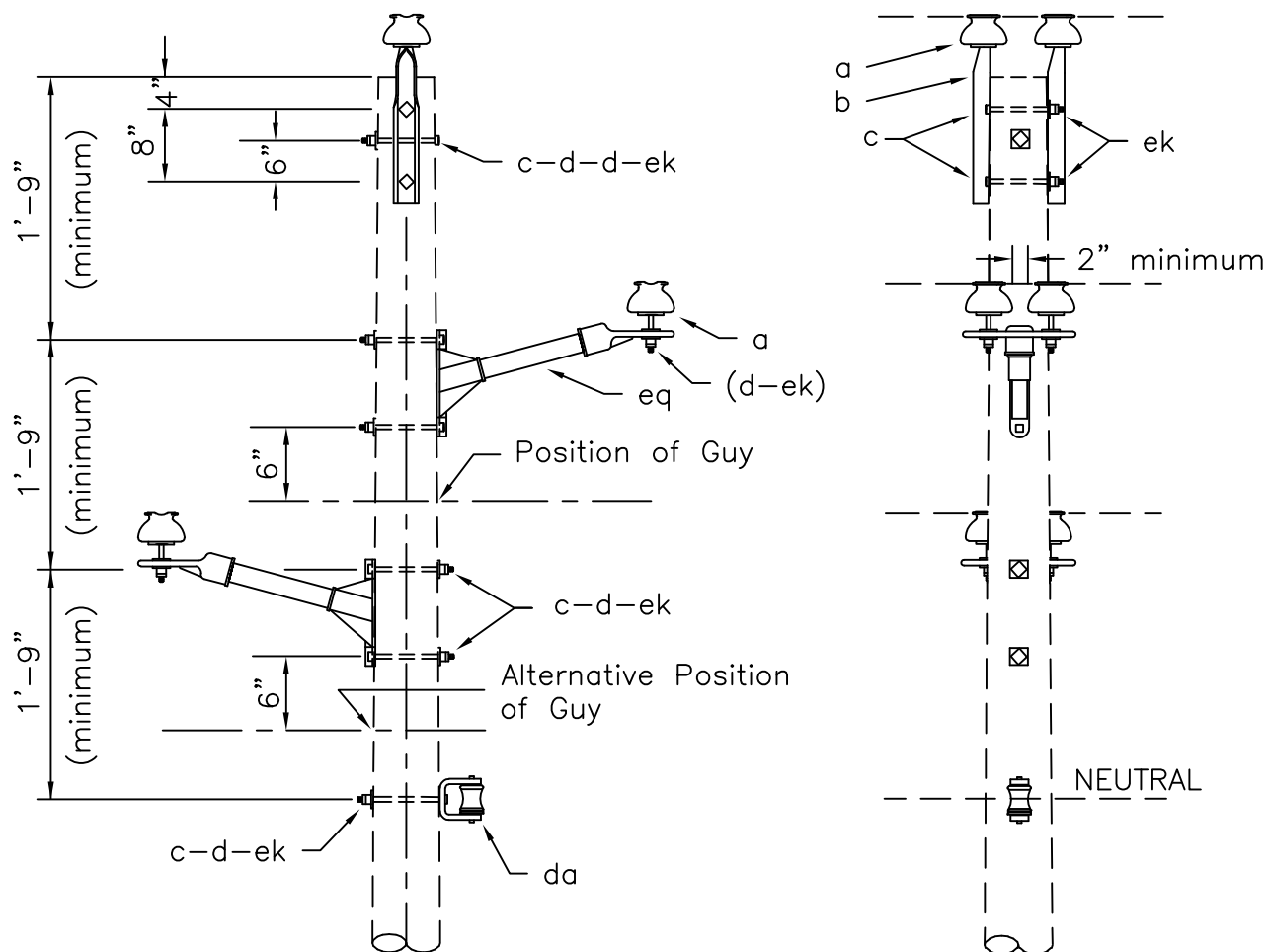
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.1NP
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

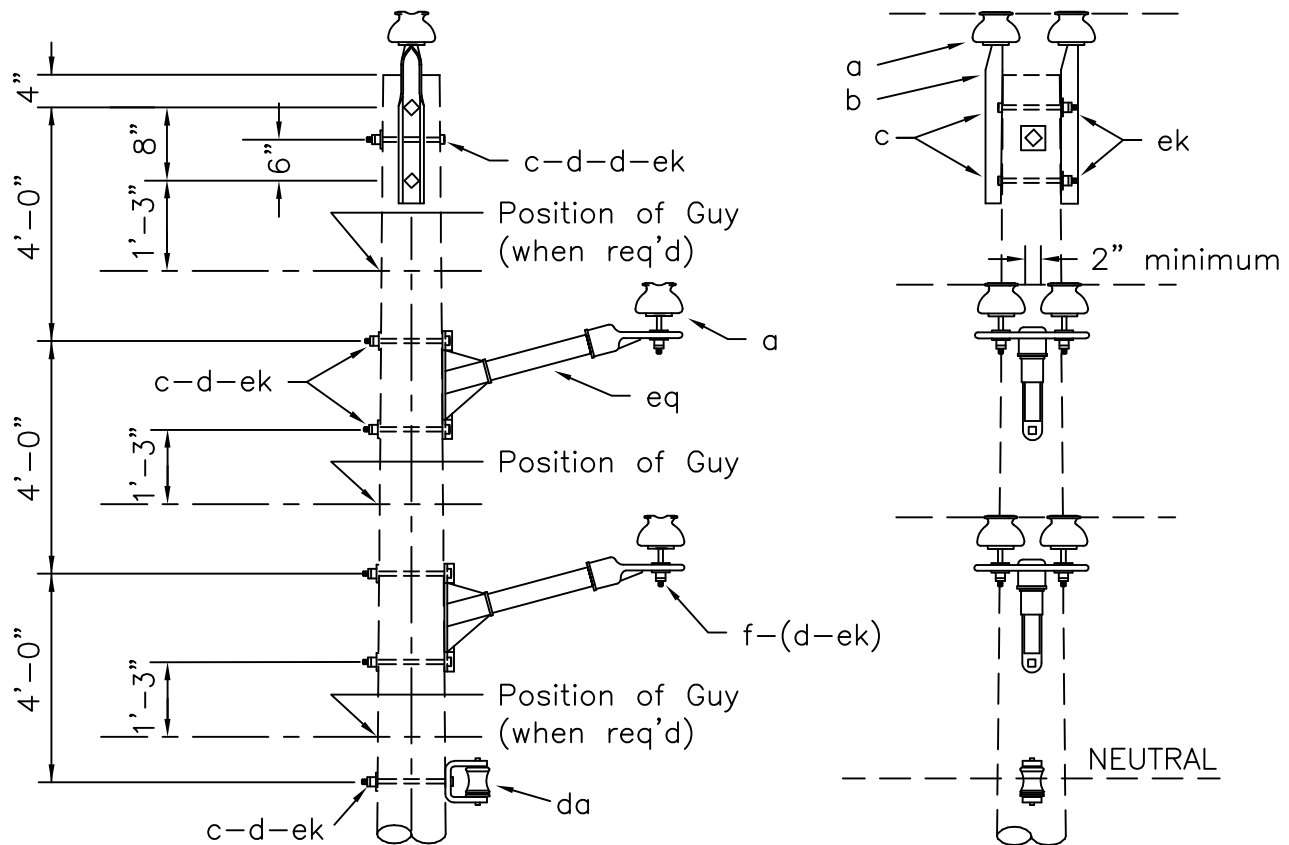
DOUBLE SUPPORT-NARROW PROFILE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.3N



Design Parameters:

MAXIMUM LINE ANGLES:
See Table III

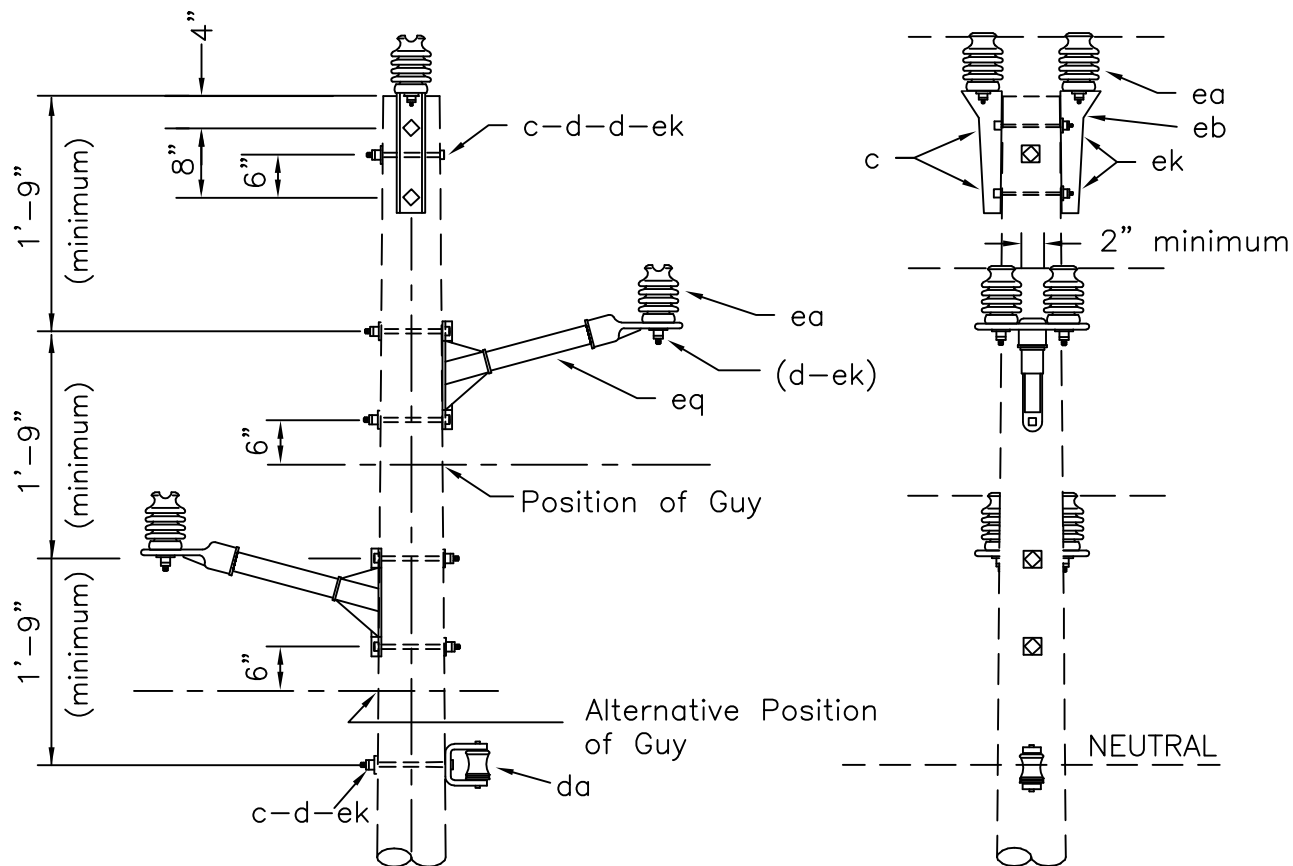
DOUBLE SUPPORT-NARROW PROFILE (ALTERNATIVE GUYING GUIDE)

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

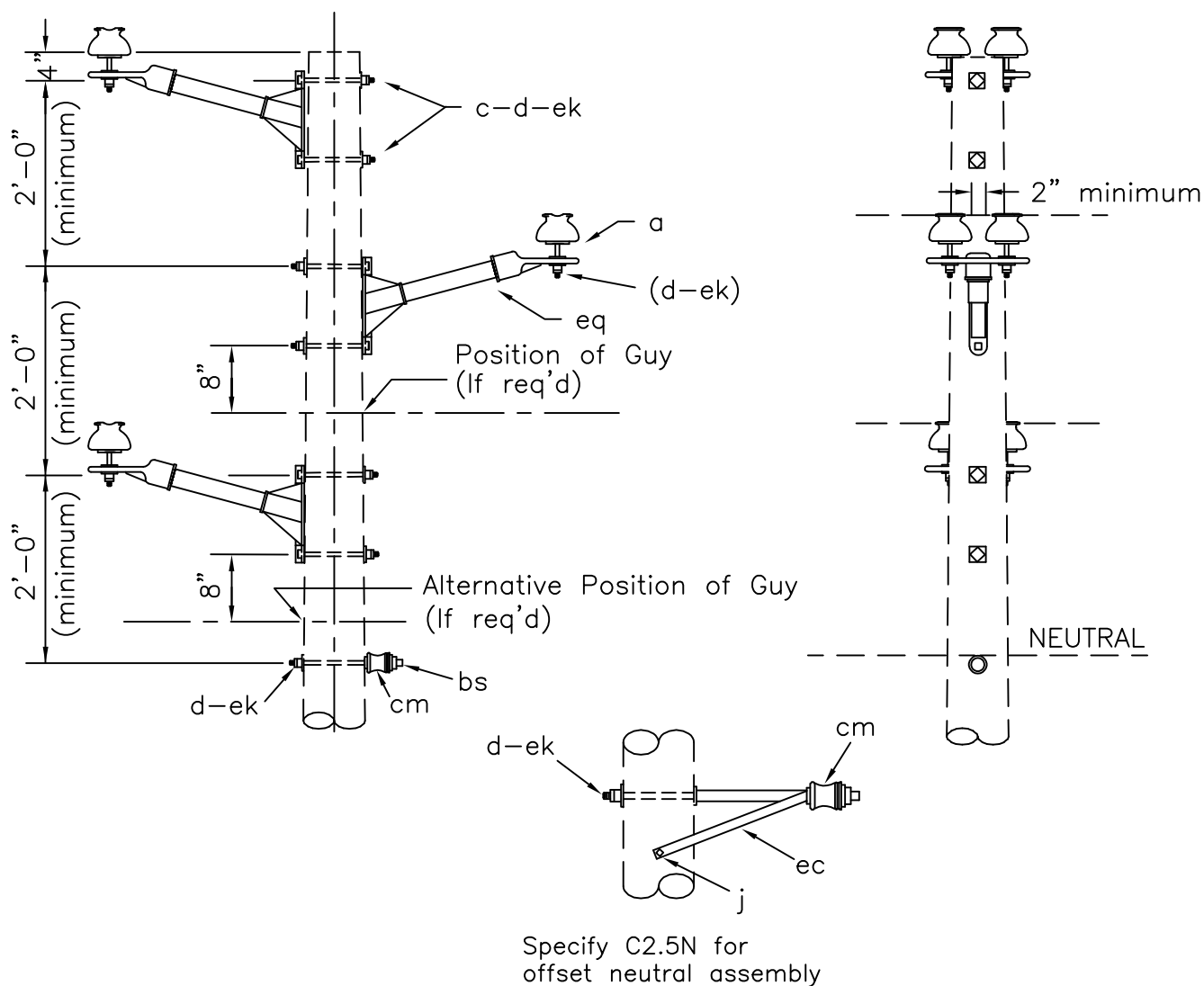
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

2 - PHASE PRIMARY
12.47/7.2 kV

C2.3NP



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

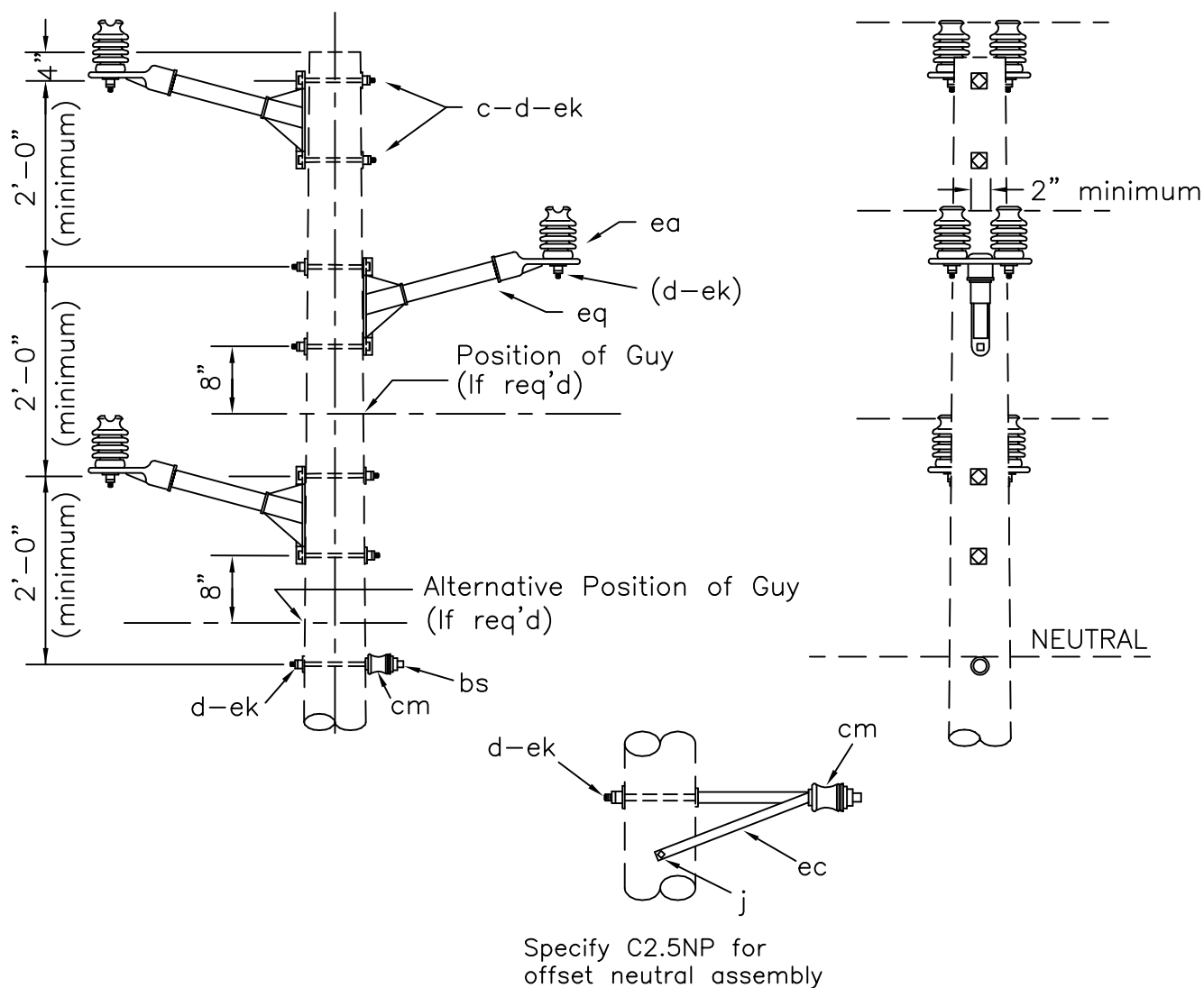
DOUBLE SUPPORT—NARROW PROFILE
 (TANGENT)

APRIL 2005

RUS

3 — PHASE PRIMARY
 12.47/7.2 kV

C2.4N
 C2.5N



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

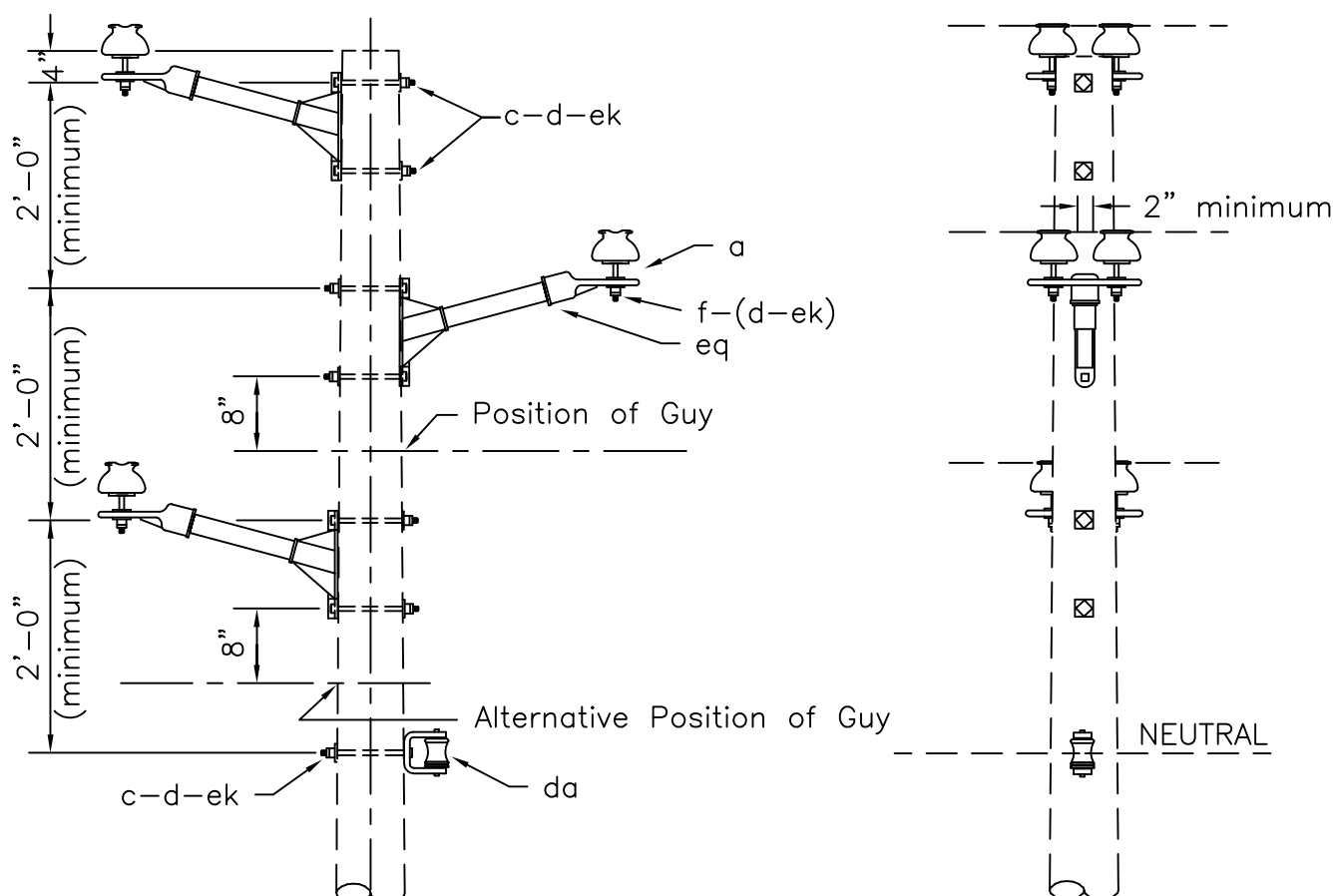
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT)(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.4NP
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

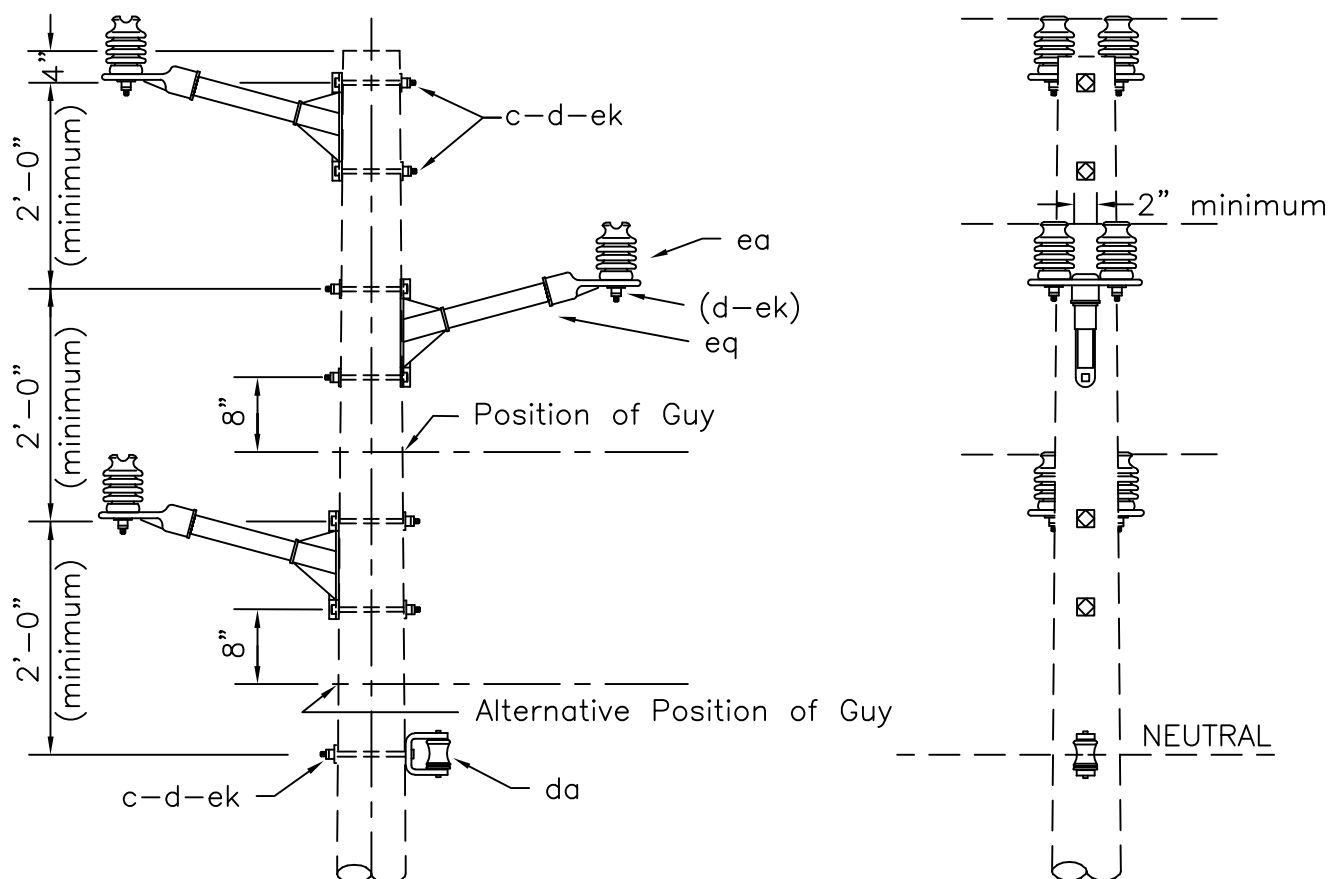
DOUBLE SUPPORT-NARROW PROFILE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.6N



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

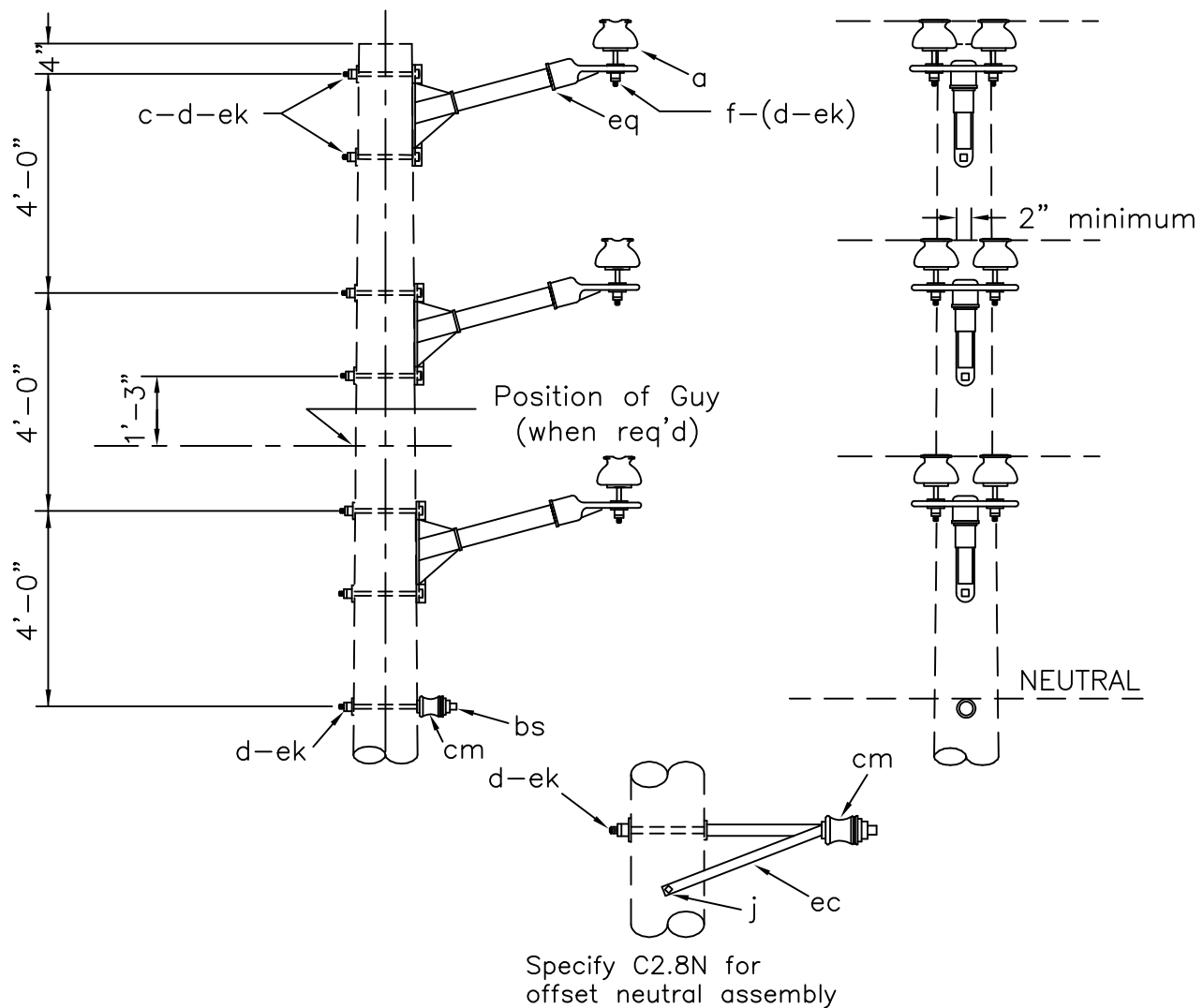
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.6NP



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

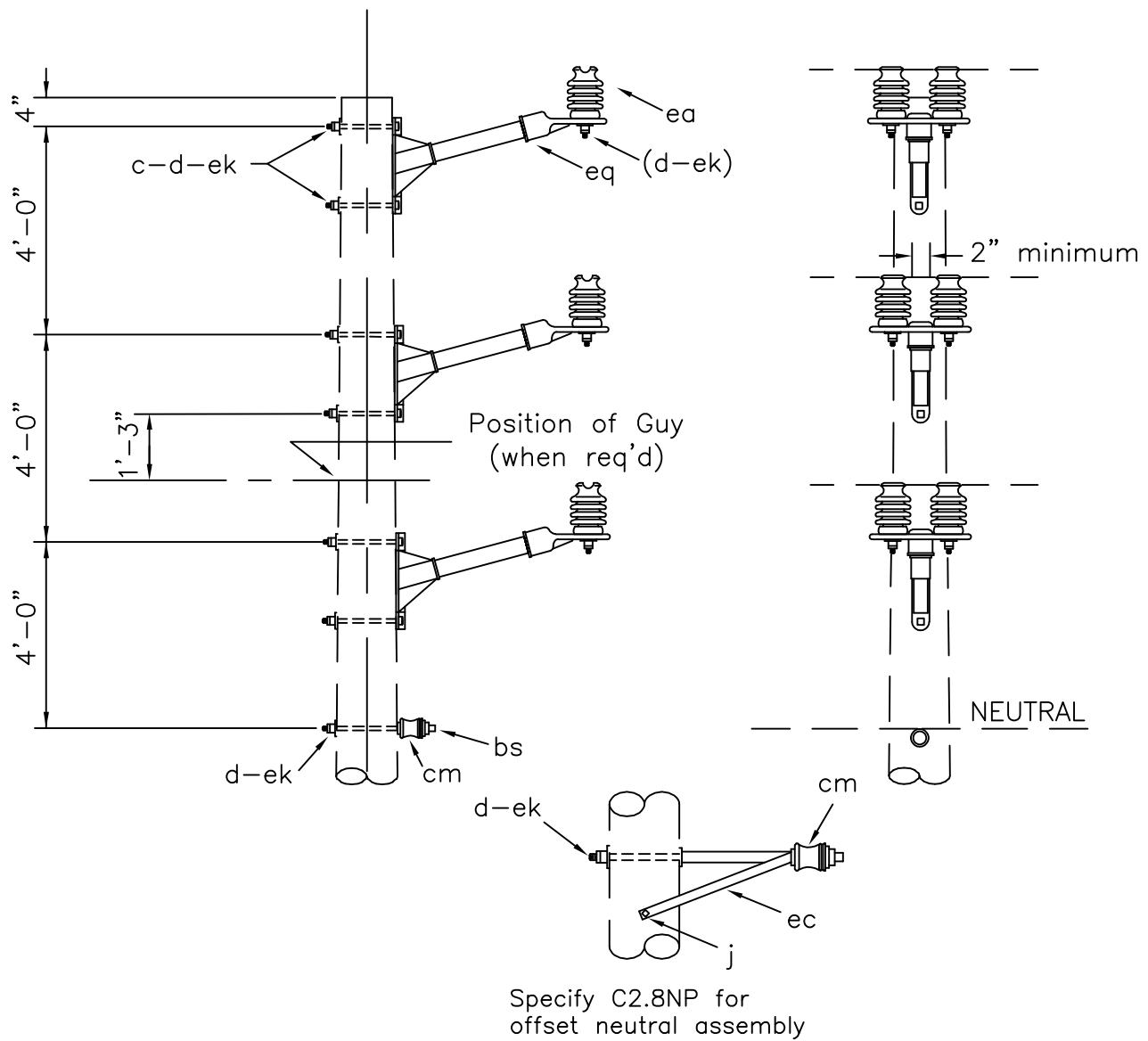
DOUBLE SUPPORT-NARROW PROFILE (TANGENT)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.7N
C2.8N



NOTE: These assemblies used for NESC Grade B construction.

Assembly: C2.		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)	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

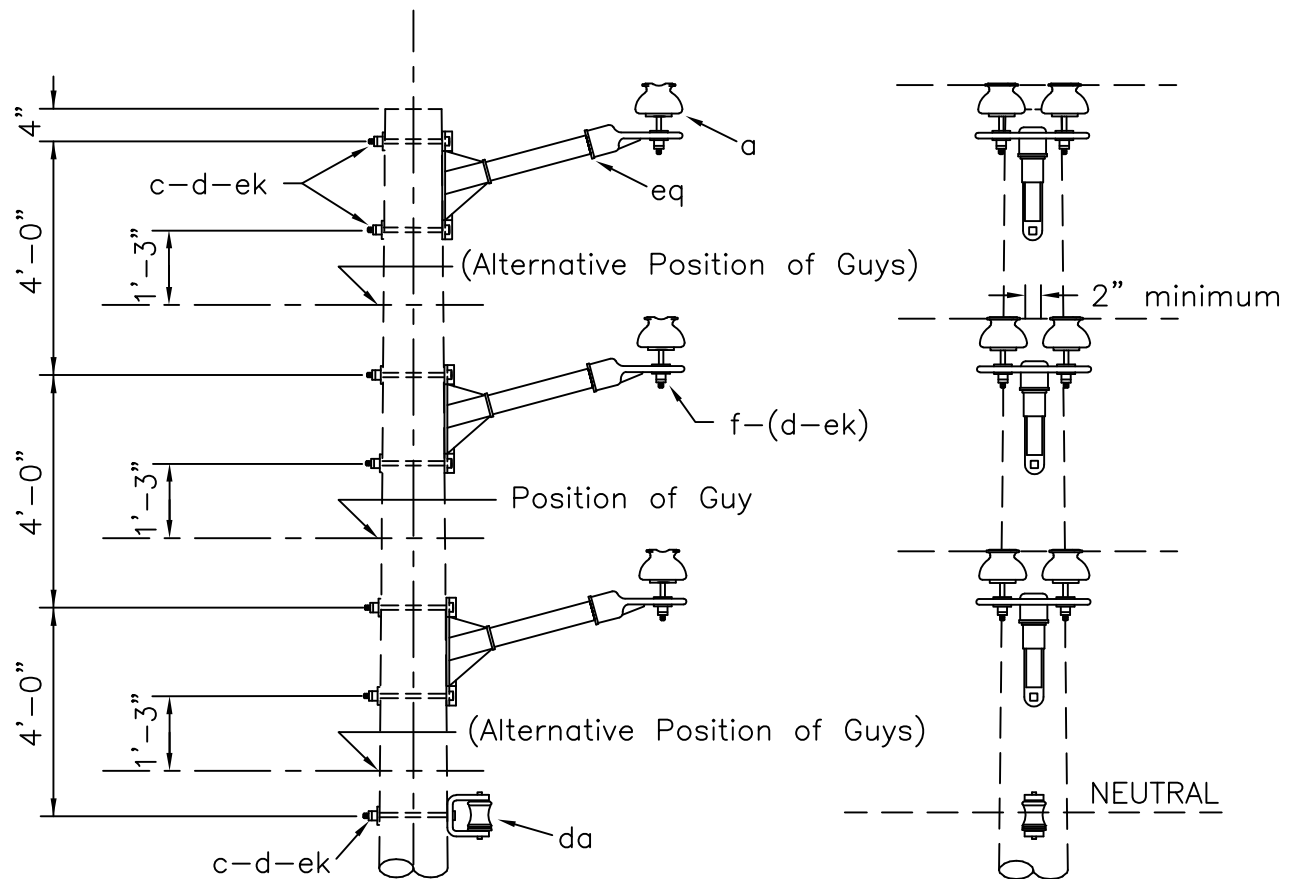
DOUBLE SUPPORT-NARROW PROFILE
(TANGENT) (POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.7NP
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

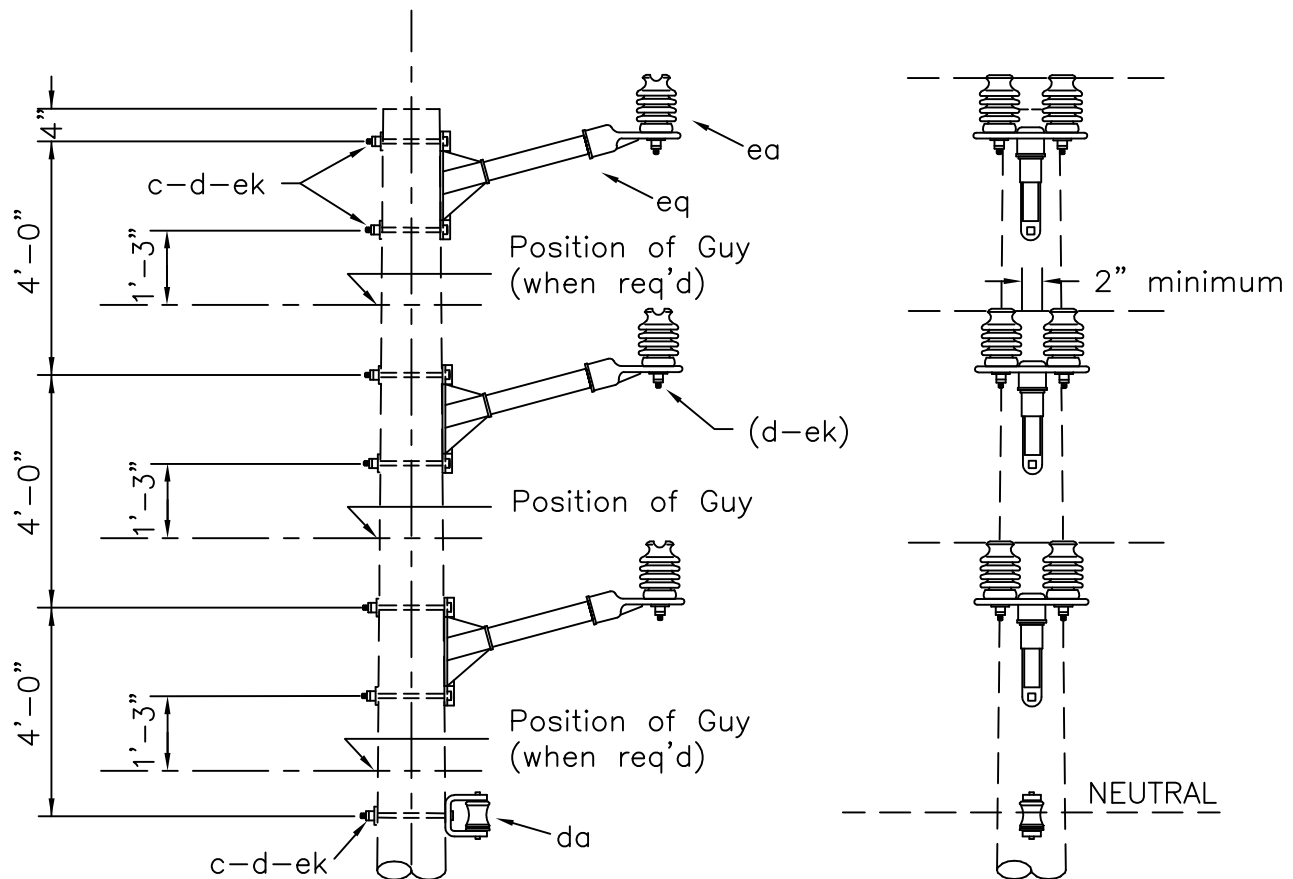
APRIL 2005

3 - PHASE PRIMARY

RUS

12.47/7.2 kV

C2.9N



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

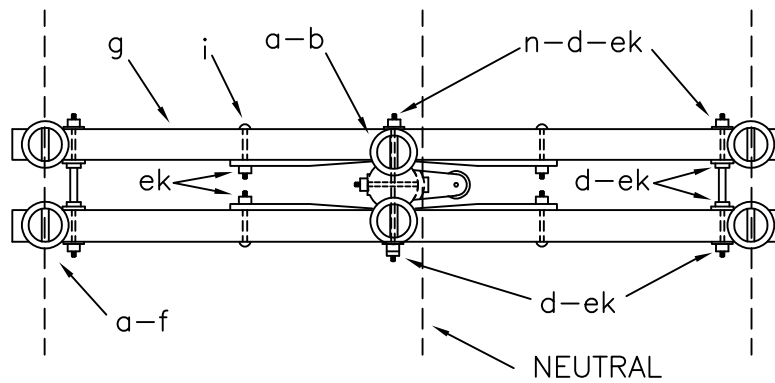
DOUBLE SUPPORT-NARROW PROFILE
(POST INSULATORS)

APRIL 2005

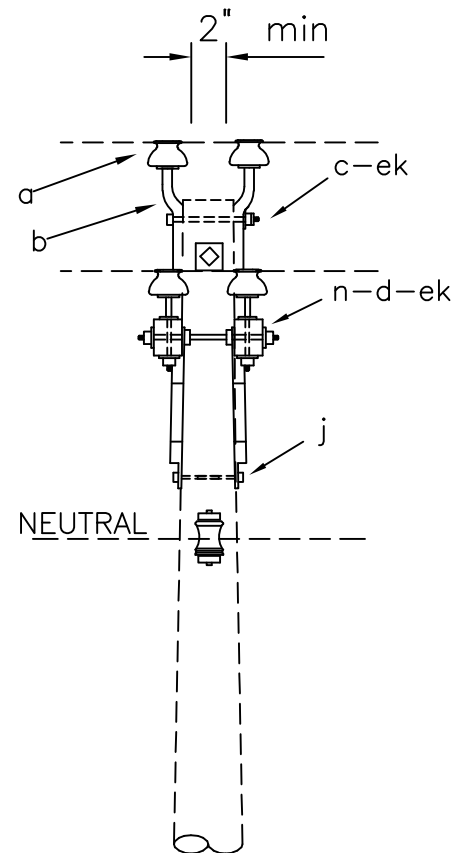
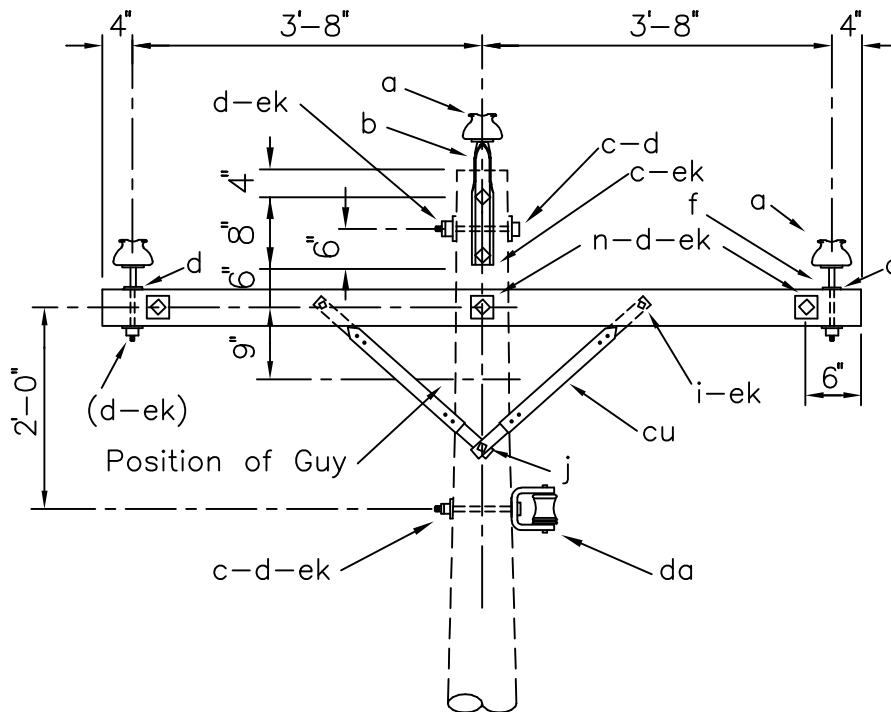
3 - PHASE PRIMARY
12.47/7.2 kV

RUS

C2.9NP



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

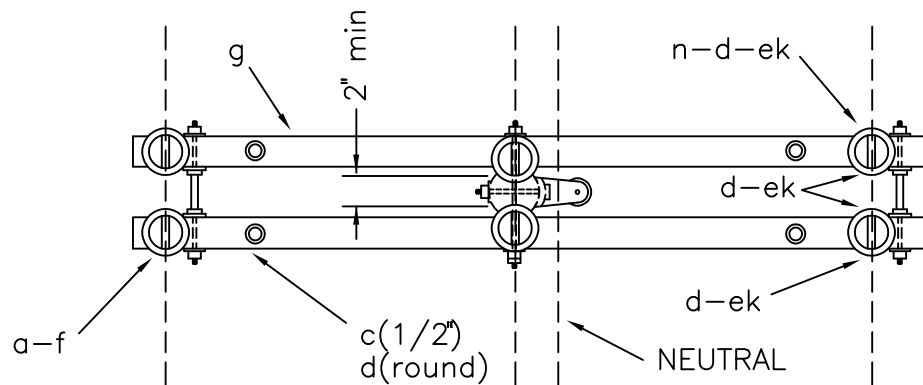
DOUBLE SUPPORT ON CROSSARMS

APRIL 2005

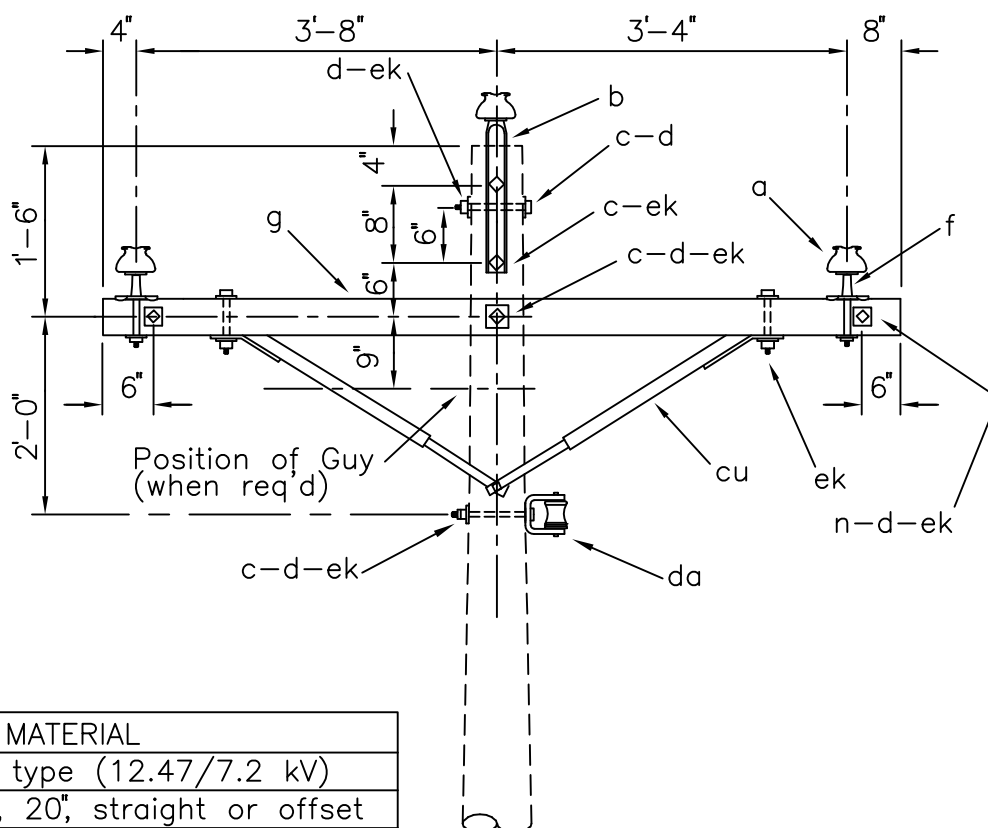
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.21
(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

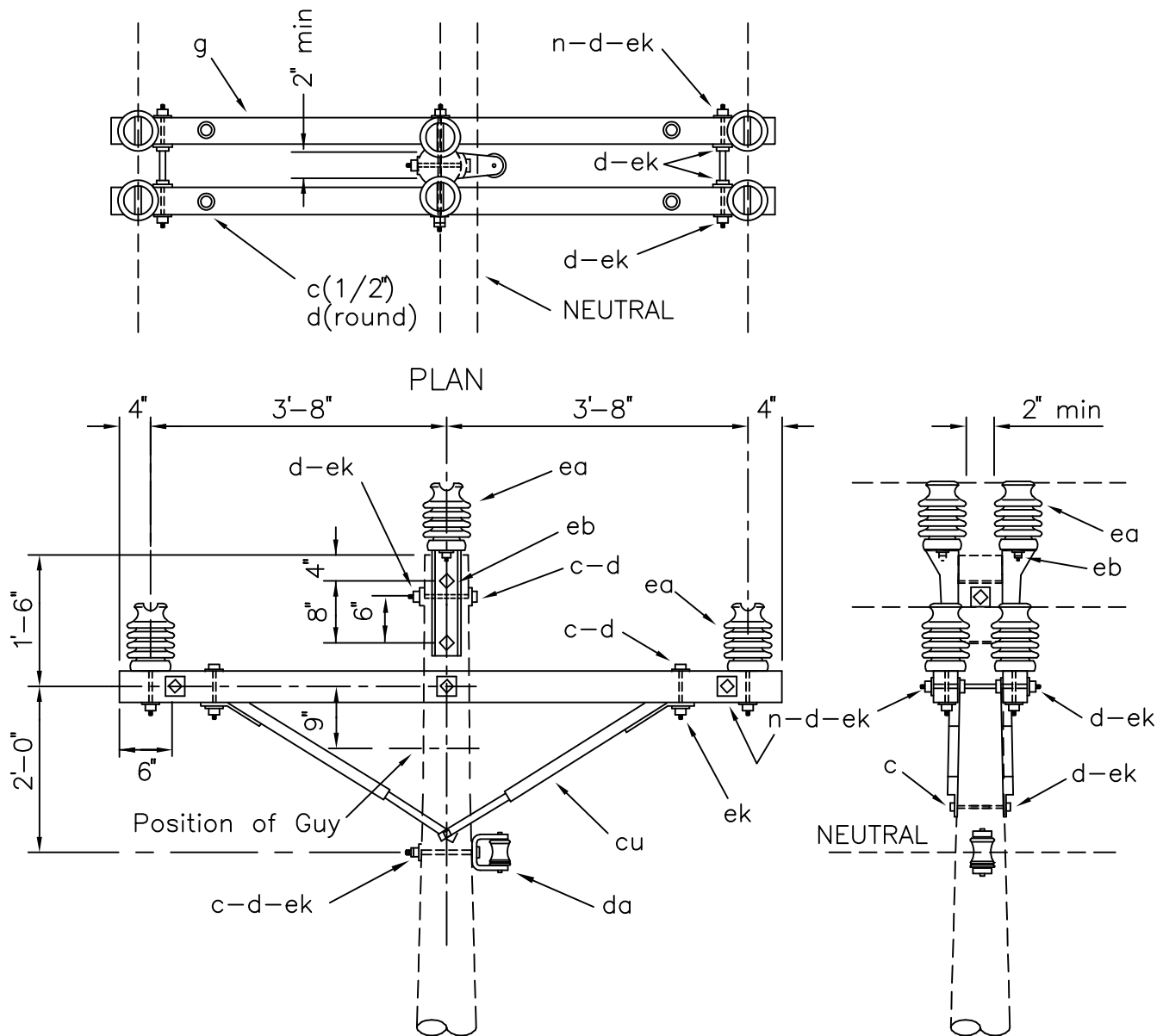
DOUBLE SUPPORT ON CROSSARMS
(LARGE CONDUCTORS)

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" x req'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

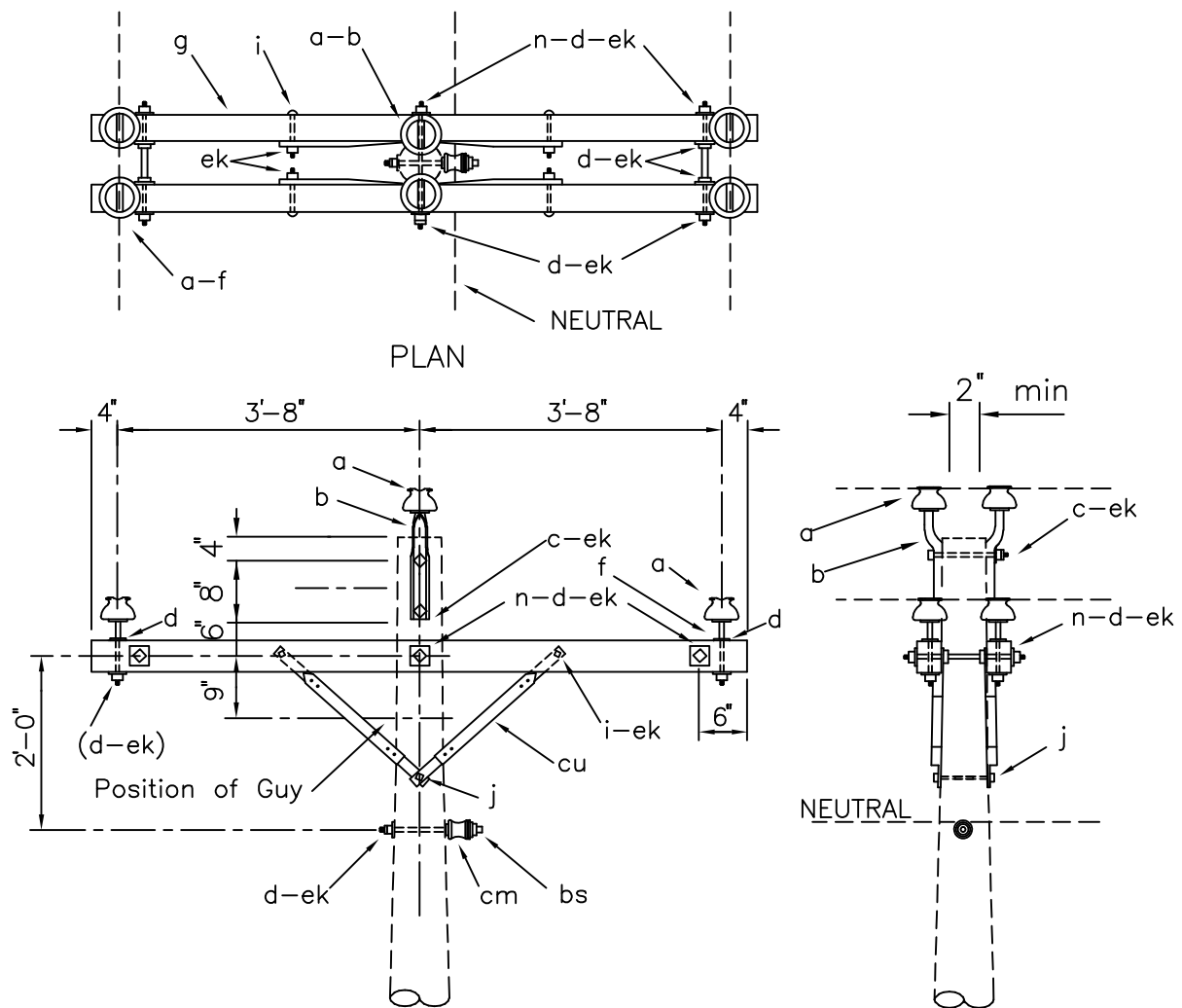
DOUBLE SUPPORT ON CROSSARMS
(POST INSULATORS)

APRIL 2005

RUS

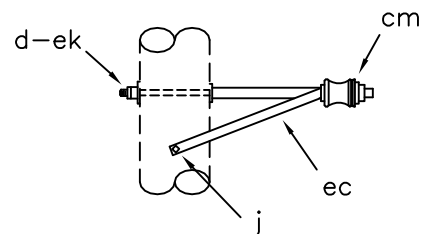
3 - PHASE PRIMARY
12.47/7.2 kV

C2.21P
(C1-3P)



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

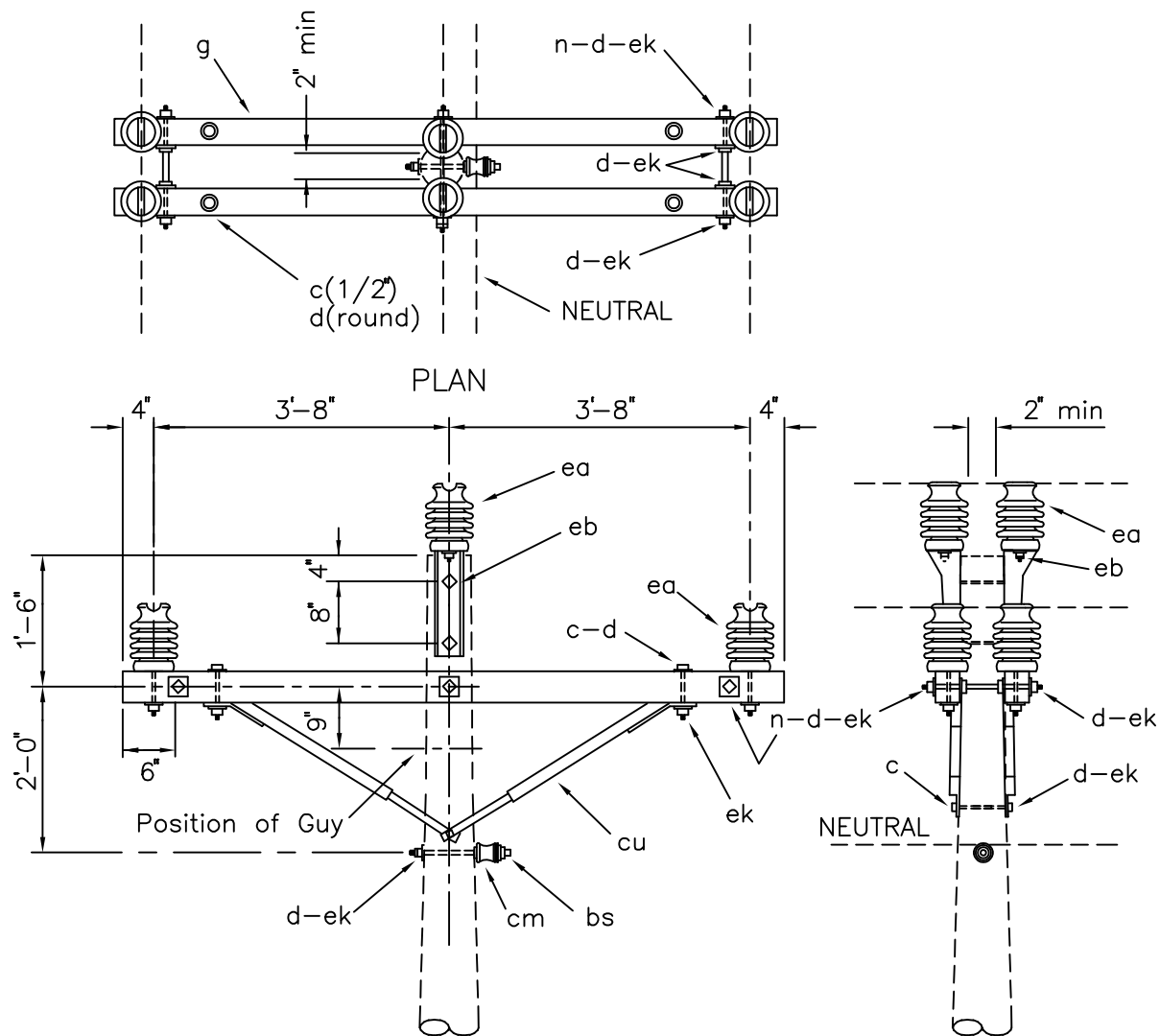
DOUBLE SUPPORT ON CROSSARMS-TANGENT

APRIL 2005

RUS

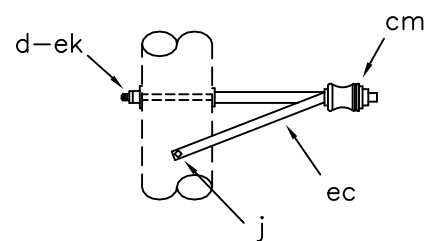
3 - PHASE PRIMARY
12.47/7.2 kV

C2.24,C2.25
(C1-1,C1-1A)



NOTE: These assemblies used for
NESC Grade B construction.

ASSEMBLY: C2.		24P	25P
ITEM	MATERIAL	QTY	QTY
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

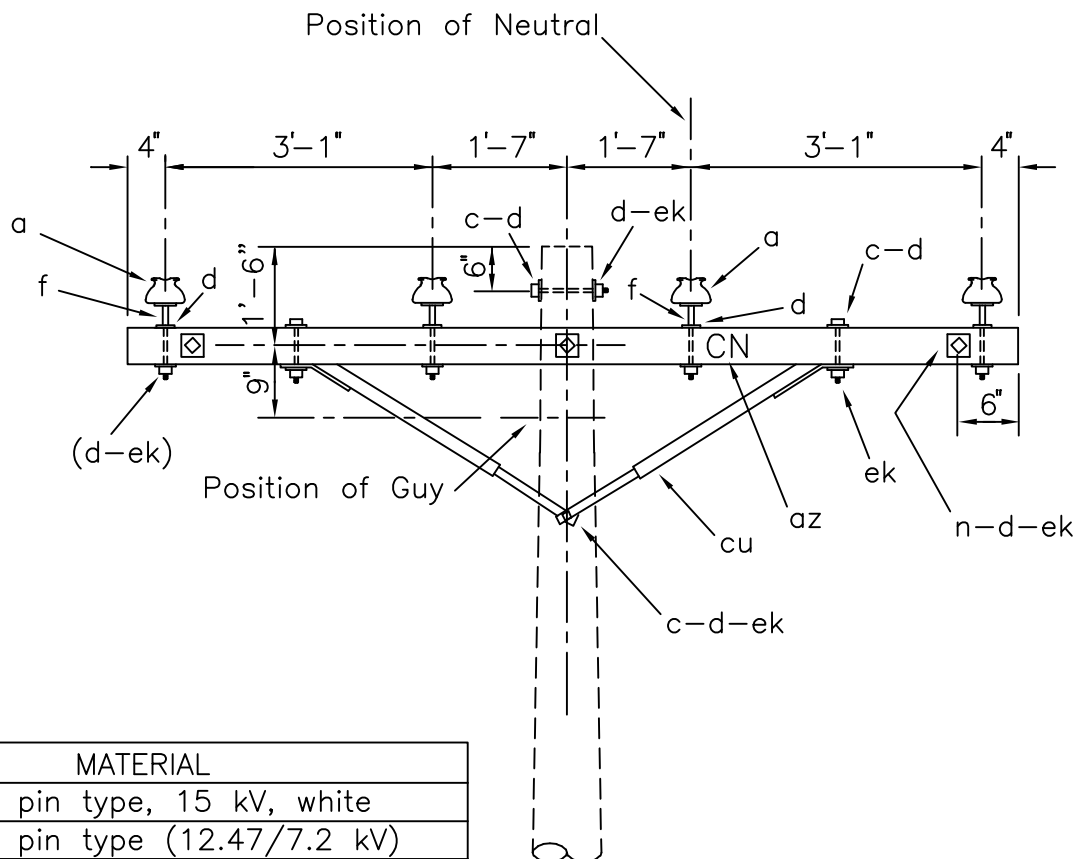
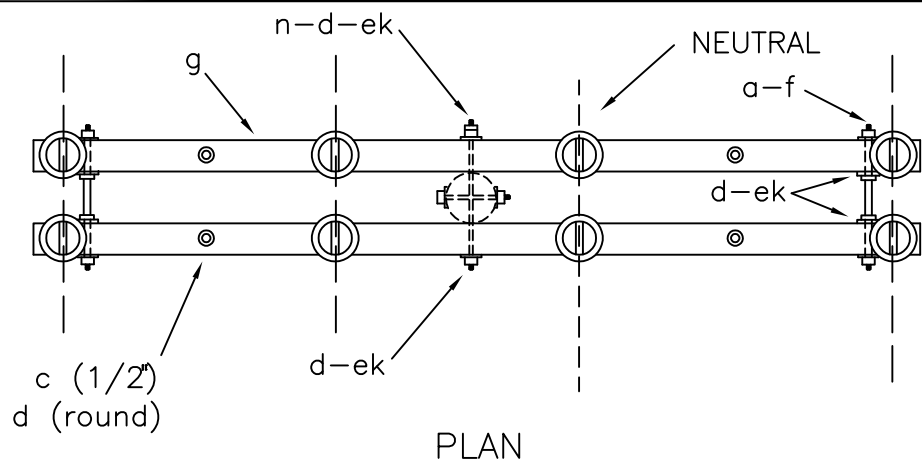
DOUBLE SUPPORT ON CROSSARMS-TANGENT
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.24P,C2.25P
(C1-1P,C1-1AP)



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

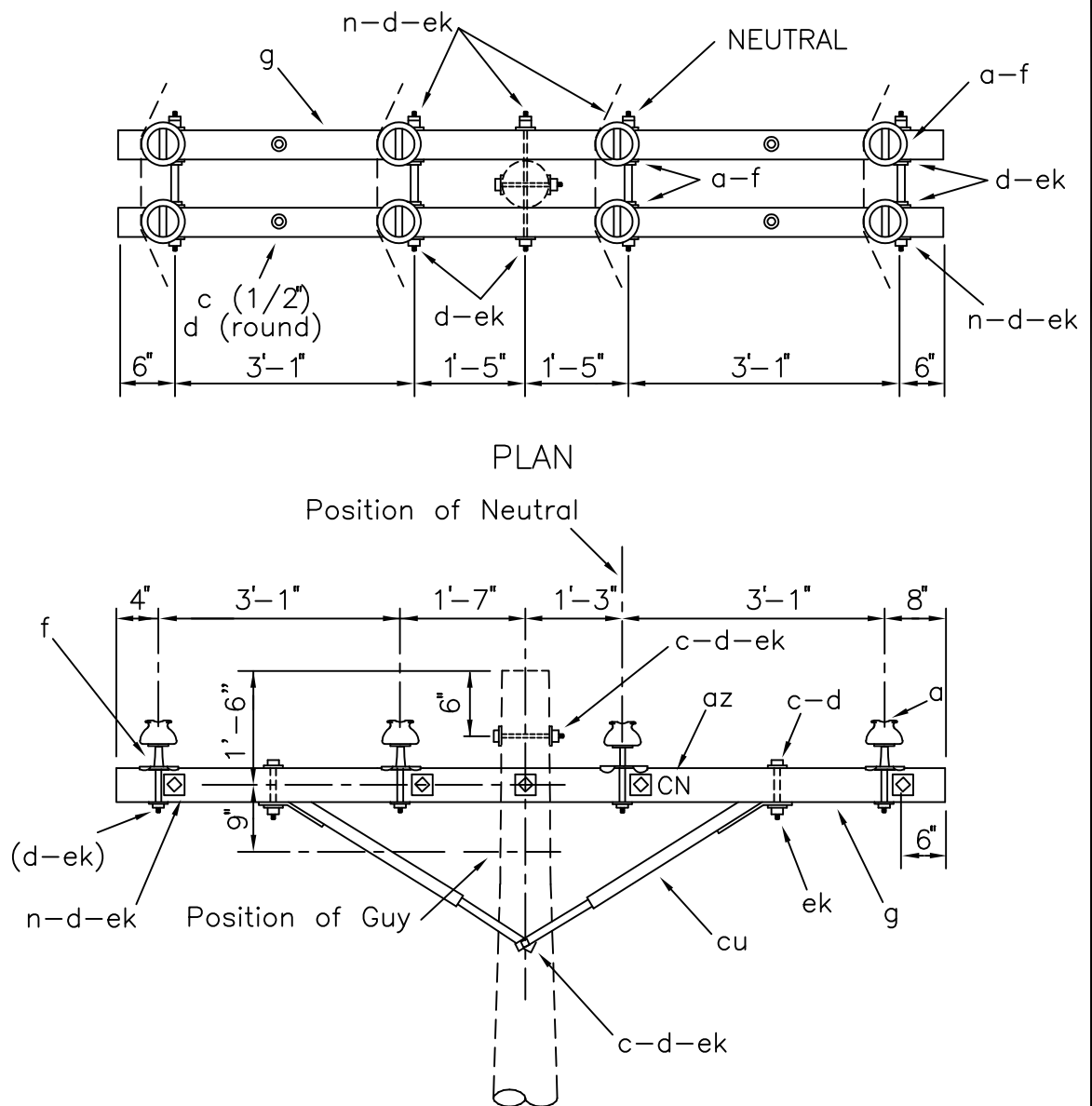
DOUBLE SUPPORT, NEUTRAL ON CROSSARMS

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.51
(C9)



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

DESIGN PARAMETERS:

See TABLE V

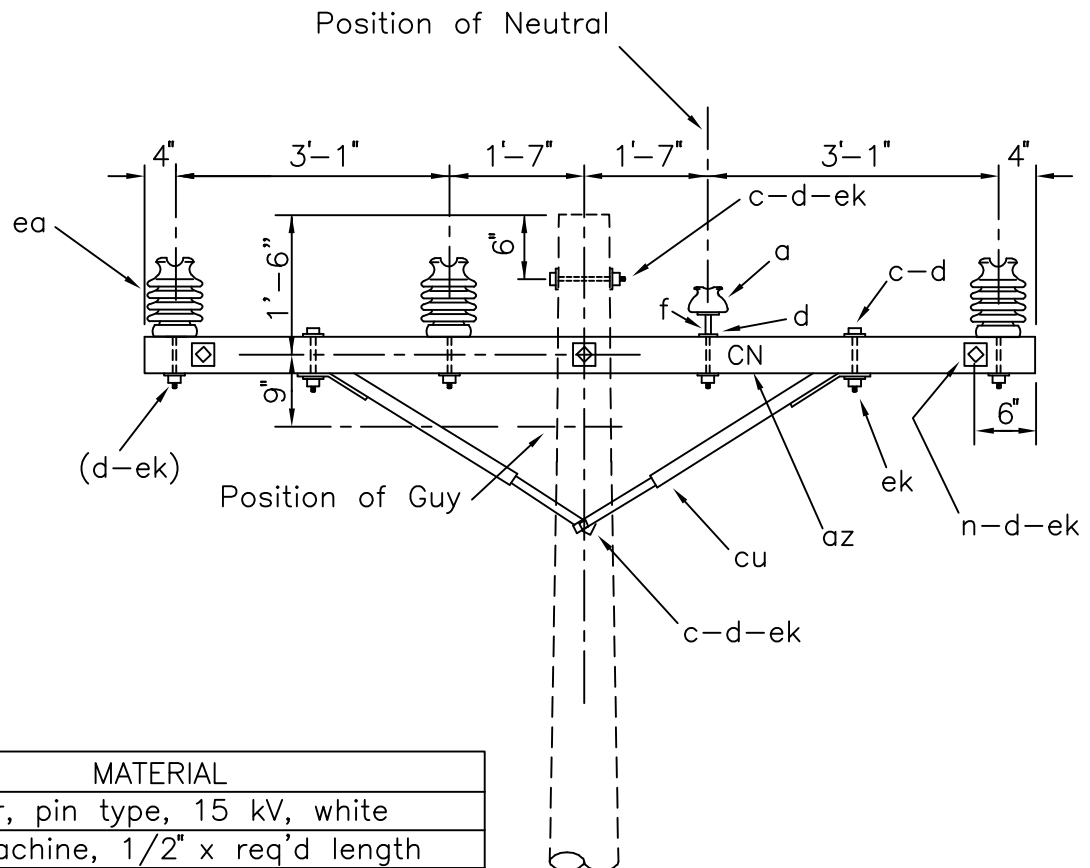
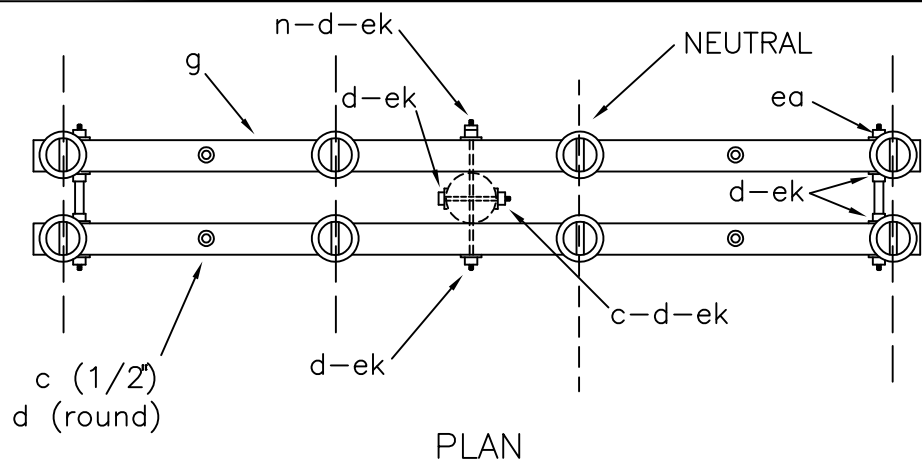
DOUBLE SUPPORT, NEUTRAL ON CROSSARMS
(LARGE CONDUCTORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.51L
(C9-2)



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

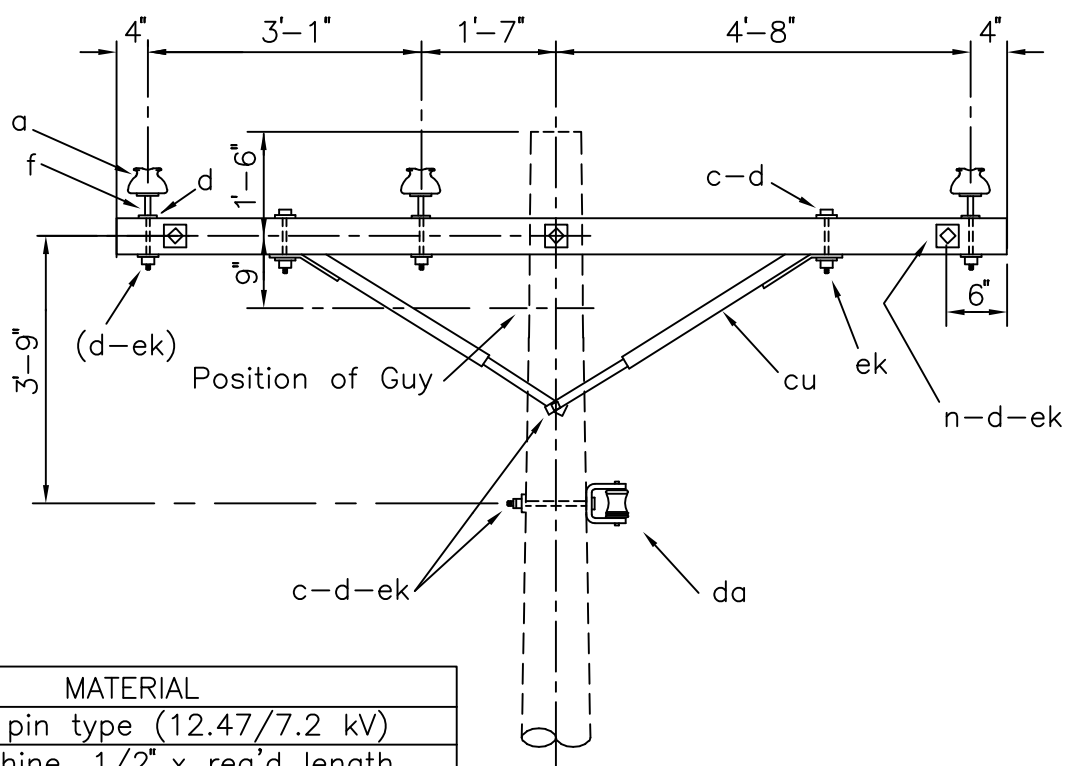
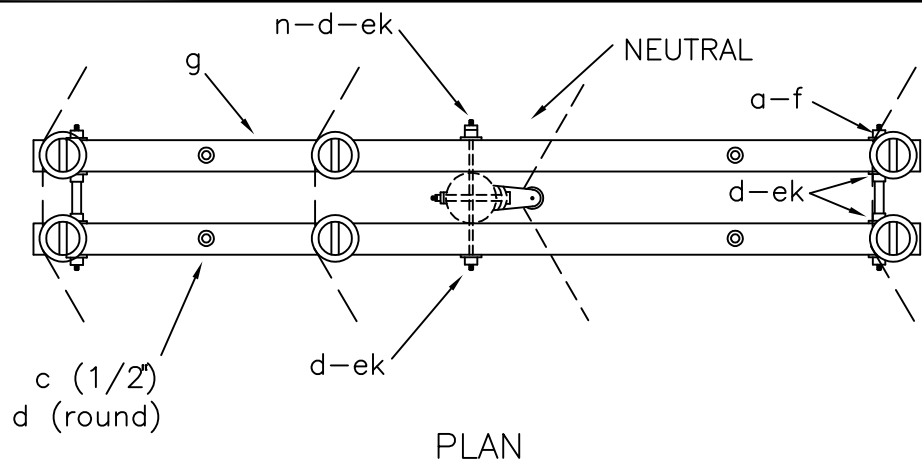
DOUBLE SUPPORT, NEUTRAL ON CROSSARMS
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.51P
(C9-2PL)



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

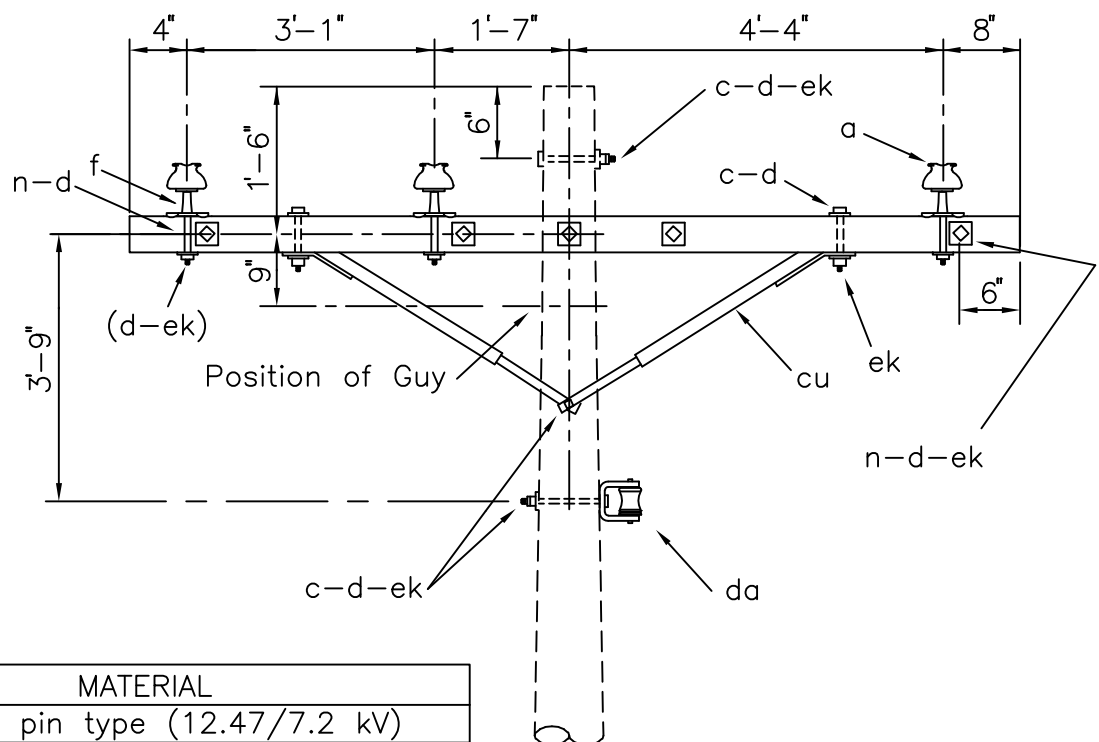
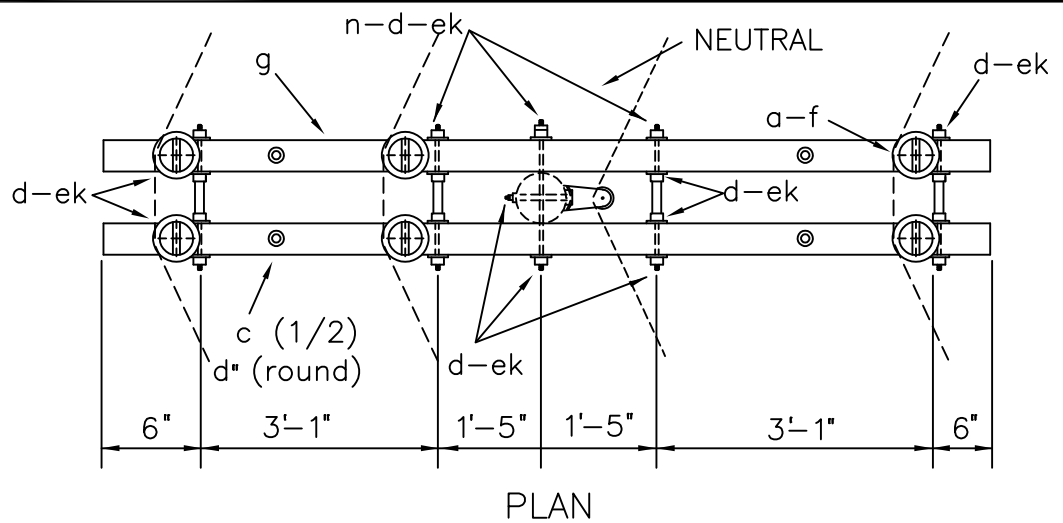
DOUBLE SUPPORT ON 10 FOOT CROSSARMS

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.52
(C2-1)



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

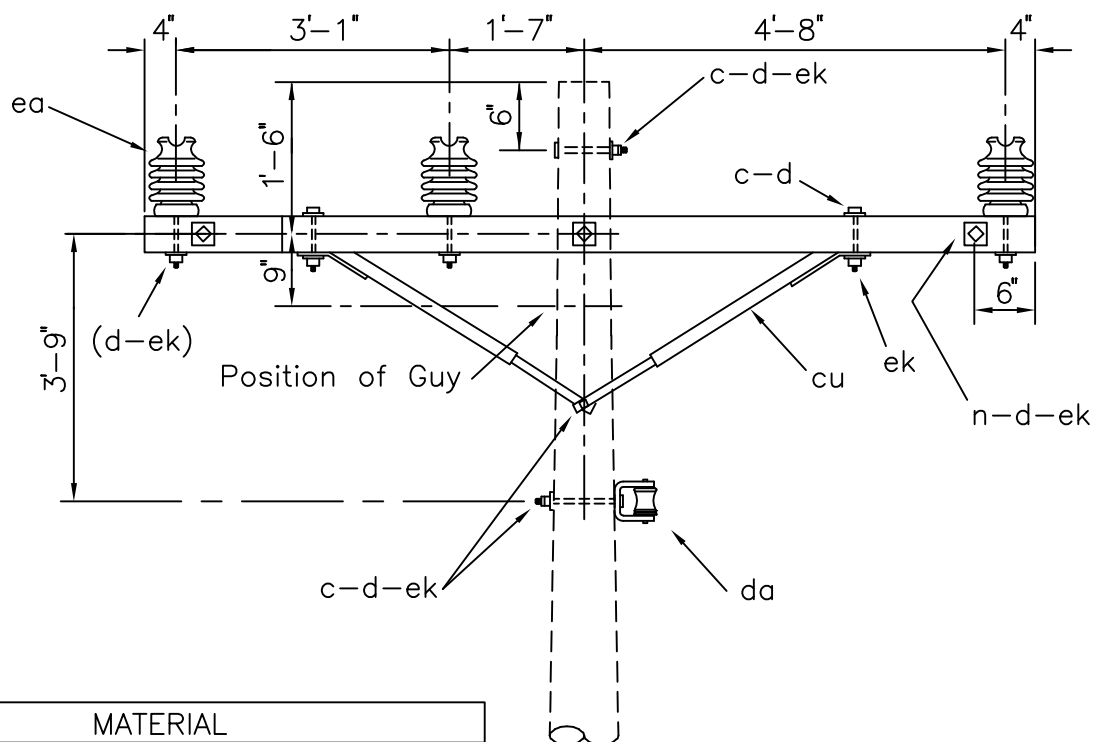
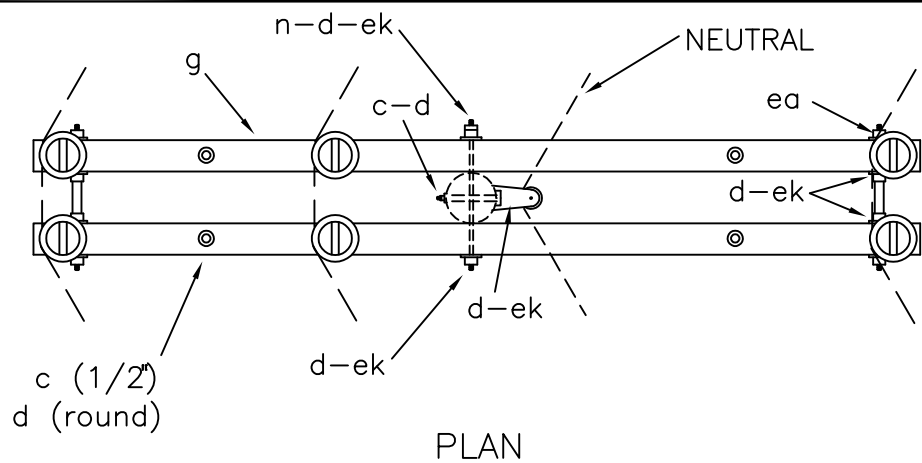
DOUBLE SUPPORT ON 10 FOOT CROSSARMS
(LARGE CONDUCTORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.52L
(C2-2)



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

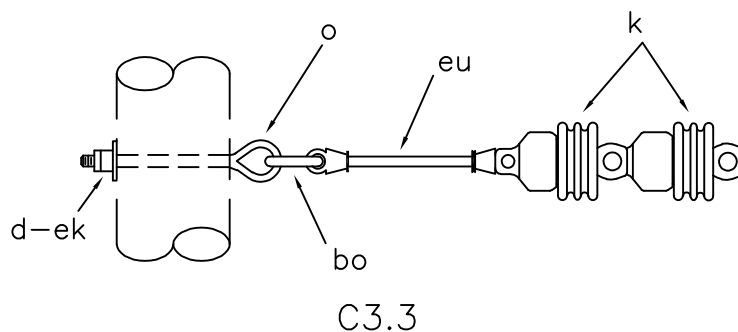
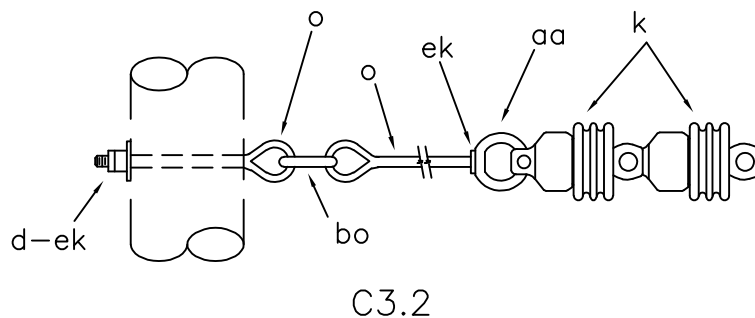
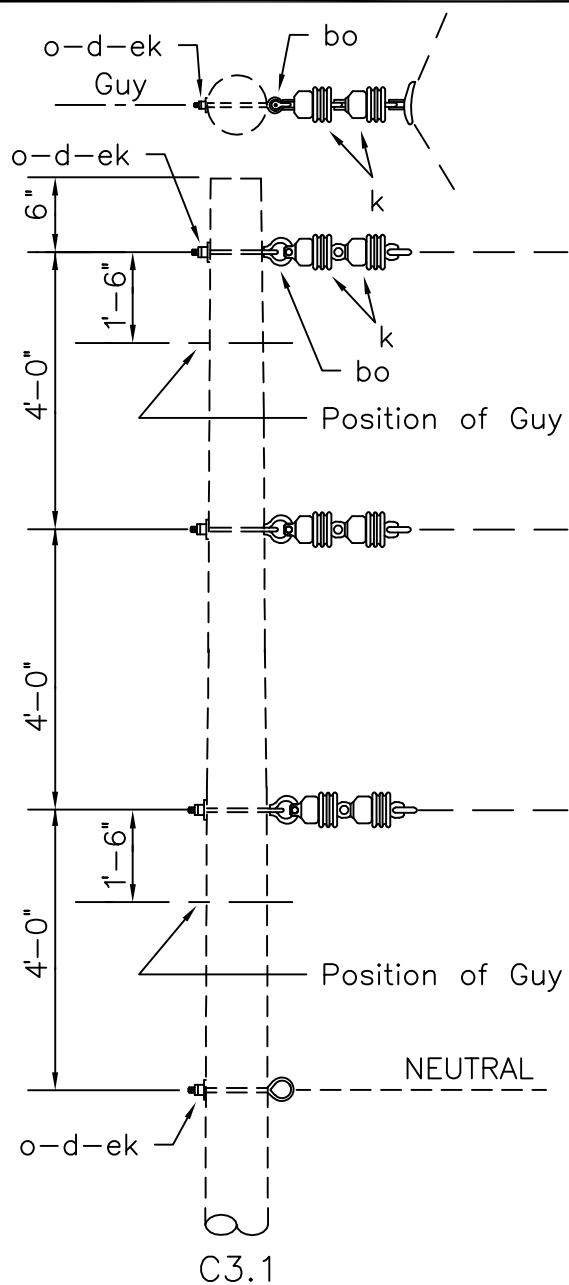
DOUBLE SUPPORT ON 10 FOOT CROSSARMS
(POST INSULATORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C2.52P
(C2-2PL)



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	Link, extension, insulated			3
(du)	(Link, extension) - (optional)			(3)

DESIGN PARAMETERS:

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

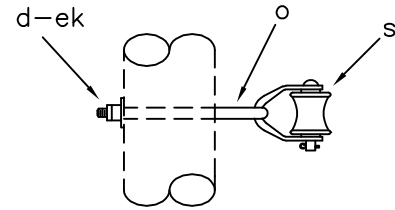
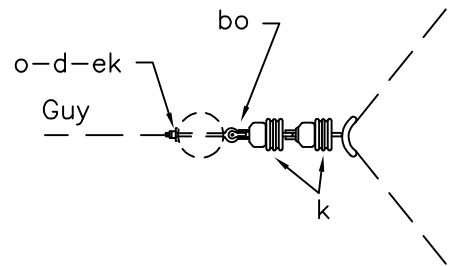
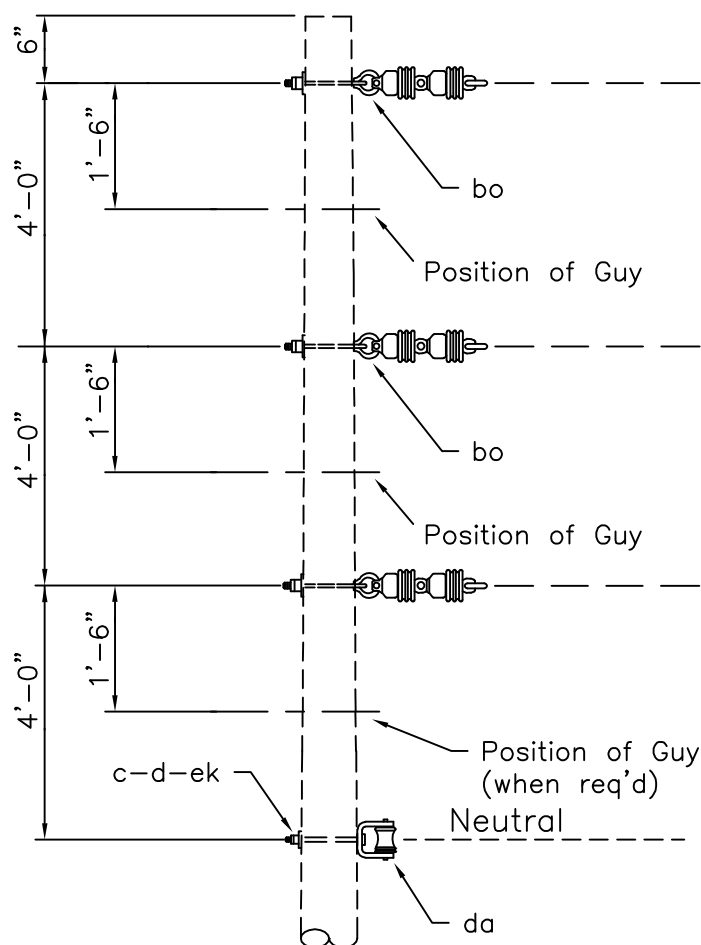
SUSPENSION ANGLE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C3.1,C3.2,C3.3
(C3)



C3.7

C3.4

- 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.

ASSEMBLY: C3		.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	3	3
da	Bracket, insulated	1	1	1			
ek	Locknuts	4	7	4	4	7	4
eu	Link, extension, insulated			3			3
(du)	(Link, extension) - (optional)			(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

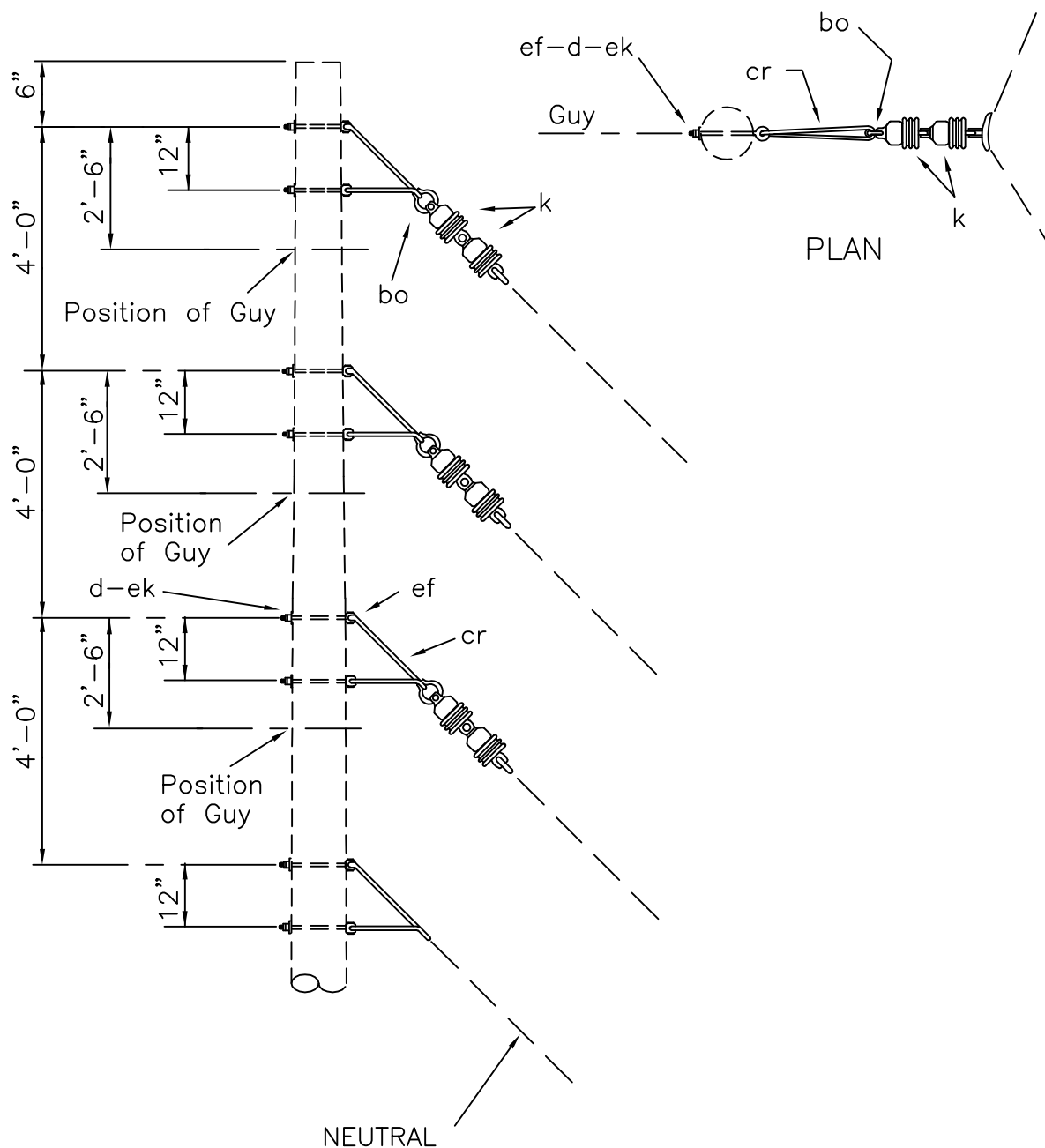
SUSPENSION ANGLE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C3.4 - C3.9



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

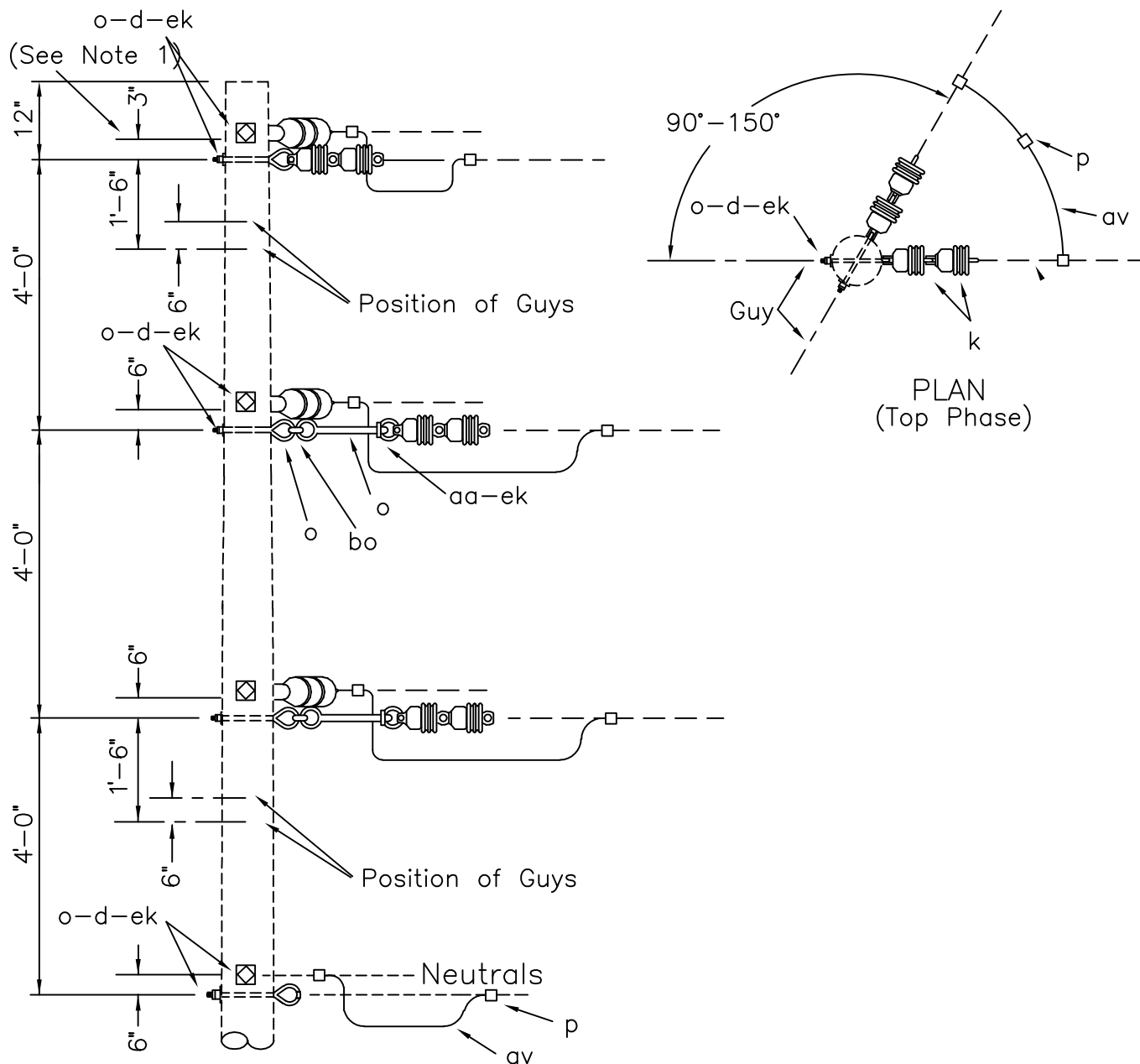
SUSPENSION ANGLE
 (LARGE CONDUCTORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
 12.47/7.2 kV

C3.1L
 (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

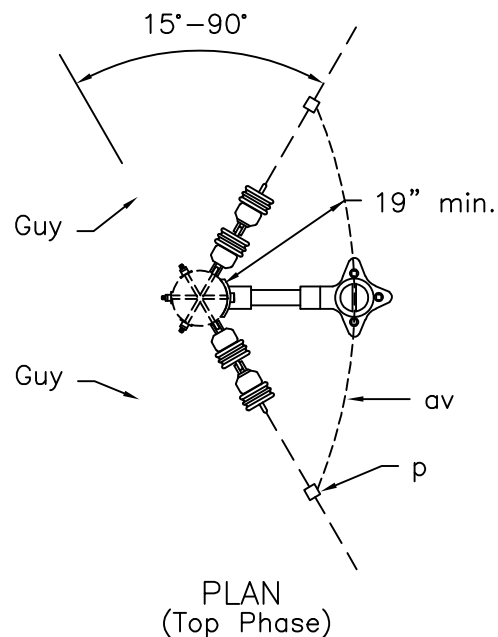
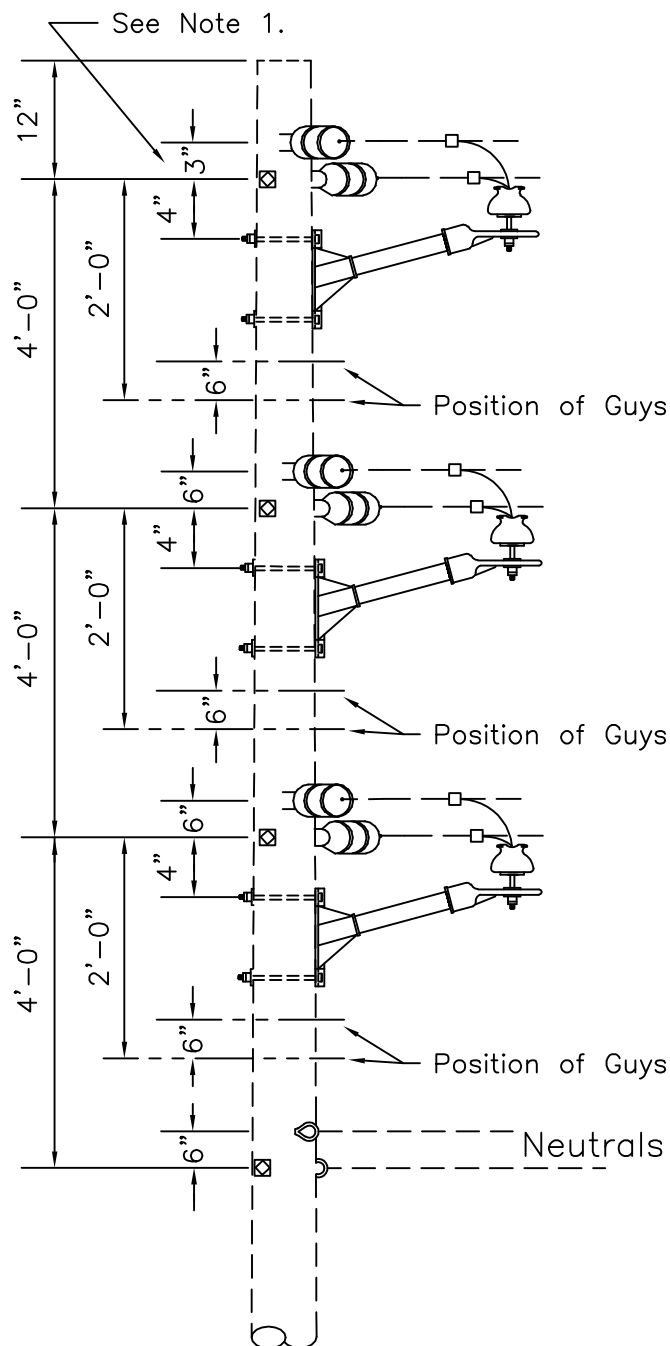
DEADEND ANGLE GUIDE (90°-150°)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C4.1G
(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

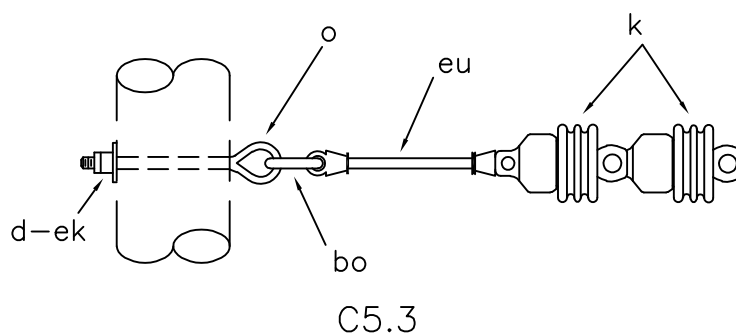
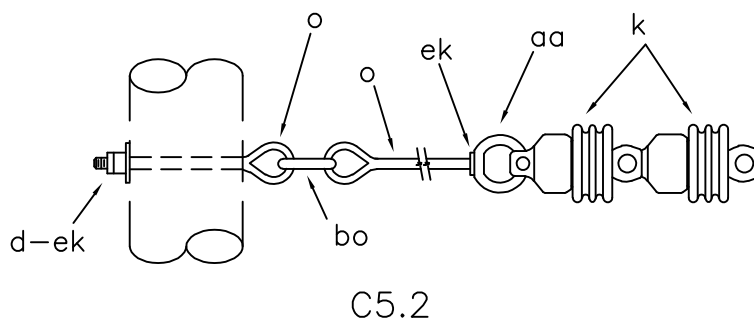
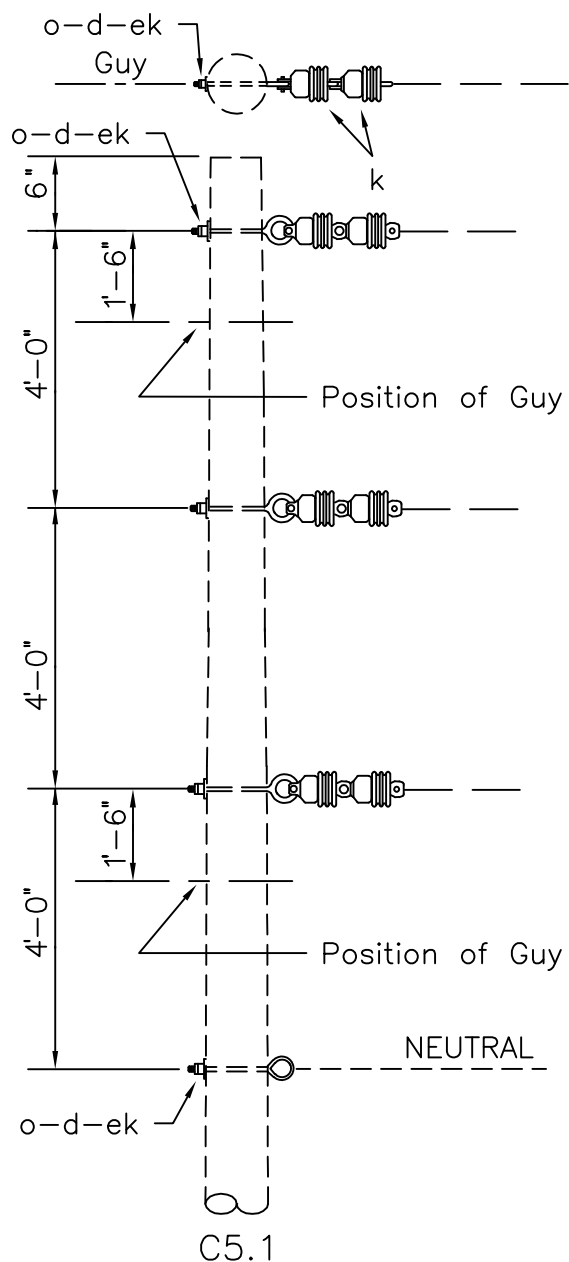
DEADEND ANGLE GUIDE (15°–90°)

APRIL 2005

RUS

3 – PHASE PRIMARY
12.47/7.2 kV

C4.2G



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	Link, extension, insulated			3
(du)	(Link, extension) - (optional)			(3)

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

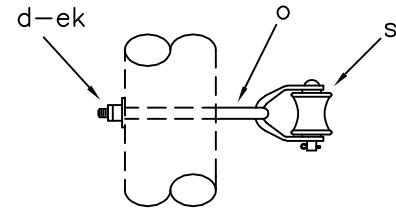
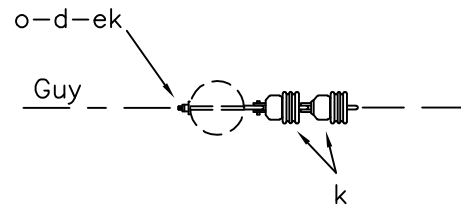
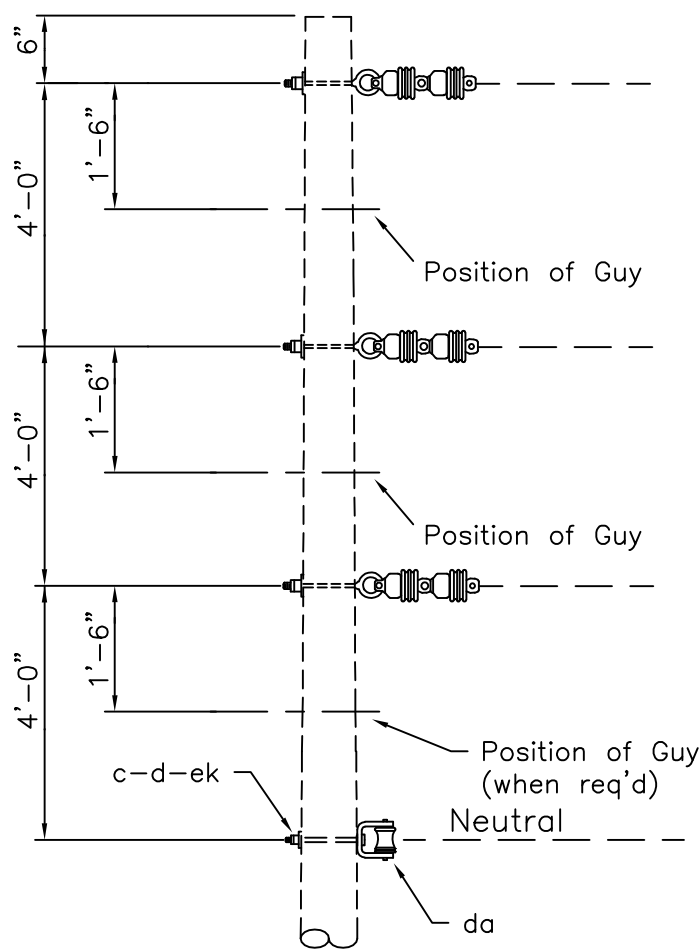
SINGLE DEADENDS

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C5.1,C5.2,C5.3
(C5.1)



C5.7

C5.4

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	Link, extension, insulated			3			3
(du)	(Link, extension) - (optional)			(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

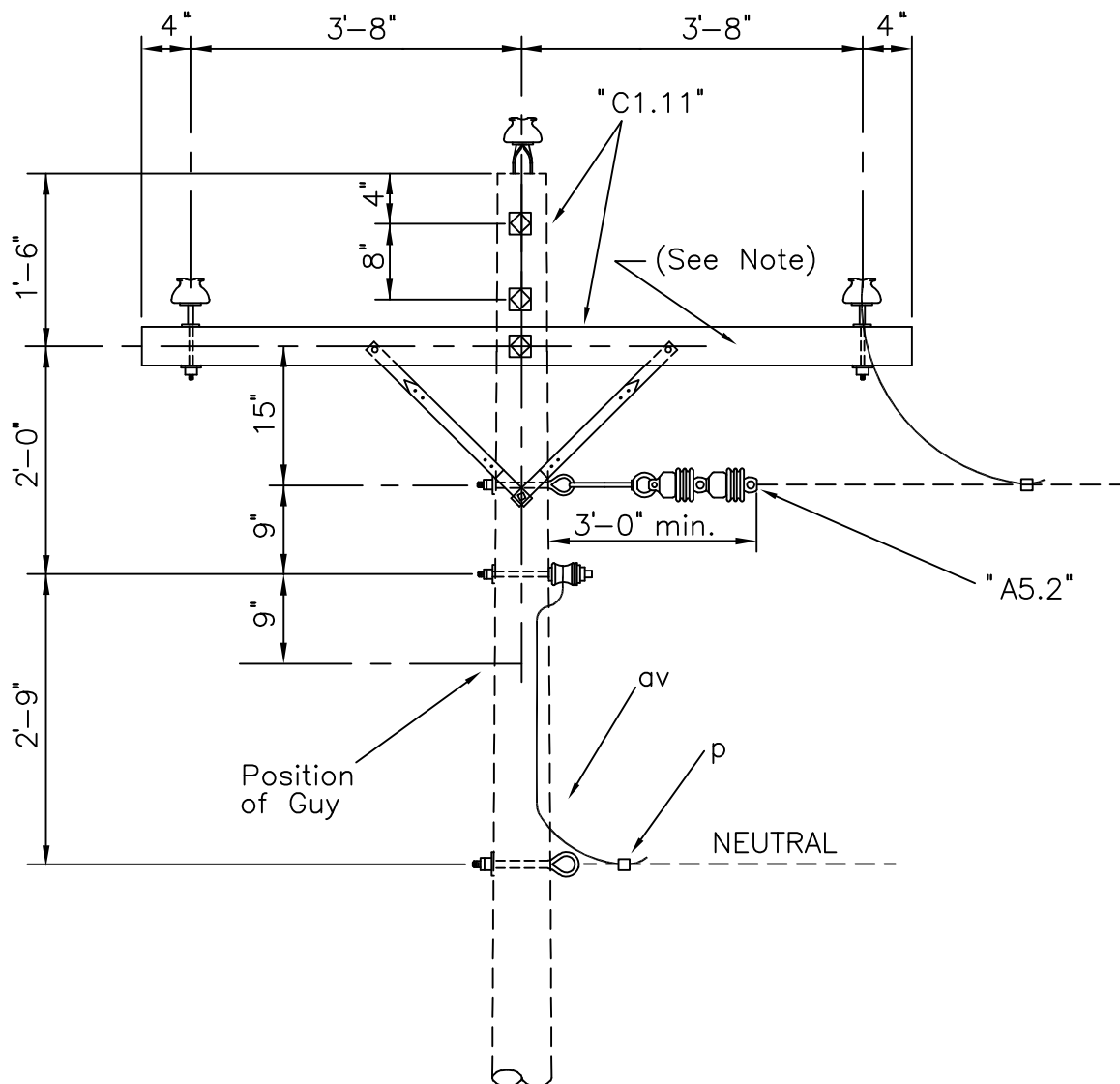
SINGLE DEADENDS

APRIL 2005

RUS

3 - PHASE PRIMARY
 12.47/7.2 kV

C5.4 - C5.9



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

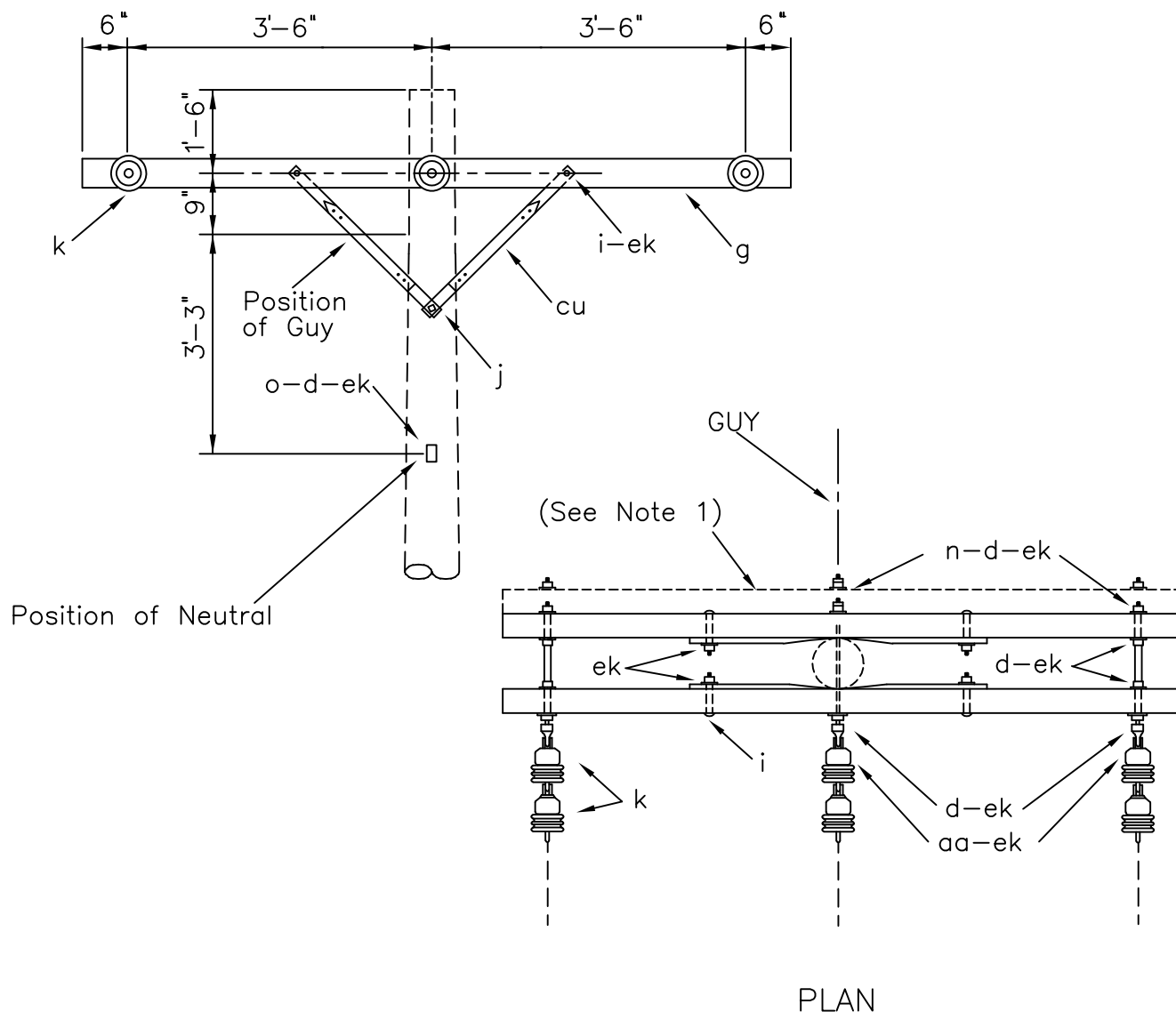
SINGLE PHASE TAP GUIDE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C5.11G



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)

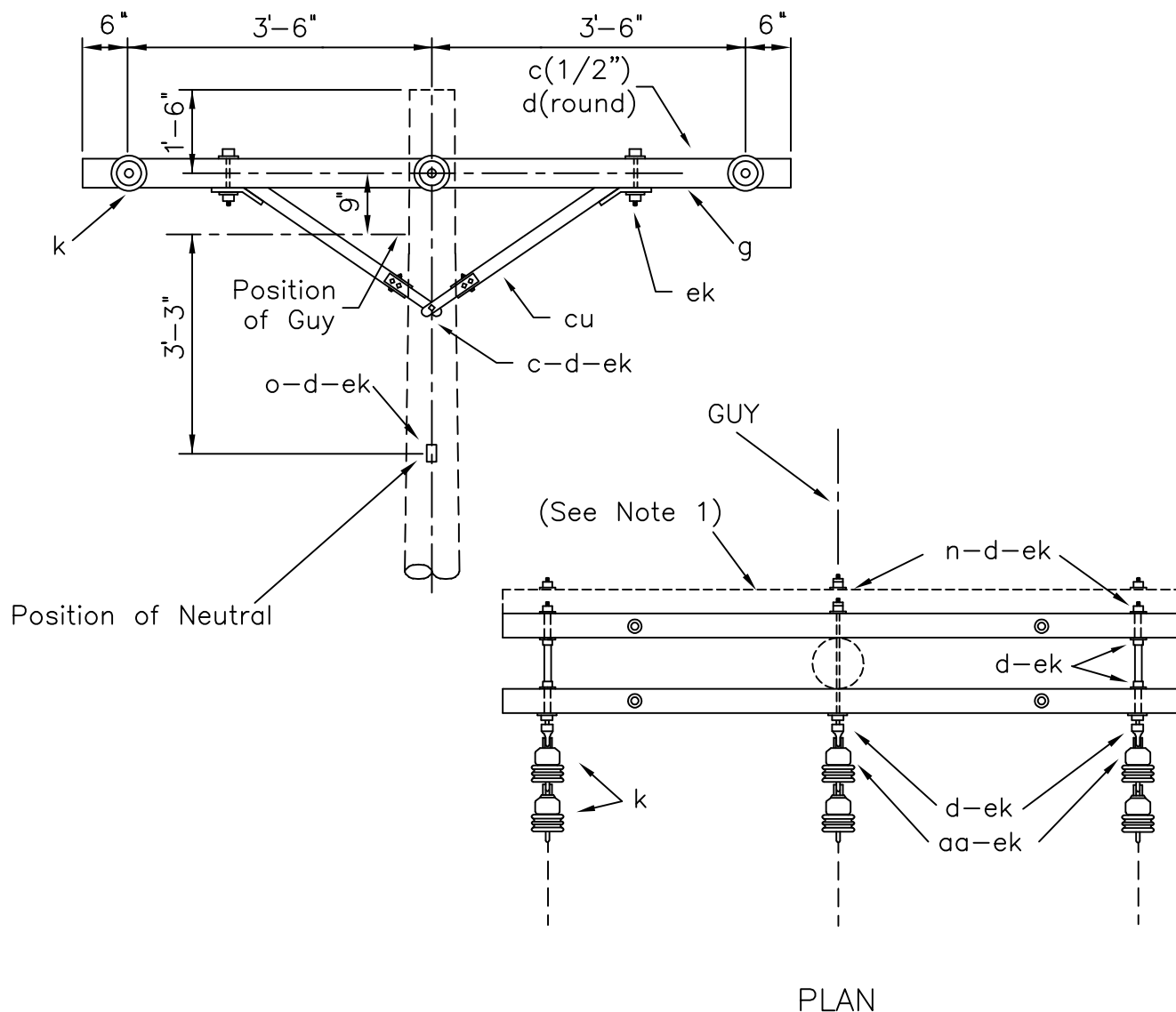
SINGLE DEADEND ON CROSSARMS

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C5.21, C5.31
(C7), (C7-1)



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)

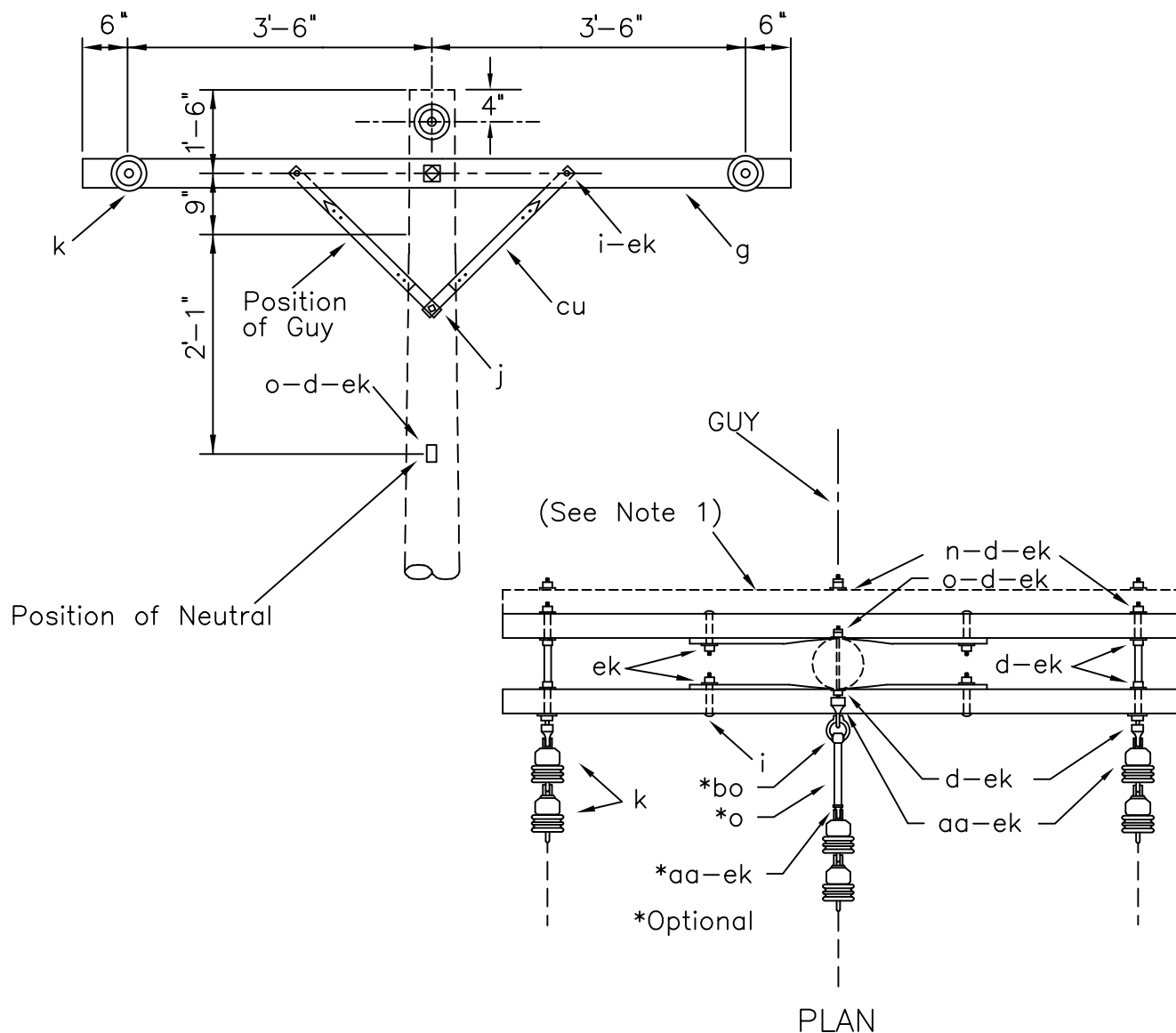
SINGLE DEADEND ON CROSSARMS
(LARGE CONDUCTORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C5.21L, C5.31L



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)

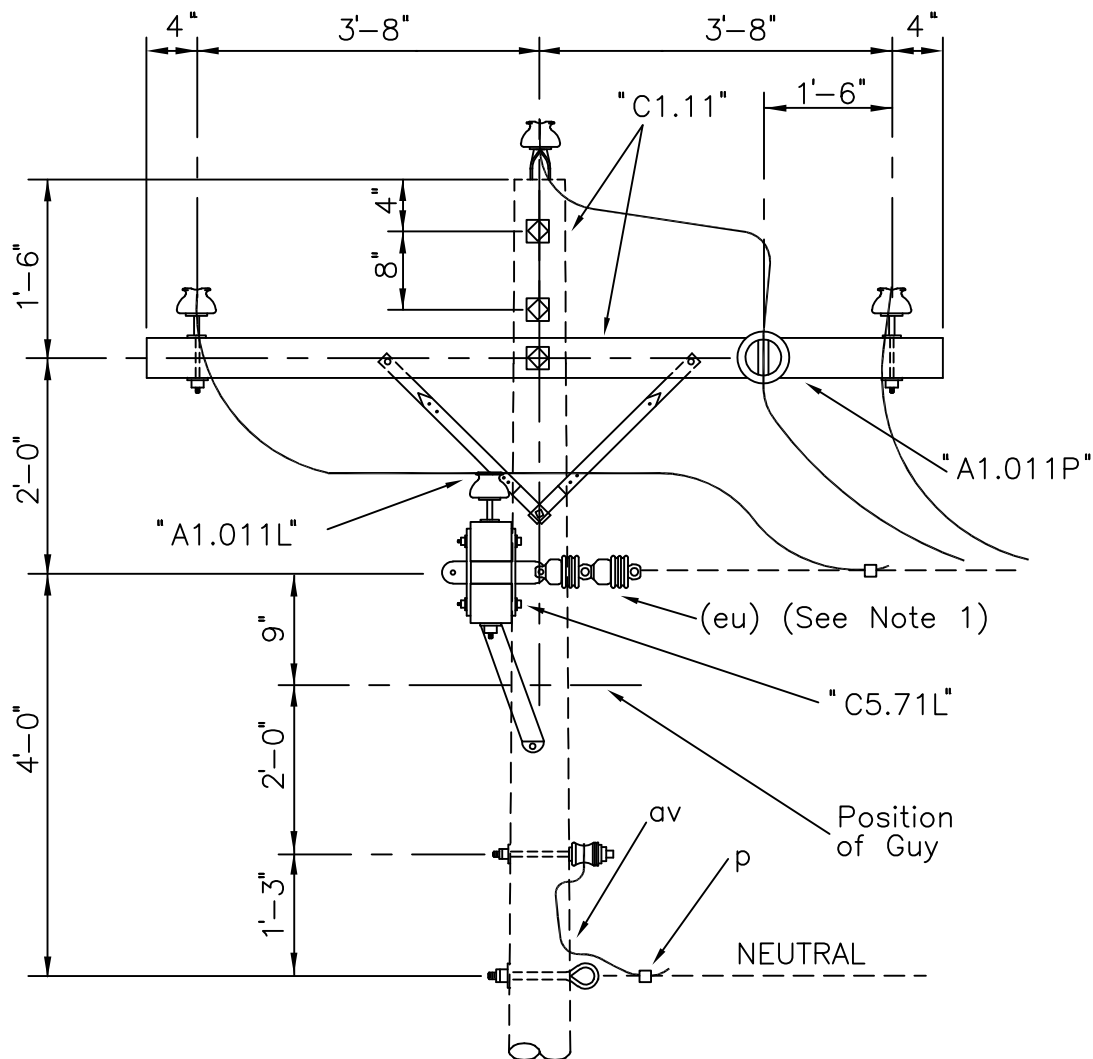
SINGLE DEADEND ON CROSSARMS—ALTERNATIVE

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C5.22, C5.32
(C7-2)



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.

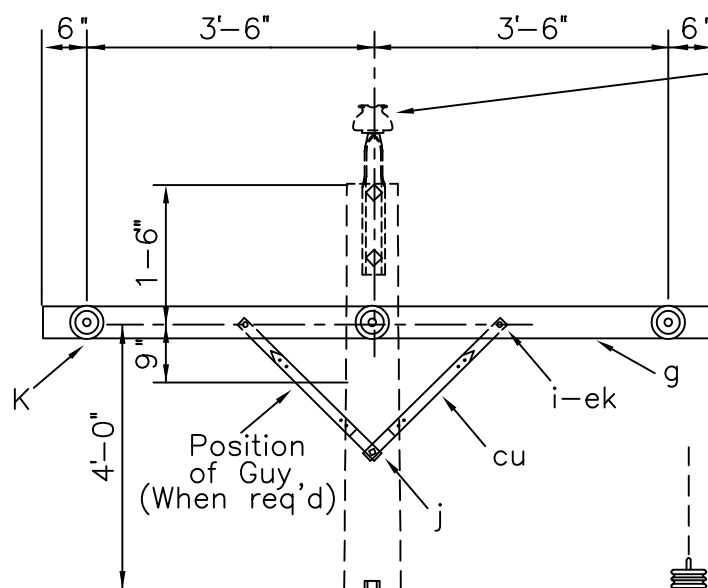
THREE PHASE HORIZONTAL TAP GUIDE

APRIL 2005

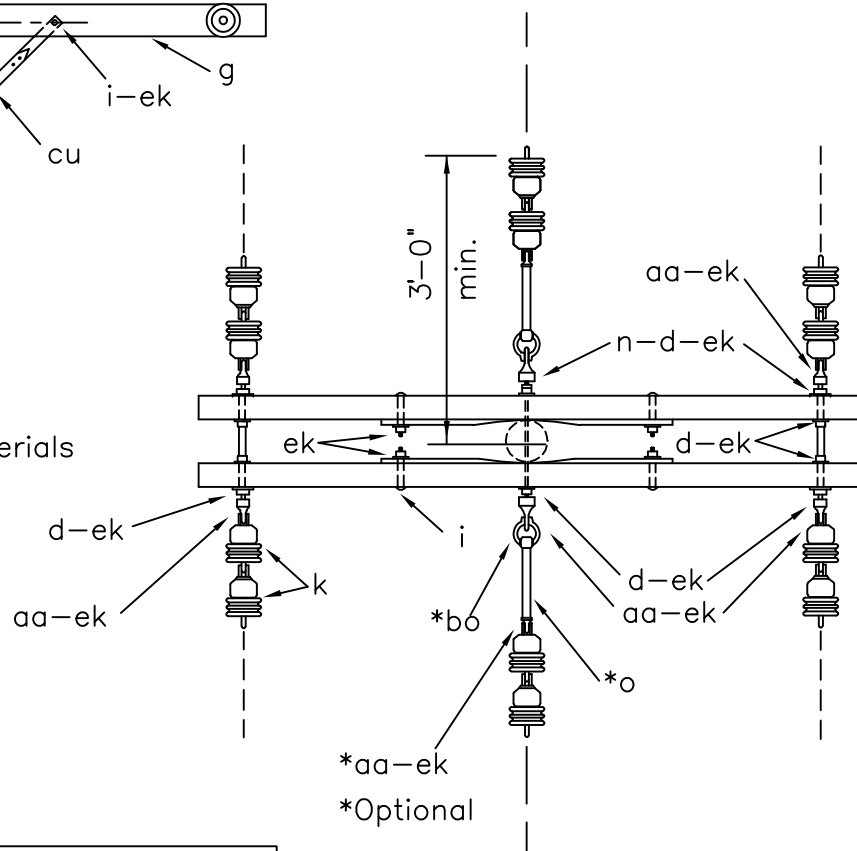
RUS

3 – PHASE PRIMARY
12.47/7.2 kV

C5.82G



Position of Neutral
(See drawing "N6.1" for materials
and construction details)



(NOTE: Install "A1.01"
when extending conductor
across assembly.)

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)

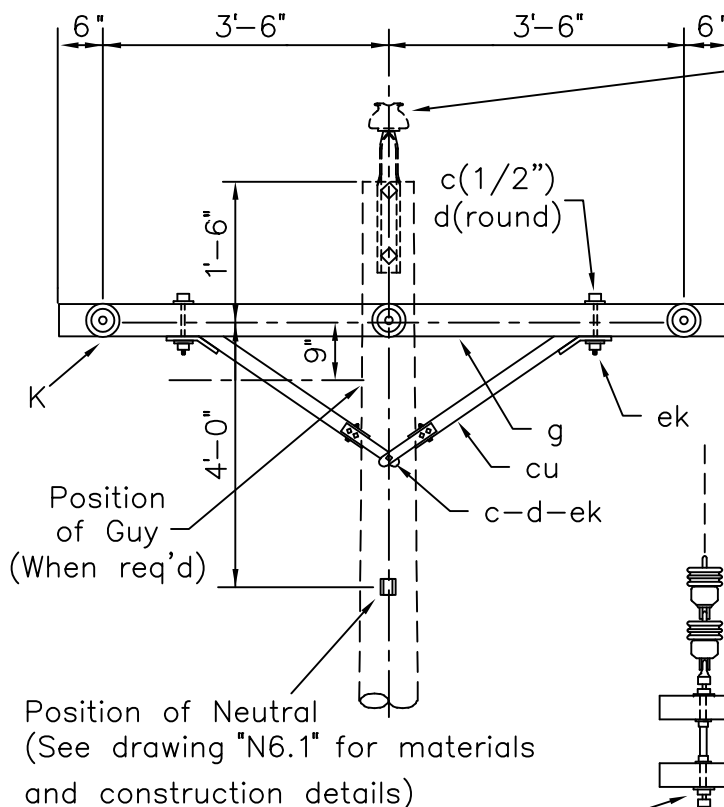
DOUBLE DEADEND ON CROSSARMS

APRIL 2005

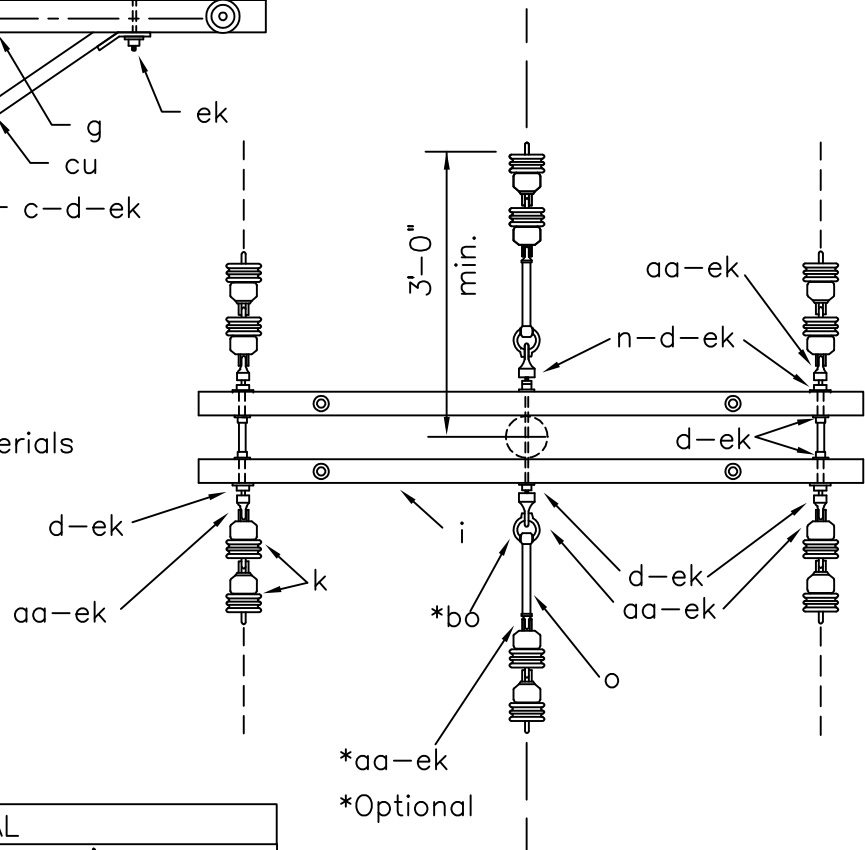
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C6.21 (C8)
C6.31



(NOTE: Install "A1.01" when extending conductor across assembly.)



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)

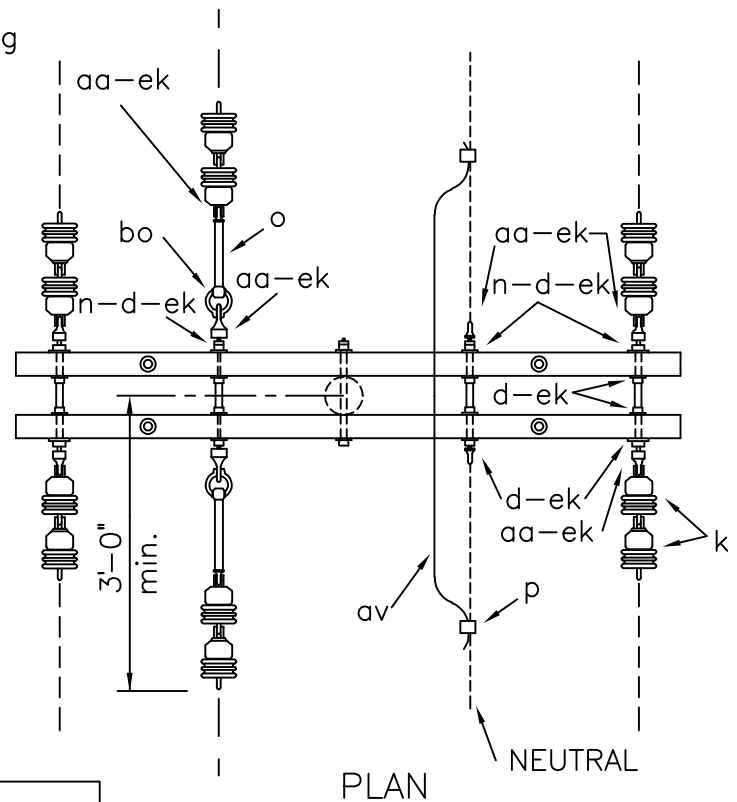
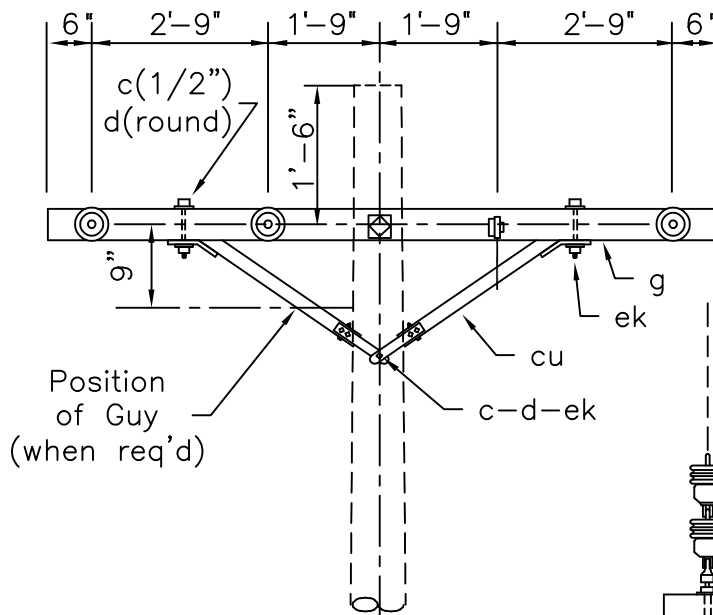
DOUBLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C6.21L
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)

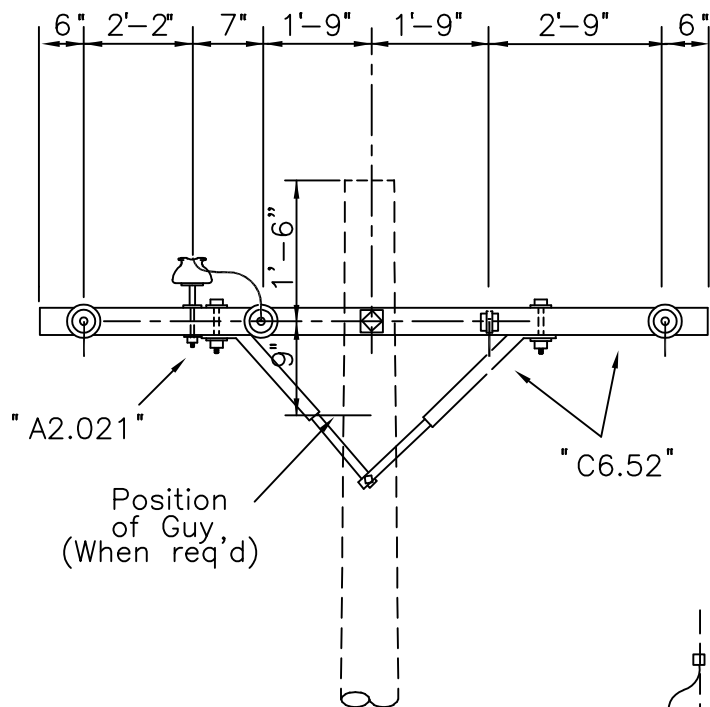
DOUBLE DEADEND ON 10 FOOT CROSSARMS

APRIL 2005

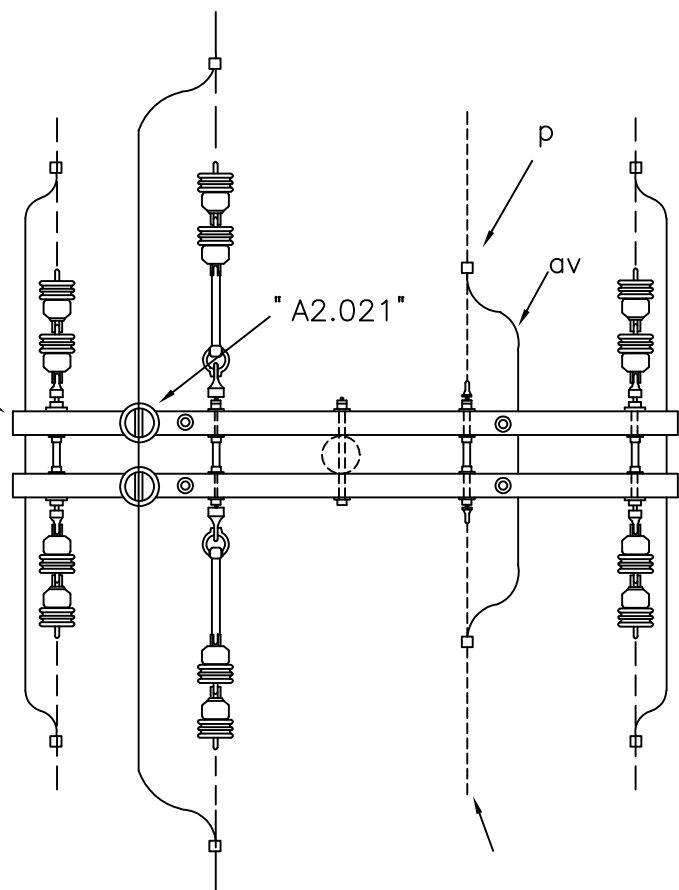
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C6.52, C6.53



"C6.52"



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)

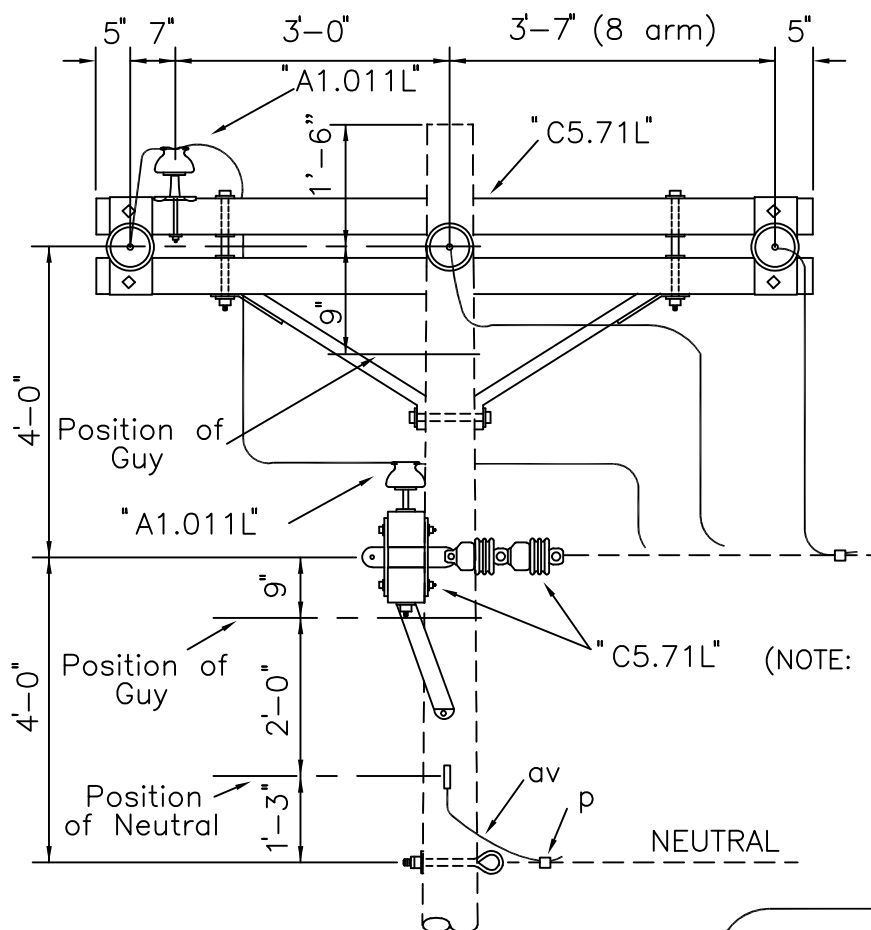
DOUBLE DEADEND ON 10 FOOT CROSSARMS
(FEEDTHROUGH GUIDE)

APRIL 2005

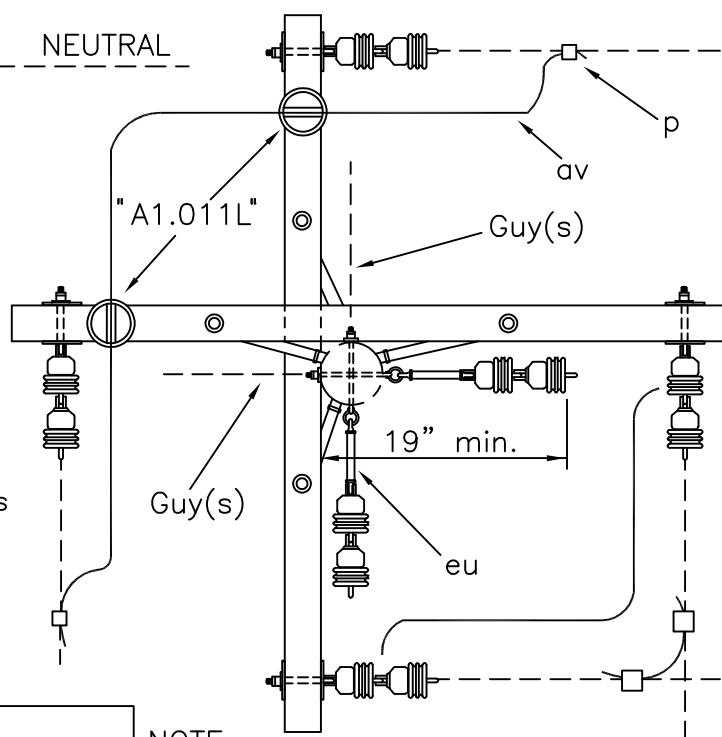
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

C6.52G



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")

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

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.

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

RUS

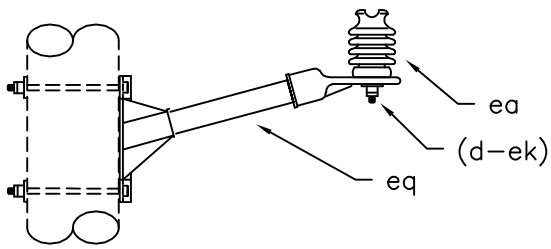
3 - PHASE PRIMARY
12.47/7.2 kV

C6.91G

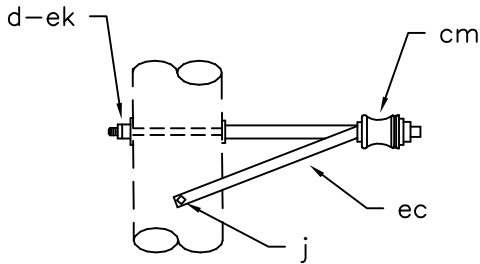
INDEX D

DOUBLE CIRCUIT PRIMARY POLE TOP ASSEMBLY UNITS

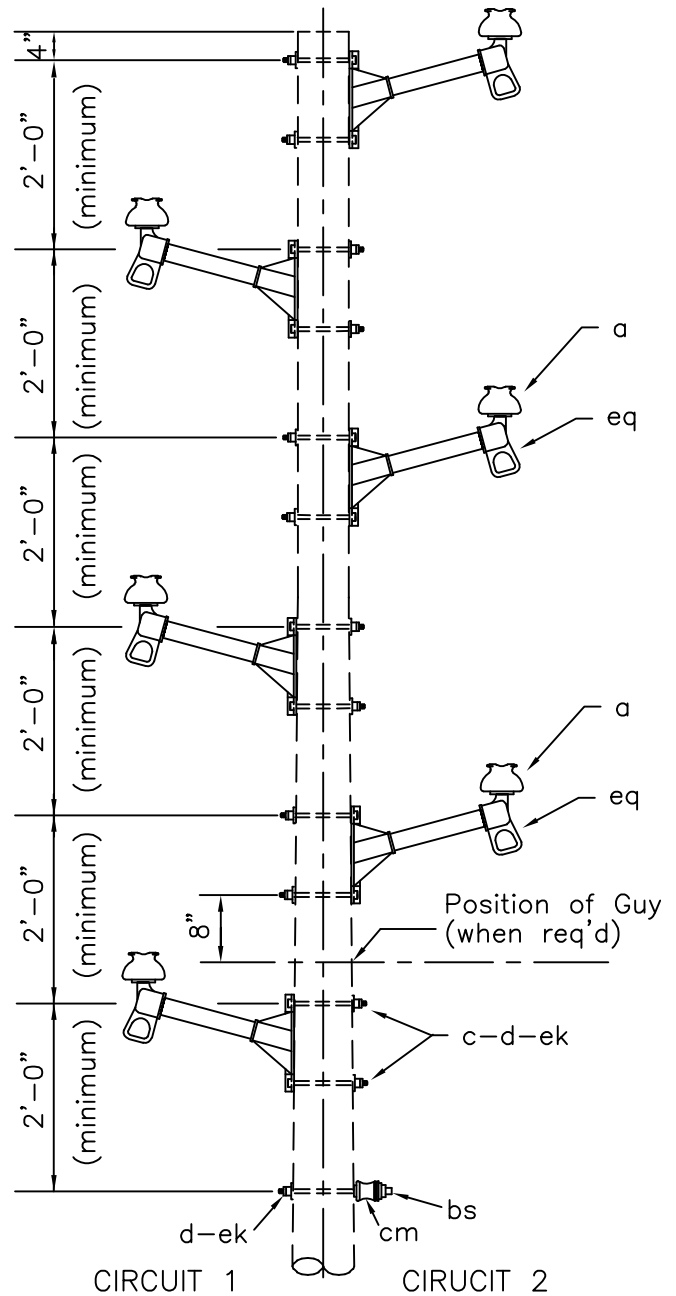
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
D1.4N D1.4NP D1.5N D1.5NP		SINGLE SUPPORT - NARROW PROFILE (TANGENT) (and POST INSULATORS)
D1.81 D1.82	(DC-C1)	SINGLE SUPPORT ON CROSSARMS (TANGENT)
D1.81L D1.82L		SINGLE SUPPORT ON CROSSARMS (TANGENT) (LARGE 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 D2.91L	(DC-C2-1)	DOUBLE SUPPORT ON CROSSARMS 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)	
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

(if req'd)

Design Parameters:

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

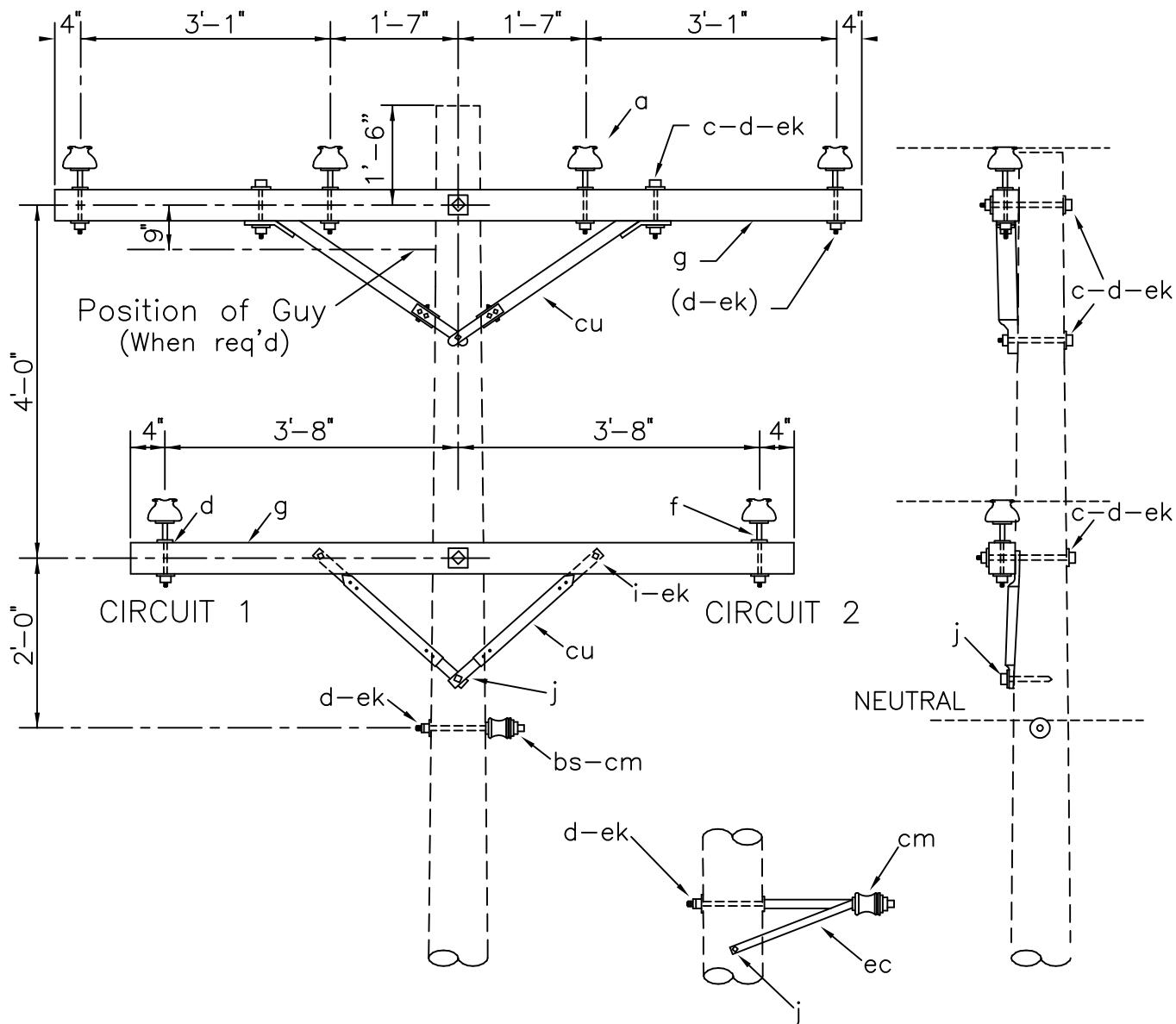
SINGLE SUPPORT—NARROW PROFILE
(TANGENT)

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
12.47/7.2 kV

D1.4N,D1.4NP
D1.5N,D1.5NP



ASSEMBLY: D1.

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.

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

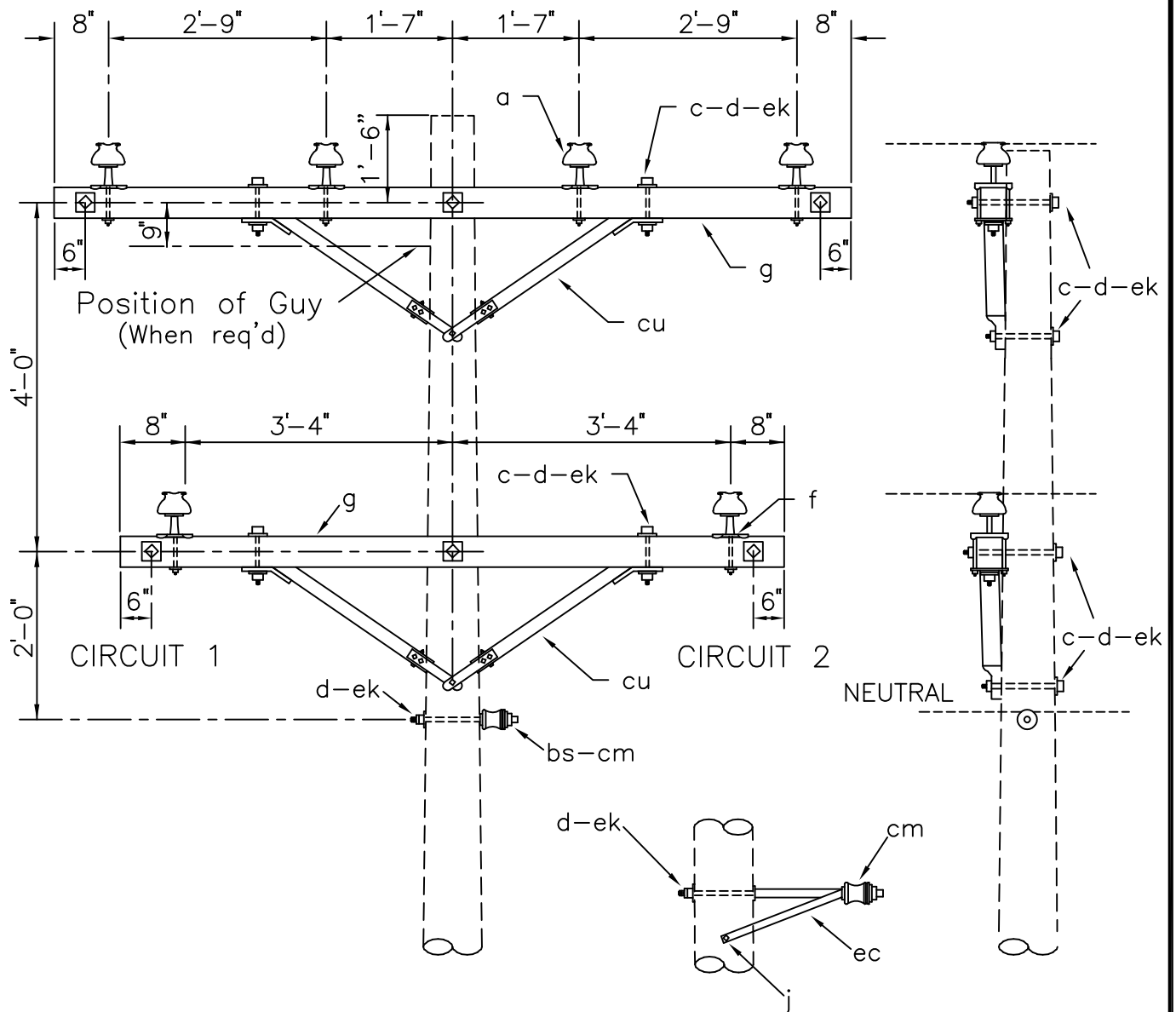
SINGLE SUPPORT ON CROSSARMS
 (TANGENT)

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
 12.47/7.2 kV

D1.81 (DC-C1)
 D1.82



ASSEMBLY: D1.

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.

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°

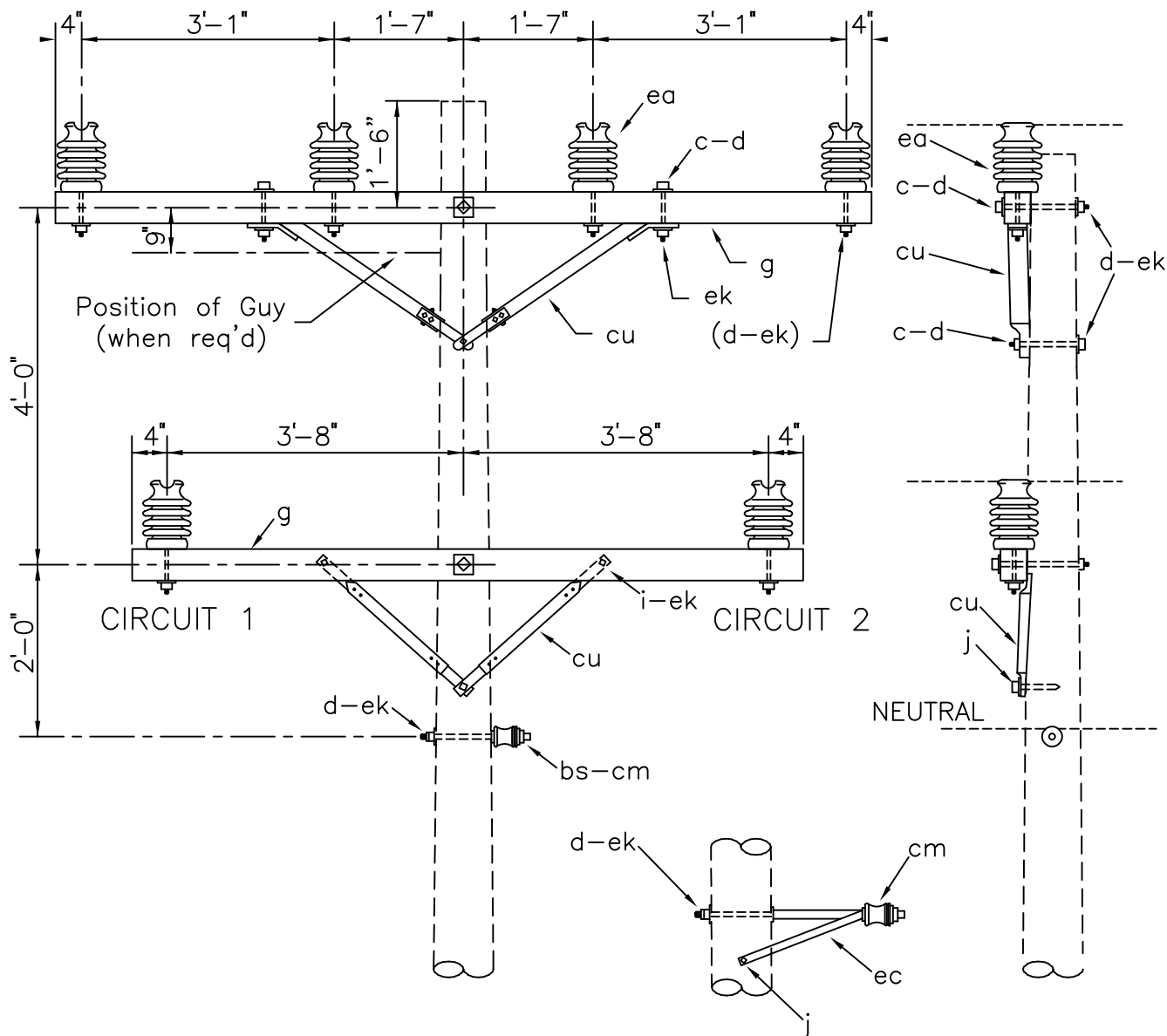
SINGLE SUPPORT ON CROSSARMS
(TANGENT) (LARGE CONDUCTORS)

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
12.47/7.2 kV

D1.81L
D1.82L



ASSEMBLY: D1.

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.

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)

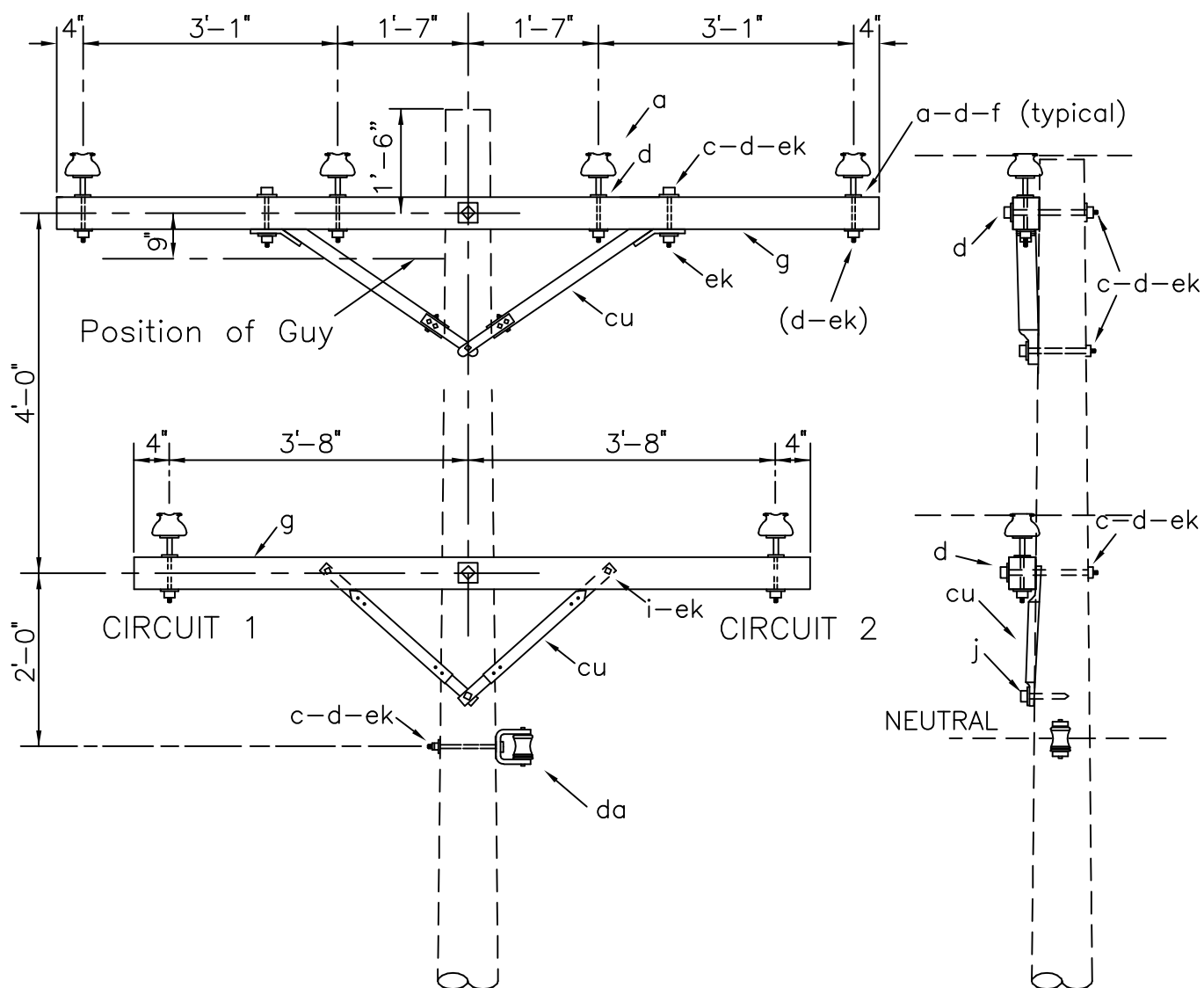
APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
 12.47/7.2 kV

D1.81P

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

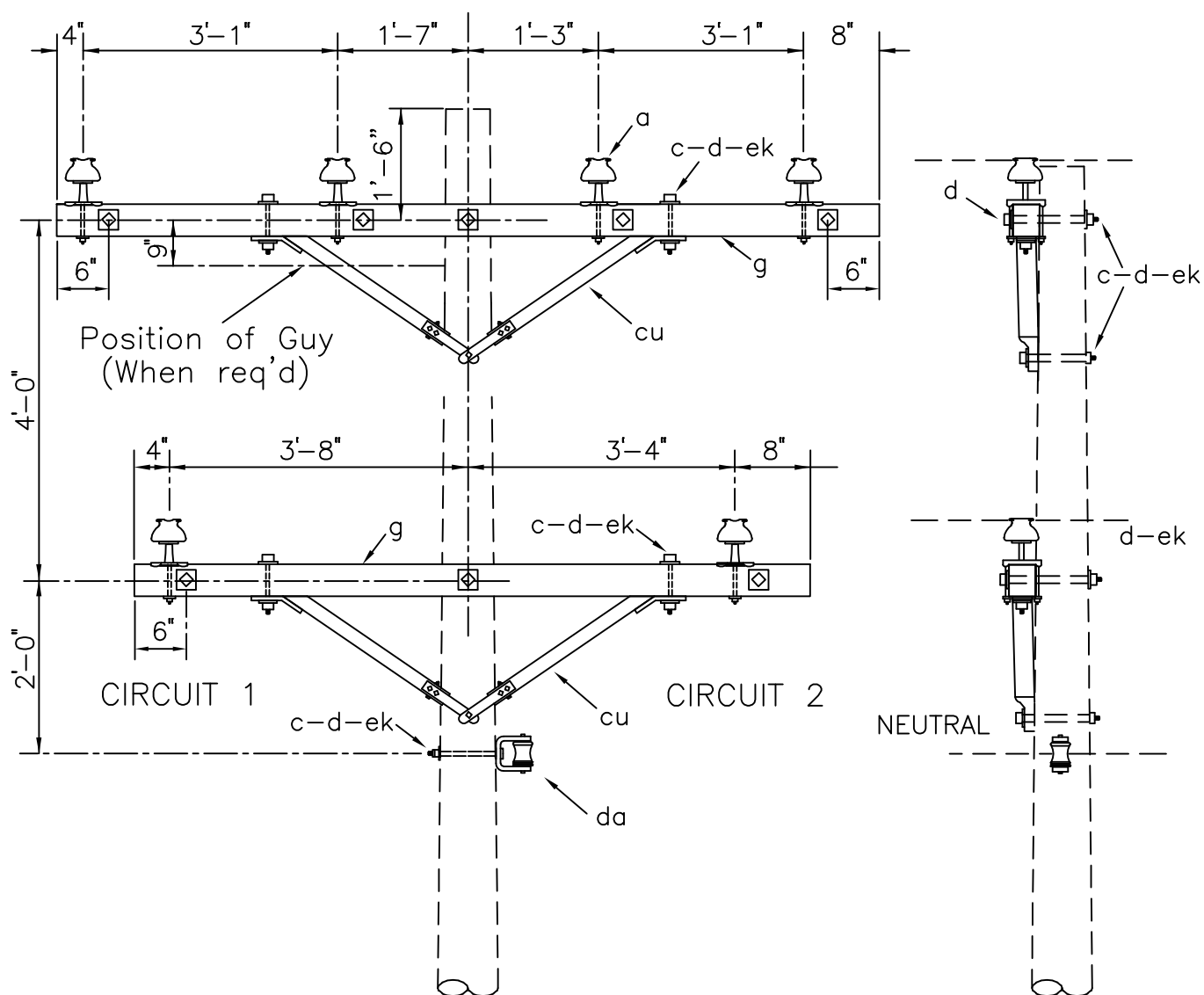
SINGLE SUPPORT ON CROSSARMS

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
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

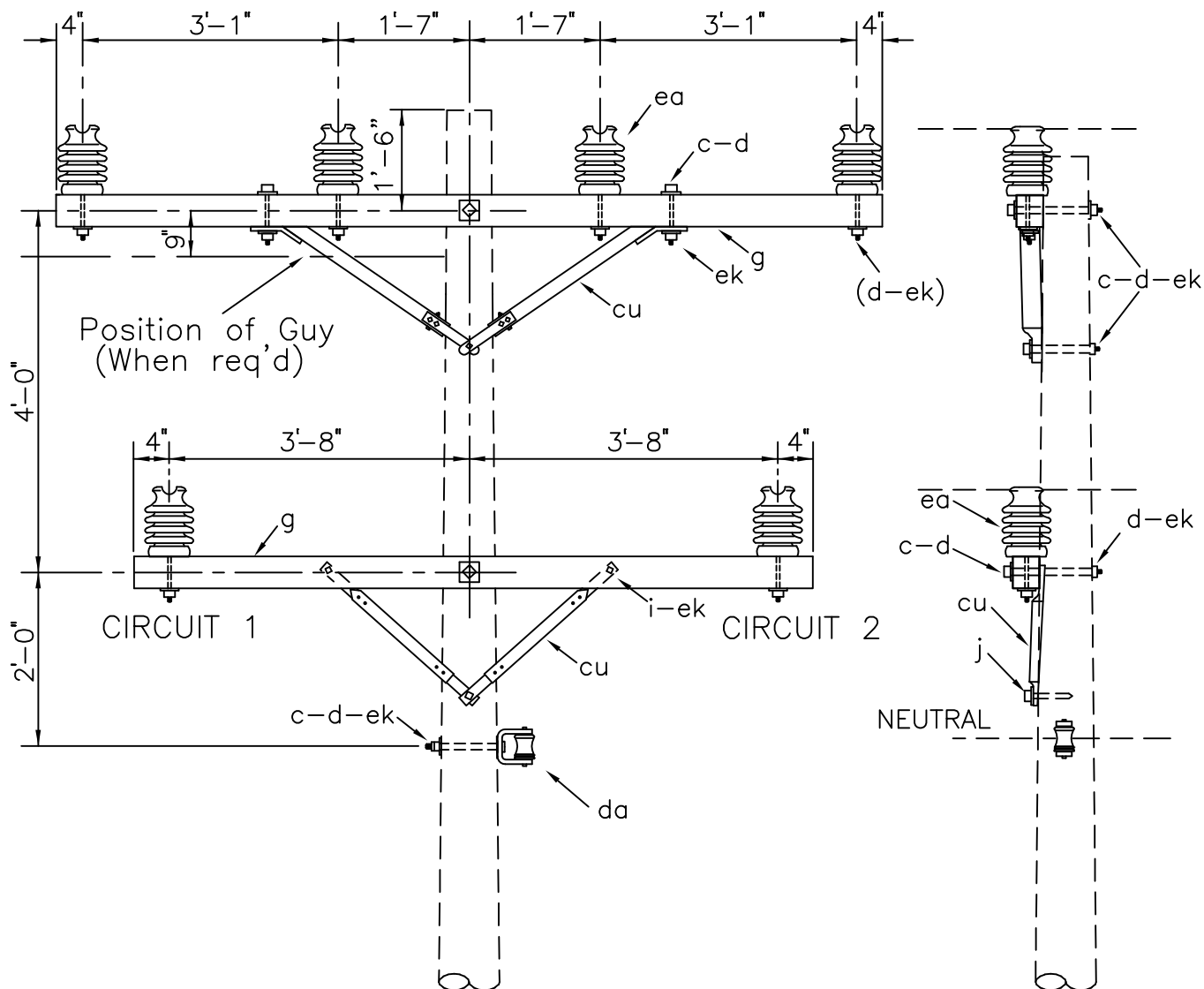
SINGLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
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)

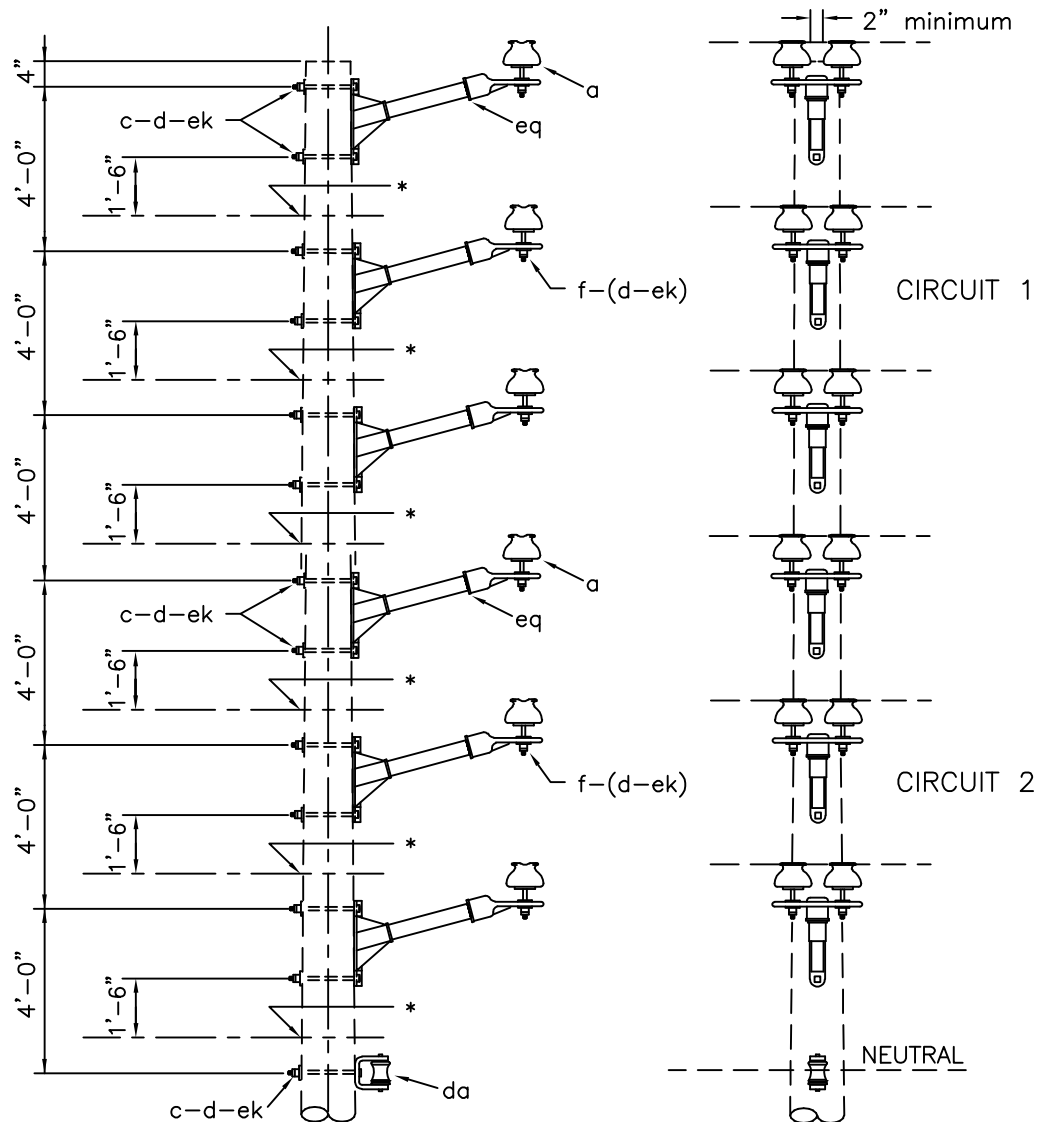
APRIL 2005

DOUBLE CIRCUIT PRIMARY

RUS

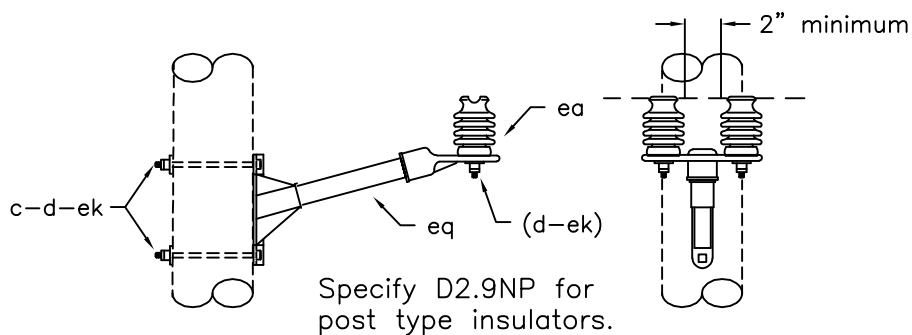
12.47/7.2 kV

D1.83P



* Position of guys
as required.

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

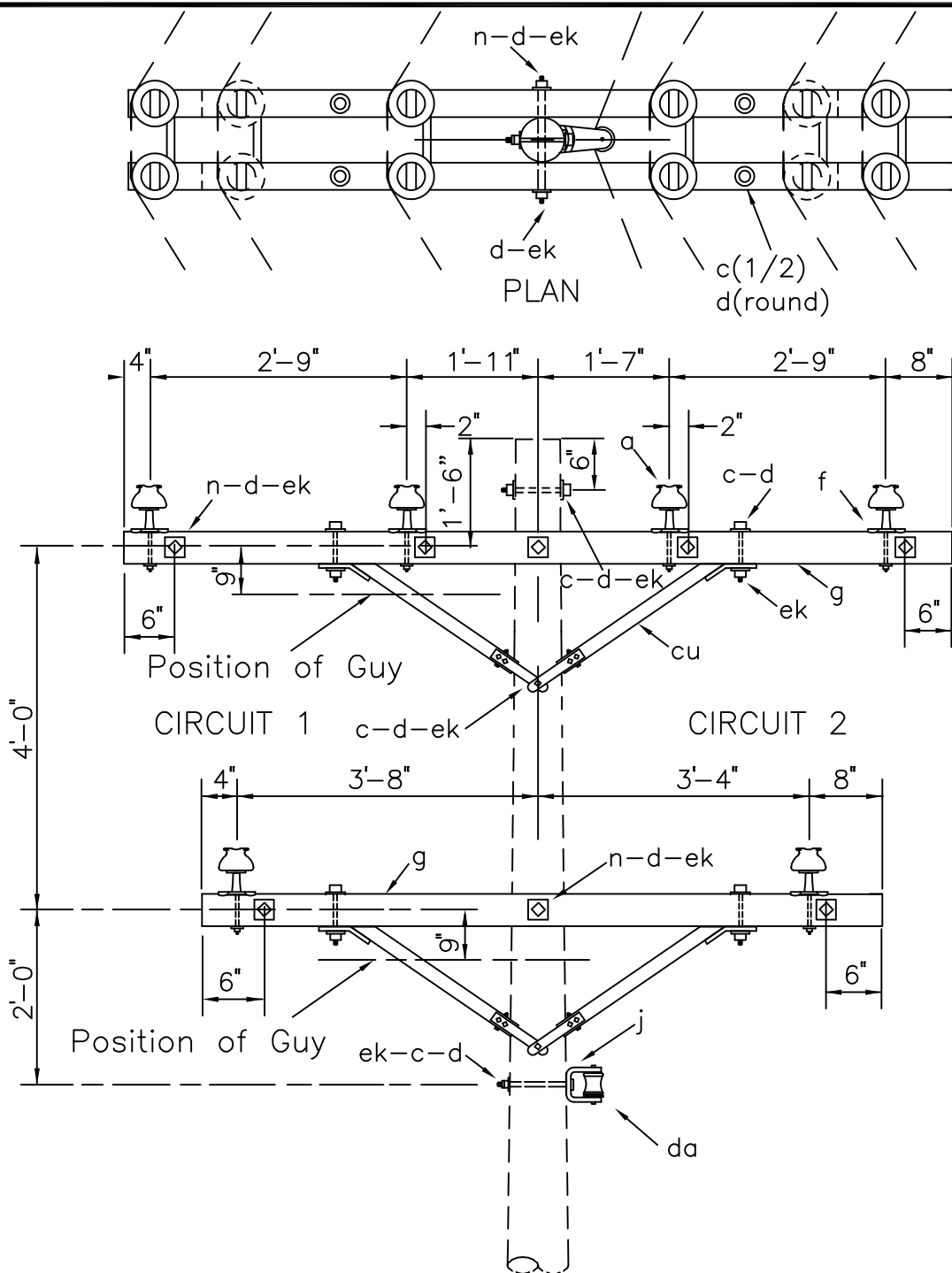
DOUBLE SUPPORT-NARROW PROFILE

APRIL 2005

DOUBLE CIRCUIT PRIMARY
12.47/7.2 kV

D2.9N
D2.9NP

D2.91
(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

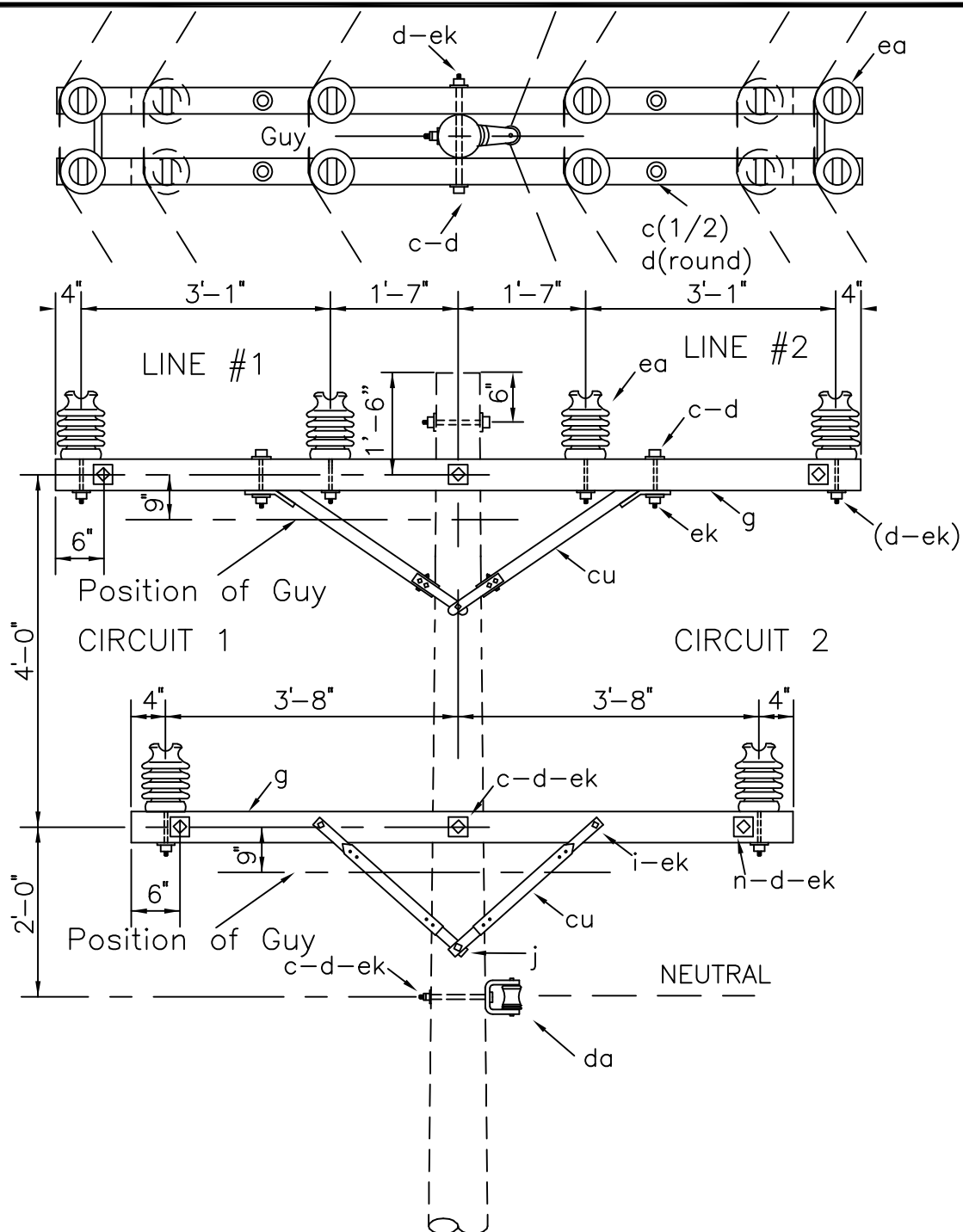
DOUBLE SUPPORT ON CROSSARMS (LARGE CONDUCTORS)

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
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

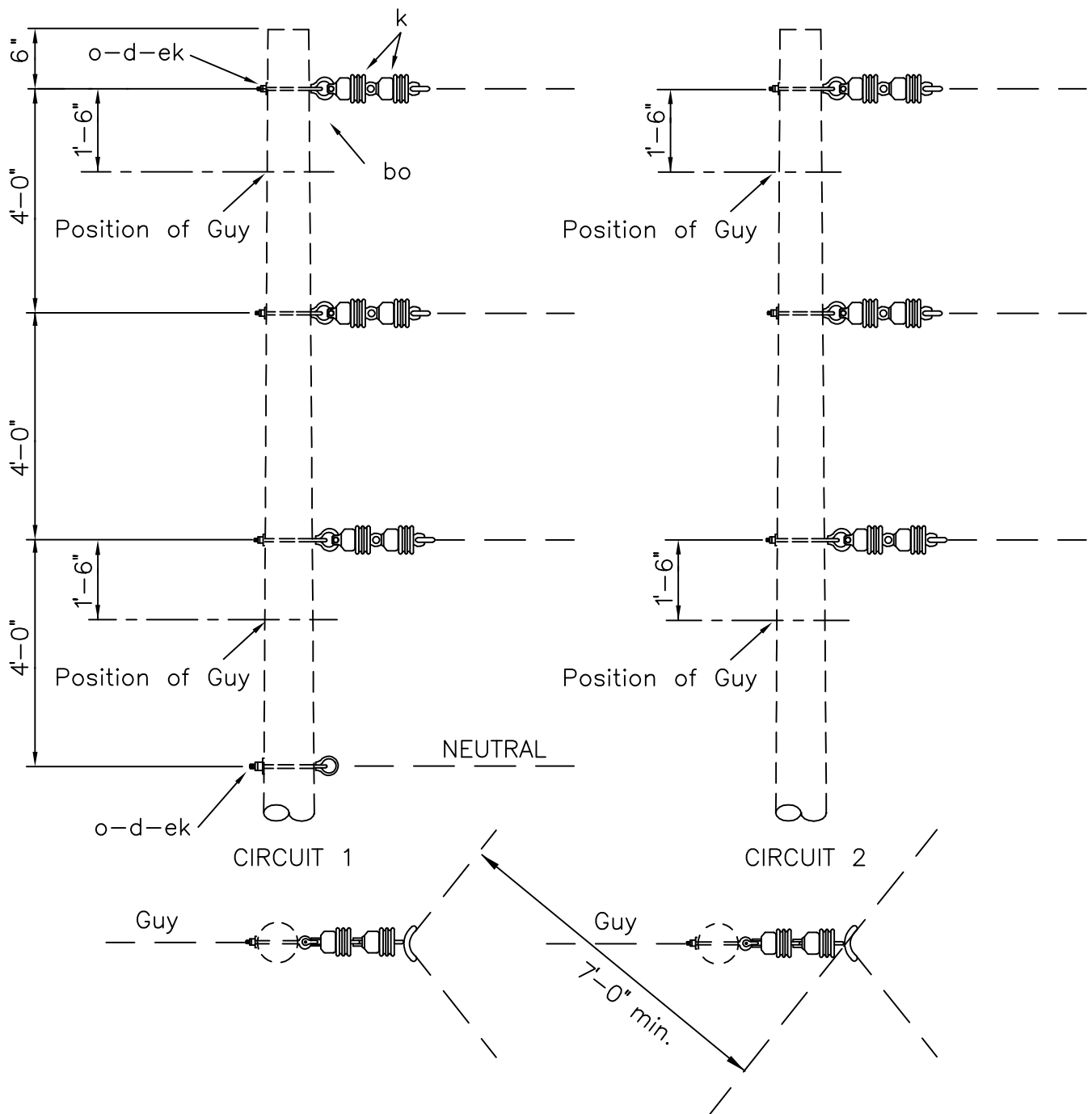
DOUBLE SUPPORT ON CROSSARMS (POST INSULATORS)

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
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"

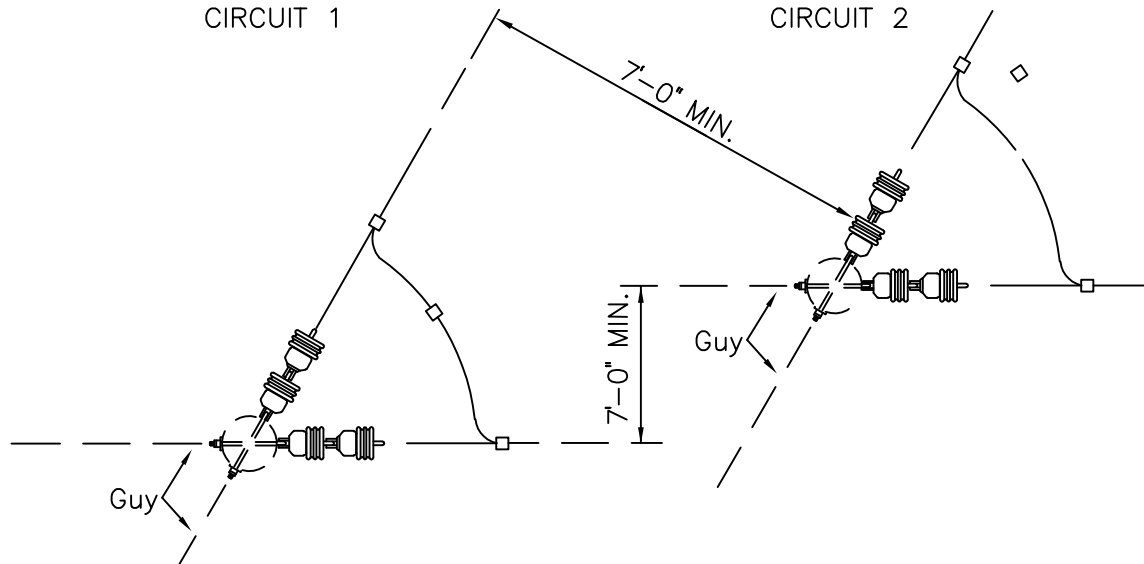
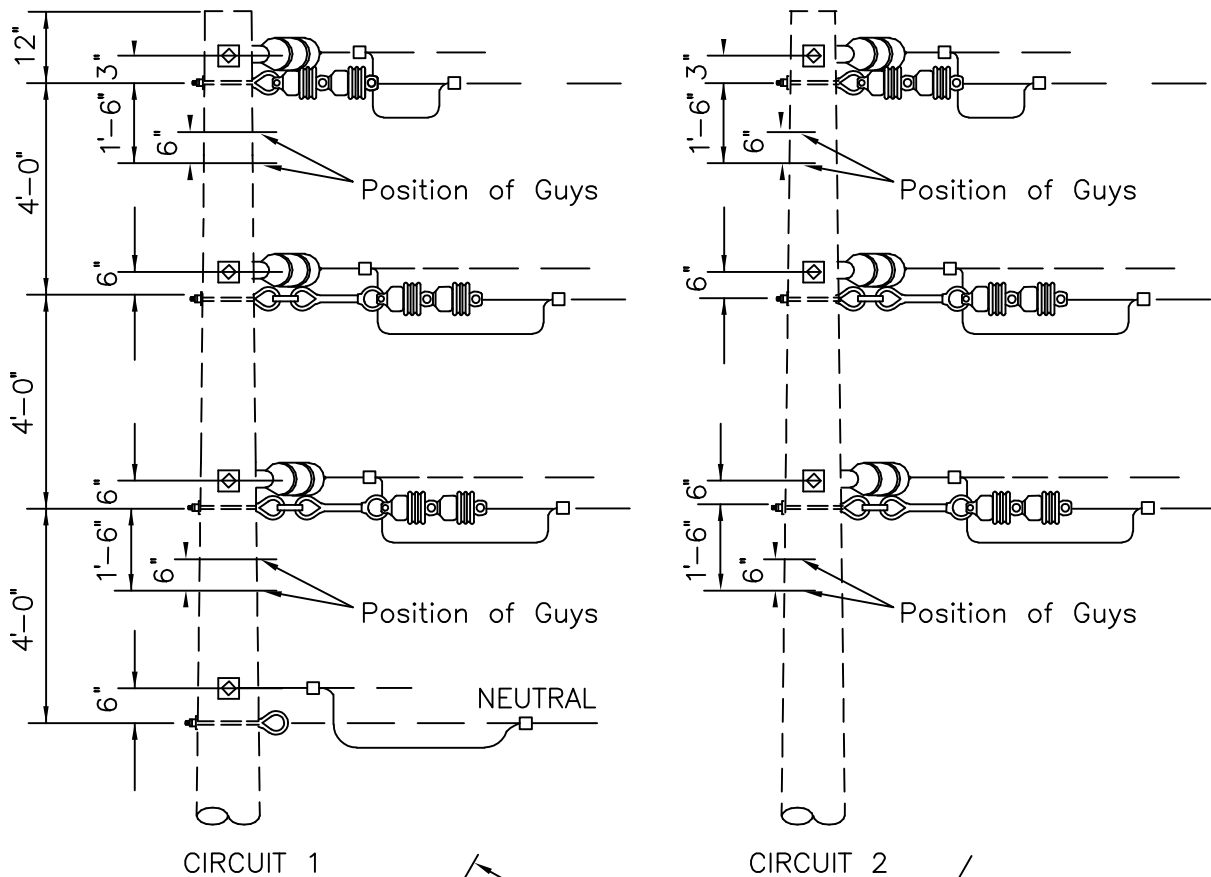
SUSPENSION ANGLE GUIDE

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
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"

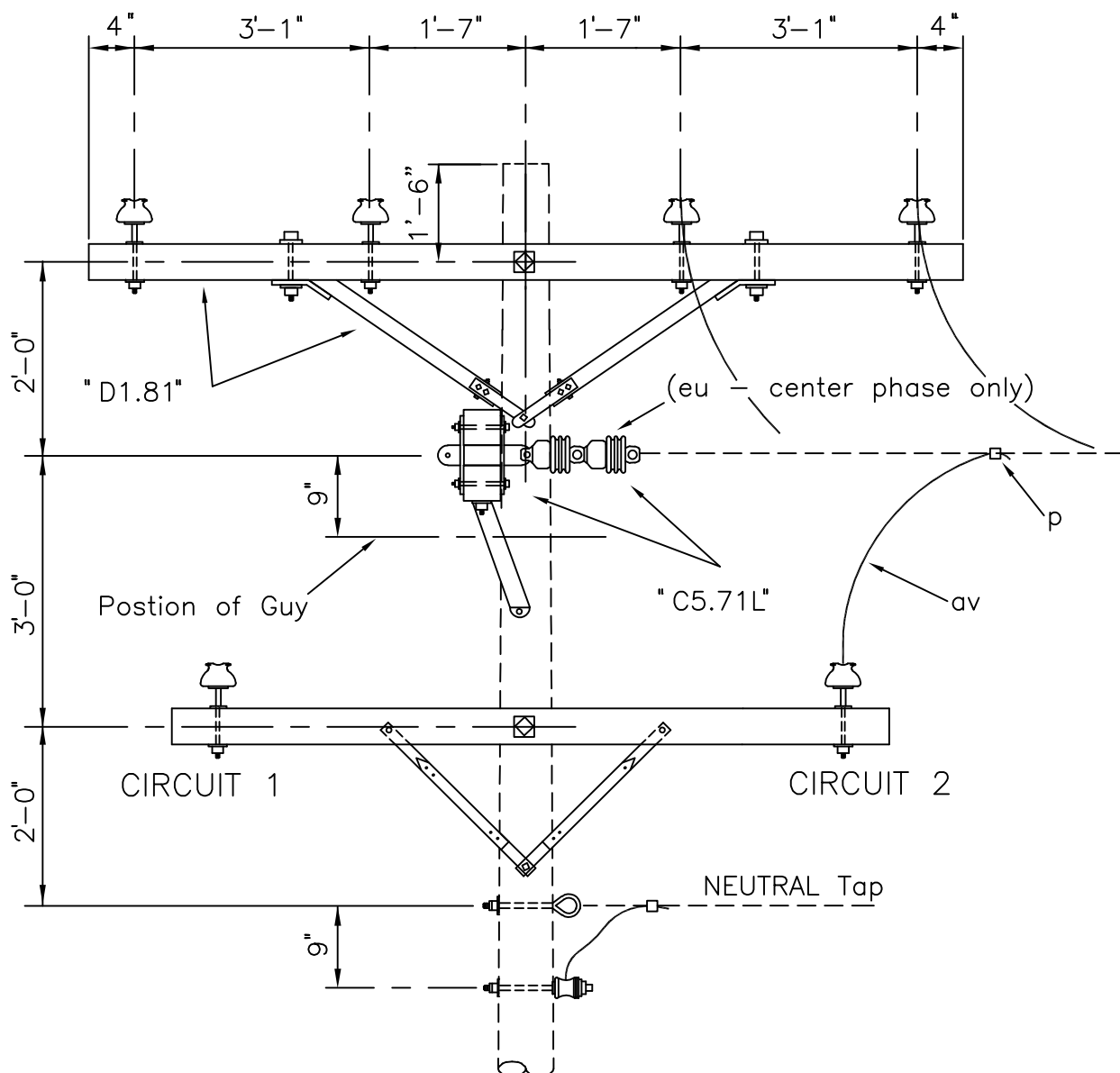
DEADEND ANGLE GUIDE

APRIL 2005

RUS

DOUBLE CIRCUIT PRIMARY
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"

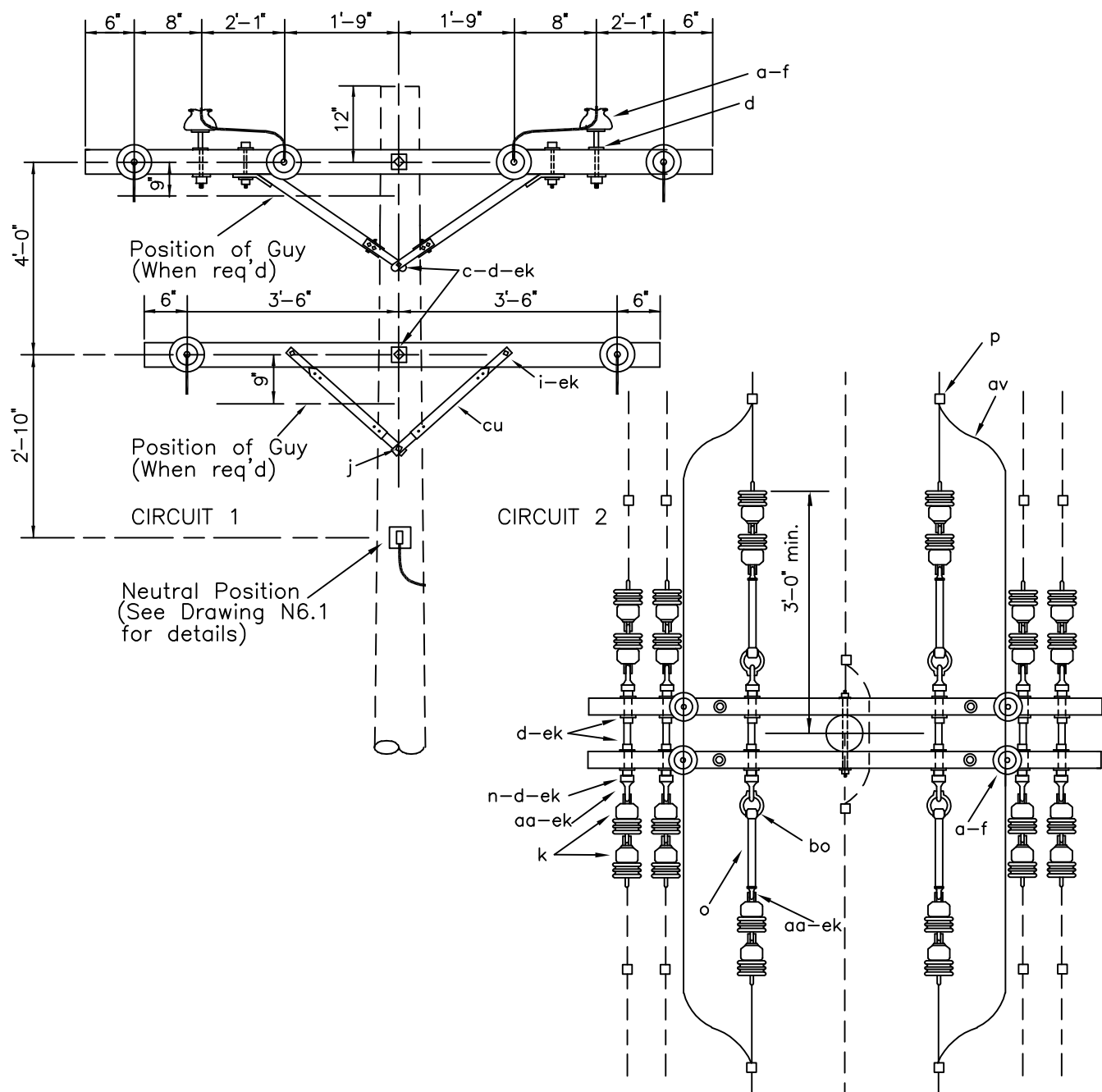
THREE PHASE TAP GUIDE

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

RUS

DOUBLE CIRCUIT PRIMARY
12.47/7.2 kV

D6.91
(DC-C8)

INDEX E

GUYING ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
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 Table 261-1A.

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.

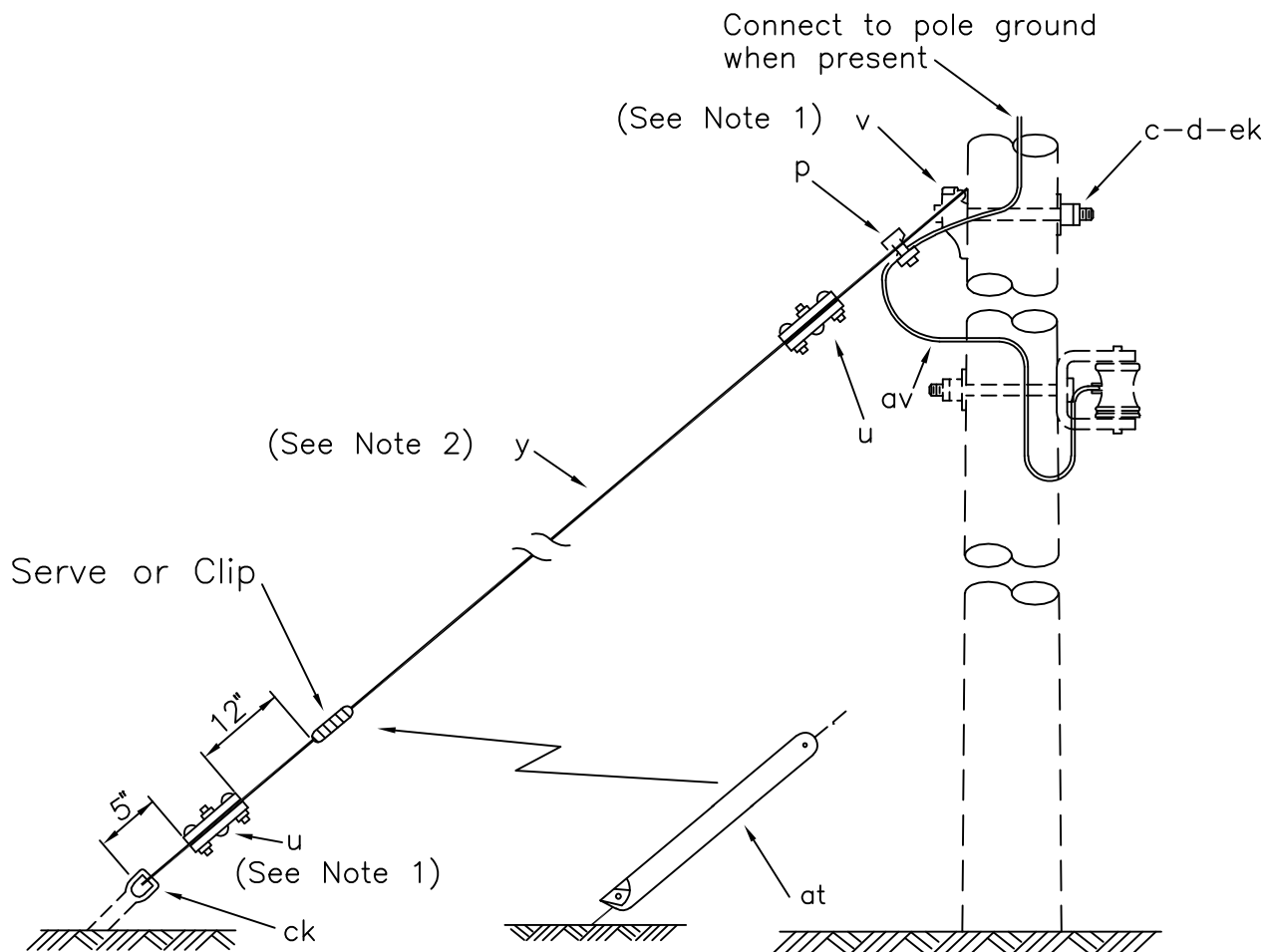
Down guy and overhead guy wires may be insulated in portions of a borrower’s service area if all 5 of the following conditions are met:

- (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:

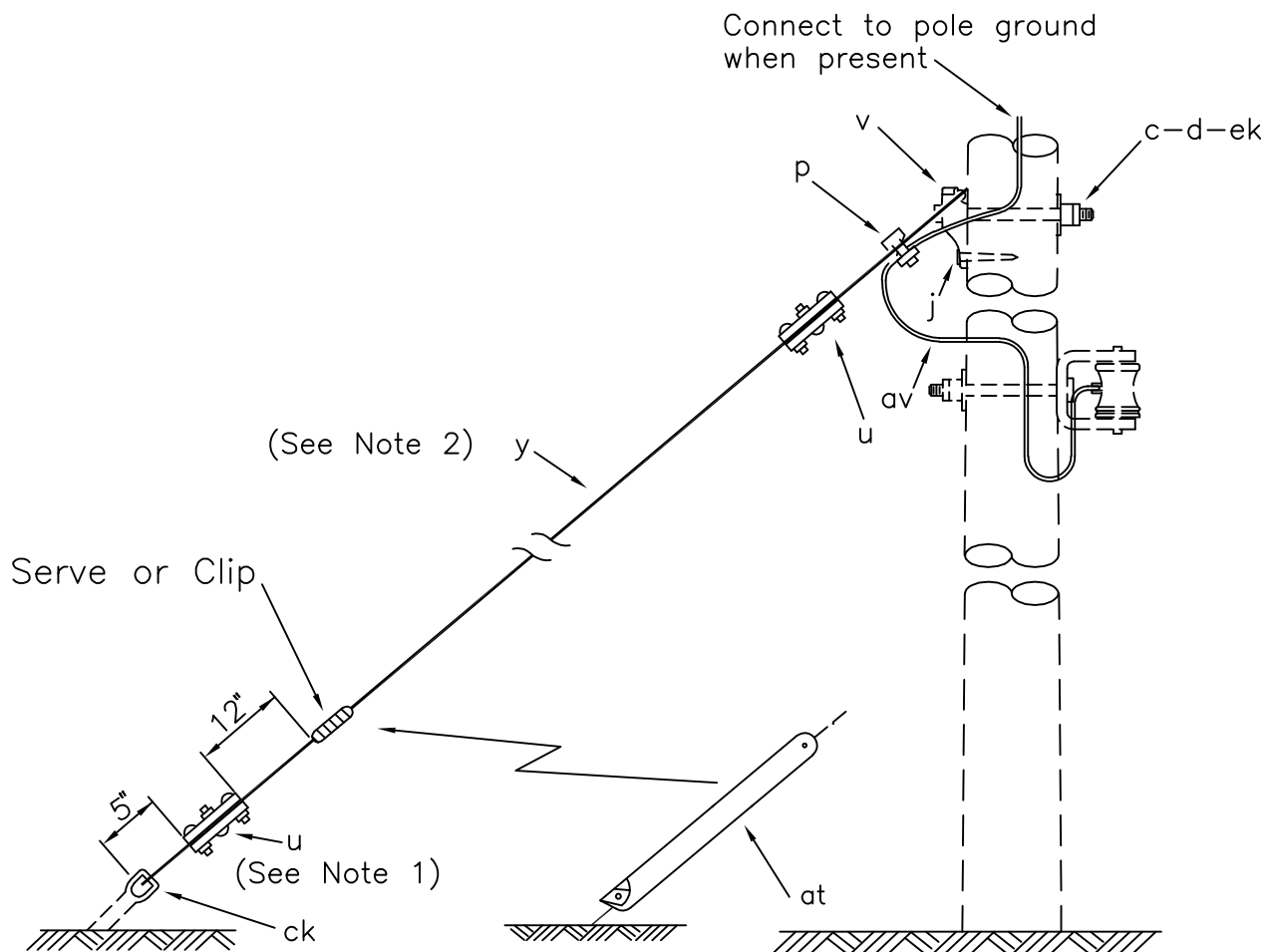
PERMITTED LOAD IS LESSER OF:
6,600 lbs (in any direction)
or 90% of RATED BREAKING
STRENGTH OF GUY WIRE

SINGLE DOWN GUY (THROUGH BOLT TYPE)

APRIL 2005

RUS

E1.1
(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 shackle (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:

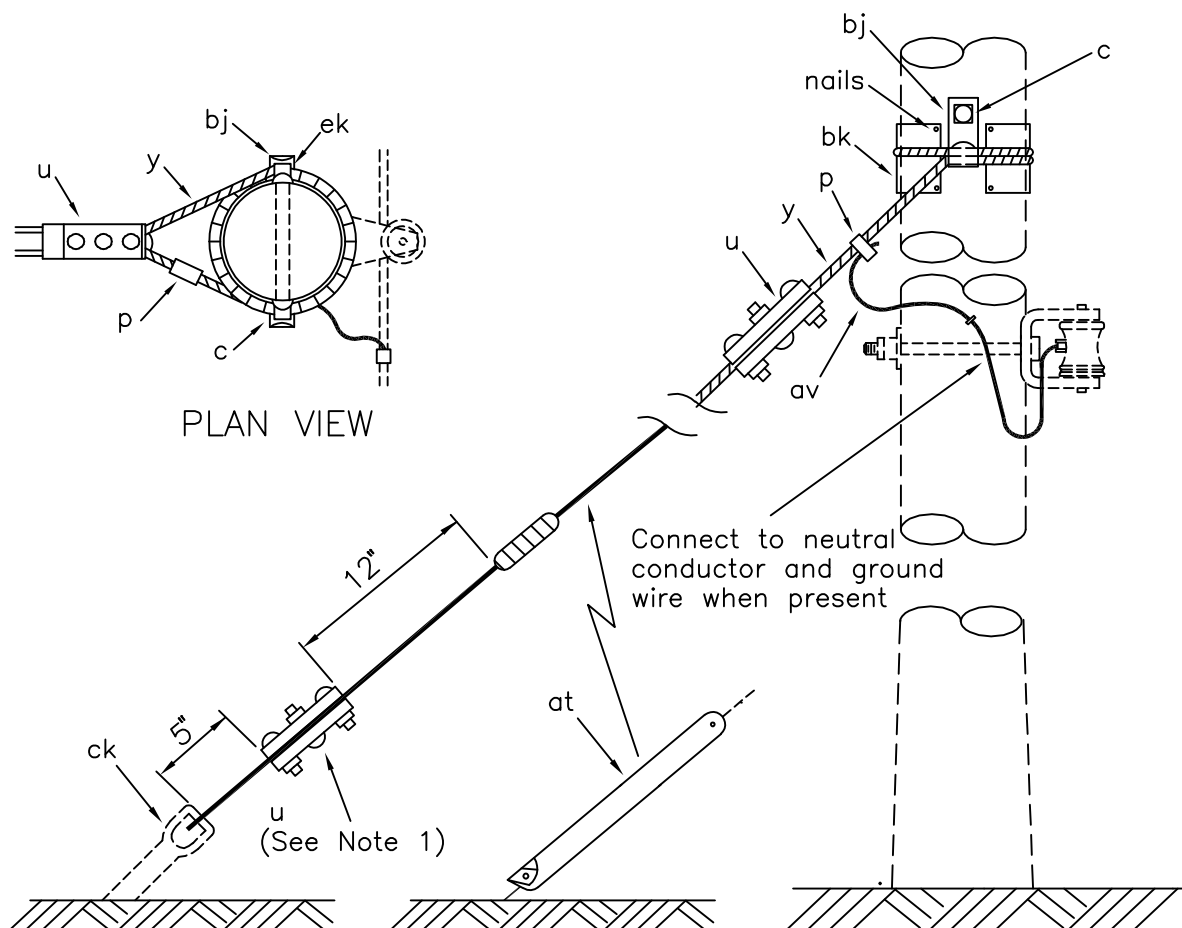
PERMITTED LOAD IS LEAST OF:
8,500 lbs (in any direction)
or 90% of RATED BREAKING
STRENGTH OF GUY WIRE

SINGLE DOWN GUY – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005

RUS

E1.1L
(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:

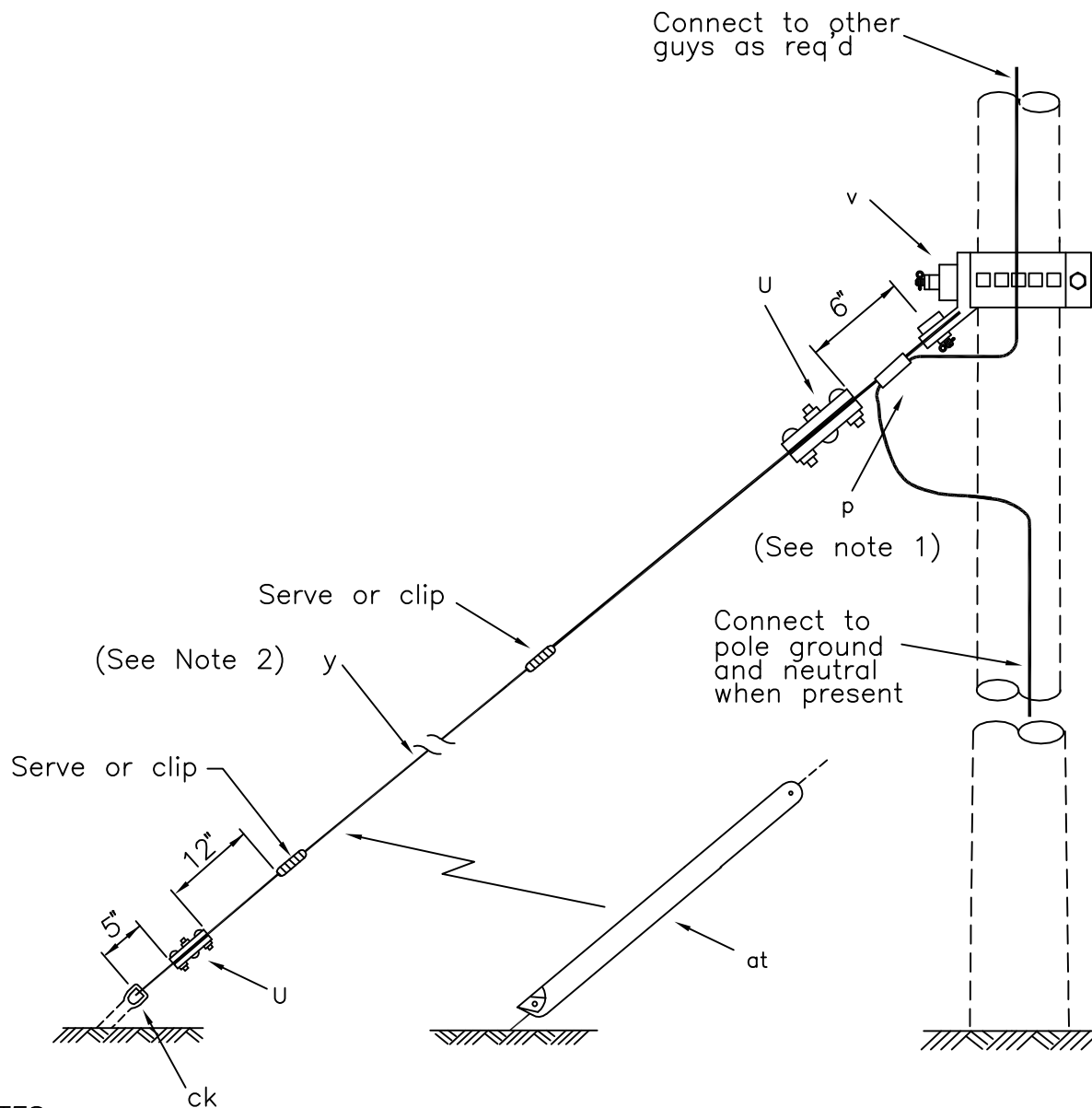
PERMITTED LOAD =
90% of RATED BREAKING
STRENGTH OF GUY WIRE

SINGLE DOWN GUY
(WRAPPED TYPE)

APRIL 2005

RUS

E1.2
(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:

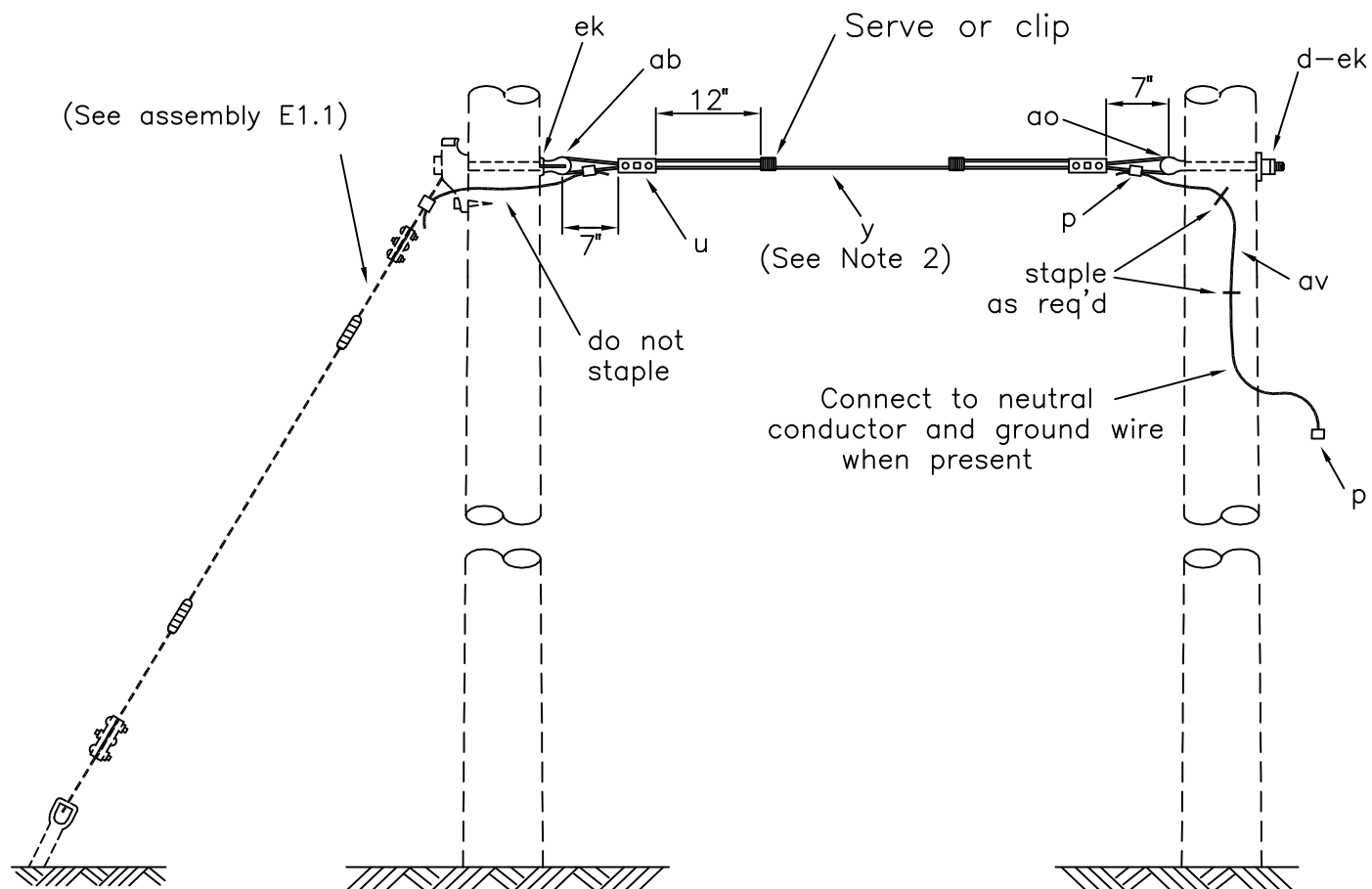
PERMITTED LOAD IS LESSER OF:
8,500 lbs. (in any direction)
or 90% of RATED BREAKING
STRENGTH OF GUY WIRE

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:

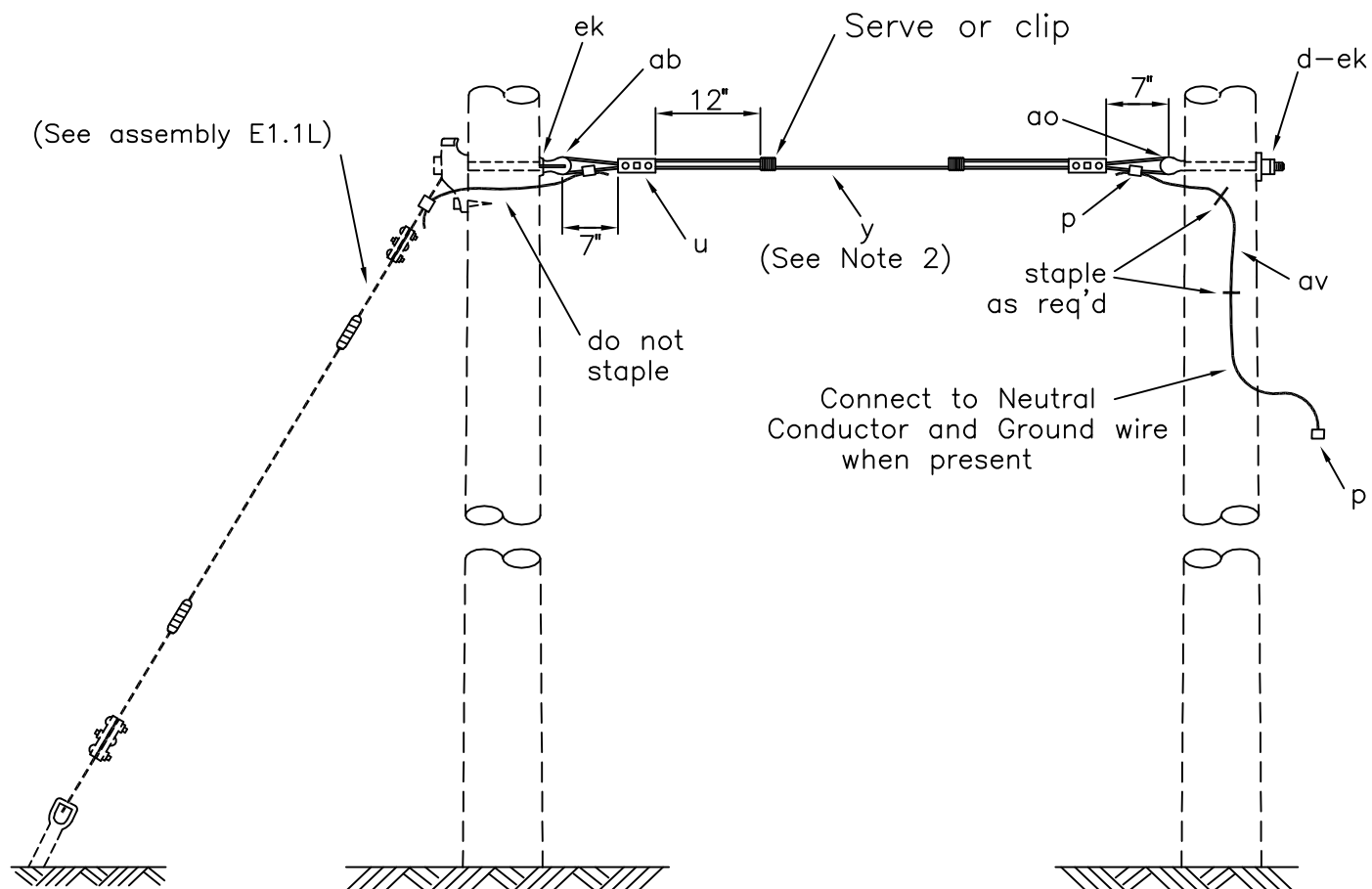
PERMITTED LOAD IS LESSER OF:
6,600 lbs. (HORIZONTAL)
or 90 % of RATED BREAKING
STRENGTH OF GUY WIRE

SINGLE OVERHEAD GUY
(THROUGH BOLT TYPE)

APRIL 2005

RUS

E1.4
(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:

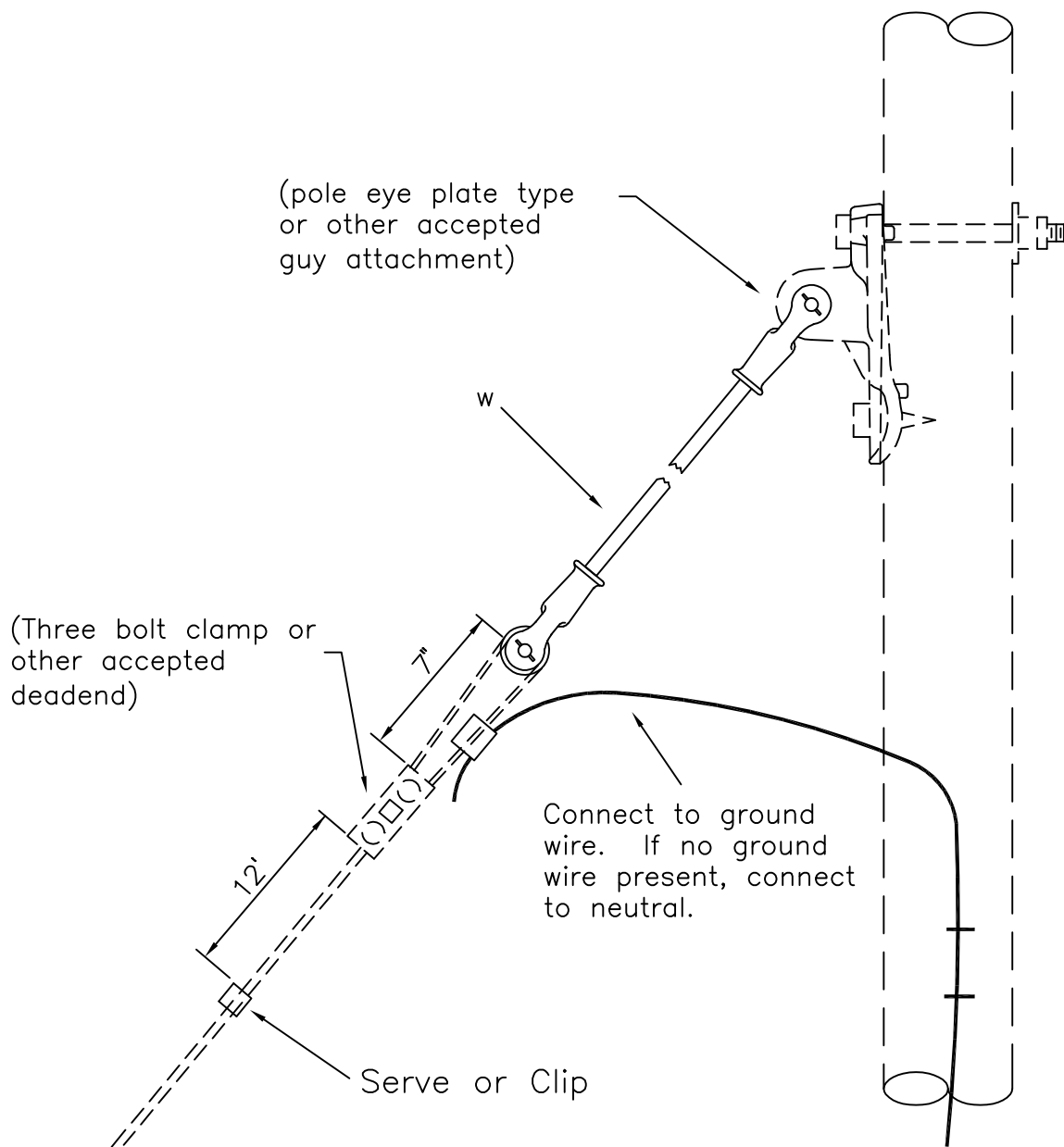
PERMITTED LOAD IS LESSER OF:
8,500 lbs. (HORIZONTAL)
or 90 % of RATED BREAKING
STRENGTH OF GUY WIRE

SINGLE OVERHEAD GUY – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005

RUS

E1.4L
(E2-3)



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

ITEM	MATERIAL
w	Insulator, guy strain

DESIGN PARAMETERS:

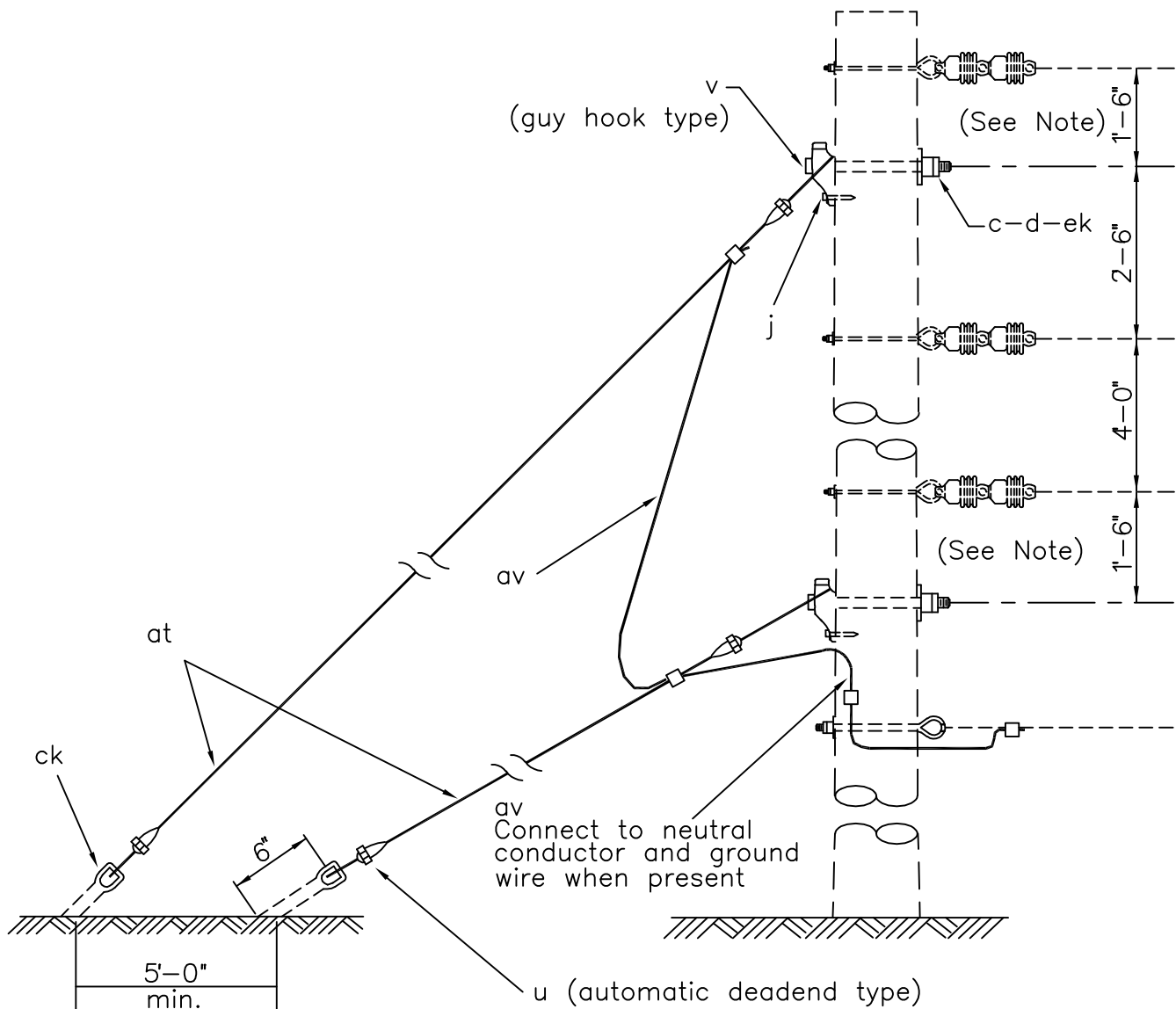
PERMITTED LOAD = 8,500 lbs.

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"), (minimum 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



u (automatic deadend type)

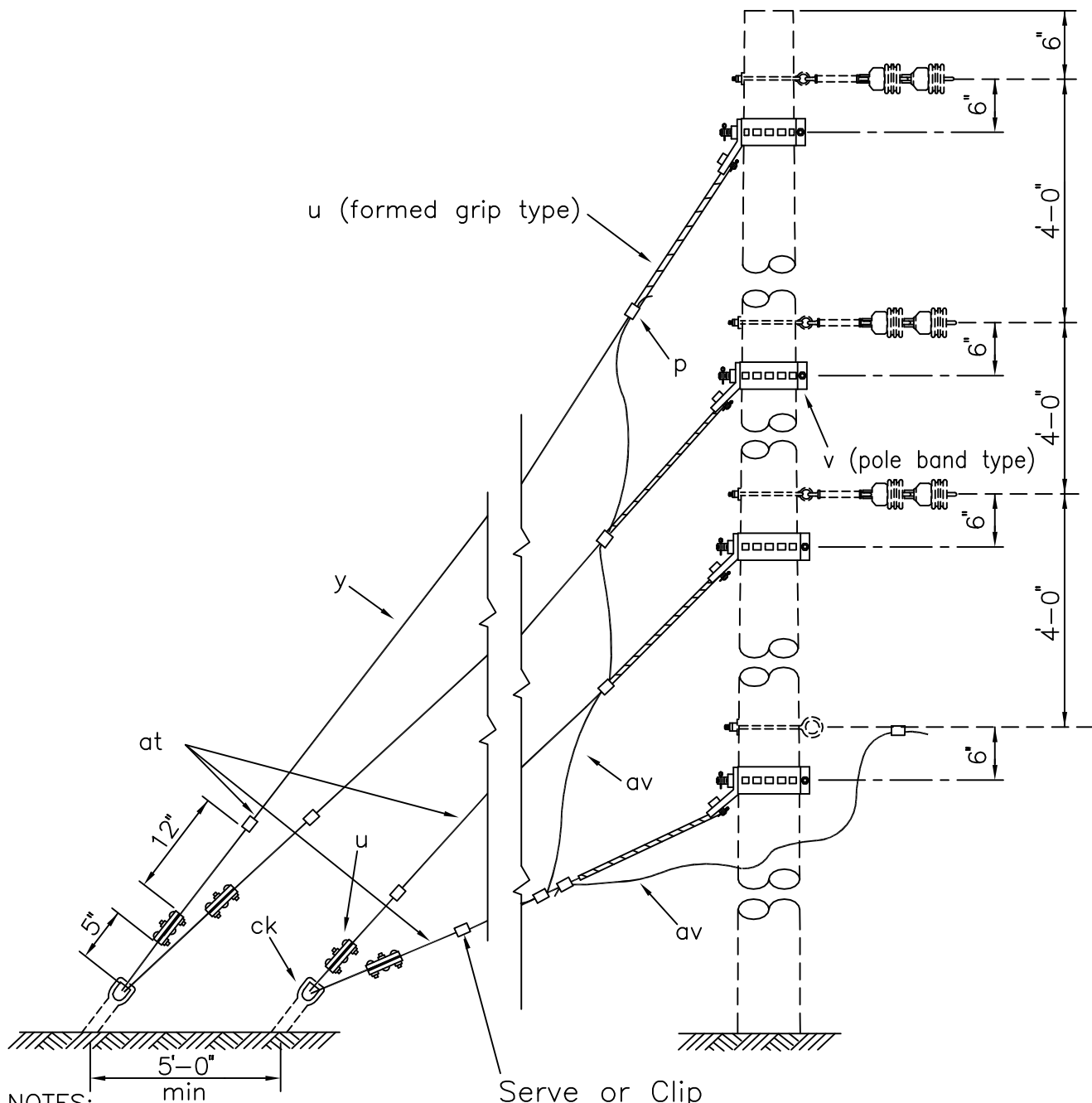
(multiply material quantities by 3):

- ### DESIGN PARAMETERS:

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

RUS

E3.1 LG



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"), (minimum 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

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804	Bulletin 50-3	
(New)	(Old)	
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.

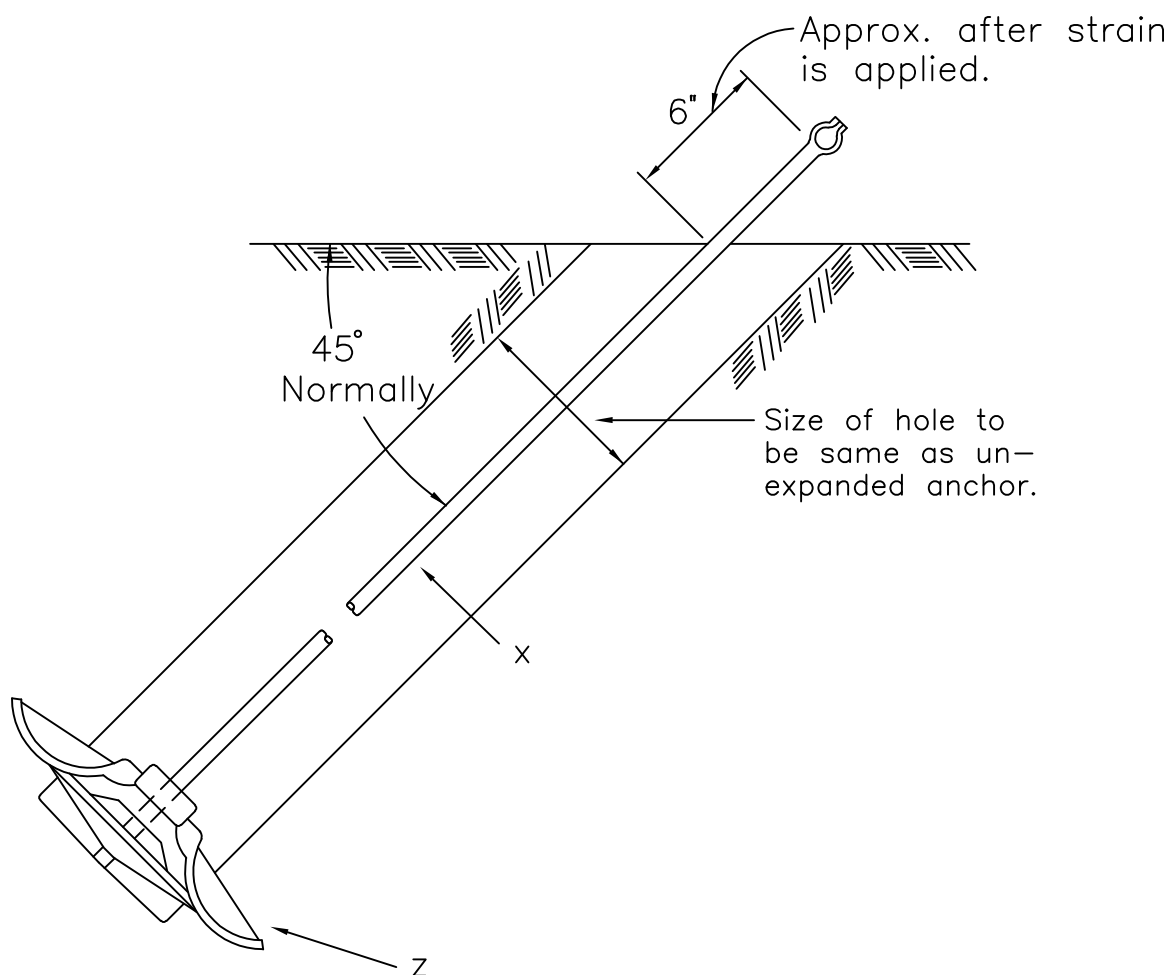
The backfill of all anchor holes must be thoroughly tamped the full depth. After a cone anchor has been set in place, the hole shall be backfilled with coarse crushed rock for 2 feet above the anchor and tamped during the filling. The remainder of the hole shall be backfilled and tamped with dirt.

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.

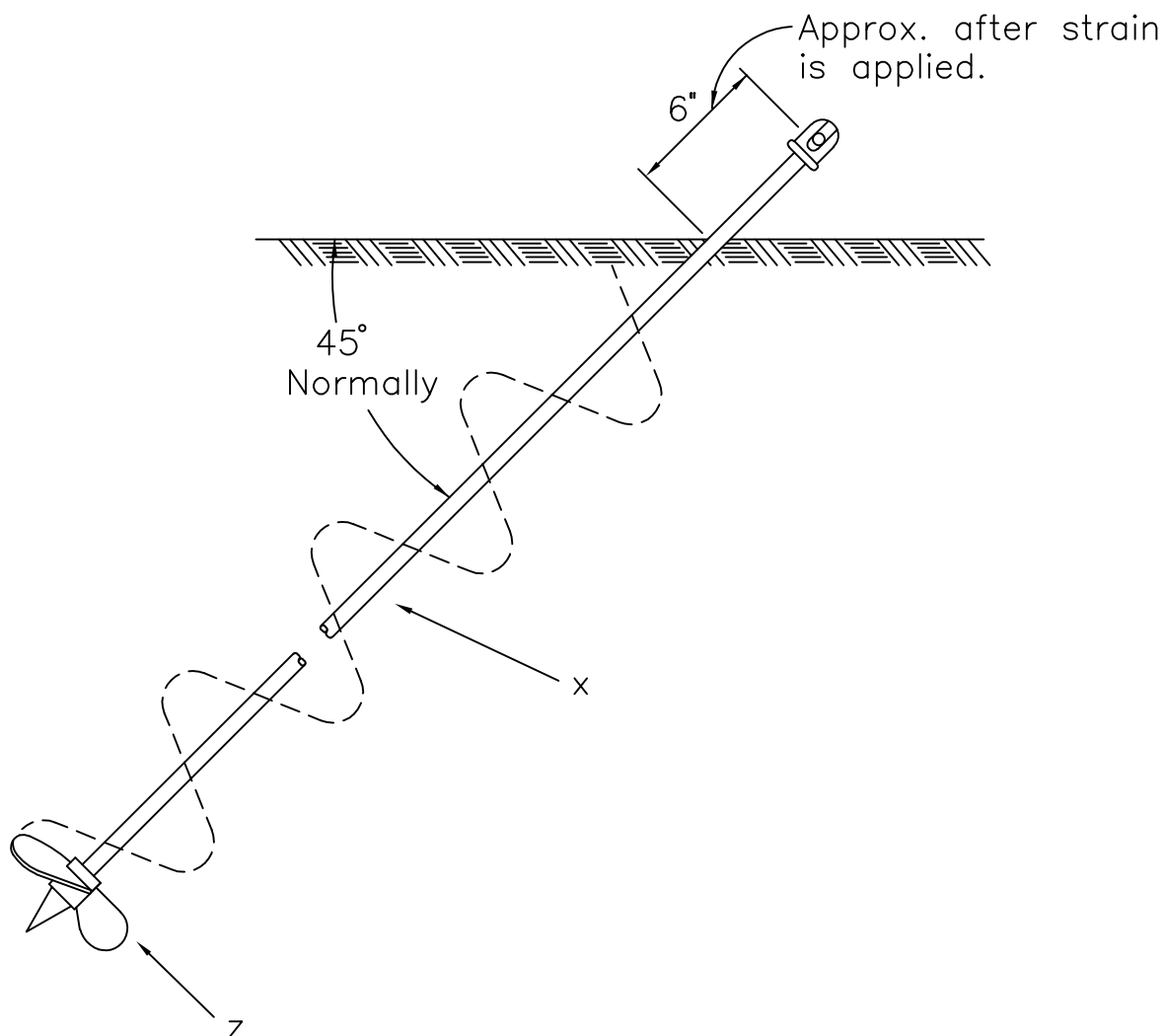
SOIL CLASSIFICATIONS

<u>Class</u>	<u>Engineering Description</u>
0	Sound hard rock, unweathered
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



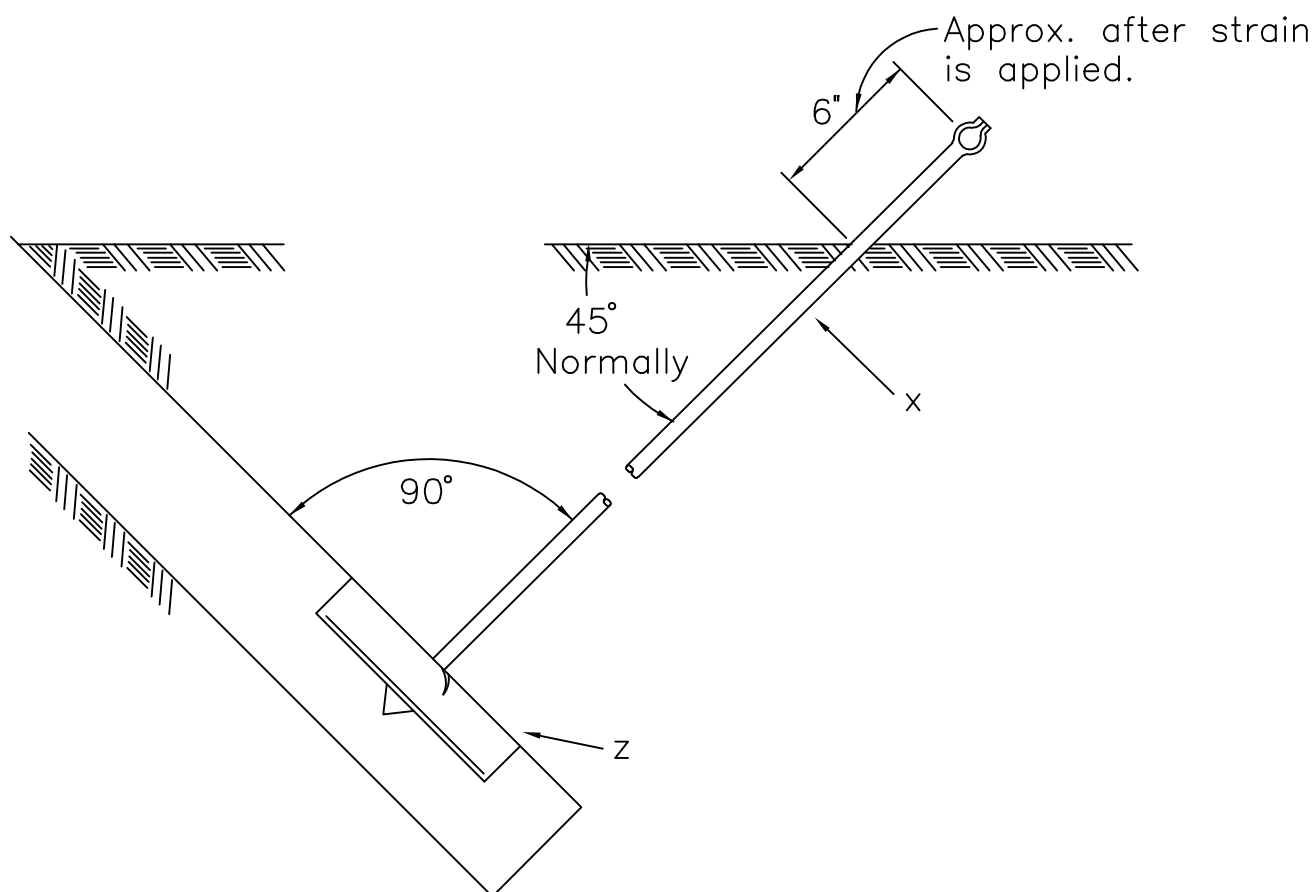
NOTE: Designated maximum holding power rating assumes proper installation in class 5 soil.

ASSEMBLY: F1		.6	.8	.10	.12	ASSEMBLY NUMBERS	
Minimum Area (sq. in.)		90	100	120	135	NEW	(OLD)
ITEM	MATERIAL	QTY	QTY	QTY	QTY	F1.6	(F1-1)
x	Rod, anchor, thimble eye, 5/8" x 7'0"	1	1			F1.8	(F1-2)
x	Rod, anchor, twin eye, 3/4" X 8'0"			1	1	F1.10	(F1-3)
z	Anchor, expanding type	1	1	1	1	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			



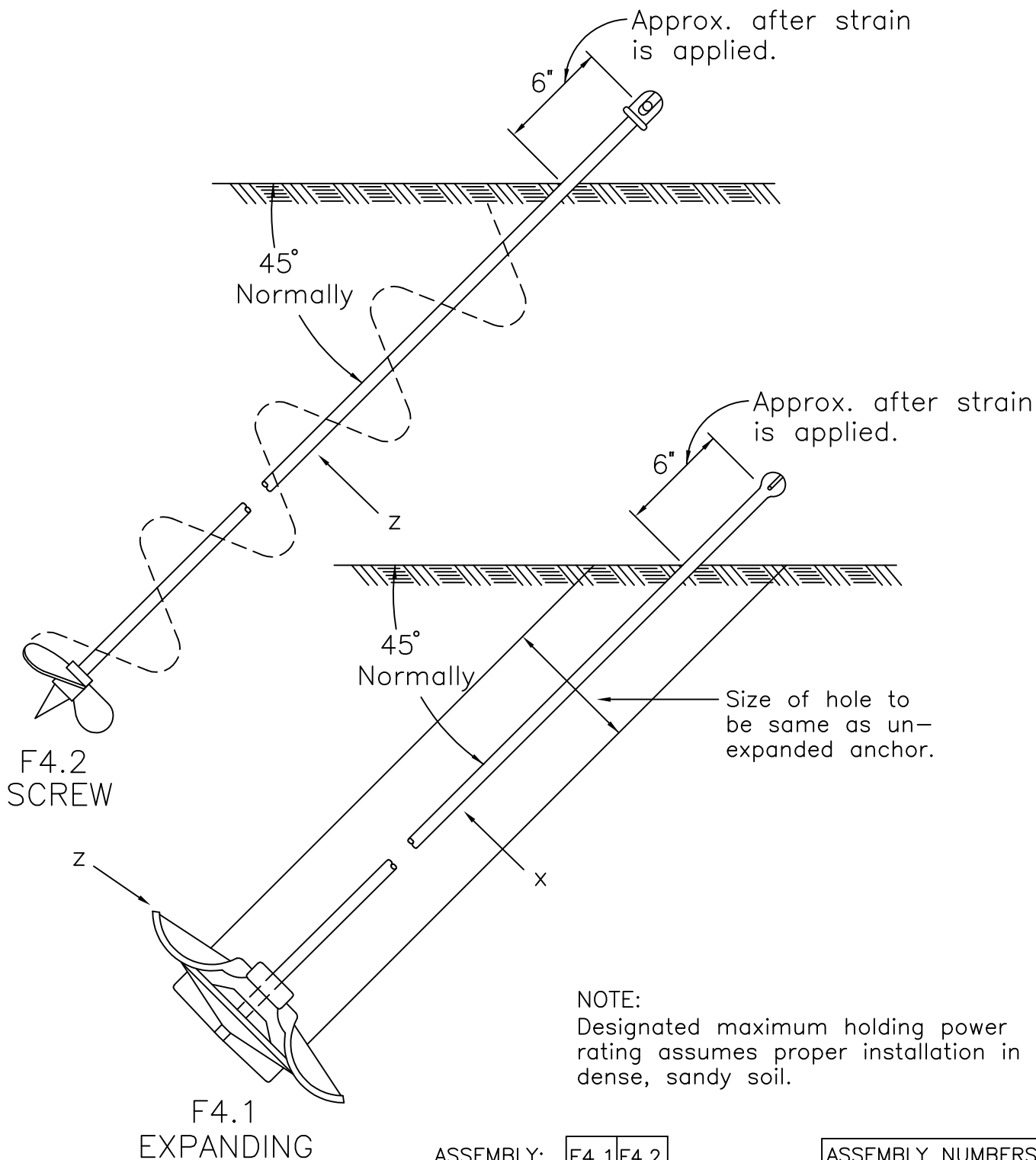
NOTE: Designated maximum holding power rating assumes proper installation in class 5 soil.

ASSEMBLY: F2		.6	.8	.10	.12	ASSEMBLY NUMBERS	
	Minimum Area (sq. in.)	90	100	120	135	<u>NEW</u>	(<u>OLD</u>)
ITEM	MATERIAL	QTY	QTY	QTY	QTY	F2.6	(F1-1S)
x	Rod, anchor, thimble eye, 5/8" x 7'0"	1	1			F2.8	(F1-2S)
x	Rod, anchor, twin eye, 3/4 X 8'0			1	1	F2.10	(F1-3S)
z	Anchor, screw type, power installed	1	1	1	1	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			F2.6, F2.8, F2.10, F2.12		
		RUS					



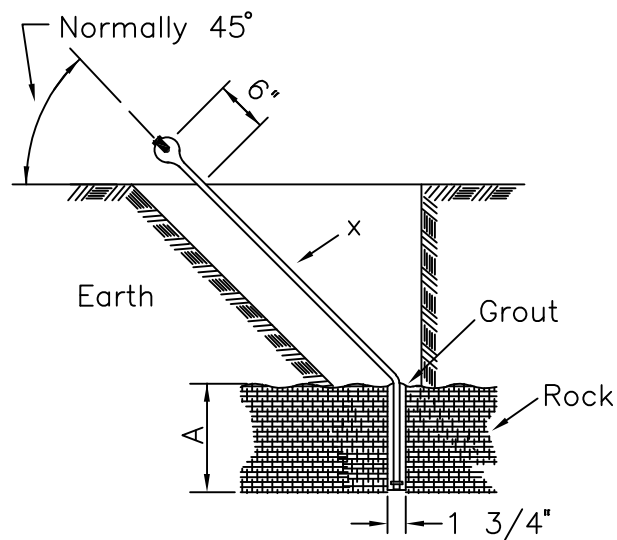
NOTE: Designated maximum holding power rating assumes proper installation in class 5 soil.

ASSEMBLY: F3		.6	.8	.10	.12	ASSEMBLY NUMBERS	
	Minimum Area (sq. in.)	90	100	120	135	<u>NEW</u>	(<u>OLD</u>)
ITEM	MATERIAL	QTY	QTY	QTY	QTY	F3.6	(F1-1P)
x	Rod, anchor, thimble eye, 5/8" x 7'0"	1	1			F3.8	(F1-2P)
x	Rod, anchor, twin eye, 3/4" X 8'0"			1	1	F3.10	(F1-3P)
z	Anchor, plate type	1	1	1	1	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			F3.6, F3.8, F3.10, F3.12		
		RUS					



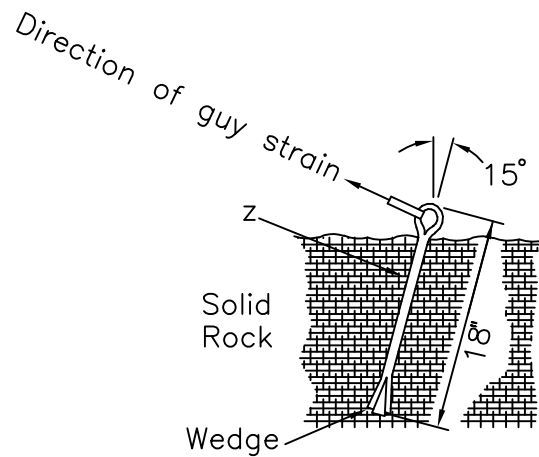
		ASSEMBLY:		ASSEMBLY NUMBERS	
ITEM	MATERIAL	QTY	QTY	NEW	(OLD)
x	Rod, anchor, thimble eye type	1		F4.1	(F4-1E)
z	Anchor, service, expanding type	1		F4.2	(F4-1S)
z	Anchor, service, screw type		1		

DESIGN PARAMETERS:		SERVICE ANCHORS		
DESIGNATED MAXIMUM HOLDING POWER (lbs.)		APRIL 2005		F4.1, F4.2
F4.1:	2,500	RUS		
F4.2:	2,500			



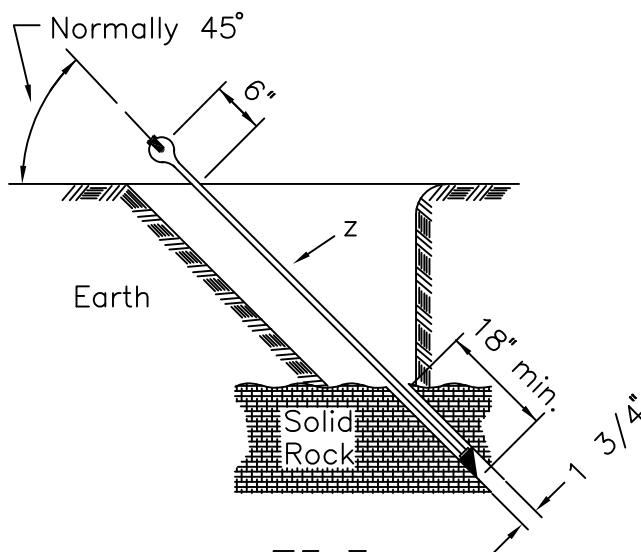
A = 18" min. for solid rock
= 30" min. for stratified rock

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)

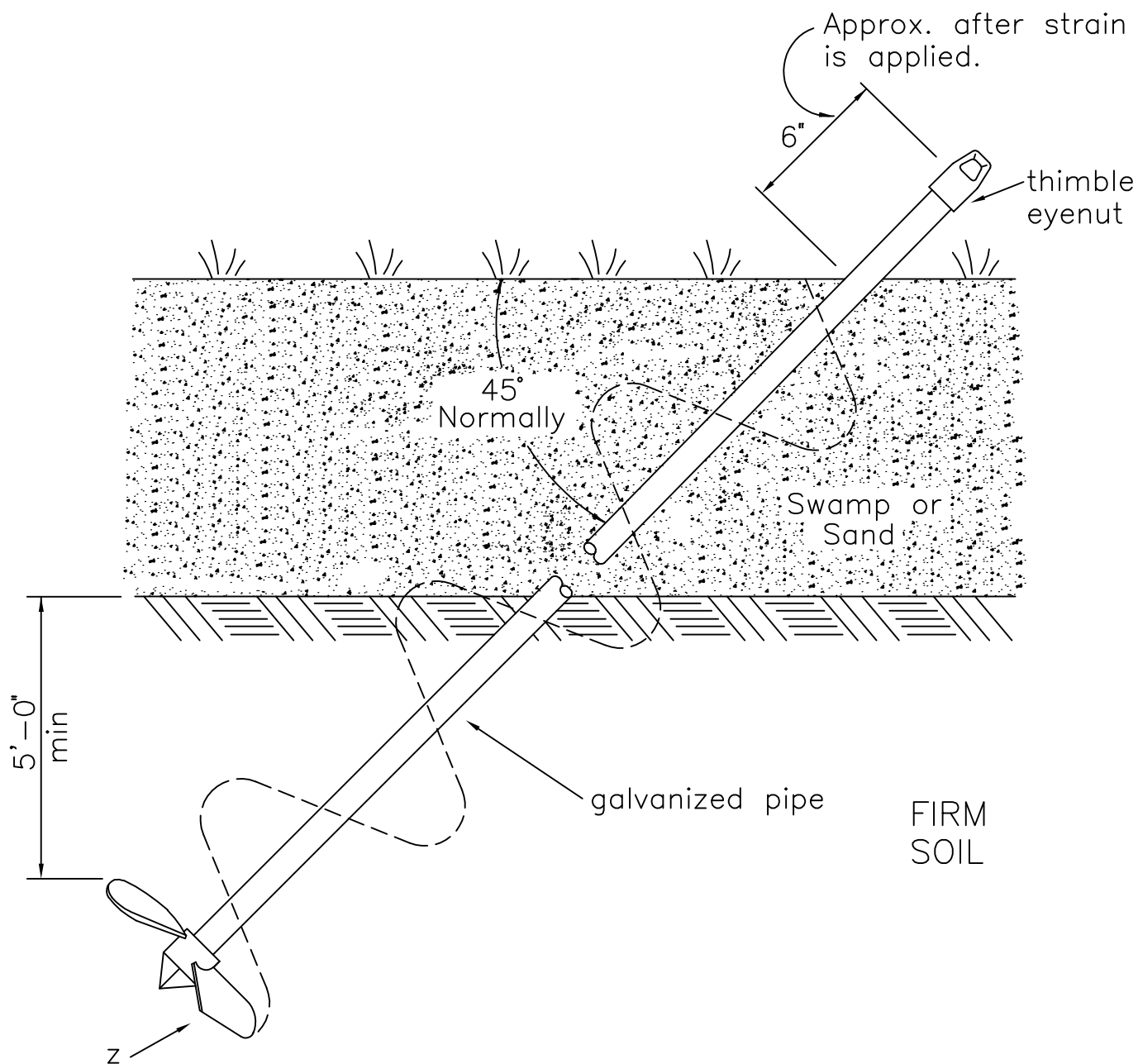
DESIGN PARAMETERS:

ROCK ANCHORS

APRIL 2005

RUS

F5.1, F5.2, F5.3



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

		F6.6	F6.8	F6.10	ASSEMBLY NUMBERS	
ITEM	MATERIAL	QTY	QTY	QTY	NEW	(OLD)
z	Anchor, swamp type (diameter)	1-10"	1-12"	1-15"	F6.6	(F6-1)
	Nut, thimble eye type	1	1	1	F6.8	(F6-2)
	Pipe, galvanized, as req'd				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		F6.6, F6.8, F6.10		
		RUS				

TRANSFORMER ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
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 UNGROUND-ED-WYE PRIMARY CENTER-TAP GROUNDED DELTA, 4 WIRE SECONDARY
G3.1G		TRANSFORMER / METER CONNECTION GUIDE UNGROUND-ED WYE - CENTER TAP GROUNDED DELTA FOR 120/240 VOLT POWER LOADS

TRANSFORMER ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
G3.2	(G311-)	THREE-PHASE TRANSFORMER BANK UNGROUND WYE - PRIMARY CORNER GROUNDED DELTA, 3 WIRE SECONDARY
G3.2G		TRANSFORMER / METER CONNECTION GUIDE UNGROUND 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.

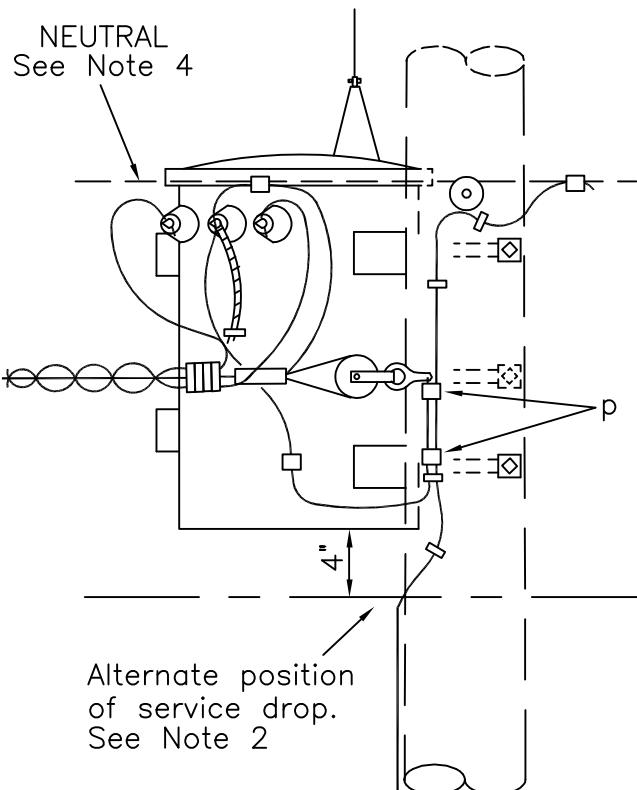
Where applicable, the external gap on surge arresters shall be set according to the manufacturer's recommended spacing.

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.

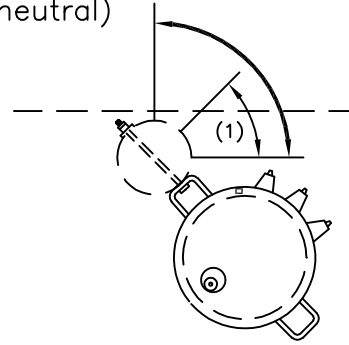
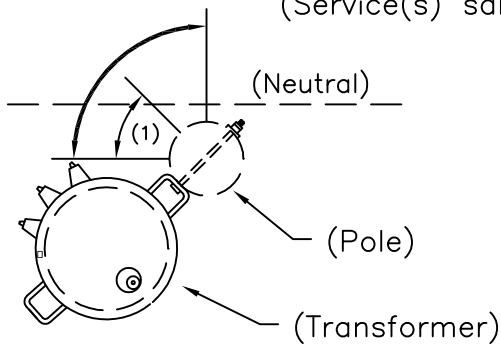


1. Install transformer on tangent poles on a quadrant on the opposite side of pole from primary neutral.
2. When it is necessary to install transformer in the same quadrant as a service drop, attach the service drops 4 inches below the transformer.
3. Install transformer so that primary neutral is at 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. (Minimum bending radius is six times the overall cable diameter).

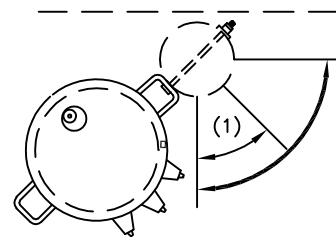
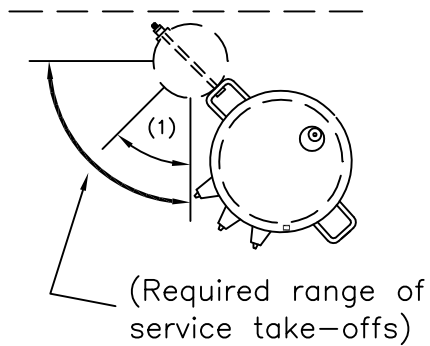
G1.1G
(M27-1A)

TANGENT POLES

(Service(s) same as neutral)

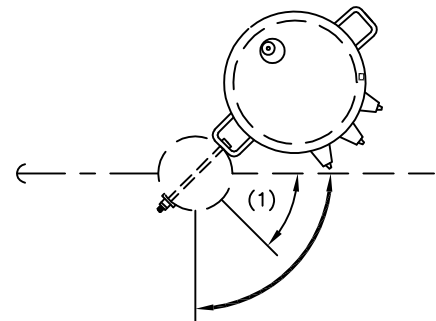
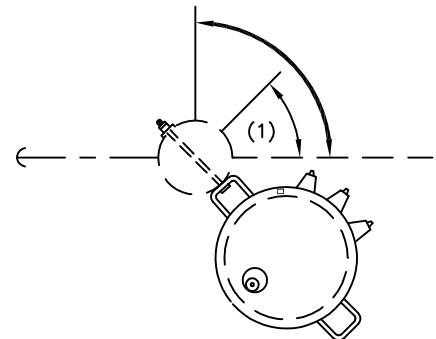
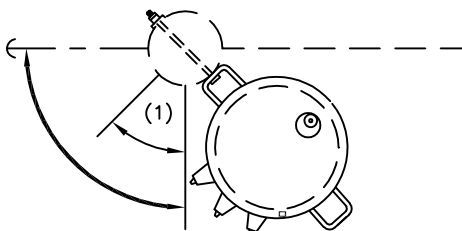
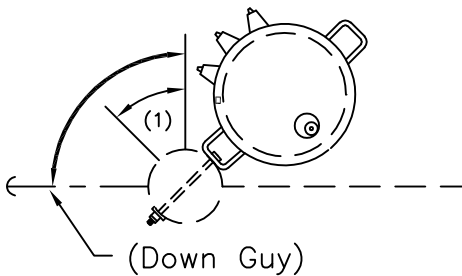


(Service(s) opposite side of neutral)



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.

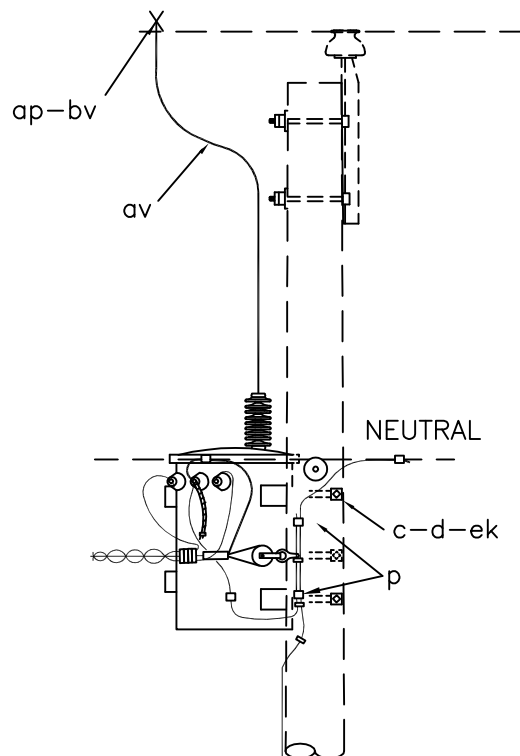
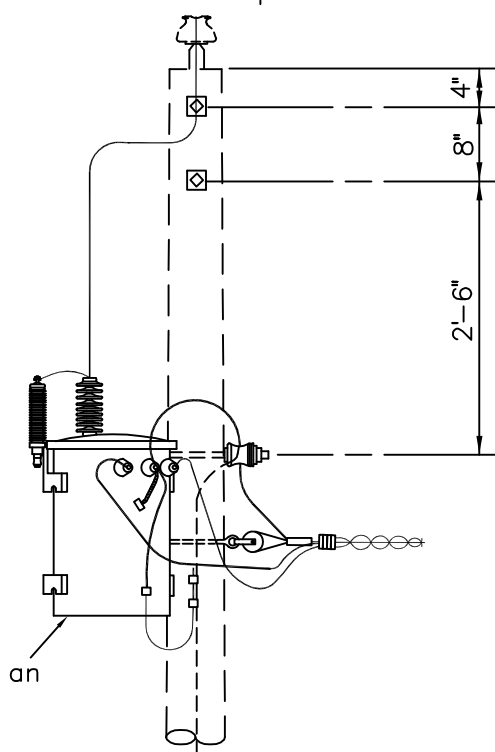
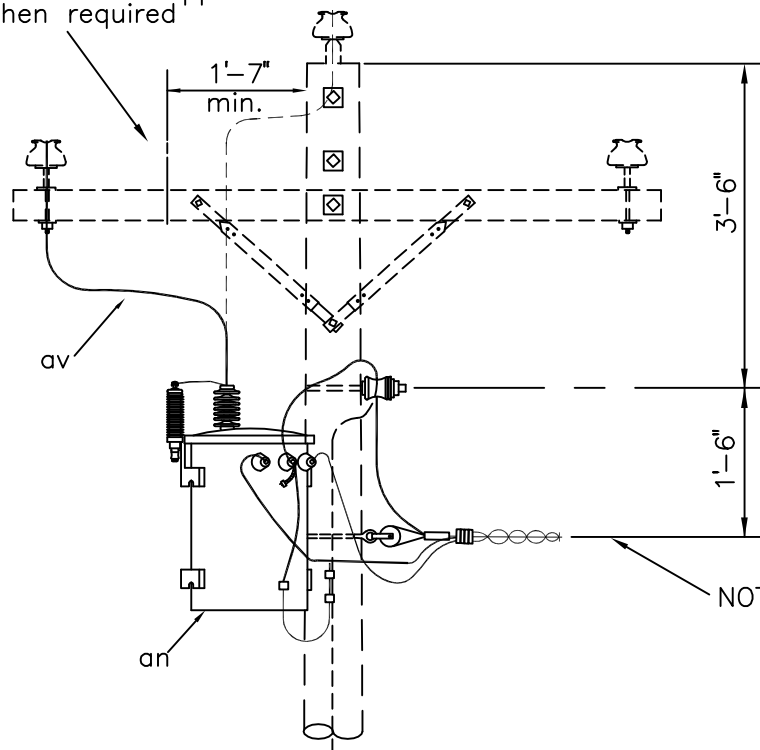
POLE TYPE TRANSFORMER LOCATION GUIDE

APRIL 2005

RUS

G1.2G

Position of support
when required



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)

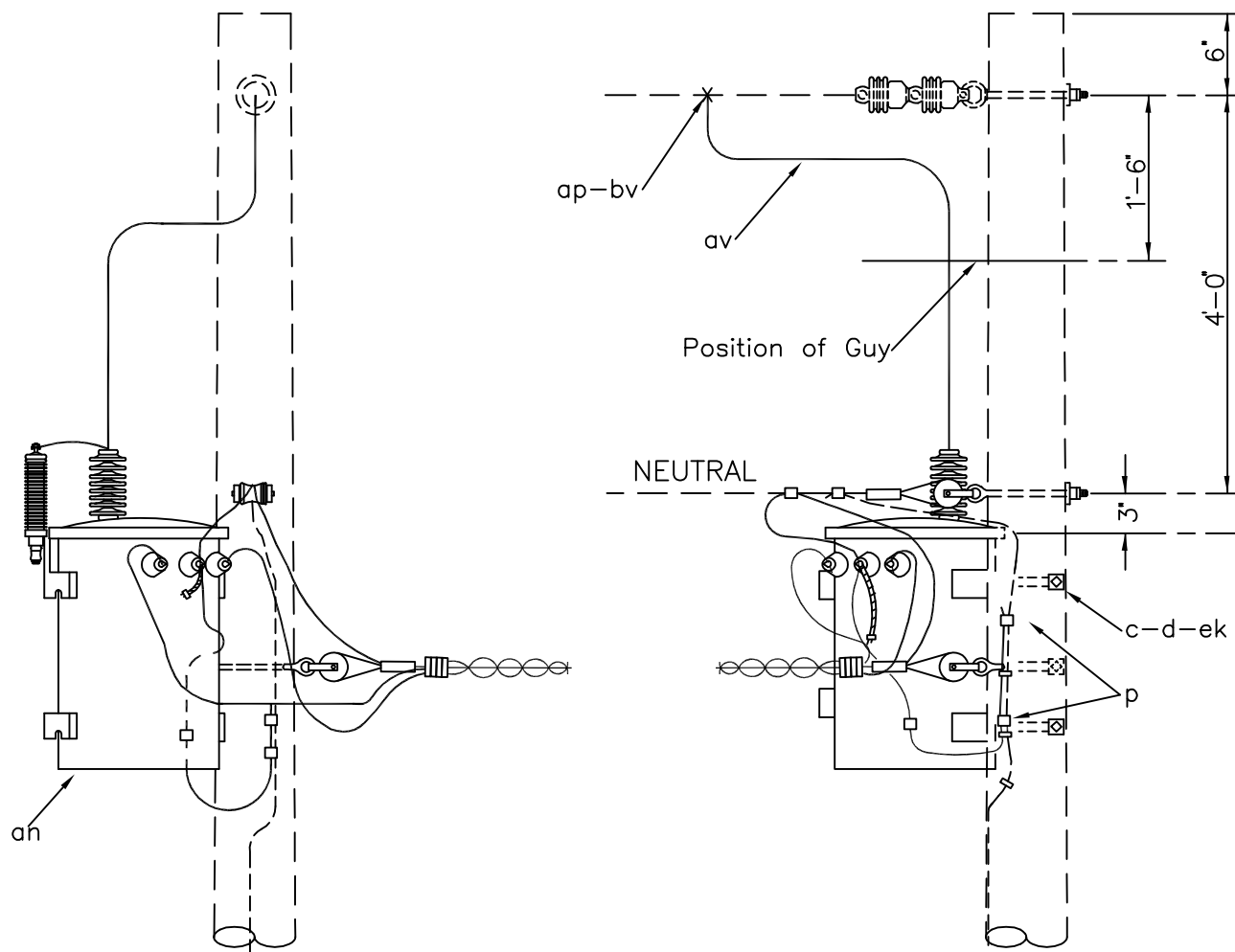
APRIL 2005

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)

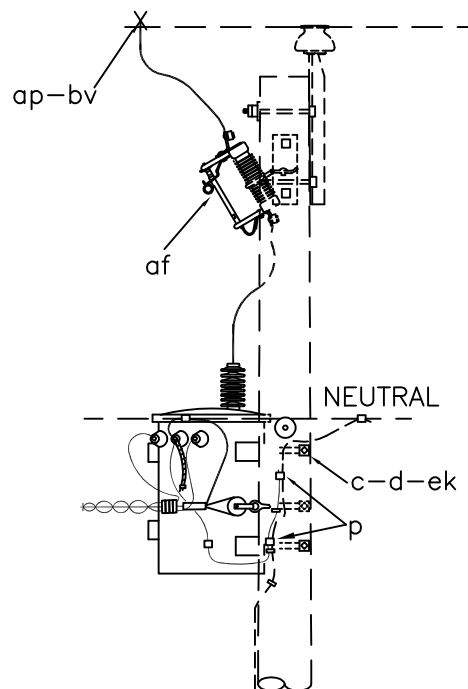
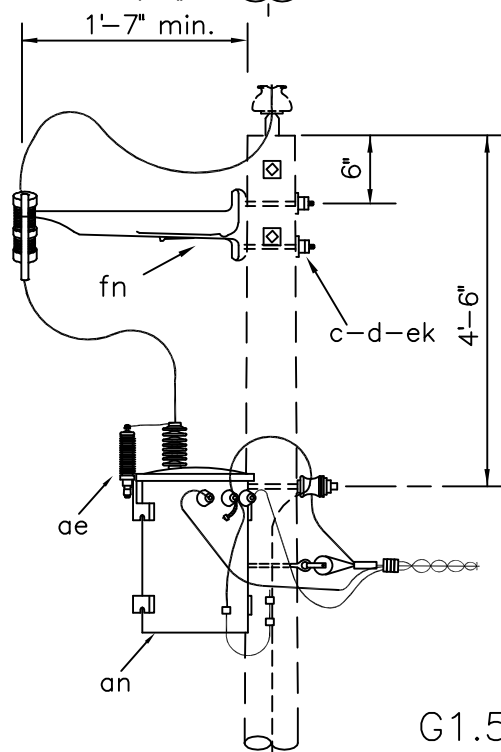
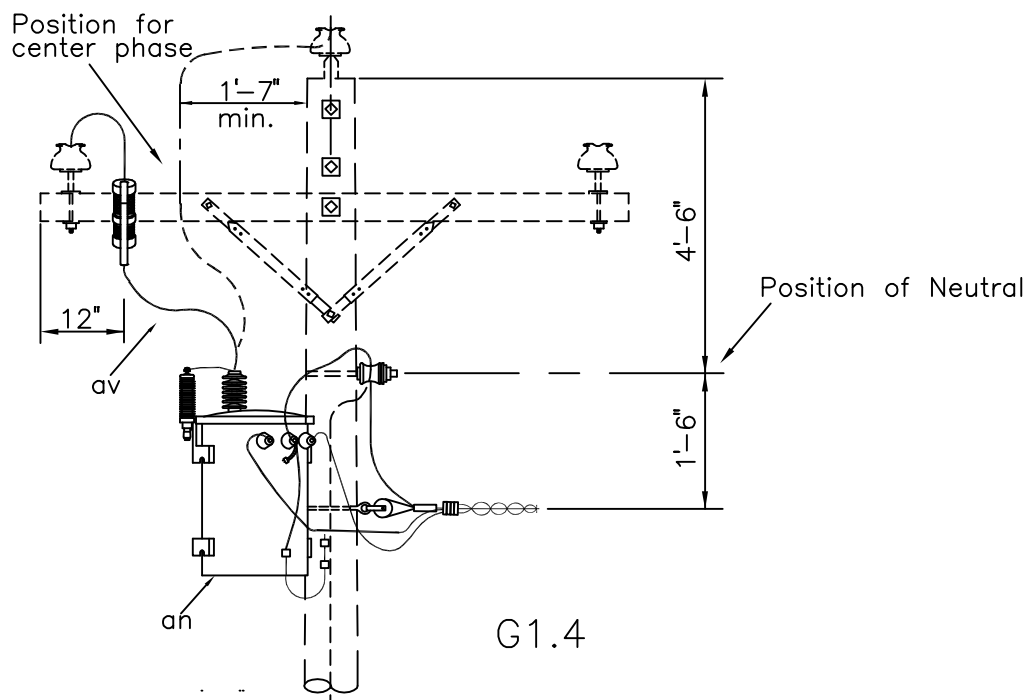
APRIL 2005

RUS

12.47/7.2 kV

G1.3

(G106-)



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

ASSEMBLY: G1		.4	.5
ITEM	MATERIAL	QTY	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

ASSEMBLY: G1		.4	.5
ITEM	MATERIAL	QTY	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)

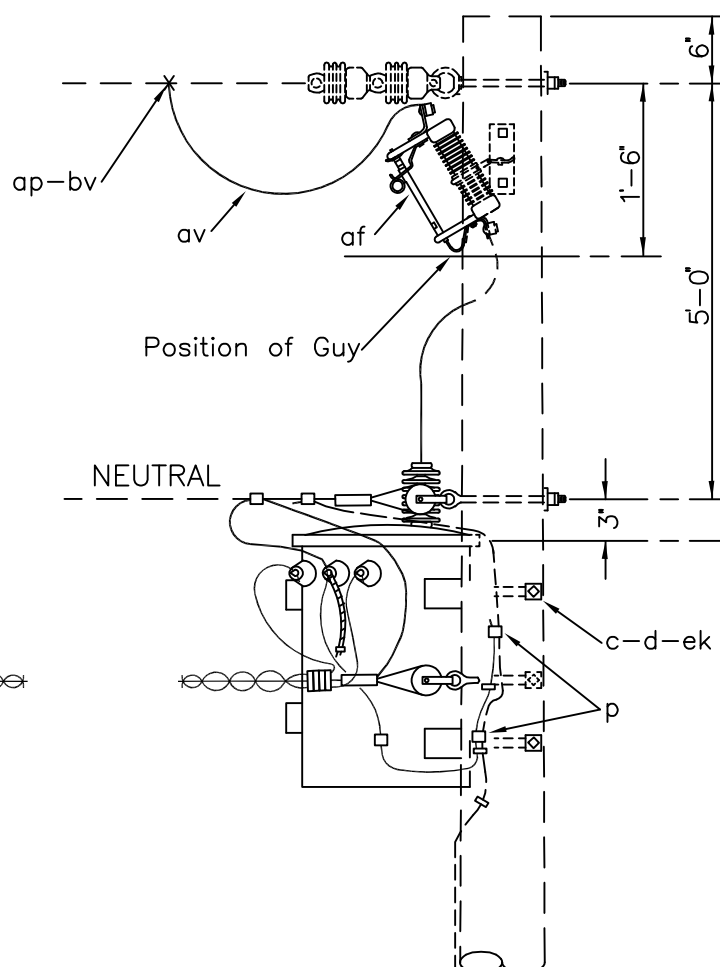
APRIL 2005

RUS

12.47/7.2 kV

G1.4

G1.5

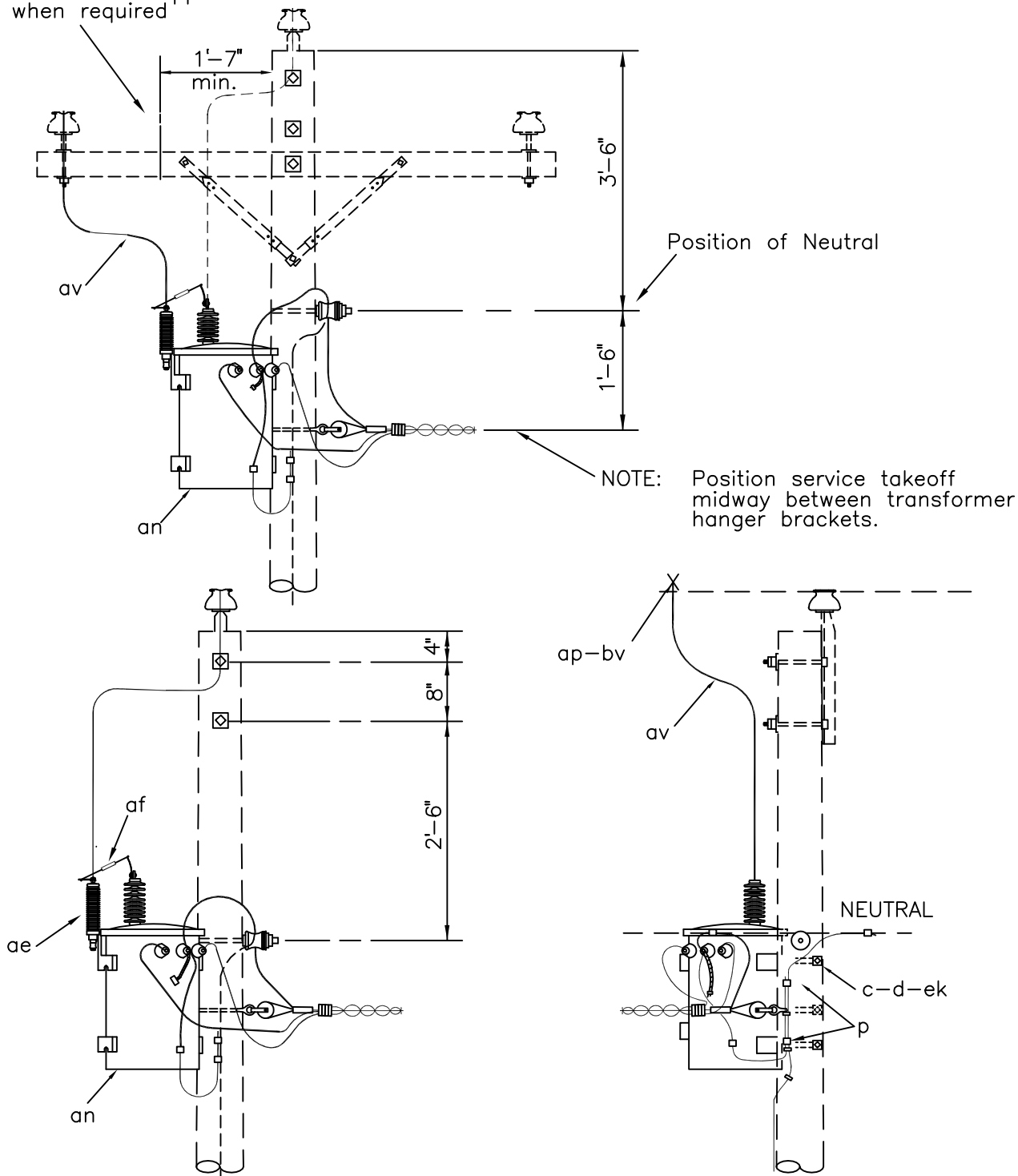


ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
p		Connectors, as req'd
ae	1	Arrester, surge (9 kV)
af	1	Cutout, dist. open (15 kV)
an	1	Transformer, 12.47 kV, conventional

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

G1.6

Position of support
when required



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"

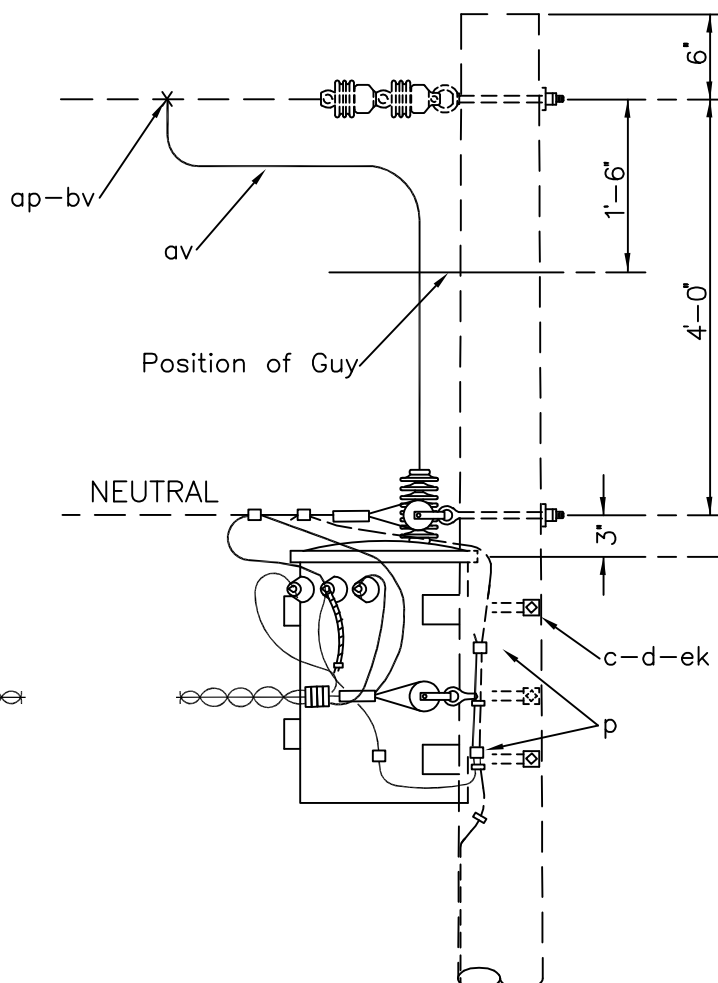
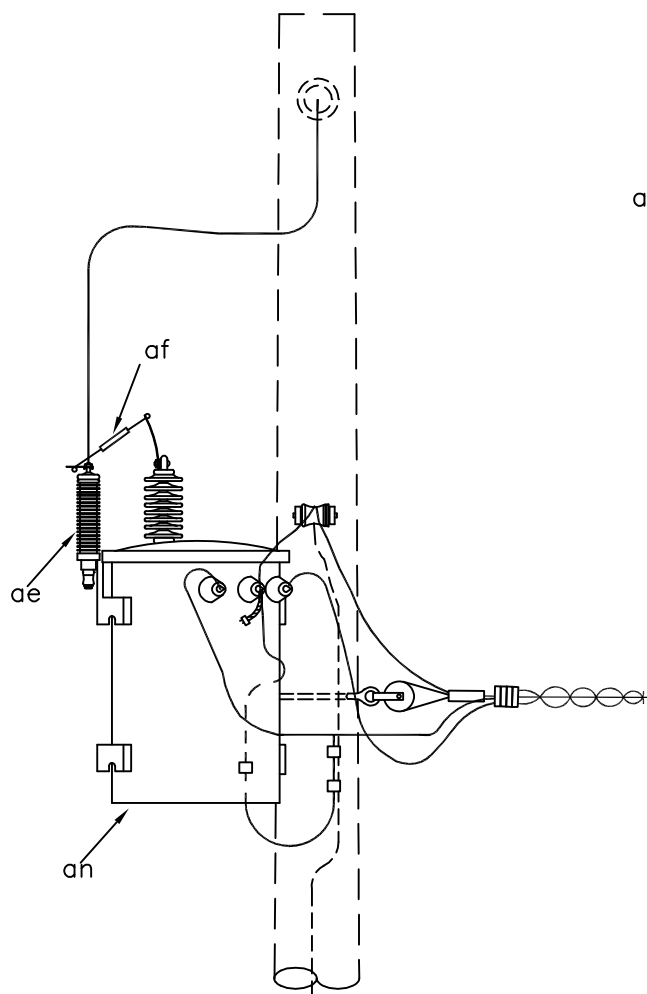
SINGLE-PHASE,
CONVENTIONAL TRANSFORMER
(TANGENT POLE)

APRIL 2005

RUS

12.47/7.2 kV

G1.7
(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"

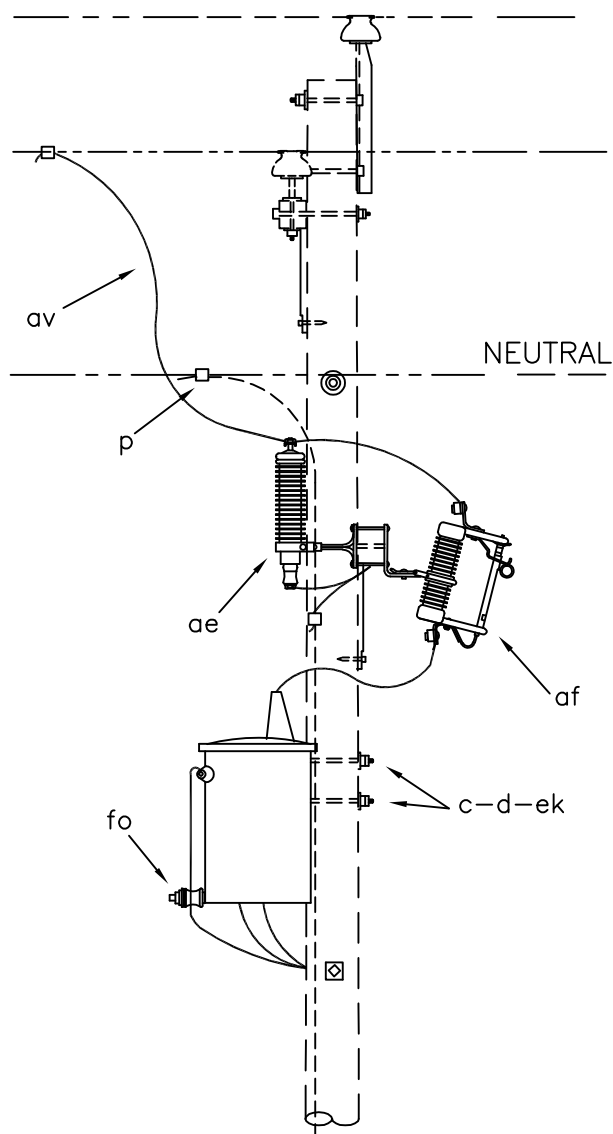
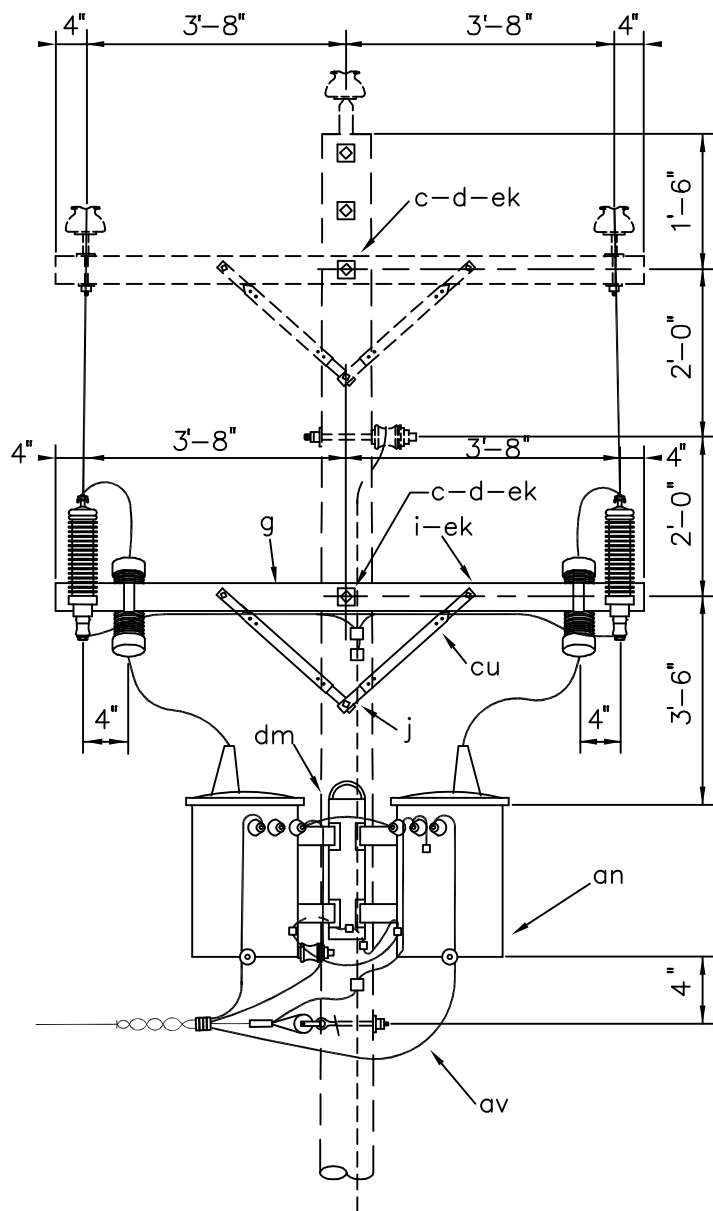
SINGLE-PHASE,
CONVENTIONAL TRANSFORMER
(DEADEND POLE)

APRIL 2005

RUS

12.47/7.2 kV

G1.8
(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"

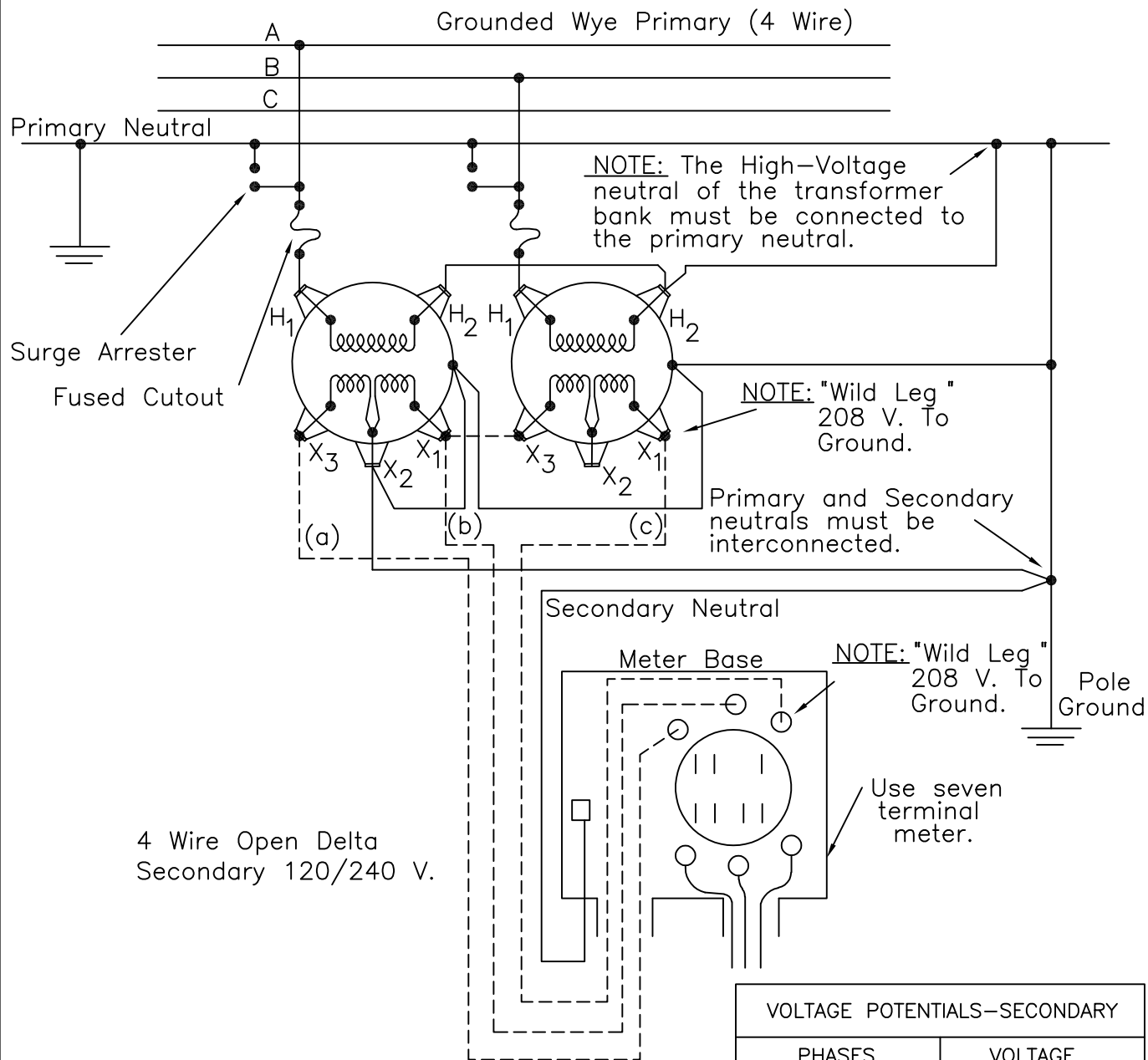
TWO-PHASE TRANSFORMER BANK OPEN-WYE PRIMARY OPEN-DELTA, 4 WIRE SECONDARY

APRIL 2005

RUS

12.47/7.2 kV

G2.1
(G210-)



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.

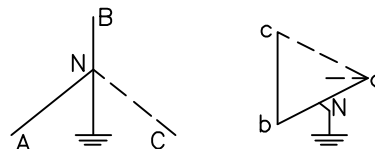
BANK RATING: This bank has only 86.6% of the rating of the two units making up the three-phase bank and only 57.7% of the three-phase rating of a closed delta-delta bank of three transformers. Thus, it is relatively inefficient where three-phase loads predominate.

(Additive Polarity—See TRANSFORMER SPECIFICATIONS)

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



TRANSFORMER/METER CONNECTION GUIDE

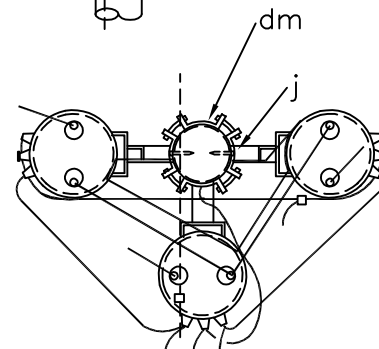
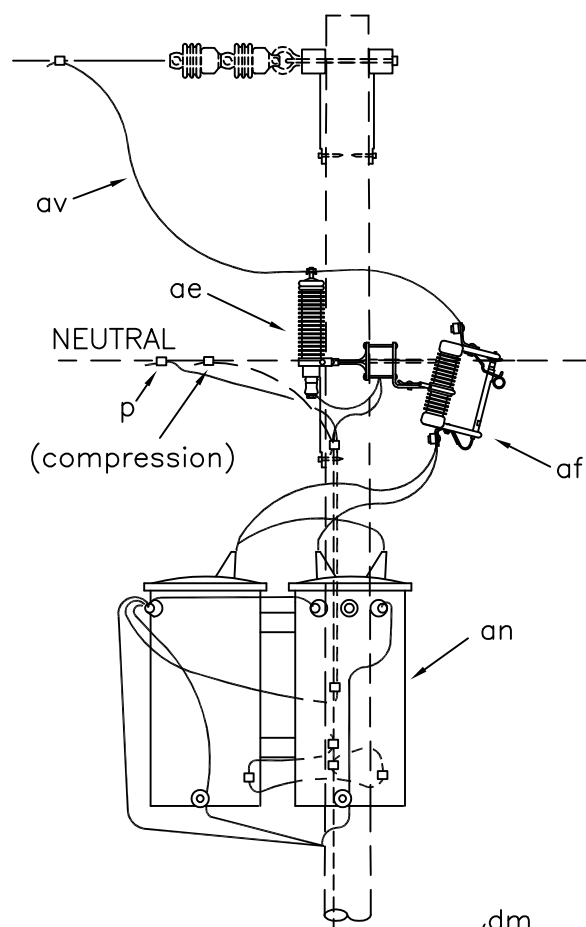
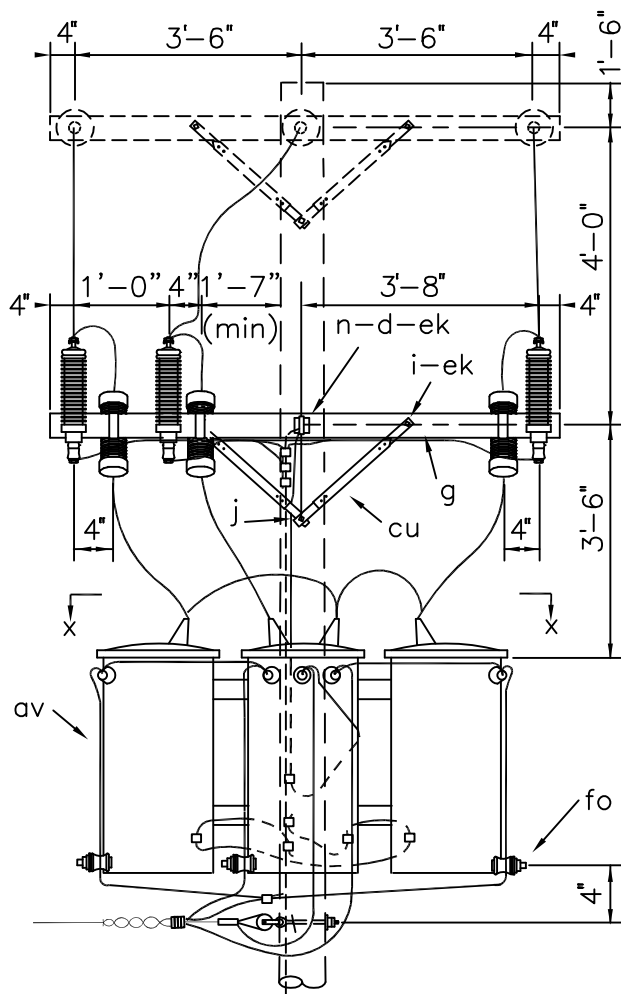
THREE-PHASE, OPEN-WYE – OPEN DELTA

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"

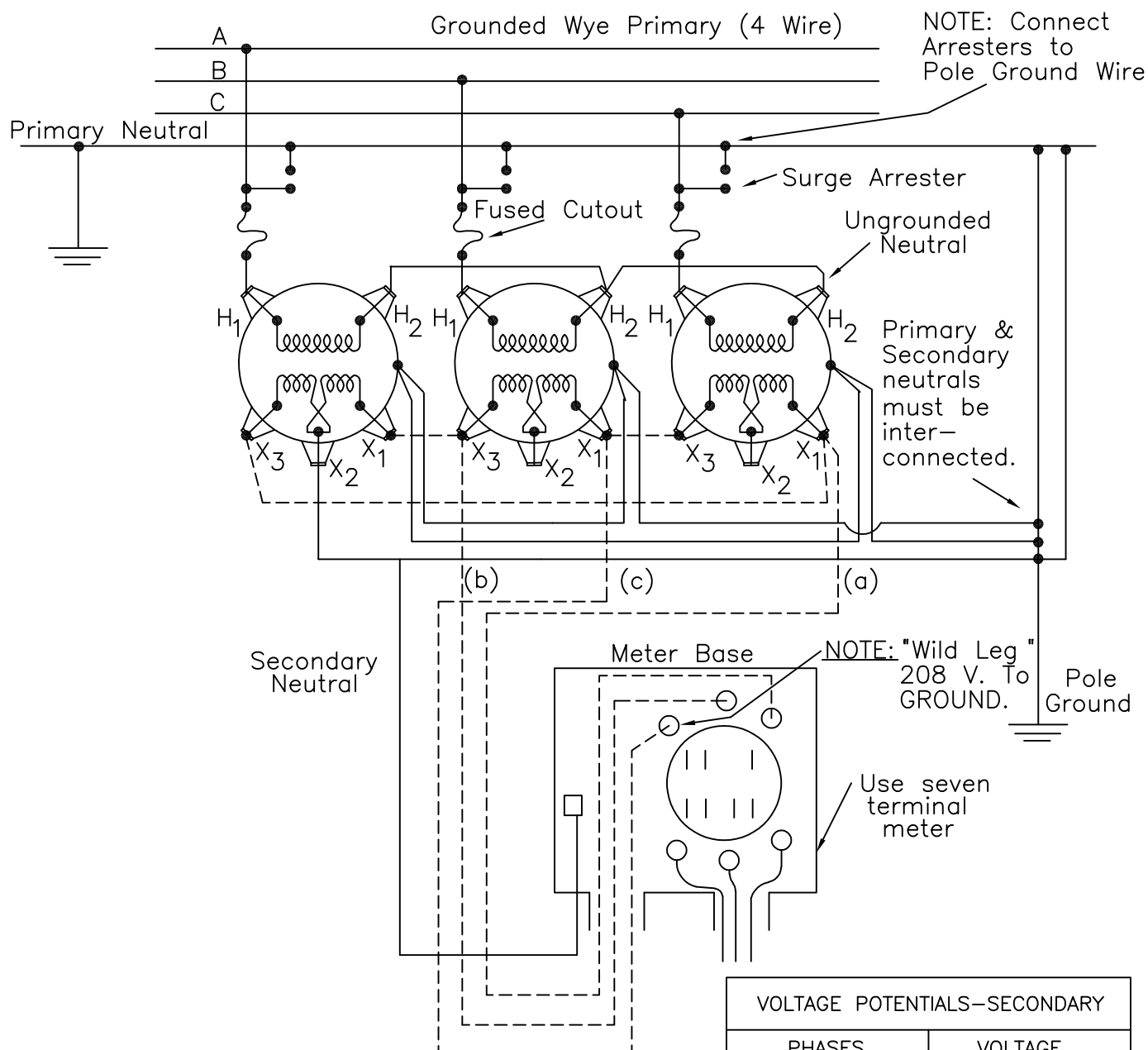
THREE-PHASE TRANSFORMER BANK
UNGROUND-WYE PRIMARY
CENTER-TAP GROUNDED DELTA, 4 WIRE SECONDARY

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

G3.1
(G310-)



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

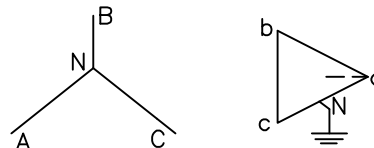
See drawing "G3.1" or "VG3.1" for construction details.

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.

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)

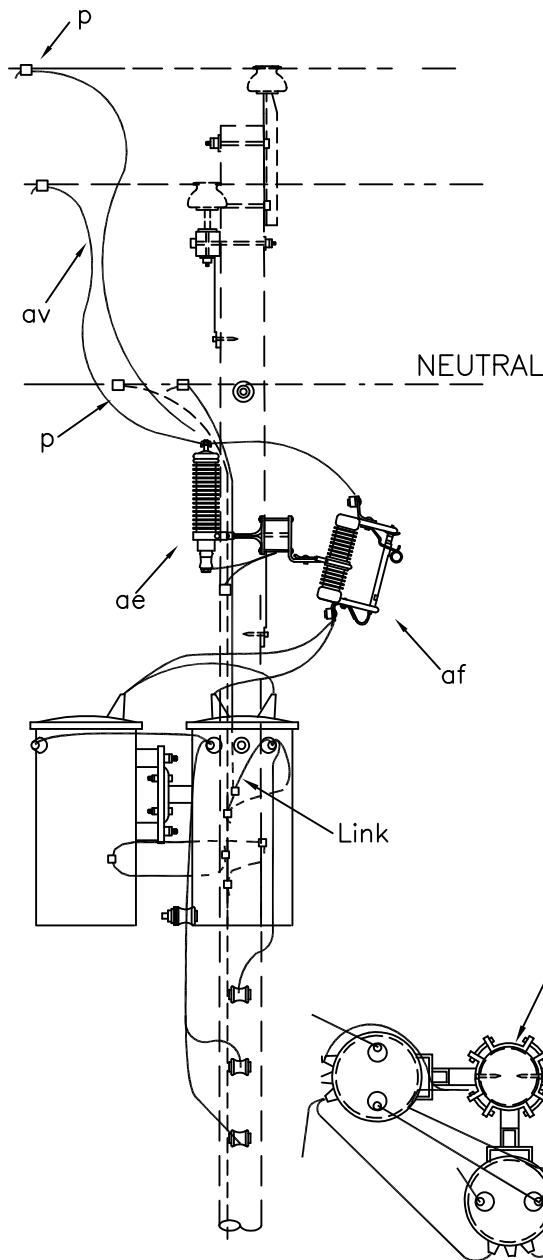
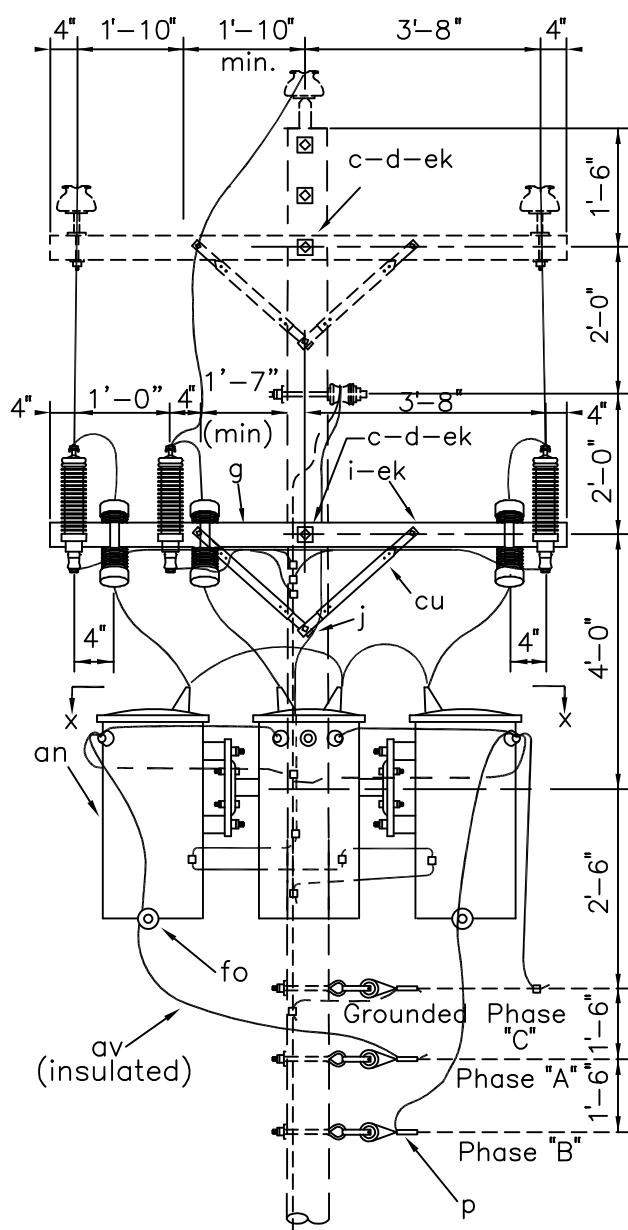
TRANSFORMER/METER CONNECTION GUIDE UNGROUNDED WYE – CENTER TAP GROUNDED DELTA FOR 120/240 VOLT POWER LOADS

APRIL 2005

3 – PHASE PRIMARY

RUS

G3.1G



NOTES:

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

SECTION X-X

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
UNGROUND-WYE PRIMARY
CORNER GROUNDED DELTA, 3 WIRE SECONDARY

APRIL 2005

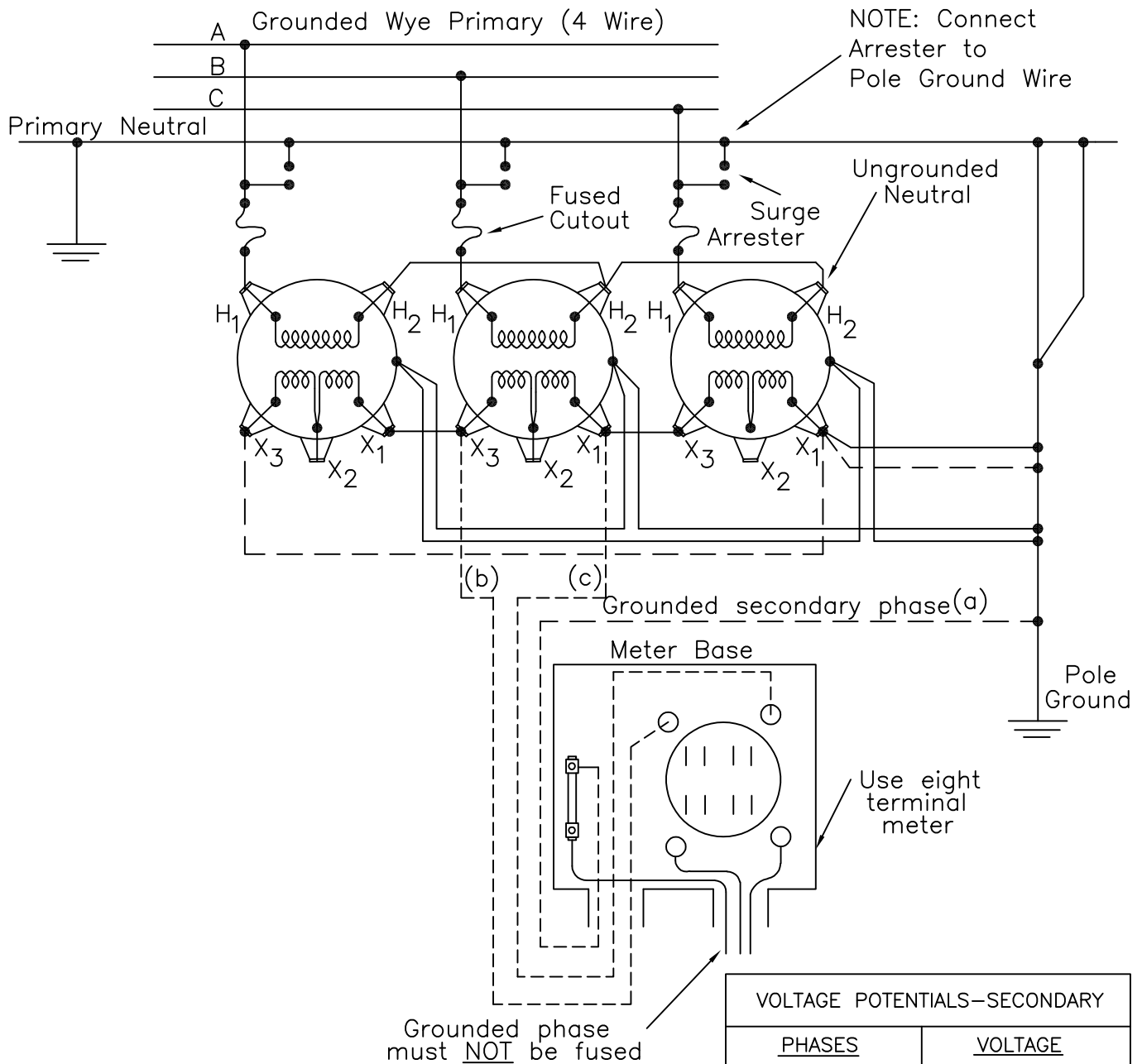
RUS

3 - PHASE PRIMARY

12.47/7.2 kV

G3.2

(G311-)



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.

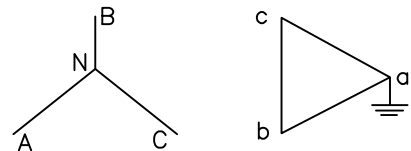
Do not ground bank on primary side. (If grounded, the bank would be a grounding bank for the entire circuit.)

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.

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)

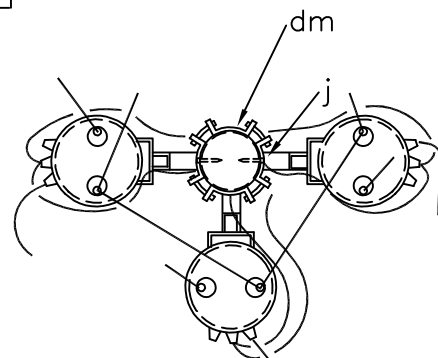
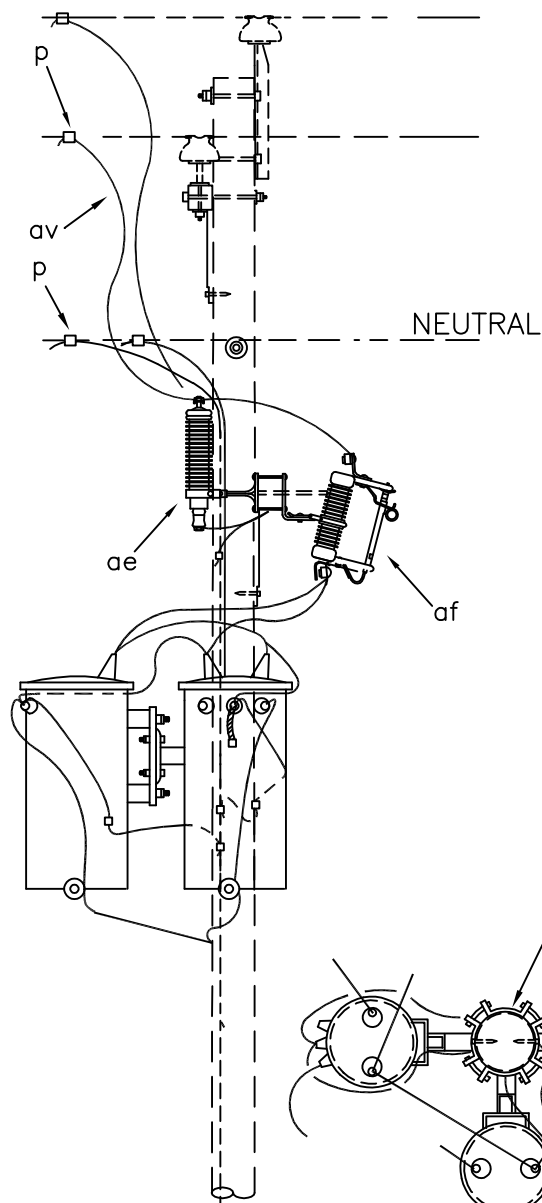
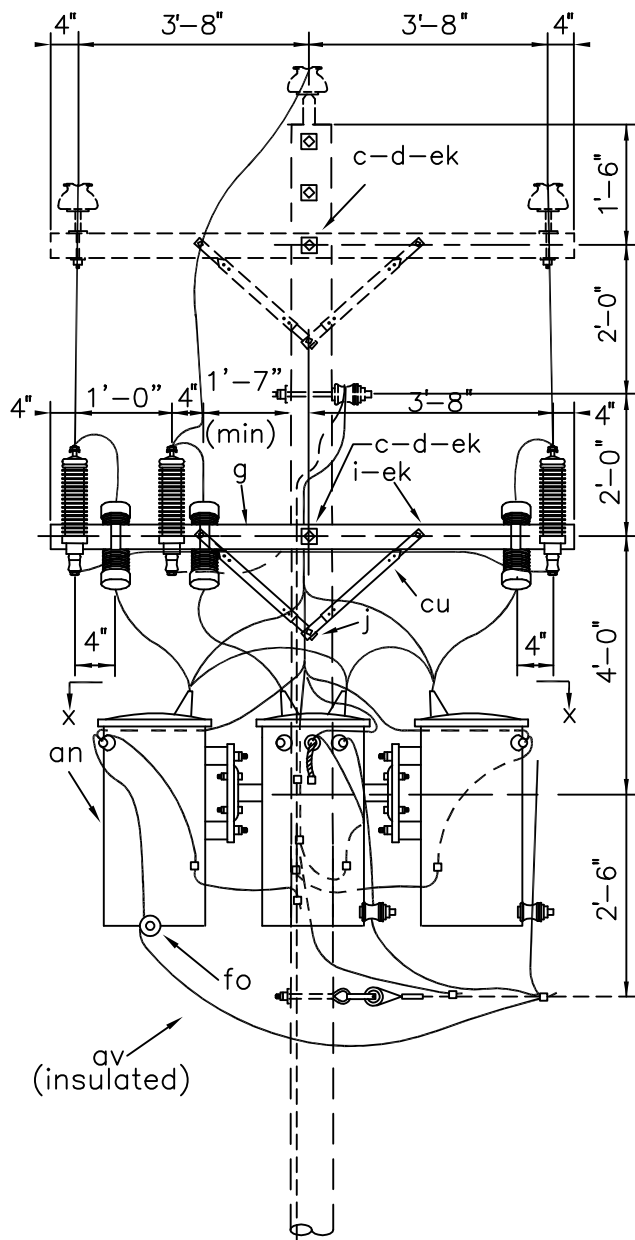
TRANSFORMER/METER CONNECTION GUIDE
UNGROUND WYE – CORNER GROUND DELTA
FOR 240 or 480 VOLT POWER LOADS

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

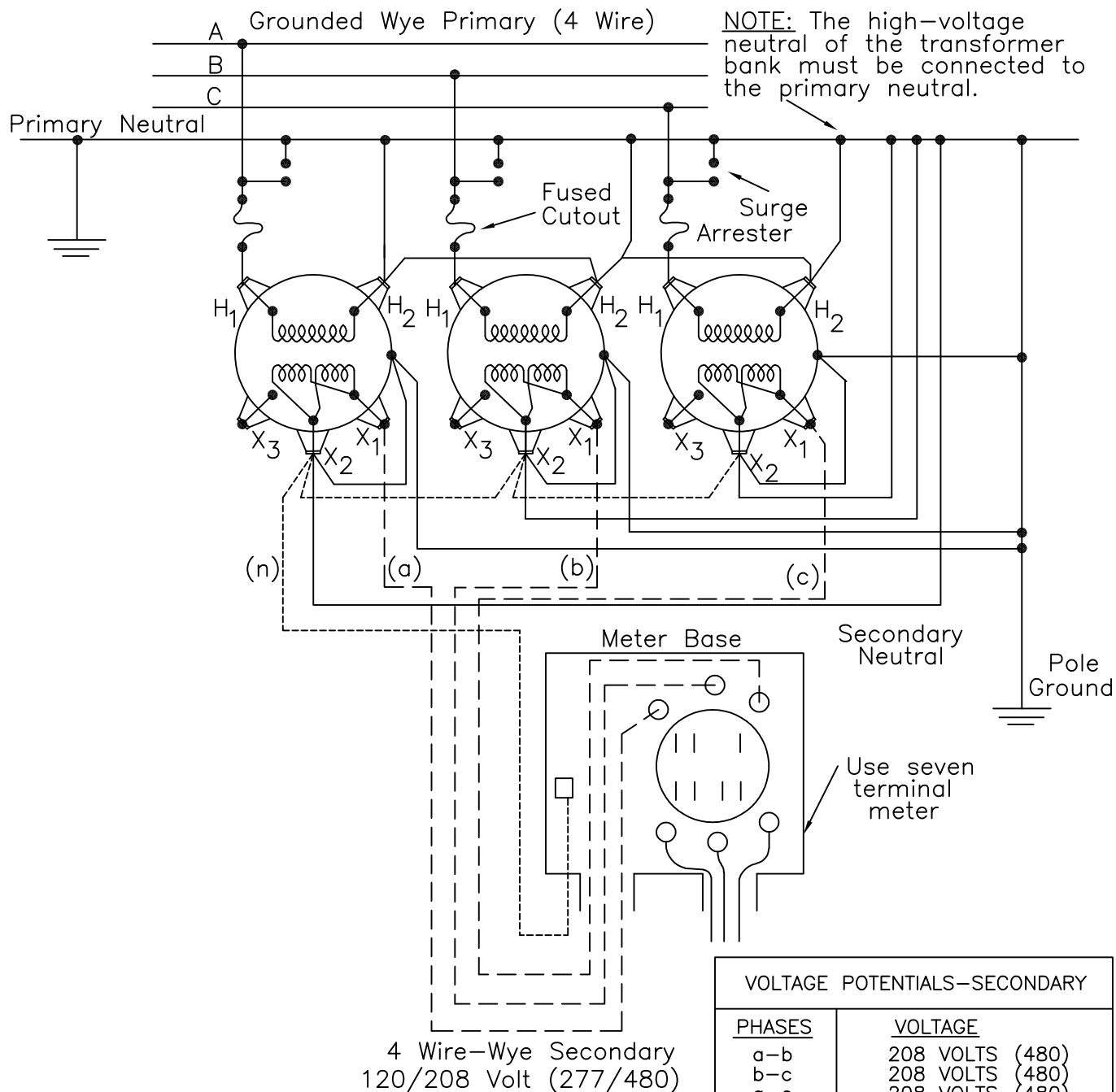
RUS

3 - PHASE PRIMARY

12.47/7.2 kV

G3.3

(G312-)



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

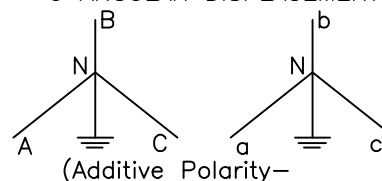
See drawing "G3.3" or "VG3.3" for construction details. Reconnect secondary windings of transformers as shown. Matched (impedance and kVA) transformers are usually used.

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.

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



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

APRIL 2005

3 — PHASE PRIMARY

RUS

G3.3G

INDEX H

GROUNDING ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
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.

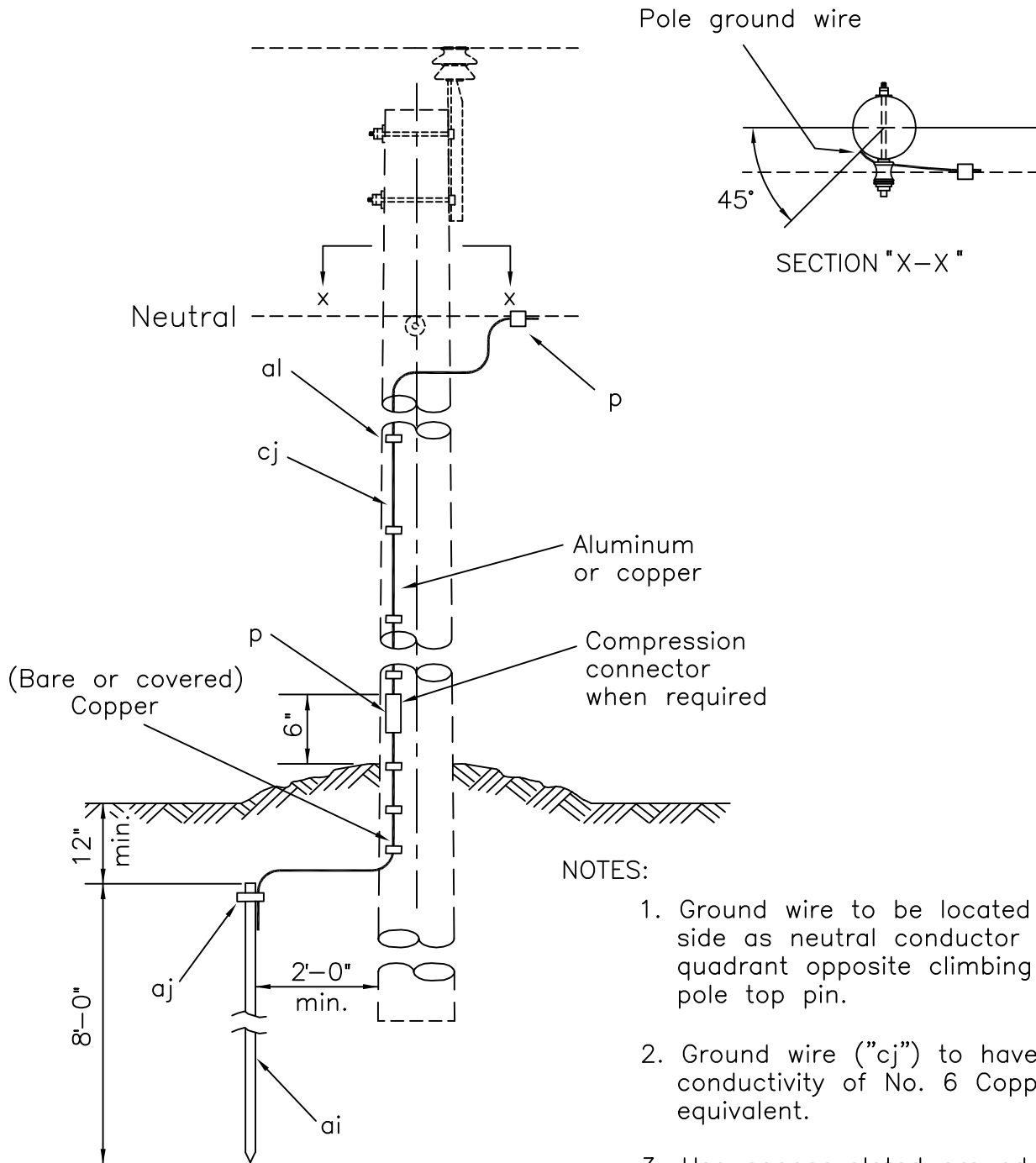
The connection between the ground rod and the system neutral should be made by one continuous piece of conductor (the pole ground wire), and shall be installed in the shortest and most direct path according to the construction drawings. Splices, if required, shall be made using a compression type connector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

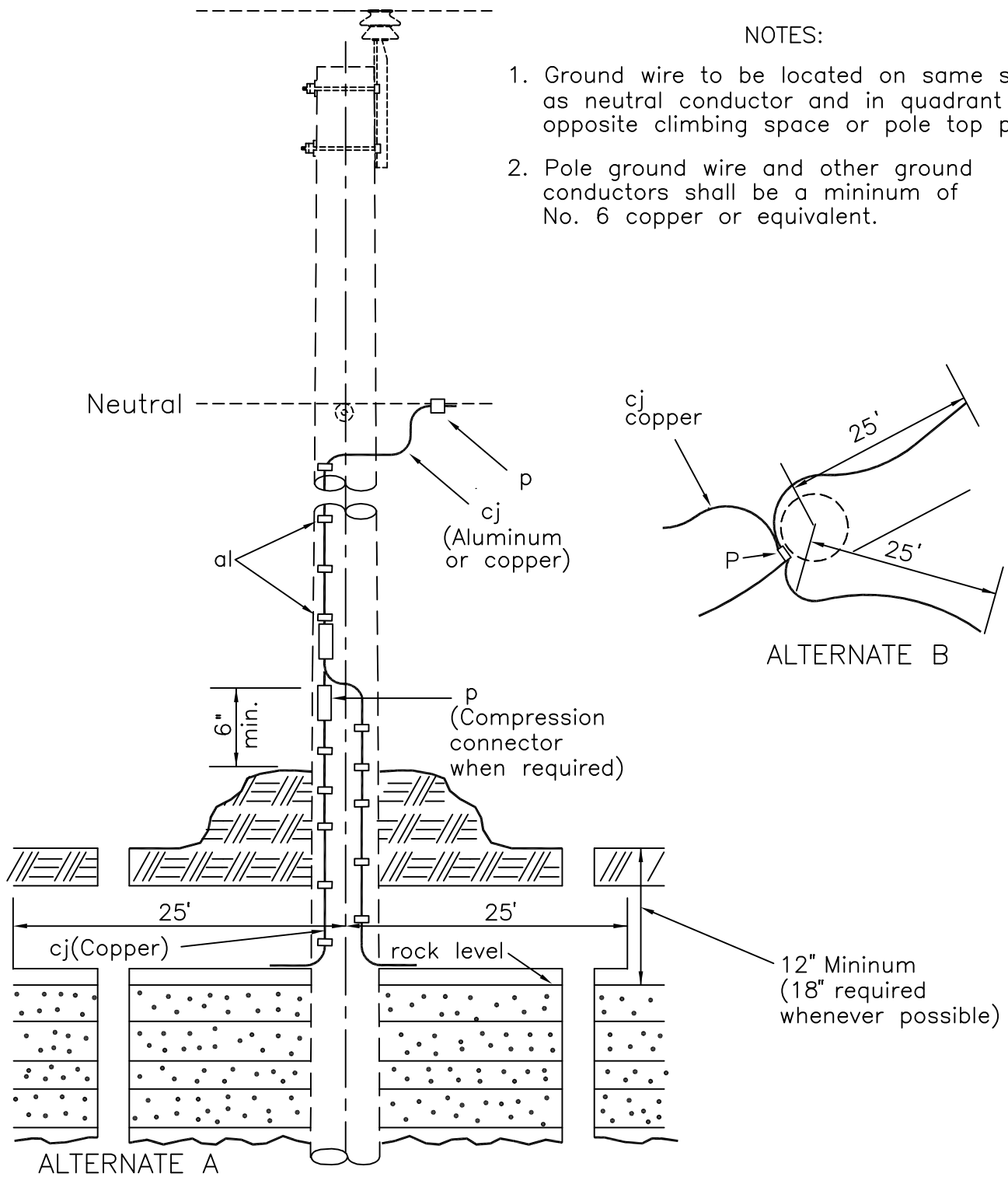
APRIL 2005

RUS

H1.1
(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 minimum of No. 6 copper or equivalent.



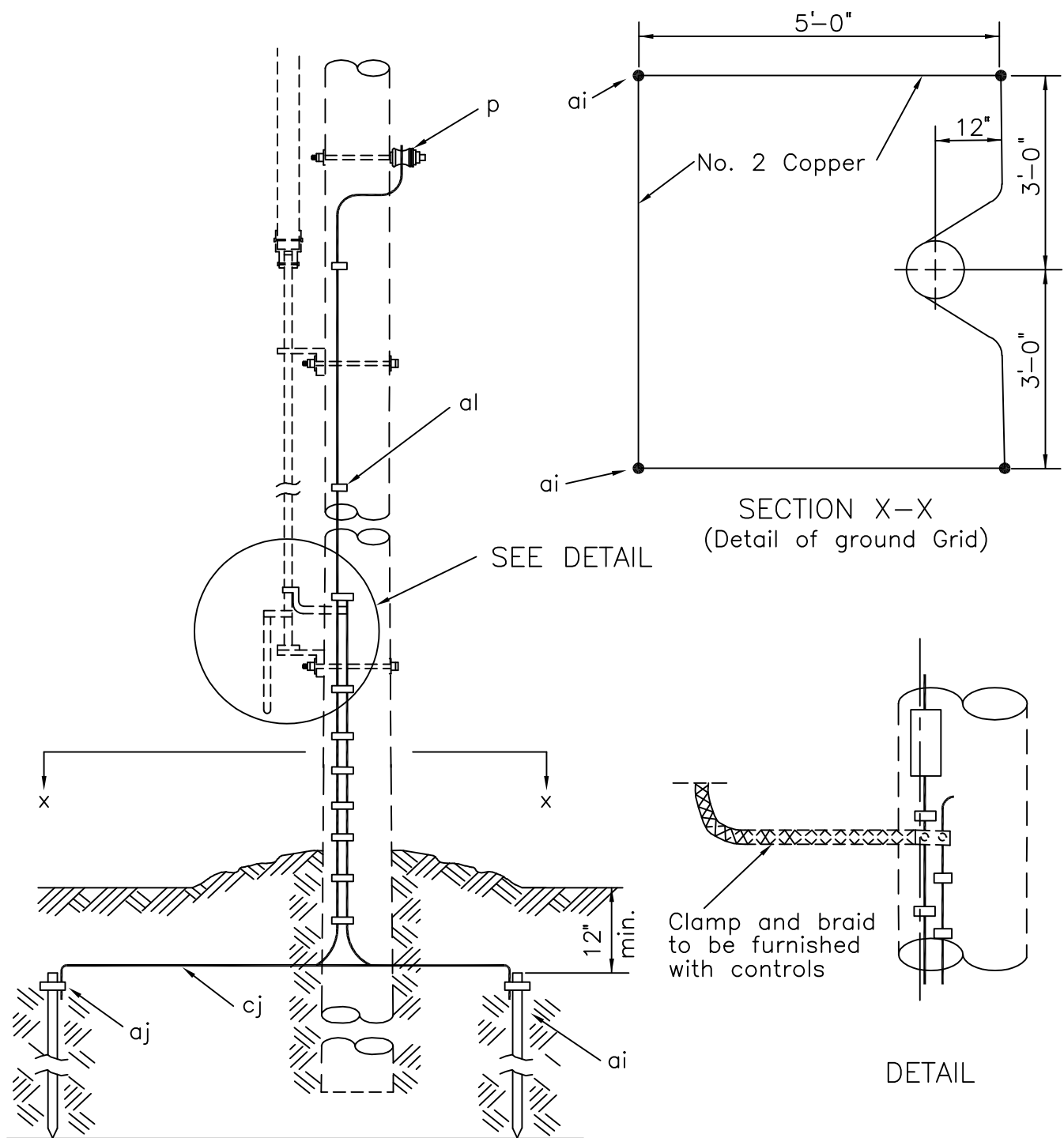
ITEM	QTY	MATERIAL
P		Connector, compression, as req'd
al		Staple, ground wire, as req'd
cj		Wire pole ground as req'd See Note 3 on Drawing H1.1

GROUNDING ASSEMBLY — TRENCH TYPE

APRIL 2005

RUS

H2.1
(M2-13)



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

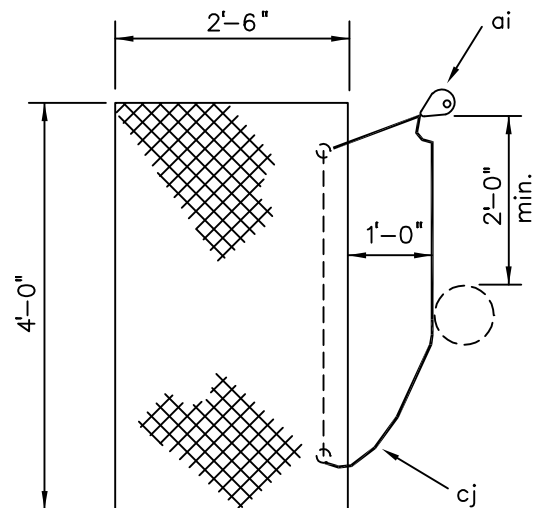
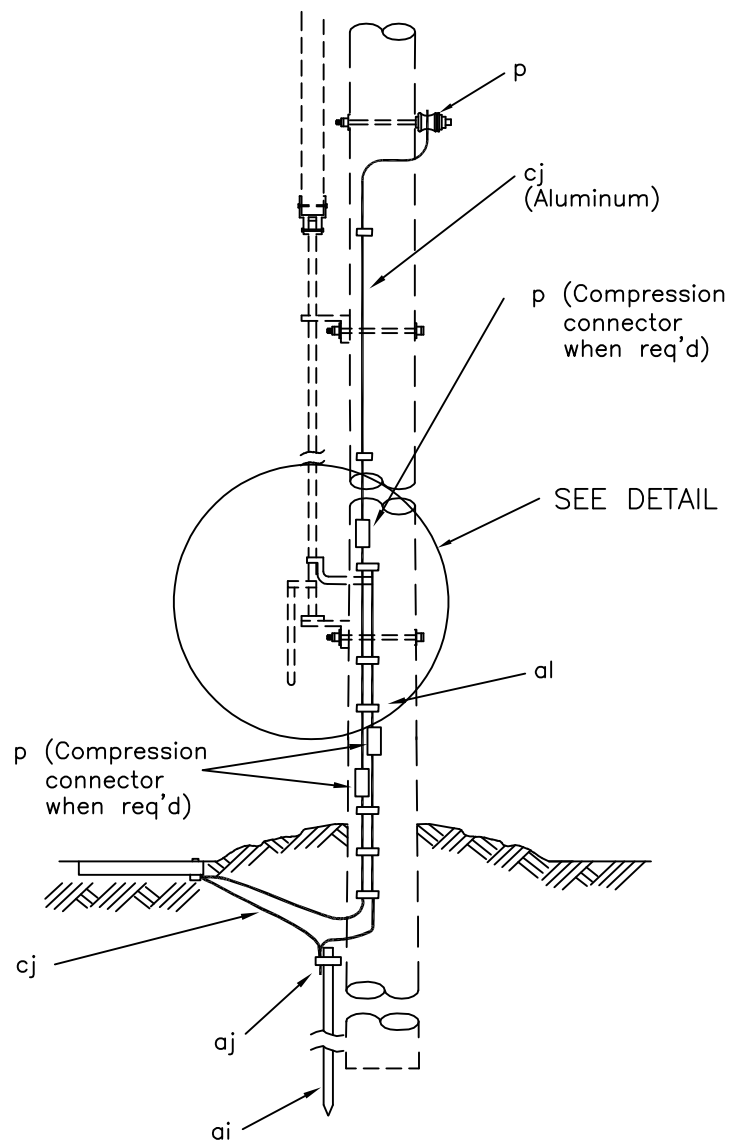
CAUTION: Rubber gloves should be worn when operating switch.

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

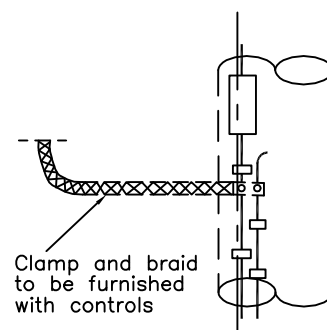
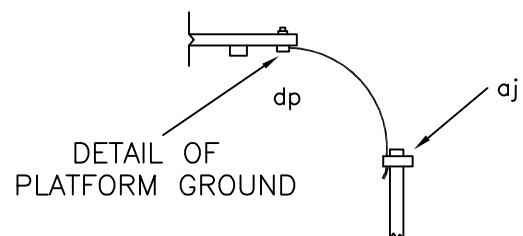
APRIL 2005

RUS

H3.1
(M2-15)



DETAIL OF PLATFORM



DETAIL

NOTE: Wear rubber gloves when operating switch.

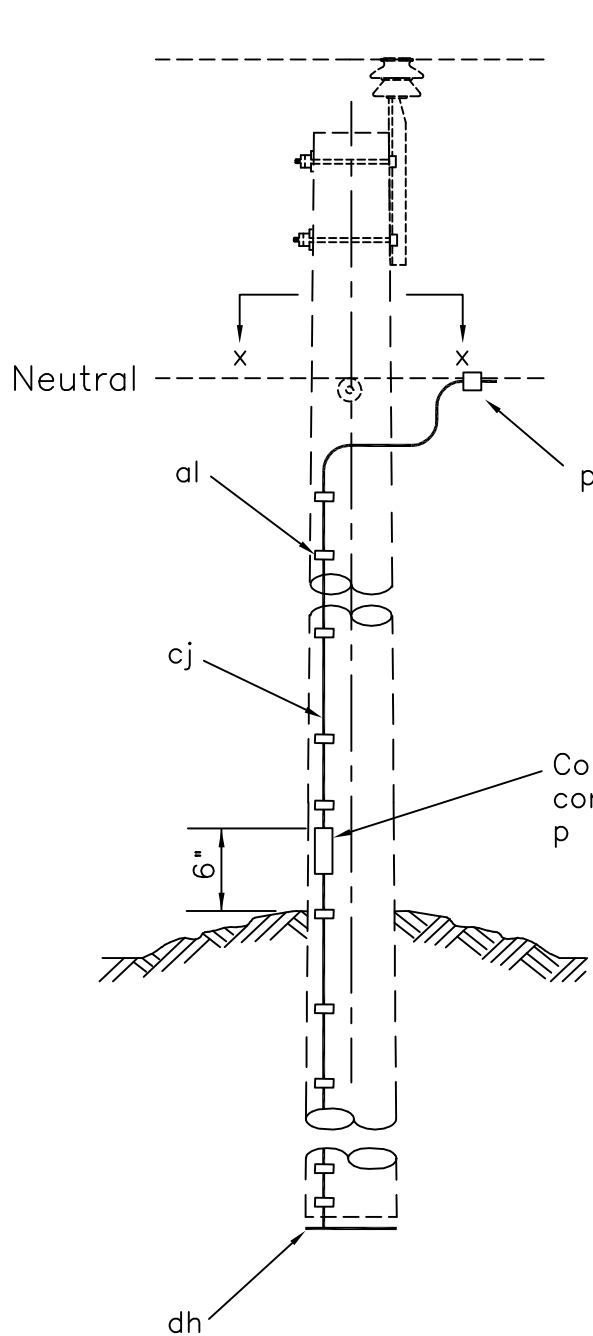
ITEM	QTY	MATERIAL
P		Connector, compression, as req'd
ai	1	Rod, ground, 5/8 min. dia., (galv.)
aj	1	Clamp, ground rod, (galvanized steel)
al		Staple, ground wire, (galv.), as req'd
cj		Wire pole ground, as req'd Soft annealed iron, 5/16" with class C galvanizing
dp	2	Clamp, ground wire, with lock washer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

GROUNDING ASSEMBLY — PLATFORM TYPE
(FOR SECTIONALIZING AIRBREAK SWITCH)

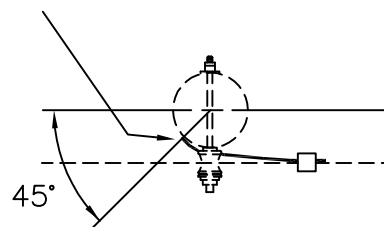
APRIL 2005

RUS

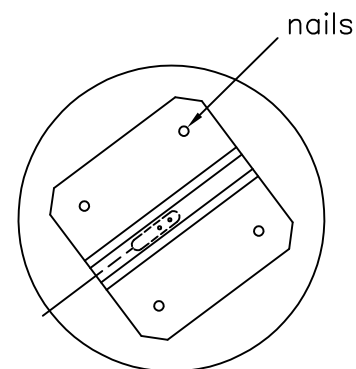
H4.1
(M2-15A)



Pole ground wire



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:

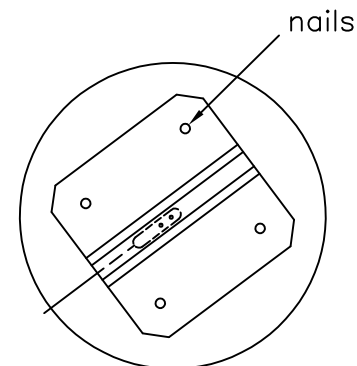
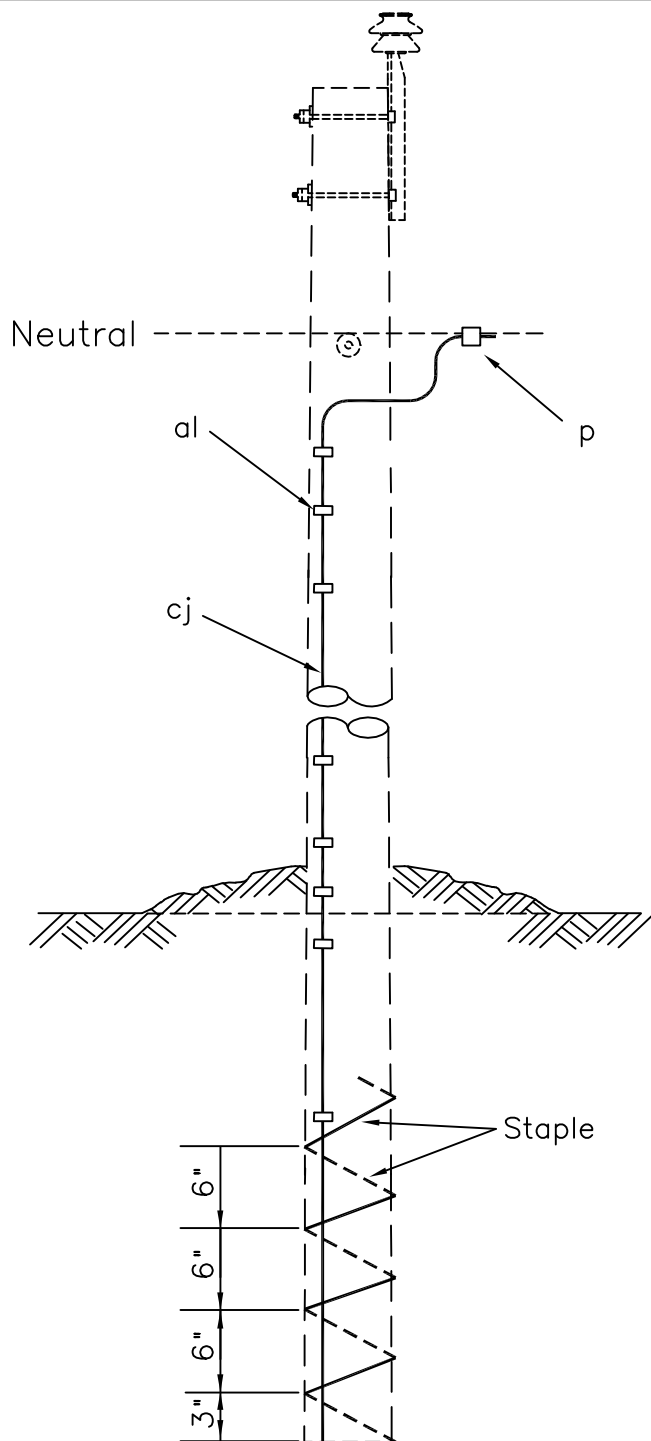
RUS SPECIFIES THAT THIS ASSEMBLY CAN NOT BE COUNTED AS A SYSTEM GROUNDING ELECTRODE REQUIRED BY THE NESC BUT RECOMMENDS ITS USE FOR OVERALL SYSTEM GROUNDING IMPROVEMENT.

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

RUS

H5.2,H5.3
(M2-12A)

INDEX J

SECONDARY ASSEMBLY UNITS

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

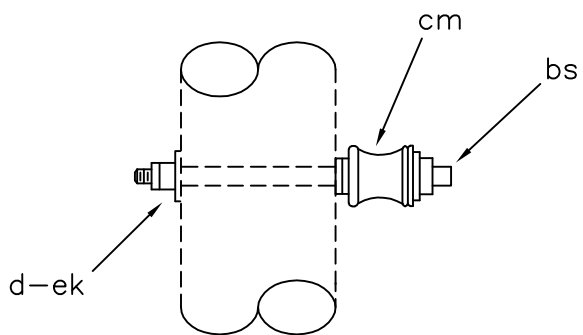
CONSTRUCTION SPECIFICATIONS FOR SECONDARY CONDUCTORS AND SERVICE DROPS

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.

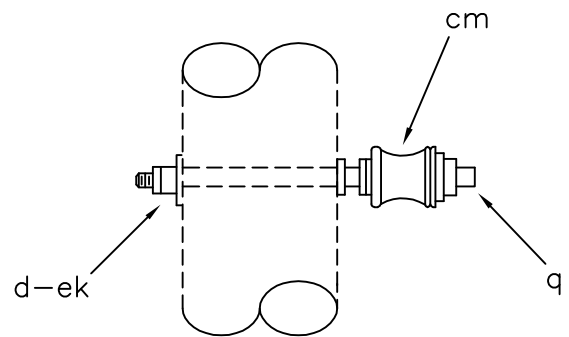
Conductors for secondary underbuild on primary lines may be bare wires, except in those circumstances where conditions may necessitate that covered wires or service cable be used. Service drop conductors shall be covered wires or service cable in accordance with NESC Rule 234C3.

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

ITEM	MATERIAL	J1.1	J1.2
		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

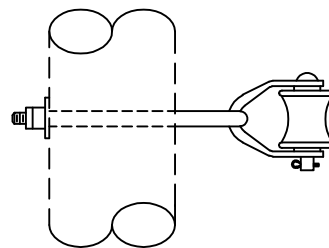
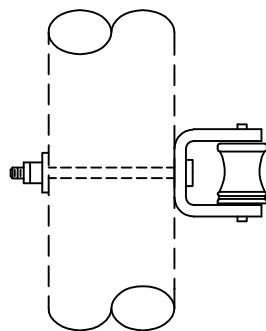
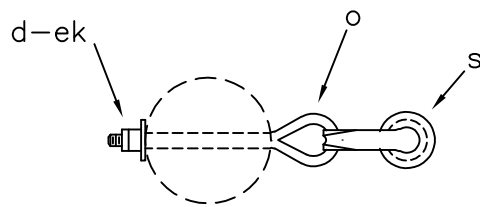
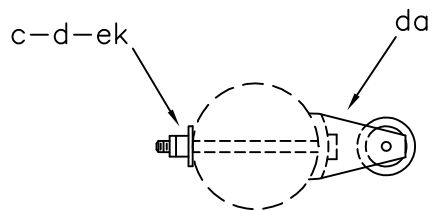
5° – Small Conductors
2° – Larger than #1/0

SECONDARY ASSEMBLIES
(SMALL ANGLE)

APRIL 2005

RUS

J1.1,J1.2
(J8),(J5)



J2.1

J2.2

ITEM	MATERIAL	J2.1	J2.2
		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

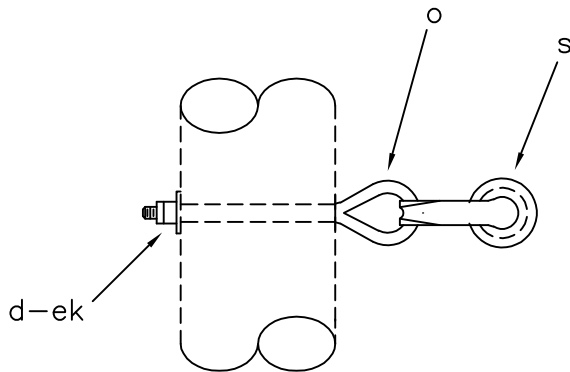
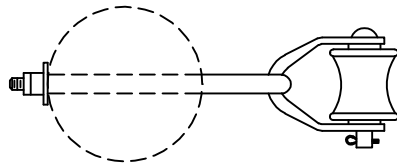
J2.1: 60°
J2.2: 60°

SECONDARY ASSEMBLIES
(LARGE ANGLE)

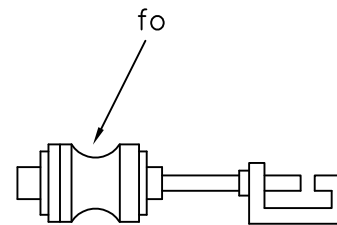
APRIL 2005

RUS

J2.1,J2.2
(J10),(J7,J7C)



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

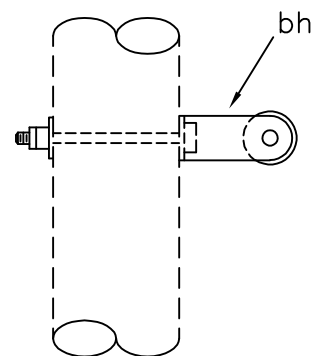
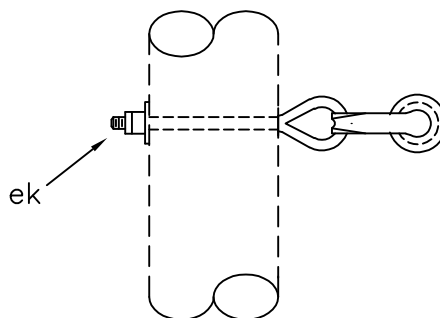
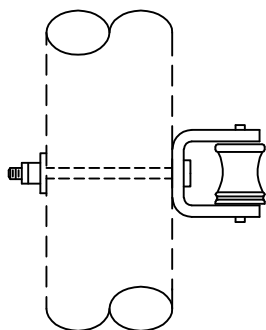
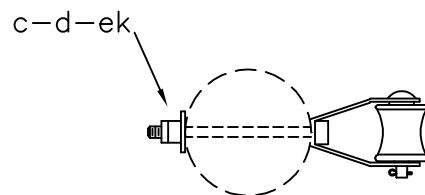
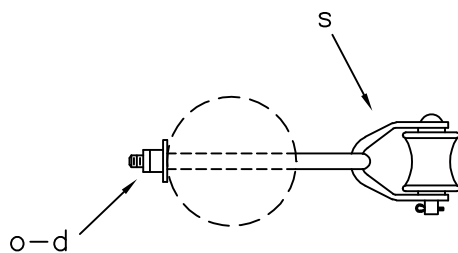
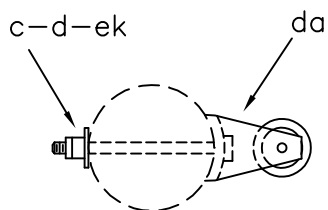
RUS

J3.1,J4.1
(J6,J11),(J12)

INDEX K

SERVICE ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
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	
<u>NEW</u>	(<u>OLD</u>)
K1.1	(K14C)
K1.2	(K11C)
K1.3	(K14)
	(K14L)

DESIGN PARAMETERS:

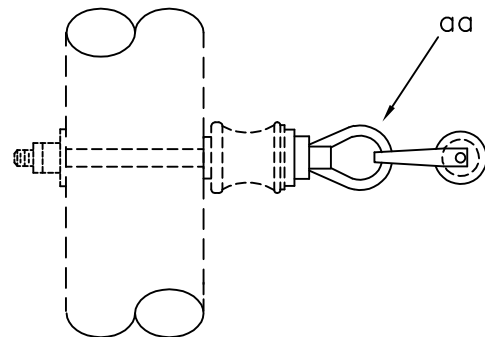
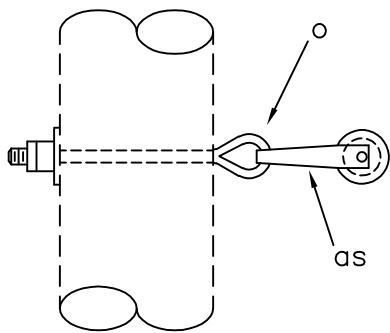
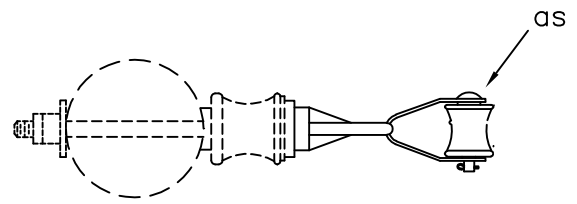
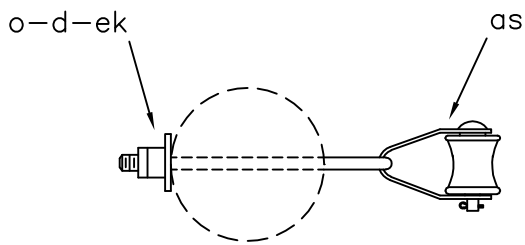
PERMITTED LONGITUDINAL LOADING:
1,500 lbs. (ANSI Class 53-2 Insulator)
2,250 lbs. (ANSI Class 53-4 Insulator)

SERVICE ASSEMBLIES
(POLE MOUNTED)

APRIL 2005

RUS

K1.1,K1.2,K1.3



K1.4

K1.5

ASSEMBLY: K1

ITEM	MATERIAL	.4 QTY	.5 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:

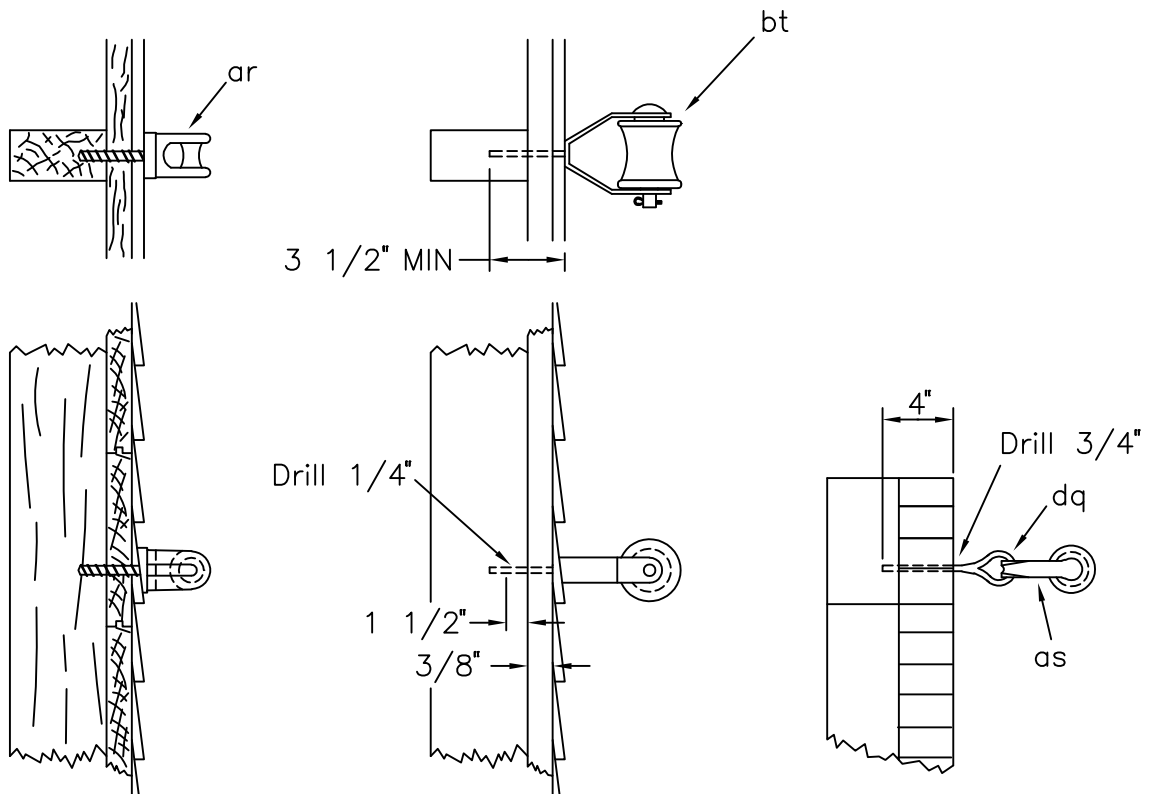
PERMITTED LONGITUDINAL LOAD:
1,500 lbs. (ANSI Class 53-2 Insulator)
2,250 lbs. (ANSI Class 53-4 Insulator)

SERVICE ASSEMBLIES
(POLE MOUNTED)

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RUS

K1.4,K1.5
(K11,K11L),(K15C)



K2.1

K2.2

K2.3

BRICK OR MASONRY

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

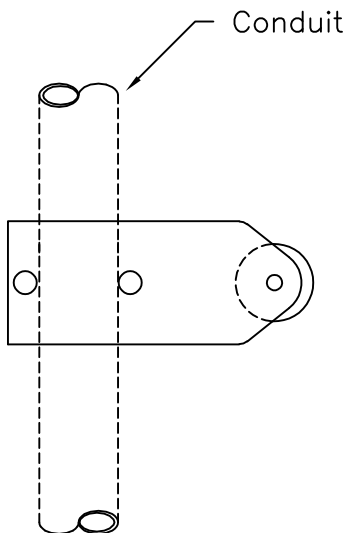
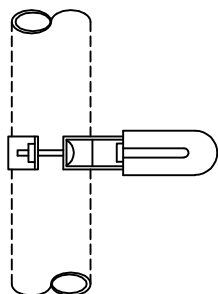
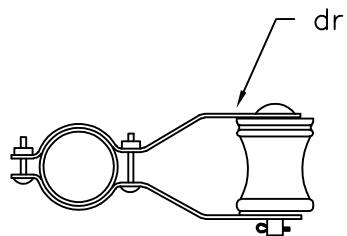
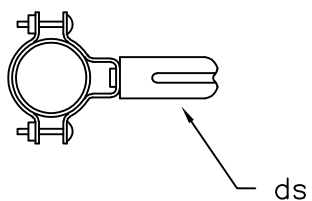
ASSEMBLY: K2		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
ar	Wireholder	1		
as	Clevis, secondary, swinging, insulated			1
bt	Wireholder, clevis type insulated, #24 Woodscrew		1	
dq	Eye, screw, elliptical, 1/2" X 6"			1
	3/4" x 3 1/2" expansion shield			1

SERVICE ASSEMBLIES

APRIL 2005

RUS

K2.1,K2.2,K2.3
(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)

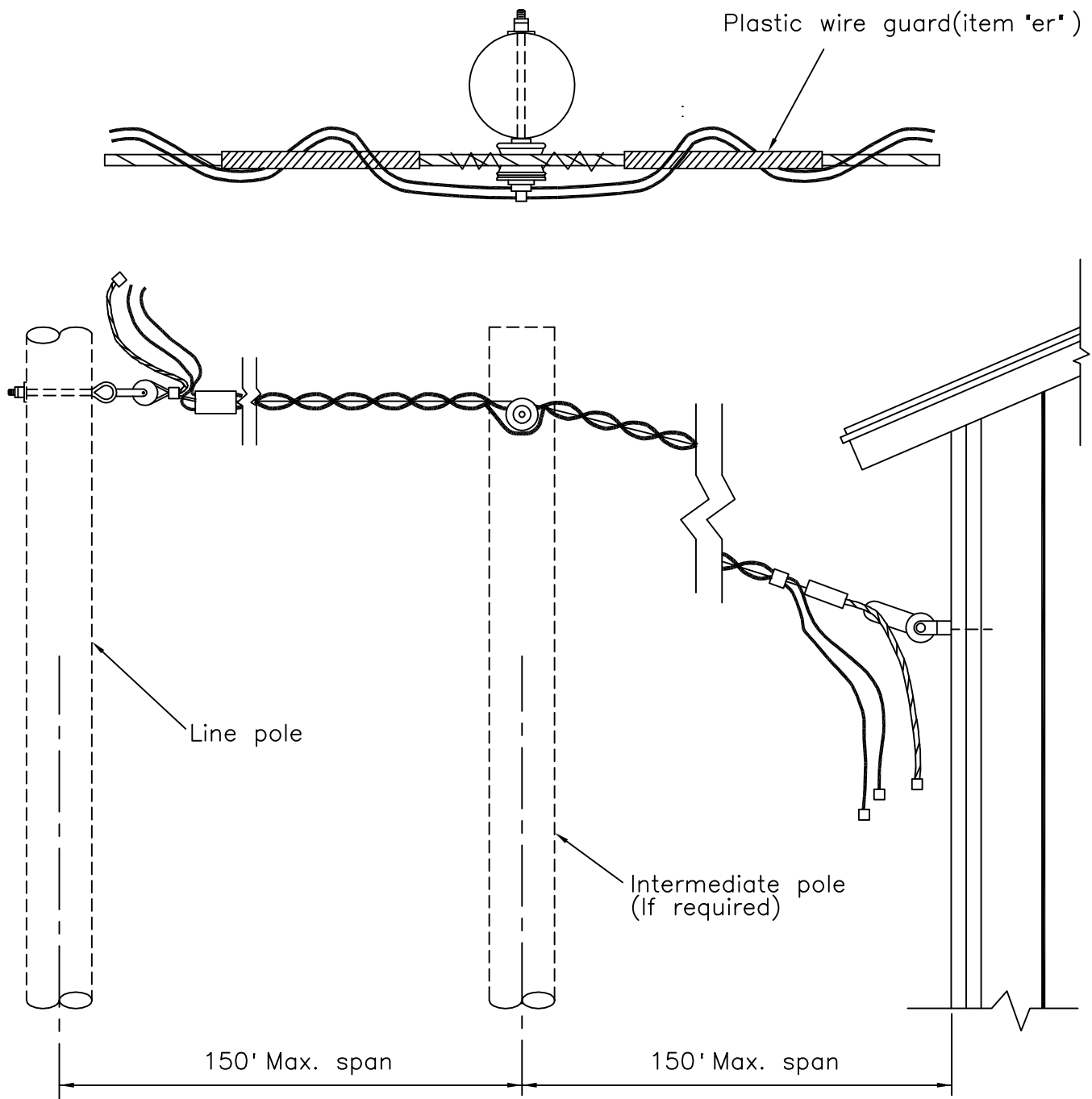
	Deadend	Cantilever
K3.1	1500	800
K3.2	1500	400

SERVICE ASSEMBLIES (MAST TYPE)

APRIL 2005

RUS

K3.1,K3.2
(K17,K17L),(K16C)



NOTES:

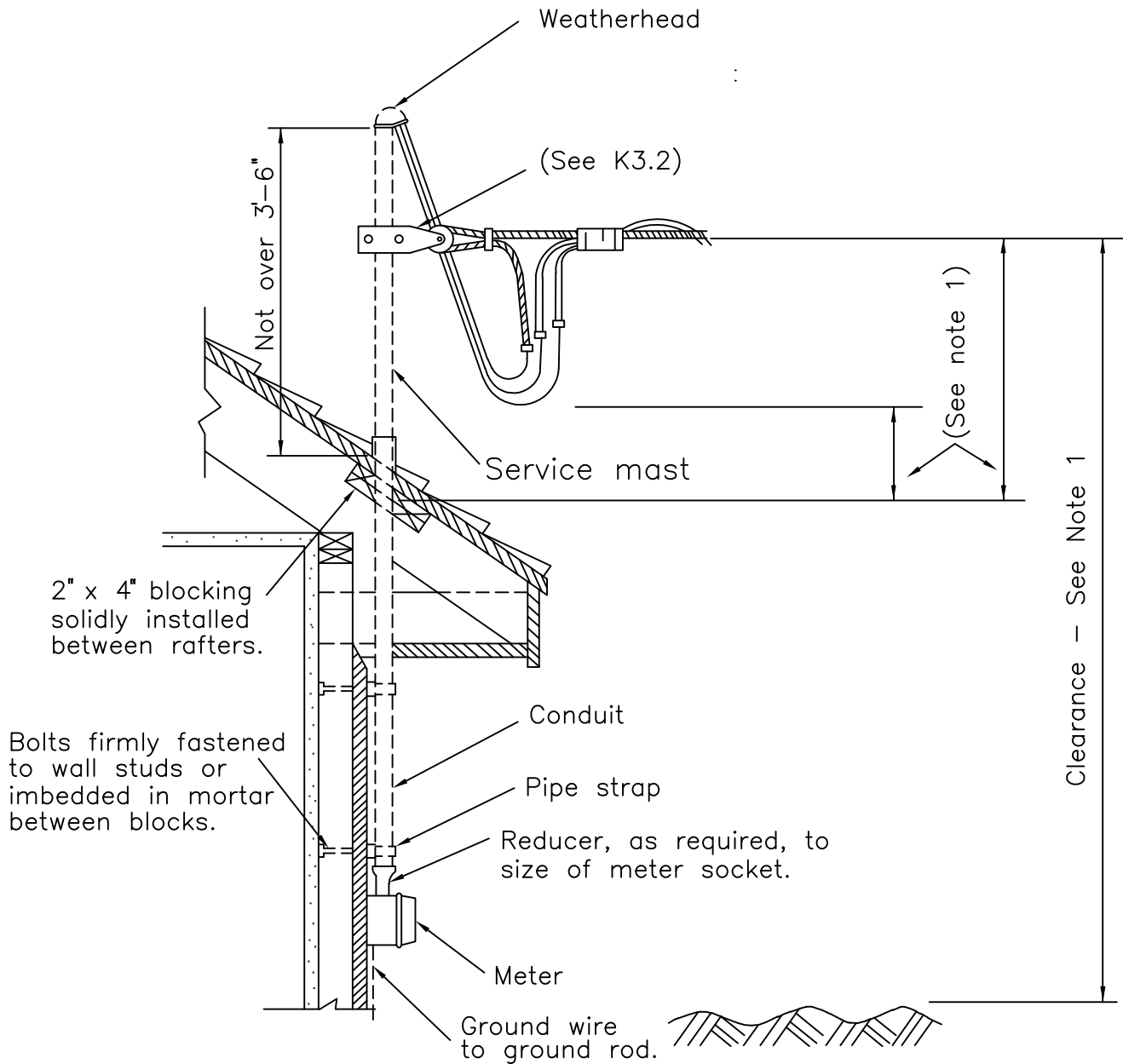
1. Services as short as possible are preferred.
2. See NESC Table 232-1 for minimum ground clearances.
3. Refer to secondary and service assemblies for construction details.
4. Service connectors to be insulated compression type.

CABLE SERVICE ASSEMBLY GUIDE

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RUS

K4.1G
(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

RUS

K4.2G
(M24-10)

INDEX L

TYING ASSEMBLIES

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
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 - (COPPER)
L3.4	(M42-3)	
L3.5	(M42-11)	NEUTRAL & SECONDARY DEADEND TYING ASSEMBLIES - (ACSR)
L3.6		
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.

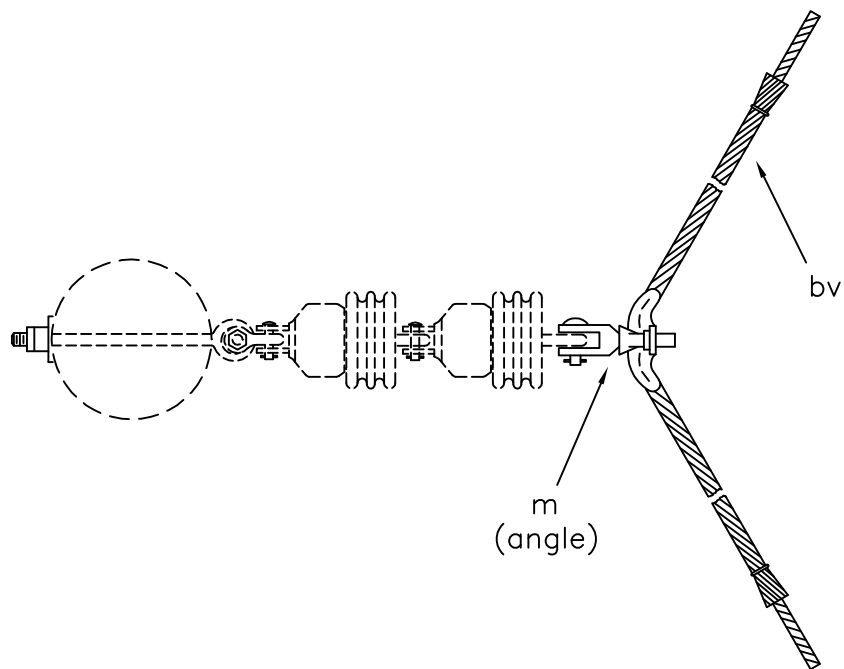
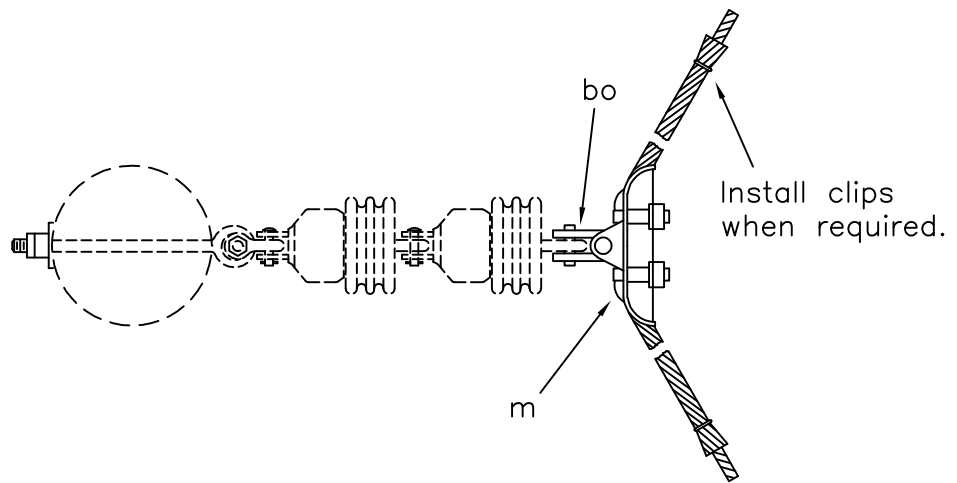
Connectors and hot-line clamps suitable for the purpose shall be installed as shown on the drawings and also in accordance with the manufacturer's specifications and recommendations. On all hot-line clamp installations, the clamp and jumper shall be installed so that they are permanently bonded to the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

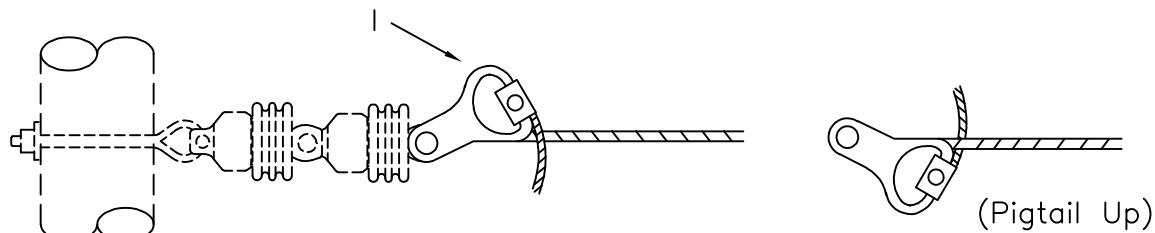
APRIL 2005

RUS

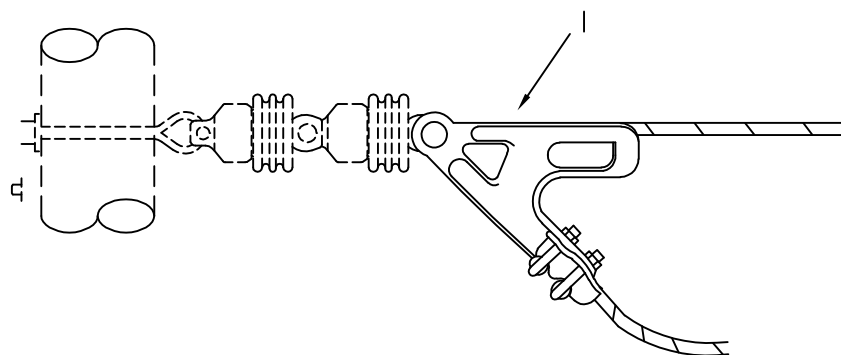
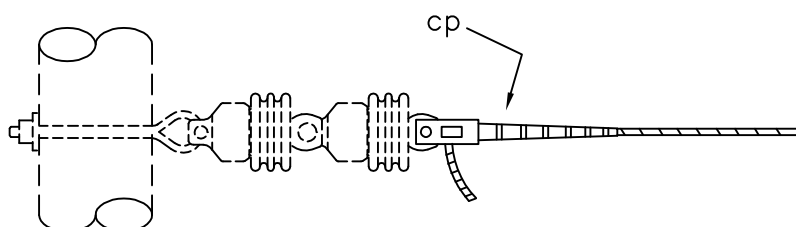
12.47/7.2 kV

L1.1,L1.2

(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	
<u>NEW</u>	(OLD)
L1.3	(M42-3)
L1.4	(M42-21)
L1.5	(M42-11)

ASSEMBLY: L1		.3	.4	.5
ITEM	MATERIAL	QTY	QTY	QTY
I	Clamp, deadend (distribution)	1		1
by	Deadend, automatic or formed type			
cp	Deadend, compression type		1	

(Not Shown)

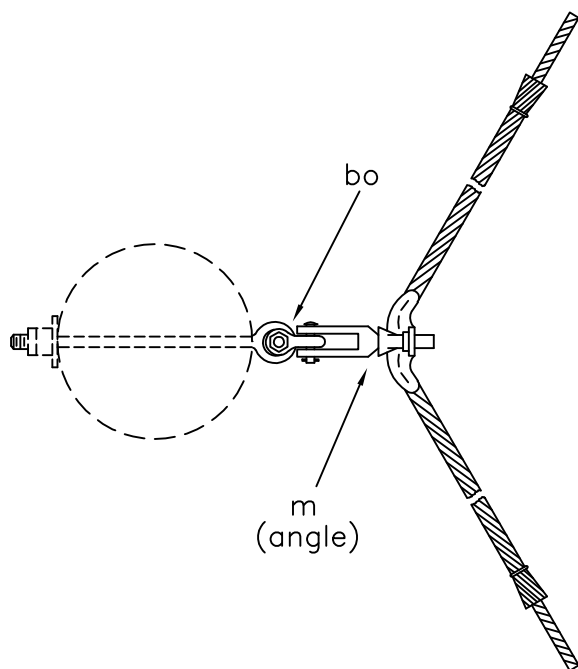
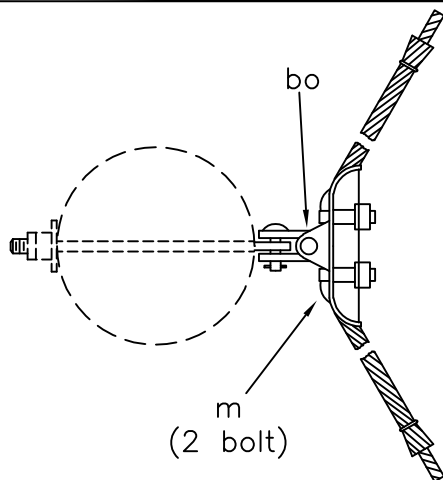
PRIMARY DEADEND TYING ASSEMBLIES

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:

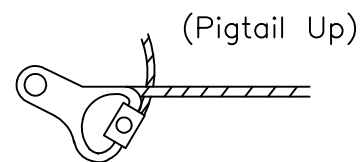
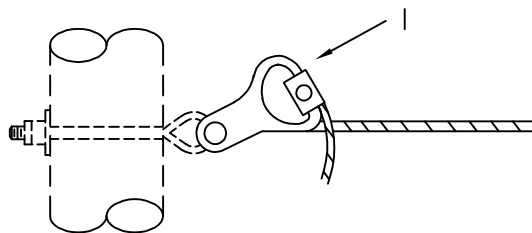
30° to 60° Line Angles

NEUTRAL ANGLE TYING ASSEMBLIES

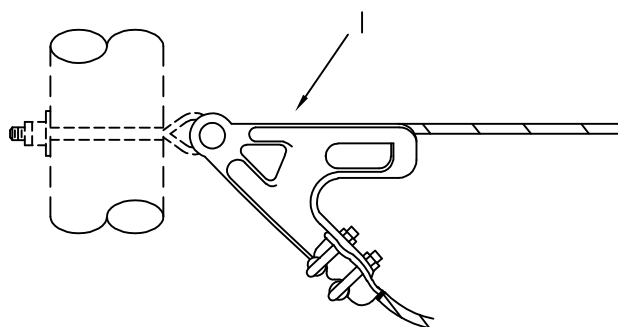
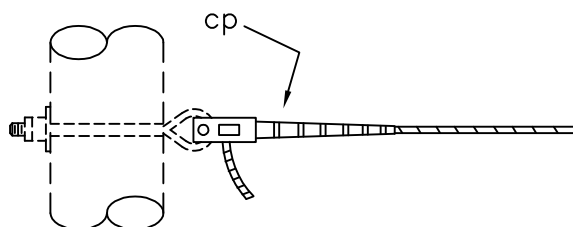
APRIL 2005

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 "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: L2

ITEM	MATERIAL	.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	

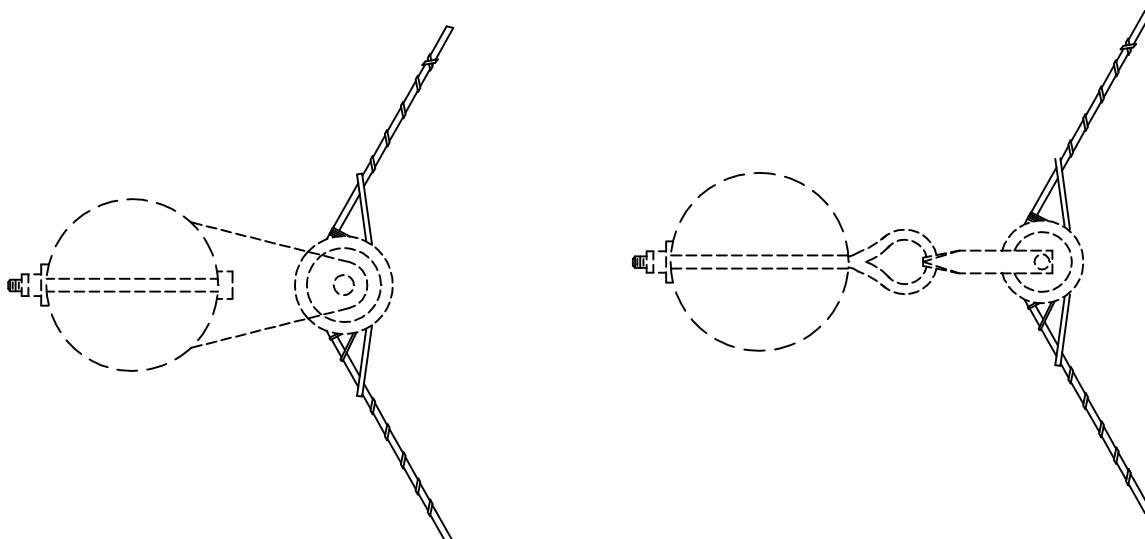
NEUTRAL DEADEND TYING ASSEMBLIES

APRIL 2005

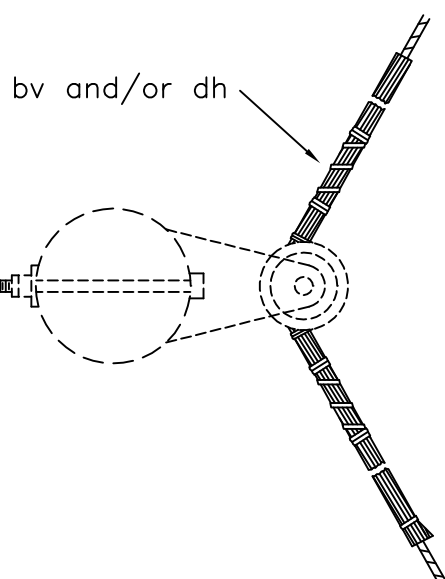
RUS

L2.3,L2.4,L2.5

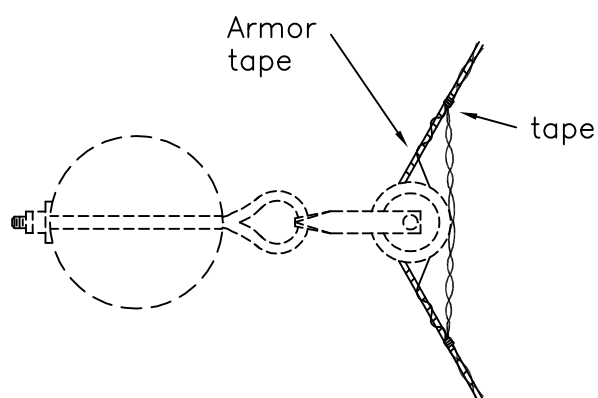
(M42-13)



For use with copper or copperweld-copper conductors.



ACSR Conductors



Self Supporting
Cable Conductors

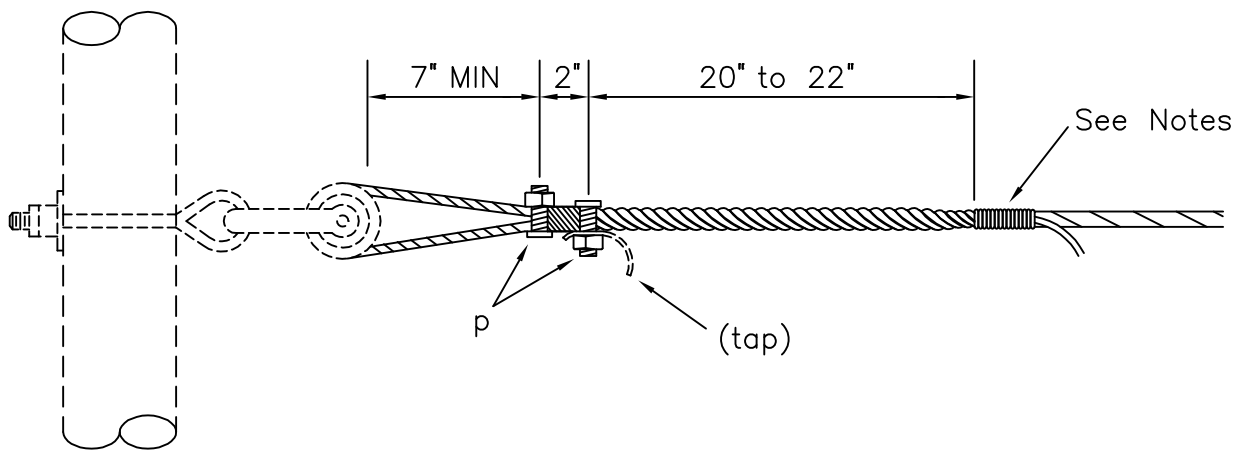
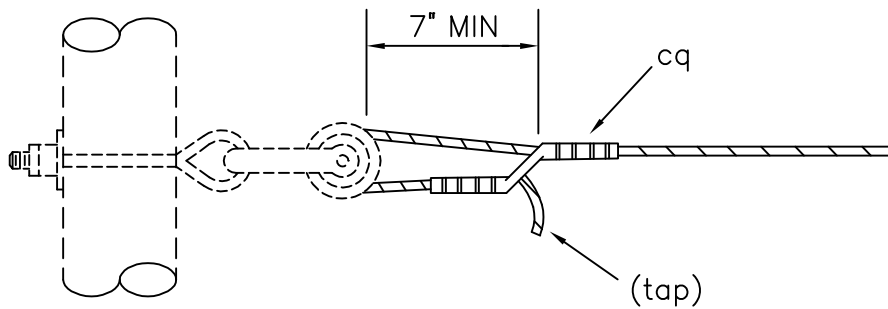
ITEM	MATERIAL
bv	Rod, armor (formed type)
dh	Tie, insulator (formed type)

NEUTRAL & SECONDARY ANGLE TYING ASSEMBLIES

APRIL 2005

RUS

L3.1,L3.2
(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.

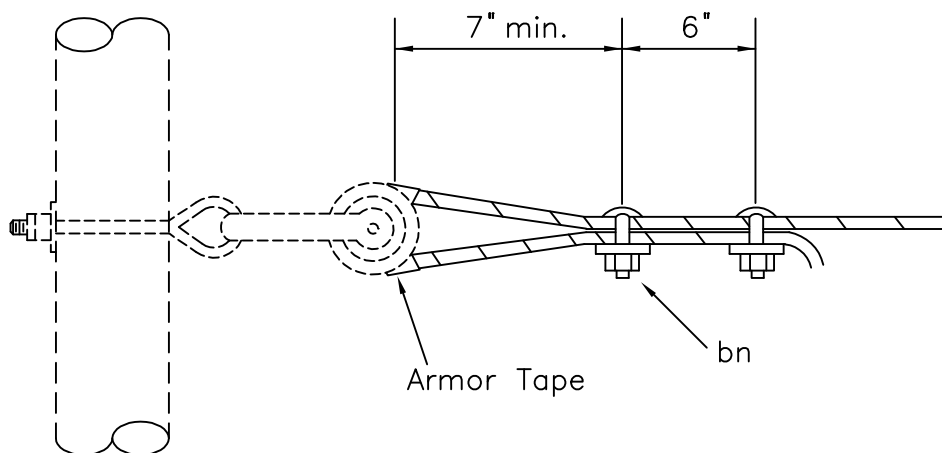
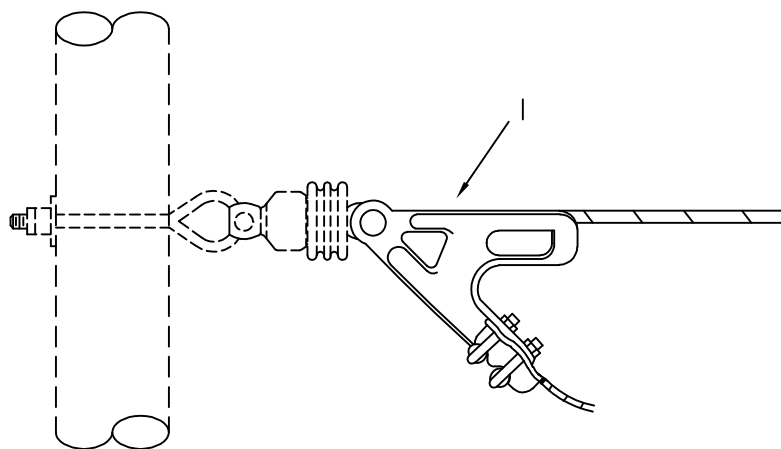
ASSEMBLY: L3		.3	.4
ITEM	MATERIAL	QTY	QTY
p	Connectors, as req'd		
cq	Deadend, secondary	1	

NEUTRAL & SECONDARY
DEADEND TYING ASSEMBLIES (COPPER)

APRIL 2005

RUS

L3.3,L3.4
(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.

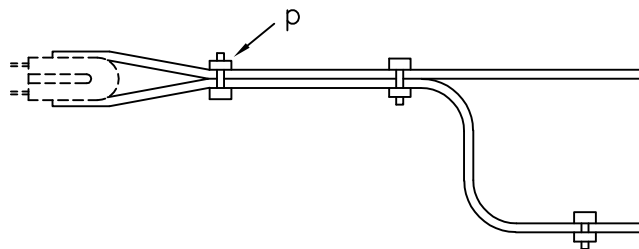
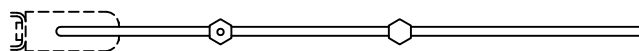
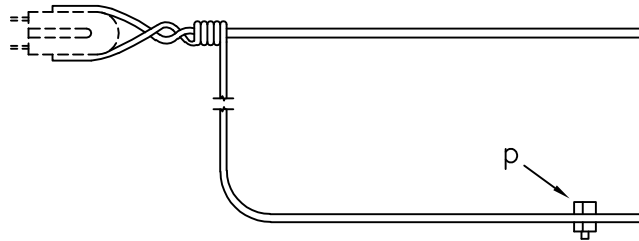
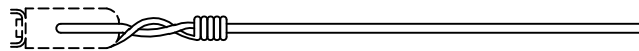
ASSEMBLY: L3		.5	.6
ITEM	MATERIAL	QTY	QTY
i	Clamp, deadend	1	
bn	Clamp, loop deadend		2

NEUTRAL & SECONDARY
DEADEND TYING ASSEMBLIES (ACSR)

APRIL 2005

RUS

L3.5,L3.6
(M42-11,13)

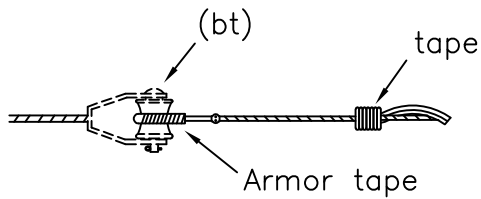


This type of construction should be used for small, aluminum covered conductors.

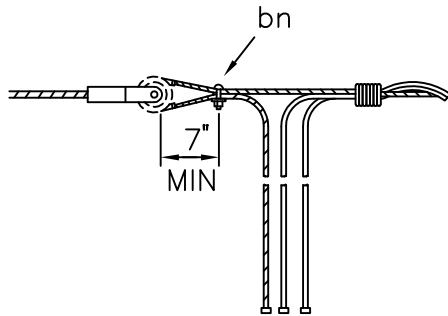
NOTE: Service connectors (p) to be applied over bare wire and then taped as required.

ITEM	MATERIAL
P	Connectors, as req'd

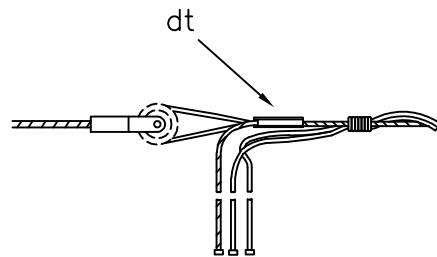
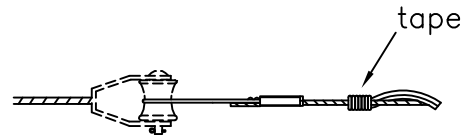
		TYING ASSEMBLY, SERVICES	
		APRIL 2005	
		RUS	L4.1



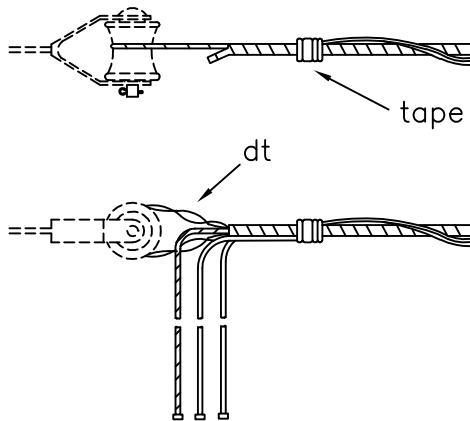
NOTE:
Groove diameter of
insulator 1 3/4" min.



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

ITEM	MATERIAL	.2 QTY	.3 QTY	.4 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

INDEX M

MISCELLANEOUS ASSEMBLY UNITS AND GUIDES

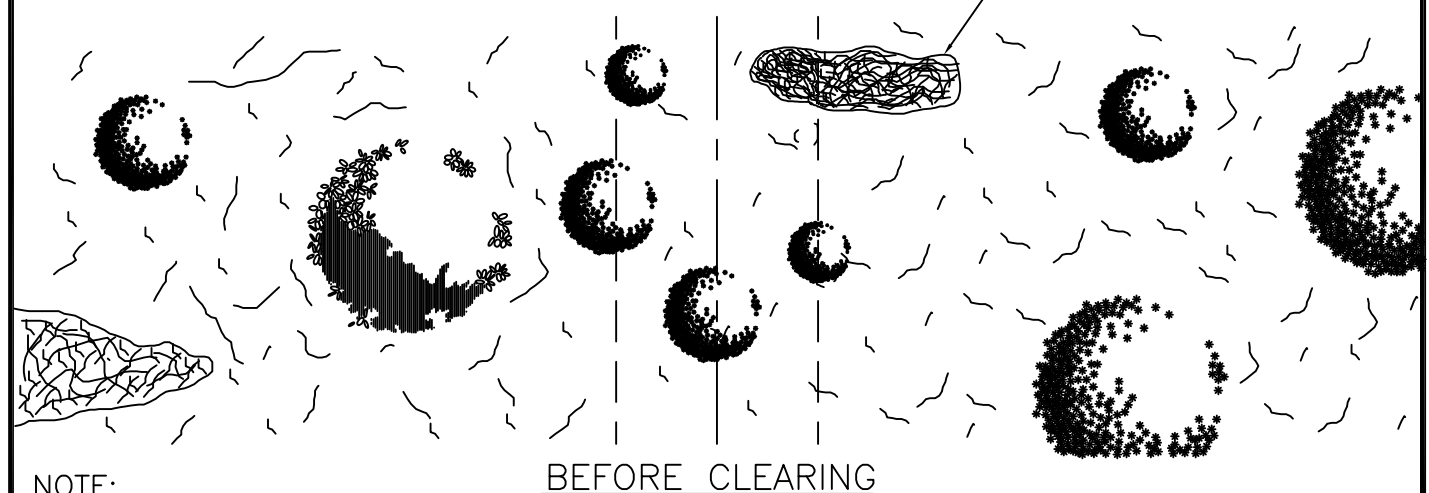
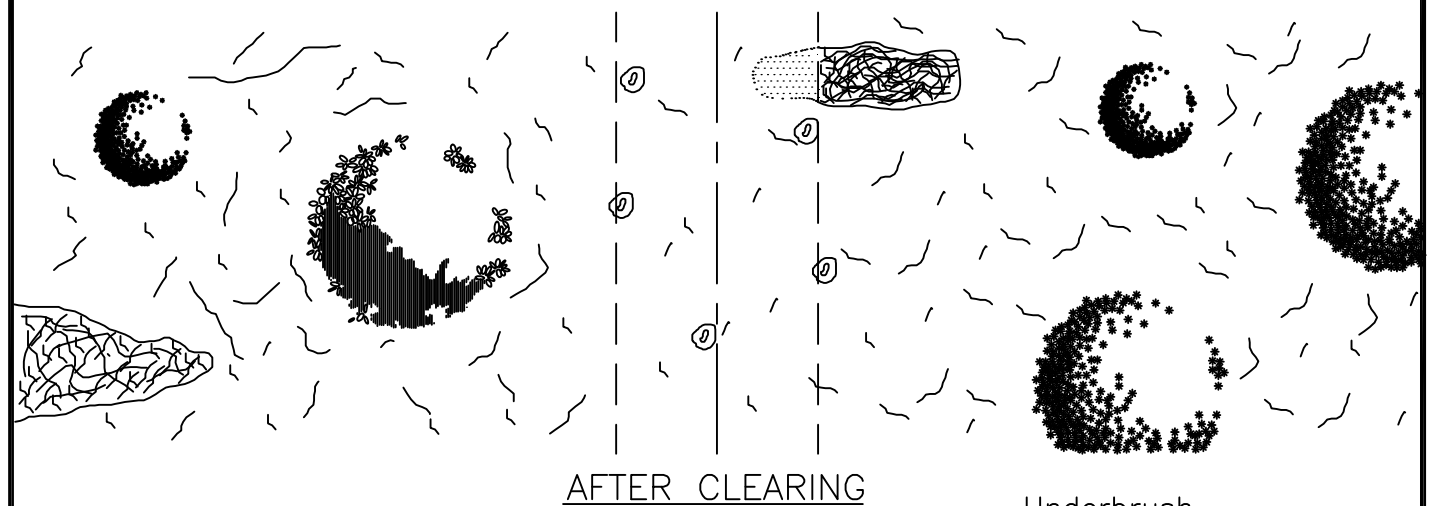
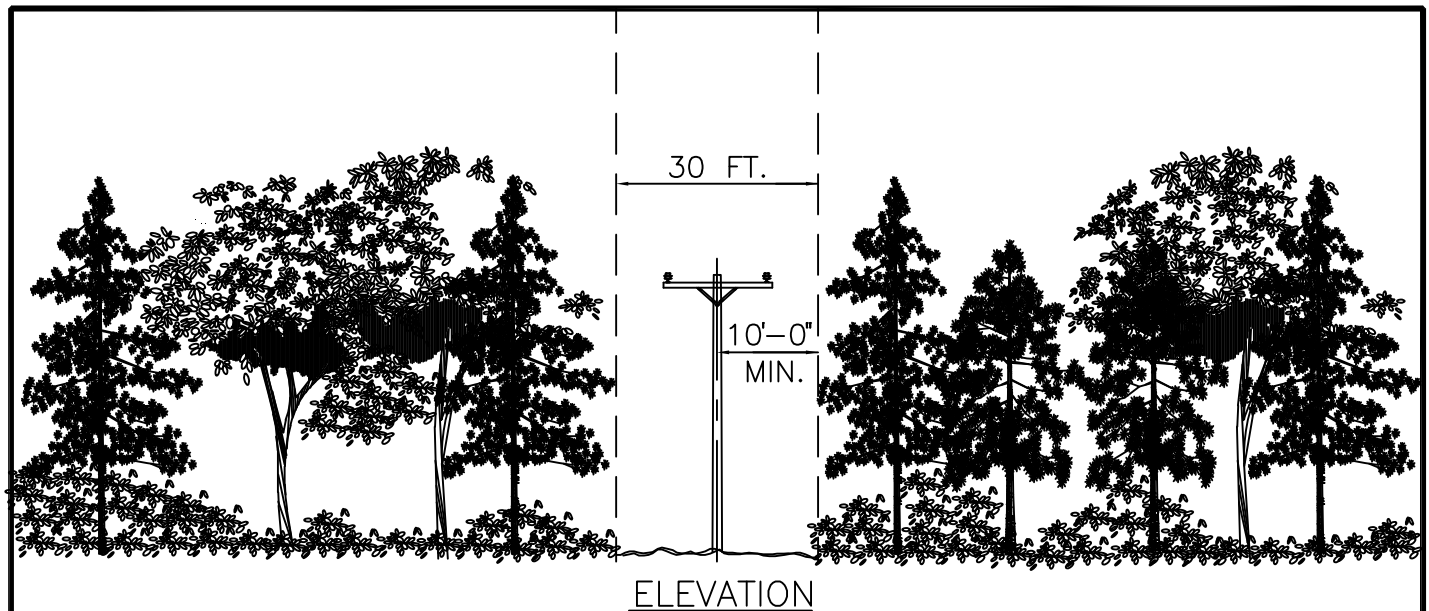
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
M1.30G	(R1)	RIGHT-OF-WAY CLEARING GUIDE

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.



NOTE:
Change suffix of drawing number to designate clearing width. (e.g. M1.30G specifies 30 foot wide clearing).

RIGHT-OF-WAY CLEARING GUIDE

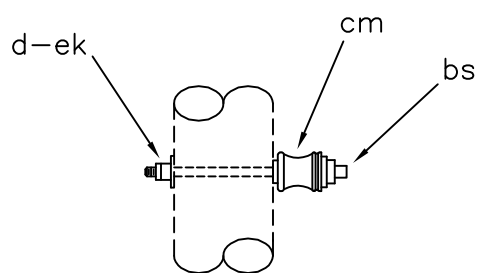
APRIL 2005

RUS

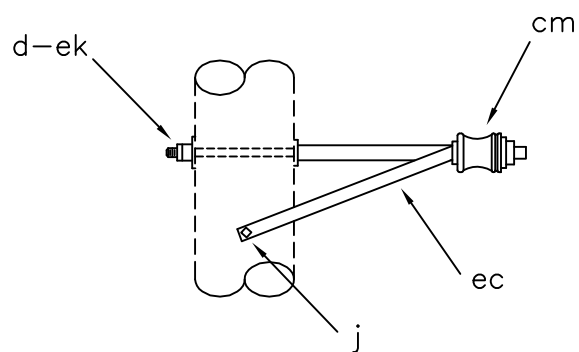
M1.30G
(R1)

NEUTRAL ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
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:

ITEM	MATERIAL	N1.1	N1.2
		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:

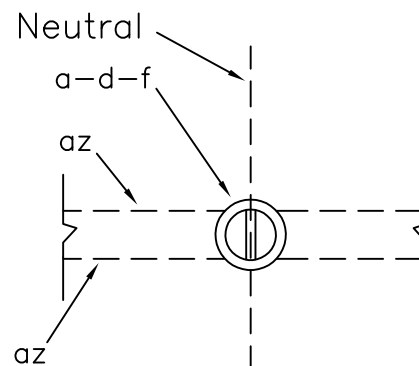
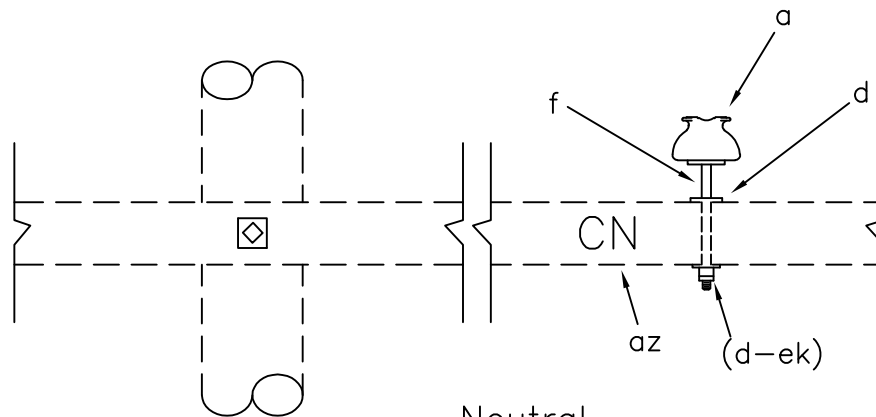
5° – Small Conductors
2° – Larger than #1/0

NEUTRAL ASSEMBLIES – TANGENT

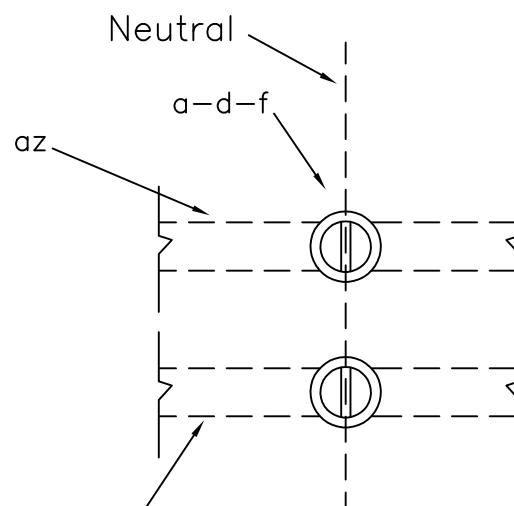
APRIL 2005

RUS

N1.1,
N1.2 (M5-19)



N1.11



N2.21

NOTE: Install either identification letters (az) or white insulator(s).

ASSEMBLY:

ITEM	MATERIAL	N1.11	N2.21
		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:

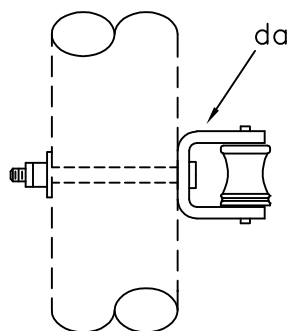
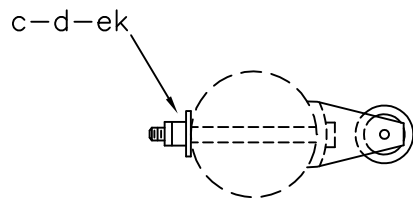
N1.11: See TABLE II
N2.21: See TABLE IV

NEUTRAL SUPPORTS ON CROSSARMS

APRIL 2005

RUS

N1.11,
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:

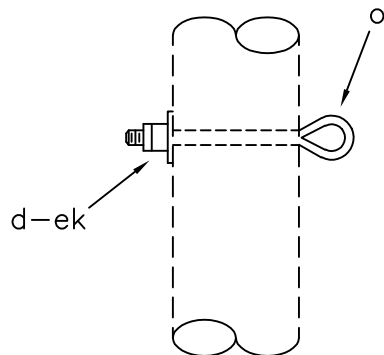
N2.1: See TABLE VI
N2.1L: See TABLE VII

NEUTRAL ASSEMBLIES – LARGE ANGLE

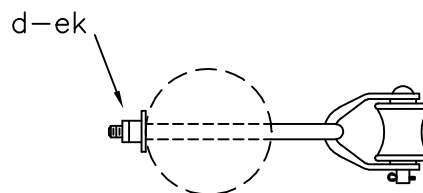
APRIL 2005

RUS

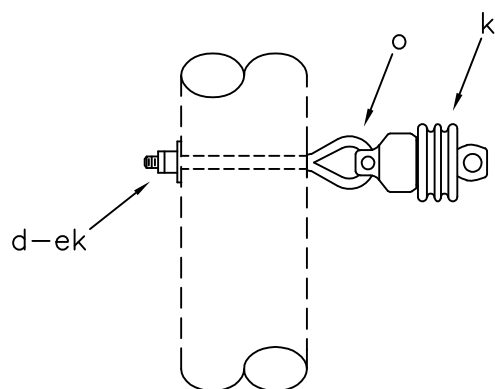
N2.1, N2.1L



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

<u>NEW</u>	<u>(OLD)</u>
N5.1	(M5-25)
N5.2	
N5.3	(M5-26)

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOADING:

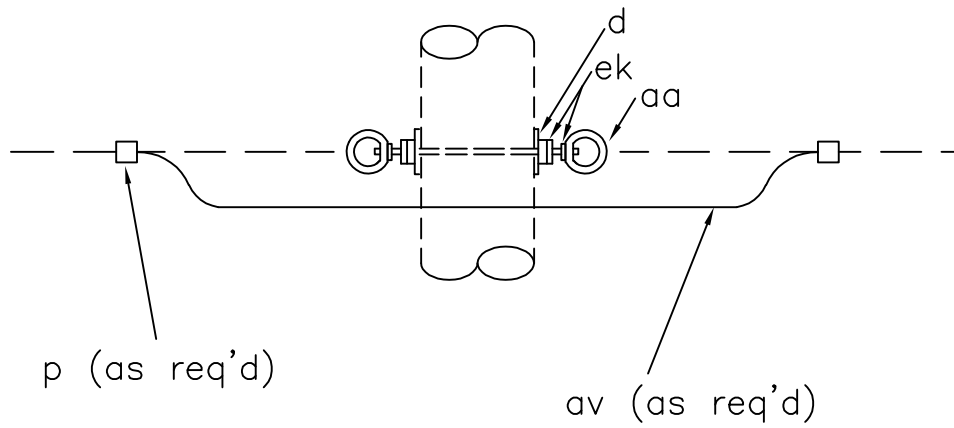
N5.1,N5.3 = 5,000 lbs.
 N5.2 = 1,500 lbs.
 (ANSI Class 53-2 Insulator)
 N5.2 = 2,250 lbs.
 (ANSI Class 53-4 Insulator)

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:

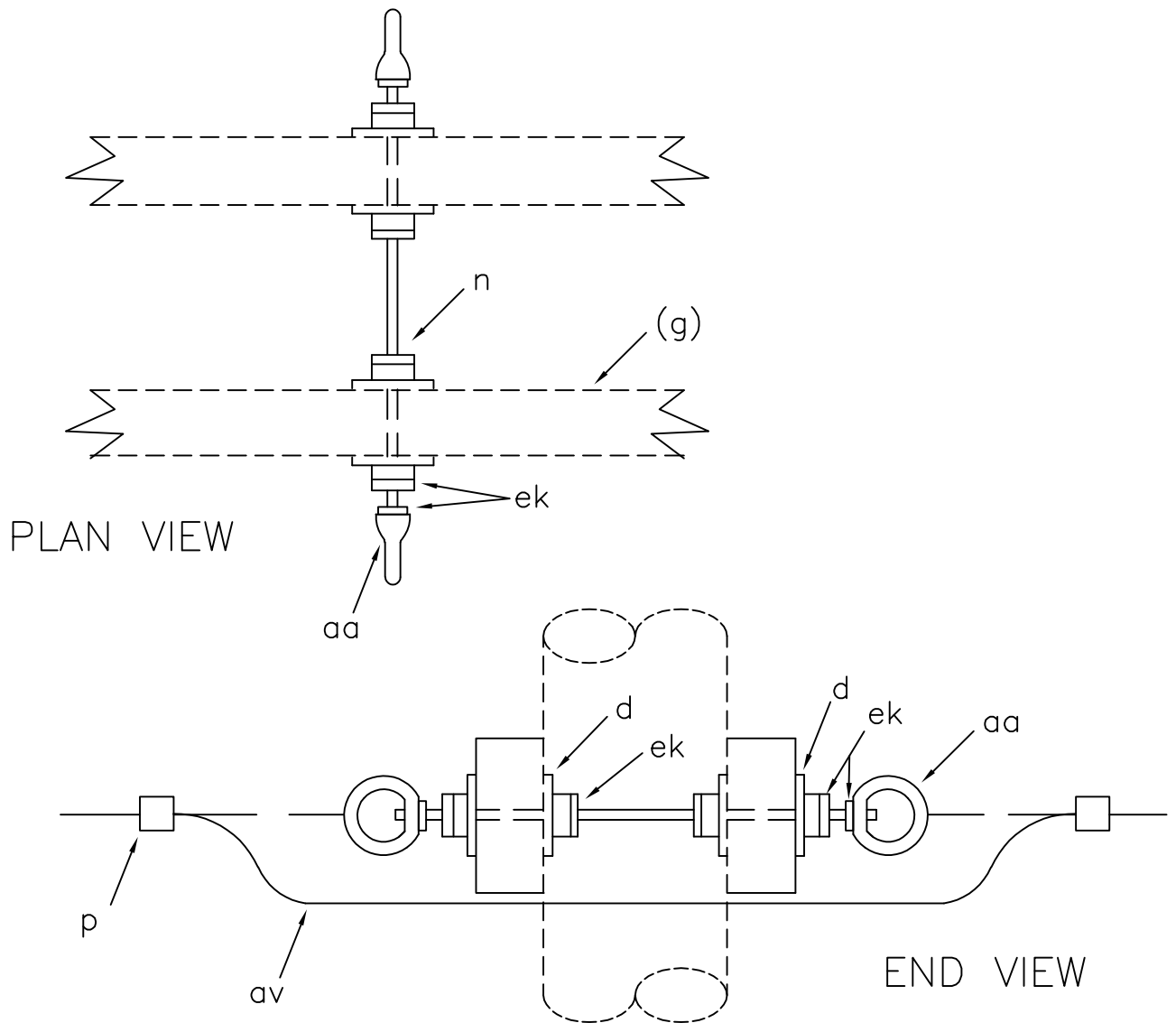
PERMITTED LONGITUDINAL
LOADING: 5,000 lbs.

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

INDEX P

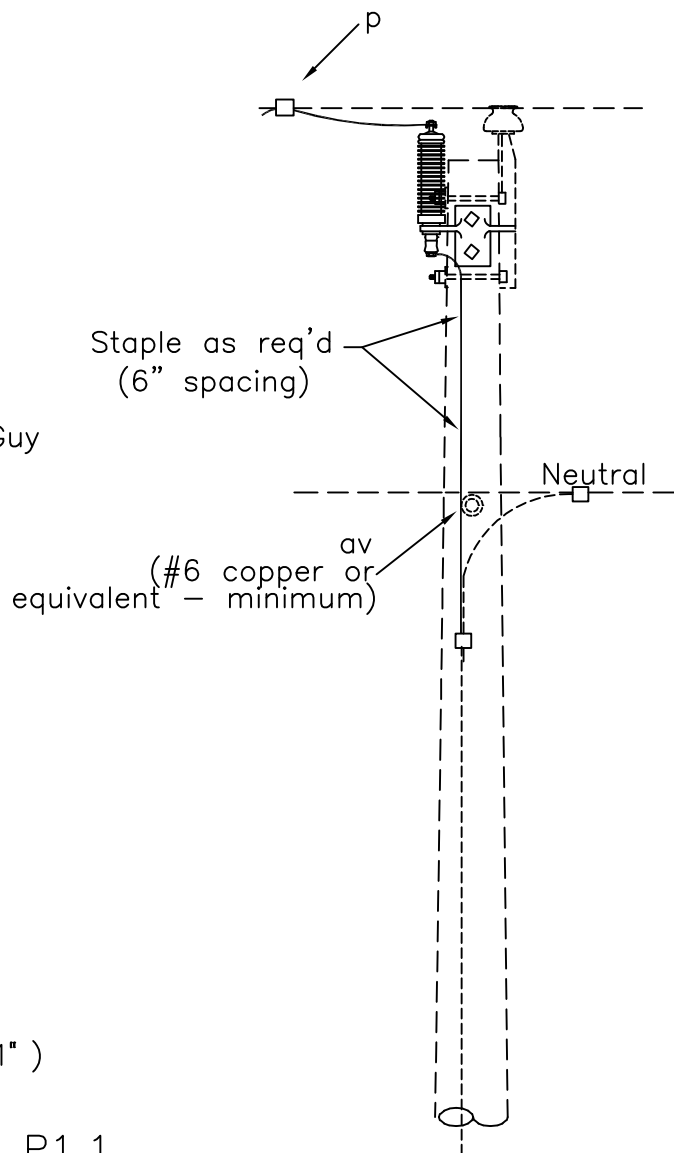
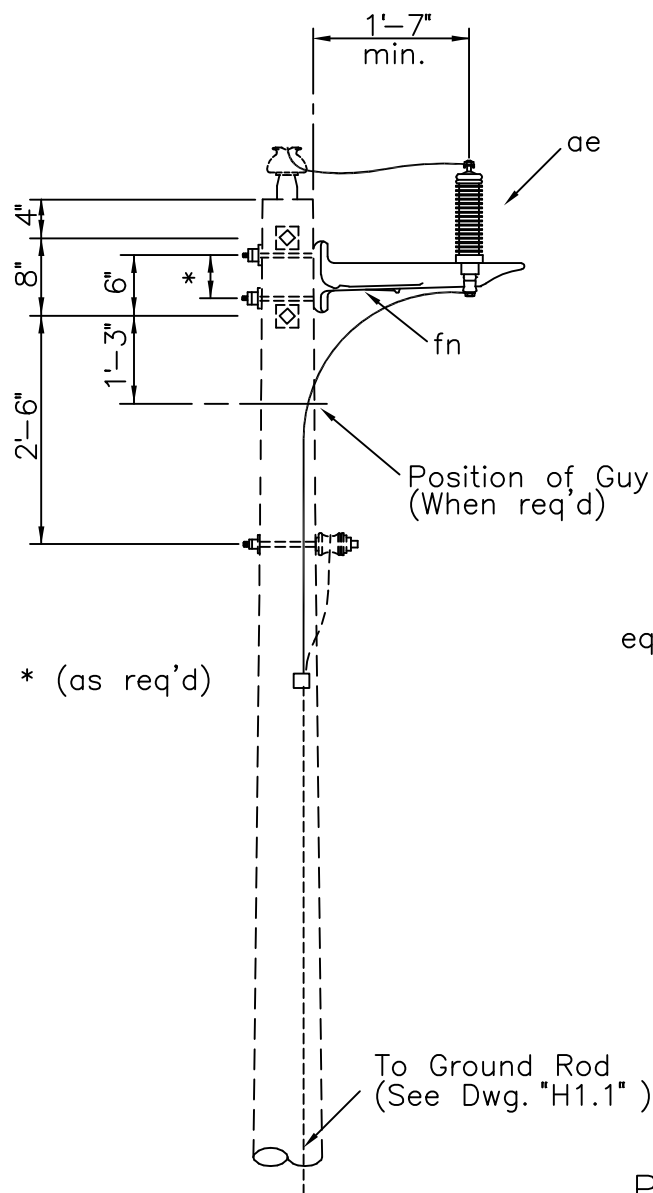
PROTECTION ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
P1.01 P1.1	(M5-6)	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

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.

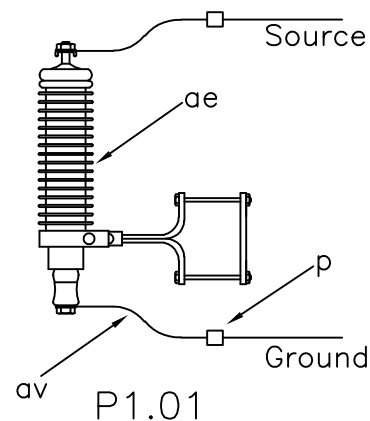
The provisions included on the “P3” series of construction drawings will help to minimize or eliminate bird electrocutions. This construction should be used in areas where raptors or other large birds are present. It may be prudent to adopt these designs for all new construction.



NOTE: Use "P1.01" on existing arm, a minimum of 19" from face of pole.

ASSEMBLY: P1

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



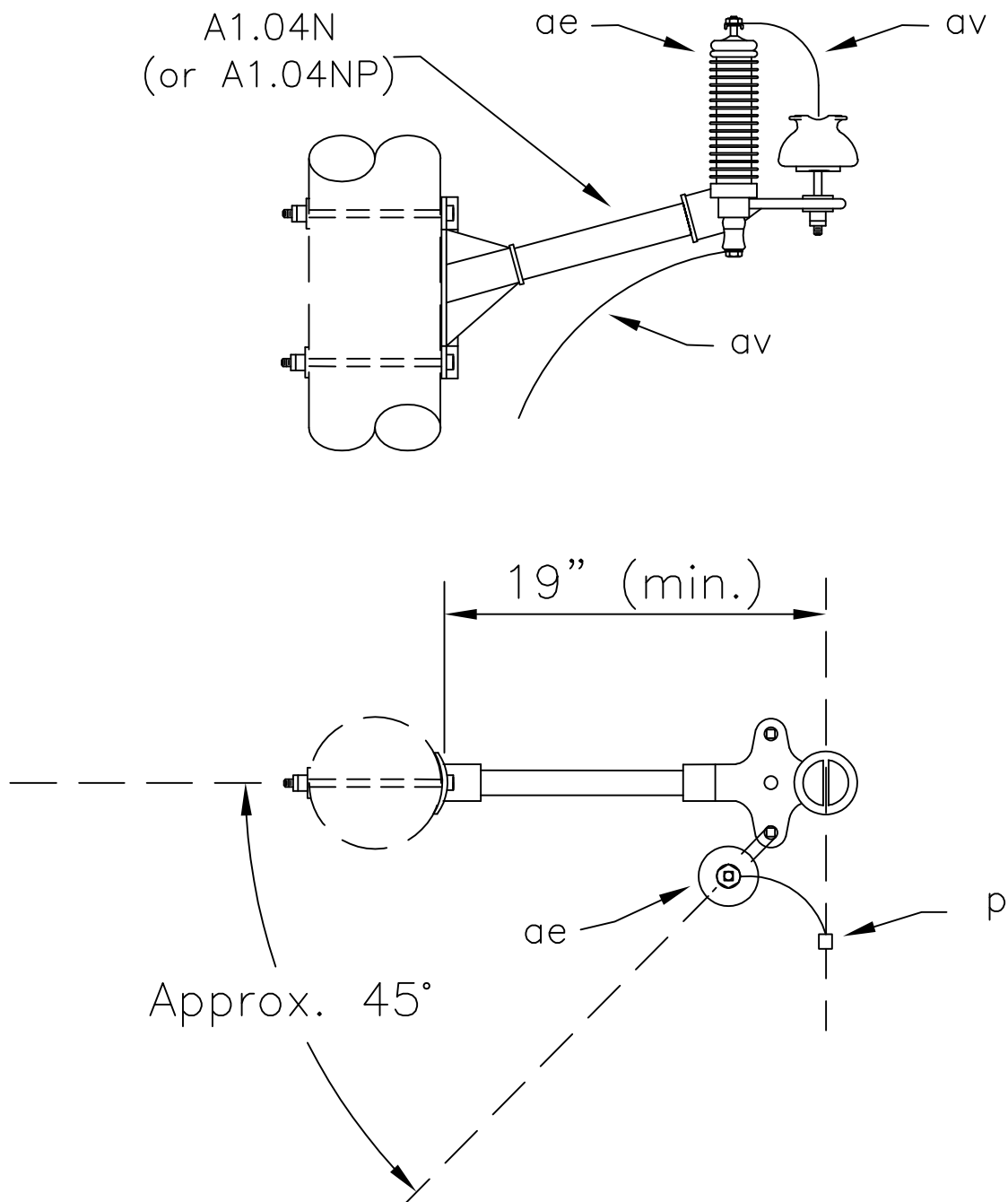
SURGE ARRESTERS – SINGLE PHASE

APRIL 2005

RUS

1 – PHASE PRIMARY
12.47/7.2 kV

P1.01, (M5-6)
P1.1



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").

ITEM	MATERIAL
	Assembly A1.04N or A1.04NP
ae	Arrester, surge (9kV)
av	Jumpers, as req'd
p	Connectors, as req'd

Design Parameters:

SURGE ARRESTER GUIDE—NARROW PROFILE

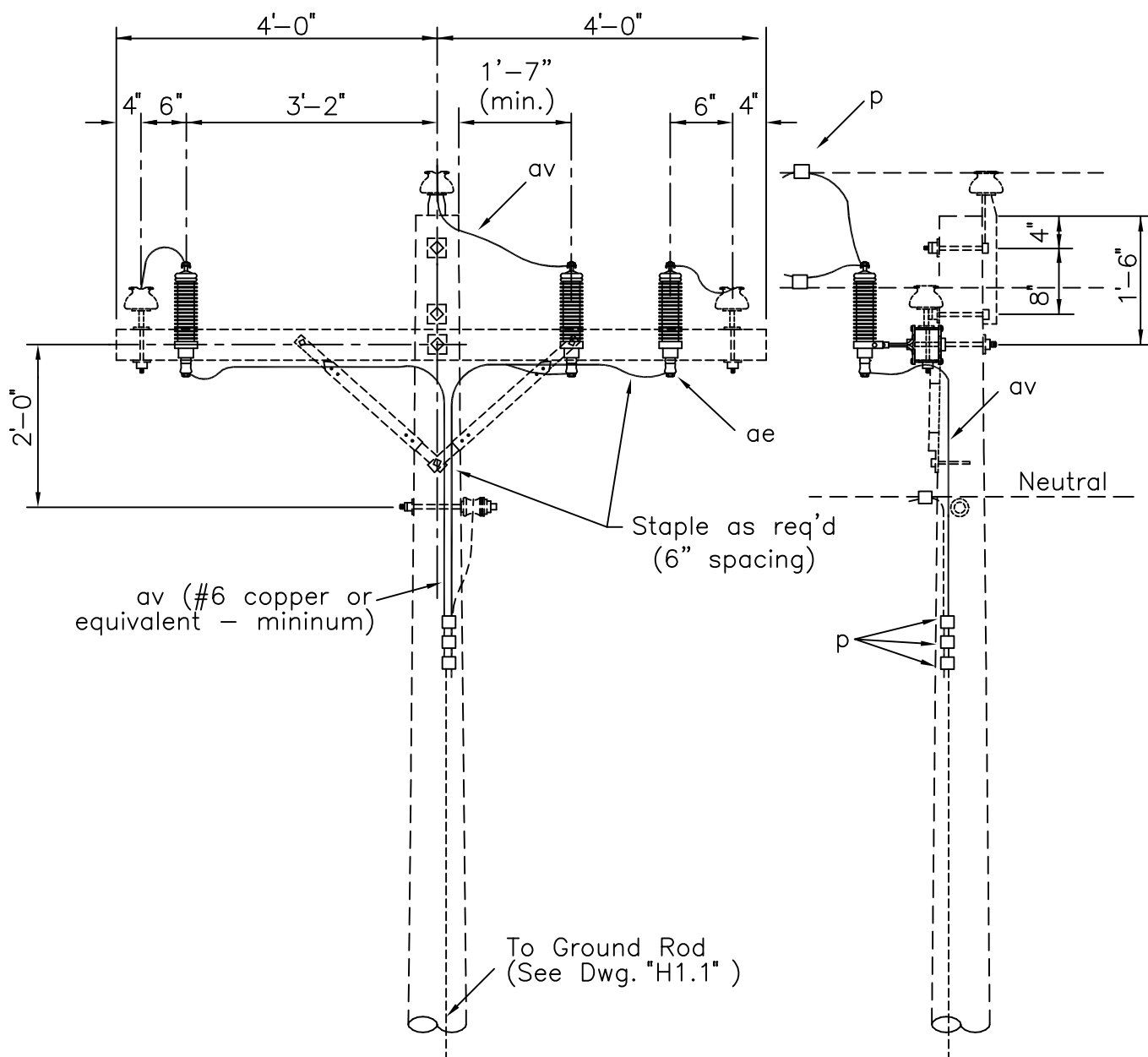
APRIL 2005

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

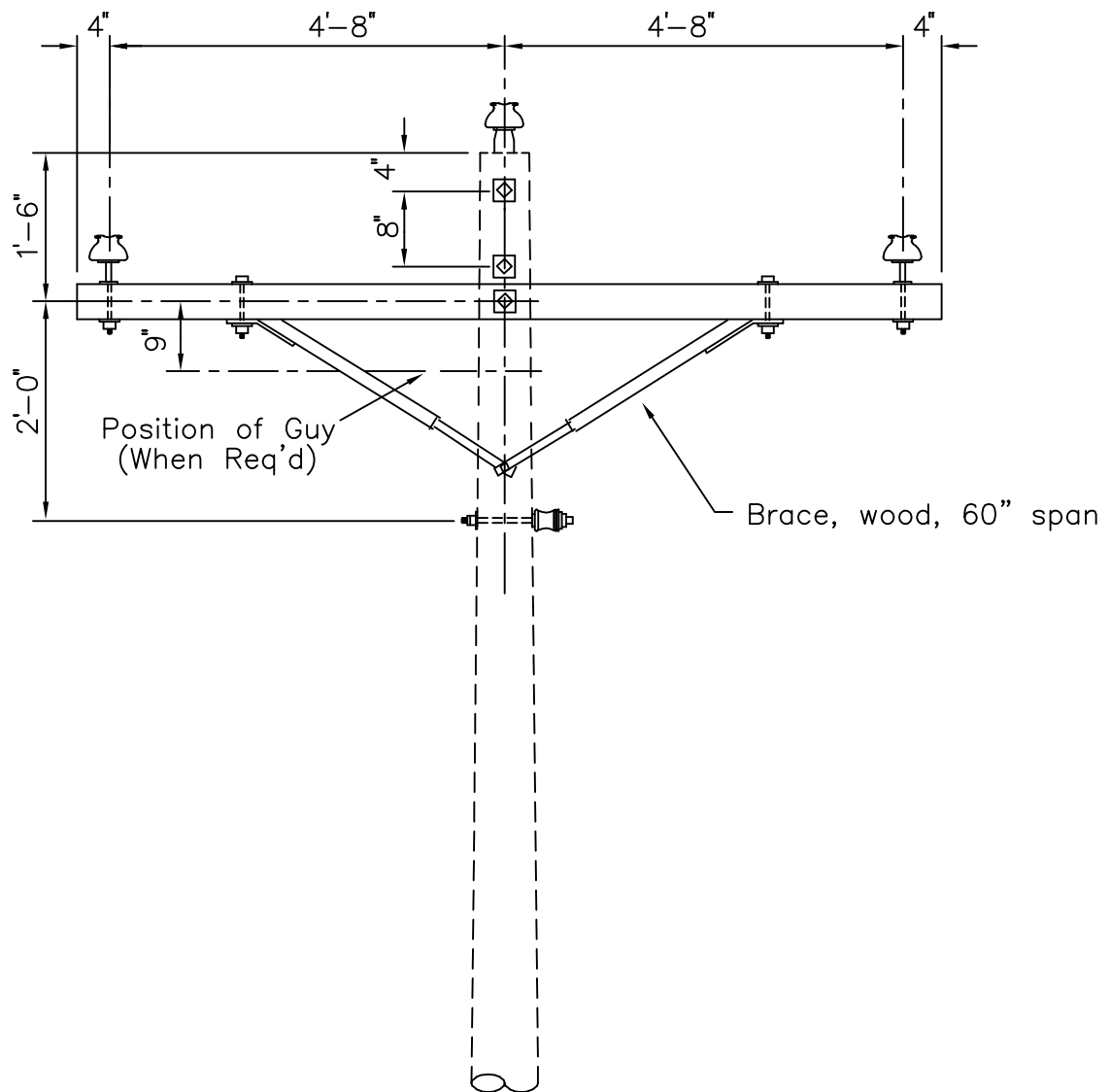
APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

P1.3

P3.1G



NOTE:

1. See "C1.11" and "C2.21" drawings for additional construction details and materials.

DESIGN PARAMETERS:

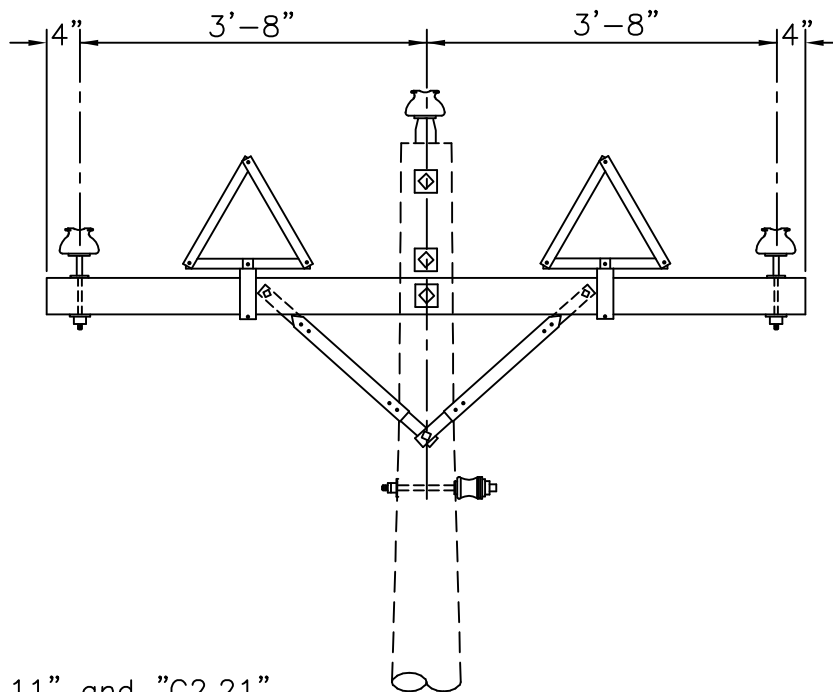
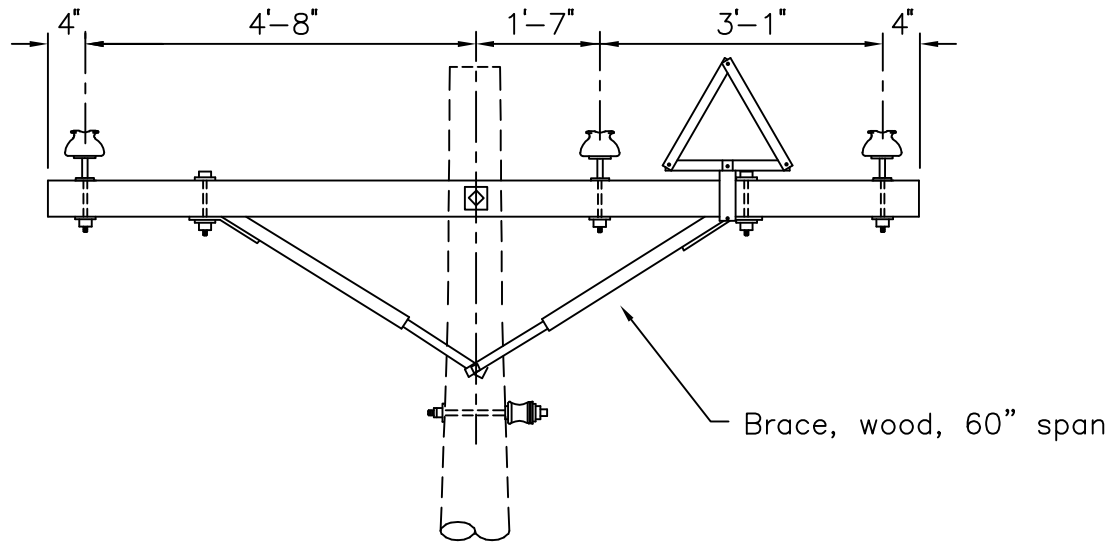
RAPTOR PROTECTION ASSEMBLY GUIDE
SUPPORT ON
10 FOOT CROSSARMS (TANGENT)

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:

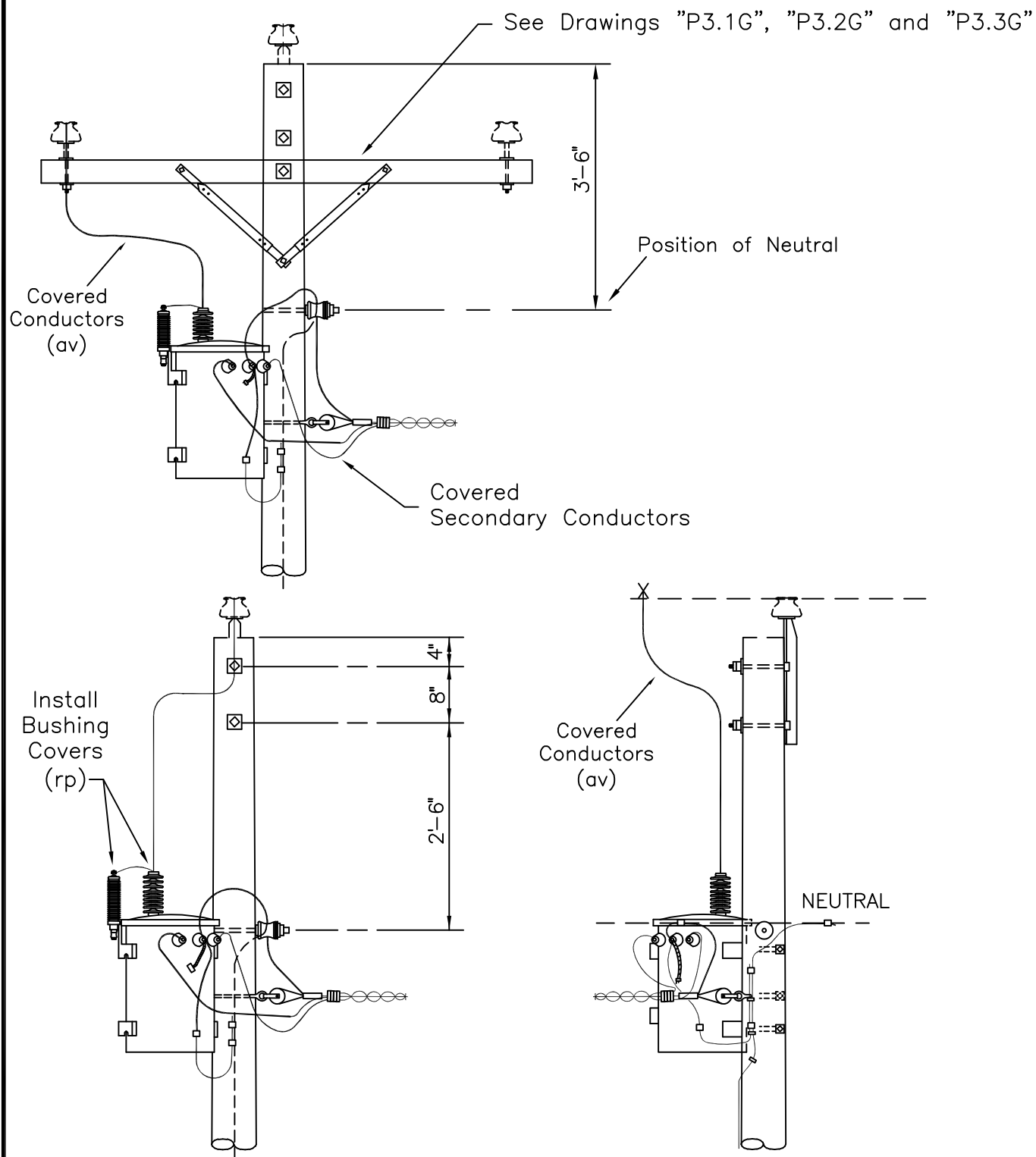
RAPTOR PROTECTION
PERCH GUARDS—GUIDE

APRIL 2005

RUS

3-PHASE PRIMARY
12.47/7.2 kV

P3.3G



DESIGN PARAMETERS:

See Assembly "G1.2"

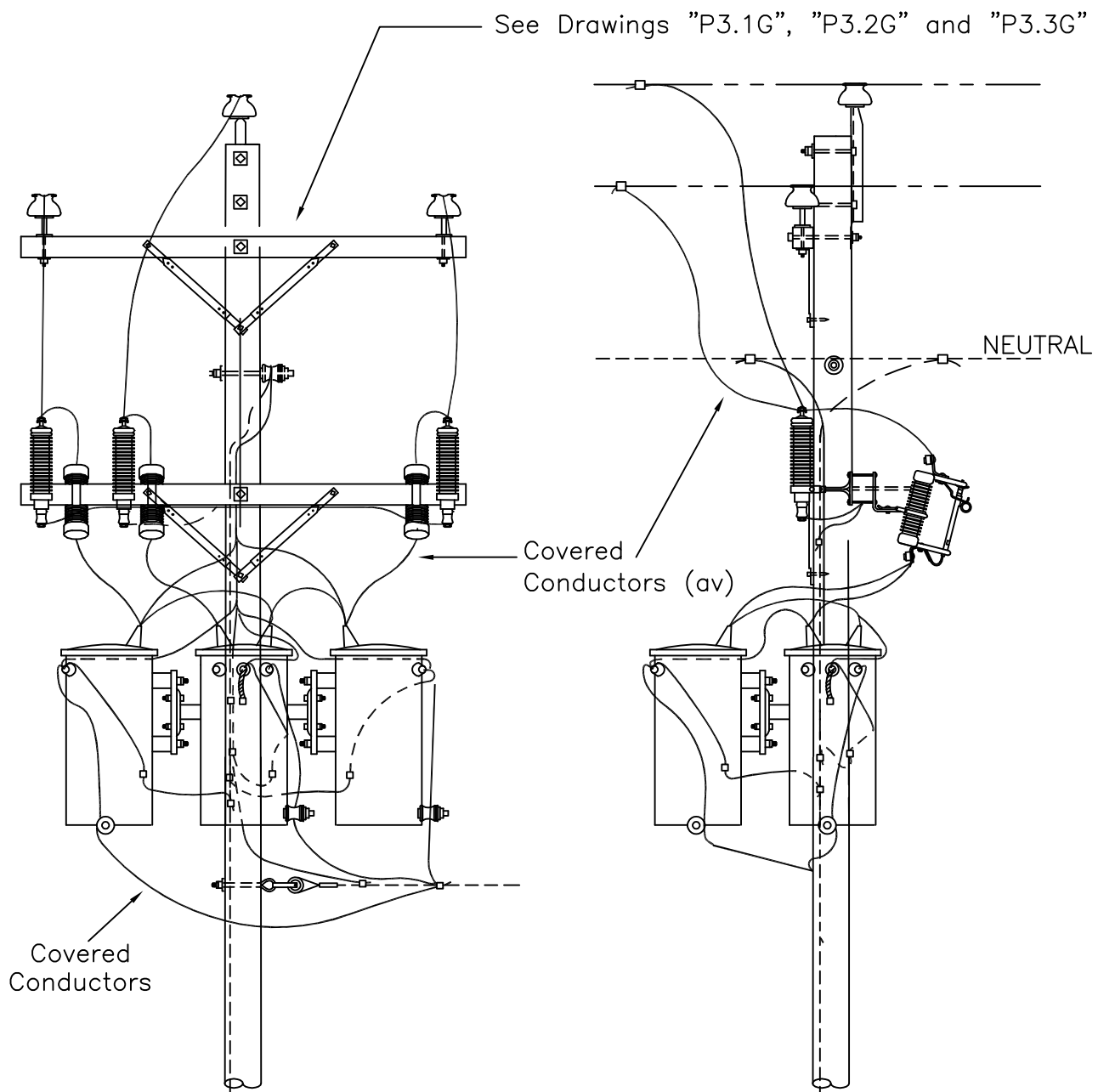
RAPTOR PROTECTION
SINGLE-PHASE, CSP TRANSFORMER
(TANGENT POLE)

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

RUS

3 - PHASE PRIMARY

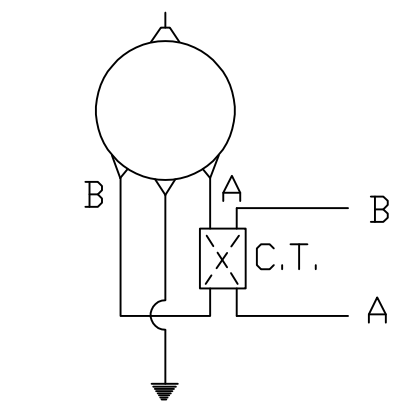
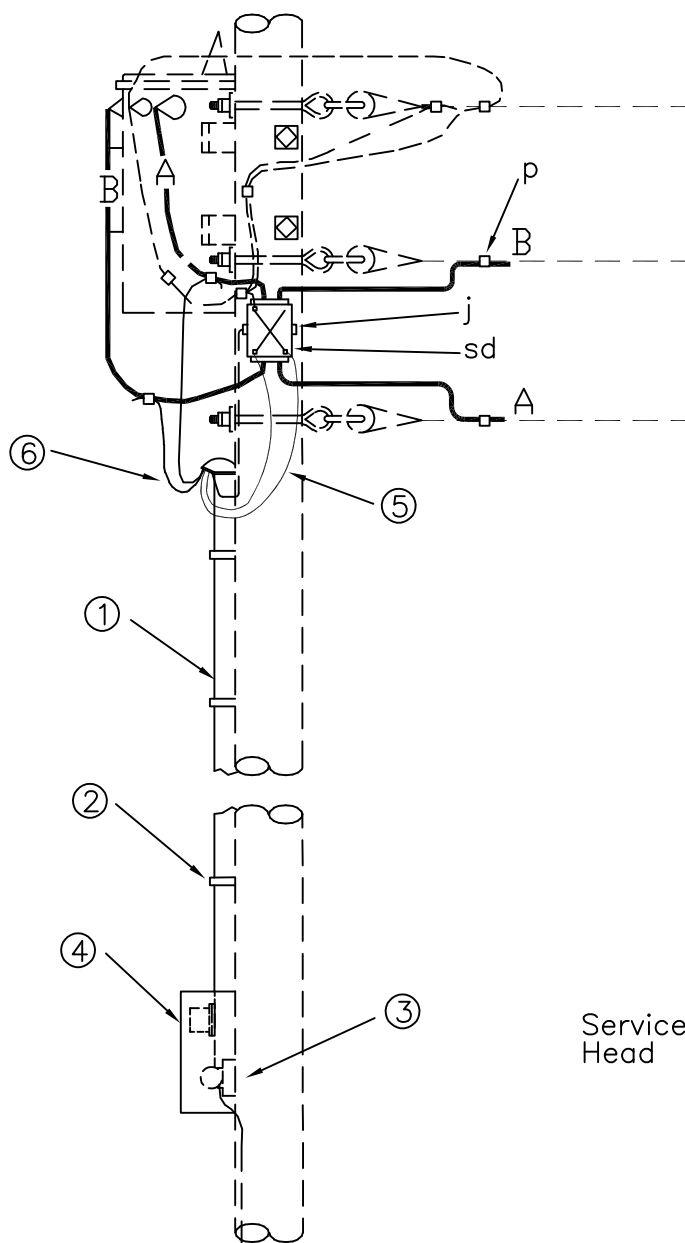
12.47/7.2 kV

P3.5G

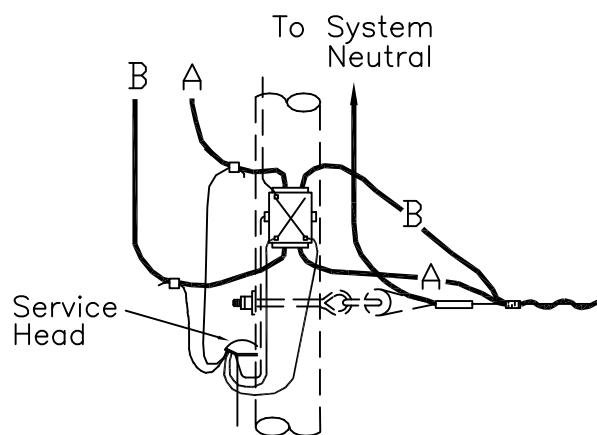
INDEX Q

METERING ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
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

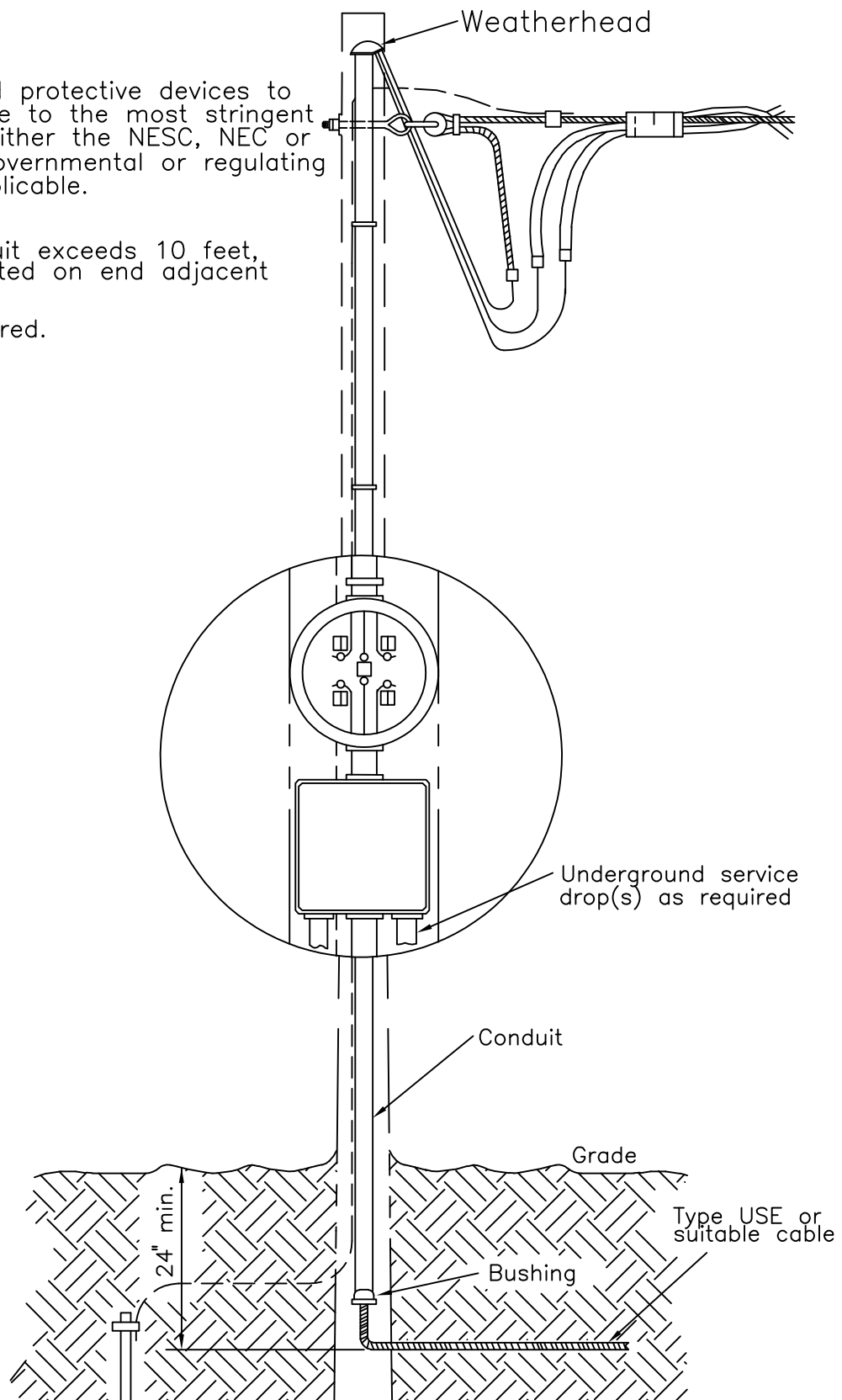
APRIL 2005

RUS

Q1.1
(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.



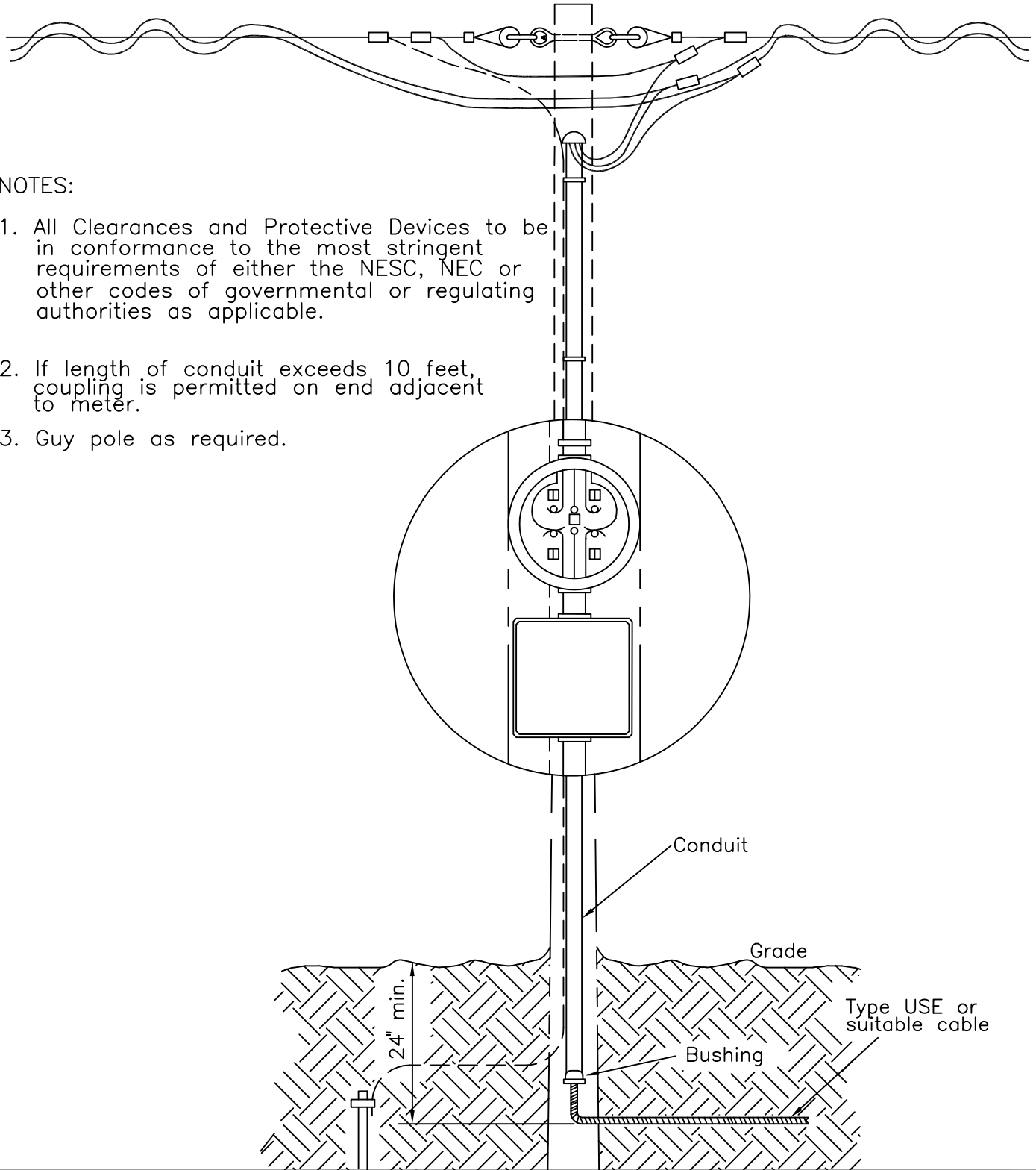
DESIGN PARAMETERS:
(See NOTE 1)

POLE TYPE SERVICE ASSEMBLY GUIDE

APRIL 2005

RUS

Q2.1G
(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.

Conduit

Grade

Type USE or suitable cable

Bushing

24" min.

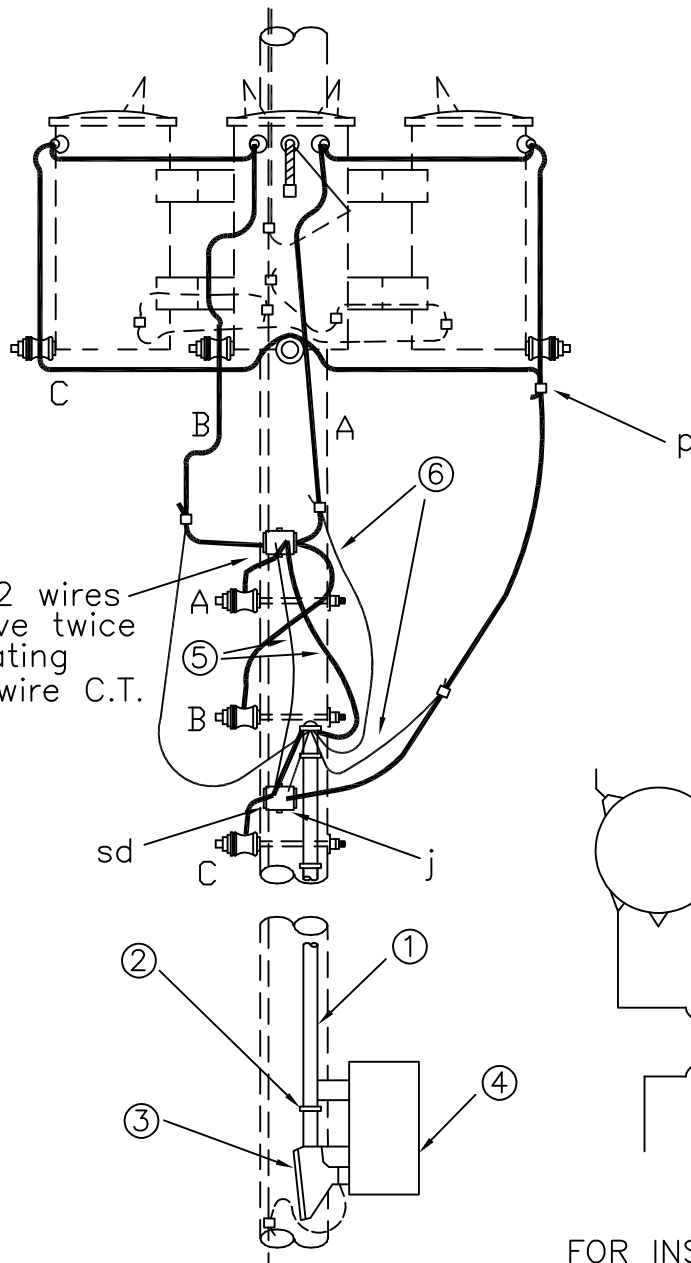
DESIGN PARAMETERS:
(See NOTE 1)

YARD POLE METER INSTALLATION GUIDE

APRIL 2005

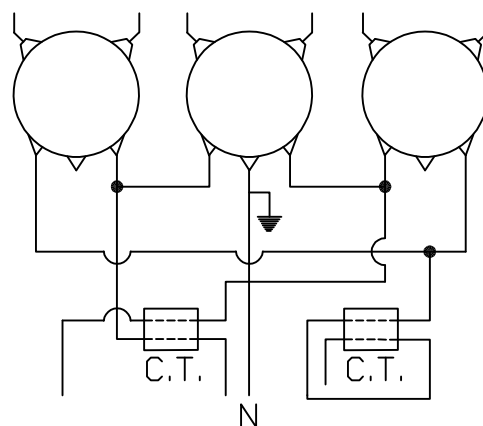
RUS

Q2.2G
(M8-9)



Note:

C.T. with 2 wires should have twice primary rating of single wire C.T.



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

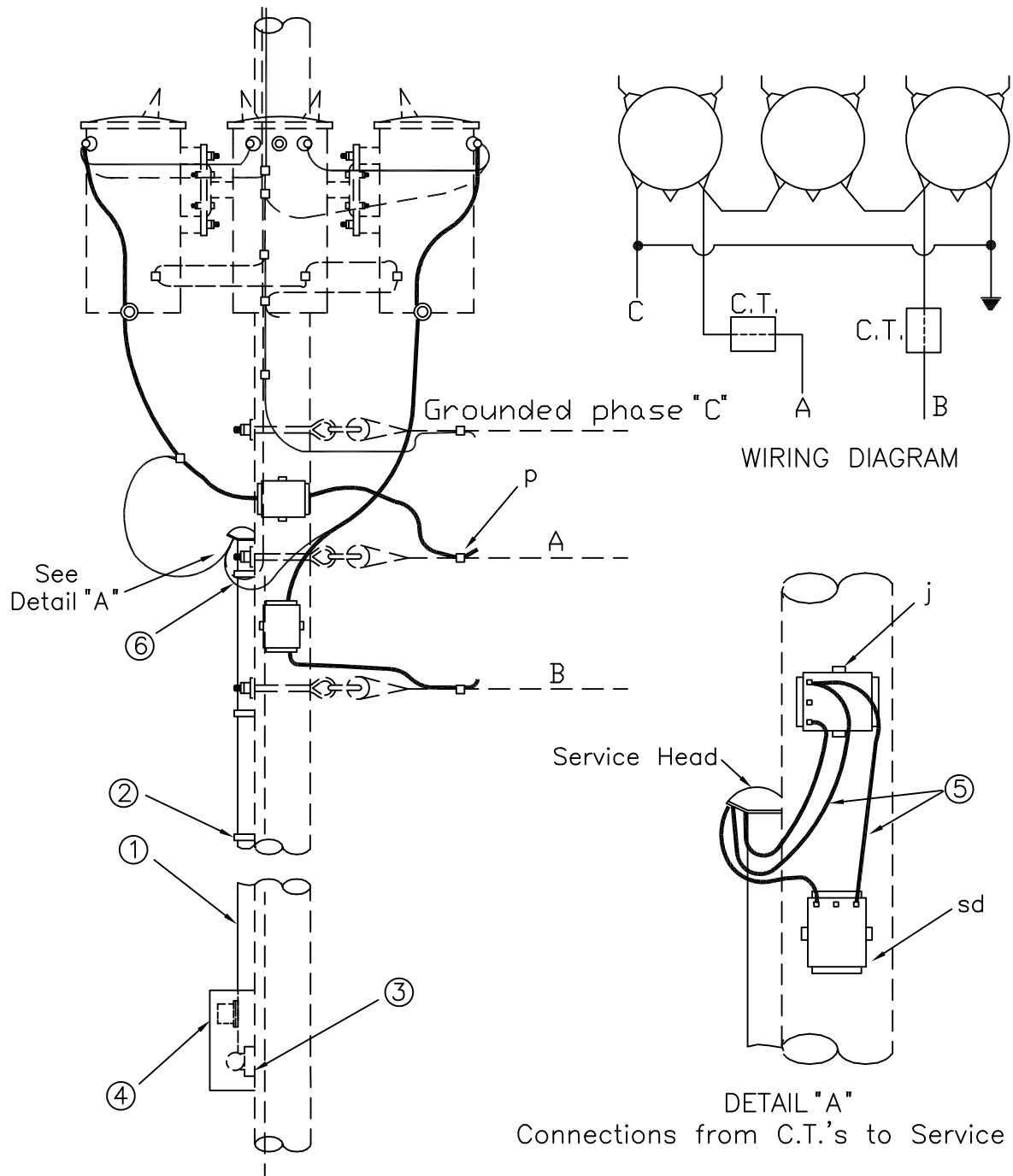
ITEM	QTY	MATERIAL
③	1	Condulet, type "LB"
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

SECONDARY METERING
THREE PHASE, 120/240 VOLTS
(4 WIRE DELTA)

APRIL 2005

RUS

Q3.1
(M8-6)



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

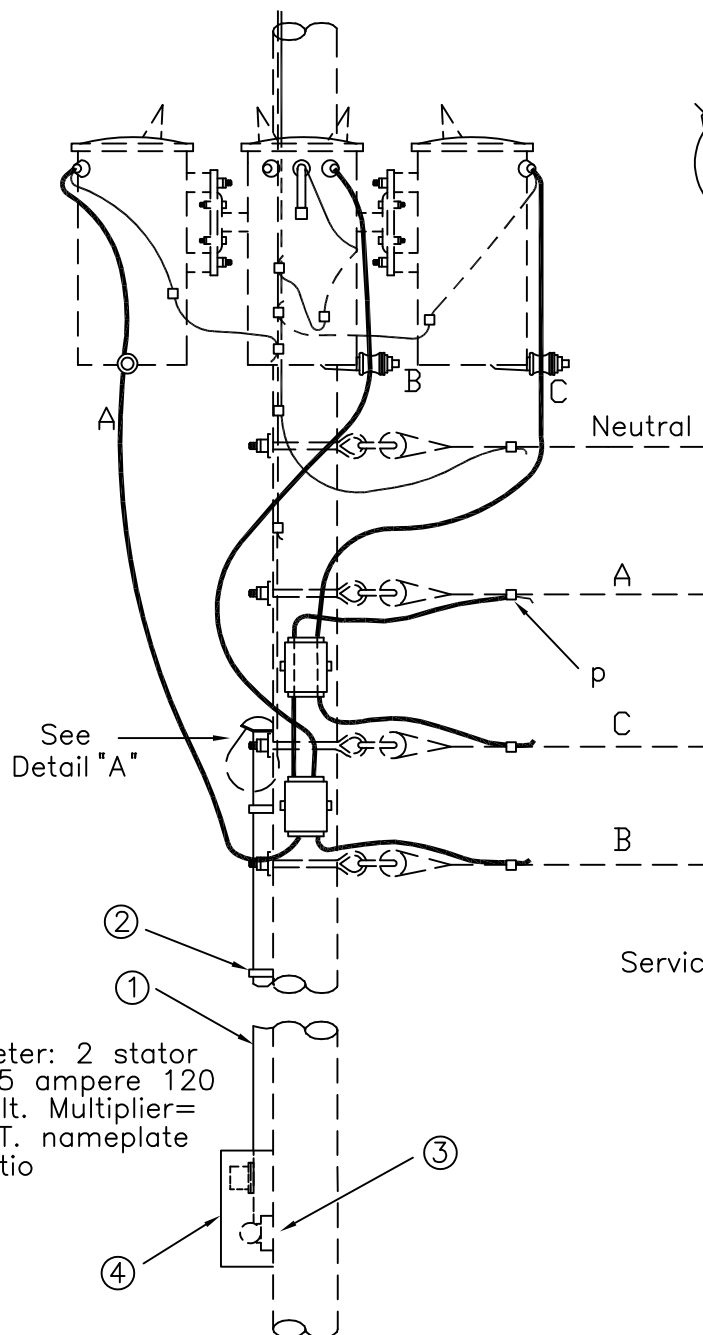
ITEM	QTY	MATERIAL
③	1	Condulet, type "LB"
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

SECONDARY METERING
THREE PHASE, 240 or 480 VOLTS
(3 WIRE CORNER GROUNDED DELTA)

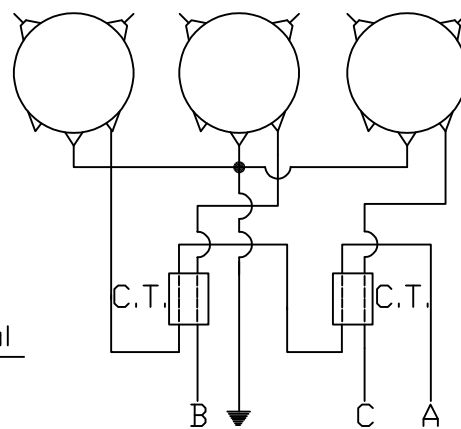
APRIL 2005

RUS

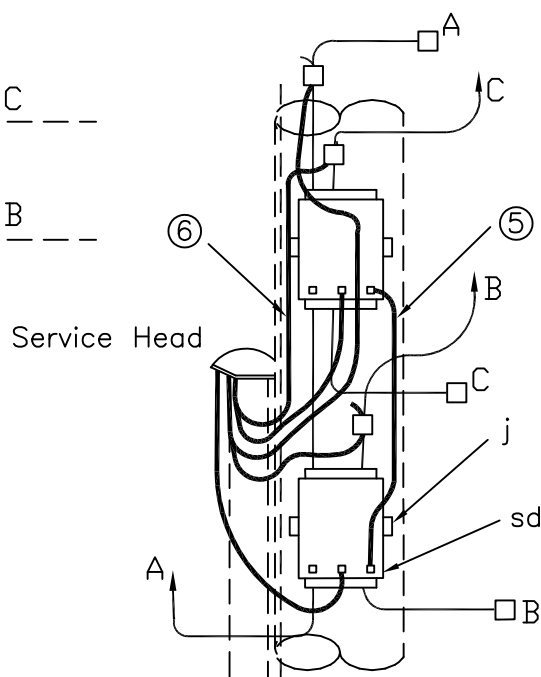
Q3.2
(M8-12)



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



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

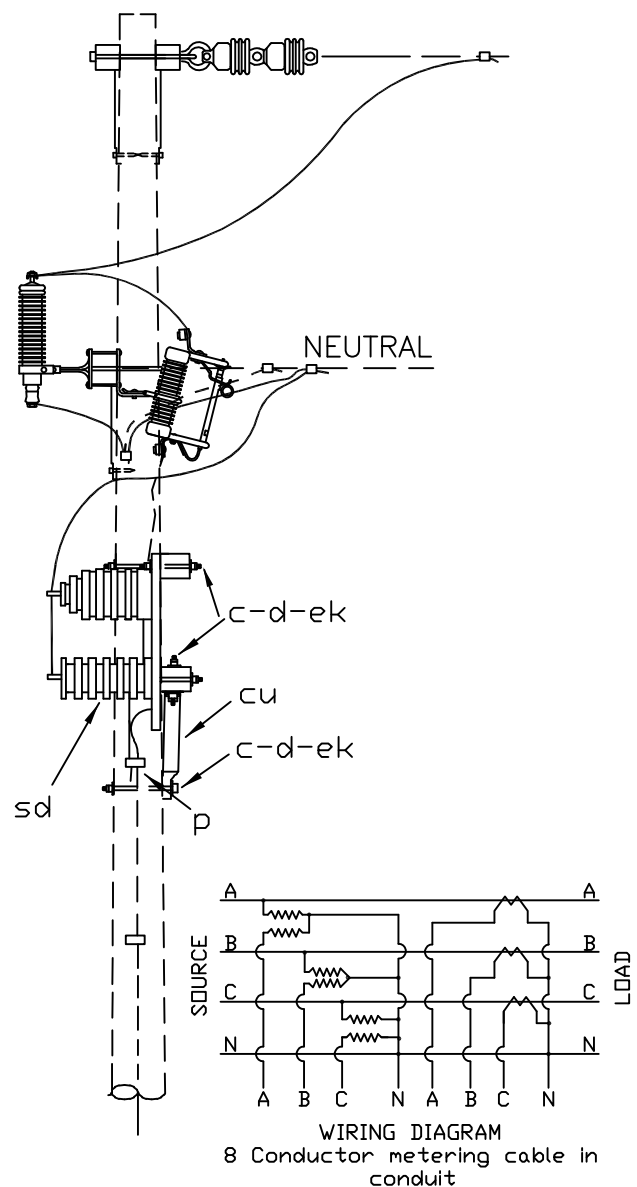
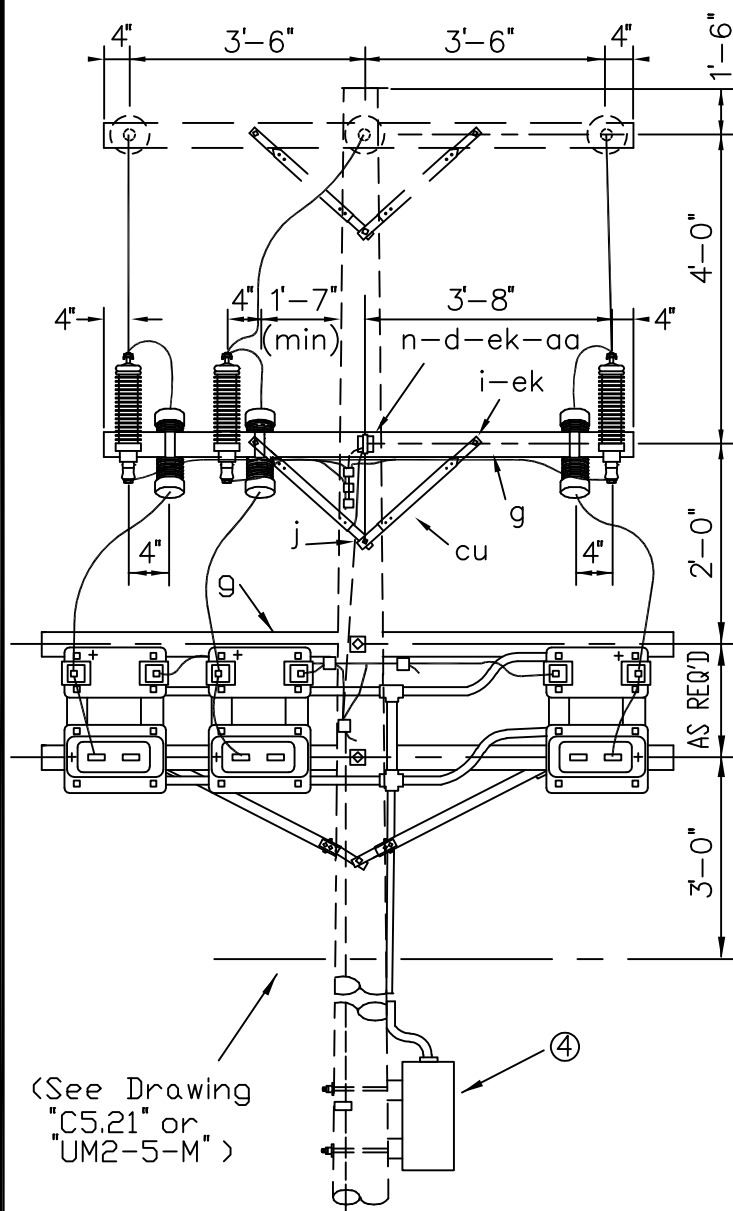
ITEM	QTY	MATERIAL
③	1	Condulet, type "LB"
④	1	Meter box, meter and test block
⑤		Wire, No. 12, insulation for current
⑥		Wire, No. 14, insulation for potential

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

APRIL 2005

RUS

Q3.3
(M8-11)



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)

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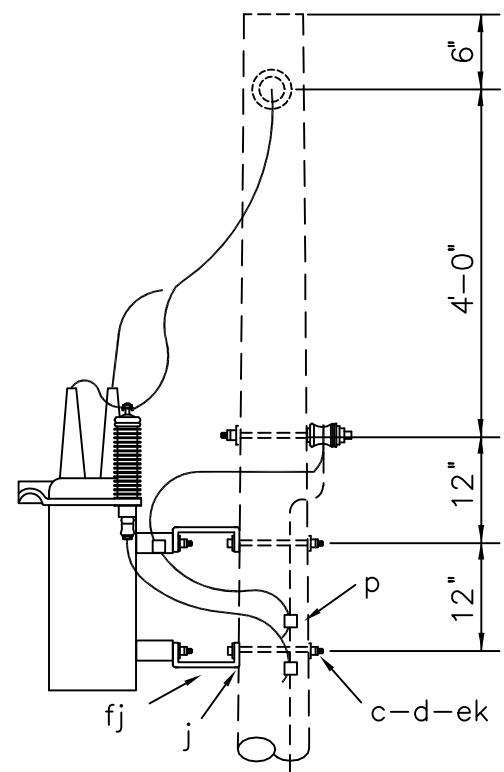
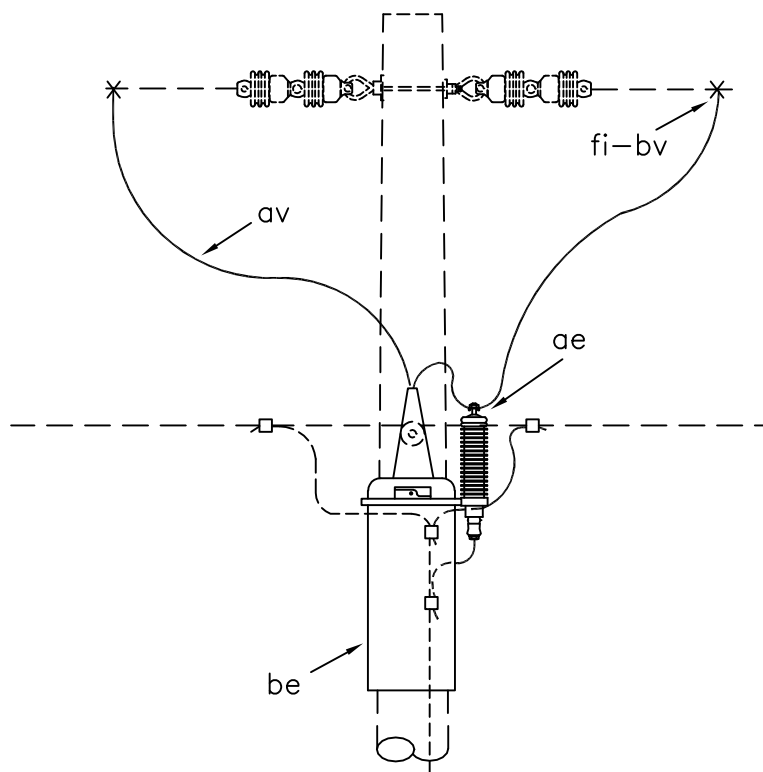
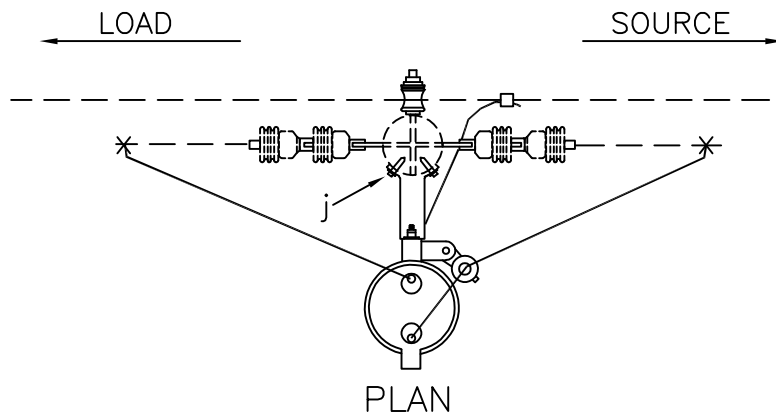
RUS

12.47/7.2 kV

Q4.1
(M8-15)

OIL CIRCUIT RECLOSER ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
R1.1	(M3-10)	OIL CIRCUIT RECLOSER
R1.2	(M3-23A)	OIL CIRCUIT RECLOSER - (WITH BYPASS CUTOUT)
R2.1	(M3-11A)	(THREE) OIL CIRCUIT RECLOSERS
R3.1	(M3-12A)	
R2.2	(M3-24A)	(THREE) OIL CIRCUIT RECLOSERS (WITH BYPASS SWITCHES)
R3.2	(M3-25A)	
R3.3	(M3-30)	THREE-PHASE OIL CIRCUIT RECLOSER WITH BY-PASS SWITCHES



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

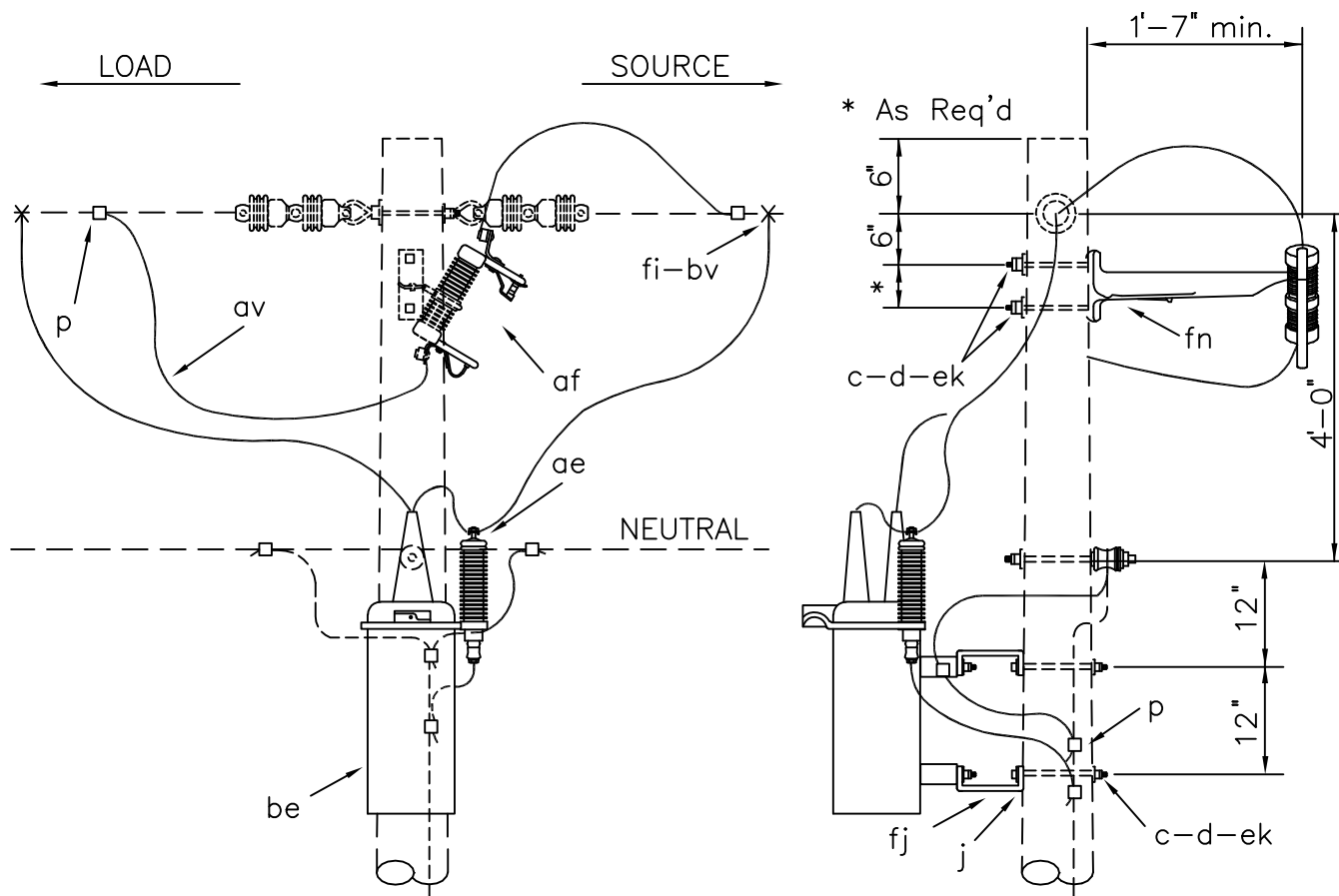
OIL CIRCUIT RECLOSER

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

R1.1
(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

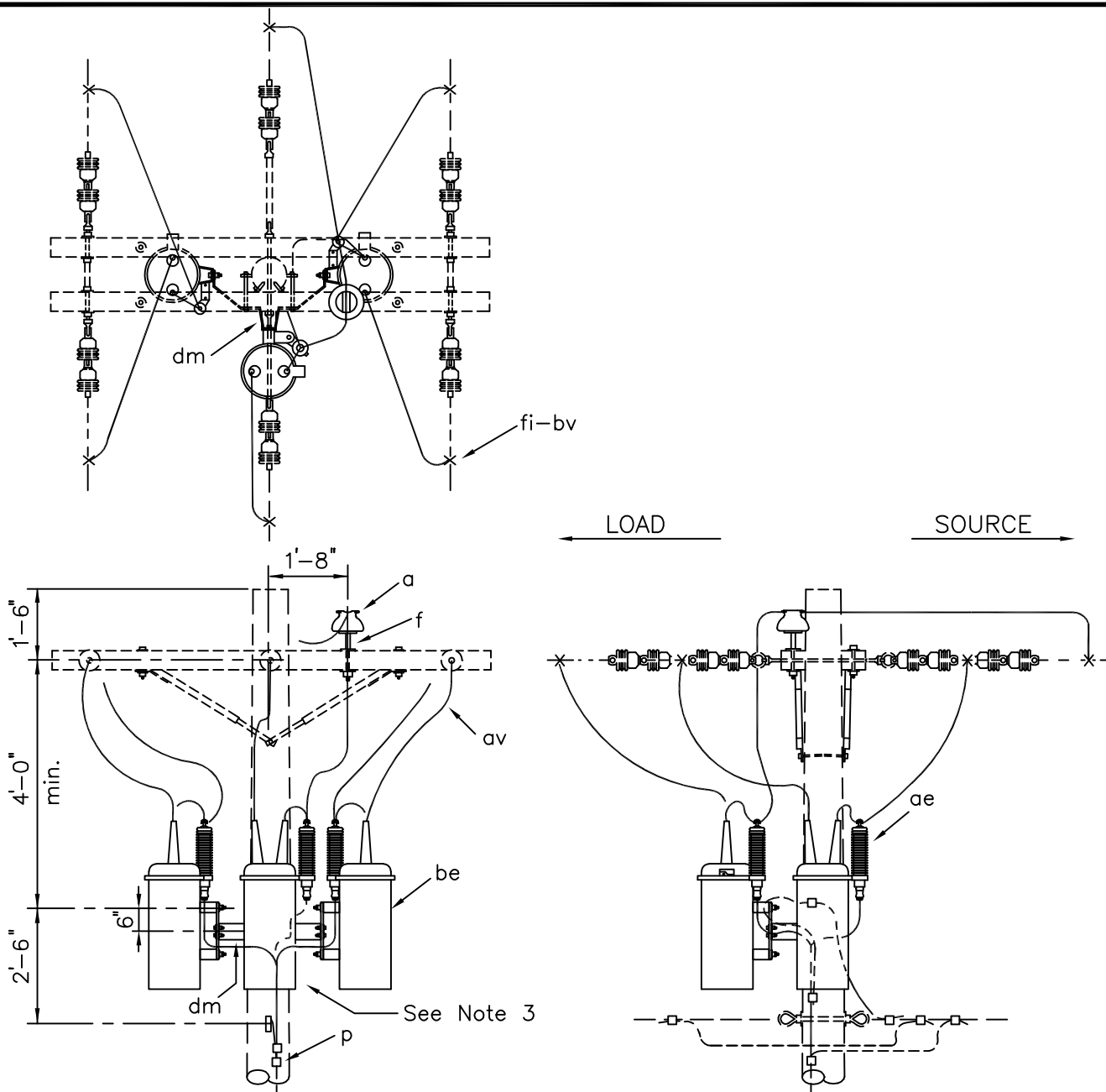
OIL CIRCUIT RECLOSER (WITH BYPASS CUTOUT)

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

R1.2
(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

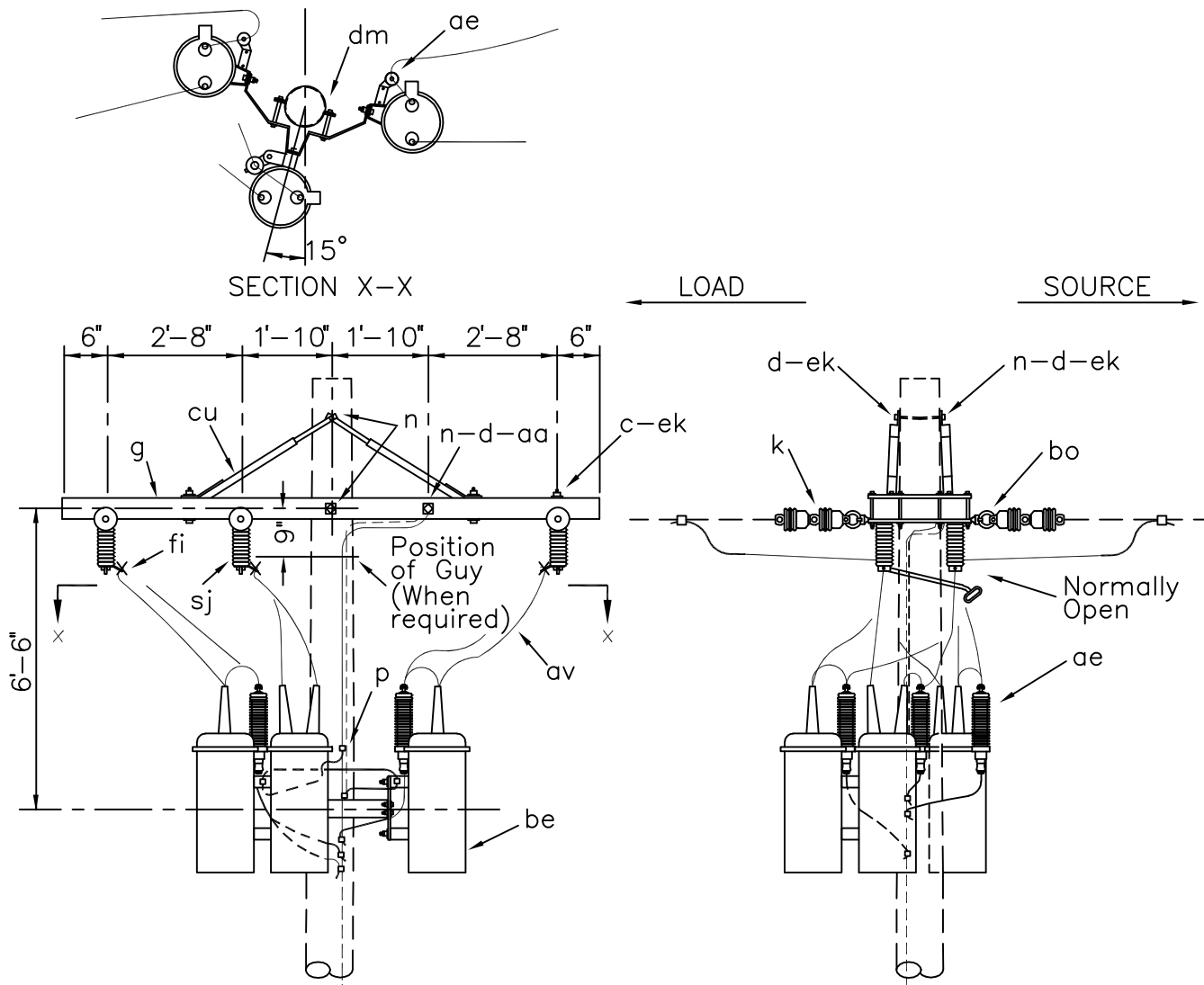
(THREE) OIL CIRCUIT RECLOSERS

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

R2.1,R3.1
(M3-11A),(M3-12A)



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)

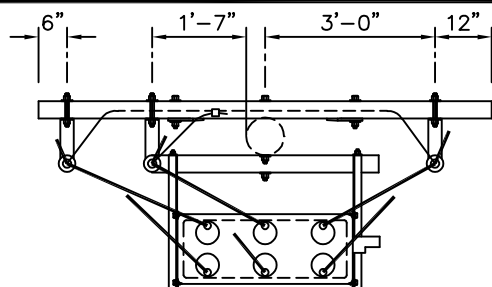
(THREE) OIL CIRCUIT RECLOSERS
(WITH BYPASS SWITCHES)

APRIL 2005

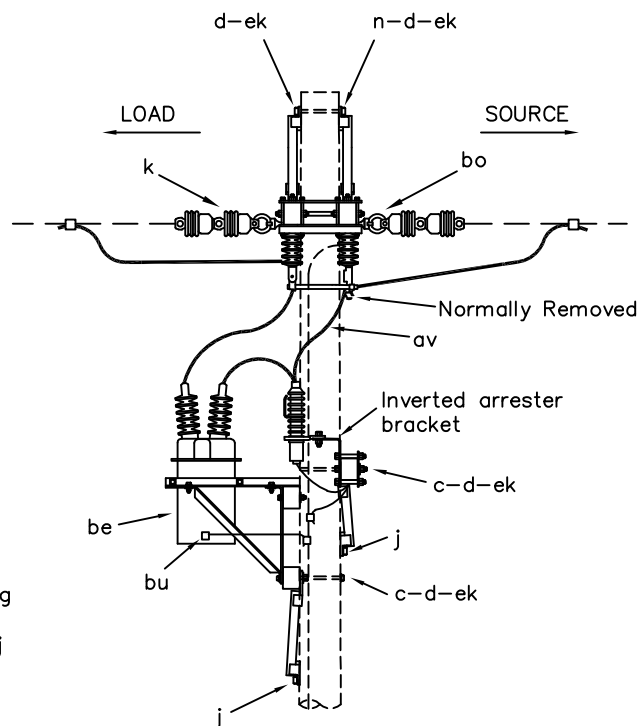
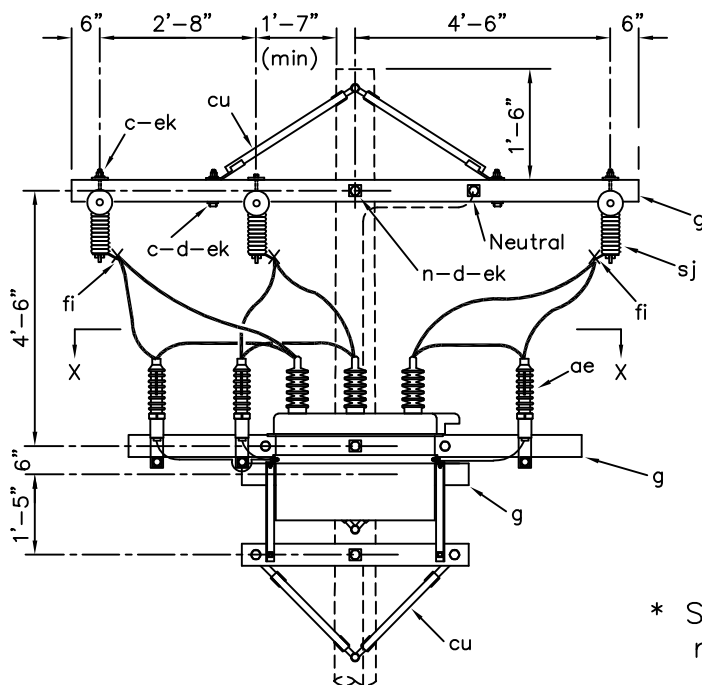
RUS

3 - PHASE PRIMARY
12.47/7.2 kV

R2.2,R3.2
(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

RUS

3 - PHASE PRIMARY

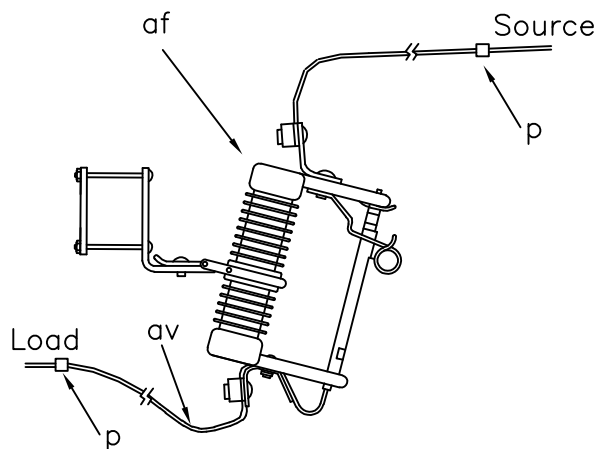
12.47/7.2 kV

R3.3

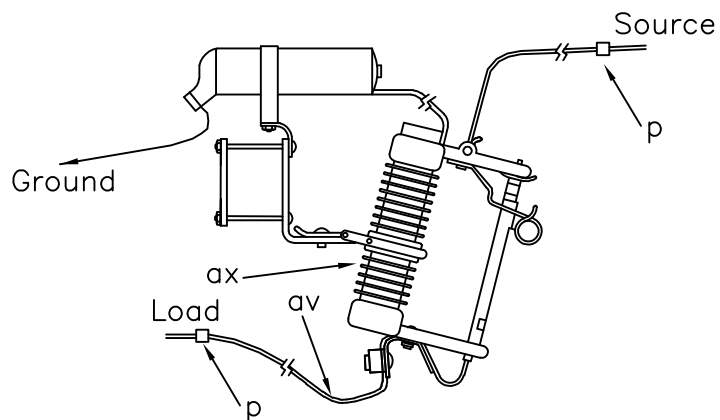
(M3-30)

SECTIONALIZING ASSEMBLY UNITS

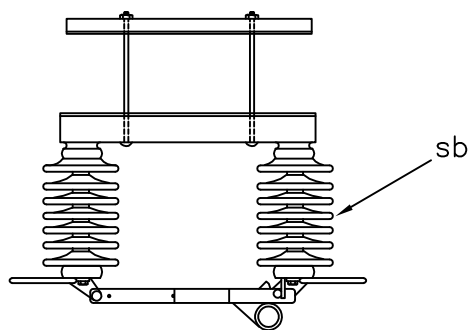
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
S1.01 S1.02 S2.01	(M5-9) (M5-10)	MISCELLANEOUS CUTOUTS AND DISCONNECT SWITCH
S1.1	(M3-4)	CUTOUT - SINGLE PHASE
S1.1N		CUTOUT GUIDE - NARROW PROFILE
S1.3		COUTOUTS - (THREE SINGLE-PHASE)
S2.3	(M3-3B)	LINE TENSION 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

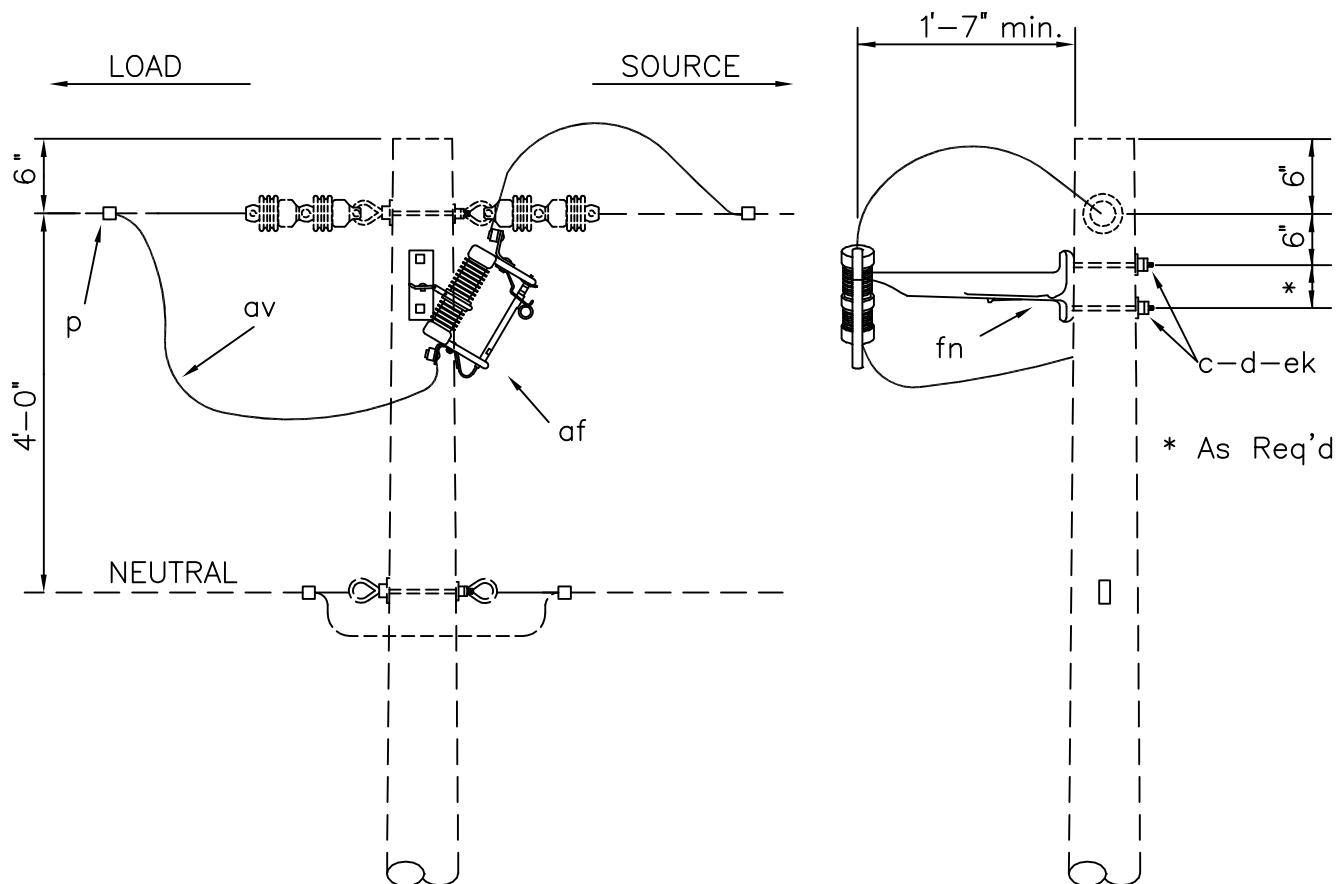
MISCELLANEOUS CUTOUTS AND DISCONNECT SWITCH

APRIL 2005

RUS

12.47/7.2 kV

S1.01,S1.02,S2.01
(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

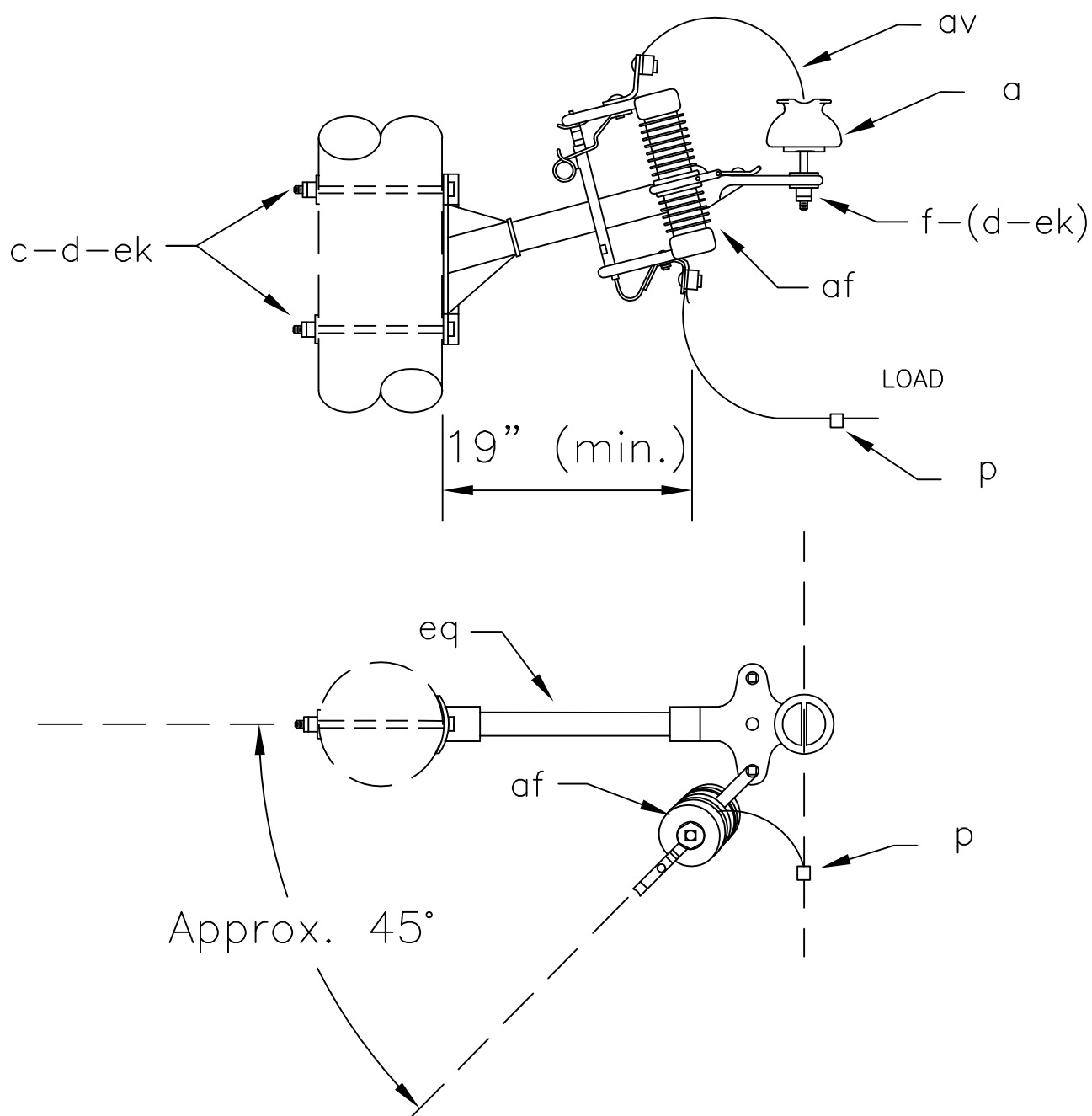
CUTOUT – SINGLE PHASE

APRIL 2005

RUS

12.47/7.2 kV

S1.1
(M3-4)



NOTE: Also see "A5.4NG".

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

Design Parameters:

Maximum Line Angles:
See Table II

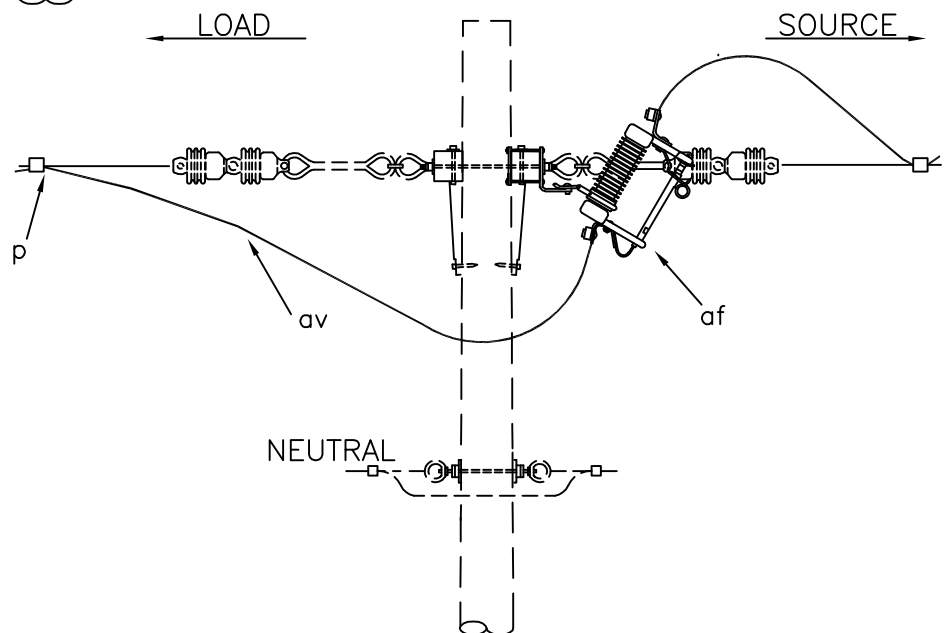
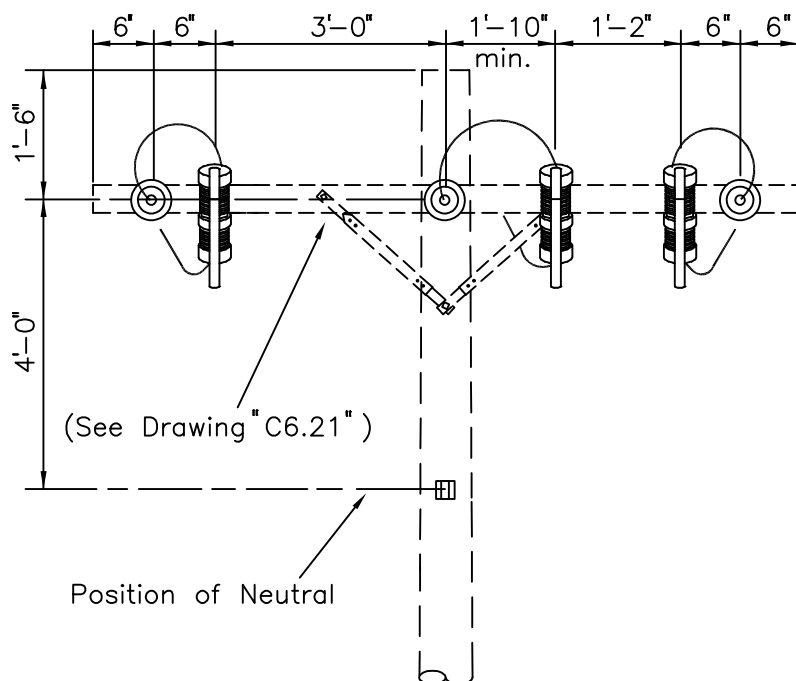
CUTOUT-NARROW PROFILE

APRIL 2005

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

S1.1N



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

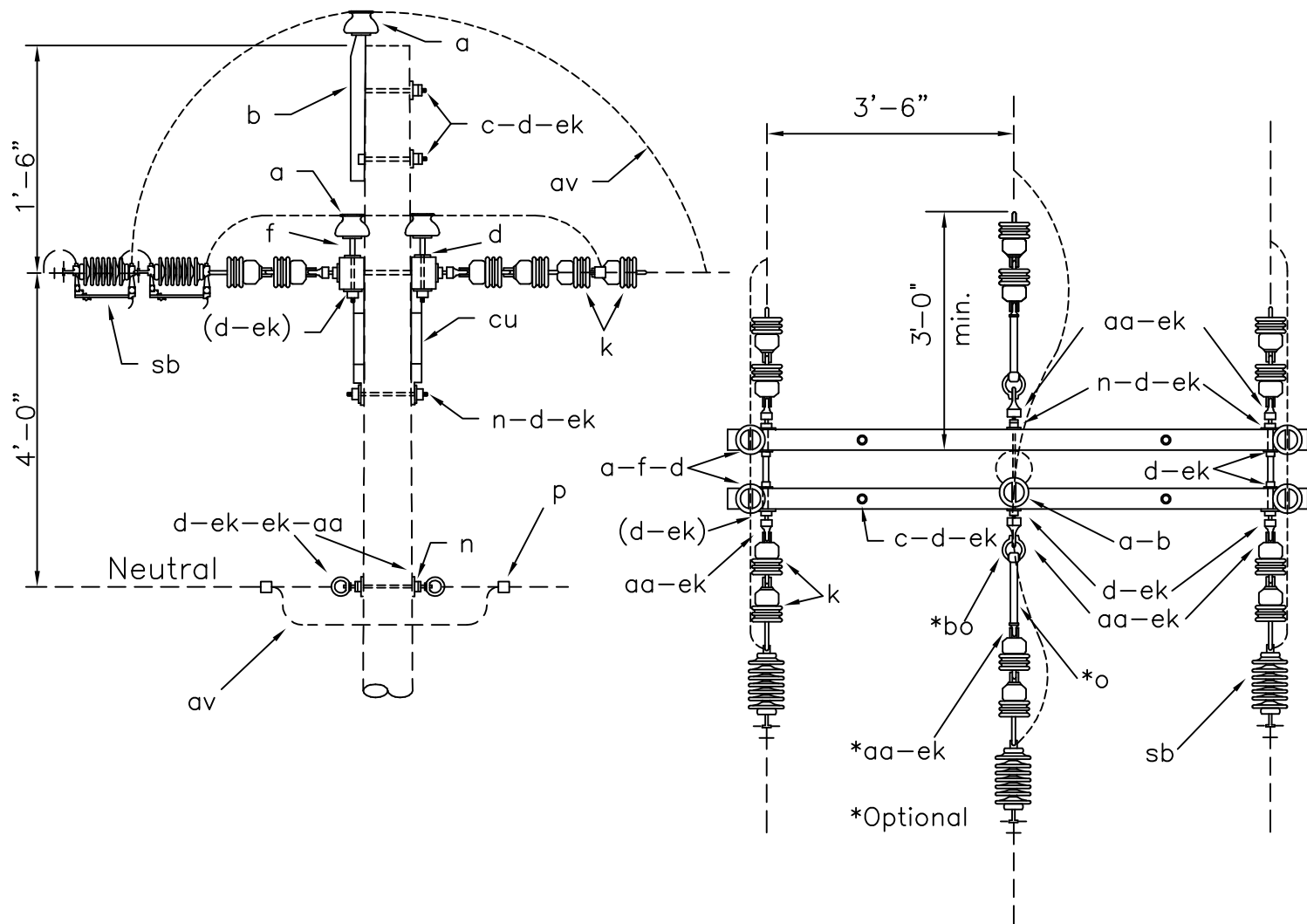
CUTOUTS
(THREE SINGLE-PHASE)

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)

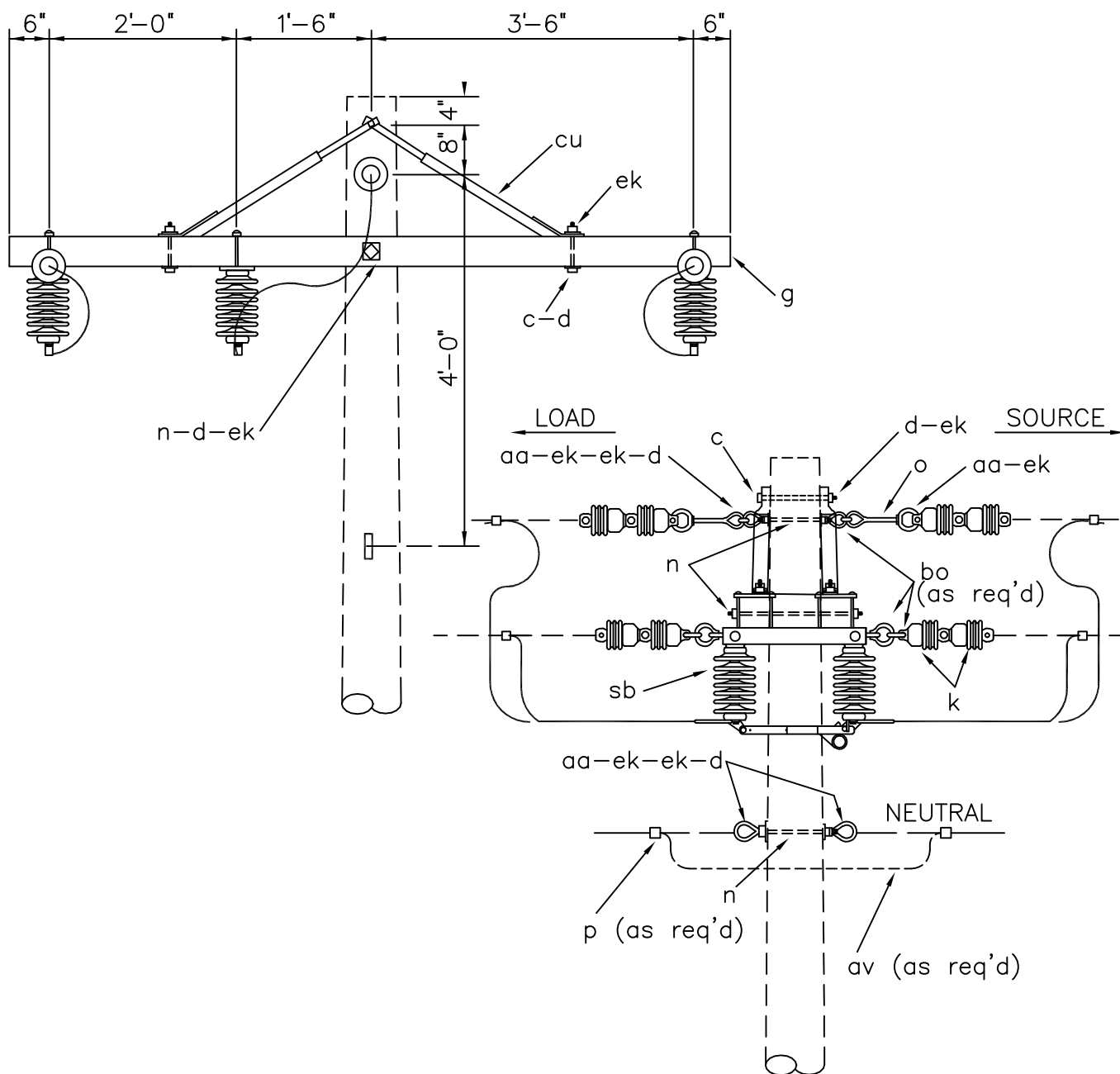
LINE TENSION SWITCHES
(THREE SINGLE-PHASE)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

S2.3 (M3-3B)



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)

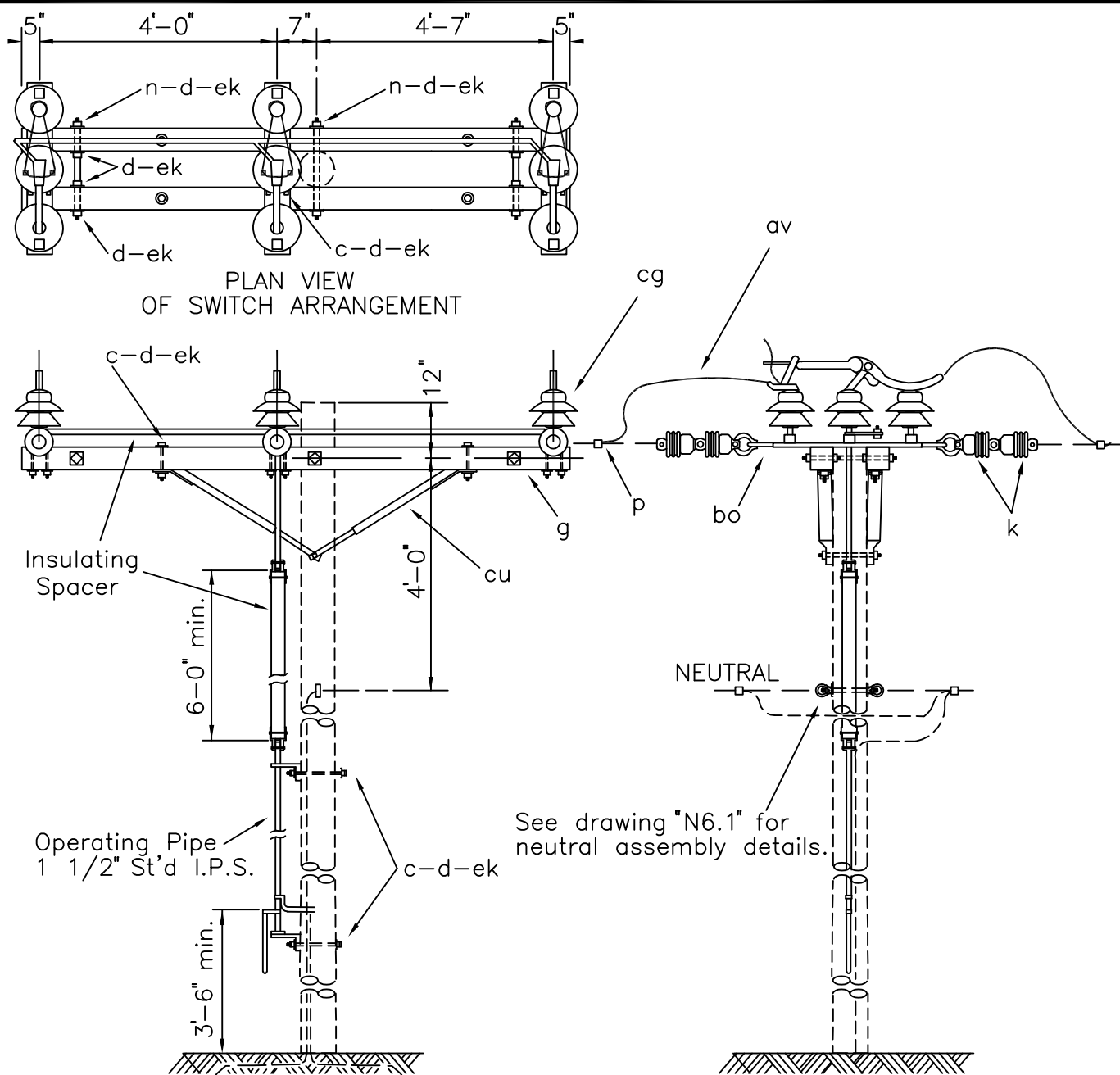
APRIL 2005

RUS

12.47/7.2 kV

S2.21,S2.31

(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

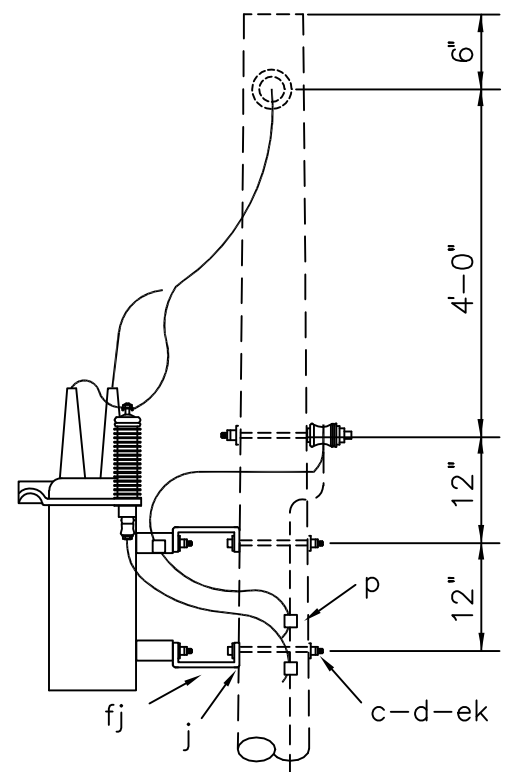
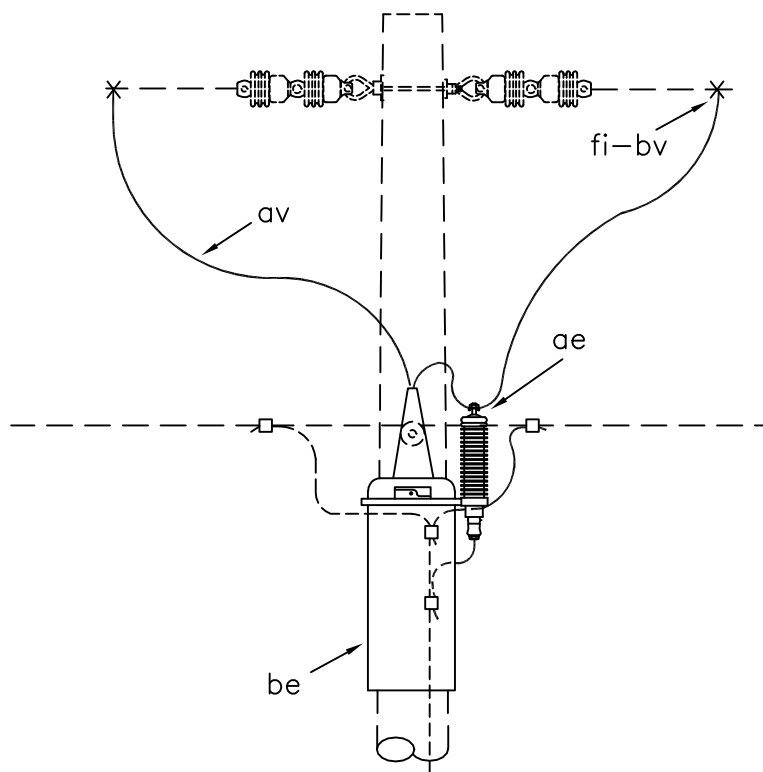
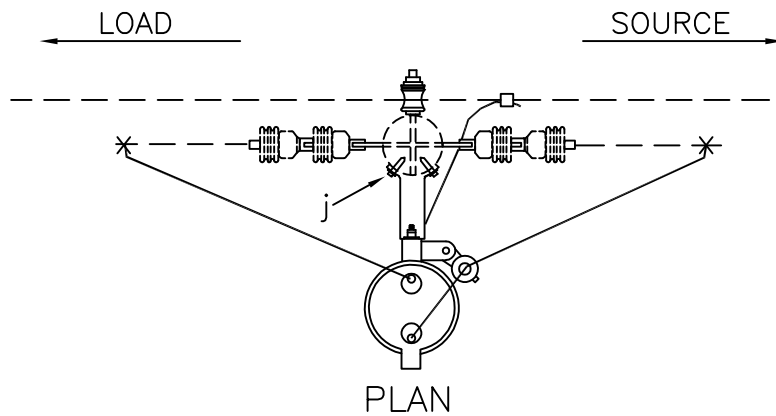
GROUP-OPERATED AIRBREAK SWITCH (THREE-PHASE)

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

S2.32
(M3-15)



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

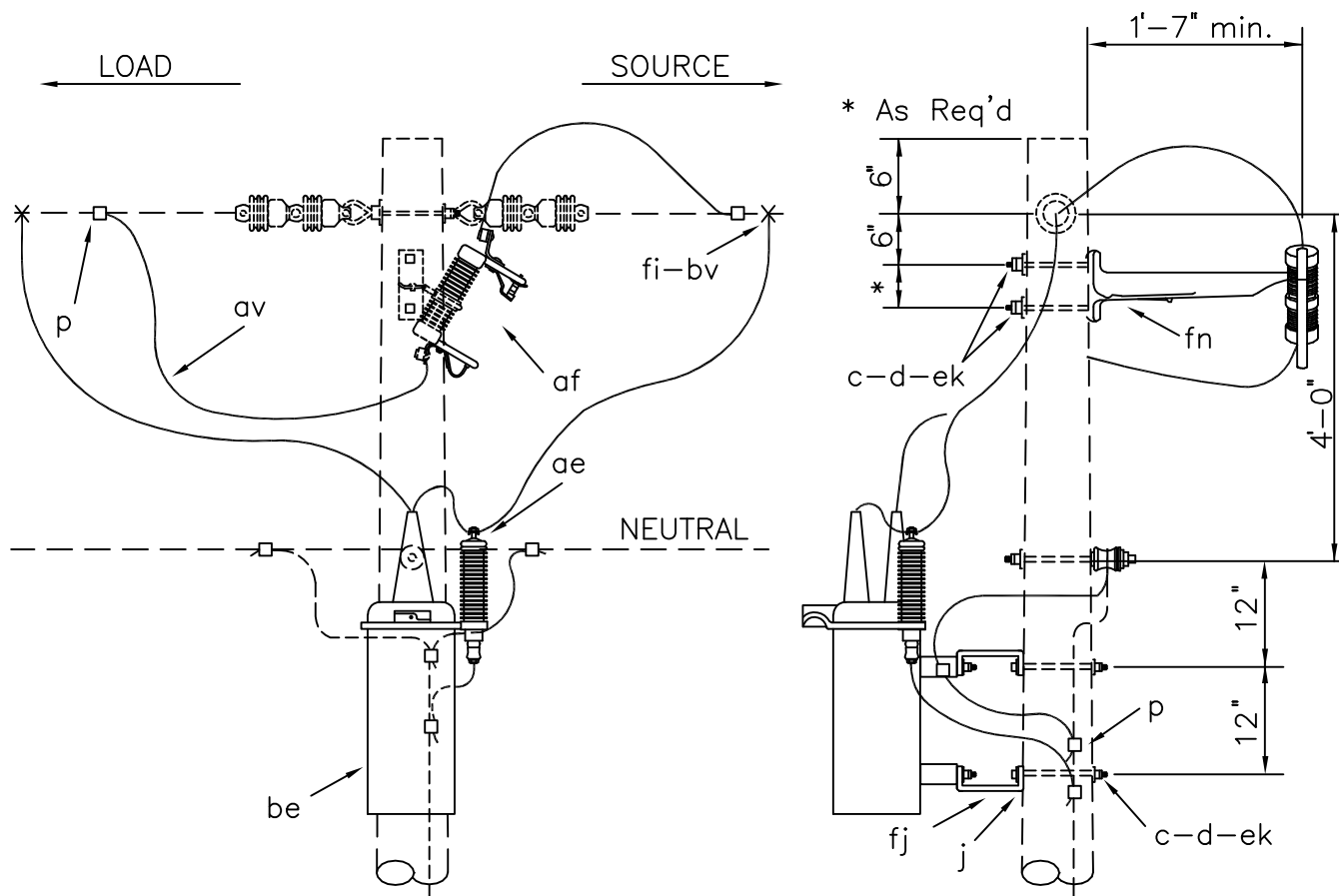
SECTIONALIZER

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

RUS

1 - PHASE PRIMARY
12.47/7.2 kV

S3.2

INDEX W

WOOD POLES, CROSSARMS AND BRACES

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
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

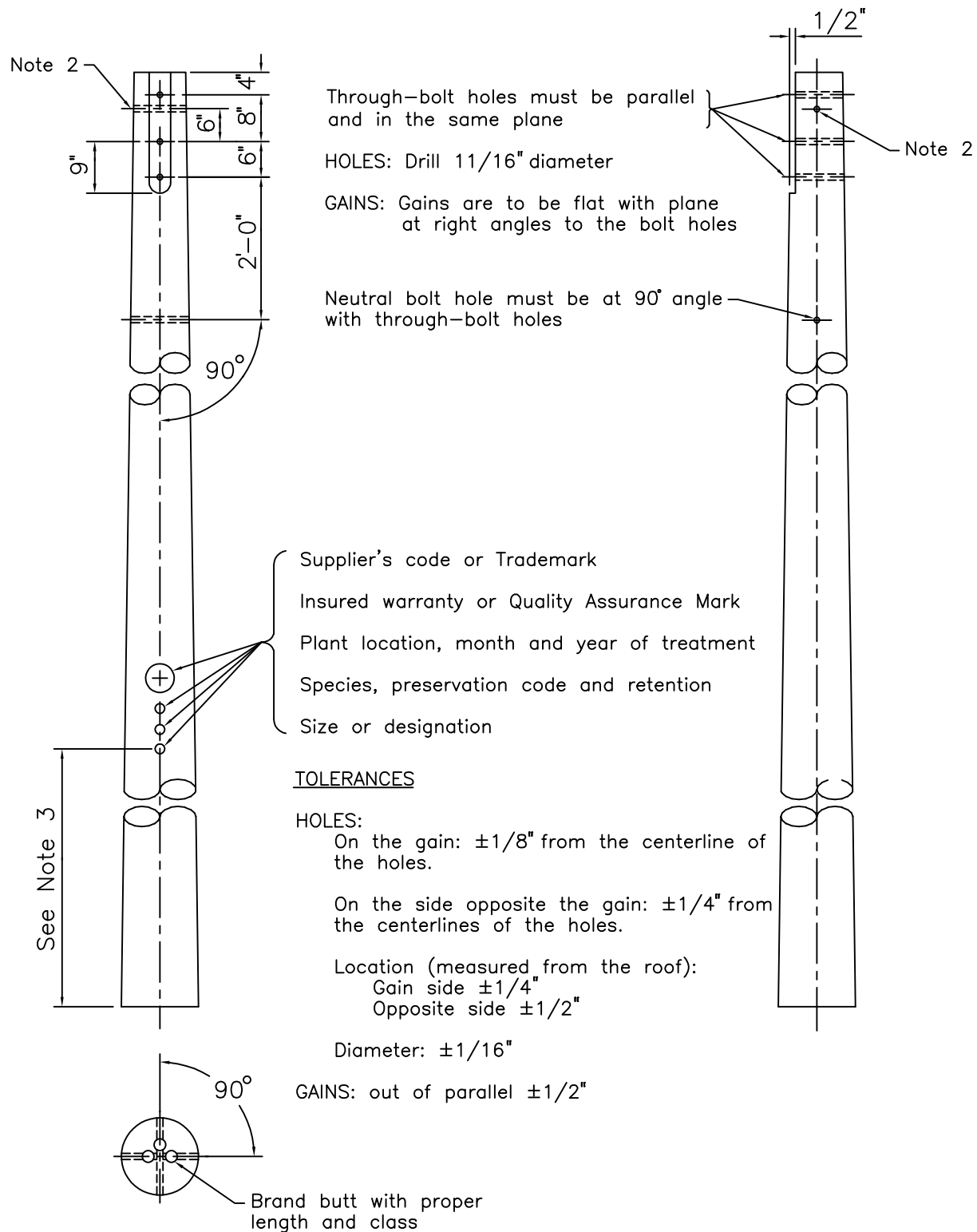
“Setting in Soil” depths apply where:

- 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' $\pm 2"$ from the pole butt for poles less than 55' in length; 14' $\pm 2"$ for poles 55' and longer.

POLE FRAMING GUIDE

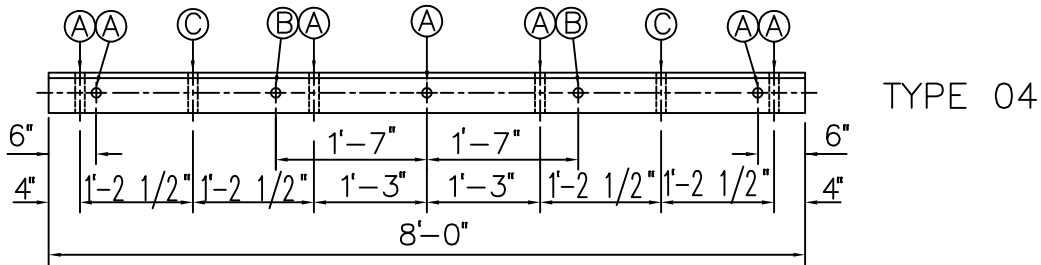
APRIL 2005

RUS

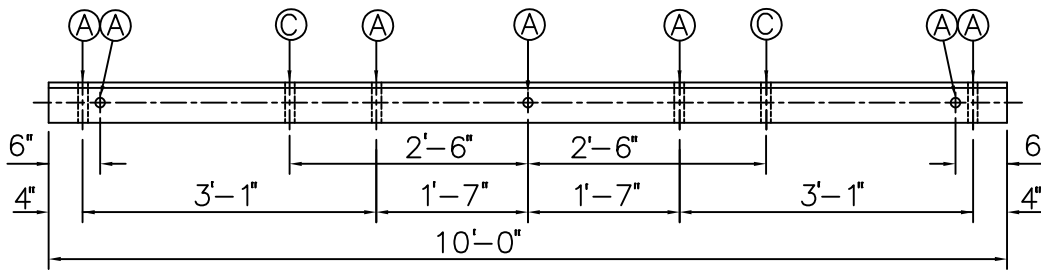
W1.1G
(M20)

TOLERANCES AND SIZES OF HOLES

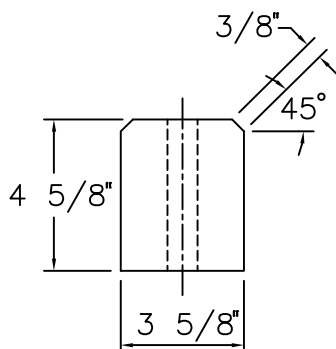
NOMINAL		GO	NO GO
Ⓐ	11/16"	5/8"	3/4"
Ⓑ	7/16"	3/8"	1/2"
Ⓒ	9/16"	1/2"	5/8"



TYPE 04



TYPE 05M



TYPICAL END SECTION

NOTES:

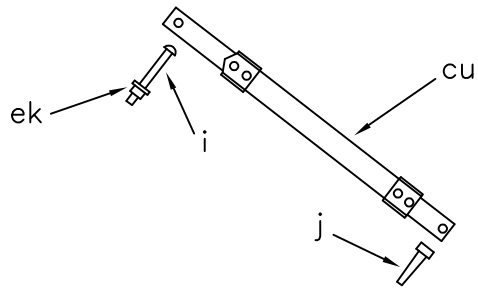
- Holes are to be located within $\pm 1/8"$
- Length of the crossarm is to be within $\pm 1/4"$
- The tolerance of the cross section is $+1/8"$ and $-0"$ at time of manufacture.
- All holes are to be drilled on centerlines of crossarm faces.

DISTRIBUTION CROSSARM DRILLING GUIDE

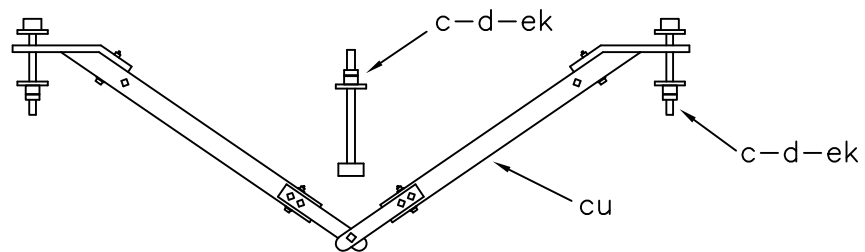
APRIL 2005

RUS

W2.1G
(M19)



W3.1



W3.2

ITEM	MATERIAL	W3.1	W3.2
		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

RUS

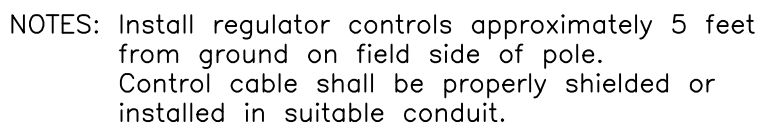
W3.1,W3.2

(M5-17),(M5-13)

INDEX Y

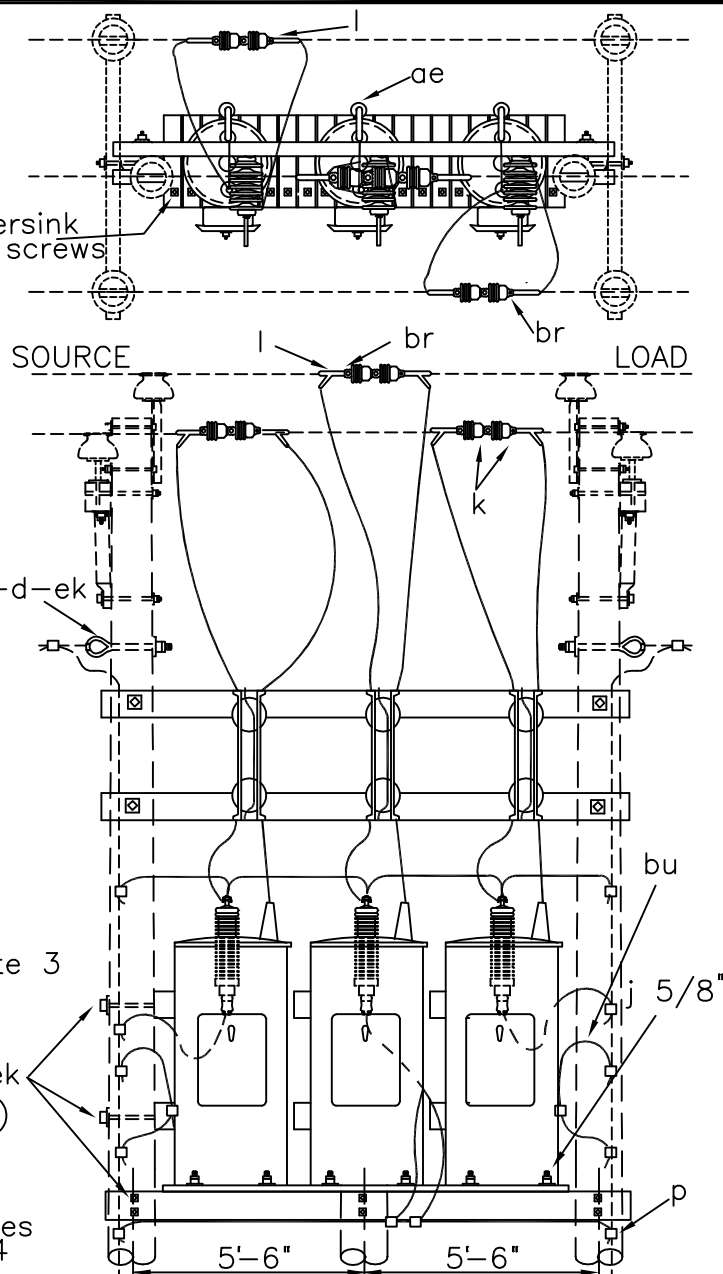
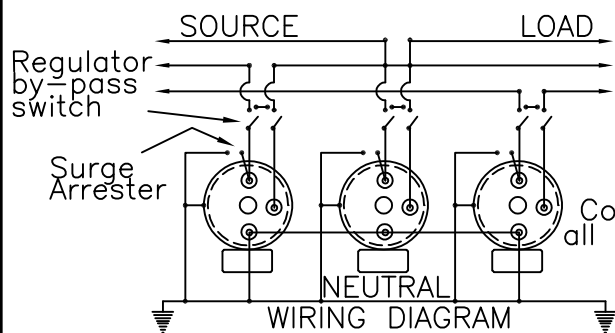
VOLTAGE ALTERATION EQUIPMENT ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-804 (New)	Bulletin 50-3 (Old)	
Y1.1	(M7-11)	VOLTAGE REGULATOR, POLE MOUNTED (ONE SINGLE-PHASE)
Y1.3	(M7-13)	VOLTAGE REGULATOR, PLATFORM MOUNTED (THREE SINGLE-PHASE)
Y2.1		AUTOTRANSFORMER, POLE MOUNTED
Y2.2		(ONE SINGLE-PHASE, STEP-DOWN)
Y3.1	(M9-11)	SINGLE-PHASE CAPACITOR BANK
Y3.2	(M9-12)	THREE-PHASE CAPACITOR BANK
Y3.3	(M9-13)	
Y3.4		SWITCHED CAPACITOR BANK - THREE-PHASE



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

Y1.1
(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

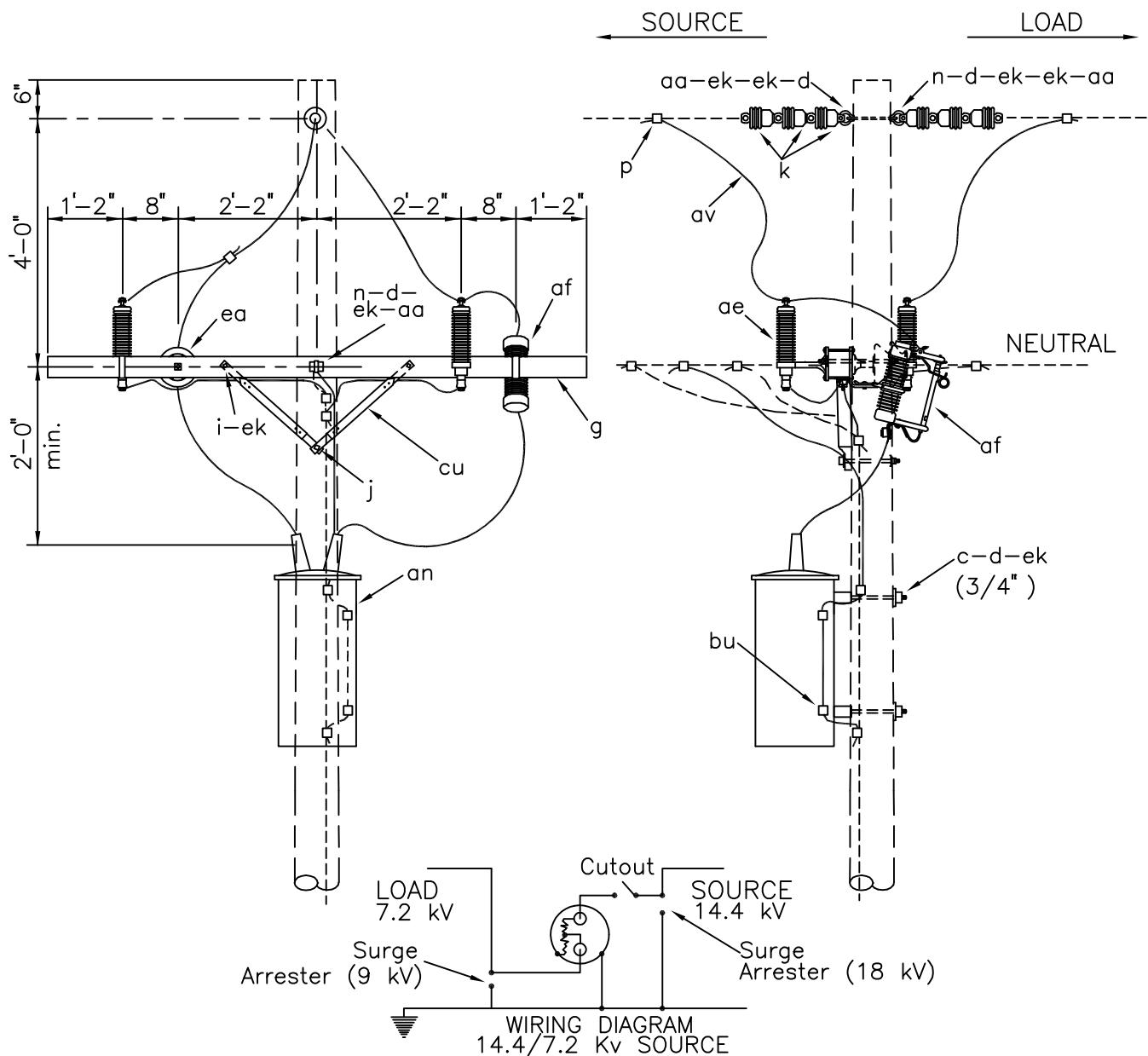
VOLTAGE REGULATORS, PLATFORM MOUNTED (THREE SINGLE-PHASE)

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

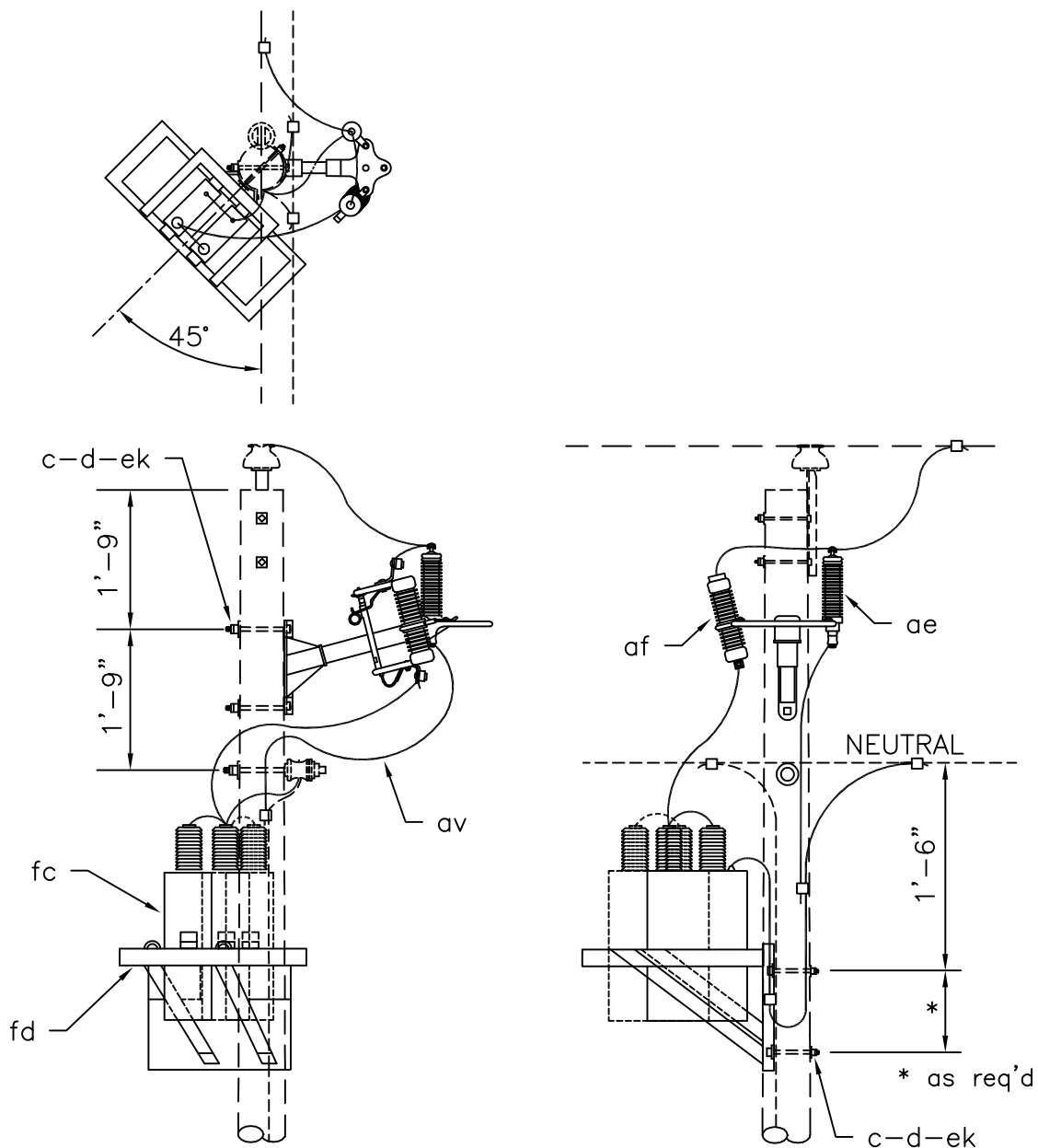
AUTOTRANSFORMER, POLE MOUNTED (ONE SINGLE-PHASE, STEP-DOWN)

APRIL 2005

RUS

1 - PHASE PRIMARY
(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

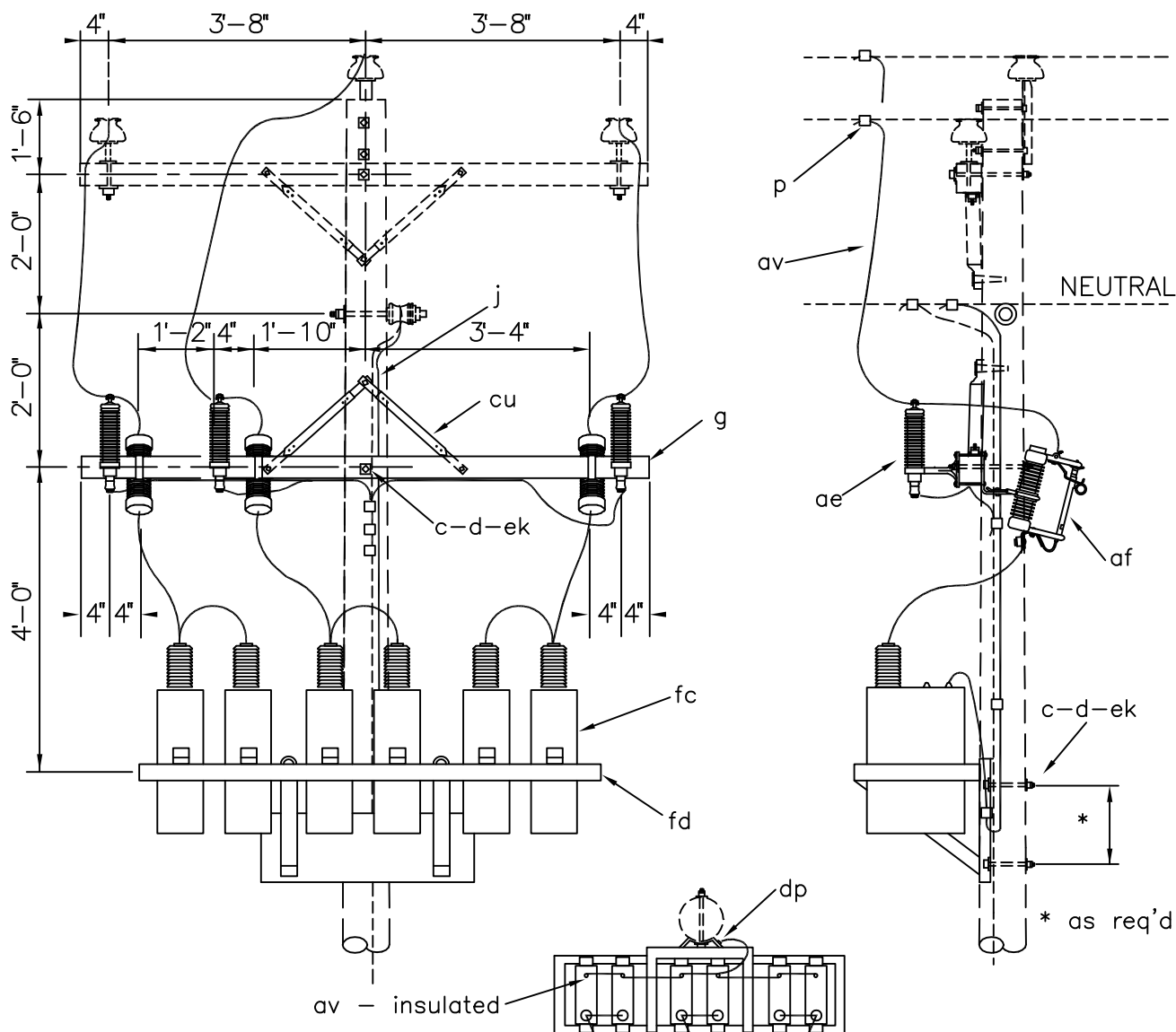
SINGLE PHASE CAPACITOR ASSEMBLY

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

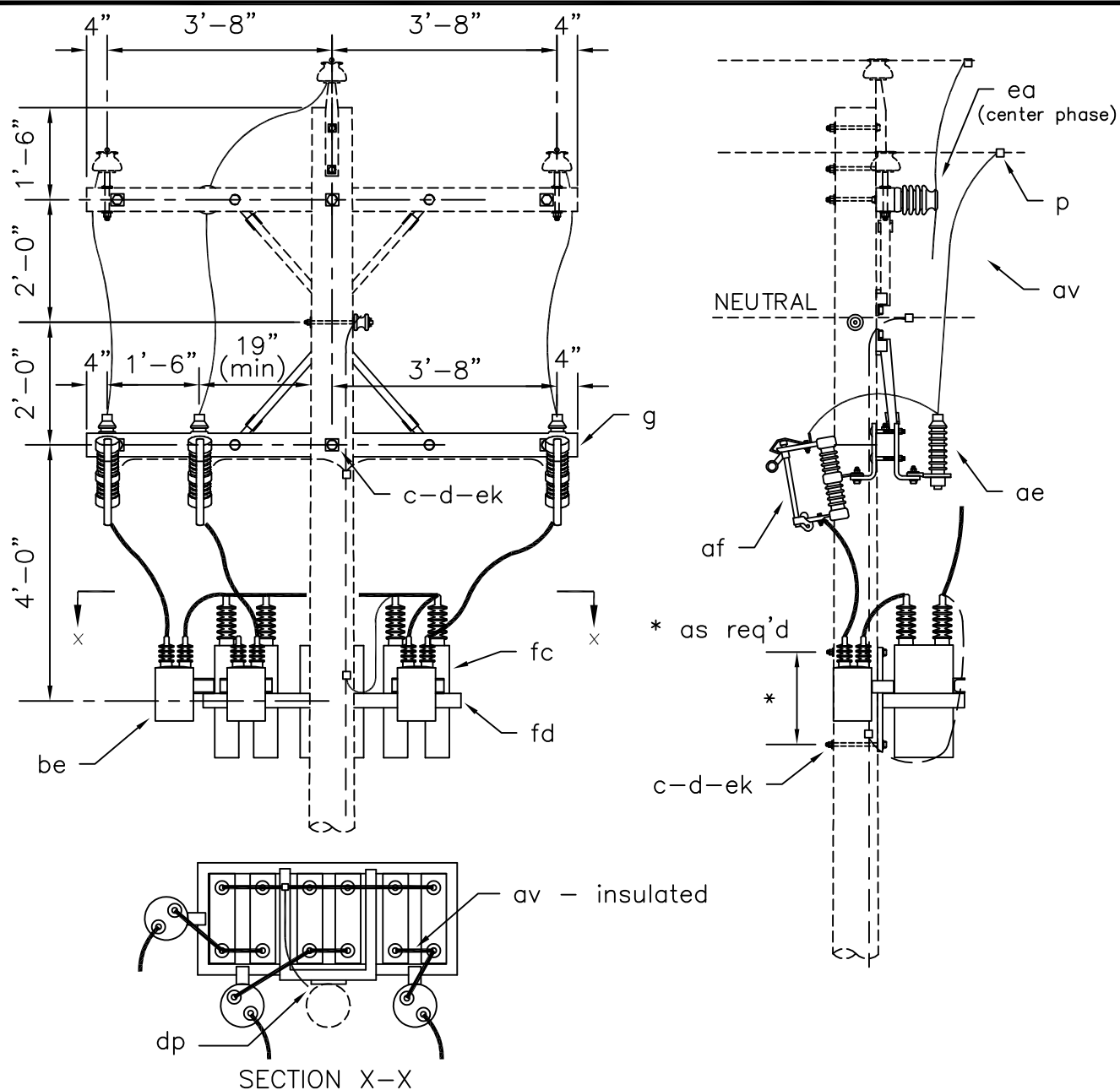
THREE PHASE CAPACITOR BANK

APRIL 2005

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

Y3.2,Y3.3
(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, grbund 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

RUS

3 - PHASE PRIMARY
12.47/7.2 kV

Y3.4

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:

$$\sin(\theta/2) = \frac{P - (F_w \times S_w \times W_w)}{2 \times F_t \times T} \quad \theta = 2 \times \text{Arc sin} \left[\frac{P - (F_w \times S_w \times W_w)}{2 \times F_t \times T} \right]$$

Where:

- θ = Maximum Line Angle (calculated): [Degrees]
- P = Designated Maximum Transverse Load (allowed on pin or insulator): [lbs]
- F_w = Wind Overload Factor for Transverse Loads
- F_t = Wire Tension Overload Factor for Transverse Loads
- S_w = Wind Span (equals ½ sum of adjacent spans): [ft]
- W_w = 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:

- F_w = 1.75 for non-crossing spans (Footnote 4 to Table 253-1)
- = 2.20 for crossing spans
- F_t = 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 (W_w) (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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
<u>CONDUCTOR SIZE</u>	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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
<u>CONDUCTOR SIZE</u>	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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
<u>CONDUCTOR SIZE</u>	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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
<u>CONDUCTOR SIZE</u>	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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
<u>CONDUCTOR SIZE</u>	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 Class 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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
<u>CONDUCTOR SIZE</u>	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 Class 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.

<u>WIND SPAN (feet)</u>	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>	<u>350</u>	<u>400</u>
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:

$$\frac{\sum \text{Applied Vertical Moments}}{\text{Permitted Vertical Moment (Capacity)}} + \frac{\sum \text{Applied Longitudinal Moments}}{\text{Permitted Longitudinal Moment (Capacity)}} \leq 1$$

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* = $N \times M_h \times F_s$
- $\sum \text{Applied Vertical Moments} =$

$$D_1 \times [(S_{in} \times W_1) + (S_{out} \times W_2)] \times F_{OLV} + D_2 \times [(S_{in} \times W_3) + (S_{out} \times W_4)] \times F_{OLV} + M_{LW}$$
- $\sum \text{Applied Longitudinal Moments} =$

$$[D_1 \times (L_{1-in} - L_{1-out}) + D_2 \times (L_{2-in} - L_{2-out})] \times F_{OLL}$$

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			3 CROSSARMS		
		WEIGHT SPANS** (feet)			WEIGHT SPANS** (feet)		
		200	300	400	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 assemblies 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			3 CROSSARMS		
		WEIGHT SPANS** (feet)			WEIGHT SPANS** (feet)		
		200	300	400	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 (<i>Material same as A5.1; Replaced with A5.2G</i>)
A5-2	A5.2	Replace 2 washers abutting pole
A5-2A		Discontinued (<i>Same as A5.2 and note</i>)
A5-3		Discontinued (<i>Same as A5.1 and note</i>)
A5-4		Discontinued (<i>Combination of A5.1, A1.1 and A5.2G</i>)
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 (<i>Combination of A1.11, A1.11 and A1.12G</i>)
A22P		Discontinued (<i>Combination of A1.11P, A1.1 and A1.12G</i>)
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 (<i>Similar to B3.1</i>)
B4-1		Discontinued (<i>Replaced with guide B4.1G</i>)
B4-1A		Discontinued (<i>Replaced with guide B4.1G</i>)
B5-1	B5.1	Replace 3 washers abutting pole and slight material changes
B5-1A		Discontinued (<i>Similar to B5.1</i>)
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 (<i>Same as B2.22 except for 10-foot crossarms</i>)
B9-3		Discontinued (<i>Same as B1.14 except for 10-foot crossarms</i>)
B9P	B2.22P	Add 2 washers under crossarm pins
B9-1P	B1.14P	Add 1 washer under crossarm pin
B9-2P		Discontinued (<i>Same as B2.22P except for 10-foot crossarms</i>)
B9-3P		Discontinued (<i>Same as B1.14P except for 10 foot crossarms</i>)
B22		Discontinued (<i>Same as two B1.11s</i>)
B22P		Discontinued (<i>Same as two B1.11Ps</i>)
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 (<i>Same as C1.11P except crossarm braces</i>)
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 (<i>Second center insulator not needed</i>)
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 (<i>Replaced with guide C4.1G</i>)

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 (<i>Replaced with C6.51</i>)
C8-2		Discontinued (<i>Similar to C5.21</i>)
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 (<i>Nearly same as C9-1P</i>)
C22		Discontinued (<i>Combination of C1.11, A1.11 and C6.91G</i>)
C24		Discontinued (<i>Replaced with C6.91G</i>)
DC-C1	D1.81	Add 6 washers under crossarm pins
DC-C1A		Discontinued
DC-C1-1A		Discontinued
DC-C1PL		Discontinued (<i>Replaced with D1.81P</i>)
DC-C1-3PL		Discontinued (<i>Replaced with D2.91P</i>)
DC-C2		Discontinued (<i>Wrong neutral for line angle</i>)
DC-C2-1	D2.91	Add 12 washers under crossarm pins
DC-C3		Discontinued (<i>Replaced by two C3's and D3.1G</i>)
DC-C4-1		Discontinued (<i>Replaced by four C3's and D4.1G</i>)
DC-C8	D6.91	Slightly different neutral and other material.
DC-C25		Discontinued (<i>Replace with guide drawing D5.91G</i>)
E1-1		Discontinued (<i>See E1.1</i>)
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 (<i>Different permitted loads</i>)
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 (<i>Different permitted loads</i>)
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 <i>(See note 3 on E1.4)</i>
E4-3		Discontinued <i>(See note 3 on E1.4)</i>
E5-1		Discontinued
E5-2		Discontinued
E6-2		Discontinued <i>(See E2.1G)</i>
E6-3		Discontinued <i>(See E2.1G)</i>
E7-2		Discontinued <i>(See E3.1LG)</i>
E7-3		Discontinued <i>(See E3.1LG)</i>
E8-2		Discontinued <i>(See E4.3LG)</i>
E8-3		Discontinued <i>(See E4.3LG)</i>
E11		Discontinued <i>(See E1.2)</i>
E12		Discontinued <i>(See E1.2)</i>
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 <i>(Not in List of Materials)</i>
F1-2C		Discontinued <i>(Not in List of Materials)</i>
F1-3C		Discontinued <i>(Not in List of Materials)</i>
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 - <i>Same as G9-</i>
G67-		Discontinued
G136-		Discontinued - <i>Same as G105-</i>
G210-	G2.1	No material changes (<i>Drawing modified</i>)
G310-	G3.1	No material changes (<i>Drawing modified</i>)
G311-	G3.2	No material changes (<i>Drawing modified</i>)
G312-	G3.3	No material changes (<i>Drawing modified</i>)
J5	J1.2	No material changes
J6	J3.1	No material changes
J7	J2.2	No material changes
J7C		Discontinued - <i>Same as J7</i>
J8	J1.1	No material changes
J10	J2.1	No material changes
J11		Discontinued - <i>Same as J6</i>
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 - <i>Same as K10</i>
K11L		Discontinued - <i>Same as K11</i>
K14L		Discontinued - <i>Same as K14</i>
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 - <i>Same as K17</i>
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 (<i>Add bracket</i>)
M3-41	S3.1	Slight material changes (<i>Add bracket</i>)
M3-11		Discontinued (<i>See R3.1</i>)
M3-12		Discontinued (<i>Replaced with R3.1</i>)
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 (<i>Add bracket</i>)
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 (<i>See A5.3</i>)
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 – <i>replace crossarms with bracket</i>
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 (<i>Guide drawing</i>)
M22-1		Discontinued (<i>Guide drawing</i>)
M22-2		Discontinued (<i>Guide drawing</i>)
M24	K4.1G	Modified guide drawing; no material
M24-1		Discontinued (<i>Guide drawing</i>)
M24-10	K4.2G	Modified guide drawing; no material
M26-5		Discontinued (<i>Guide drawing</i>)
M27		Discontinued (<i>Guide drawing</i>)
M27-1		Discontinued (<i>Guide drawing</i>)
M27-1A	G1.1G	Modified guide drawing; no material
M27-2		Discontinued (<i>Guide drawing</i>)

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 (<i>See G1.1G</i>)
M29-1		Discontinued (<i>See guide drawings in Sections A and C</i>)
M29-2		Discontinued (<i>See guide drawings in Sections A and C</i>)
M30-1		Discontinued (<i>Guide drawing</i>)
M30-2		Discontinued (<i>Guide drawing</i>)
M40-11		Discontinued (<i>Guide drawing</i>)
M41-1		Discontinued (<i>Replaced assemblies L1.1 and L3.1</i>)
M41-10		Discontinued (<i>Replaced assemblies L1.2 and L3.2</i>)
M42-3		Discontinued (<i>Replaced assemblies L1.3 and L3.4</i>)
M42-11		Discontinued (<i>Replaced assemblies L1.5 and L3.5</i>)
M42-13		Discontinued (<i>Replaced assembly L2.5</i>)
M42-21		Discontinued (<i>Replaced assemblies L1.4 and L3.3</i>)
M43-4		Discontinued (<i>Guide drawing</i>)
M43-10		Discontinued (<i>Guide drawing</i>)
M52-3		Discontinued (<i>Guide drawing</i>)
M52-4		Discontinued (<i>Guide drawing</i>)
R1	M1.30G	Modified guide drawing; no material
	249 <u>Total Assemblies</u> (257 – 8 discontinued duplicates) 82 Discontinued 94 Re-used: No material changes 37 Re-used: Washer changes only 36 <u>Re-used: Other slight material changes</u> 167 Total assemblies re-used 32 <u>Total Guide Drawings</u> 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 ($90^{\circ} - 150^{\circ}$)
C4.2G	DEADEND GUIDE ($15^{\circ} - 90^{\circ}$)
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 UNGROUND WYE - CENTER TAP GROUNDED DELTA FOR 120/240 VOLT POWER LOADS
G3.2G	TRANSFORMER / METER CONNECTION GUIDE UNGROUND WYE - CORNER GROUNDED DELTA FOR 240 OR 480 VOLT POWER LOADS
G3.3G	TRANSFORMER / METER CONNECTION GUIDE GROUND 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: **L₁N₁.N₂**

L₁ 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 (L₁) RUS has assigned to represent them.

DESIGNATED MEANINGS of ASSEMBLY CATEGORY NUMBERS (L₁)		
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	

N₁ 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 (L₁). 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 (N₁) that represent the 6 subcategories within pole-top assembly categories “A” through “D”.

DESIGNATED MEANINGS of SUBCATEGORY NUMBERS (N₁) 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 (N₁) for the remaining 15 (L₁) 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>.

N₂, 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 (N₁) 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 (N₂) 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	<i>Not used – Reserved for future</i>
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) **N** (Narrow profile construction assembly)

L (Large conductor construction) **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

<i>To Convert From</i>	<i>To</i>	<i>Multiply By</i>	
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

<i>To Convert From</i>	<i>To</i>	<i>Multiply By</i>	
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

<i>To Convert From</i>	<i>To</i>	<i>Multiply By</i>	
kilogram force (kgf)	newton (N)	9.806650	
kip	newton (N)	4.448222	E+03
pound force (lbf)	newton (N)	4.448222	

MASS

<i>To Convert From</i>	<i>To</i>	<i>Multiply By</i>	
pound (avoirdupois) (lb)	kilogram (kg)	4.535924	E-01

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service

RUS BULLETIN 1728F-806

SUBJECT: Specifications and Drawings for Underground Electric Distribution

TO: RUS Electric Staff
RUS Electric Borrowers

DATES:

Effective Date: October 11, 2018

Incorporation by Reference: IBR approved by Director, Office of the *Federal Register* - 2018.

OFFICE OF PRIMARY INTEREST: Electric Staff Division

FILING INSTRUCTION: This bulletin replaces RUS Bulletin 1728F-806, Specifications and Drawing for Underground Electric Distribution, dated June 2000.

PURPOSE: This bulletin contains complete specifications settings forth the RUS requirements for constructing rural underground electric distribution systems using state-of-the-art materials, equipment, and construction methods. This information is incorporated by reference in [7 CFR Part 1728](#).


Christopher A. McLean
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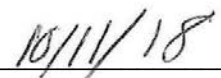

Date

TABLE OF CONTENTS

1	General	4
2	Storage of Material and Equipment	5
3	Handling of Cable	5
4	Plowing	6
5	Special Requirements for Coordination Between Owner and Contractor Where Cable is to be Installed by Plowing	7
6	Trenching	7
7	Installing Cable in Trench	8
8	Installing Cable by Directional Bore	9
9	Minimum Bending Radius of Cable	9
10	Conduit	9
11	Tagging of Cables at Termination Points	10
12	Joints/Splices	10
13	Primary Cable Termination and Stress Cones	10
14	Special Precautions for Cable Joints/Splices and Terminations	11
15	Secondary and Service Connections	11
16	Pedestals	12
17	Inspection and Inventory of Buried Units	12
18	Backfilling	12
19	Equipment Pads	13
20	Transformers	13
21	Below Grade Enclosures	13
22	Utility Safety Signs	13
23	Sacrificial Anodes	14
24	Grounding	14
25	Cable Route Location Markers	14
26	Installed Cable and Acceptance Tests	14
27	Placement of Surge Arresters	15

Attachments

Attachment A - Drawing Descriptions

Attachment B - Construction Drawings

Attachment C - RUS Standard Format and Meaning of Underground Distribution Assembly Numbers

INDEX:

ASSEMBLIES

Underground Distribution – Bul. 1728F-806

SPECIFICATIONS AND STANDARDS:

Construction Specifications and Drawings – Bul. 1728F-806

Underground Distribution – Bul. 1728F-806

UNDERGROUND DISTRIBUTION:

Underground Rural Distribution – Bul. 1728F-806

ABBREVIATIONS

ANSI – American National Standards Institute

IEEE - Institute of Electrical and Electronic Engineers, Inc.

NEMA - National Electrical Manufacturers Association

NESC - Compliance with National Electrical Safety Code

NRECA – National Rural Electric Cooperative Association

1 GENERAL

- a These specifications provide for the construction of underground distribution power facilities as specified by the owner. The owner is defined as the organization contracting for the services and when used in connection with RUS financed facilities, is synonymous with the term borrower as defined in ~1710.2.
- b It is the responsibility of the owner to ensure that all construction work shall be accomplished in a thorough and workmanship manner in accordance with the staking sheets, plans and specifications, and the construction drawings.
- c If construction work is performed by the Owner's force labor account crews instead of a contractor, any reference to "Contractor" in the narrative portions or drawings of this bulletin shall also apply to the force labor account crews.
- d The provisions of 7 CFR 1724.50, Compliance with National Electrical Safety Code (NESC) applies to all borrower electric system facilities regardless of the source of financing.
 - (1) The owner shall ensure that its electric system, including all electric distribution, transmission, and generating facilities, is designed, constructed, operated, and maintained in accordance with all applicable provisions of the most current and accepted criteria of the NESC and all applicable and current electrical and safety requirements of any State or local government entity in which they serve. Copies of the NESC may be obtained from the Institute of Electrical and Electronic Engineers, Inc.,

EEE Customer Service
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331
Telephone: (800)678-4333
Web site: <http://shop.ieee.org/ieeestore/>
 - (2) This requirement applies to the borrower's electric system regardless of the source of financing.
 - (3) Any electrical standard requirement established by RUS are in addition to, and not in substitution for or a modification of, the most current and accepted criteria of the NESC and any applicable electrical or safety requirement of any State or local governmental entity.

- e Overhead distribution design specifications and standards are in RUS Bulletin 1728F-804 and Bulletin 1728F-803. With the underground assemblies attached to the overhead facilities, please note: 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. Overhead transmission circuits shall be constructed with not less than the Grade B strength requirement as described in NESC Section 26.
- f An effective program for identifying underground cable routes is a good mapping system.
- g 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 System of RUS Electrification Borrowers" ("List of Material"). Any drawing of any piece of equipment or material that resembles a specific product of a manufacturer is unintentional.
- h Owners shall use the new assembly and guide coding system on the new assembly units and guide drawings as listed in the RUS Bulletin 1728F-806. However, owners may elect to continue using the old numbers of these assembly and guide drawings, but only for the previous (dated June 2000 publication) assemblies and guide drawings and their old numbers if they make the applicable material changes to the old assemblies.

2 STORAGE OF MATERIAL AND EQUIPMENT

All material and equipment to be used in construction shall be stored so as to be protected from deteriorating effects of the elements. If outdoor storage cannot be avoided, the material and equipment must be protected from the elements as appropriate, and with due regard to public safety.

3 HANDLING OF CABLE

The cable shall be handled carefully at all times to avoid damage, and shall not be dragged across the ground, fences or sharp projections. This includes setting up utility signs to mark cable laying in a vehicle traffic area to prevent cable damage. Care shall be exercised to avoid excessive bending of the cable. The ends of the cable shall be sealed at all times against moisture with suitable end caps. Where it is necessary to cut the cable, the ends will be terminated or sealed immediately after the cutting operation.

4 PLOWING

- a When cables, flexible conduit, and cable-in-conduit are to be installed by plowing, it is the responsibility of the owner to ensure that the plowing equipment be subject to the approval of the Owner and the public authorities having jurisdiction over highway and road rights-of-way. The plow shall be provided with a means to assure positive hold-down of the plow blade to provide proper depth at all times.
- b The design of the plowshare shall ensure that the cable passing through the plow will not be bent in a radius less than 12 times the outside diameter of the cable. The equipment shall be capable of extending the plow a minimum of 6 inches below the specified depth under all terrain conditions of plow utilization.
- c The owner shall ensure that equipment and construction methods used during construction cause minimum displacement of the soil. The slot made in the soil by the cable plows shall be closed immediately by driving a vehicle track or wheel over the slot or by other suitable means.
- d Starting and terminating points of the plowing operation shall be excavated prior to cable installation to reduce possible cable damage and to assure sufficient burial depth.
- e During the plowing operation, care is to be exercised to feed the cable or wire into the ground through the plow loosely and at minimum tension. Besides using proper equipment and construction methods, supervision by the owner or owner's representative shall be furnished at all times at the site of plowing operations to assure compliance with these specifications.
- f If, during the plowing operation, the plow should strike a buried object or rock that would stop the equipment and necessitate removal of the plow from the ground, the plow must be removed from the ground carefully and, if practical, without backing the plow. If it should be necessary to back the plow to remove it from the ground, the cable must be uncovered a sufficient distance back for inspection by the Owner to determine whether the cable or wire has been damaged.
- g The cable shall be inspected carefully as it is payed out from the reel to be certain that it is free from visible defects. Every instance of damaged cable observed at any time, whether prior to installation, during installation, or when discovered by test or observation subsequent to installation in plant, shall be immediately called to the attention of the Owner. Repair or correction of such damage shall be done promptly and in accordance with the written instruction of the Owner. The location of any such repair shall be indicated on the staking sheet.

5 SPECIAL REQUIREMENTS FOR COORDINATION BETWEEN OWNER AND CONTRACTOR WHERE CABLE IS TO BE INSTALLED BY PLOWING

- a Staking sheets shall be reviewed jointly in the field by the contractor and Owner prior to the start of construction. At that time, the Contractor shall propose any desirable changes or clarifications. These changes, if approved by the Owner, shall be made and recorded on the staking sheets. No changes on the staking sheets shall be made by the Contractor without the prior written approval of the Owner. A representative of the Owner shall remain in the immediate vicinity of the plowing operations at all times and will consider and possibly approve any acceptable changes proposed by the Contractor. A representative of the Owner shall also inspect any damage to cable and approve acceptable methods of repair or correction of such damage in accordance with the provisions of these specifications.
- b In the event that rock is encountered during the plowing operation so that the buried cable cannot be installed to the required minimum depths in soil, the Contractor shall determine for the Owner the nature and extent of the rock encountered. Based on this information, the Owner will determine whether the cable is to be rerouted, trenched in rock, protected by conduit or concrete or a change made to aerial construction. This decision shall be made promptly, and appropriate changes in units shall be made on the staking sheets. Such changes shall be in writing, dated, and initialed by the Owner.
- c Due to the necessity of making on-the-spot corrections and changes on staking sheets, it may not be possible for the Owner to issue revised staking sheets to the Contractor in all cases. When changes are made, dated, and initialed by the Owner on a set of the Contractor's staking sheets, it shall be the Contractor's responsibility to transfer these changes to all other sets of staking sheets being used by the Contractor for construction purposes.
- d The Contractor shall provide a competent representative to work with the Owner on the inventory and inspection of buried cable units. The inventory of buried cable will be made as soon after the plowing operation as practical to avoid later disagreements on the quantity of cable installed when changes are required in the project.

6 TRENCHING

- a It is the responsibility of the owner to ensure that all trenching depths specified are listed as minimum as measured from the final grade to the top surface of the cable or conduit. The routing shall be as shown on the staking sheets and plans and specifications unless conditions encountered are such that changes are necessary to accomplish the work. In

- such event, the Owner shall be notified promptly. If rock or other difficult digging (i.e. trench caves in) is involved, the Contractor shall determine the nature and extent of the difficulty, and the Owner will determine whether rerouting, rock trenching, plowing, rock sawing or other changes are necessary. Loose soil or crumbly rock shall not be considered as "difficult digging." The trench widths specified are minimums and should be increased as necessary to obtain the required depths in loose soils.
- b Where trenches are intended for more than one cable, particular care shall be taken to provide for extra depth and width to allow for soil falling into the trench during the laying of the first cables.
 - c Care shall be exercised to minimize the likelihood of waterflow since this may cause trench damage and reduction in trench depth. If this occurs, the trench must be cleared to the specified depth before installing the cable.
 - d All trenches including secondary and service trenches shall follow straight lines between staked points to the greatest extent possible to help in cable locating. The trenches shall be dug so that the bottom has a smooth grade. Large rocks, stones and gravel in excess of 1 inch shall be removed from the bottom of the trench. Where this cannot be done, a 2 inch bed of sand or clean soil shall be placed in the bottom of the trench.
 - e Construction shall be arranged so that trenches will be left open for the shortest practical time to avoid creating a hazard to the public and to minimize the likelihood of collapse of the trench due to other construction activity, rain, accumulation of water in the trench, etc.

7 INSTALLING CABLE IN TRENCH

- a It is the responsibility of the owner to ensure that the cable shall be placed in the trench as soon after the trenching operation as feasible. Wherever possible, cable shall be payed out from the reel mounted on a moving vehicle or trailer. The reel shall be supported so that it can turn easily without undue strain on the cable. The cable shall be carefully placed in the trench by hand. All cable placements shall be done under constant supervision to be certain that no damage to the cable occurs.
- b The cable shall be inspected carefully as it is removed from the reel in laying operations to be certain that it is free from visible defects. The Owner shall decide upon corrective action when defects are discovered.
- c Where more than one cable are to be placed in a trench, the spacings required by the specifications must be observed. Care shall be taken that any soil falling into the trench

- during the laying of the first cable does not reduce the clearances of the last cable below that specified. Should this occur, the excess soil shall be removed carefully by hand or with equipment so as not to damage the installed cables.
- d Sufficient slack, and in no case less than 24 inches, shall be left at all risers, transformer pads, pedestals and terminal points so that movements of cable after backfilling will not cause damaging strain on the cable or terminals. The cable trench shall be mechanically compacted 36 inches minimum from all riser poles, pads, pedestals and terminal points.
 - e The ends of all secondary cable terminated below ground shall be long enough to reach at least 12 inches above the top of the underground enclosure.

8 INSTALLING CABLE BY DIRECTIONAL BORE

It is the responsibility of the owner to investigate the boring route. If the bore is in public/private right-of-way, a review of the permit is required to determine what type of construction may be required for the installation. During the boring operation, multiple bend/turns should be avoided as it increases the pulling tension on the cable. The cable and or conduits must be handled and or trained with proper guides at the entry and exit points to prevent damage. Procedures for cable handling in trenching and plowing also apply to installation by directional boring.

9 MINIMUM BENDING RADIUS OF CABLE

The minimum bending radius of primary cable is 12 times the overall diameter of the cable. The minimum bending radius of secondary and service cable is six times the overall diameter of the cable. In all cases the minimum radius specified is measured to the surface of the cable on the inside of the bend. No cable bends shall be made within 6 inches of a cable terminal base.

10 CONDUIT

- a Cable Protection shall have all exposed ends of the conduit plugged during construction to prevent the entrance of foreign matter and moisture into the conduit. Burrs or sharp projections which might injure the cable shall be removed. Conduits shall be sized to meet the fill limits based on the number and size of cables to be installed. Lubricants used in the aid of cable pulling shall be compatible with both the conduit and cable.

- b Direct Buried Riser shield or conduit shall extend at least 18 inches below grade at all riser poles. If full round conduit is used as a riser shield, an end bell shall be installed on the lower end to prevent damage to the cable. Any aluminum portion of the riser shall not be placed below grade.
- c Three Phase Riser Guide conduit provides good protection when all three phases are in one conduit. The advantage of each phase in a separate conduit is having improved reliability and lower cable pulling tensions. However, the disadvantages has the separated phase and neutral currents causing induced current in magnetic metal conduits leading to increases in line losses which develops heat that can damage the cable insulation.
- D It is the responsibility of the owner to perform cable pulling calculations prior to pulling through a conduit system so that maximum cable tensions are not exceeded. When pulling conductors into a conduit system, the owners shall lubricate cable as needed to reduce pulling tensions.

11 TAGGING OF CABLES AT TERMINATION POINTS

As the cables are laid, it is the responsibility of the owner to ensure that they are identified and tagged. The identification shall be of a permanent type, such as that done on plastic or corrosion resistant metal tags. The tag shall be securely attached to the cable. Paper or cloth tags are not acceptable.

12 JOINTS/SPLICES

- a Cable joints/splices shall be of the pre-molded rubber, heat-shrink, or cold-shrink type, of the correct voltage rating and shall be installed in accordance with the joint/splice manufacturer's instructions. Joints/Splices that depend solely on tape for a moisture barrier shall not be used.
- b Not more than one joint/splice may be permitted for each 2000 feet of cable installed unless authorized by the Owner. No bends may be permitted within 12 inches of the ends of a joint/splice. The cable or circuit numbers and the exact location of all joints/splices shall be noted on the staking sheets (as built).

13 PRIMARY CABLE TERMINATION AND STRESS CONES

- a Prefabricated stress cones or terminations shall be installed in accordance with the manufacturer's instructions at all primary cable terminals. They shall be suitable for the size and type of cable that they are used with and for the environment in which they will

operate. Any indication of misfit, such as a loose or exceptionally tight fit, shall be called to the Owner's attention. The outer semi-conductive surface of the termination shall be bonded to the system neutral. A heat-shrink or cold-shrink sleeve shall be installed to seal between the body of the termination and the cable jacket.

14 SPECIAL PRECAUTION FOR CABLE JOINTS/SPLICES AND TERMINATIONS

A portable covering or shelter shall be available for use when joints/splices or terminations are being prepared and when prefabricated terminations are being switched. The shelter shall be used as necessary to keep rain, snow and windblown dust off the insulating surfaces of these devices. Since cleanliness is essential in the preparation and installation of primary cable fittings, care shall be exercised to prevent the transfer of conducting particles from the hands to insulating surfaces. Mating surfaces shall be wiped with a solvent to remove any possible accumulation of dirt, moisture or other conducting materials. A silicone grease or similar lubricant should be applied afterwards in accordance with the manufacturer's recommendations. Whenever prefabricated cable devices are opened, the unenergized mating surfaces shall be lubricated with silicone grease before the fittings are reconnected.

15 SECONDARY AND SERVICE CONNECTIONS

- a 15.1 A suitable inhibiting compound shall be used with all secondary and service connections.
- b All secondary cable connections located below grade or in secondary pedestals shall be made with pre-insulated secondary connector blocks. Diving bells with open terminals, insulating boots or moisture barriers that depend solely on tape are not acceptable.
- c All transformer secondary phase terminal connections shall be completely insulated. If the secondary phase terminals are threaded studs, the connection shall be made with a pre-insulated secondary transformer connection block. If the transformer secondary phase terminals are insulated cable leads, connection shall be made with a pre-insulated secondary connector block or with a secondary prefabricated joint/splice when the transformer leads continue directly to the service.
- d If a transformer is so large that it must have secondary spades, the spades shall be taped or otherwise insulated. Boots used for insulation shall be taped or secured so that they cannot be readily slipped off.
- e Secondary connections to terminals of pole-mounted transformers shall be made so that moisture cannot get inside the cable insulation. This may be accomplished by covering the terminals and bare conductor ends with an appropriate moisture sealant (a listing of

acceptable items is in RUS Informational Publication 202-1, List of Materials for use on systems of RUS Electrification Borrowers) or by providing a drip loop.

- f 15.6 The secondary connections and insulation shall have accommodations for all future and existing services as shown on the plans and specifications.

16 PEDESTALS

Where required, pedestal stakes shall be driven vertically into the bottom of the trench before cables are placed, and shall be located as shown on the staking sheets. Pedestal posts and supporting stakes shall be in place before the cable is installed. All pedestals should be approximately at the same height above finished grade.

17 INSPECTION AND INVENTORY OF BURIED UNITS

Before any backfilling operations are begun, it is the responsibility of the owner to ensure that the Contractor and Owner shall jointly inspect all trenches, cable placement, risers, pedestal stakes, and other construction that will not be accessible after backfilling, and an inventory of units shall be taken. If corrections are required, a second inspection shall be made after completion of the changes.

18 BACKFILLING

- a The first 6 inches of trench backfill shall be free from rock, gravel or other material which might damage the cable jacket. In lieu of cleaning the trench, the Contractor may, at the Contractor's option, place a 2 inch bed of clean sand or soil under the cable and 4 inches of clean soil above the cable. Cleaned soil backfill when used shall contain no solid material larger than 1 inch. This soil layer shall be carefully compacted so that the cable will not be damaged.
- b Backfilling shall be completed in such a manner that voids will be minimized. Excess soil shall be piled on top and shall be well tamped.
- c 18.3 Pieces of scrap cable or other material remaining after installation shall not be buried in the trench as a means of disposal.
- c Conduit provides protection for the cable to be installed. However, the backfilling method for cable in conduit shall be the same as direct buried cable. Additional protection can be obtained by pouring a concrete cap over a partial filled backfill above the direct buried cable or conduit.

Further protection for the conduits is done by concrete encapsulation using spacers to insure enough concrete surrounds the conduits.

19 EQUIPMENT PADS

The site for the pad shall be on undisturbed earth adjacent to but not over the trench. The site shall be cleared of all debris and excavated to the specified depth. Gravel or sand may be added to the site and thoroughly compacted. The developer/property owner shall provide the finished grade so steps can be taken to insure foundations are installed level at the specified elevation.

20 TRANSFORMERS

Transformers shall be handled carefully to avoid damage to the finish and shall be positioned in accordance with the staking sheets and the plans and specifications. Only qualified and experienced personnel shall be allowed to make connections and cable terminations.

21 BELOW GRADE ENCLOSURES

Excavations for sleeve-type transformer pads and other below-grade enclosures shall be made so as to disturb the surrounding earth as little as practical. Enclosures shall be installed with side walls plumb. When enclosures are of fiber, plastic, or other semi-flexible material, backfilling should be done with covers in place and with careful tamping so as to avoid distortion of the enclosure. When installation is complete, the cover of the enclosure shall not be lower than and not more than 2 inches higher than the grade specified by the Owner. Soil in the immediate vicinity shall be tamped and sloped away from the enclosure. At the Owner's option, the excess soil shall be removed from the site or spread evenly over the surface of the ground to the satisfaction of the Owner.

22 UTILITY SAFETY SIGNS

- a Utility safety signs shall be in accordance with the provisions of ANSI Z535.2011 and any updated revision of these codes when it is released, Environmental and Facility Safety Signs shall be applied in accordance with RUS drawings. Copies of the ANSI Z535.2-2011 may be obtained from:

National Electrical Manufacturers Association (NEMA)
1300 North 17th Street
Suite 1847
Rosslyn, Virginia 22209.

- b Transformers and other high voltage equipment enclosures installed at ground level in a public access area shall display owner/operator contact information with contact name and telephone number.

23 SACRIFICIAL ANODES

Sacrificial anodes specified shall be installed with backfill package intact and connecting leads positioned for proper connection after the equipment is in place. Anodes shall not be moved, positioned, lifted, nor lowered into place by pulling on the connecting leads.

24 GROUNDING

- a 24.1 All neutral conductors, ground electrodes, sacrificial anodes and grounded parts of equipment shall be interconnected. All interconnections for grounding shall be made and consistent with installation standard used by the owner. A copper-clad or galvanized steel ground rod with minimum length of 8 feet shall be installed at all equipment locations and at all accessible cable joints/splices and taps.
- b 24.2 All pad-mounted equipment enclosures, including transformers, shall be grounded in such a manner that two separate grounding paths exist between the enclosure and the grounding rod(s).
- c 24.3 Counterpoise grounding is an effective means of reducing the impedance to ground in areas of high-resistivity soils. A common designed counterpoise is a horizontal grid or conductor below ground level functioning as one plate of a large capacitor, with the conductive layers of the earth acting as the other plate. A counterpoise shall not be used when normal electrode grounding can be installed.

25 CABLE ROUTE LOCATION MARKERS

The above ground location of permanent cable markers shall be as shown on the staking sheets. URD cable markers provide identification of cable routes to contractors, other utilities, and general public to guard against unauthorized contact.

26 INSTALLED CABLE AND ACCEPTANCE TESTS

- a The best method for quality assurance of the cable is to require the manufacturer to submit samples for testing before the cable is accepted. The acceptance tests are simple

- checks to ensure that the cable components meet the current specifications and compliance standards. NRECA has a list of cable testing facilities. The typical cable sampling rates are to test one sample, each, from the first and last reel on the order of 50,000 feet or less and one sample for each additional 50,000 feet of cable ordered.
- b Continuity: After installation of the cable, authorized personnel shall perform a simple continuity test on the system. This can easily be accomplished by grounding the conductor at the source and checking for continuity from the end of each tap with an ohmmeter or with a battery and ammeter.
 - c WARNING: A hazardous voltage may exist on the cable; therefore, before handling the cable, the conductor shall be grounded to permit any charge to drain to earth.

27 PLACEMENT OF SURGE ARRESTERS

The arrester connection on a riser pole shall have the grounding conductor going from system neutral to the pole ground to surge arrester ground than to cable neutral/ground. The combination of both the line lead length and ground lead length shall be less than 3 feet. 27.2 The higher margin of protection on the underground cable system is reached when the riser type class arresters are used at each overhead riser pole cable termination. Also, by the placement of a distribution class arresters at open points on the cable system to help limit the transient voltage reflection peaks. Note a higher surge arrester MCOV rating should be selected for both open and mid-point arresters on the underground cables system as compared to the MCOV rating of the overhead riser pole arrester.

Bulletin 1728F-806

Attachment A - Drawing Descriptions

Attachment B - Construction Drawings

Attachment C - RUS Standard Format and Meaning of Underground Distribution Assembly Numbers

Attachment A

<u>SECTION</u>	<u>CATEGORY DESCRIPTIONS</u>
UA	<u>SINGLE-PHASE RISER POLE ASSEMBLY UNITS</u> Single-Phase Riser Primary Pole Installations
UA1	Single Phase Cable Terminal Pole with Two Brackets
UA2	Single Phase Cable Terminal Pole with One Bracket
UA3	Single Phase Cable Terminal Pole with Crossarm Mounted Cutout
UA4	Single Phase Cable Terminal Pole without Cutout
UA.G	Cable Terminal Pole Arrester Connection Guide
UA1.USG	Alternate Connection For Underground Source Guide
UB	<u>TWO-PHASE RISER POLE ASSEMBLY UNITS</u> Two-Phase Riser Primary Pole Installations
UB1	Two Phase Cable Terminal Pole with Cutouts and Crossarm Mounting Arresters
UB2	Two Phase Cable Terminal Pole with Cutouts and Bracket Mounting Arresters
UB3	Two Phase Cable Terminal Pole without Cutouts and Crossarm Mounting Arresters
UB4	Two Phase Cable Terminal Pole without Cutouts and Bracket Mounting Arresters
UB5	Two Phase Cable Terminal Pole with Upper Crossarm Mounting Cutouts and Crossarm Mounting Arresters
UB6	Two Phase Cable Terminal Pole with Upper Crossarm Mounting Cutouts and Bracket Mounting Arresters
UC	<u>THREE-PHASE RISER POLE ASSEMBLY UNITS</u> Three-Phase Riser Primary Pole Installations
UC1	Three Phase Cable Terminal Pole with Cutouts and Crossarm Mounting Arresters
UC2	Three Phase Cable Terminal Pole with Cutouts and Bracket Mounting Arresters
UC3	Three Phase Cable Terminal Pole without Cutouts and Crossarm Mounting Arresters
UC4	Three Phase Cable Terminal Pole without Cutouts and Bracket Mounting Arresters
UC5	Three Phase Cable Terminal Pole with Upper Crossarm Mounting Cutouts and Crossarm Mounting Arresters

UC6	Three Phase Cable Terminal Pole with Upper Crossarm Mounting Cutouts and Bracket Mounting Arresters
UC7.1	Bracket Mounting Switches
UC7.2	Horizontal Mounting Switches
UC7.3	Vertical Switches Mounted on Three Crossarms
UC7.4	Vertical Switches Mounted on Four Crossarms
UC8.1	Three Phase Cable Terminal Pole with Vertical Framing and Two Brackets per Phase
UC8.2	Three Phase Cable Terminal Pole with Vertical Framing and One Brackets per Phase

UF FOUNDATIONS ASSEMBLY UNITS

Types & Products Used in Foundation Installations

UF.PBC, UF.PBN	Primary Pull Box Underground Cable
UF1.BC, UF1.BN	Single Phase Equipment Foundations
UF1.PC, UF1.PN, UF3.PN	Single Phase and Three Phase Equipment Foundations
UF3.BC, UF3.BN, UF3.VC	Three Phase Equipment Foundations
UF3.PC	Concrete Pad for Three Phase Equipment

UG TRANSFORMER ASSEMBLY UNITS

Types & Products Used in Transformer Installations

UG1.01, UG1.1	Single Phase One Bushing Padmounted Transformer (Radial Feed)
UG1.2	Single Phase Two Bushing Padmounted Transformer (Radial Feed)
UG1.02, UG1.3	Single Phase Two Bushing Padmounted Transformer (Loop Feed)
UG2.1	Open Delta Connection with Single Phase Padmounted Transformers
UG3.01, UG3.1	Three Phase Three Bushing Padmounted Transformer (Radial Feed)
UG3.2	Three Phase Six Bushing Padmounted Transformer (Radial Feed)
UG3.02, UG3.3	Three Phase Six Bushing Padmounted Transformer (Loop Feed)

UH GROUNDING ASSEMBLY UNITS

Types & Methods used in Grounding Installations

UH.01	Ground Rod Assembly
UH1.1	Grounding Assembly for Padmounted Transformers and Enclosures (1 Rod)
UH1.2	Grounding Assembly for Padmounted Transformers and Enclosures (2 Rod)
UH1.4	Grounding Assembly for Padmounted Transformers and Enclosures (4 Rod)
UH1.7	Grounding Array for Padmounted Transformers and Enclosures
UH2.0, UH2.2	Counterpoise Grounding
UH2.7	Trench Type Grounding Assembly – Riser to Transformer Outside of Conduit
UH3.1	Grounding Assembly for Sectionalizing Enclosures (1 Rod)
UH4.1	Grounding Assembly for Cable Above Grade Enclosures (1 Rod)
UH4.1G	Jacketed Cable Grounding Installation (Heat Shrink or Cold Shrink)

UJ SECONDARY ASSEMBLY UNITS

Types & Products used in Secondary Installations

UJ1.01	Secondary Splice
UJ1	Secondary Insulated Connector Block
UJ2	Transformer Connector Block
UJ3.1	Secondary Pedestal Single Phase Above Grade Enclosure
UJ3.3	Secondary Pedestal Three Phase Above Grade Enclosure
UJ4.1	Secondary Handhole Single Phase Below Grade Enclosure
UJ4.3	Secondary Handhole Three Phase Below Grade Enclosure

UK SECONDARY SERVICE ASSEMBLY UNITS

Types & Products used in Secondary Meter Installations

UK1.1	Secondary Cable Riser Pole without Meter Base
UK2.1	Secondary Riser Bottom Connection
UK2.2	Secondary Riser Bottom Side Connection
UK3.1	Temporary Conduit Termination without Meter Base
UK4	Secondary Breaker

UM MISCELLANEOUS ASSEMBLY UNITS

Miscellaneous Installation Products & Service

UM1.XX	Right-Of-Way Clearing
UM2	Cable Route Marker
UM3	Safety Signs

UM6.C, Caps and Plugs

UM6.PL

UM6.EL Elbows

UM6.FI Fault Indicators

UM6.IN Inserts

UM6.JN Multipoint Junctions

UM6.PK Parking Stands

UM6.RK, Primary Terminations

UM6.SP,

UM6.T,

UM6.TS

UO OUTDOOR LIGHTING ASSEMBLY UNITS

Types & Products used in Outdoor Lighting Installations

UO1 Outdoor Light Installation Guide

UO2 Light Structure Installation Guide

UP SYSTEM PROTECTION ASSEMBLY UNITS

System Cable Protection & Interface Products Used

UP1, Arresters

UP2,

UP3

UP4, Arresters and Anodes

UP5

UP7.01, Riser Shield, Back Plate, Conduit Cable Riser

UP7.02,

UP7.03

UP7.04 Conduit Elbow

UP7.B1 Single Conduit Riser with Stand-Off Brackets

UP7.B2 Two Conduit Riser with Stand-Off Brackets

UP7.B3 Three Conduit Riser with Stand-Off Brackets

UP7.C Strap Attached Conduit Riser

UP7.FC Flex Conduit Riser

UP7.UG U-Guard Riser

UP8 Underground Conduit

UQ METERING ASSEMBLY UNITS

Types & Products used in Metering Installations

UQG	Meter Options Guide
UQ._B_	Meter on Building
UQ._P_	Through Type Meter Pedestal and Meter Pedestal Wood Post
UQ._S_	
UQ._T_	Meter Pedestal at Transformer

UR RECLOSER ASSEMBLY UNITS

Types & Products used in Recloser Installations

UR3._ _	Three Phase Padmounted Recloser
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US SECTIONALIZING ASSEMBLY UNITS

Types & Products used in System Sectionalizing Installations

US1.DC	Single Phase Padmounted Transformer Deferred Unit Cabinet Type
US1.DP	Single Phase Padmounted Transformer Deferred Unit Pedestal Type
US1.DV	Single Phase Padmounted Transformer Deferred Unit Pad Sleeve Type
US1.PJ.,	Single and Three Phase Primary Junctions
US3.PJ.	
US_SF_	Switch / Fuse Enclosure Installation
US1.SF_	Single Pole Switching 200 Amp Fuse Enclosure Installation Wiring Diagrams
US2.SF_	(Single Phase & Two Phase)
US3.SF_	Fuse Enclosure (200-600 Amp) Wiring Diagrams (Three Phase)

UT TRENCH ASSEMBLY UNITS

Types & Products used in Trenching & Boring Installations

UT1,	Trenches for Conduit and Direct Burial Cables
UT2,	
UT3,	
UT4,	
UT5	

UY VOLTAGE ASSEMBLY UNITS

Types & Products used in Voltage Control Installations

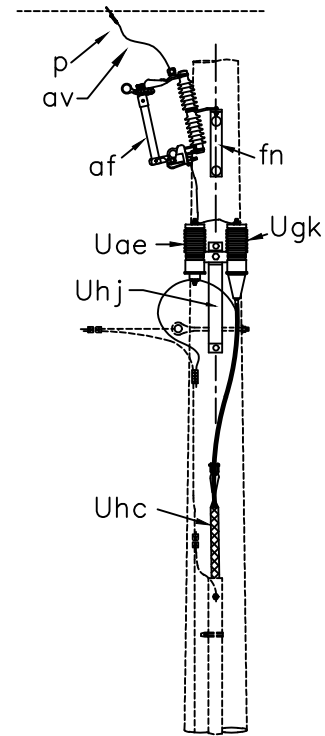
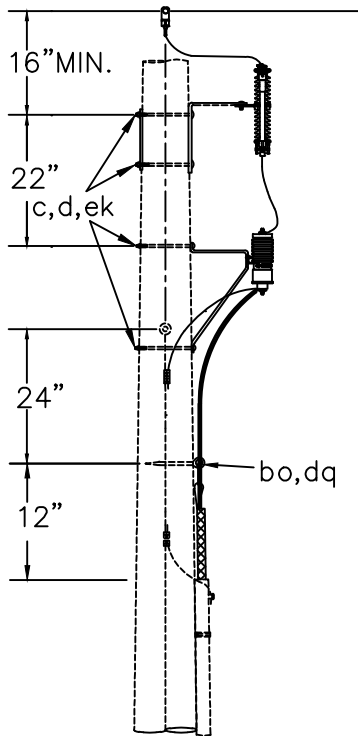
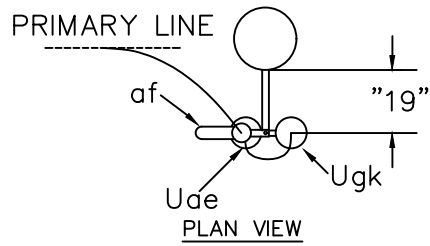
UY1.1.XX	Single Phase Padmounted Voltage Regulation with No Bypass Switch
UY1.1.XXSW	Single Phase Padmounted Voltage Regulation with Bypass Switch
UY3.2L	Three Phase Padmounted Shunt Reactor with Loop Feed
UY3.3L	Three Phase Padmounted Capacitor with Loop Feed

Attachment B

Construction Drawings

SINGLE PHASE RISER POLE ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806 (New)	1728F-806 (Old)	
UA1	UA1	SINGLE PHASE CABLE TERMINAL POLE WITH TWO BRACKETS
UA2	UA2	SINGLE PHASE CABLE TERMINAL POLE WITH ONE BRACKET
UA3	UA3	SINGLE PHASE CABLE TERMINAL POLE WITH CROSSARM MOUNTED CUTOUT
UA4		SINGLE PHASE CABLE TERMINAL POLE WITHOUT CUTOUT
UA.G	UX11	CABLE TERMINAL POLE ARRESTER CONNECTION GUIDE
UA1.USG		UNDERGROUND SOURCE CONNECTION GUIDE



ITEM	QTY.	MATERIAL
c	4	Bolt, machine, 5/8" x required length.
d	4	Washer, square 2 1/4".
p		Connectors, as required.
af	1	Fuse link.
af	1	Cutout
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	4	Locknuts
fn	1	Bracket, cutout extension.
Uae	1*	Surge arrester
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

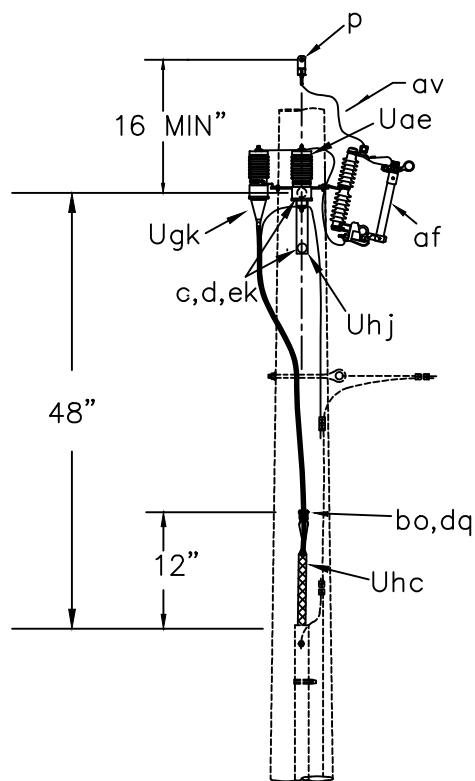
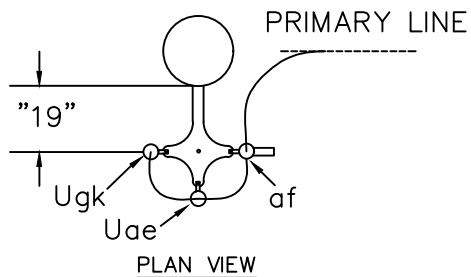
SINGLE PHASE CABLE
TERMINAL POLE WITH TWO BRACKETS

AUG 2016

RUS

1 - PHASE PRIMARY

UA1



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
p		Connectors, as required.
af	1	Fuse link.
af	1	Cutout
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	2	Locknuts
fn	1	Bracket, cutout extension.
Uae	1*	Surge arrester
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

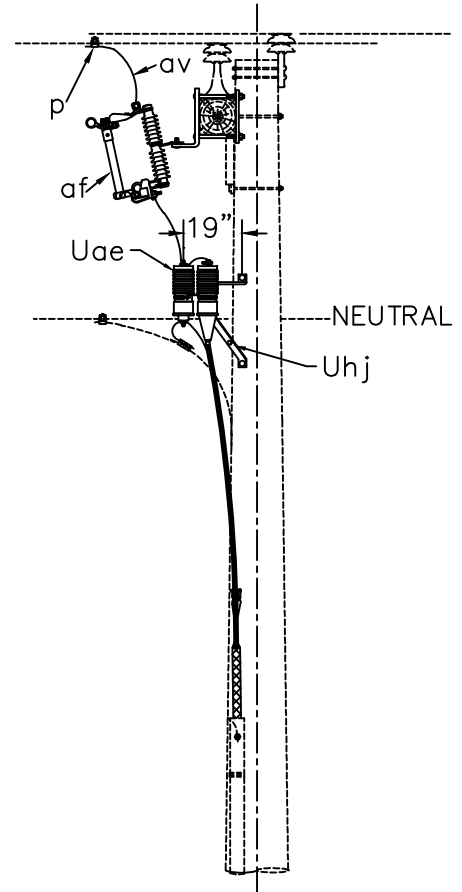
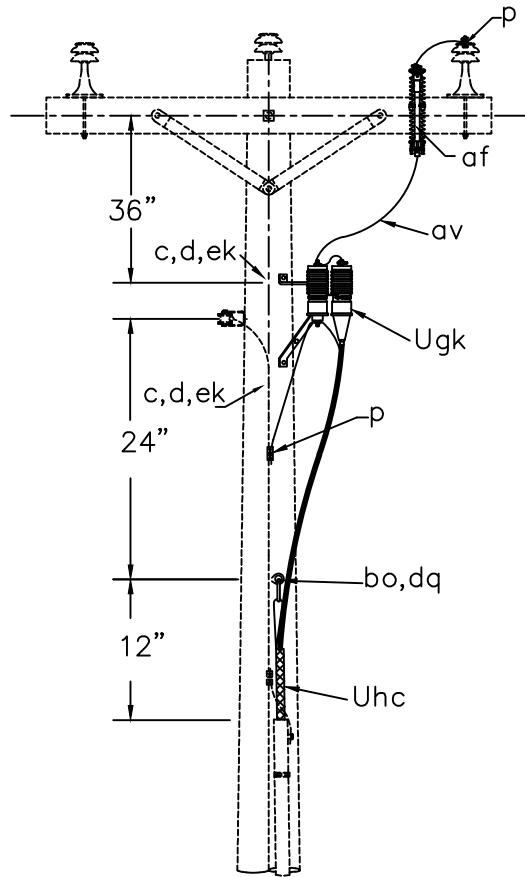
SINGLE PHASE CABLE
TERMINAL POLE WITH ONE BRACKET

AUG 2016

RUS

1 - PHASE PRIMARY

UA2



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
j		Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	1	Fuse link.
af	1	Cutout.
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	2	Locknuts.
Uae	1*	Surge arrester.
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS

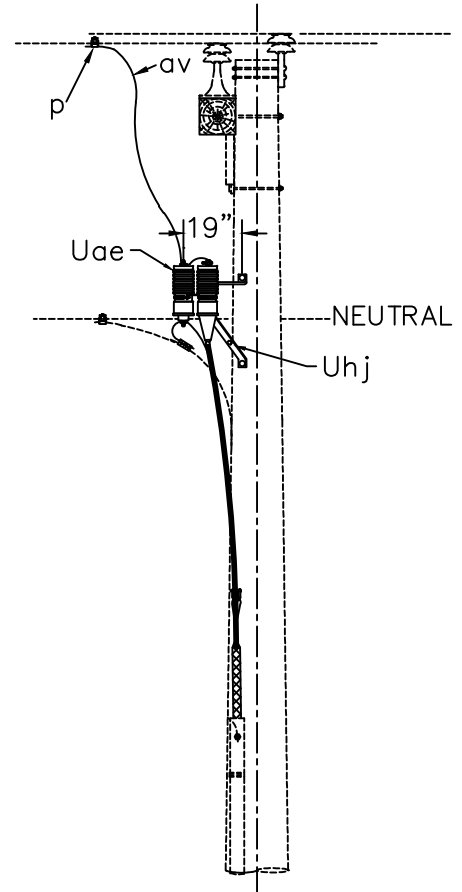
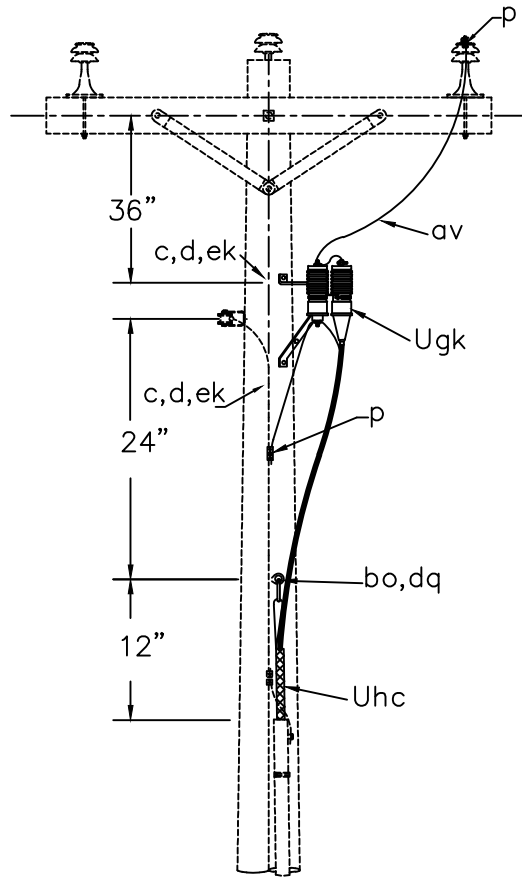
SINGLE PHASE CABLE TERMINAL POLE
WITH CROSSARM MOUNTED CUTOUT

AUG 2016

RUS

1 - PHASE PRIMARY

UA3



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
j		Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	1	Fuse link.
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	2	Locknuts
Uae	1*	Surge arrester
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS

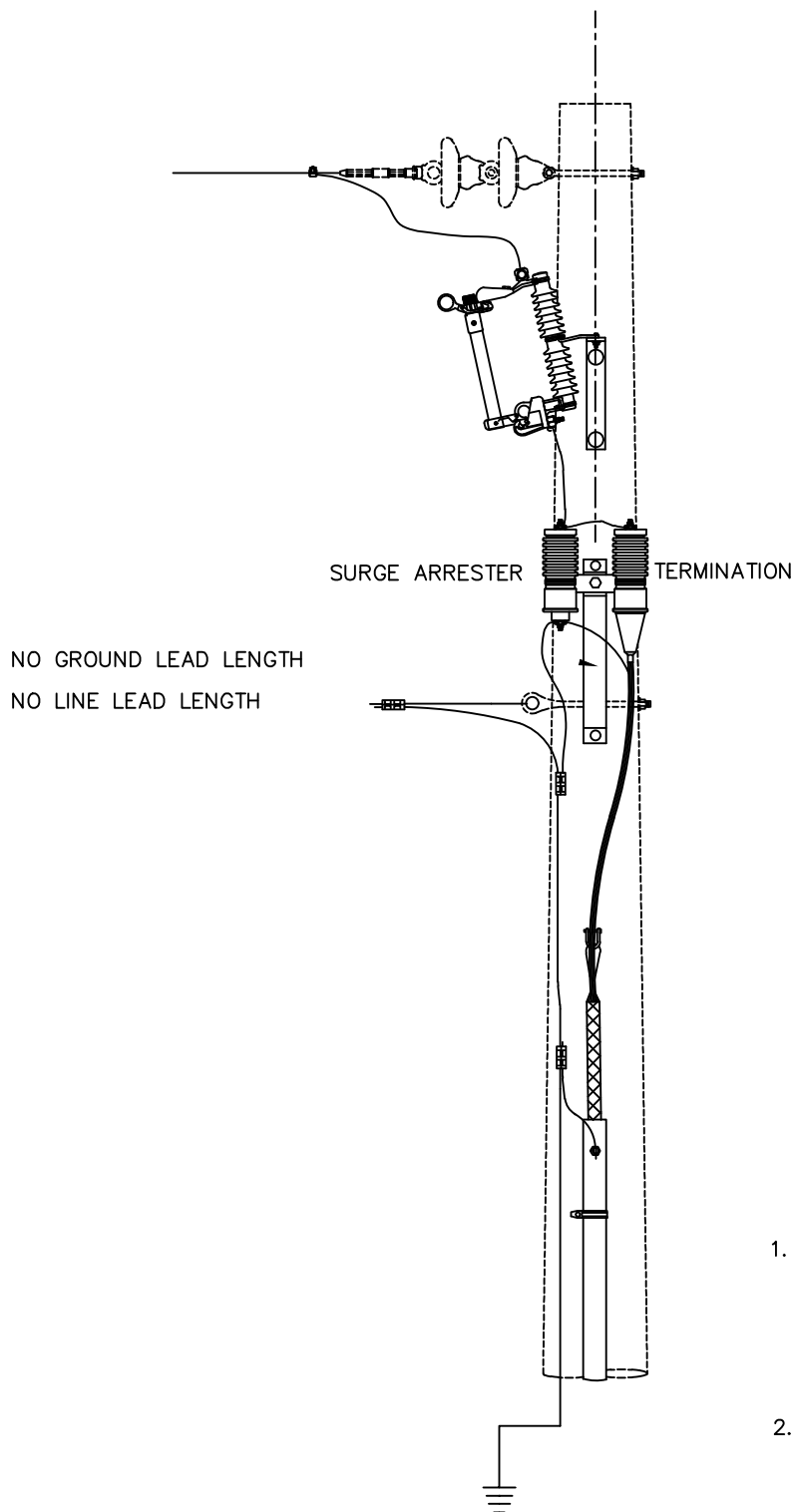
SINGLE PHASE CABLE TERMINAL
POLE WITHOUT CUTOUT

AUG 2016

RUS

1 - PHASE PRIMARY

UA4



NOTES:

1. ARRESTER LEAD LENGTH IS ZERO IF SOURCE VOLTAGE LEAD GOES DIRECTLY TO ARRESTER THEN TO CABLE TERMINATION AND THE GROUND LEAD GOES DIRECTLY FROM CABLE TERMINATION TO ARRESTER TO POLE GROUND.
2. LEAD WIRE FROM LINE TO ARRESTER TO TERMINATION SHOULD BE OF A SIZE EQUIVALENT TO RISER CONDUCTOR. CONNECTORS ON ARRESTER AND TERMINATION SHOULD BE SPECIFIED TO ACCOMODATE LEAD WIRE.

GUIDELINE ONLY

CABLE TERMINAL POLE ARRESTER
CONNECTION GUIDE

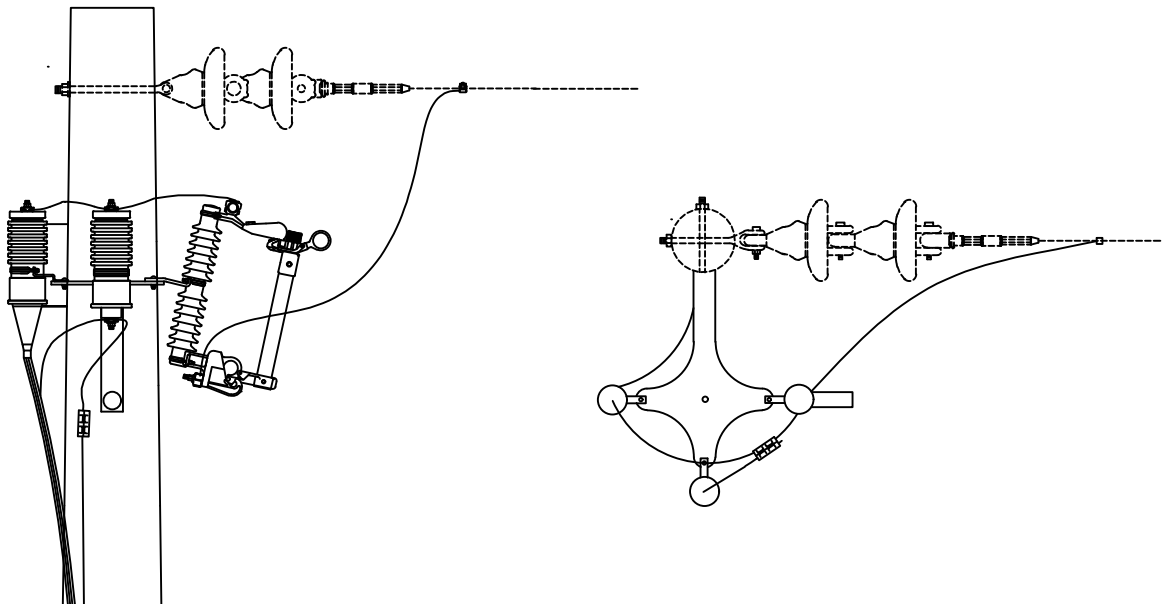
AUG 2016

RUS

UA.G

REVISED CONNECTIONS FOR UNDERGROUND SOURCE

1. OBJECTIVE: FUSE TUBE IS NOT ENERGIZED WHEN FUSE TUBE IS OPEN
2. MATERIAL SAME AS NORMAL FEED RISER ASSEMBLY



ALTERNATE CONNECTION
FOR UNDERGROUND SOURCE GUIDE

AUG 2016

RUS

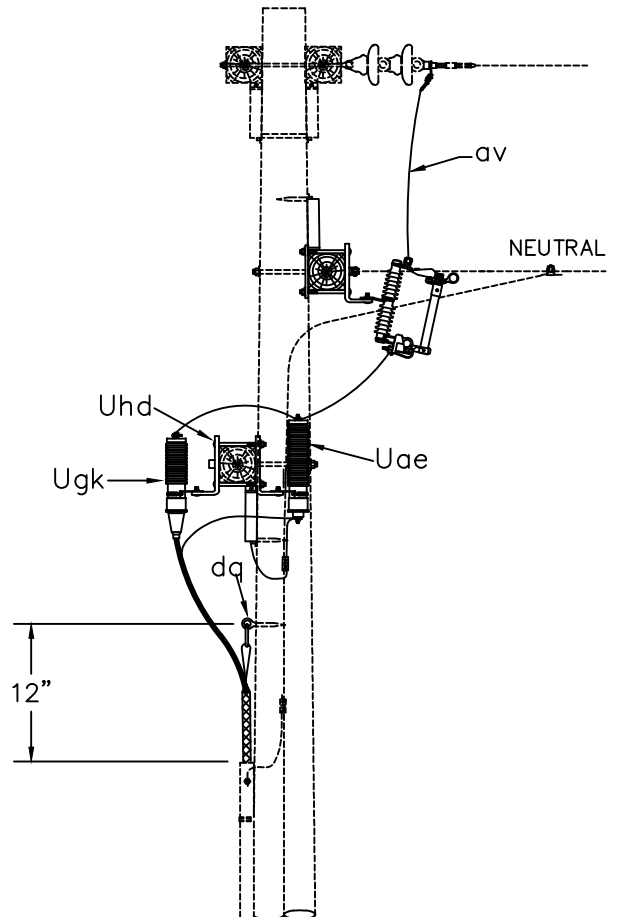
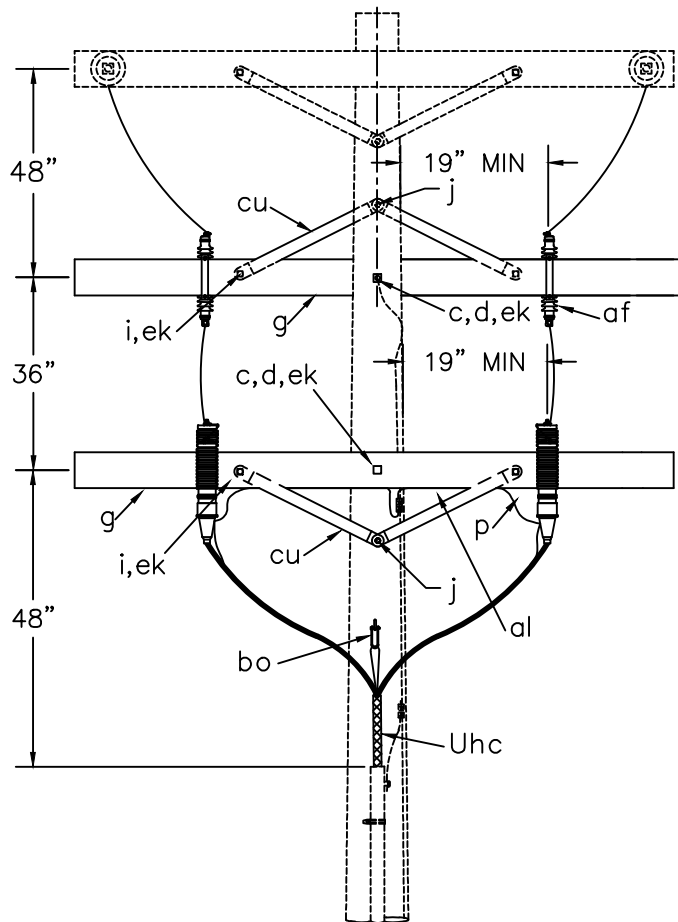
UA1.USG

TWO PHASE RISER POLE ASSEMBLY UNITS**DRAWING NUMBERS**

1728F-806	1728F-806
(New)	(Old)

DRAWING TITLE (DESCRIPTION)

UB1	(UB1)	TWO PHASE CABLE TERMINAL POLE WITH CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UB2	(UB2)	TWO PHASE CABLE TERMINAL POLE WITH CUTOUTS AND BRACKET MOUNTING ARRESTERS
UB3	(UB3)	TWO PHASE CABLE TERMINAL POLE WITHOUT CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UB4	(UB4)	TWO PHASE CABLE TERMINAL POLE WITHOUT CUTOUTS AND BRACKET MOUNTING ARRESTERS
UB5		TWO PHASE CABLE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UB6		TWO PHASE CABLE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND BRACKET MOUNTING ARRESTERS



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	4	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" as required.
p		Connectors, as required.
af	2	Cutout
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	4	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	6	Locknuts, as required.
Uae	2*	Surge arrester
Ugc	2	Cable termination.
Uhc	2	Cable support.
Uhd	2	Crossarm mounting bracket.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

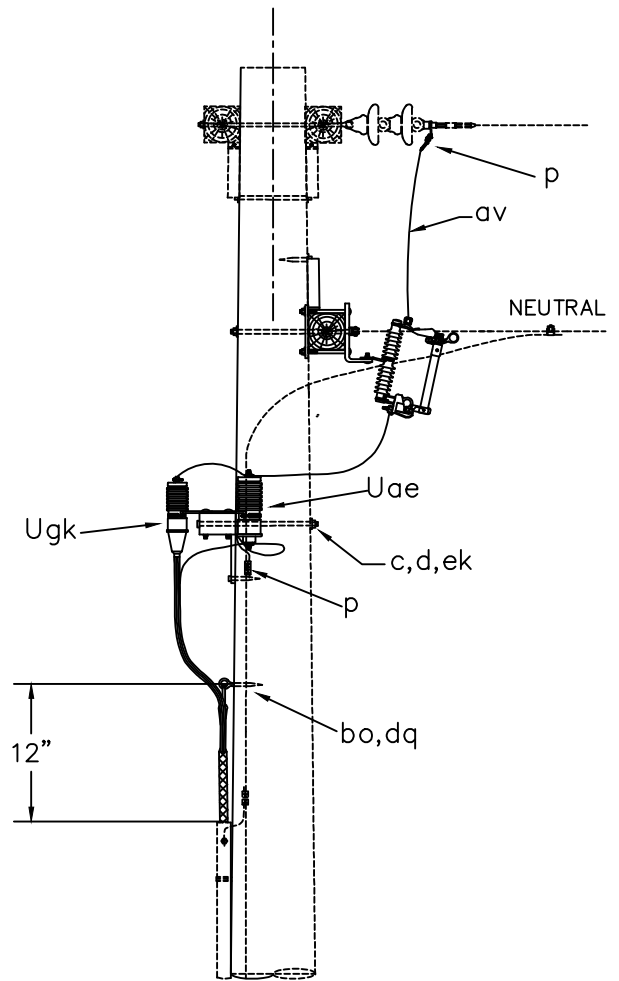
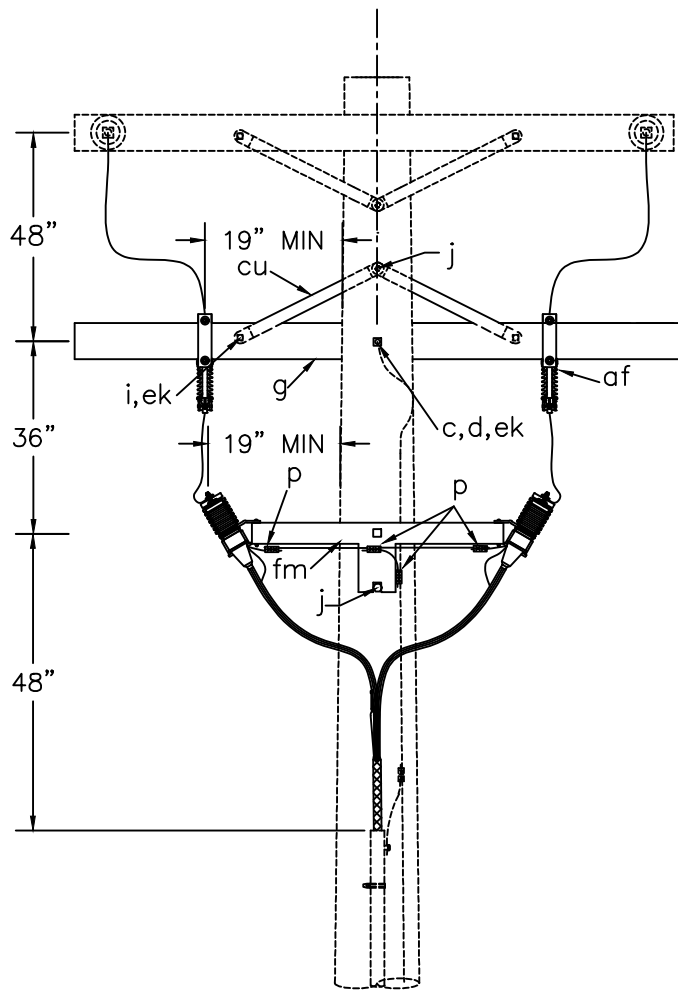
TWO PHASE CABLE TERMINAL POLE
WITH CUTOUTS AND CROSSARM
MOUNTING ARRESTERS

AUG 2016

RUS

2 - PHASE PRIMARY

UB1



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required 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	2	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	2	Cutout
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	4	Locknuts, as required.
fm	1	Mounting bracket.
Uae	2*	Surge arrester
Ugk	2	Cable termination.
Uhc	2	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

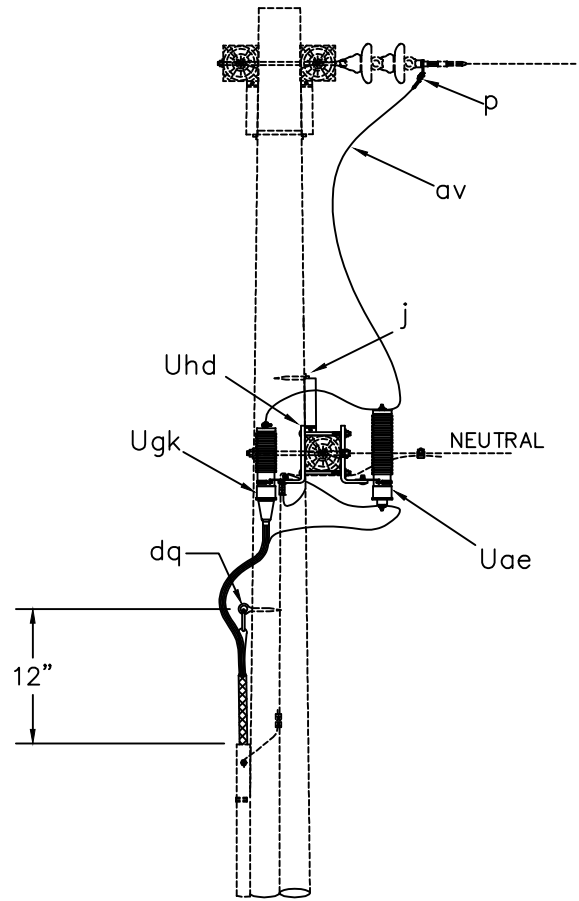
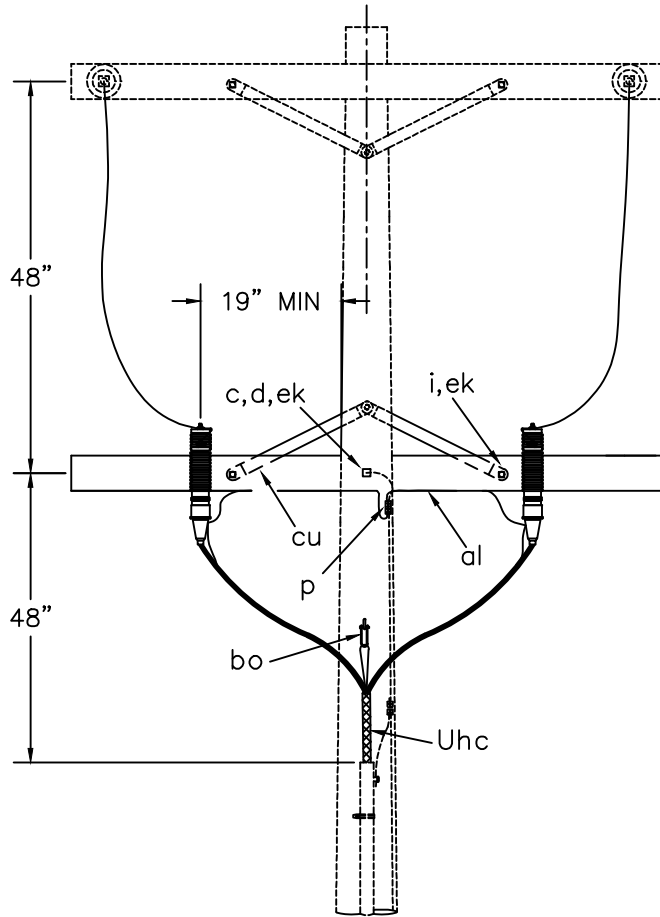
TWO PHASE CABLE TERMINAL POLE
WITH CUTOUTS AND BRACKET
MOUNTING ARRESTERS

AUG 2016

RUS

2 - PHASE PRIMARY

UB2



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
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 required.
p		Connectors, as required.
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	3	Locknuts, as required.
Uae	2*	Surge arrester
Ugk	2	Cable termination.
Uhc	2	Cable support.
Uhd	2	Crossarm mounting bracket.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

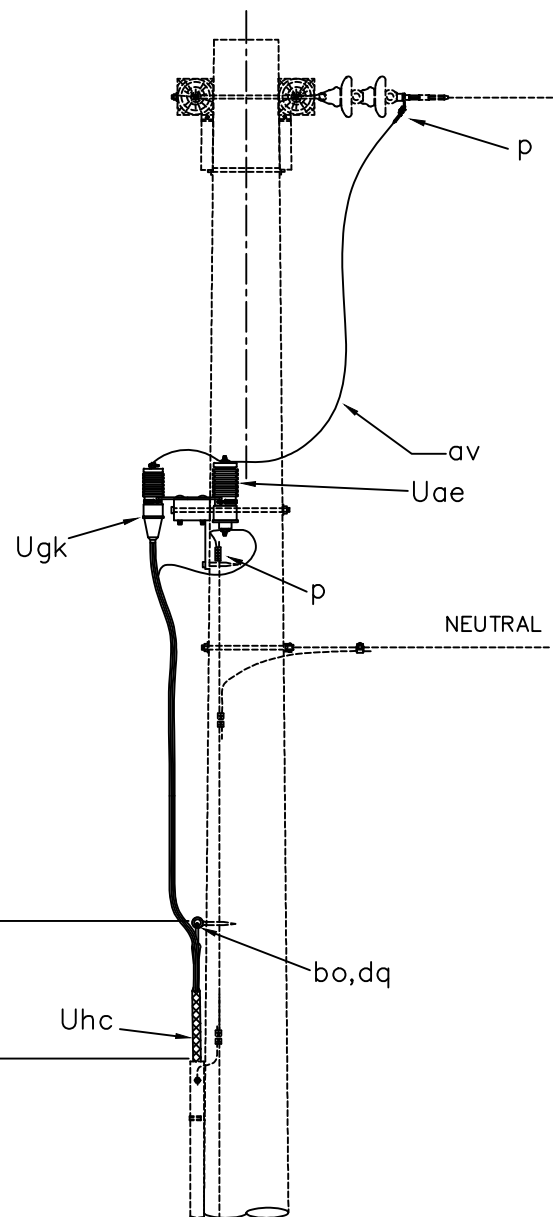
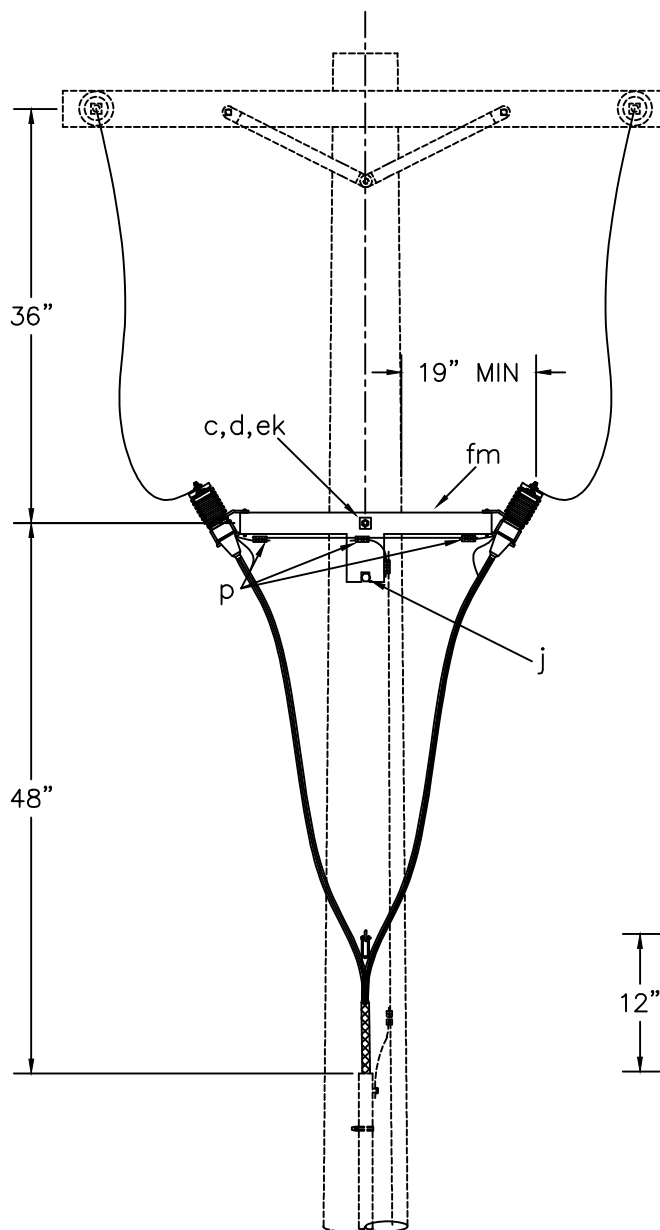
TWO PHASE CABLE TERMINAL POLE
WITHOUT CUTOOTS AND CROSSARM
MOUNTING ARRESTERS

AUG 2016

RUS

2 - PHASE PRIMARY

UB3



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
j	1	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
dq	1	Eye screw, elliptical or drive hook.
ek	1	Locknuts, as required.
fm	1	Mounting Bracket.
Uae	2*	Surge arrester
Ugk	2	Cable termination.
Uhc	2	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

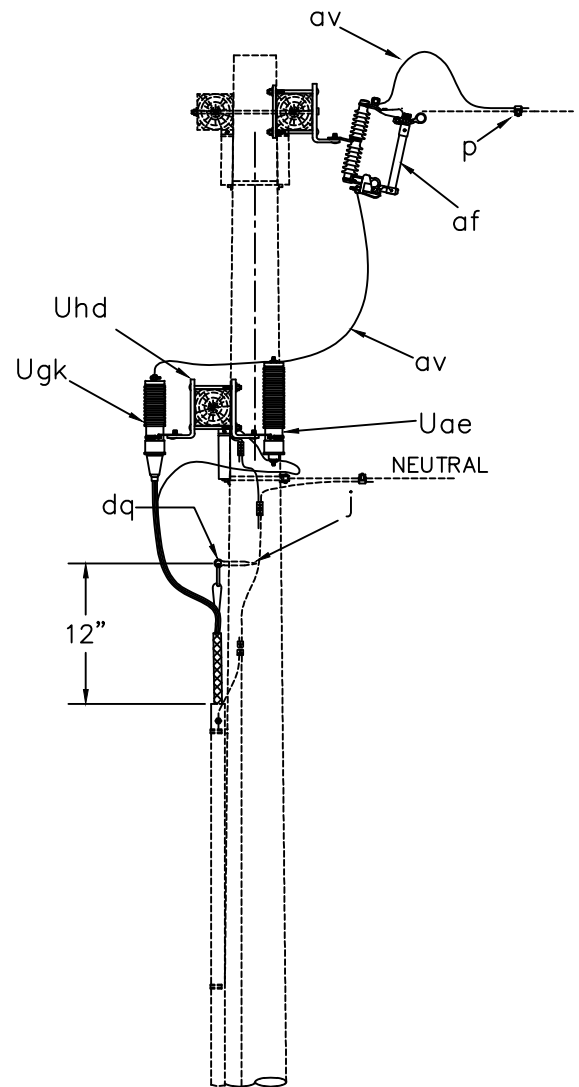
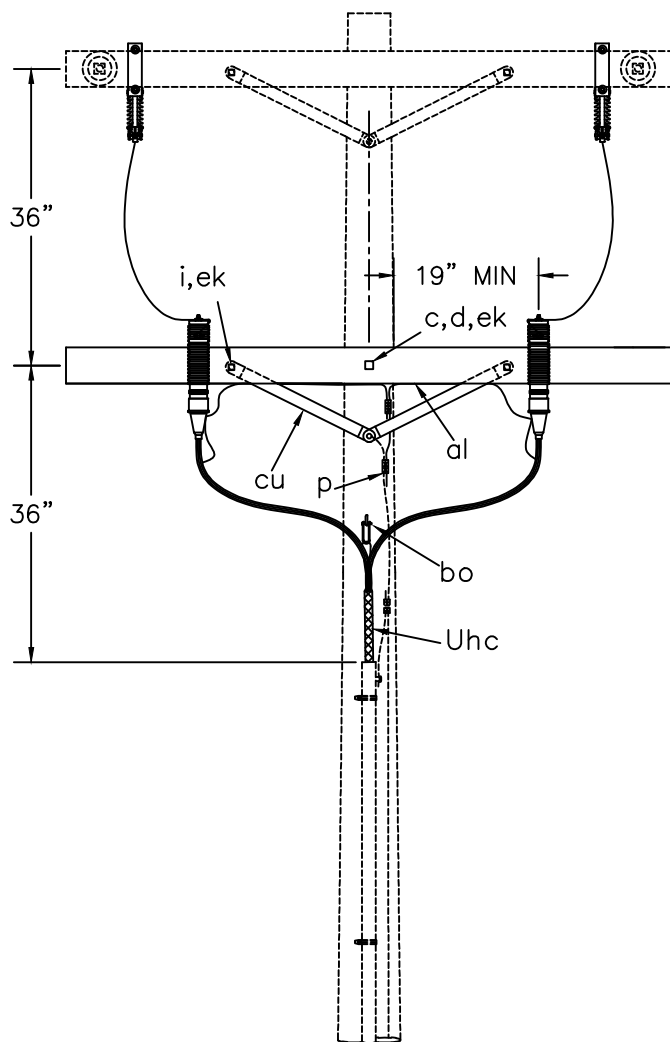
TWO PHASE CABLE TERMINAL POLE
WITHOUT CUTOUTS AND BRACKET
MOUNTING ARRESTERS

AUG 2016

RUS

2 - PHASE PRIMARY

UB4



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
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 required.
p		Connectors, as required.
af	2	Cutout
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	3	Locknuts, as required.
Uae	2*	Surge arrester
Ugk	2	Cable termination.
Uhc	2	Cable support.
Uhd	2	Crossarm mounting bracket.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

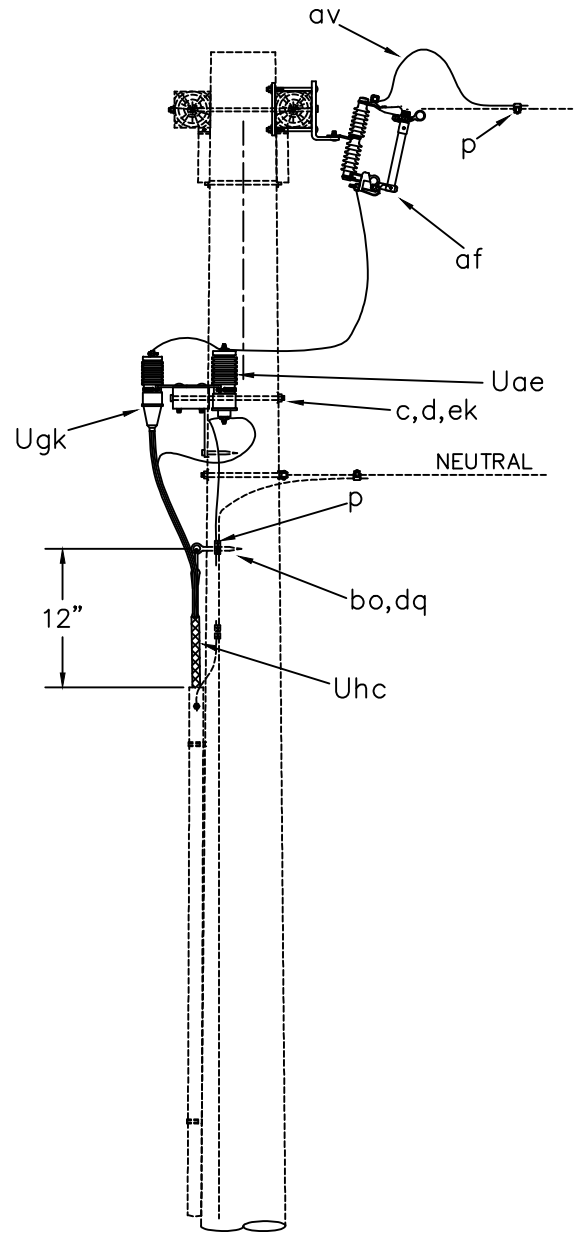
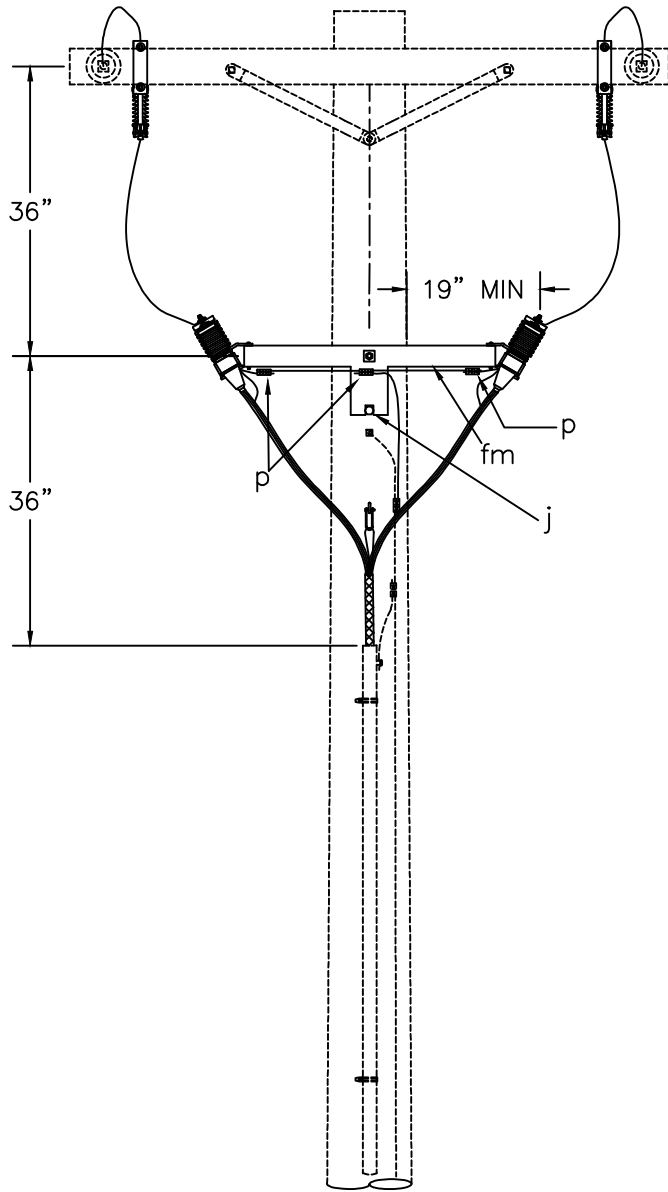
TWO PHASE CABLE TERMINAL POLE
WITH UPPER CROSSARM MOUNTING CUTOUTS
AND CROSSARM MOUNTING ARRESTERS

AUG 2016

RUS

2 - PHASE PRIMARY

UB5



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
j	1	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	2	Cutout
av		Jumpers, as required.
bo	1	Anchor, shackle.
ek	1	Locknuts, as required.
fm	1	Mounting bracket.
dq	1	Eye screw, elliptical or drive hook.
Uae	2*	Surge arrester
Ugk	2	Cable termination.
Uhc	2	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

TWO PHASE CABLE TERMINAL POLE
WITH UPPER CROSSARM MOUNTING CUTOUTS
AND BRACKET MOUNTING ARRESTERS

AUG 2016

RUS

2 - PHASE PRIMARY

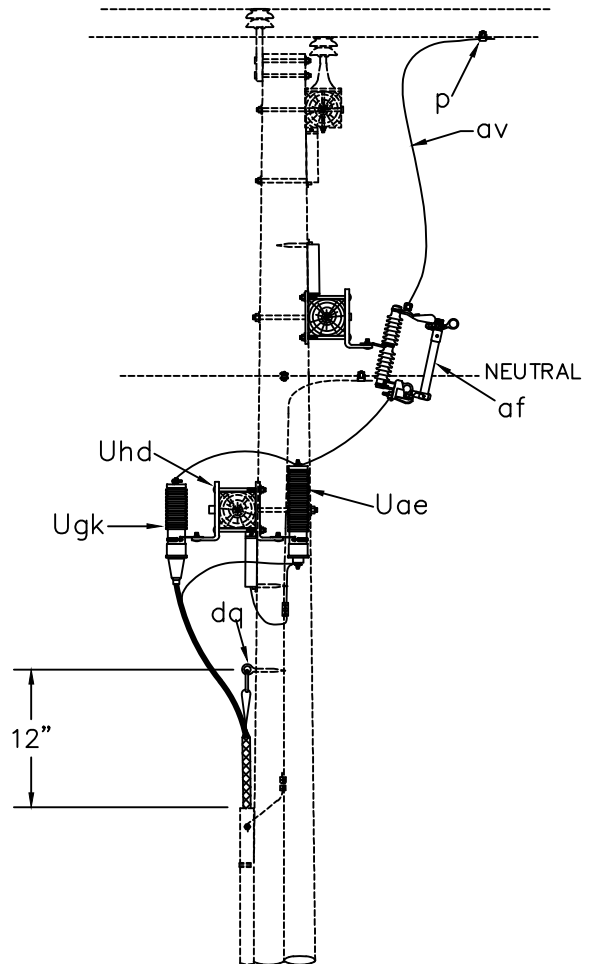
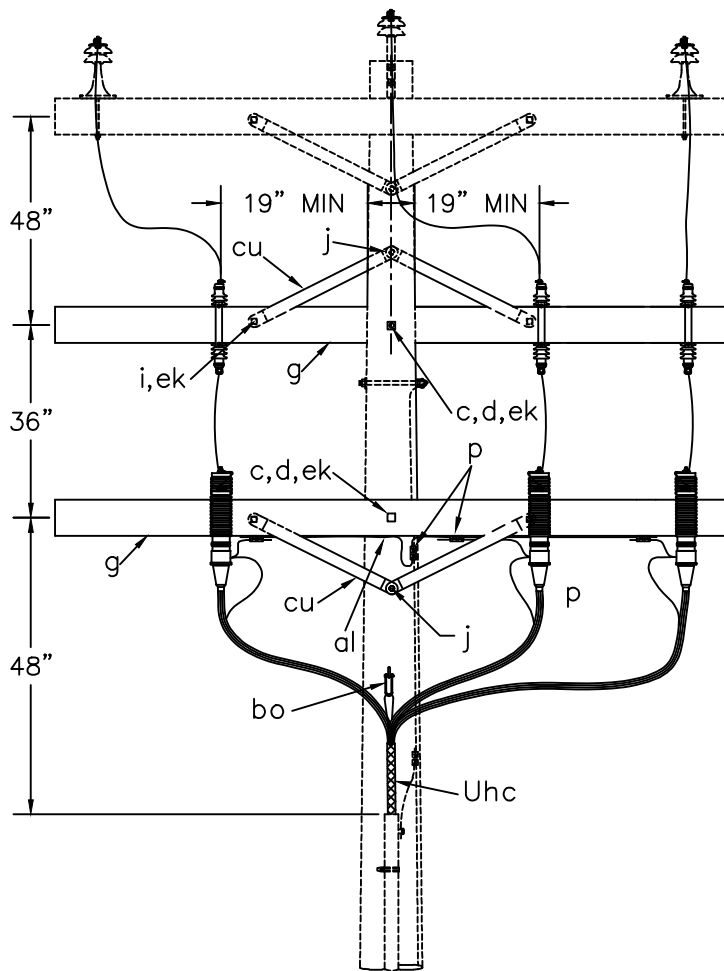
UB6

THREE PHASE RISER POLE ASSEMBLY UNITS**DRAWING NUMBERS**

1728F-806	1728F-806
(New)	(Old)

DRAWING TITLE (DESCRIPTION)

UC1	(UC1)	THREE PHASE CABLE TERMINAL POLE WITH CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UC2	(UC2)	THREE PHASE CABLE TERMINAL POLE WITH CUTOUTS AND BRACKETS MOUNTING ARRESTERS
UC3		THREE PHASE CABLE TERMINAL POLE WITHOUT CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UC4		THREE PHASE CABLE TERMINAL POLE WITHOUT CUTOUTS AND BRACKET MOUNTING ARRESTERS
UC5		THREE PHASE CABLE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UC6	(UC2-1) (UC2-2)	THREE PHASE CABLE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND BRACKET MOUNTING ARRESTERS
UC7.1		BRACKET MOUNTED SWITCHES
UC7.2	(UC5-1,UC6-1)	HORIZONTAL MOUNTED SWITCHES
UC7.3		VERTICAL SWITCHES MOUNTED ON THREE CROSSARMS
UC7.4		VERTICAL SWITCHES MOUNTED ON FOUR CROSSARMS
UC8.1		THREE PHASE CABLE TERMINAL POLE WITH VERTICAL FRAMING AND TWO BRACKETS PER PHASE
UC8.2		THREE PHASE CABLE TERMINAL POLE WITH VERTICAL FRAMING AND ONE BRACKET PER PHASE



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	4	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" as required.
p		Connectors, as required.
af	3	Cutout
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	4	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	6	Locknuts, as required.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.
Uhd	3	Crossarm mounting bracket.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.
4. NEUTRAL POSITION MAY VARY.

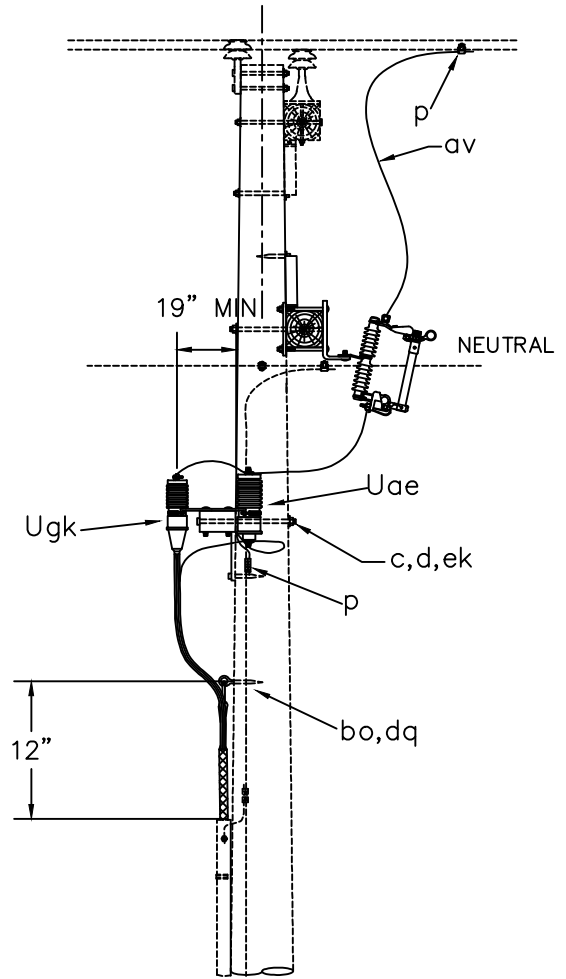
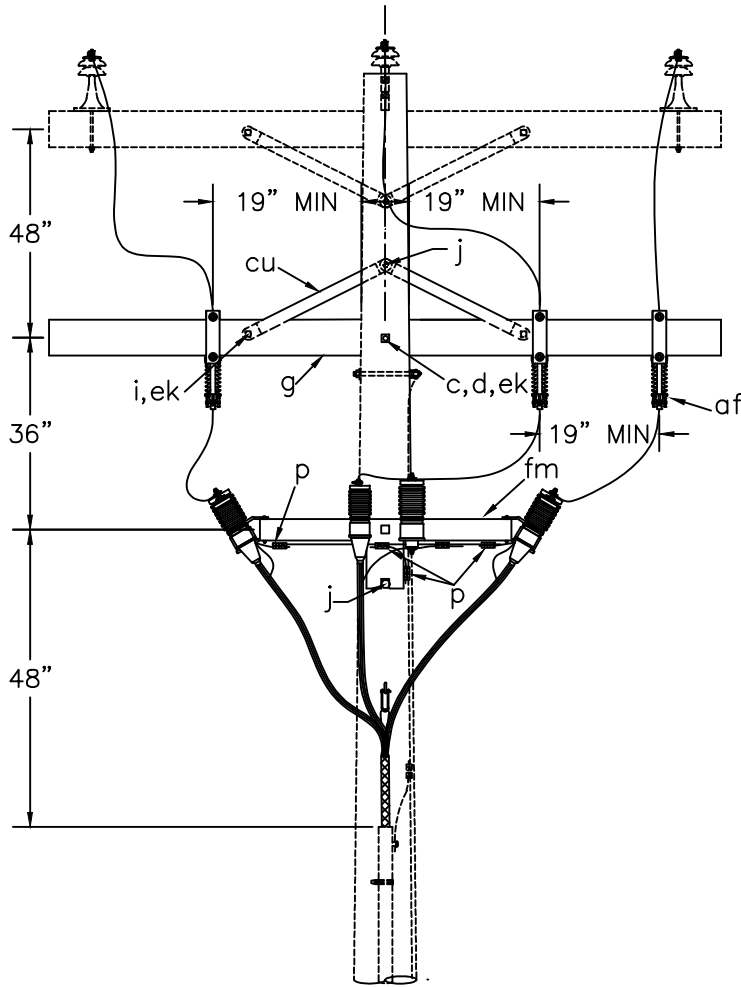
THREE PHASE CABLE TERMINAL POLE
WITH CUTOUTS AND CROSSARM
MOUNTING ARRESTERS

AUG 2016

RUS

3 - PHASE PRIMARY

UC1



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required 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	2	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	2	Cutout
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	4	Locknuts, as required.
fm	1	Mounting bracket.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

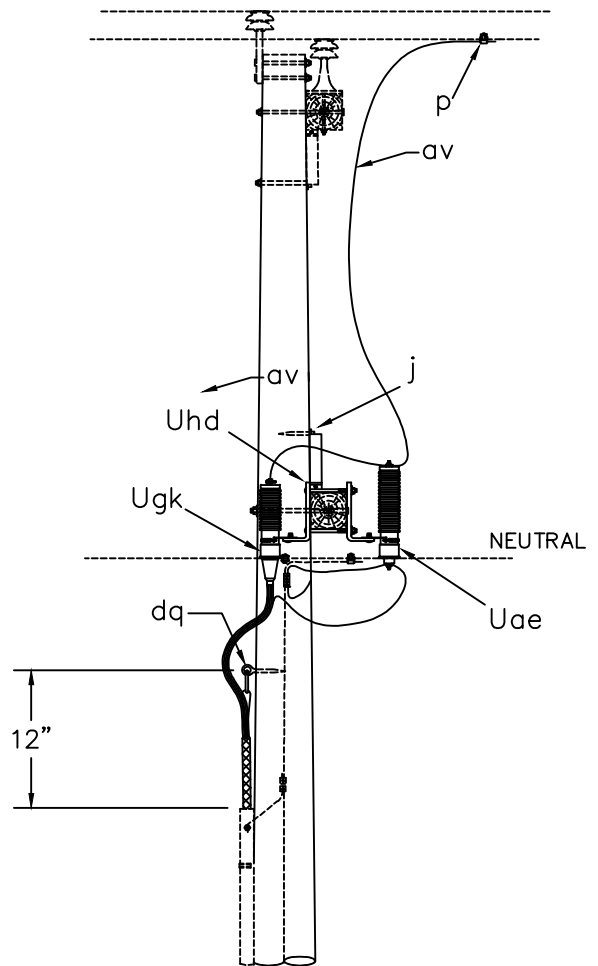
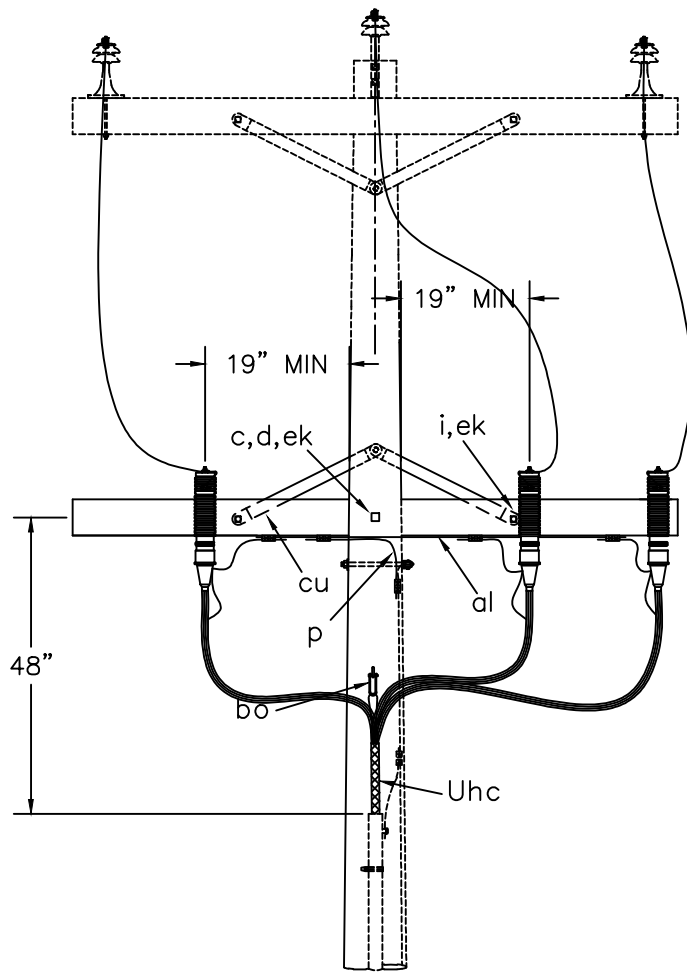
THREE PHASE CABLE TERMINAL POLE
WITH CUTOUTS AND BRACKET
MOUNTING ARRESTERS

AUG 2016

RUS

3 - PHASE PRIMARY

UC2



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
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	1	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	3	Locknuts, as required.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.
Uhd	3	Crossarm mounting bracket.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

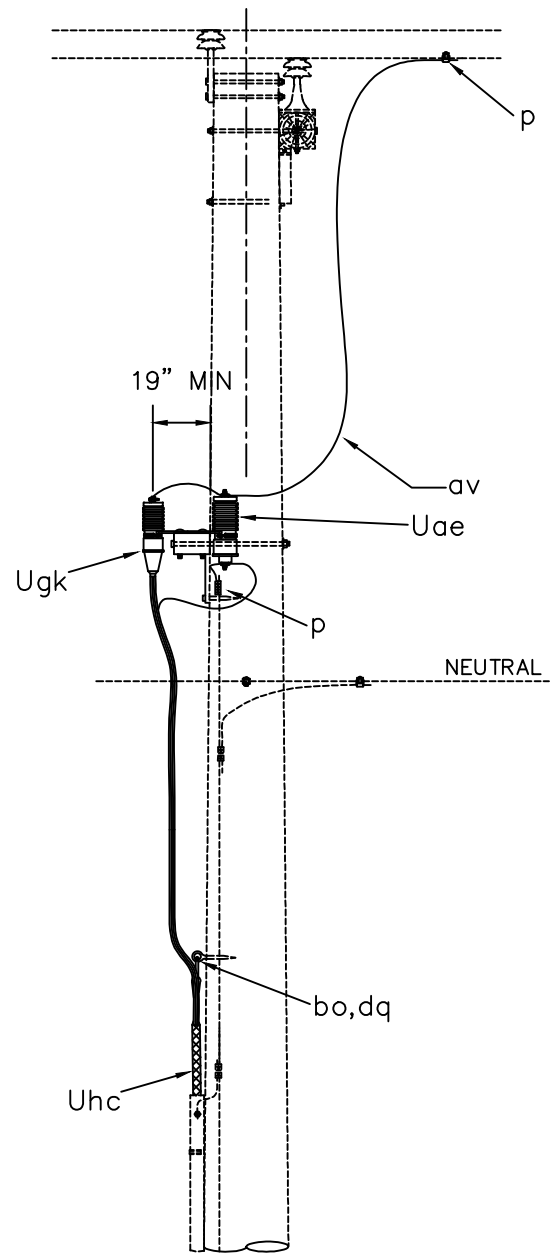
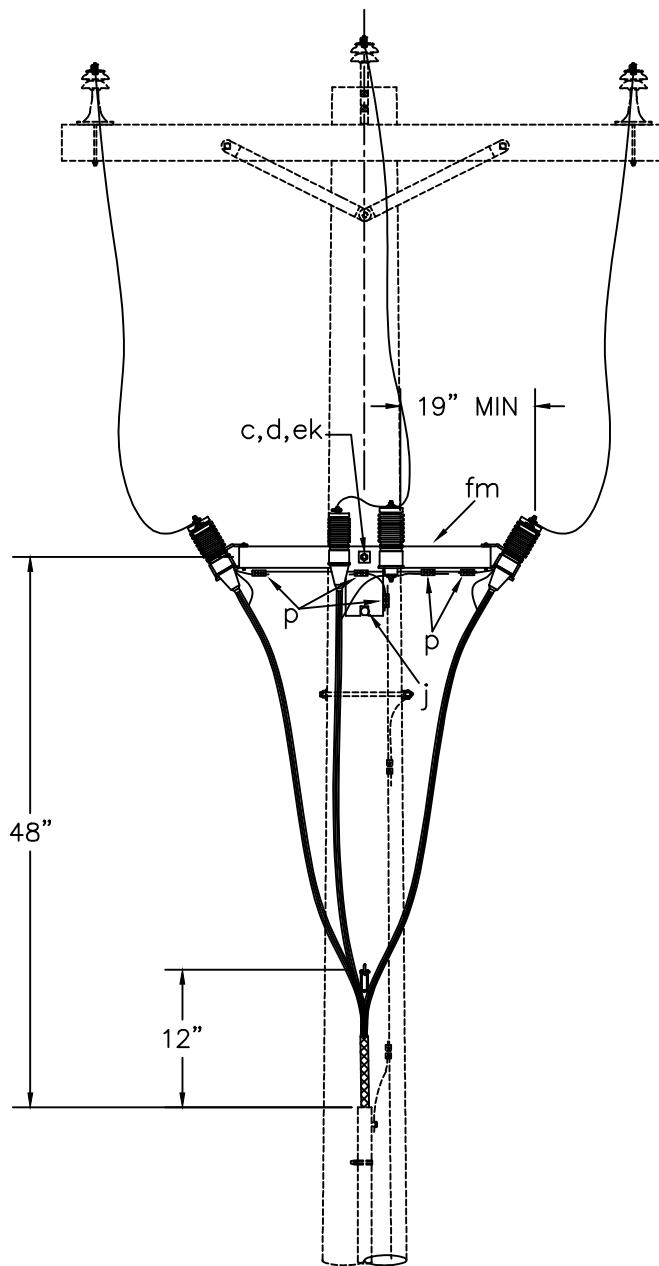
THREE PHASE CABLE TERMINAL POLE
WITHOUT CUTOUTS AND CROSSARM
MOUNTING ARRESTERS

AUG 2016

RUS

3 - PHASE PRIMARY

UC3



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
j	1	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
dq	1	Eye screw, elliptical or drive hook.
ek	1	Locknuts, as required.
fm	1	Mounting Bracket.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

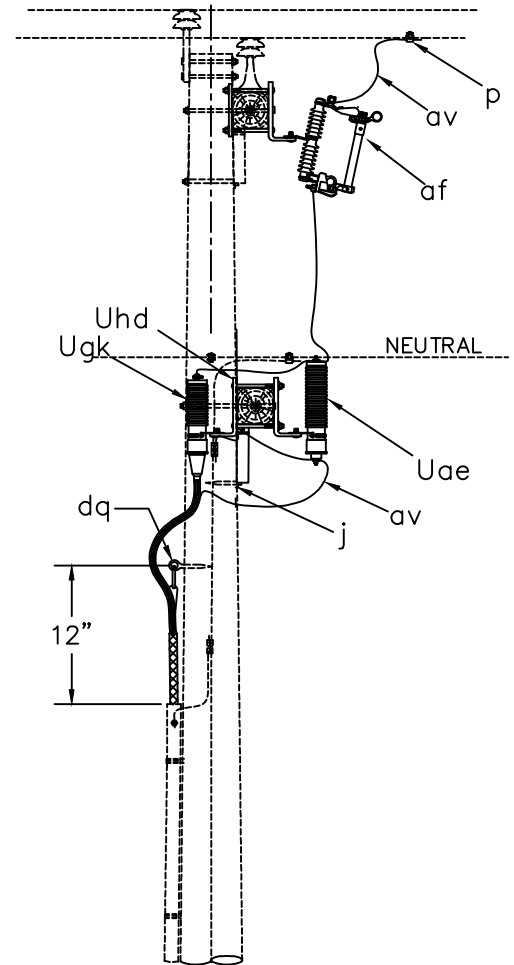
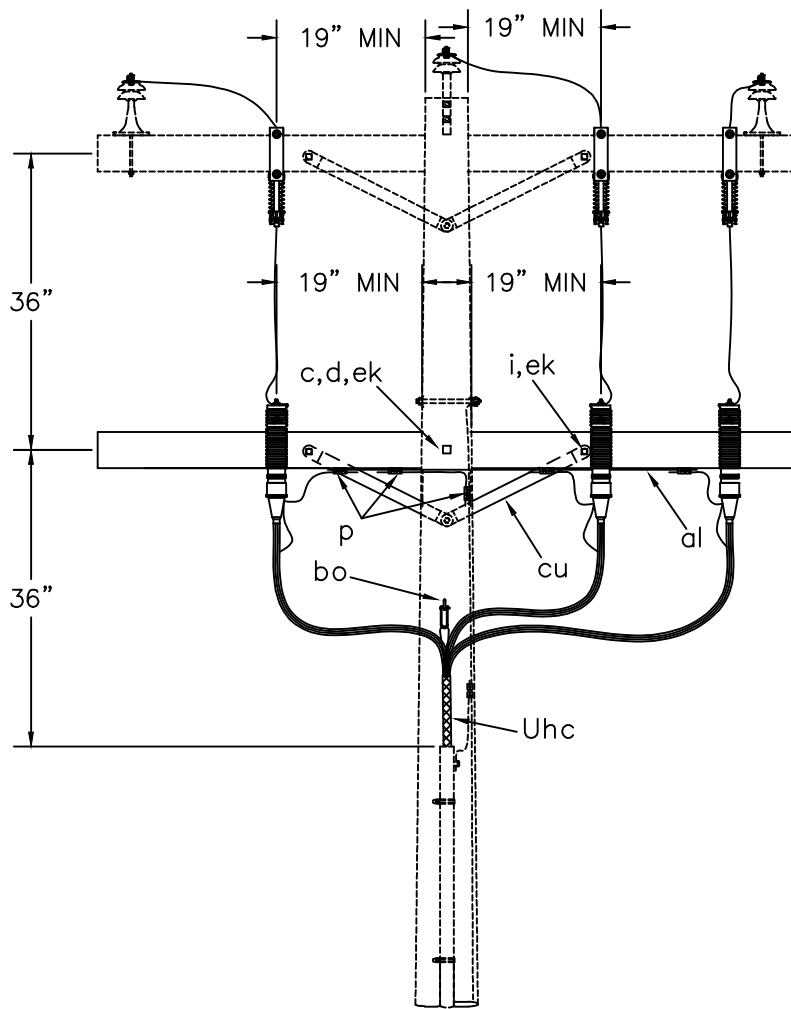
THREE PHASE CABLE TERMINAL POLE
WITHOUT CUTOOTS AND BRACKET
MOUNTING ARRESTERS

AUG 2016

RUS

3 - PHASE PRIMARY

UC4



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
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	1	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	3	Cutout
al		Staples, as required.
av		Jumpers, as required.
bo	1	Anchor, shackle.
cu	2	Brace, wood, 28"
dq	1	Eye screw, elliptical or drive hook.
ek	3	Locknuts, as required.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.
Uhd	3	Crossarm mounting bracket.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

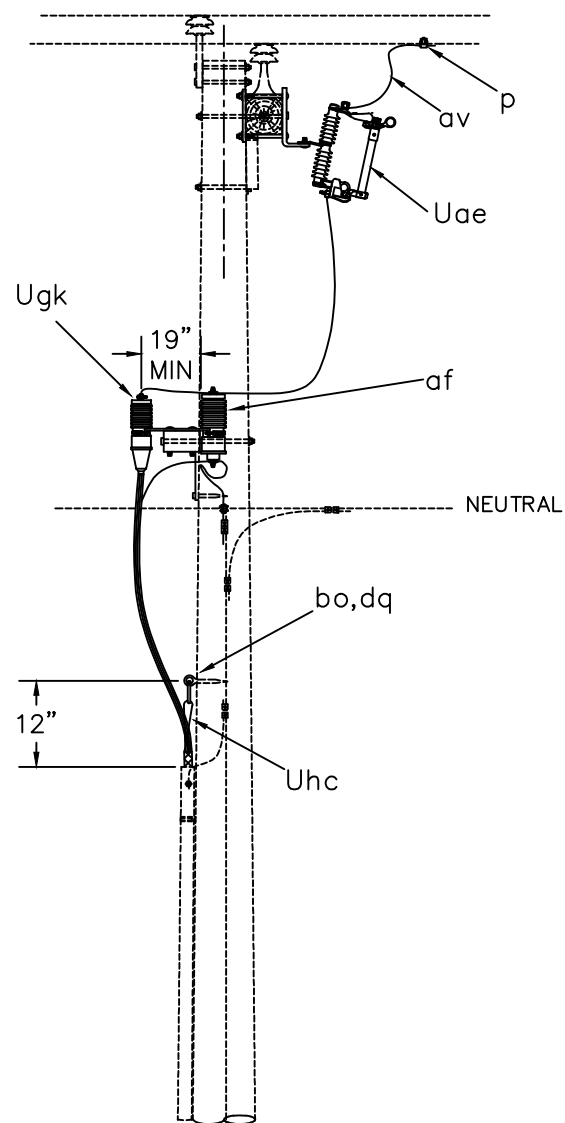
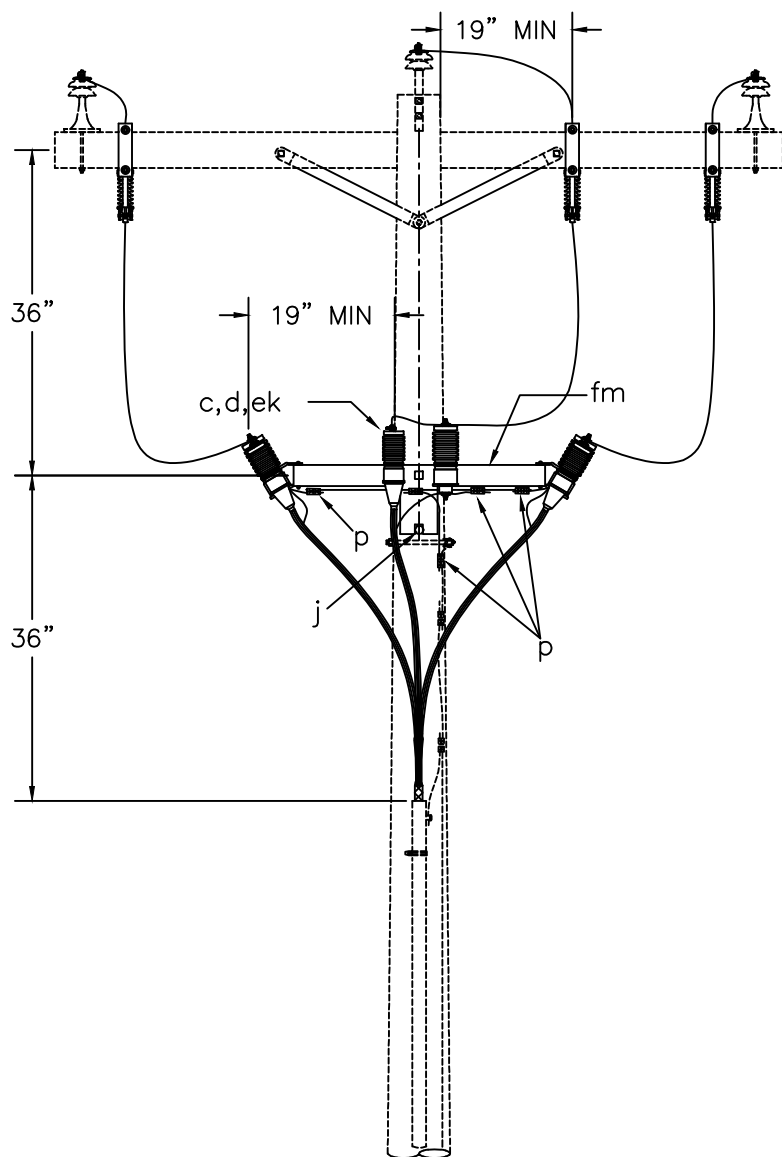
THREE PHASE CABLE TERMINAL POLE
WITH UPPER CROSSARM MOUNTING CUTOUTS
AND CROSSARM MOUNTING ARRESTERS

AUG 2016

RUS

3 - PHASE PRIMARY

UC5



ITEM	QTY.	MATERIAL
c	1	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
j	1	Screw, lag 1/2" x 4" as required.
p		Connectors, as required.
af	3	Cutout
av		Jumpers, as required.
bo	1	Anchor, shackle.
ek	1	Locknuts, as required.
fm	1	Mounting bracket.
dq	1	Eye screw, elliptical or drive hook.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.
4. THIS UNIT ALLOWS MORE ROOM FOR COMMUNICATIONS ATTACHMENTS.

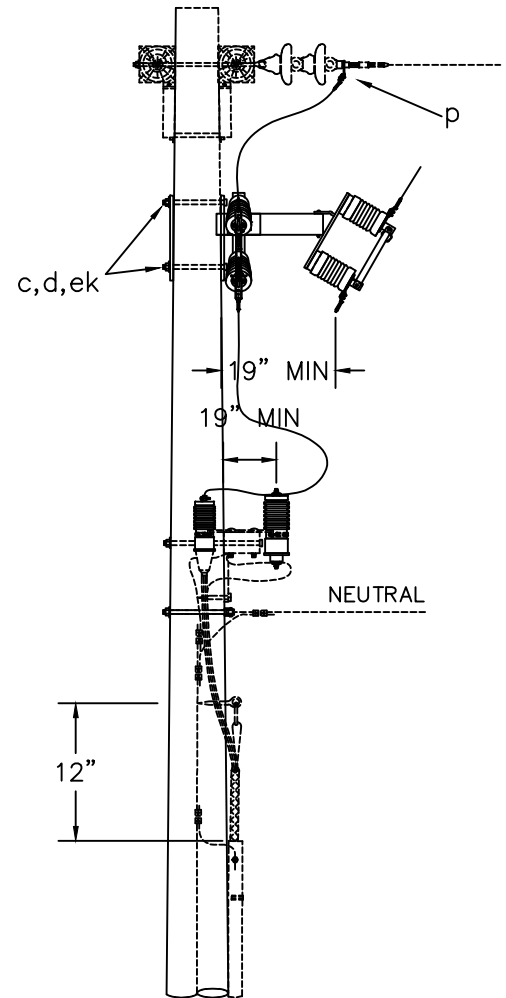
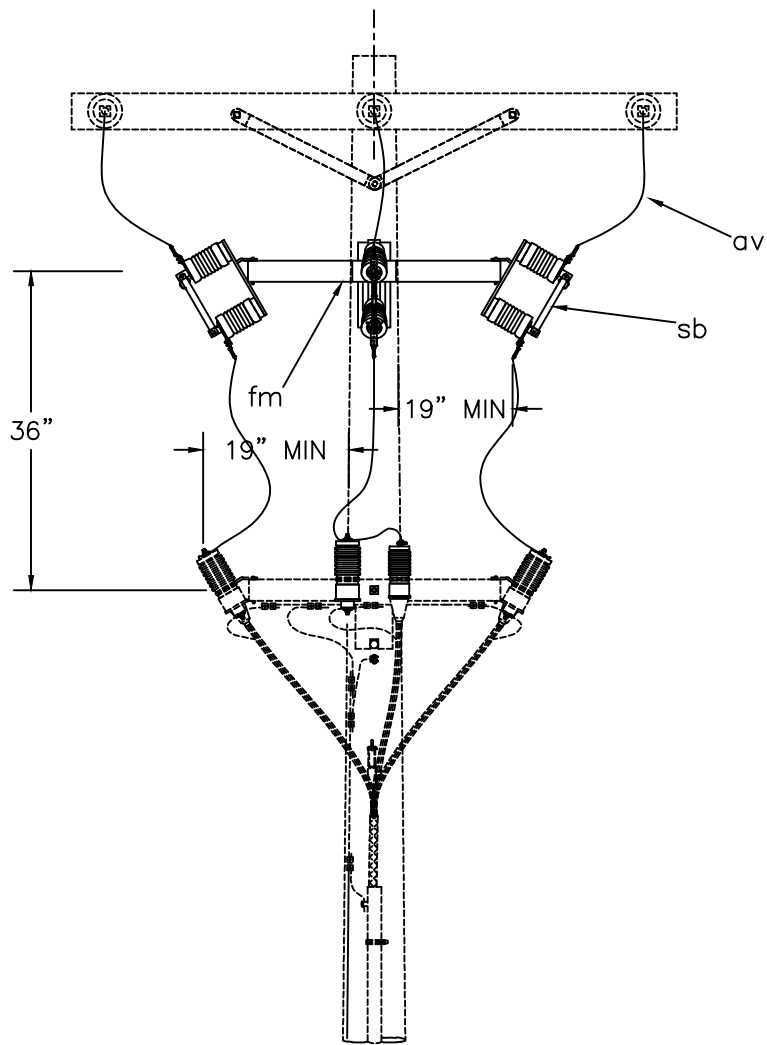
THREE PHASE CABLE TERMINAL POLE
WITH UPPER CROSSARM MOUNTING CUTOUTS
AND BRACKET MOUNTING ARRESTERS

AUG 2016

RUS

3 - PHASE PRIMARY

UC6



NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	4	Washer, square 2 1/4".
p		Connectors, as required.
av		Jumpers, as required.
ek	2	Locknuts, as required.
fm	1	Mounting bracket
sb	3	Disconnect, 600 A load break.

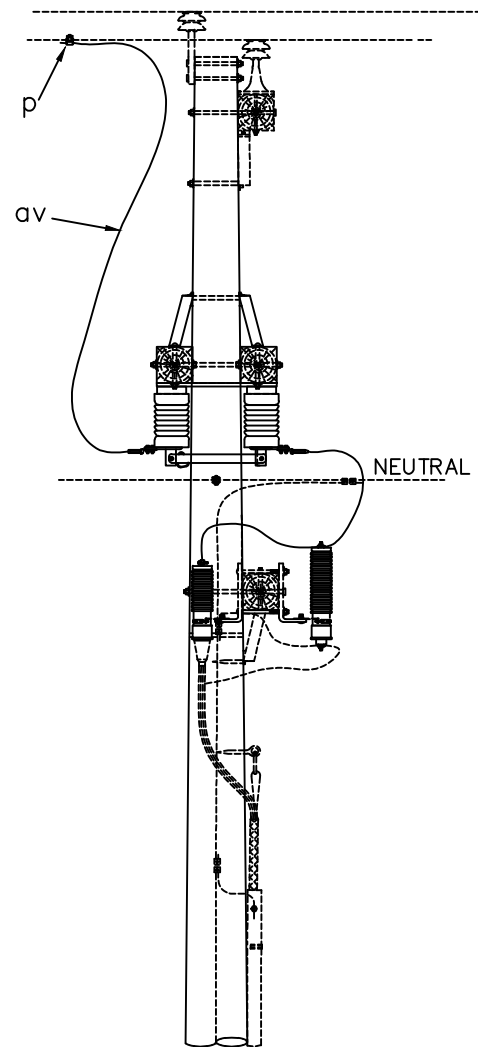
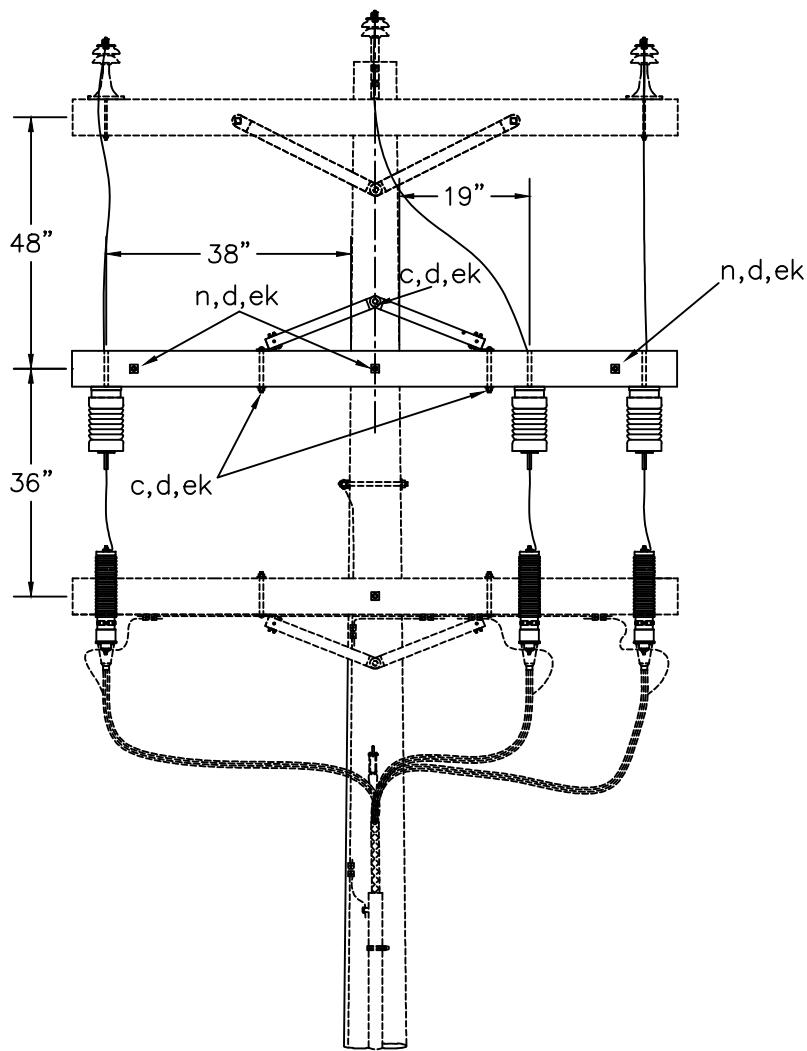
BRACKET MOUNTED SWITCHES

AUG 2016

RUS

3 - PHASE PRIMARY

UC7.1



ITEM	QTY.	MATERIAL
c	4	Bolt, machine, 1/2" x required length.
c	1	Bolt, machine, 5/8" x required length.
d	4	Washer, 1 3/8" x 9/16" round.
d	11	Washer, square 2 1/4".
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
n	3	Bolt, double arming, 5/8" x req'd length.
p		Connectors, as required.
av		Jumpers, as required.
cu	4	Brace, crossarm 60" span.
ek	15	Locknuts, as required.
sb	3	Disconnect, 600 A load break.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

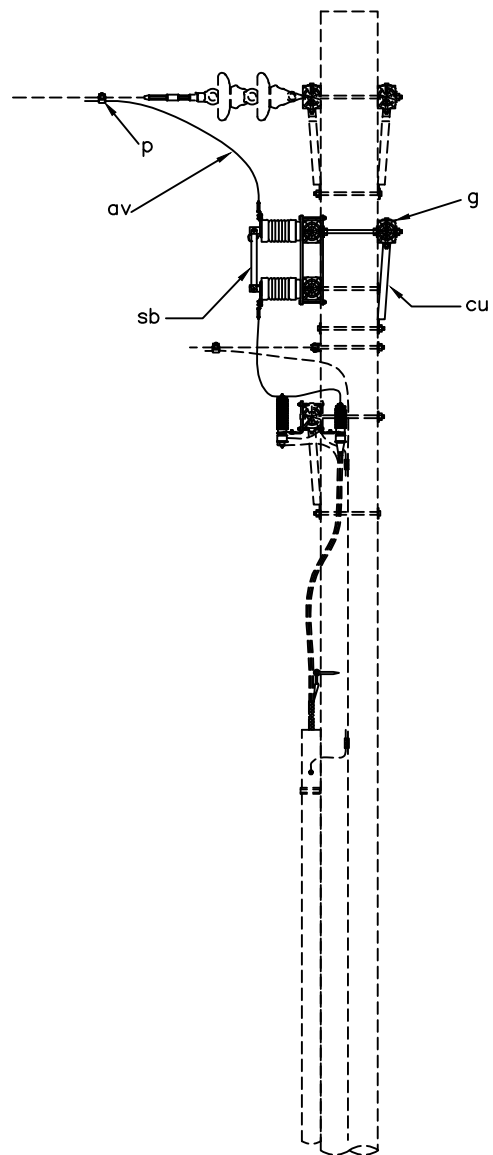
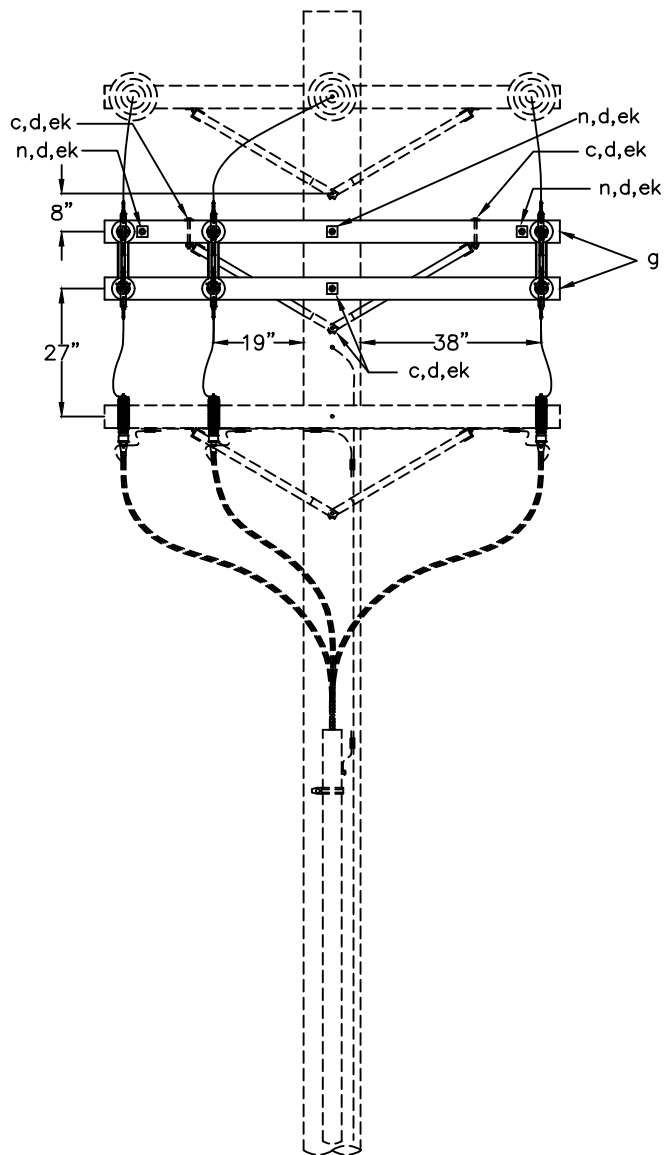
HORIZONTAL MOUNTED SWITCHES

AUG 2016

RUS

3 - PHASE PRIMARY

UC7.2



ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 1/2" x required length.
c	2	Bolt, machine, 5/8" x required length.
d	2	Washer, 1 3/8" x 9/16" round.
d	13	Washer, square 2 1/4".
g	3	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
n	3	Bolt, double arming, 5/8" x req'd length.
p		Connectors, as required.
av		Jumpers, as required.
cu	2	Brace, crossarm 60" span.
ek	14	Locknuts, as required.
sb	3	Disconnect, 600 A load break.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

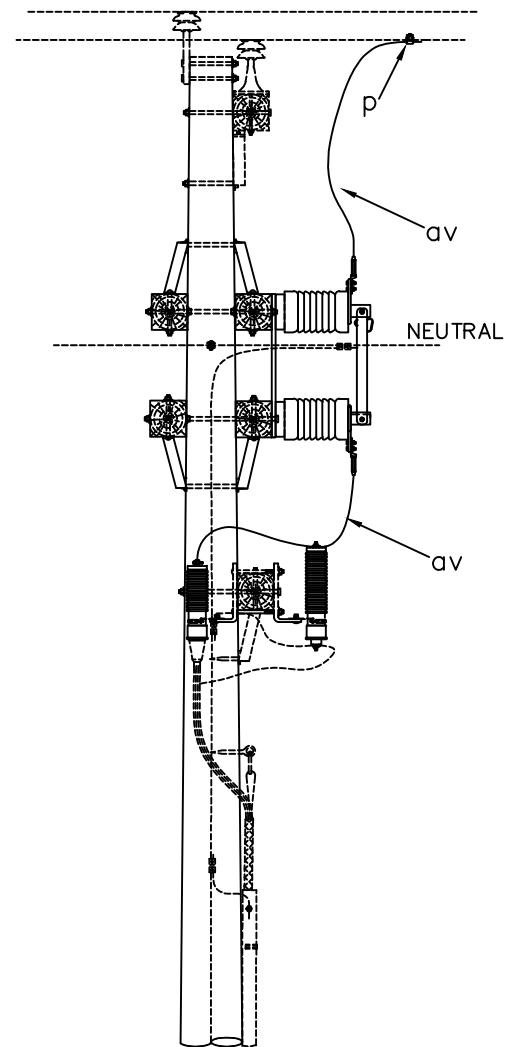
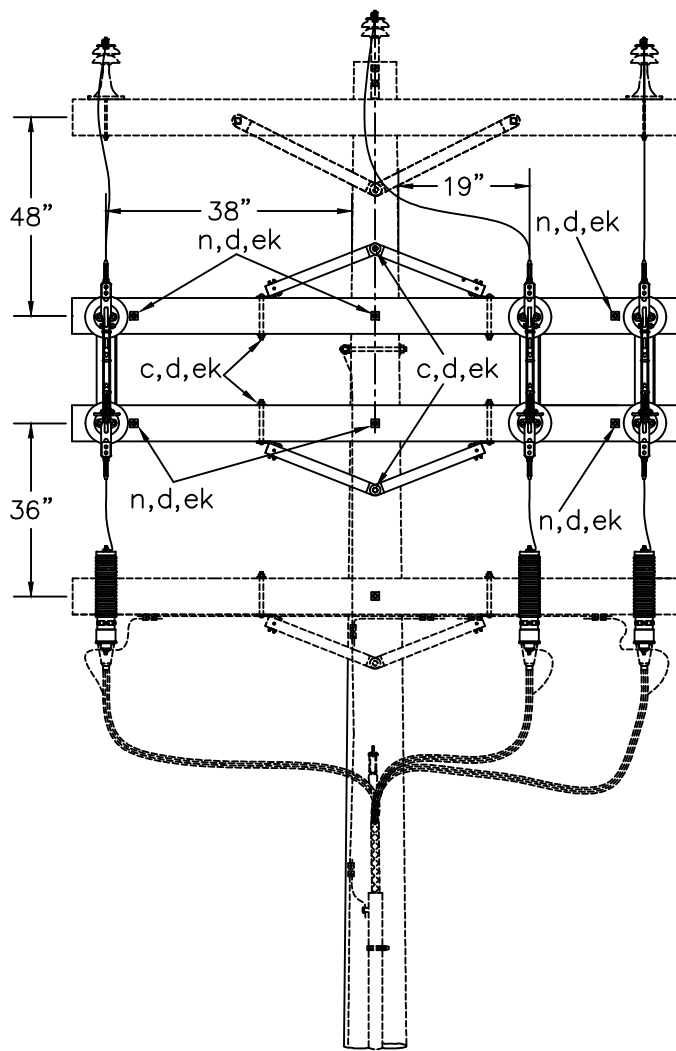
VERTICAL SWITCHES MOUNTED ON THREE CROSSARMS

AUG 2016

RUS

3 - PHASE PRIMARY

UC7.3



ITEM	QTY.	MATERIAL
c	8	Bolt, machine, 1/2" x required length.
c	2	Bolt, machine, 5/8" x required length.
d	8	Washer, 1 3/8" x 9/16" round.
d	22	Washer, square 2 1/4".
g	4	Crossarm, 3 5/8" x 4 5/8" x 8'-0"
n	6	Bolt, double arming, 5/8" x req'd length.
p		Connectors, as required.
av		Jumpers, as required.
cu	4	Brace, crossarm 60" span.
ek	30	Locknuts, as required.
sb	3	Disconnect, 600 A load break.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

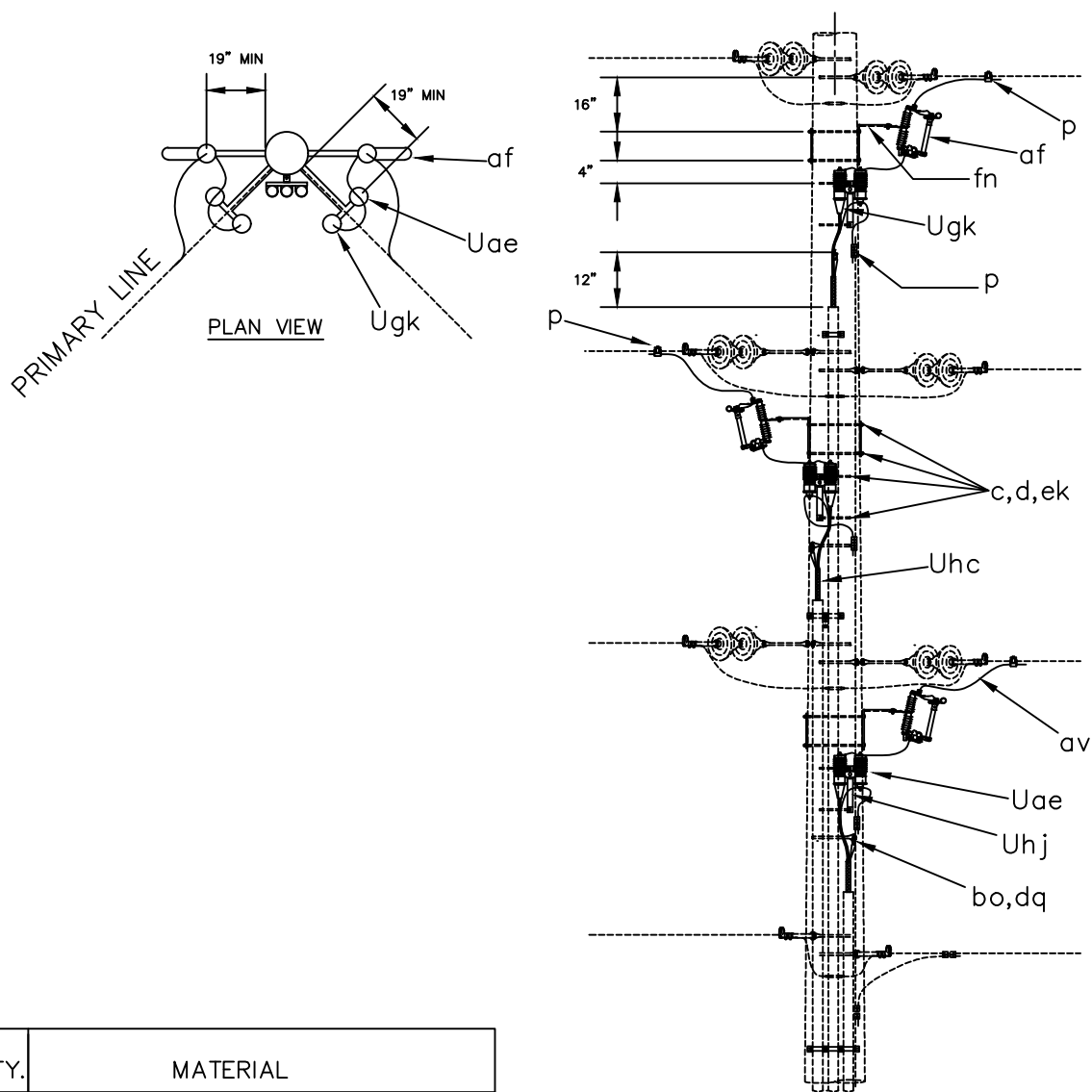
VERTICAL SWITCHES MOUNTED ON FOUR CROSSARMS

AUG 2016

RUS

3 - PHASE PRIMARY

UC7.4



ITEM	QTY.	MATERIAL
c	12	Bolt, machine, 5/8" x required length.
d	12	Washer, square 2 1/4".
p		Connectors, as required.
af	3	Fuse link.
af	3	Cutout
av		Jumpers, as required.
bo	3	Anchor, shackle.
dq	3	Eye screw, elliptical or drive hook.
ek	12	Locknuts
fn	3	Bracket, cutout extension.
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.
Uhj	3	Bracket combination.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

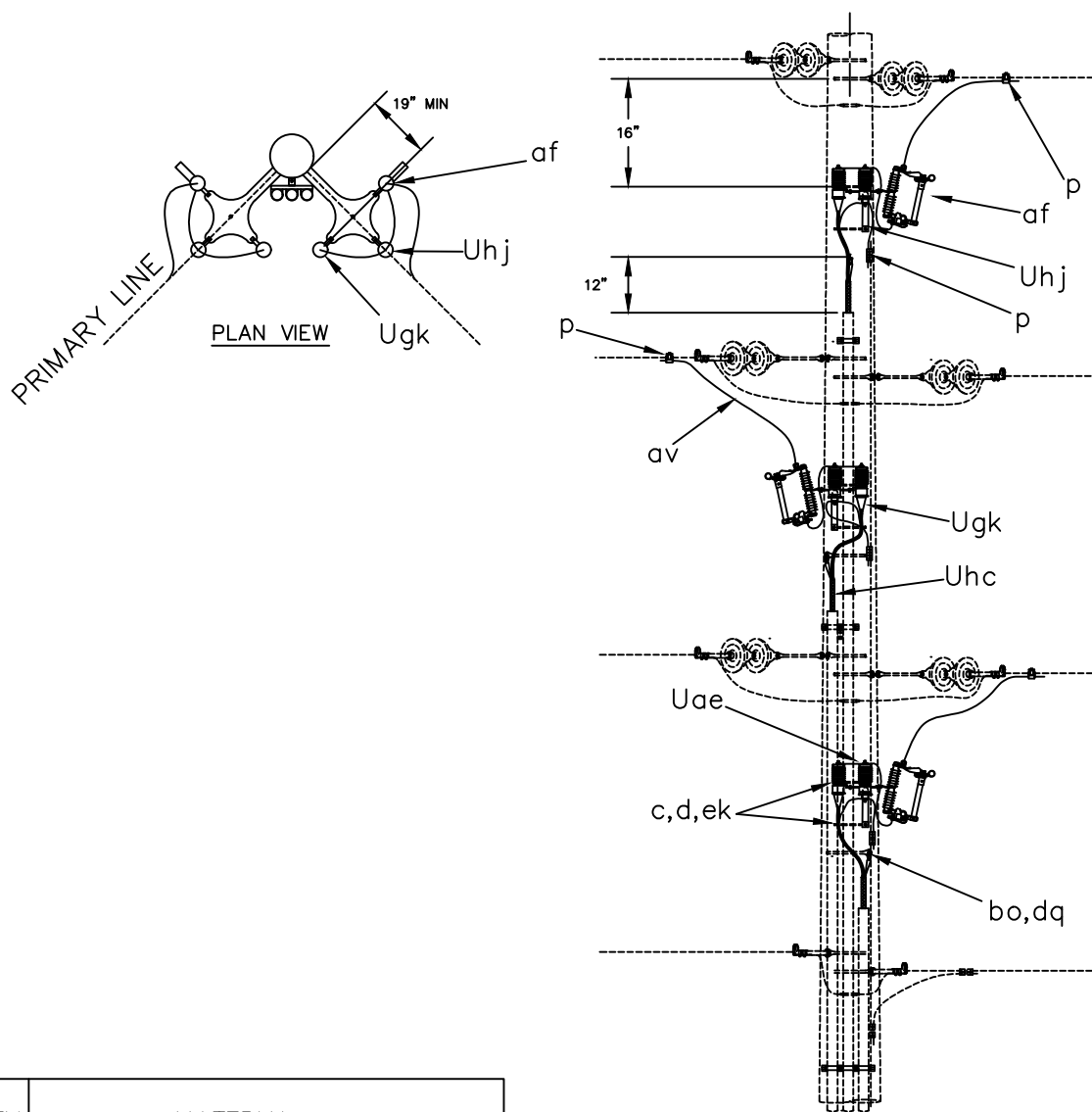
THREE PHASE CABLE TERMINAL POLE
WITH VERTICAL FRAMING AND
TWO BRACKETS PER PHASE

AUG 2016

RUS

3 - PHASE PRIMARY

UC8.1



ITEM	QTY.	MATERIAL
c	6	Bolt, machine, 5/8" x required length.
d	6	Washer, square 2 1/4".
p		Connectors, as required.
af	3	Fuse link.
af	3	Cutout
av		Jumpers, as required.
bo	3	Anchor, shackle.
dq	3	Eye screw, elliptical or drive hook.
ek	6	Locknuts
Uae	3*	Surge arrester
Ugk	3	Cable termination.
Uhc	3	Cable support.
Uhj	3	Bracket combination.

NOTES:

1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

THREE PHASE CABLE TERMINAL POLE
WITH VERTICAL FRAMING AND
ONE BRACKET PER PHASE

AUG 2016

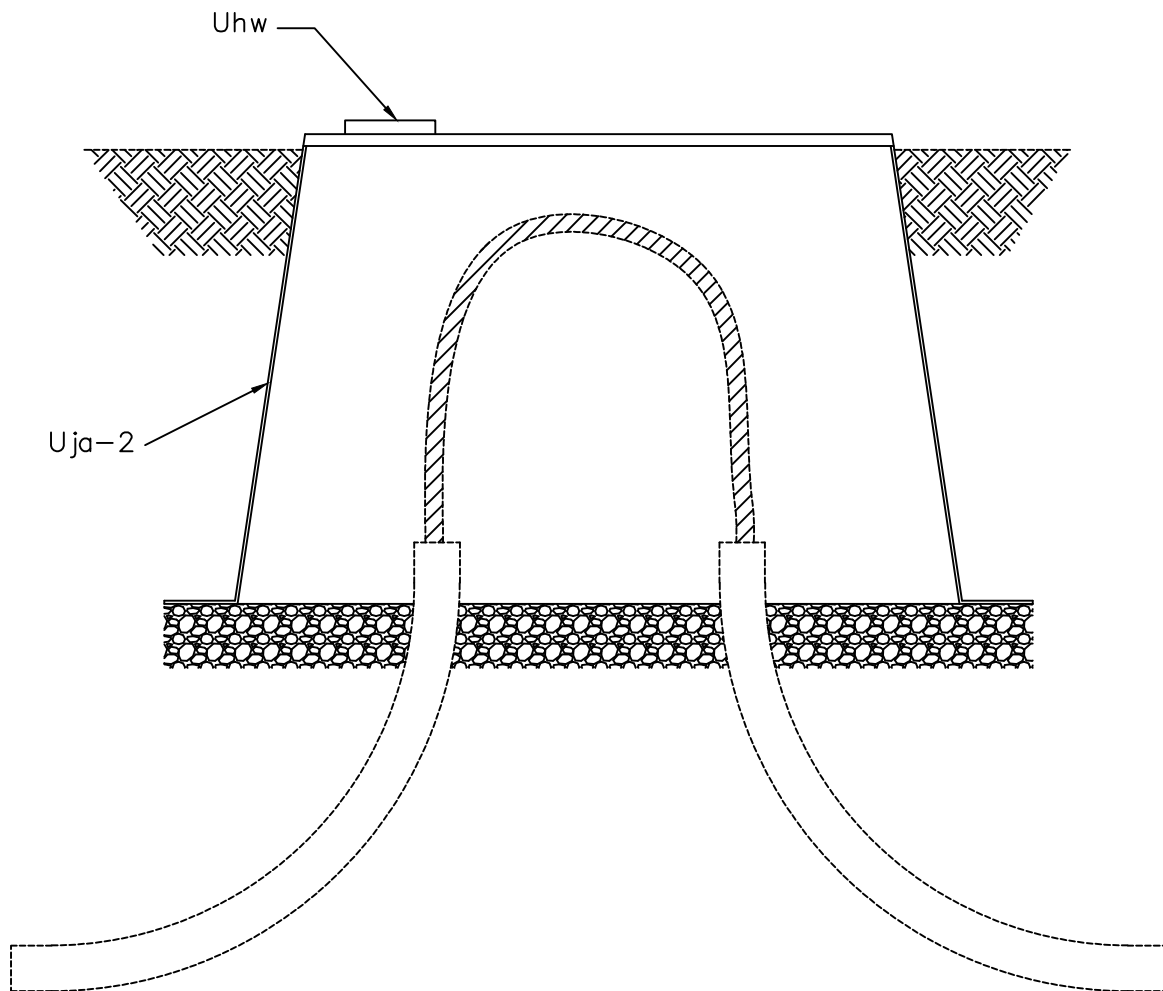
RUS

3 - PHASE PRIMARY

UC8.2

FOUNDATION ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806 (New)	1728F-806 (Old)	
		PRIMARY PULL BOX UNDERGROUND CABLE
UF.PBC		CONCRETE PRIMARY PULL BOX
UF.PBN		NON-CONCRETE PRIMARY PULL BOX
		SINGLE PHASE EQUIPMENT FOUNDATIONS
UF1.BC	(UM1-7C)	CONCRETE BOX PAD FOR SINGLE PHASE EQUIPMENT
UF1.BN	(UM1-7NC)	NON-CONCRETE BOX PAD FOR SINGLE PHASE EQUIPMENT
		SINGLE PHASE AND THREE PHASE EQUIPMENT FOUNDATIONS
UF1.PC	(UM1-5C)	CONCRETE PAD FOR SINGLE PHASE EQUIPMENT
UF1.PN	(UM1-5NC)	NON-CONCRETE PAD FOR SINGLE PHASE EQUIPMENT
UF3.PN		NON-CONCRETE PAD FOR THREE PHASE EQUIPMENT
		THREE PHASE EQUIPMENT FOUNDATIONS
UF3.BC		CONCRETE BOX PAD FOR THREE PHASE EQUIPMENT
UF3.BN		NON-CONCRETE BOX PAD FOR THREE PHASE EQUIPMENT
UF3.VC		CONCRETE VAULT FOR THREE PHASE EQUIPMENT
UF3.PC	(UM1-6C)	CONCRETE PAD FOR THREE PHASE EQUIPMENT



ITEM	MATERIAL	UF.PBC	UF.PBN
Uja-2	Equipment Box Pad, concrete	1	
Uja-2	Equipment Box Pad, non-concrete		1
Uhw	Safety signs	1	1

NOTES:

1. COVER, IF METAL, SHALL BE GROUNDED.

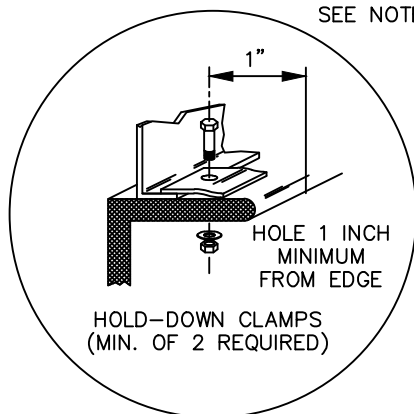
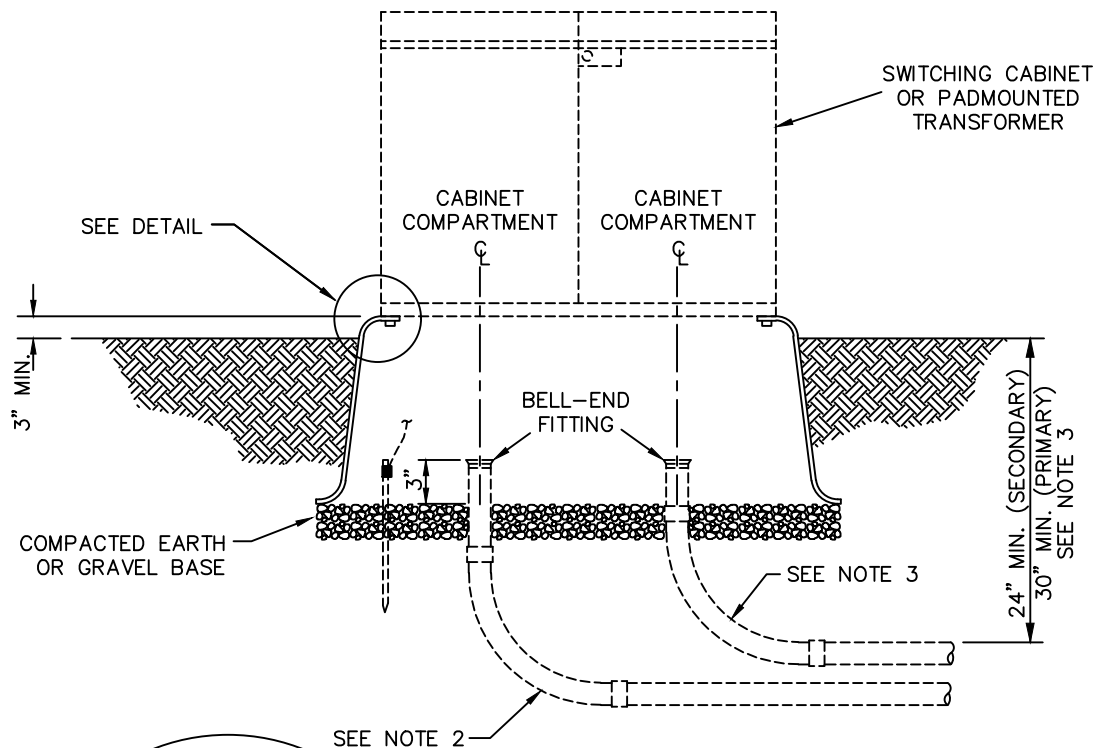
PRIMARY PULL BOX
UNDERGROUND CABLE

AUG 2016

RUS

UF.PBC

UF.PBN



DETAIL

NOTES:

1. UNIT MAY CONSIST OF A ONE-PIECE UNIT OR FOUR SEPARATE WALL SECTIONS.
2. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENT IF PULLING TENSIONS DICTATE.
3. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

UNIT DESIGNATION:

UF1.BC CONCRETE BOX PAD FOR SINGLE PHASE EQUIPMENT

UF1.BN NON-CONCRETE BOX PAD FOR SINGLE PHASE EQUIPMENT

ITEM	QTY.	MATERIAL
Uja-2	1	Equipment Box Pad

SINGLE PHASE
EQUIPMENT FOUNDATIONS

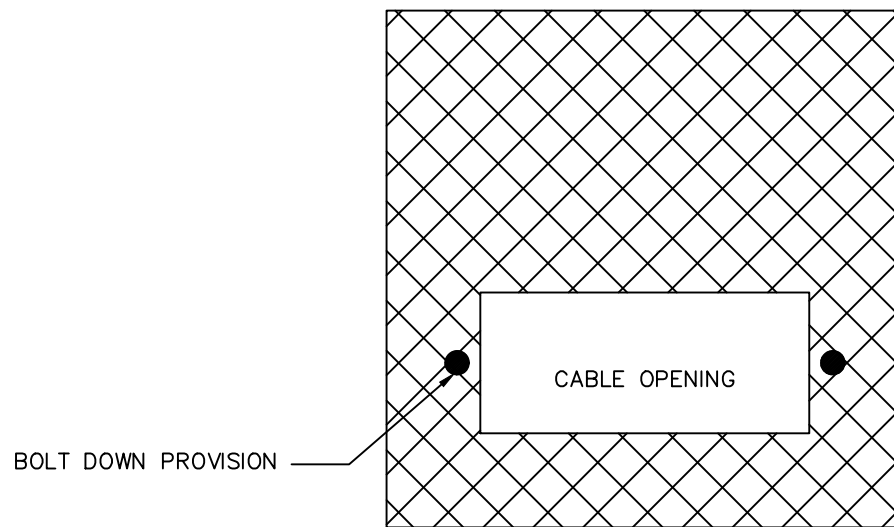
AUG 2016

RUS

1 - PHASE PRIMARY

UF1.BC

UF1.BN



NOTES:

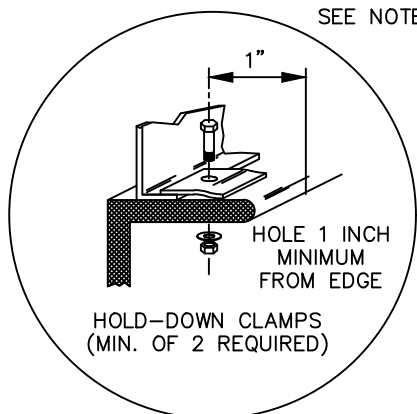
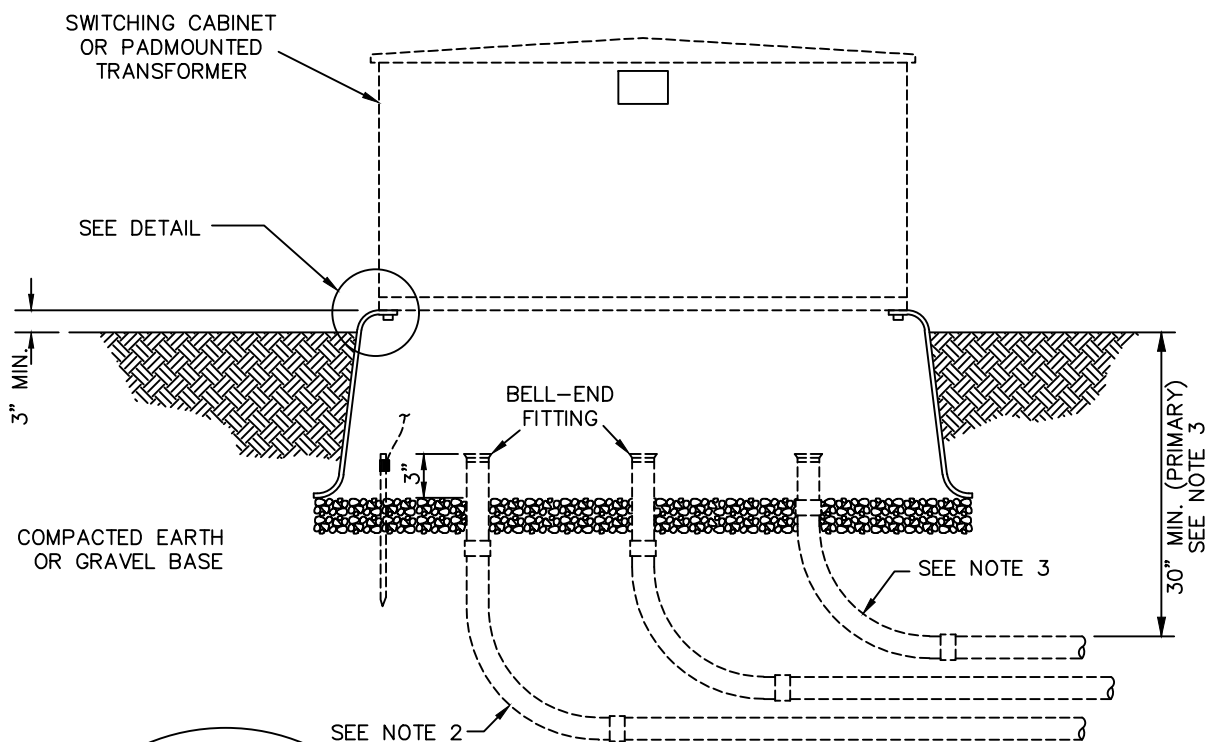
1. PAD ASSEMBLIES INCLUDE SITE PREPARATION, BEDDING AND DRAINAGE.
2. EQUIPMENT SHALL BE SECURED TO PAD IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
3. CABLE OPENING AND PAD DIMENSIONS SHALL BE AS REQUIRED.

UNIT DESIGNATION:

UF1.PC	CONCRETE PAD FOR SINGLE PHASE EQUIPMENT
UF1.PN	NON-CONCRETE PAD FOR SINGLE PHASE EQUIPMENT
UF3.PN	NON-CONCRETE PAD FOR THREE PHASE EQUIPMENT

ITEM	MATERIAL	UF1.PC	UF1.PN	UF3.PN
Uja-1	Transformer concrete pad	1		
Uja-1	Transformer non-concrete pad		1	1

	SINGLE PHASE AND THREE PHASE EQUIPMENT FOUNDATIONS			
	AUG 2016			UF1.PC,UF1.PN
	RUS			UF3.PN



DETAIL

NOTES:

1. UNIT MAY CONSIST OF A ONE-PIECE UNIT OR FOUR SEPARATE WALL SECTIONS.
2. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENT IF PULLING TENSIONS DICTATE.
3. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

UNIT DESIGNATION:

- UF3.BC CONCRETE BOX PAD FOR THREE PHASE EQUIPMENT
- UF3.BN NON-CONCRETE BOX PAD FOR THREE PHASE EQUIPMENT
- UF3.VC CONCRETE VAULT FOR THREE PHASE EQUIPMENT (UNIT NOT SHOWN, REQUIRES SPECIFIC DESIGN)

ITEM	QTY.	MATERIAL
Uja-2	1	Equipment Box Pad

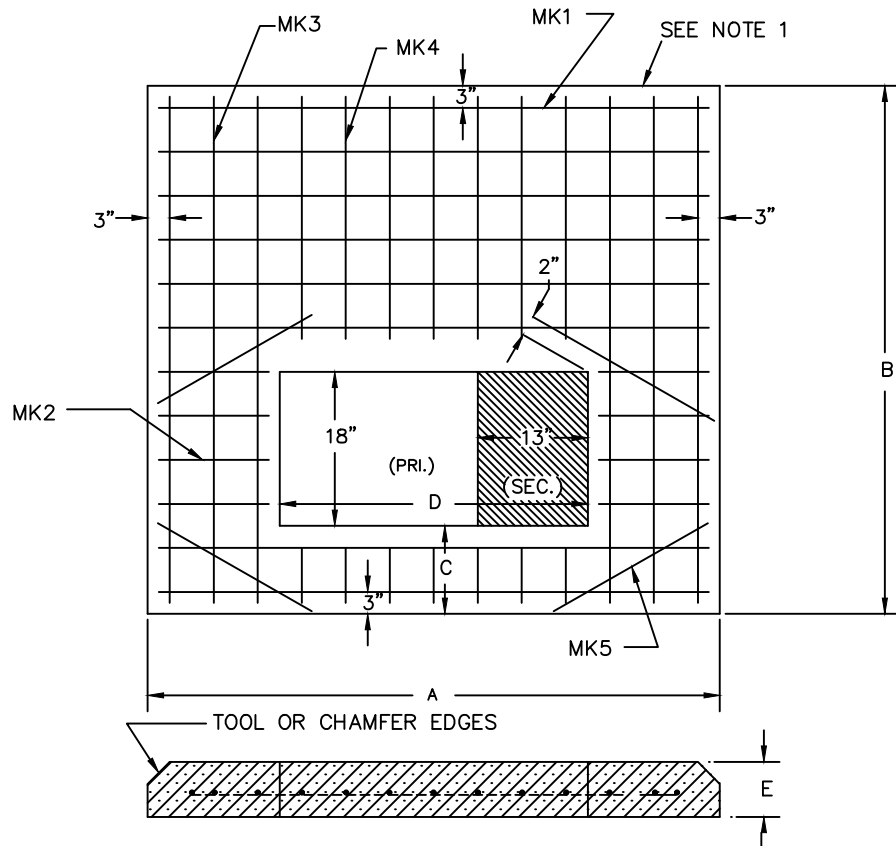
THREE PHASE
EQUIPMENT FOUNDATIONS

AUG 2016

RUS

3 - PHASE PRIMARY

UF3.BC,UF3.BN
UF3.VC



PAD	3-PHASE TRANSF. kVA	DIMENSIONS IN INCHES					REINFORCING BARS				
		A	B	C	D	E	MK1	MK2	MK3	MK4	MK5
#1	75, 112 1/2, 150, 225, 300, 500	76	62	10	42	6	7 #4 70"	4 #4 10"	6 #4 57"	6 #4 28"	4 #4 26"
#2	750, 1000 1500, 2500	104	100	10	54	8	12 #4 98"	6 #4 19"	6 #4 94"	7 #4 66"	4 #4 29"

NOTES:

1. CONCRETE TESTING, 3000 POUNDS MIN. PER SQUARE INCH; 4% TO 6% ENTRAINED AIR, 3/4" MAXIMUM SIZE AGGREGATE.
2. REINFORCING STEEL, ATSM-A615 GRADE 60, PLACE APPROX. 6" O.C. EACH WAY AND SECURELY TIED.
3. MINIMUM CONCRETE COVER OVER REINFORCING STEEL 2 INCHES UNLESS NOTED.
4. WOOD FLOAT FINISH, LEAVING NO DEPRESSIONS.
5. PAD DIMENSION AND REBAR SPACING SHALL BE ADJUSTED TO HANDLE TRANSFORMER SIZE AND WEIGHT.

ITEM	QTY.	MATERIAL
		Concrete, as required
		Reinforcing bar, as required

CONCRETE PAD FOR
THREE PHASE EQUIPMENT

AUG 2016

RUS

3 - PHASE PRIMARY

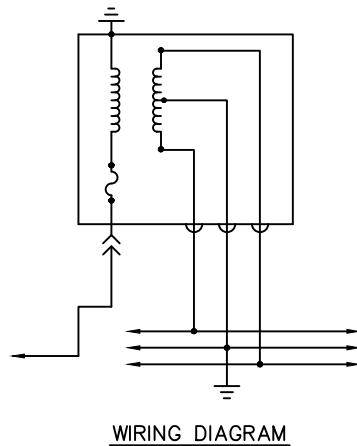
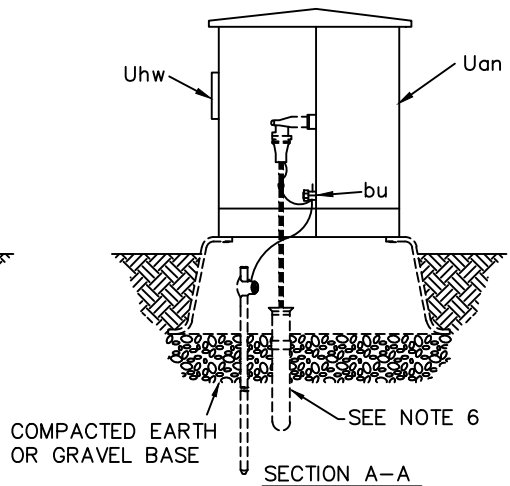
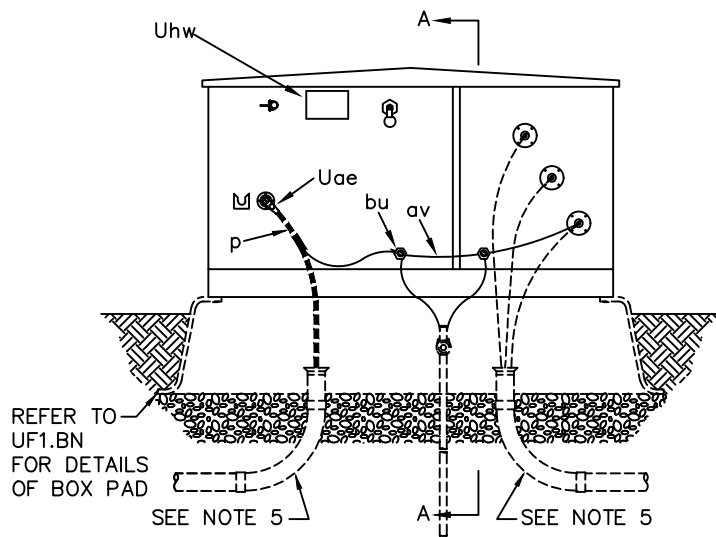
UF3.PC

TRANSFORMER ASSEMBLY UNITS

DRAWING NUMBERS**DRAWING TITLE (DESCRIPTION)**

1728F-806 **1728F-806**
 (New) (Old)

		SINGLE PHASE ONE BUSHING PADMOUNTED TRANSFORMER (RADIAL FEED)
UG1.01		SINGLE PHASE ONE BUSHING PADMOUNTED TRANSFORMER ONLY
UG1.1	(UG6)	RADIAL TYPE SINGLE PHASE ONE BUSHING PADMOUNTED TRANSFORMER
UG1.2		SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER (RADIAL FEED)
		SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER (LOOP FEED)
UG1.02		SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER ONLY
UG1.3	(UG7)	LOOP TYPE SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER
UG2.1	(UX1)	OPEN DELTA CONNECTION WITH SINGLE PHASE PADMOUNTED TRANSFORMERS
		THREE PHASE THREE BUSHING PADMOUNTED TRANSFORMER (RADIAL FEED)
UG3.01		THREE PHASE THREE BUSHING PADMOUNTED TRANSFORMER ONLY
UG3.1	(UG17)	RADIAL TYPE THREE PHASE THREE BUSHING PADMOUNTED TRANSFORMER
UG3.2	(UG17-3)	THREE PHASE SIX BUSHING PADMOUNTED TRANSFORMER (RADIAL FEED)
		THREE PHASE SIX BUSHING PADMOUNTED TRANSFORMER (LOOP FEED)
UG3.02		THREE PHASE SIX BUSHING PADMOUNTED TRANSFORMER ONLY
UG3.3	(UG17-2)	LOOP TYPE THREE PHASE SIX BUSHING PADMOUNTED TRANSFORMER



* SPECIFY UG1.01 FOR PADMOUNTED, RADIAL TYPE TRANSFORMER ONLY.

NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1.1 OR OTHER GROUNDING UNIT.
3. SPECIFY PAD OR SLEEVE SEPARATELY.
4. INSTALL SAFETY SIGNS ON TRANSFORMER INSIDE AND OUTSIDE ENCLOSURE ACCORDINGLY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper as required
bu	2	Connector, equipment ground
Uae	1	Arrester, bushing
Uan	1	Transformer, padmounted, radial
Ufz	3	Transformer connector block
Uhp	1	Termination, elbow
Uhw	2	Safety signs

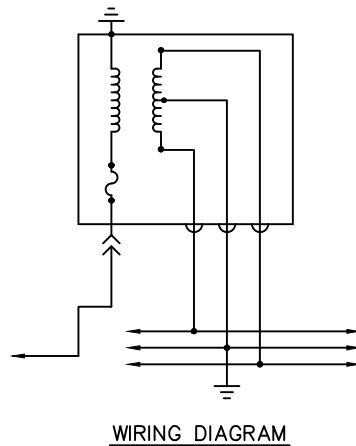
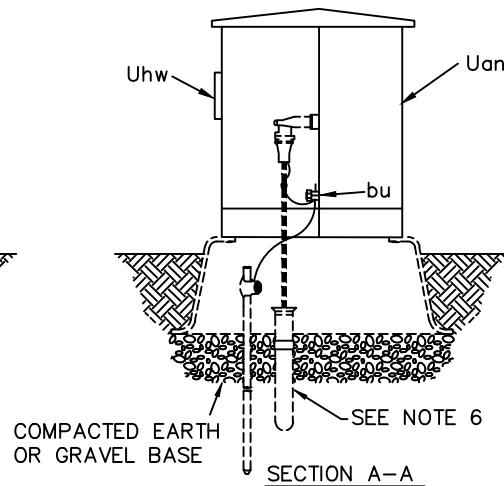
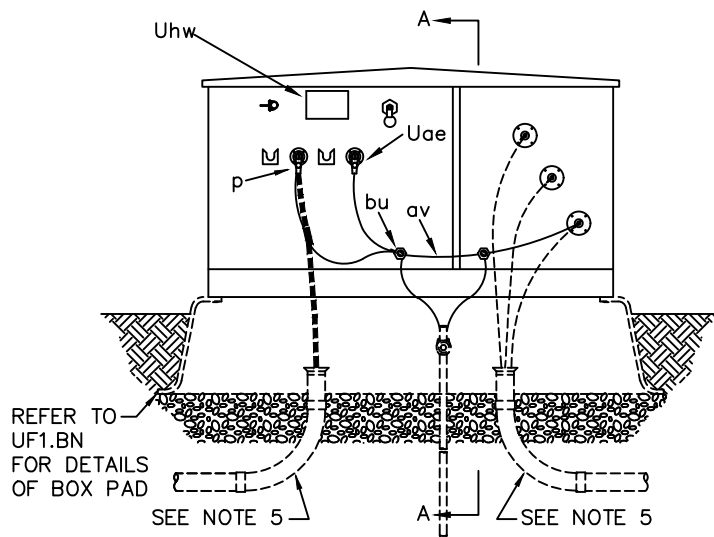
SINGLE PHASE ONE BUSHING
PADMOUNTED TRANSFORMER
(RADIAL FEED)

AUG 2016

RUS

1 - PHASE PRIMARY

UG1.01
UG1.1



NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1.1 OR OTHER GROUNDING UNIT.
3. SPECIFY PAD OR SLEEVE SEPARATELY.
4. INSTALL SAFETY SIGNS ON TRANSFORMER INSIDE AND OUTSIDE ENCLOSURE ACCORDINGLY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper as required
bu	2	Connector, equipment ground
Uae	1	Arrester, elbow
Uan	1	Transformer, padmounted, loop
Ufz	3	Transformer connector block
Uhp	1	Termination, elbow
Uhw	2	Safety signs

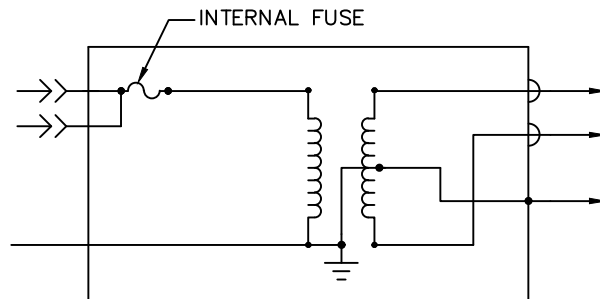
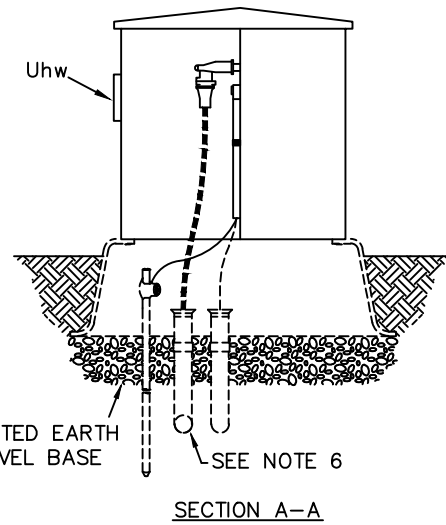
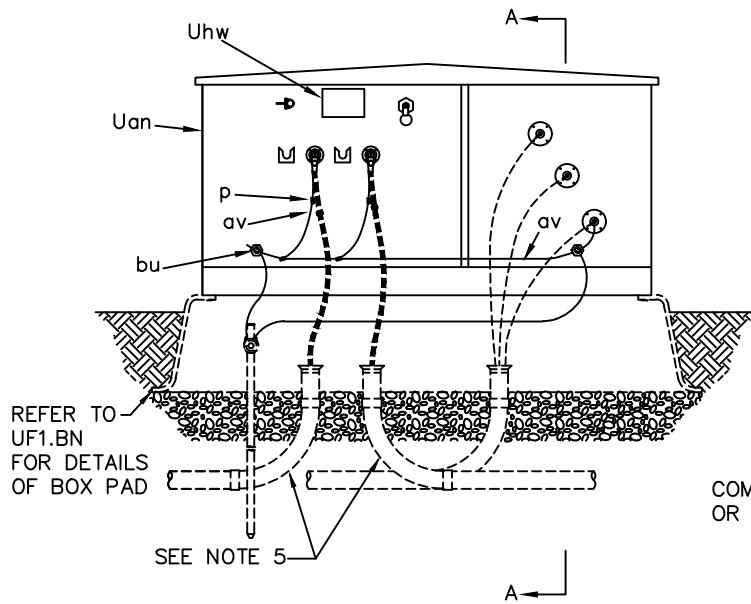
SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER (RADIAL FEED)

AUG 2016

RUS

1 - PHASE PRIMARY

UG1.2



WIRING DIAGRAM

NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1.1 OR OTHER GROUNDING UNIT.
3. SPECIFY PAD OR SLEEVE SEPARATELY.
4. INSTALL SAFETY SIGNS ON TRANSFORMER INSIDE AND OUTSIDE ENCLOSURE ACCORDINGLY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

* SPECIFY UG1.02 FOR PADMOUNTED, LOOP TYPE TRANSFORMER ONLY.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper, as required
bu	2	Connector, equipment ground
Uae		Arrester, bushing, as required
Uan	1	Transformer, padmounted, loop
Ufz	3	Transformer connector block
Uhp	2	Termination, elbow
Uhw	2	Safety signs

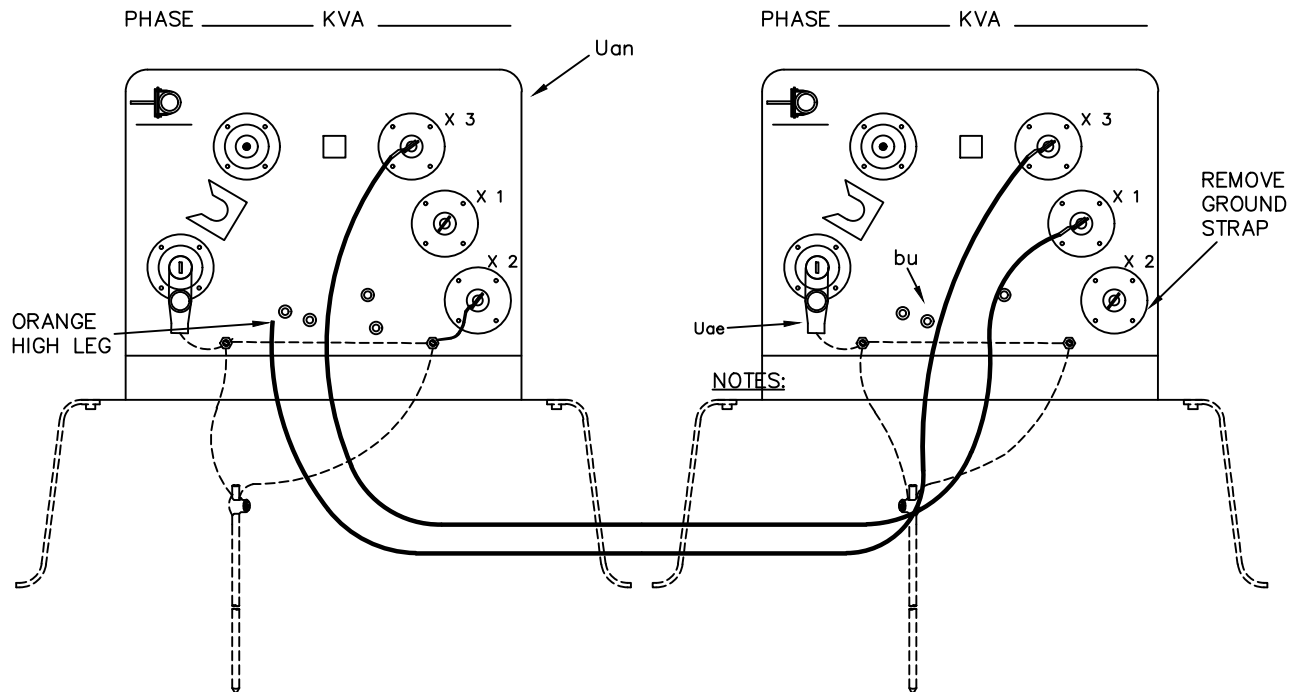
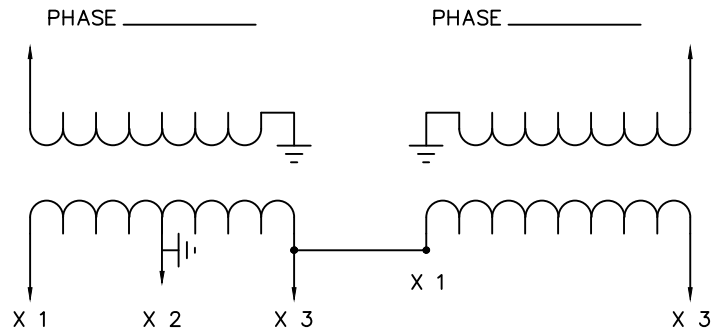
SINGLE PHASE TWO BUSHING
PADMOUNTED TRANSFORMER
(LOOP FEED)

AUG 2016

RUS

1 - PHASE PRIMARY

UG1.02
UG1.3



ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper, as required
bu	4	Connector, equipment ground
Uae	2	Arrester, bushing, as required
Uan	2	Transformer, padmounted, loop
Uhp	2	Termination, elbow
Uhw	4	Safety signs

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.

BANK RATING: THIS BANK HAS ONLY 86.6% OF THE RATING OF THE TWO UNITS MAKING UP THE THREE PHASE SYSTEM AND ONLY 57.7% OF THE THREE PHASE TRANSFORMER RATING. THUS, IT IS RELATIVELY INEFFICIENT WHERE THREE PHASE LOADS PREDOMINATE.

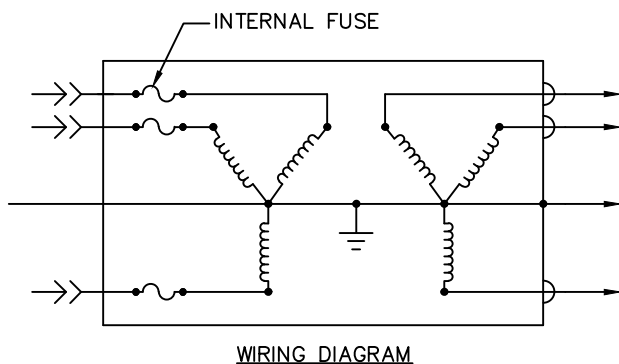
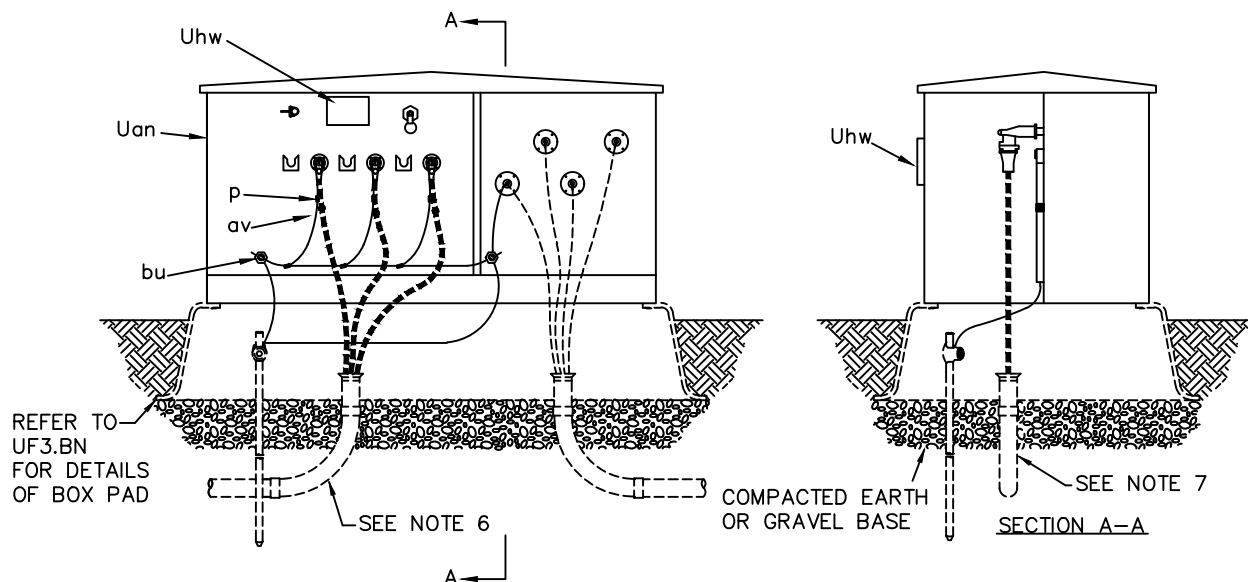
OPEN DELTA CONNECTION
WITH SINGLE PHASE
PADMOUNTED TRANSFORMERS

AUG 2016

RUS

1 - PHASE PRIMARY

UG2.1



* SPECIFY UG3.01 FOR PADMOUNTED, RADIAL TYPE TRANSFORMER ONLY.

NOTES:

1. ONLY THE WYE-WYE CONNECTION SHOULD BE USED TO MINIMIZE FERRORESONANCE.
2. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
3. INSTALL WITH UNIT UH1.2 OR OTHER GROUNDING UNIT.
4. SPECIFY PAD OR SLEEVE SEPARATELY.
5. INSTALL SAFETY SIGNS ON TRANSFORMER INSIDE AND OUTSIDE ENCLOSURE ACCORDINGLY.
6. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
7. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.
8. BORROWER SHOULD ADD ARRESTER PROTECTION TO PRIMARY BUSHINGS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper, as required
bu	2	Connector, equipment ground
Uae		Arrester, bushing, as required
Uan	1	Transformer, padmounted, radial
Ufz		Transformer connector block, as required
Uhp	3	Termination, elbow
Uhw	2	Safety signs

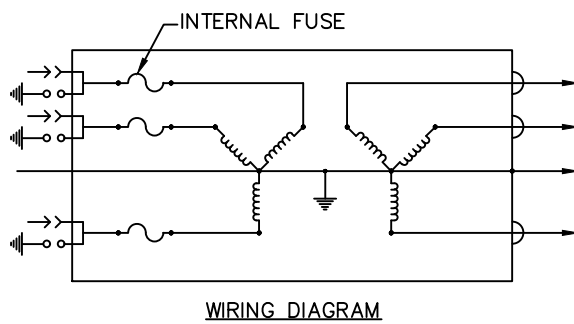
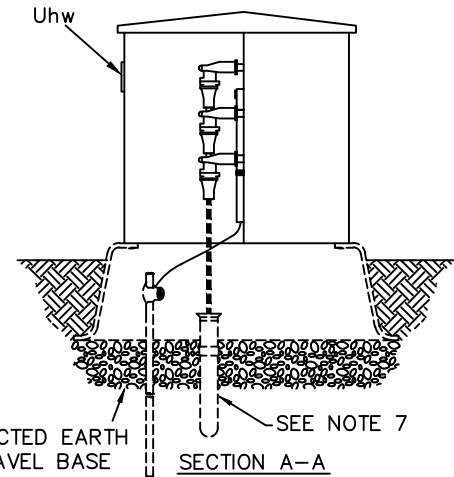
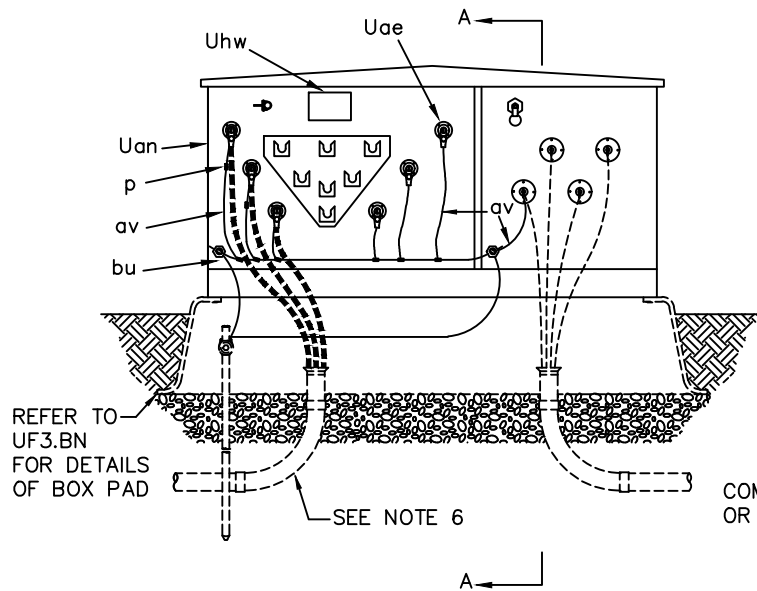
THREE PHASE THREE BUSHING
PADMOUNTED TRANSFORMER
(RADIAL FEED)

AUG 2016

RUS

3 - PHASE PRIMARY

UG3.01
UG3.1



NOTES:

1. ONLY THE WYE-WYE CONNECTION SHOULD BE USED TO MINIMIZE FERRORESONANCE.
2. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
3. INSTALL WITH UNIT UH1.2 OR OTHER GROUNDING UNIT.
4. SPECIFY PAD OR SLEEVE SEPARATELY.
5. INSTALL SAFETY SIGNS ON TRANSFORMER INSIDE AND OUTSIDE ENCLOSURE ACCORDINGLY.
6. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
7. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper, as required
bu	2	Connector, equipment ground
Uae	3	Arrester, elbow type
Uan	1	Transformer, padmounted, loop
Ufz		Transformer connector block, as required
Uhp	3	Termination, elbow
Uhw	2	Safety signs

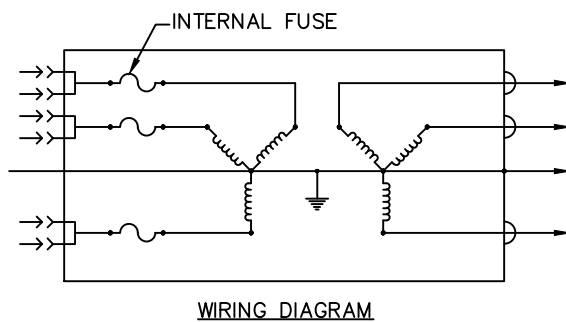
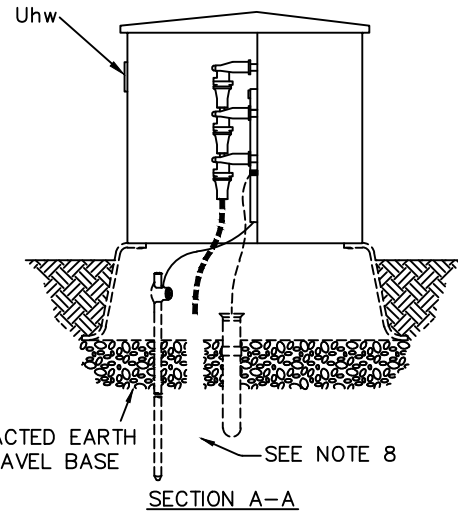
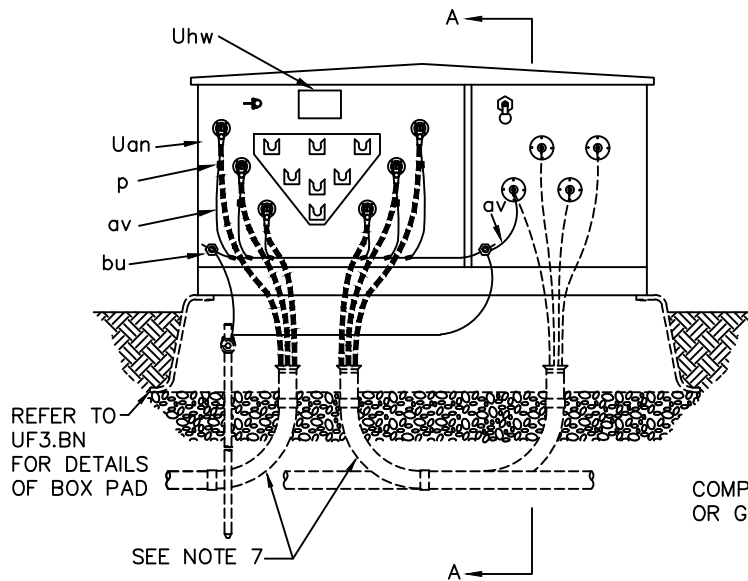
THREE PHASE SIX BUSHING PADMOUNTED TRANSFORMER (RADIAL FEED)

AUG 2016

RUS

3 - PHASE PRIMARY

UG3.2



WIRING DIAGRAM

* SPECIFY UG3.02 FOR PADMOUNTED, LOOP TYPE TRANSFORMER ONLY.

NOTES:

1. ONLY THE WYE-WYE CONNECTION SHOULD BE USED TO MINIMIZE FERRORESONANCE.
2. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
3. INSTALL WITH UNIT UH1.2 OR OTHER GROUNDING UNIT.
4. SPECIFY KVA SIZE OF TRANSFORMER.
5. SPECIFY PAD OR SLEEVE SEPARATELY.
6. INSTALL SAFETY SIGNS ON TRANSFORMER INSIDE AND OUTSIDE ENCLOSURE ACCORDINGLY.
7. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
8. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper, as required
bu	2	Connector, equipment ground
Uae		Arrester, bushing, as required
Uan	1	Transformer, padmounted, loop
Ufz		Transformer connector block, as required
Uhp	6	Termination, elbow
Uhw	2	Safety signs

THREE PHASE SIX BUSHING
PADMOUNTED TRANSFORMER
(LOOP FEED)

AUG 2016

RUS

3 - PHASE PRIMARY

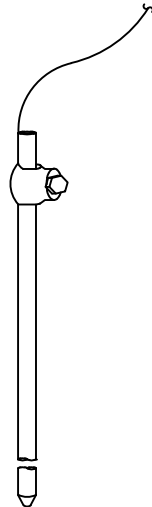
UG3.02
UG3.3

GROUNDING ASSEMBLY UNITS

DRAWING NUMBERS**DRAWING TITLE (DESCRIPTION)**

1728F-806 **1728F-806**
 (New) (Old)

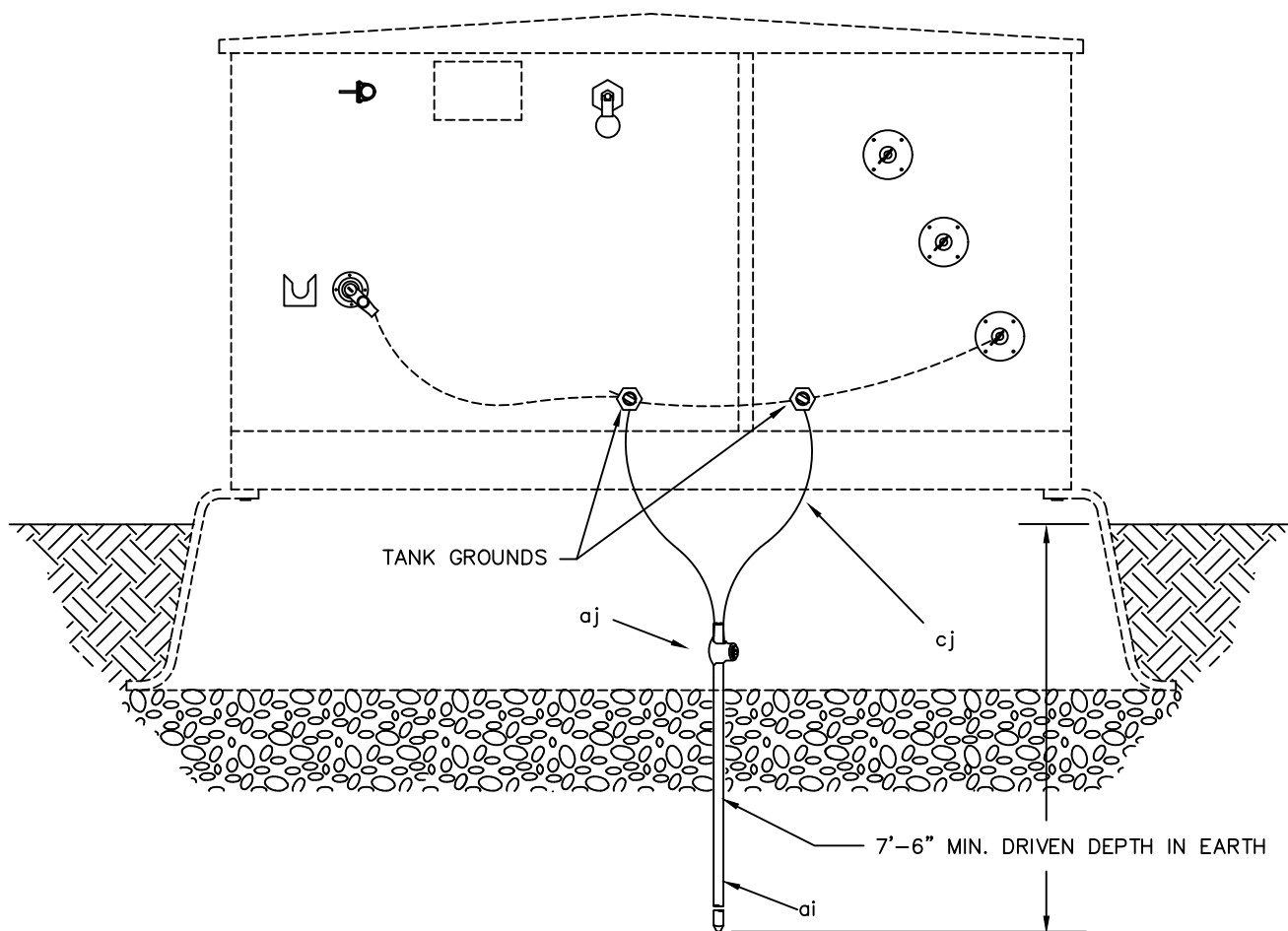
UH.01	(UM6-6)	GROUND ROD ASSEMBLY
UH1.1	(UM48-1)	GROUNDING ASSEMBLY FOR PADMOUNTED TRANSFORMERS AND ENCLOSURES (1 ROD)
UH1.2	(UM48-2)	GROUNDING ASSEMBLY FOR PADMOUNTED TRANSFORMERS AND ENCLOSURES (2 RODS)
UH1.4	(UM48-5)	GROUNDING ASSEMBLY FOR PADMOUNTED TRANSFORMERS AND ENCLOSURES (4 RODS)
UH1.7	(UM48-6)	GROUND ARRAY FOR PADMOUNTED TRANSFORMERS AND ENCLOSURES
UH2.0 UH2.2		COUNTERPOISE GROUNDING
UH2.7		TRENCH TYPE GROUNDING ASSEMBLY - RISER TO TRANSFORMER OUTSIDE OF CONDUIT
UH3.1	(UX5)	GROUNDING ASSEMBLY FOR SECTIONALIZING ENCLOSURES (1 ROD)
UH4.1	(UX4)	GROUNDING ASSEMBLY FOR CABLE ABOVE GRADE ENCLOSURES (1 ROD)
UH4.1G	(UM6-39)	JACKETED CABLE GROUNDING INSTALLATION (HEAT SHRINK OR COLD SHRINK)



ai, aj, cj
GROUND ROD ASSEMBLY

ITEM	QTY.	MATERIAL
ai	1	Rod, ground
aj	1	Clamp, ground rod
cj		Wire, ground, as required

	GROUND ROD ASSEMBLY		
	AUG 2016		
	RUS		UH.01



ITEM	QTY.	MATERIAL
p		Connector, as required
ai	1	Rod, ground
aj	1	Clamp, ground rod
cj		Wire, ground, as required

NOTES:

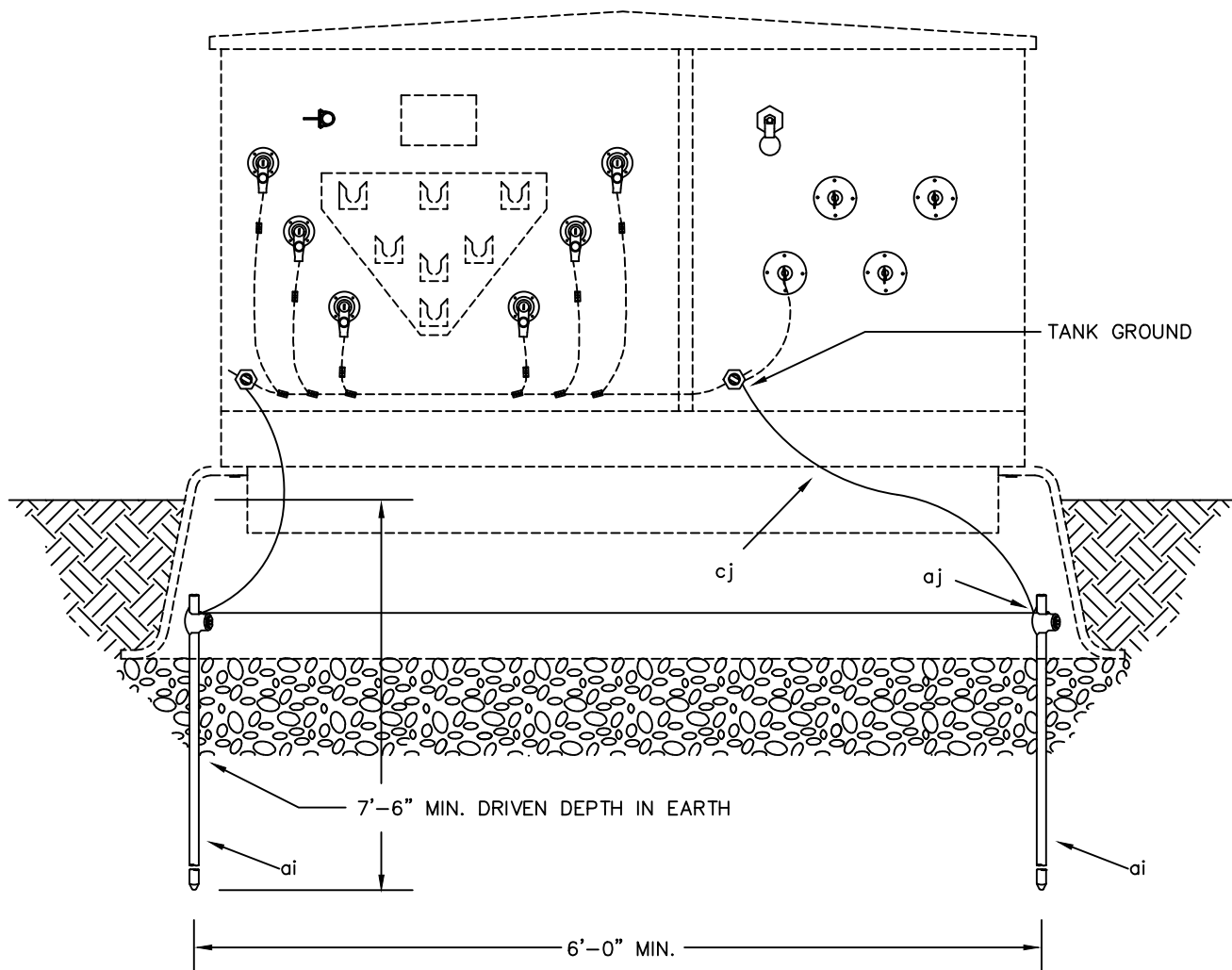
1. TIE CONCENTRIC NEUTRALS TOGETHER BEFORE TAP TO GROUND LOOP OR SIZE GROUND LOOP LARGE ENOUGH TO ASSURE SAME CONDUCTIVITY AS CABLE NEUTRAL.

GROUNDING ASSEMBLY FOR
PADMOUNTED TRANSFORMERS AND ENCLOSURES
(1 ROD)

AUG 2016

RUS

UH1.1



NOTES:

1. TIE CONCENTRIC NEUTRALS TOGETHER BEFORE TAP TO GROUND LOOP OR SIZE GROUND LOOP LARGE ENOUGH TO ASSURE SAME CONDUCTIVITY AS CABLE NEUTRAL.
2. MULTIPLE RODS MAY NOT FIT INSIDE ENCLOSURE. ONLY ONE ROD MUST BE INSTALLED INSIDE ENCLOSURE.

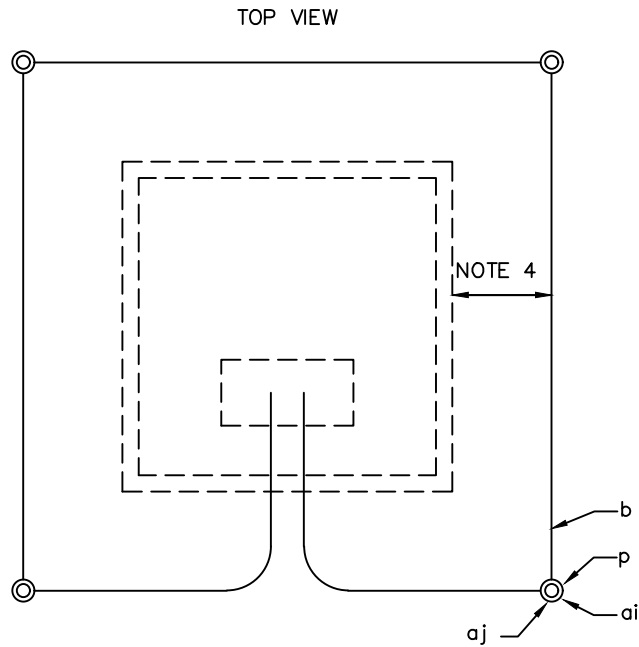
ITEM	QTY.	MATERIAL
p		Connector, as required
ai	2	Rod, ground
aj	2	Clamp, ground rod
cj		Wire, ground, as required

GROUNDING ASSEMBLY FOR
PADMOUNTED TRANSFORMERS AND ENCLOSURES
(2 RODS)

AUG 2016

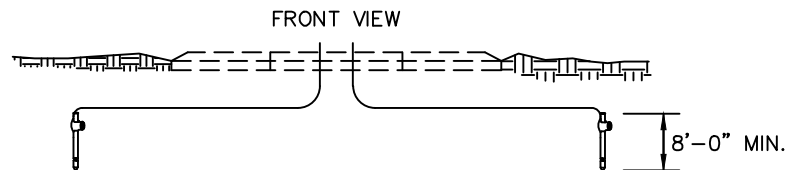
RUS

UH1.2



NOTE:

IF USED, CONNECT ANODE LEAD INSIDE PAD MOUNTED ENCLOSURES FOR TESTING PURPOSES.



NOTES:

1. PLACE ONE GROUND ROD AT EACH CORNER.
2. GROUNDING GRID BARE COPPER BURIED 6" BELOW GROUND, RUN WIRE INTO BASEMENT AND ALLOW 5'-0" FOR GROUNDING LIVE FRONT SWITCH / FUSE ENCLOSURES.
3. PAD OR BOX PAD IS NOT PART OF THIS UNIT.
4. PLACE GROUND WIRE A MINIMUM OF 24" AWAY FROM THE SIDE OR SIDES OF PAD THAT A PERSON WOULD STAND TO OPERATE THE EQUIPMENT. THE GROUND WIRE MAY BE PLACED WITHIN 12" OF THE OTHER SIDES.
5. SPECIFY LENGTH OF GROUND RODS AT EACH CORNER.

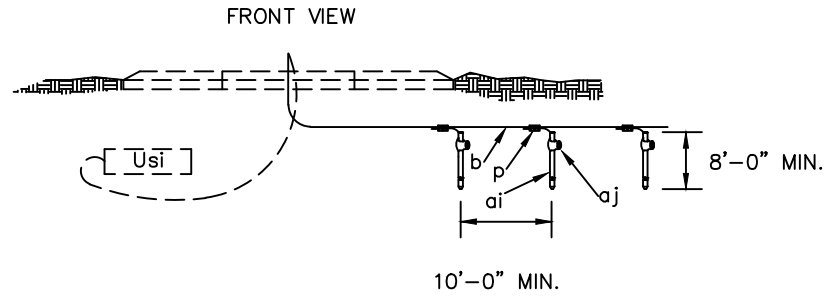
ITEM	QTY.	MATERIAL
p		Connector, as required
ai	4	Rod, ground
aj	4	Clamp, ground rod
cj		Wire, ground, bare copper, as required

GROUNDING ASSEMBLY FOR
PADMOUNTED TRANSFORMERS AND ENCLOSURES
(4 RODS)

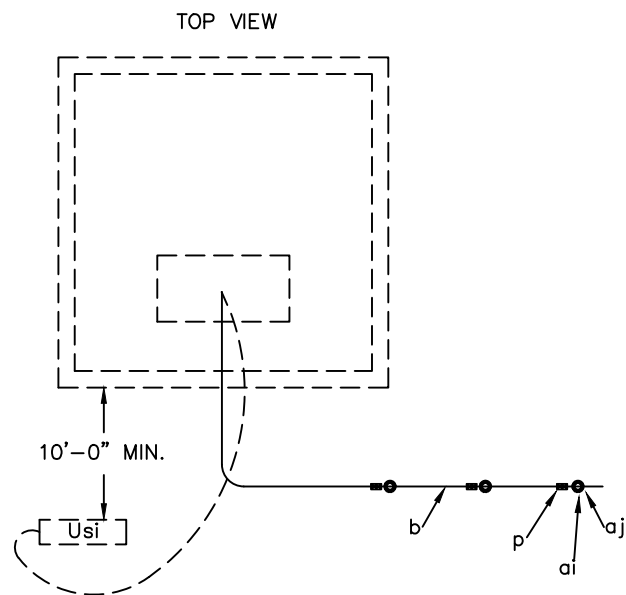
AUG 2016

RUS

UH1.4



NOTE:
IF USED, CONNECT ANODE LEAD INSIDE PAD MOUNTED
ENCLOSURES FOR TESTING PURPOSES



NOTES:

1. PLACE A MINIMUM OF TWO GROUND RODS IN SERIES. MINIMUM DISTANCE BETWEEN GROUND UNIT ASSEMBLIES - 10'-0".
2. GROUNDING GRID BARE COPPER BURIED 6" BELOW GROUND, RUN WIRE INTO BASEMENT AND ALLOW 5'-0" FOR GROUNDING LIVE FRONT SWITCH / FUSE ENCLOSURES.
3. PAD OR BOX PAD IS NOT PART OF THIS UNIT.
4. SPECIFY NUMBER AND LENGTH OF GROUND RODS.

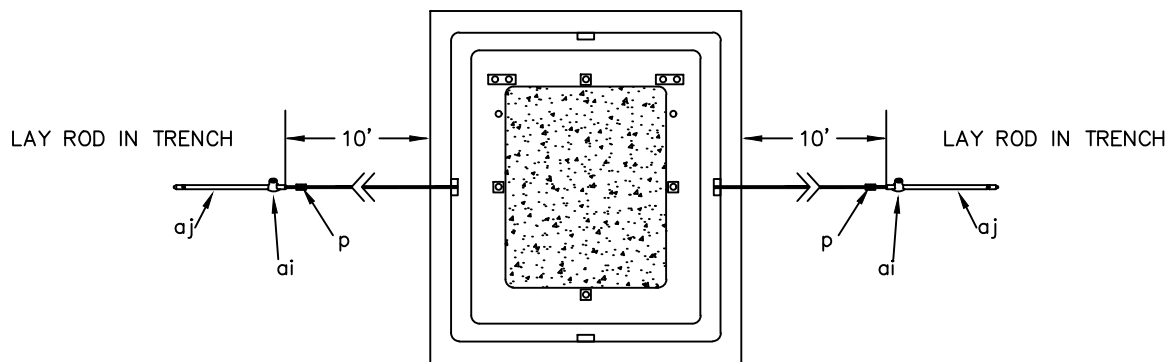
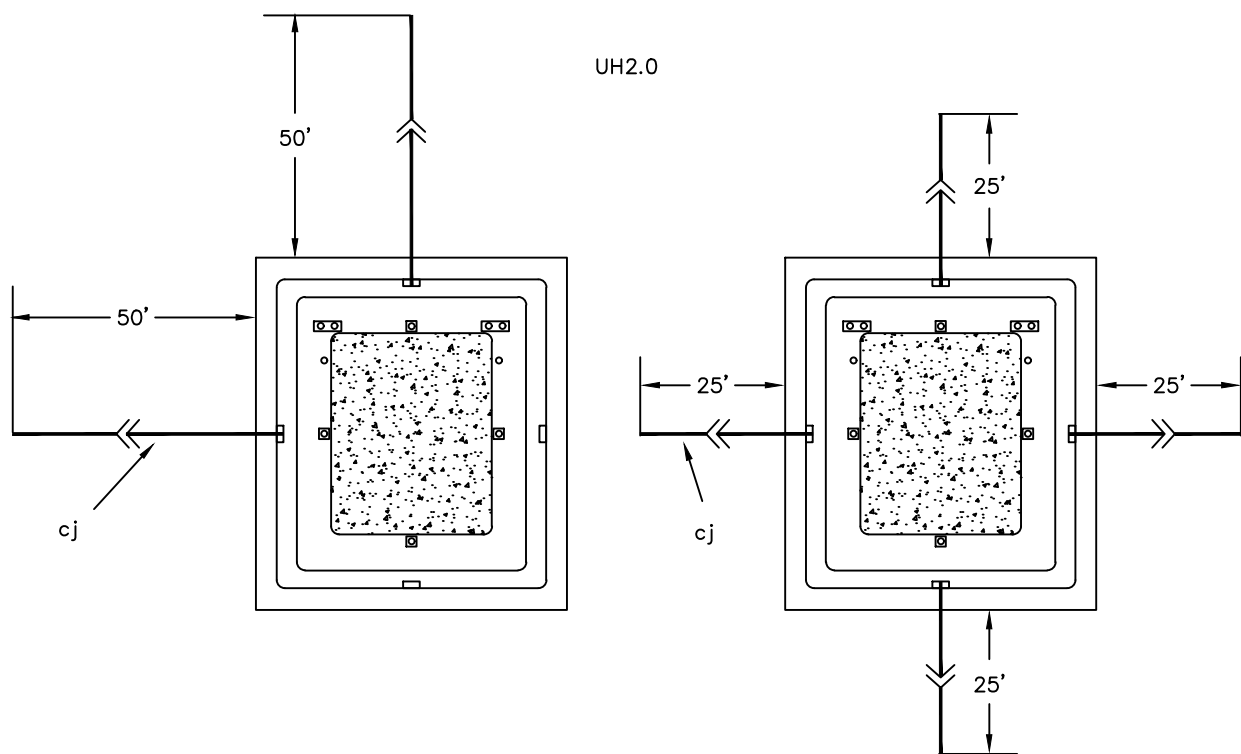
ITEM	QTY.	MATERIAL
p		Connector, as required
ai		Rod, ground, as required
aj		Clamp, ground rod, as required
cj		Wire, ground, bare copper, as required

GROUNDING ARRAY
FOR PADMOUNTED
TRANSFORMERS AND ENCLOSURES

AUG 2016

RUS

UH1.7



ITEM	MATERIAL	UH2.0	UH2.2
p	Connector, as required		
ai	Rod, ground		2
aj	Clamp, ground rod		2
cj	Wire, ground, bare copper	100	20

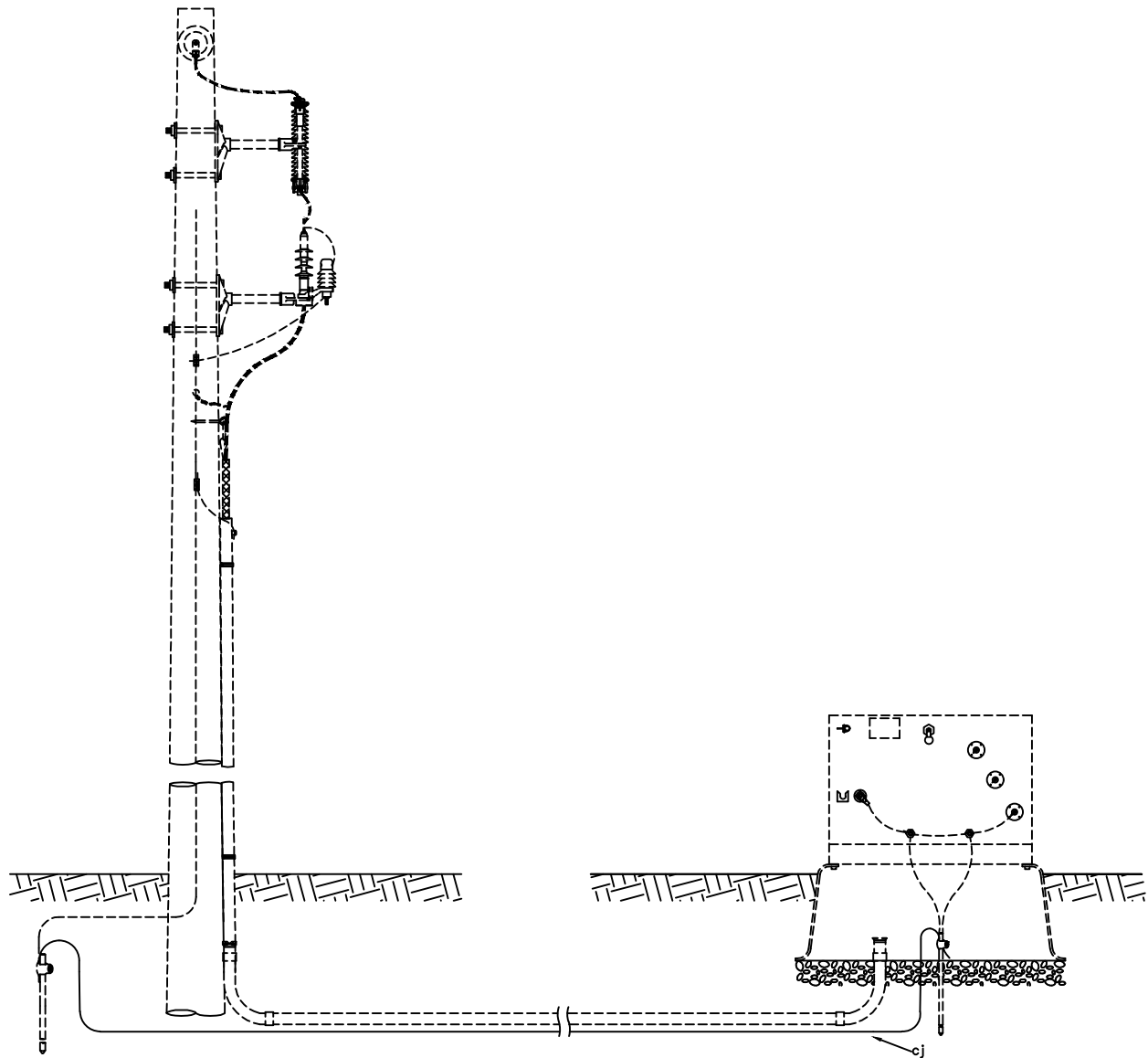
COUNTERPOISE GROUNDING

AUG 2016

RUS

UH2.0

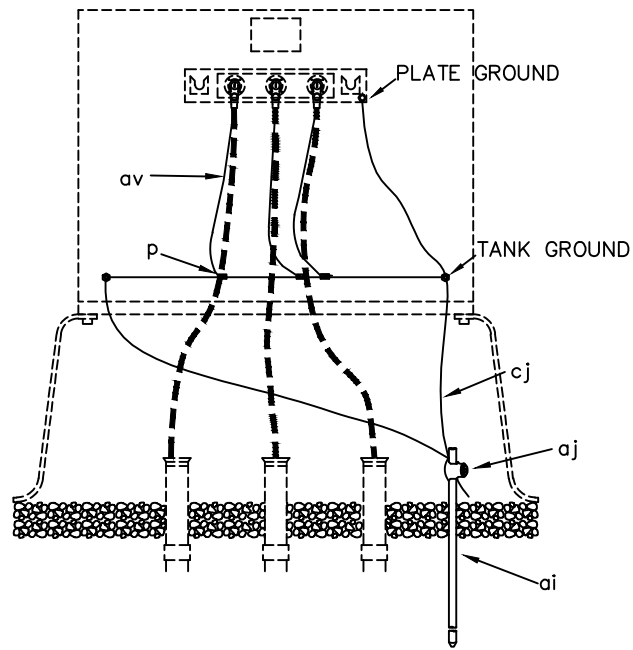
UH2.2



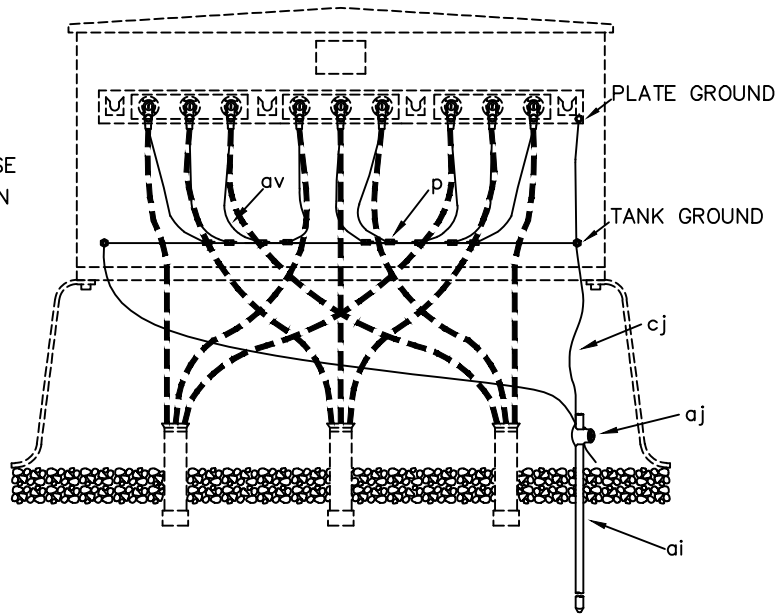
ITEM	QTY.	MATERIAL
p		Connector, as required
cj		Wire, ground, bare copper, as required

		TRENCH TYPE GROUNDING ASSEMBLY – RISER TO TRANSFORMER OUTSIDE OF CONDUIT	
		AUG 2016	
		RUS	UH2.7

SINGLE PHASE APPLICATION



THREE PHASE APPLICATION



ITEM	MATERIAL	UH3.1	UH3.2
p	Connector, as required		
ai	Rod, ground	1	1
aj	Clamp, ground rod	1	1
av	Jumper, copper, as required		
cj	Wire, ground, as required		

NOTES:

1. TIE CONCENTRIC NEUTRALS TOGETHER BEFORE TAP TO GROUND LOOP OR SIZE GROUND LOOP LARGE ENOUGH TO ASSURE SAME CONDUCTIVITY AS CABLE NEUTRAL.

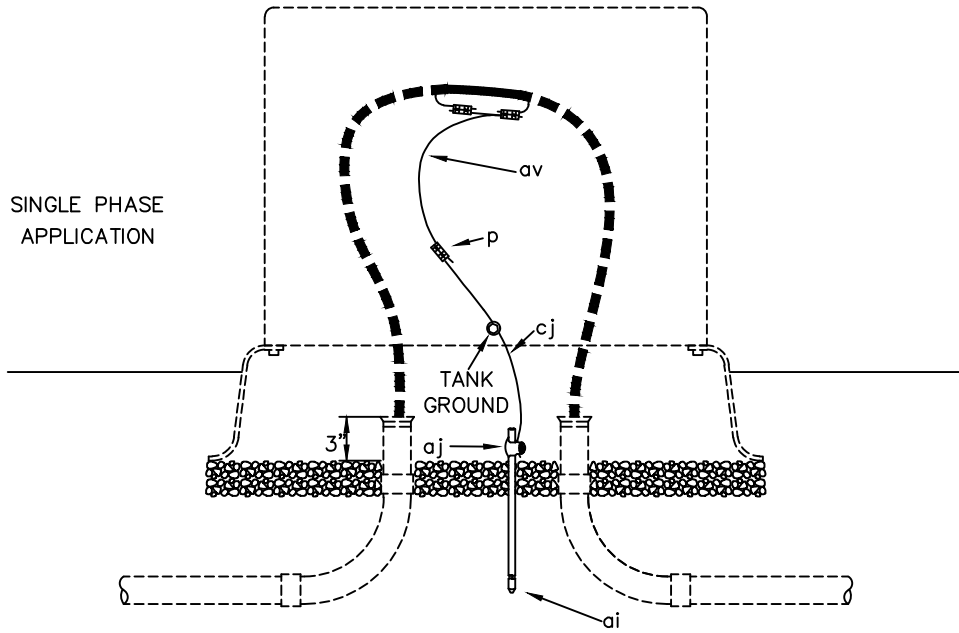
GROUNDING ASSEMBLY FOR
SECTIONALIZING ENCLOSURES
(1 ROD)

AUG 2016

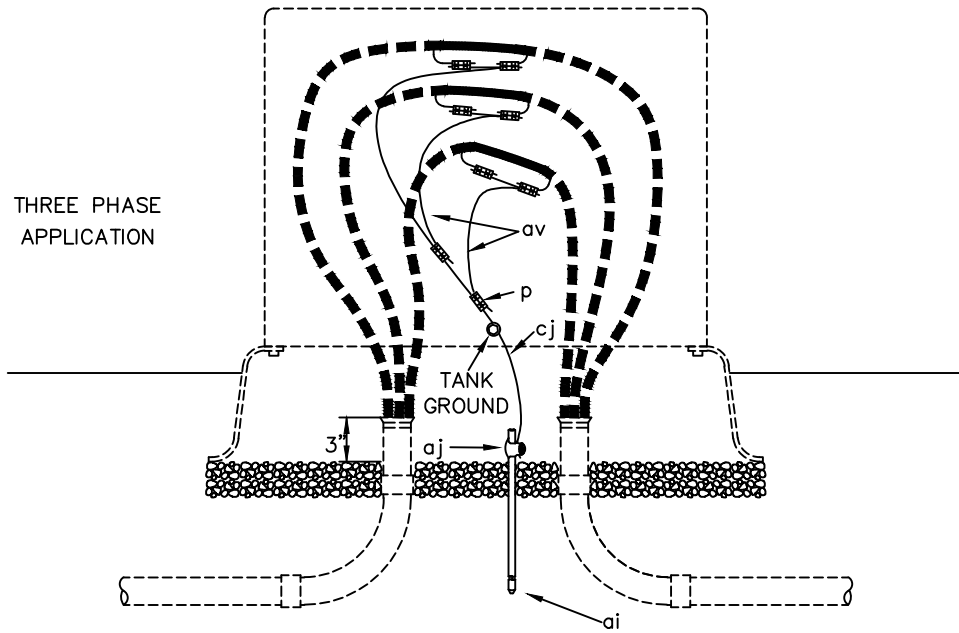
RUS

UH3.1

SINGLE PHASE APPLICATION



THREE PHASE APPLICATION



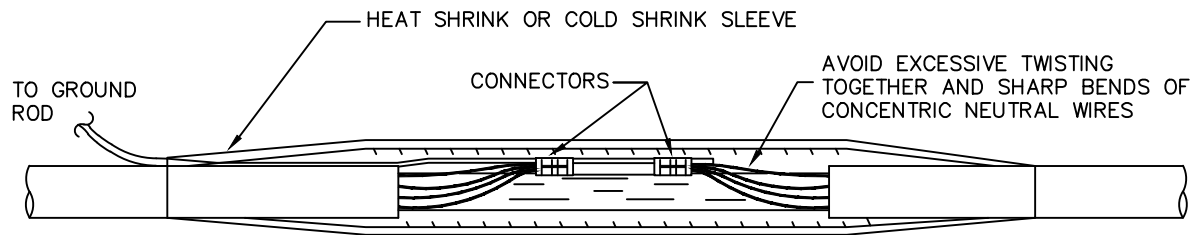
ITEM	MATERIAL	UH4.1	UH4.2
p	Connector, as required		
ai	Rod, ground	1	1
aj	Clamp, ground rod	1	1
av	Jumper, copper, as required		
cj	Wire, ground, as required		

GROUNDING ASSEMBLY FOR
CABLE ABOVE GRADE ENCLOSURES
(1 ROD)

AUG 2016

RUS

UH4.1



JACKETED CABLE
GROUNDING INSTALLATION
(HEAT SHRINK OR COLD SHRINK)

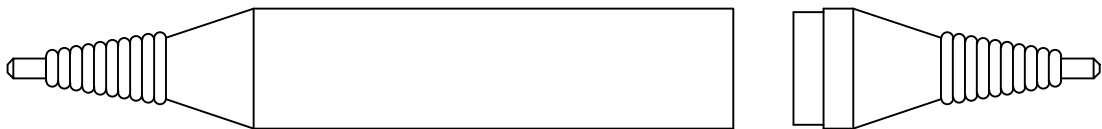
AUG 2016

RUS

UH4.1G

SECONDARY ASSEMBLY UNITS

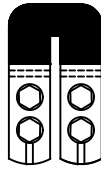
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806 (New)	1728F-806 (Old)	
UJ1.01	(UM6-32)	SECONDARY SPLICE
UJ1	(UJ1)	SECONDARY INSULATED CONNECTOR BLOCKS
UJ2	(UJ2)	TRANSFORMER CONNECTOR BLOCKS
UJ3.1	(UK5)	SECONDARY PEDESTAL SINGLE PHASE UNDERGROUND CABLE
UJ3.3		SECONDARY PEDESTAL THREE PHASE UNDERGROUND CABLE
UJ4.1	(UK6)	SECONDARY HANDHOLE SINGLE PHASE UNDERGROUND CABLE
UJ4.3		SECONDARY HANDHOLE THREE PHASE UNDERGROUND CABLE



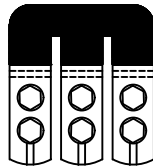
BOOT OR SLEEVE – INSULATED
(600 VOLT)

ITEM	QTY.	MATERIAL
Ugq	1	Boot or sleeve, insulated
	1	Secondary connector, as required

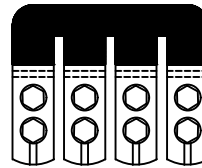
		SECONDARY SPLICE		
		AUG 2016		
		RUS		UJ1.01



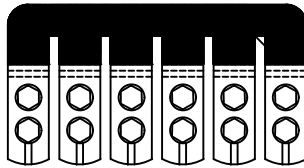
UJ2.1



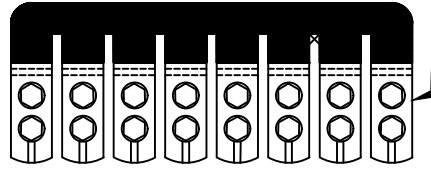
UJ3.1



UJ4.1



UJ6.1



UJ8.1

Ugp

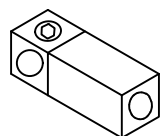
CONNECTOR BLOCKS USED IN SECONDARY PEDESTALS

NOTES:

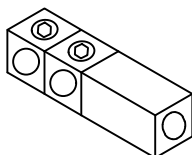
1. INSULATED COVERS ARE NOT SHOWN.
2. ADD SUFFIX ".1" FOR SET OF 2 INSULATED AND ONE BARE FOR NEUTRAL

ITEM	QTY.	MATERIAL
Ugp		Connector Blocks, as required

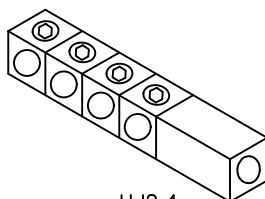
		SECONDARY INSULATED CONNECTOR BLOCKS	
		AUG 2016	
		RUS	UJ1



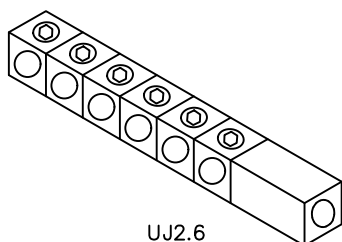
UJ2.1



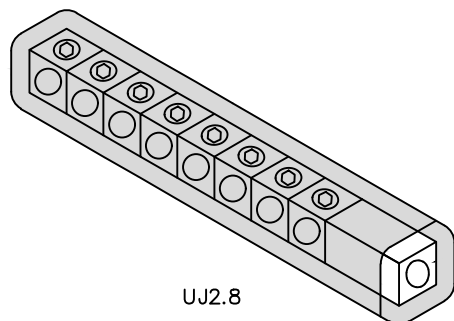
UJ2.2



UJ2.4



UJ2.6

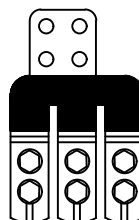


UJ2.8

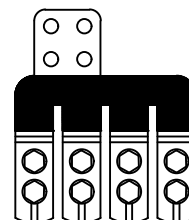
Ufz



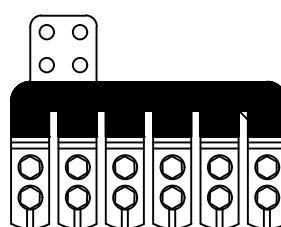
UJ2.2SPD



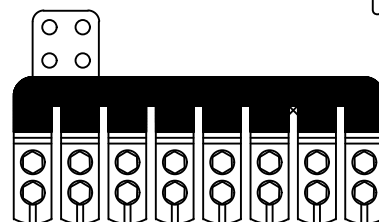
UJ2.3SPD



UJ2.4SPD



UJ2.6SPD



UJ2.8SPD

Ugp

TRANSFORMER CONNECTOR BLOCKS

NOTES:

1. INSULATED COVERS ARE NOT SHOWN.
2. SUFFIX "SPD" FOR SPADE APPLICATION.
3. ADD SUFFIX ".1" FOR SET OF 2 INSULATED AND ONE BARE FOR NEUTRAL.

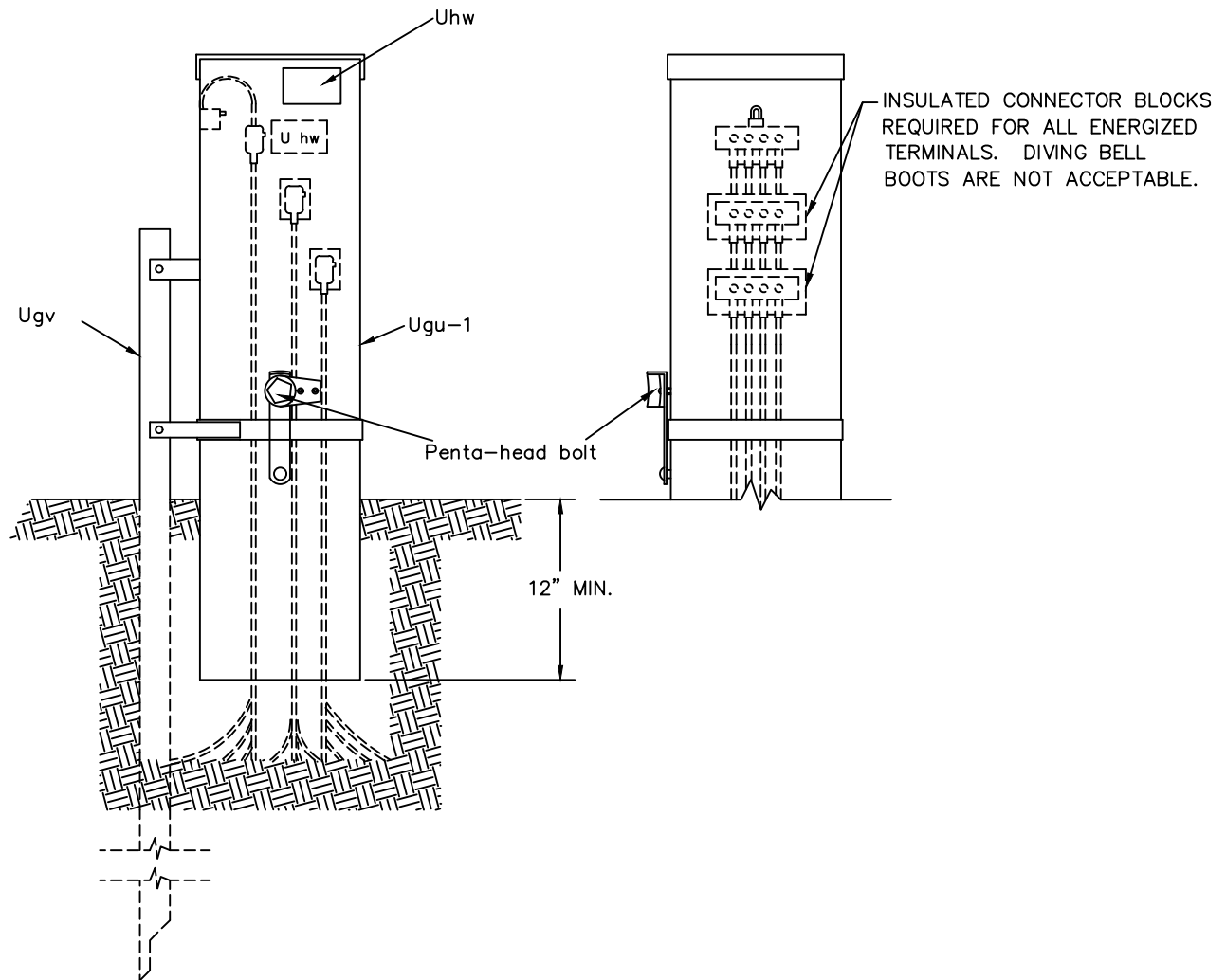
ITEM	QTY.	MATERIAL
Ufz		Transformer Connector Block, as required
Ugp		Connector Blocks, as required

TRANSFORMER CONNECTOR BLOCKS

AUG 2016

RUS

UJ2



ITEM	QTY.	MATERIAL
Ugu-1	1	Pedestal, Power
Ugv	1	Stake, Power Pedestal (if necessary)
Uhw	2	Safety signs

NOTES:

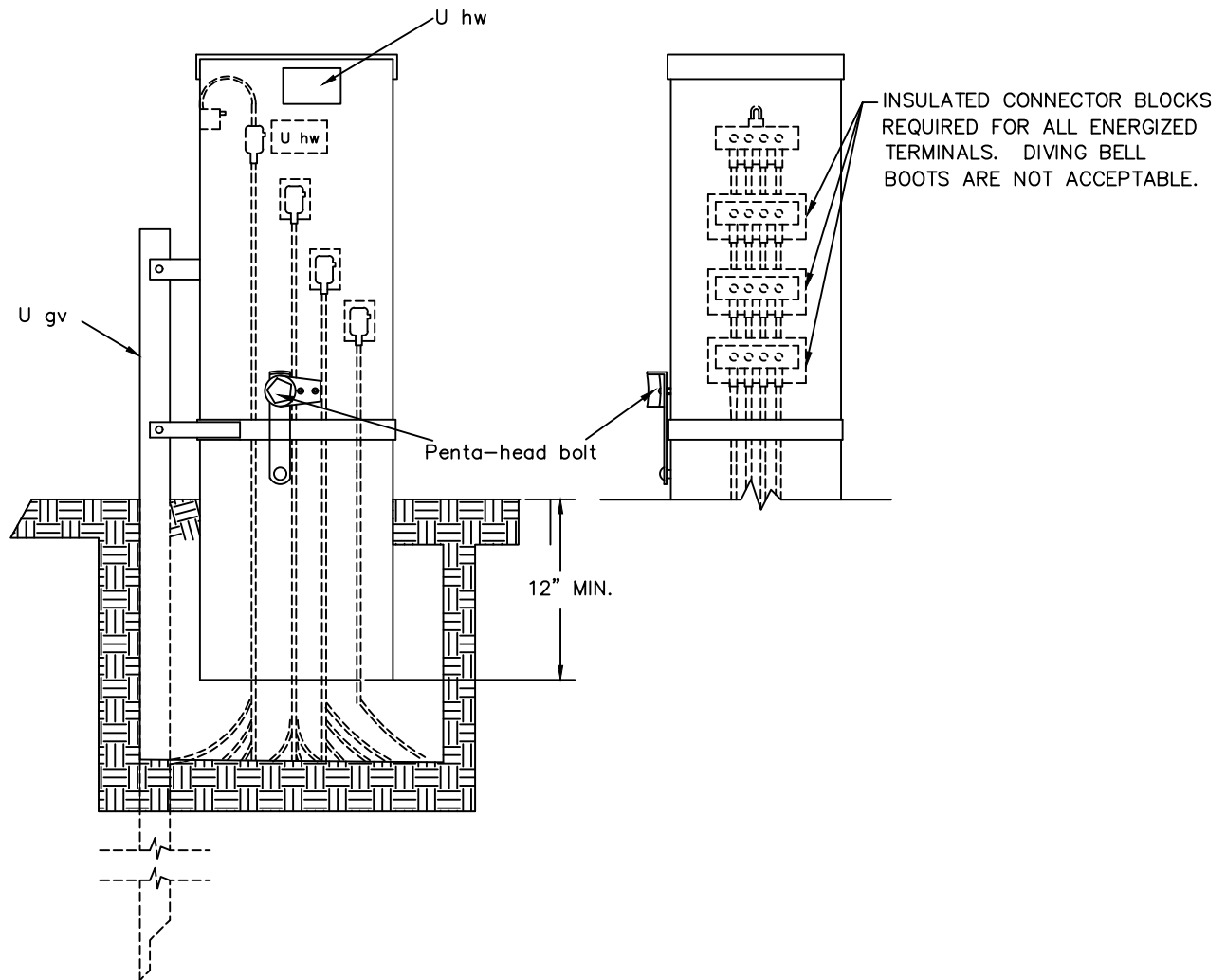
1. ITEM Ugv OPTIONAL – SEE PEDESTAL MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.
2. ALL PEDESTALS SHALL BE GROUNDED IN ACCORANCE WITH THE NATIONAL ELECTRICAL SAFETY CODE (NESC).

SECONDARY PEDESTAL SINGLE PHASE
ABOVE GRADE ENCLOSURE

AUG 2016

RUS

UJ3.1



NOTES:

1. INSTALL "WARNING" SIGN ON OUTSIDE OF PEDESTAL.
2. ITEM Ugv OPTIONAL – SEE PEDESTAL MANUFACTURER'S SPECIFICATIONS AND RECOMMENDATIONS.
3. ALL PEDESTALS SHALL BE GROUNDED IN ACCORANCE WITH THE NATIONAL ELECTRICAL SAFETY CODE (NESC).

ITEM	QTY.	MATERIAL
Ugu-1	1	Pedestal, Power
Ugv	1	Stake, Power Pedestal (if necessary)
Uhw	2	Safety signs

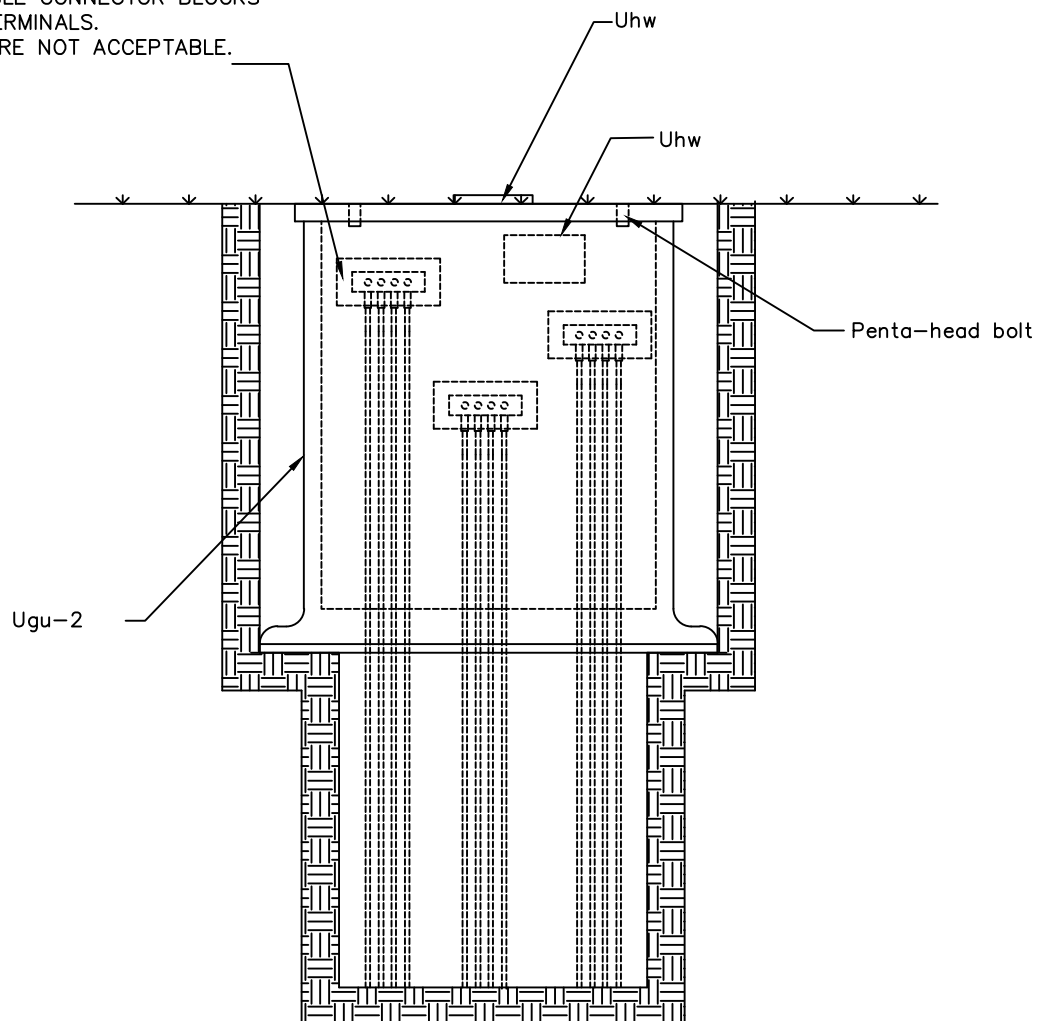
SECONDARY PEDESTAL THREE PHASE
ABOVE GRADE ENCLOSURE

AUG 2016

RUS

UJ3.3

INSULATED SUBMERSIBLE CONNECTOR BLOCKS
REQUIRED FOR ALL TERMINALS.
DIVING BELL BOOTS ARE NOT ACCEPTABLE.



ITEM	QTY.	MATERIAL
Ugu-2	1	Pedestal, Power, below grade
Uhw	2	Safety signs

NOTES:

1. ALL PEDESTALS SHALL BE GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL SAFETY CODE (NESC).

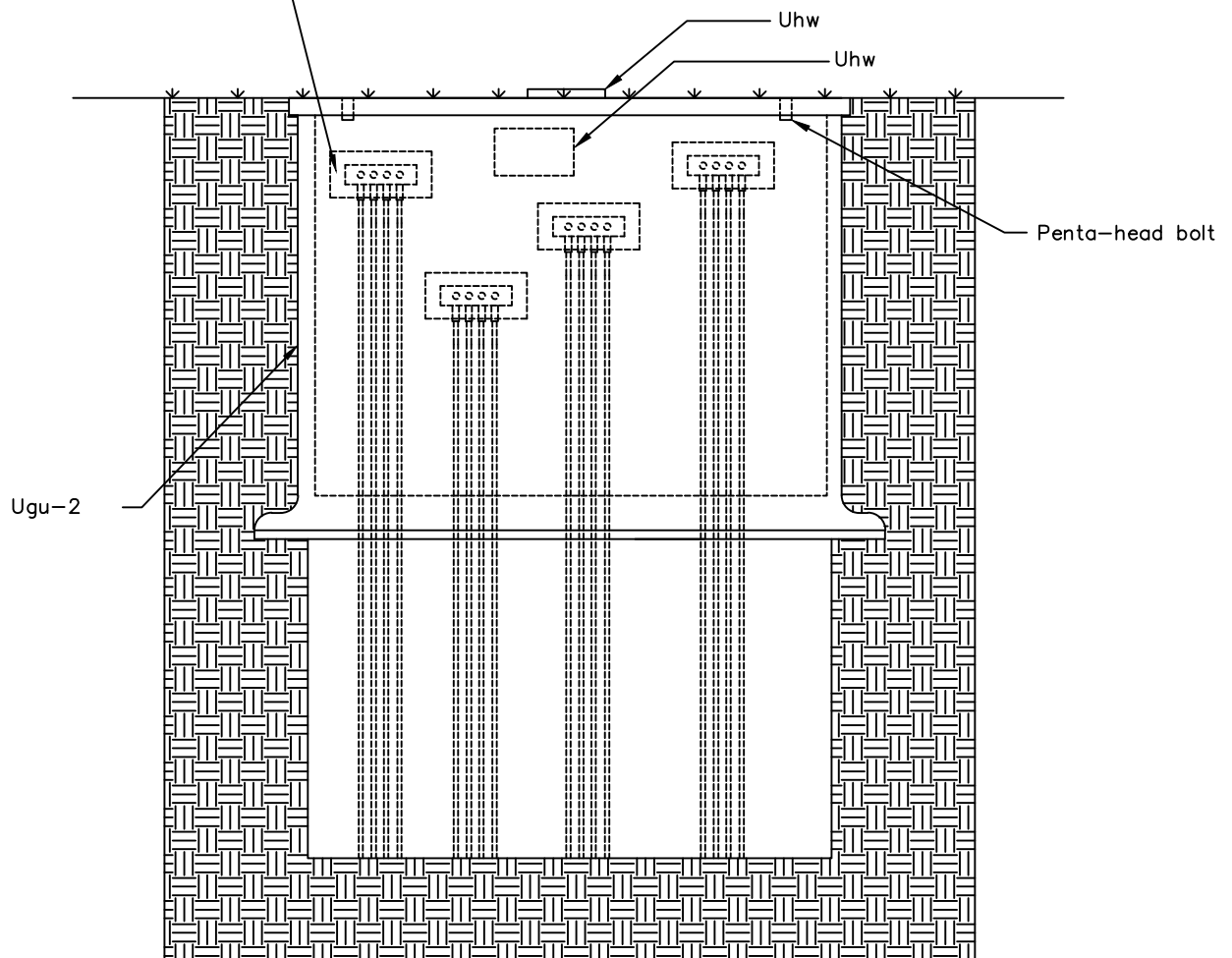
SECONDARY HANDHOLE SINGLE PHASE
BELOW GRADE ENCLOSURE

AUG 2016

RUS

UJ4.1

INSULATED SUBMERSIBLE CONNECTOR BLOCKS
REQUIRED FOR ALL TERMINALS.
DIVING BELL BOOTS ARE NOT ACCEPTABLE.



ITEM	QTY.	MATERIAL
Ugu-2	1	Pedestal, Power, below grade
Uhw	2	Safety signs

NOTES:

1. ALL PEDESTALS SHALL BE GROUNDED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL SAFETY CODE (NESC).

SECONDARY HANDHOLE THREE PHASE
BELOW GRADE ENCLOSURE

AUG 2016

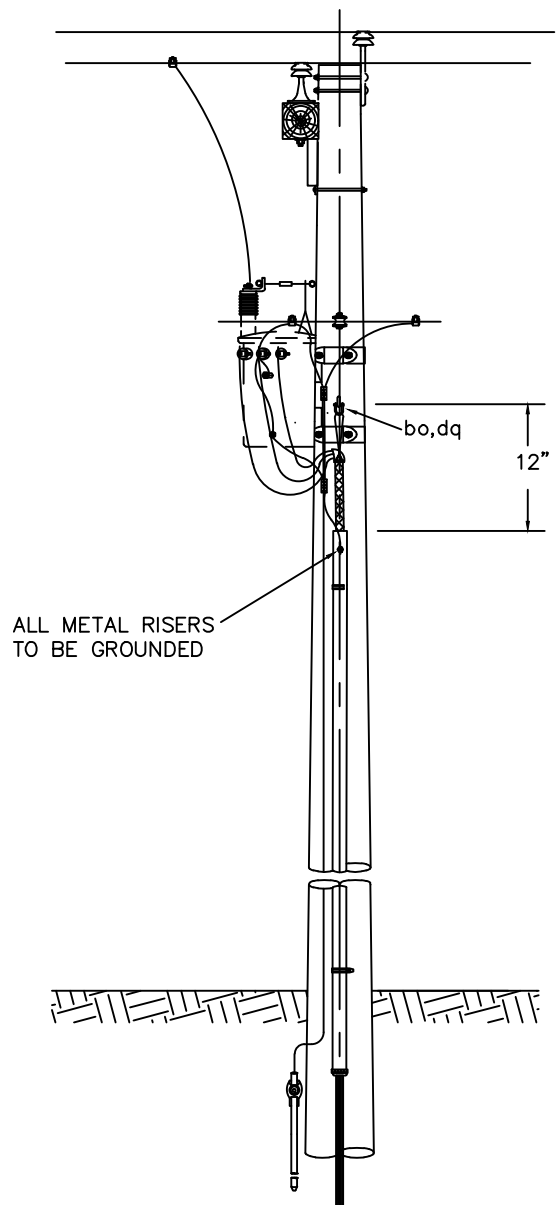
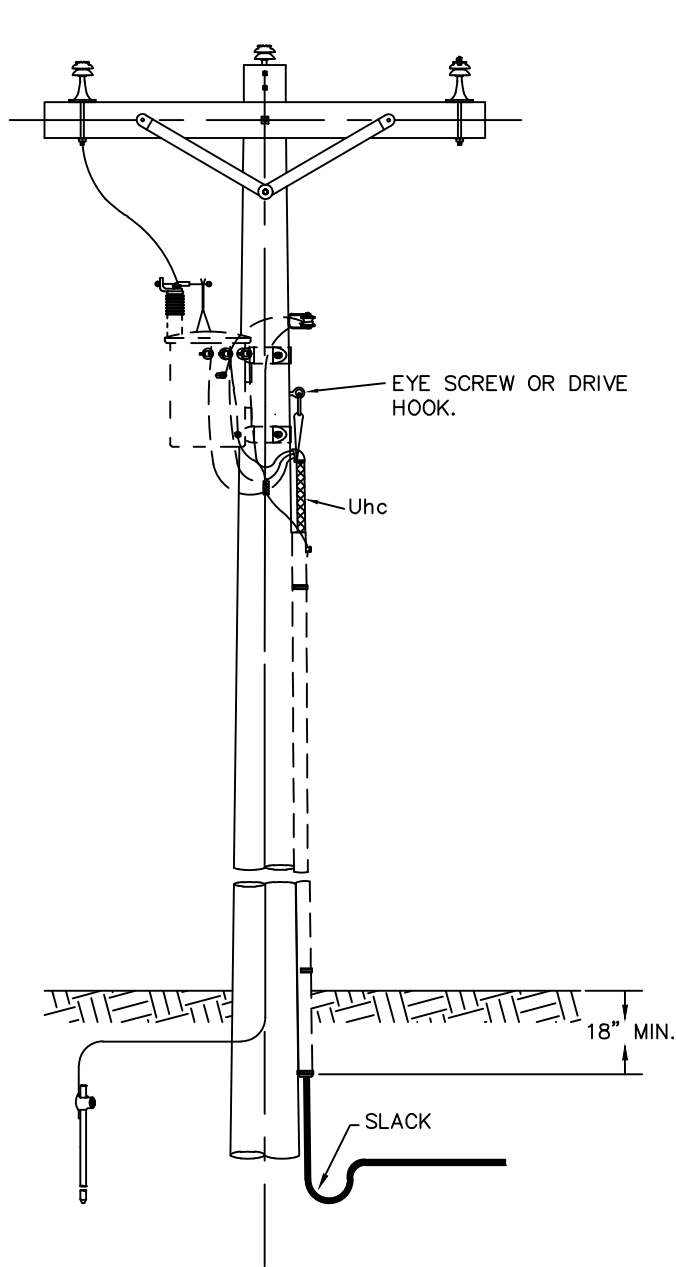
RUS

UJ4.3

SECONDARY SERVICE ASSEMBLY UNITS

DRAWING NUMBERS**1728F-806** **1728F-806**
(New) (Old)**DRAWING TITLE (DESCRIPTION)**

UK1.1	(UM5)	SECONDARY CABLE RISER POLE WITHOUT METER BASE
UK2.1		SECONDARY RISER BOTTOM CONNECTION
UK2.2		SECONDARY RISER BOTTOM SIDE CONNECTION
UK3.1	(UX8)	TEMPORARY CONDUIT TERMINATION WITHOUT METER BASE
UK4		SECONDARY BREAKER



ITEM	QTY.	MATERIAL
bo	1	Shackle, anchor
dq	1	Eye Screw, Elliptical or Drive Hook
Uhc	1	Cable Support

NOTES:

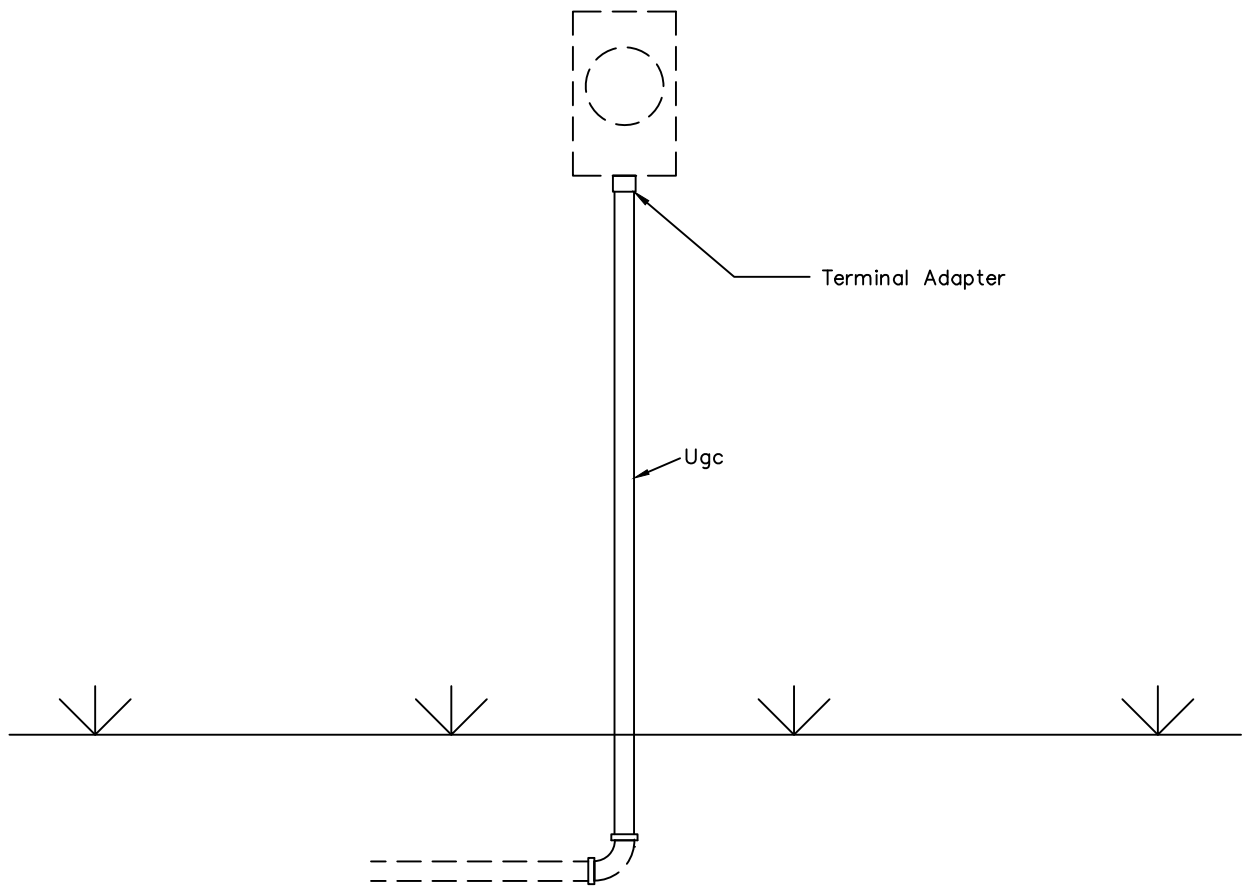
1. ALLOW MINIMUM CABLE SLACK OF 24" AT BOTTOM OF RISER.
2. ADD UP7 UNIT TO COMPLETE CABLE PROTECTION FOR THIS UNIT.

SECONDARY CABLE RISER POLE
WITHOUT METER BASE

AUG 2016

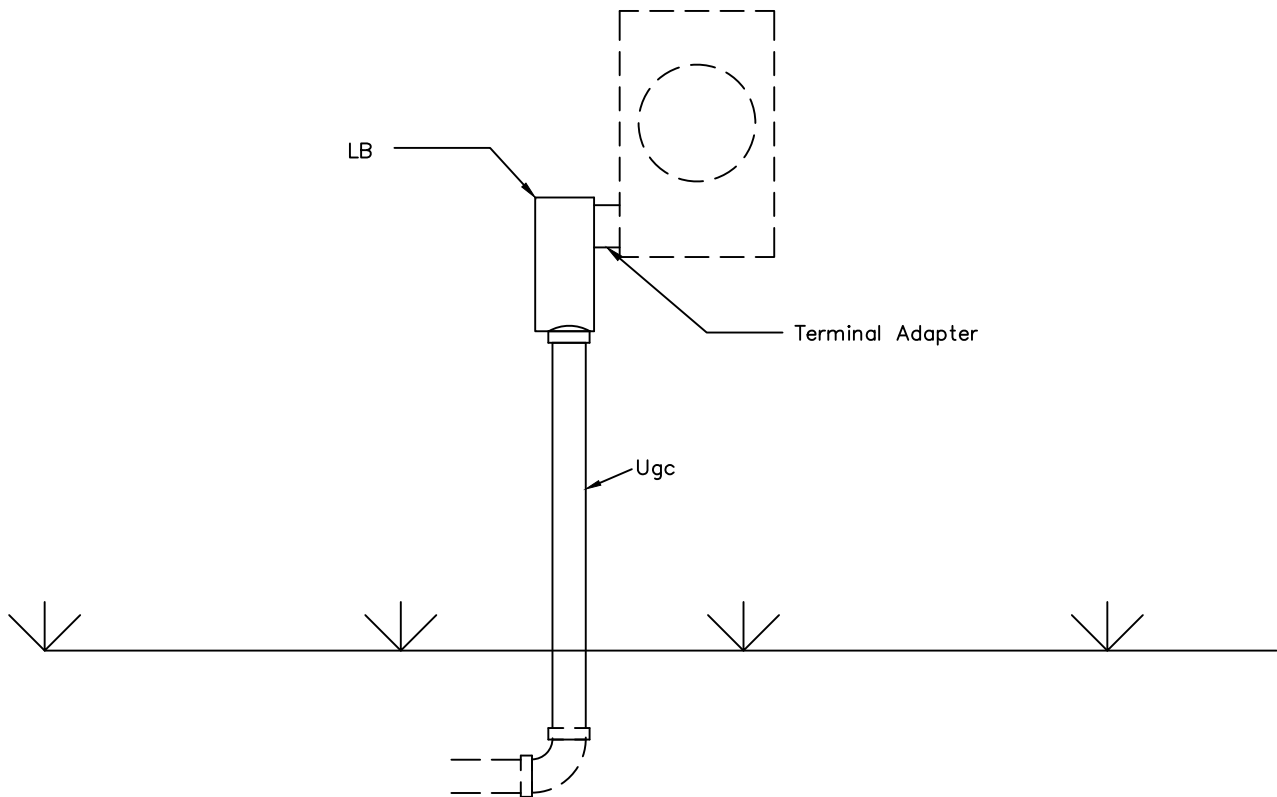
RUS

UK1.1



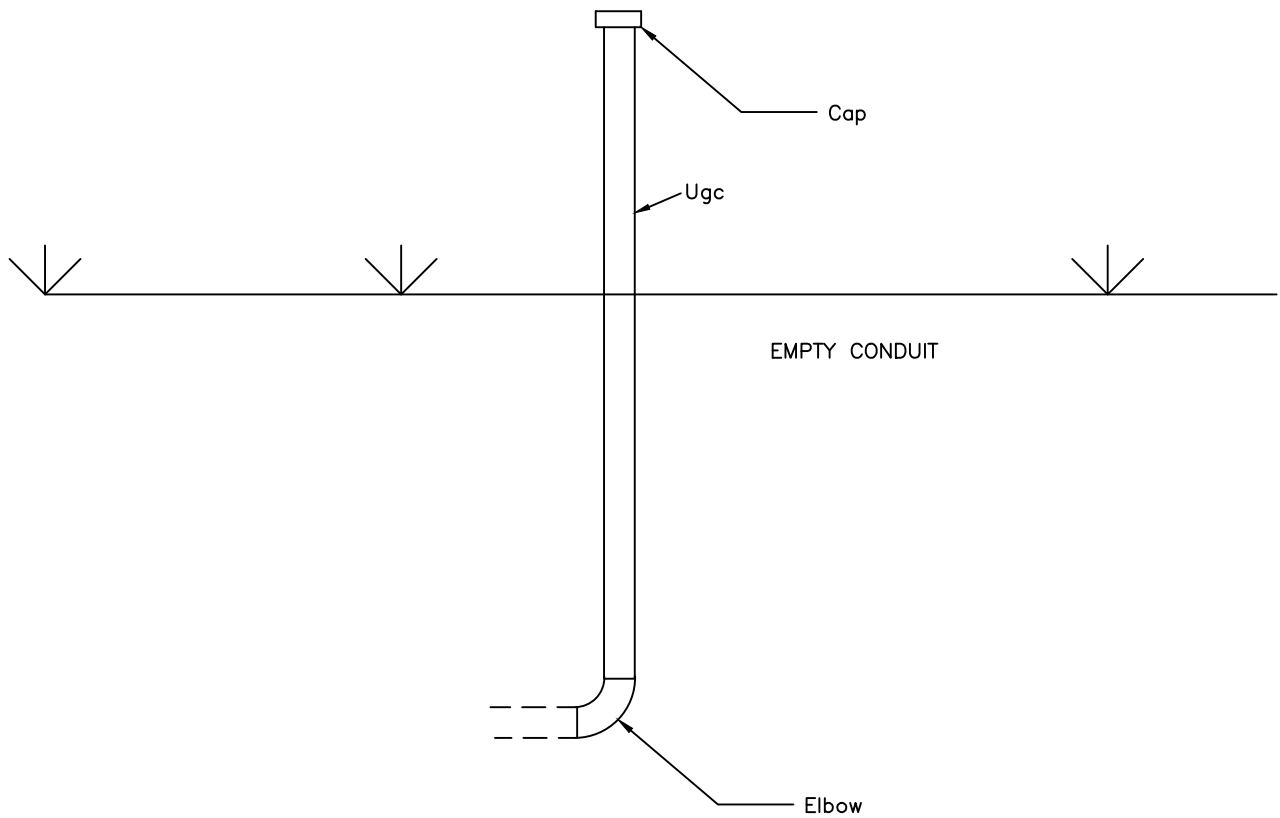
ITEM	QTY.	MATERIAL
Ugc		Conduit, as required
	1	Conduit terminal adapter

		SECONDARY RISER BOTTOM CONNECTION	
		AUG 2016	
		RUS	UK2.1



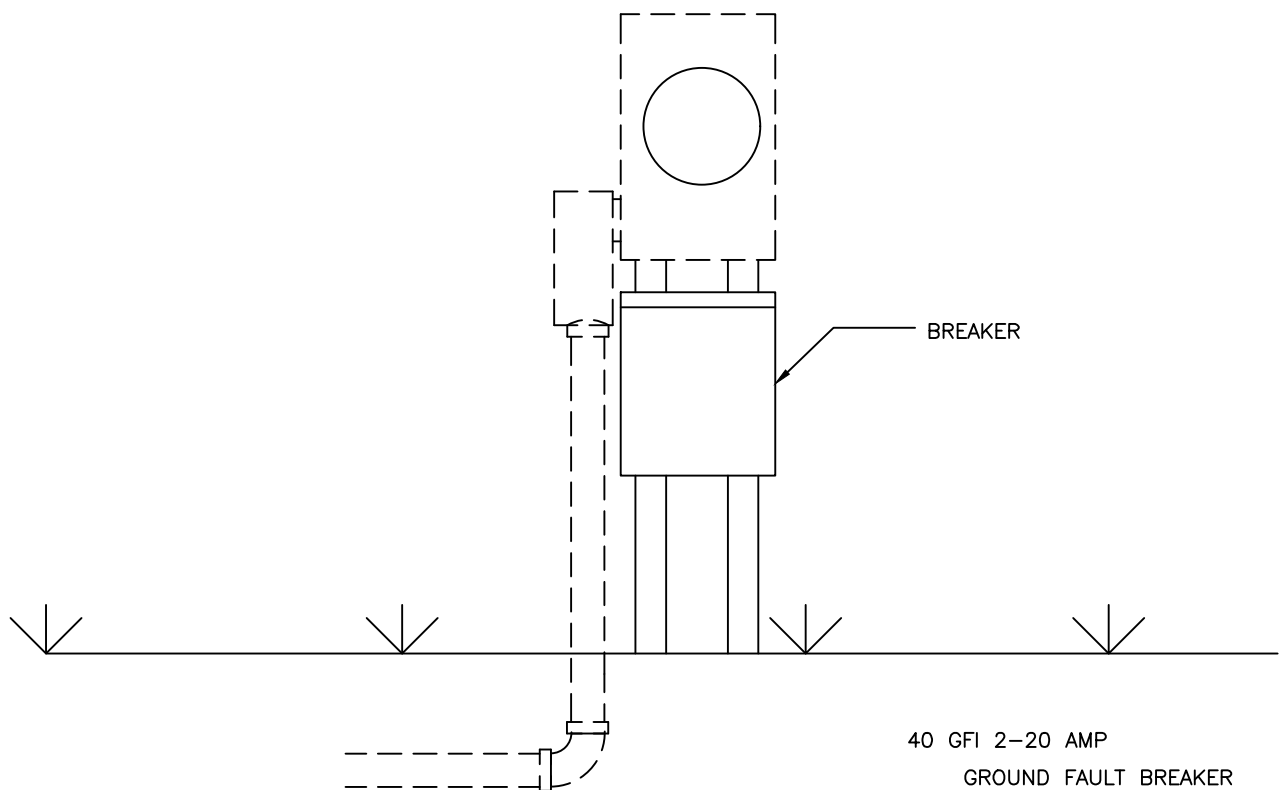
ITEM	QTY.	MATERIAL
Ugc		Conduit, as required
	1	Conduit terminal adapter
	1	Conduit LB

	SECONDARY RISER BOTTOM SIDE CONNECTION		
	AUG 2016		
	RUS		UK2.2



ITEM	QTY.	MATERIAL
Ugc		Conduit, as required
	1	Conduit cap
	1	Conduit elbow

		TEMPORARY CONDUIT TERMINATION WITHOUT METER BASE	
		AUG 2016	
		RUS	UK3.1



40 GFI 2-20 AMP
GROUND FAULT BREAKER
100 - 100 AMP BREAKER
200 - 200 AMP BREAKER
400 - 400 AMP BREAKER

ITEM	QTY.	MATERIAL
	1	Breaker

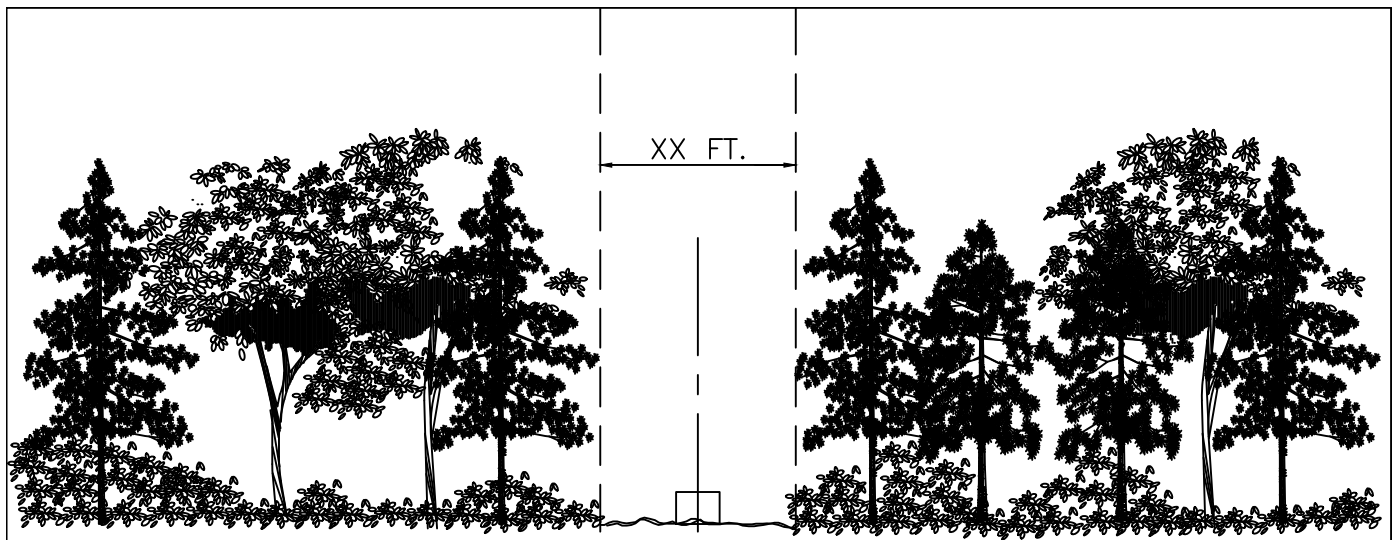
		SECONDARY BREAKER	
		AUG 2016	
		RUS	UK4

MISCELLANEOUS ASSEMBLY UNITS

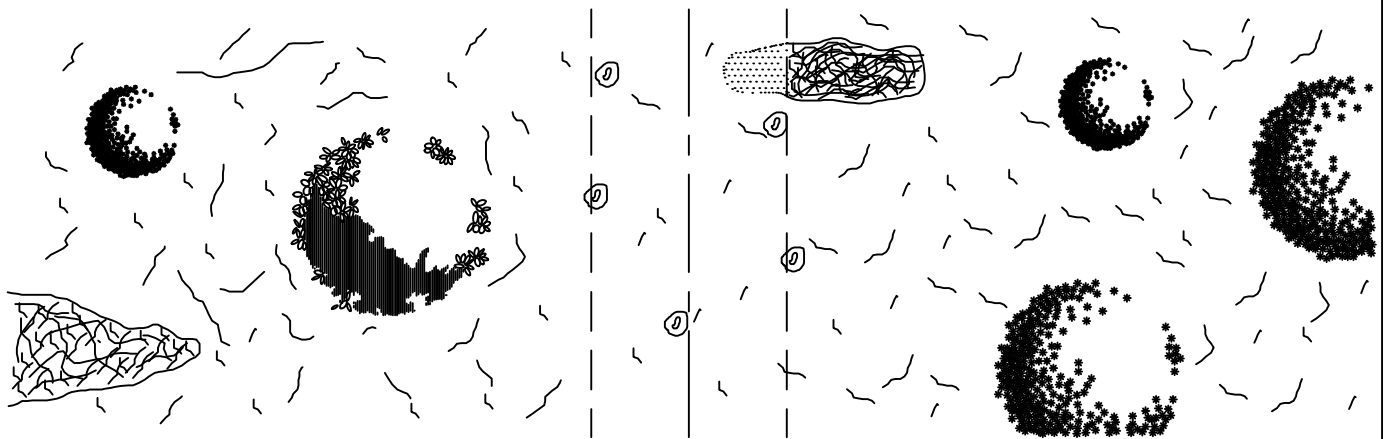
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806 (New)	1728F-806 (Old)	
UM1.XX		RIGHT-OF-WAY CLEARING
UM2	(UM6-12)	CABLE ROUTE MARKER
UM3		SAFETY SIGNS
		CAPS AND PLUGS
UM6.C2	(UM6-10)	INSULATED PROTECTIVE CAP - 200 AMP LOAD BREAK
UM6.C6	(UM6-11)	INSULATED PROTECTIVE CAP - 600 AMP DEAD BREAK
UM6.PL2	(UM6-7)	BUSHING WELL PLUG - 200 AMP LOAD BREAK
UM6.PL6	(UM6-17)	INSULATING PLUG TEE CONNECTOR - 600 AMP DEAD BREAK
		ELBOWS
UM6.EL2	(UM6-1)	LOAD BREAK ELBOW - 200 AMP LOAD BREAK
UM6.EL2F	(UM6-2)	FUSED ELBOW TERMINATION - 200 AMP LOAD BREAK
UM6.EL6	(UM6-3)	DEAD BREAK ELBOW TERMINATION - 600 AMP
UM6.EL9	(UM6-3)	DEAD BREAK ELBOW TERMINATION - 900 AMP
UM6.FI	(UM6-4)	FAULT INDICATORS
		INSERTS
UM6.IN22	(UM6-5)	FEED THROUGH INSERT - 200 AMP LOAD BREAK
UM6.IN2	(UM6-13)	LOAD BREAK INSERT - 200 AMP LOAD BREAK
UM6.IN6	(UM6-14)	DEAD BREAK INSERT - 600 AMP DEAD BREAK
		MULTIPOINT JUNCTIONS
UM6.JN22	(UM6-20)	TWO POINT TERMINATION, 2-200 AMP LOAD BREAK
UM6.JN222	(UM6-21)	THREE POINT TERMINATION, 3-200 AMP LOAD BREAK
UM6.JN2222	(UM6-22)	FOUR POINT TERMINATION, 4-200 AMP LOAD BREAK
UM6.JN6226		FOUR POINT TERMINATION, 2-600 AMP DEAD BREAK AND 2-200 AMP LOAD BREAK

MISCELLANEOUS ASSEMBLY UNITS

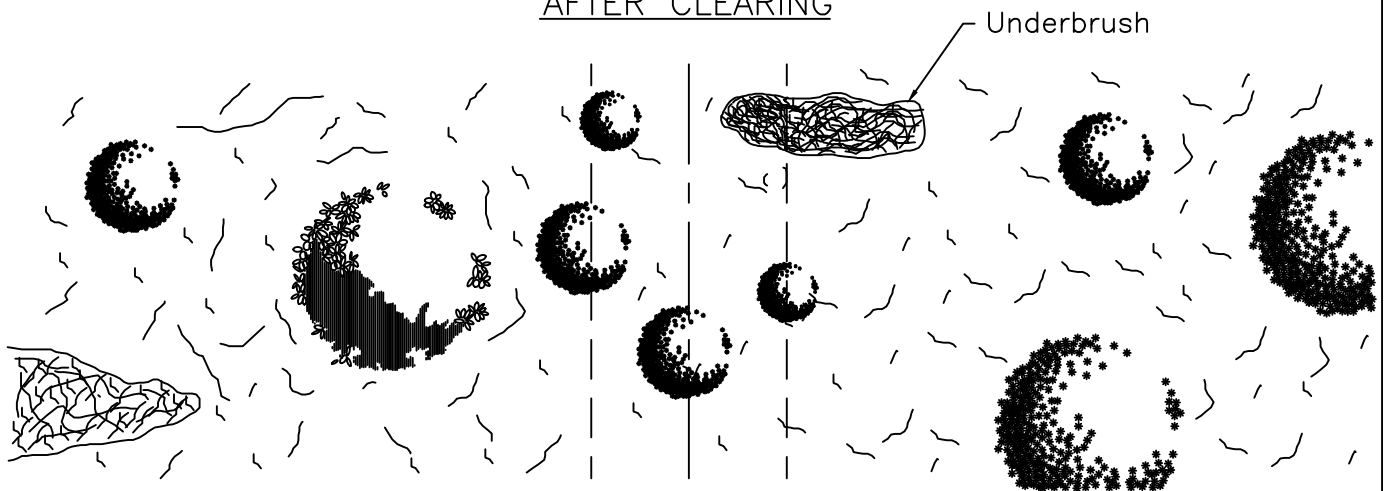
<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806 (New)	1728F-806 (Old)	
		PARKING STANDS
UM6.PK2	(UM6-15)	STAND OFF INSULATOR
UM6.PKGD		ONE POINT GROUND
UM6.PK22	(UM6-19)	STAND OFF INSULATOR FEED THROUGH - 200 AMP
		PRIMARY TERMINATIONS
UM6.RK		HEAT SHRINK OR COLD SHRINK TUBING
UM6.SP	(UM6-28)	IN LINE PRIMARY SPLICE
UM6.T	(UM6-24)	OUTDOOR TERMINATION
UM6.TS	(UM6-26)	INDOOR STRESS RELIEF CONE



ELEVATION



AFTER CLEARING

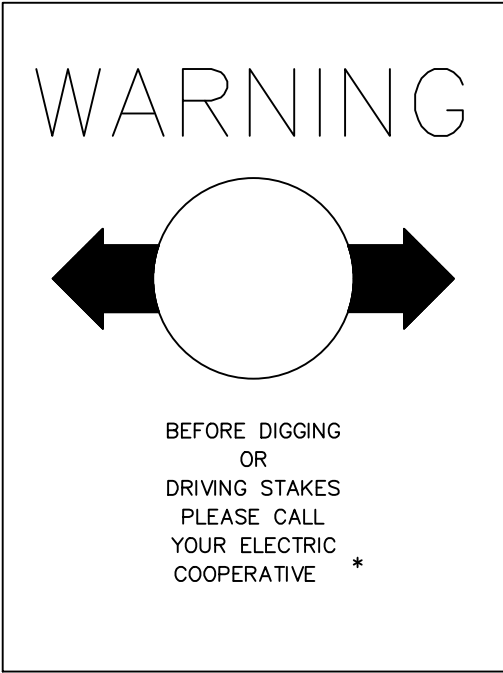


BEFORE CLEARING

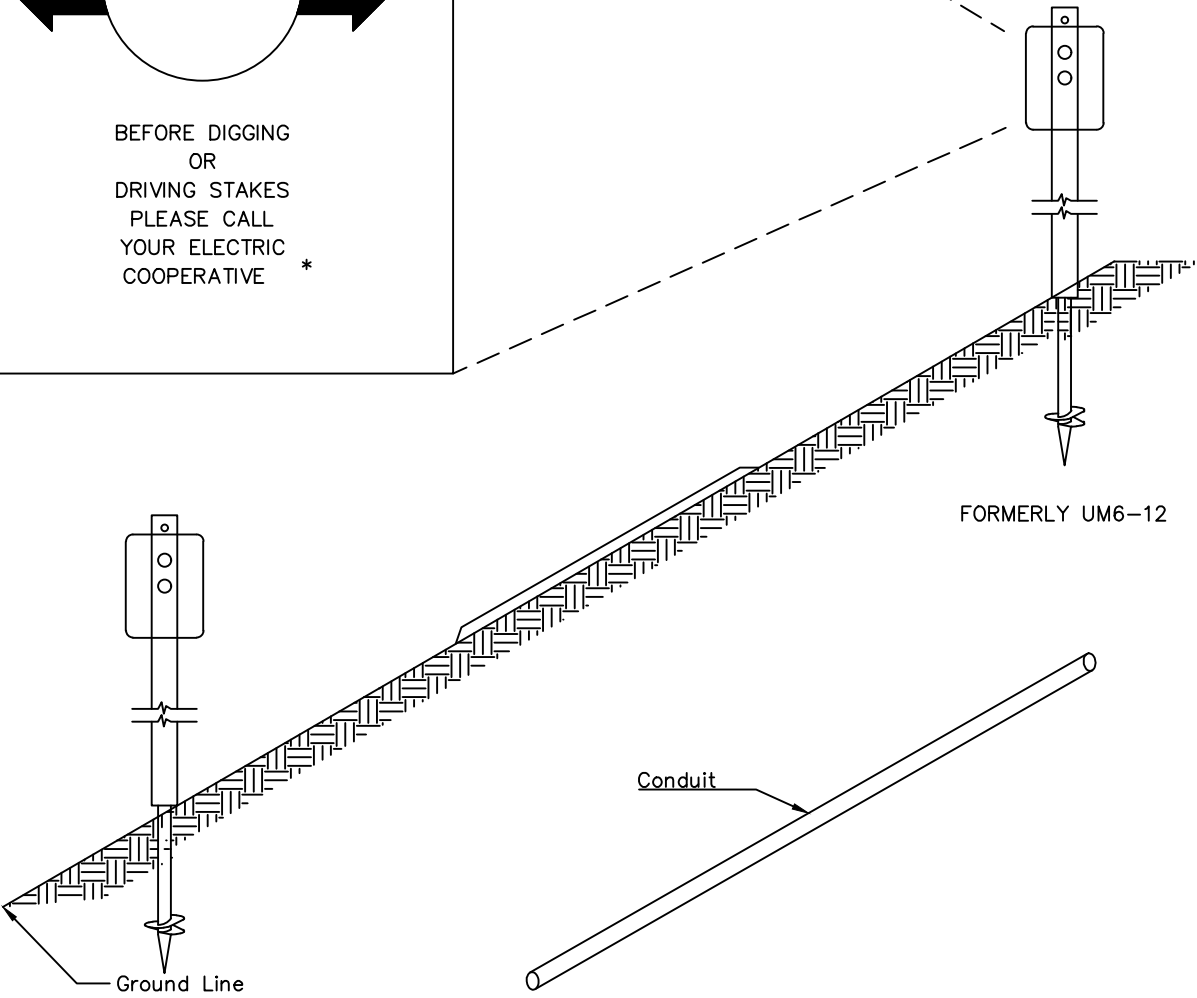
NOTE:

Change suffix of drawing number to designate clearing width. (e.g. UM1.30 specifies 30 foot wide clearing).

				RIGHT-OF-WAY CLEARING	
				AUG 2016	
				RUS	UM1.XX



1. SIGN SHALL BE SUPPORTED AND DISPLAYED AS SPECIFIED BY OWNER.
 2. SIGN SHALL MEET ANSI-Z535 STANDARD.
- * COOPERATIVE NAME AND TELLERHONE NUMBER MAY BE INSERTED AS AN ALTERNATE



ITEM	QTY.	MATERIAL
Uhx	1	Cable Route Marker

		CABLE ROUTE MARKER	
		AUG 2016	
		RUS	UM2

DANGER
HIGH VOLTAGE

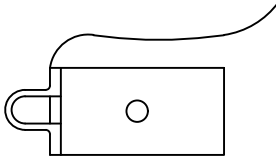
WARNING

ITEM	QTY.	MATERIAL
Uhw	1	Safety Signs

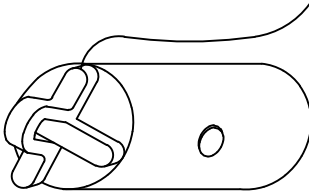
NOTES:

1. ALL SIGNAGE SHALL BE IN ACCORDANCE WITH ANSI Z535.

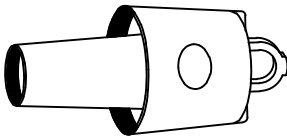
	SAFETY SIGNS		
	AUG 2016		
	RUS		UM3



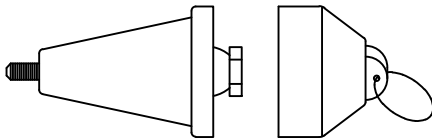
UM6.C2 INSULATED PROTECTIVE CAP
200 AMP LOAD BREAK (FORMERLY UM6-10)



UM6.C6 INSULATED PROTECTIVE CAP
600 AMP DEAD BREAK (FORMERLY UM6-11)



UM6.PL2 BUSHING WELL PLUG
200 AMP LOAD BREAK (FORMERLY UM6-7)



UM6.PL6 INSULATING PLUG TEE CONNECTOR
600 AMP DEAD BREAK (FORMERLY UM6-17)

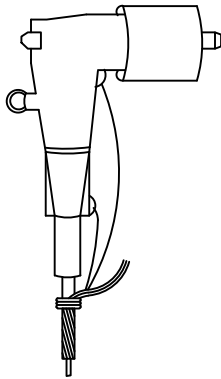
NOTES:

UM6.C (CAP DESCRIPTION)
2 FOR 200 AMP LOAD BREAK CAP
6 FOR 600 AMP DEAD BREAK CAP

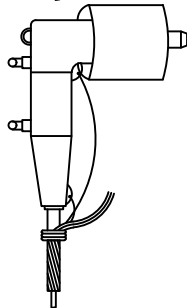
UM6.PL (PLUG DESCRIPTION)
2 FOR 200 AMP BUSHING WELL INSERTS
6 FOR 600 AMP TEE CONNECTOR

ITEM	MATERIAL	UM6.C2	UM6.C6	UM6.PL2	UM6.PL6
Uhb	Insulated protective cap, 200 AMP	1			
Uhb	Insulated protective cap, 600 AMP		1		
Uhb	Bushing well plug, 200 AMP			1	
Uhb	Insulating plug tee connector, 600 AMP				1

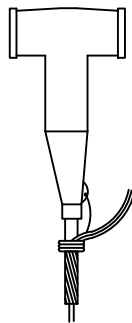
		CAPS AND PLUGS			
		AUG 2016			UM6.C
		RUS			UM6.PL



LOAD BREAK ELBOW – 200 AMP LOAD BREAK
UM6.EL2.WIRE SIZE
(FORMERLY UM6-1)



FUSED ELBOW TERMINATION 200 AMP LOAD BREAK
UM6.EL2F.FUSE SIZE.WIRE SIZE
UM6.EL2F.30.WIRE SIZE FOR 30 AMP FUSE
(FORMERLY UM6-2)

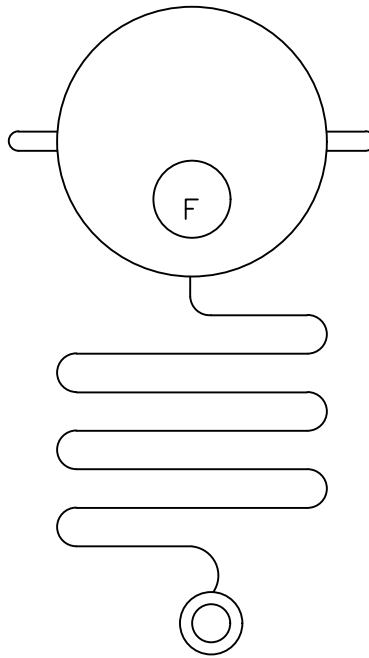


DEAD BREAK TERMINATION 600 AMP
UM6.EL6.WIRE SIZE
DEAD BREAK TERMINATION 900 AMP
UM6.EL9.WIRE SIZE
(FORMERLY UM6-3)

NOTES:
APPEND "R" SUFFIX TO INDICATE LONGER ELBOW
FOR REPAIR OR REPLACEMENT

ITEM	MATERIAL	UM6.EL2	UM6.EL2F	UM6.EL6	UM6.EL9
Uhp	Elbow, 200 AMP, load break	1			
Uhp	Fused elbow, 200 AMP, load break		1		
Uhb	Dead break termination, 600 AMP			1	
Uhb	Dead break termination, 900 AMP				1

	ELBOWS		
	AUG 2016		
	RUS		UM6.EL

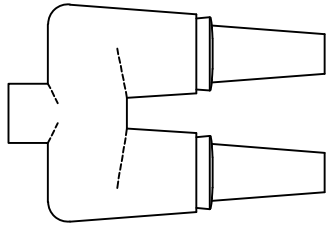


UM6.FIMR FAULT INDICATOR
(FORMERLY UM6-4)

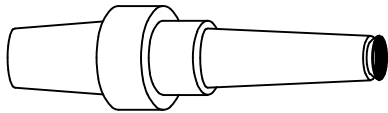
ITEM	QTY.	MATERIAL
Ugo	1	Fault indicator

NOTES:
MR-MANUAL RESET
VR-VOLTAGE RESET
TR-TIME RESET
RR-REMOTE RESET

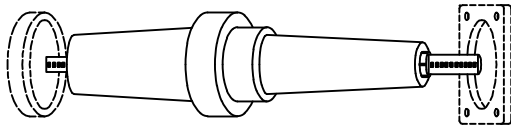
		FAULT INDICATORS	
		AUG 2016	
		RUS	UM6.FI



UM6.IN22 FEED THROUGH INSERT
2-200 AMP LOAD BREAK (FORMERLY UM6-5)



UM6.IN2 LOAD BREAK INSERT
1-200 AMP LOAD BREAK (FORMERLY UM6-13)

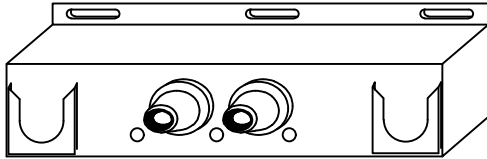


UM6.IN6
1-600 AMP DEAD BREAK INSERT
(FORMERLY UM6-14)

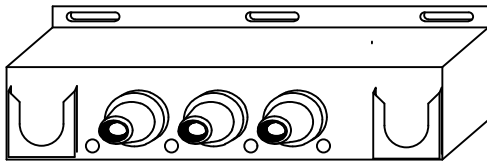
DEFINE THE NUMBER AND TYPE OF POINTS FOR EACH MODULE
2 FOR 200 AMP LOAD BREAK
6 FOR 600 AMP DEAD BREAK

ITEM	MATERIAL	UM6.IN22	UM6.IN2	UM6.IN6
Uhb	Feed through insert, 200 AMP	1		
Uhb	Load break insert, 200 AMP		1	
Uhb	Dead break insert, 600 AMP			1

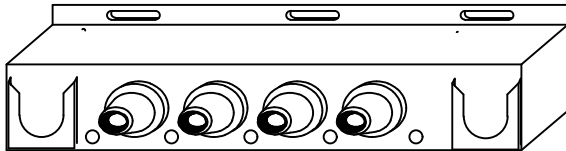
	INSERTS		
	AUG 2016		
	RUS		UM6.IN



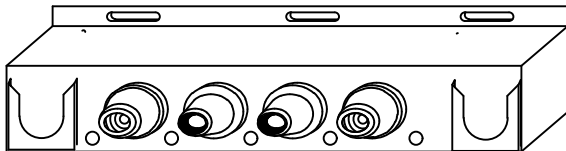
UM6.JN22 TWO POINT TERMINATION
2-200 AMP LOAD BREAK (FORMERLY UM6-20)



UM6.JN222 THREE POINT TERMINATION
3-200 AMP LOAD BREAK (FORMERLY UM6-21)



UM6.JN2222 FOUR POINT TERMINATION
4-200 AMP LOAD BREAK (FORMERLY UM6-22)

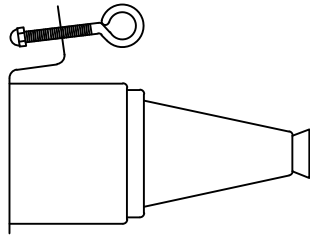


UM6.JN6226 FOUR POINT TERMINATION
2-600 AMP DEAD BREAK
2-200 AMP LOAD BREAK

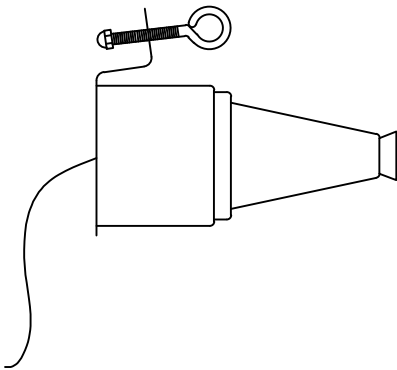
ITEM	QTY.	MATERIAL
Uhq	1	Multipoint junction

DEFINE THE NUMBER OF POINTS
AND TYPE OF POINT FOR EACH MODULE
2 FOR 200 AMP LOAD BREAK
6 FOR 600 AMP DEAD BREAK
9 FOR 900 AMP DEAD BREAK

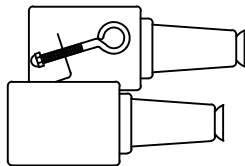
			MULTIPOINT JUNCTIONS	
			AUG 2016	
			RUS	UM6.JN



UM6.PK2 STAND OFF INSULATOR
INSULATED (FORMERLY UM6-15)



UM6.PKGD ONE POINT GROUND
GROUNDED

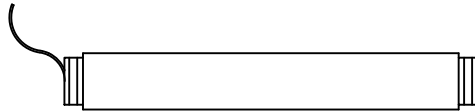


UM6.PK22 STAND-OFF INSULATOR
FEED THROUGH 200 AMP (FORMERLY UM6-19)

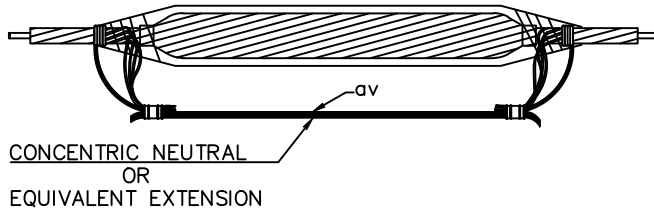
ITEM	QTY.	MATERIAL
Uhq	1	Parking stand

DEFINE THE NUMBER AND TYPE OF POINTS FOR EACH MODULE
2 FOR 200 AMP LOAD BREAK
6 FOR 600 AMP DEAD BREAK
GP FOR POINT WITH GROUND JUMPER
22 FOR 200 AMP FEED THROUGH

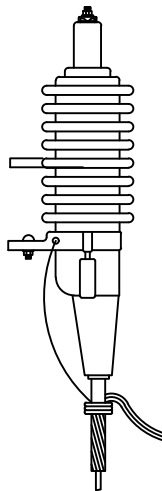
		PARKING STANDS	
		AUG 2016	
		RUS	UM6.PK



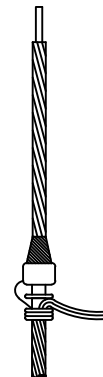
HEAT SHRINK OR
COLD SHRINK TUBING
UM6.RK



IN LINE PRIMARY SPLICE
UM6.SP.WIRE SIZE
(FORMERLY UM6-28)



OUTDOOR TERMINATION
UM6.T.WIRE SIZE
(FORMERLY UM6-24)



INDOOR STRESS RELIEF CONE
UM6.TS.WIRE SIZE
(FORMERLY UM6-26)

ITEM	MATERIAL	UM6.RK	UM6.SP	UM6.T	UM6.TS
Uhr	Heat Shrink or Cold Shrink Tubing	1			
Uhy	Splice, underground		1		
Ugk-2	Termination, outdoor			1	
Ugk-1	Termination, indoor				1

		PRIMARY TERMINATIONS			
		AUG 2016			UM6.RK, UM6.SP
		RUS			UM6.T, UM6.TS

OUTDOOR LIGHTING ASSEMBLY UNITS

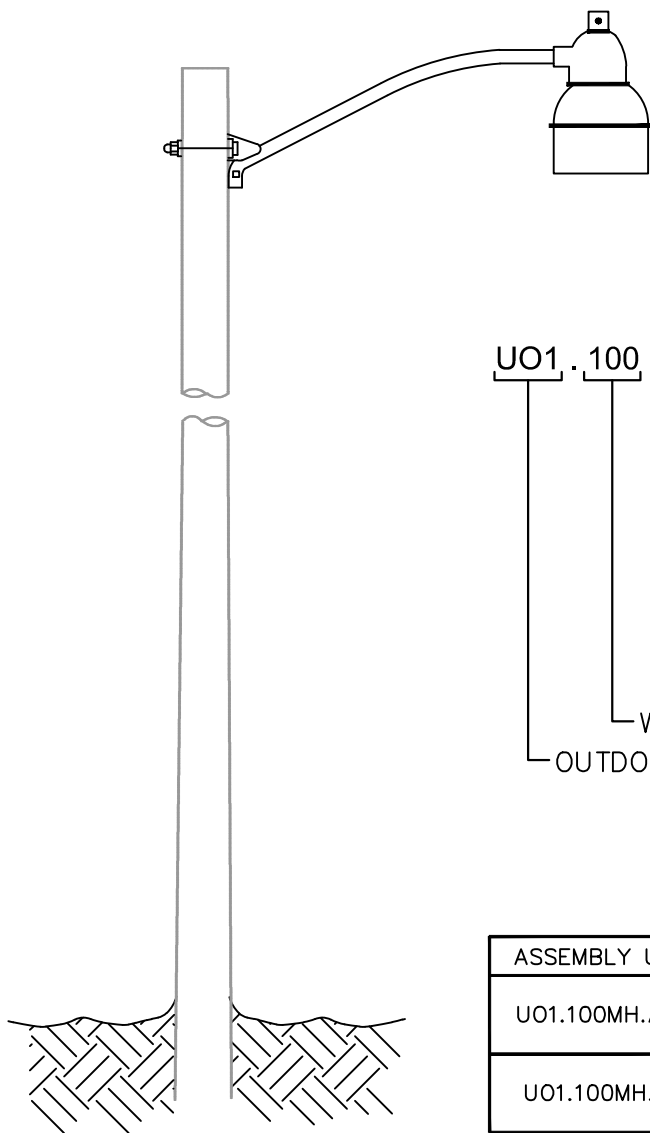
DRAWING NUMBERS

DRAWING TITLE (DESCRIPTION)

1728F-806	1728F-806
(New)	(Old)

U01	OUTDOOR LIGHT INSTALLATION GUIDE
-----	----------------------------------

U02	LIGHT STRUCTURE INSTALLATION GUIDE
-----	------------------------------------



U01 . 100 MH . A4

STANDARD MAST WITH LENGTH

TYPE:

MV=MERCURY VAPOR,(RETIREMENT ONLY)

MH=METAL HALIDE

HPS=HIGH PRESSURE SODIUM

LPS=LOW PRESSURE SODIUM

LED=LIGHT EMITTING DIODE

IL=INDUCTIVE LAMP

S=SOLAR POWERED

WATTAGE

OUTDOOR LIGHT ON POLE

EXAMPLES:

ASSEMBLY UNIT	DESCRIPTION
U01.100MH.A4	100 Watt Metal Halide Outdoor Light on standard Mast
U01.100MH.A	100 Watt Metal Halide Outdoor Light for standard Mast

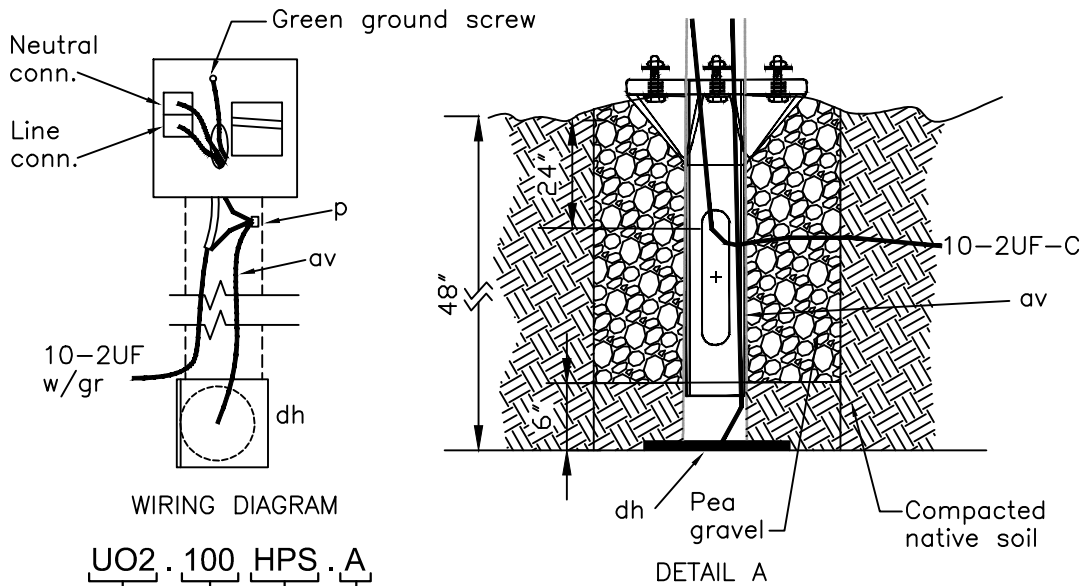
QTY.	MATERIAL
1	Outdoor Lighting Package
	Connectors, as required

OUTDOOR LIGHT INSTALLATION GUIDE

AUG 2016

RUS

U01



WIRING DIAGRAM

DETAIL A

UO2 . 100 HPS . A

COOPERATIVE DESIGNATION

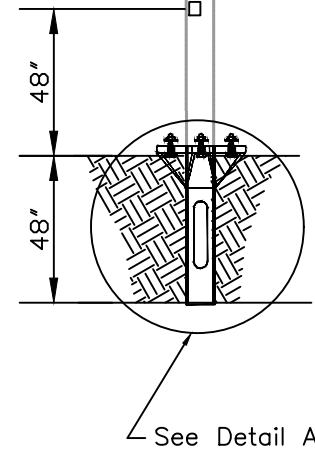
TYPE:
MV=MERCURY VAPOR,(RETIREMENT ONLY)
MH=METAL HALIDE
HPS=HIGH PRESSURE SODIUM
LPS=LOW PRESSURE SODIUM
LED=LIGHT EMITTING DIODE
IL=INDUCTIVE LAMP
S=SOLAR POWERED

WATTAGE

OUTDOOR LIGHT ON POLE

EXAMPLES:

ASSEMBLY UNIT	DESCRIPTION
UO2.100HPS.A12	100 Watt High Pressure Sodium Lamp in Outdoor Light Head on 12-foot Mast on pole.
UO2.100MH.B	Custom Type "B" could equal MH decorative pole top fixture of a specific style and decorative pole to match.



ITEM	QTY.	MATERIAL
av	30	#10 THW Cu.
p	1	Connector, wire nut
dh	1	Ground plate
	1	Post/Pole Structure
	1	Photo electric control
	1	Lamp, 175w MV
		Connections as required

LIGHT STRUCTURE INSTALLATION GUIDE

AUG 2016

RUS

UO2

SYSTEM PROTECTION ASSEMBLY UNITS

DRAWING NUMBERS

1728F-806	1728F-806
(New)	(Old)

DRAWING TITLE (DESCRIPTION)

ARRESTERS

UP1	(UM6-33)	RISER POLE ARRESTER
UP2	(UM6-34)	ELBOW ARRESTER
UP3	(UM6-38)	BUSHING ARRESTER

ARRESTERS AND ANODES

UP4	(UM6-37)	PARKING STAND ARRESTER
UP5	(UM27-1,-2,-3) (UM28)	SACRIFICIAL ANODES

UP7.01	(UM6-8)	RISER SHIELD
UP7.02	(UM6-18)	BACK PLATE
UP7.03	(UM6-9)	CONDUIT CABLE RISER

UP7.04		CONDUIT ELBOW
--------	--	---------------

UP7.B1		SINGLE CONDUIT RISER WITH STAND-OFF BRACKETS
--------	--	--

UP7.B2		TWO CONDUIT RISER WITH STAND-OFF BRACKETS
--------	--	---

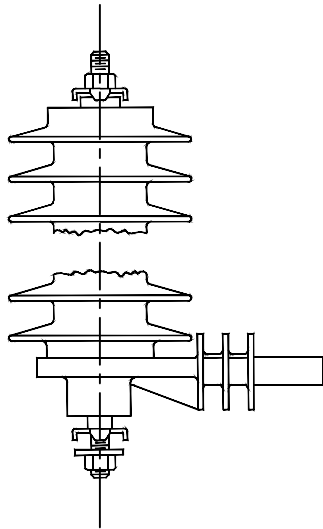
UP7.B3		THREE CONDUIT RISER WITH STAND-OFF BRACKETS
--------	--	---

UP7.C		STRAP ATTACHED CONDUIT RISER
-------	--	------------------------------

UP7.FC		FLEX CONDUIT RISER
--------	--	--------------------

UP7.UG		U-GUARD RISER
--------	--	---------------

UP8		UNDERGROUND CONDUIT
-----	--	---------------------

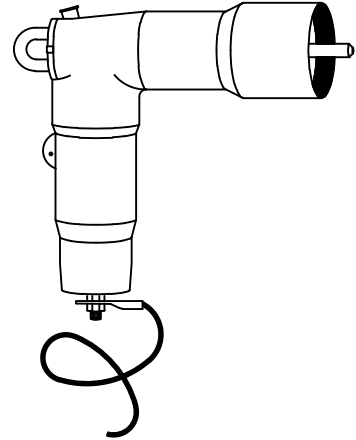


UP1 – RISER POLE ARRESTER

UP1 . X

- 01=SUBUNIT ARRESTER ONLY
- 1=REPLACE OH SINGLE ARRESTER WITH RISER POLE
- 3=REPLACE OH THREE ARRESTERS WITH RISER POLE

— RISER POLE ARRESTER

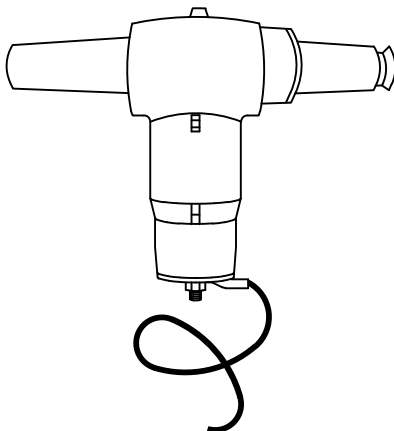


UP2 – ELBOW ARRESTER

UP2 . X

- 2=200 AMP LOAD BREAK

— ELBOW ARRESTER



UP3 – BUSHING ARRESTER

UP3 . X

- 2=LOAD BREAK INTERFACE
- 6=DEAD BREAK INTERFACE

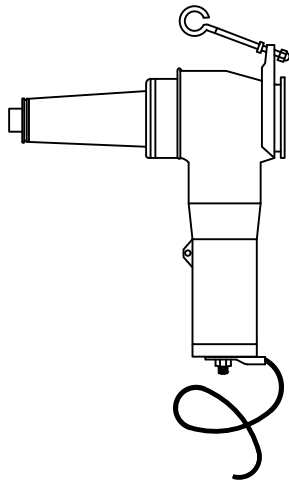
— BUSHING ARRESTER

ARRESTERS

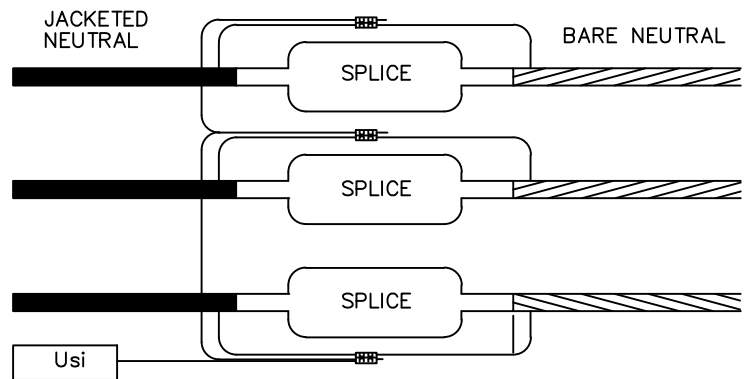
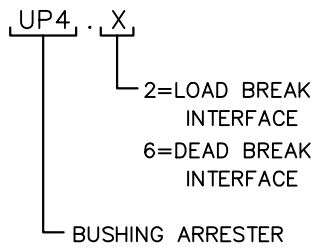
AUG 2016

RUS

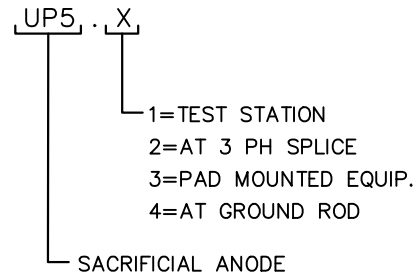
UP1, UP2
UP3



UP4 – PARKING STAND ARRESTER



UP5 – SACRIFICIAL ANODES



ARRESTERS AND ANODES

AUG 2016

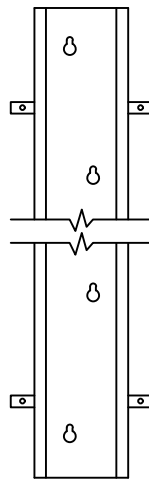
RUS

UP4

UP5



UP7.01
RISER SHIELD (U GUARD)
(FORMERLY UM6-8)



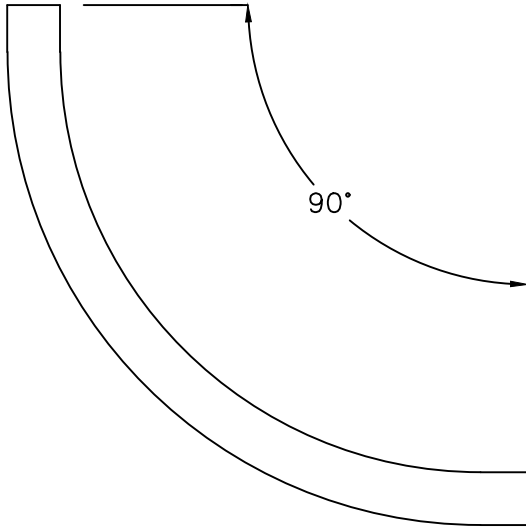
UP7.02
BACKING PLATE FOR
U-GUARD RISER SHIELD
(FORMERLY UM6-18)



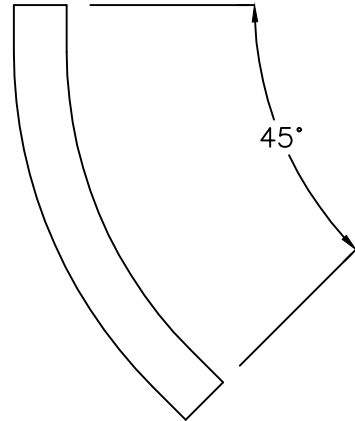
UP7.03
CONDUIT CABLE RISER
(FORMERLY UM6-9)

ITEM	MATERIAL	UP7.01	UP7.02	UP7.03
	Riser shield	1		
	Riser shield, back plate		1	
	Conduit riser			1

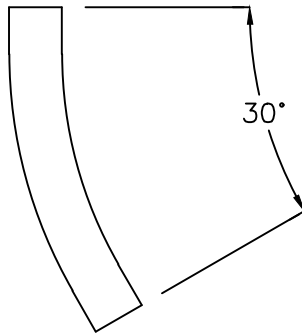
	RISER SHIELD BACK PLATE CONDUIT CABLE RISER		
	AUG 2016		UP7.01
	RUS		UP7.02, UP7.03



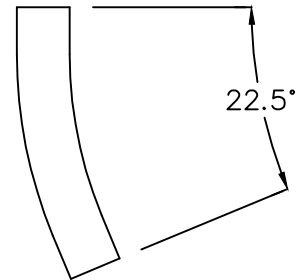
UP7.04.90



UP7.04.45



UP7.04.30



UP7.04.22

ITEM	QTY.	MATERIAL
	1	Conduit, elbow

DESIGN PARAMETERS:

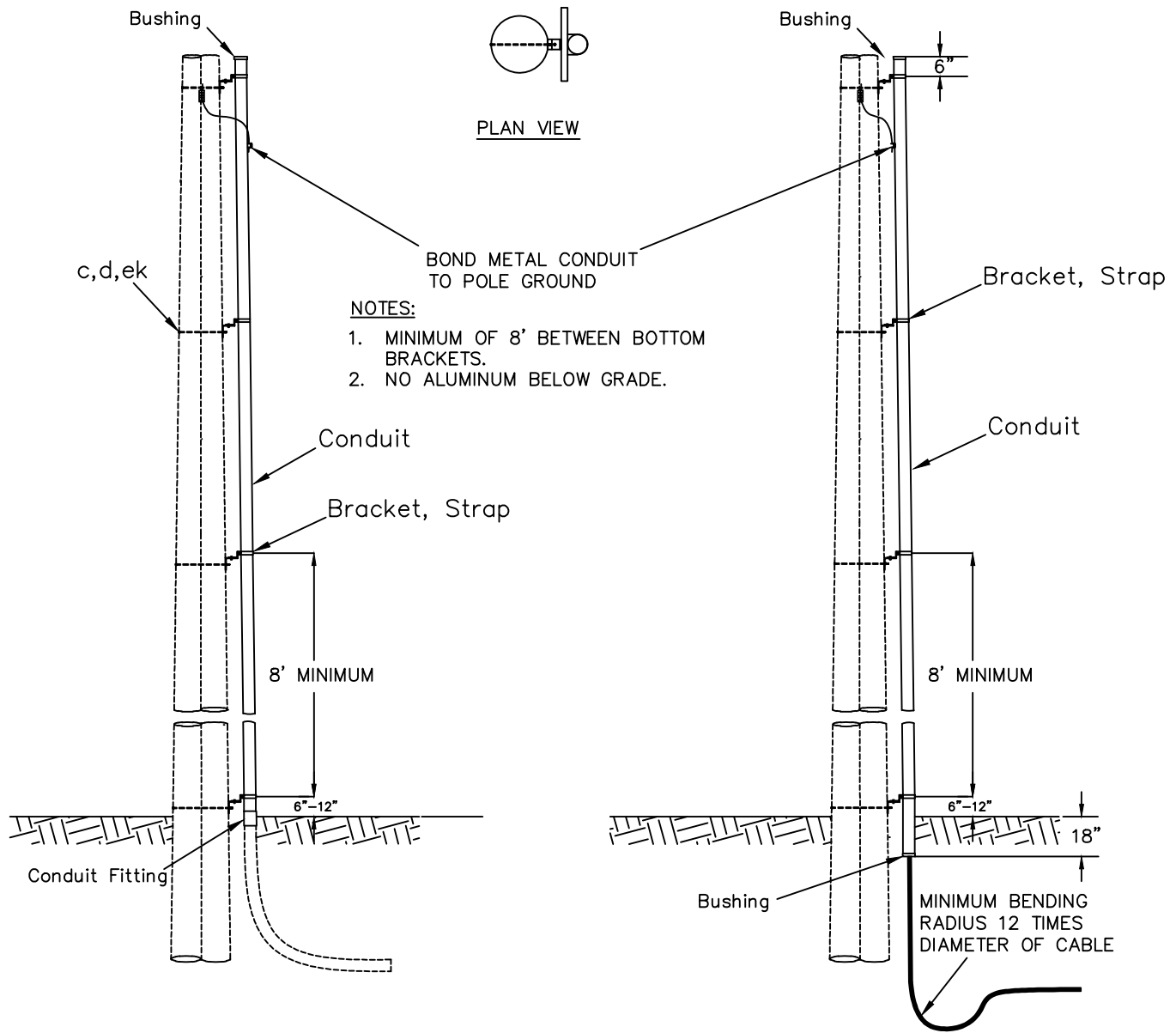
SEE SECTION 8.1 FOR
MINIMUM BENDING RADIUS.

CONDUIT ELBOW

AUG 2016

RUS

UP7.04



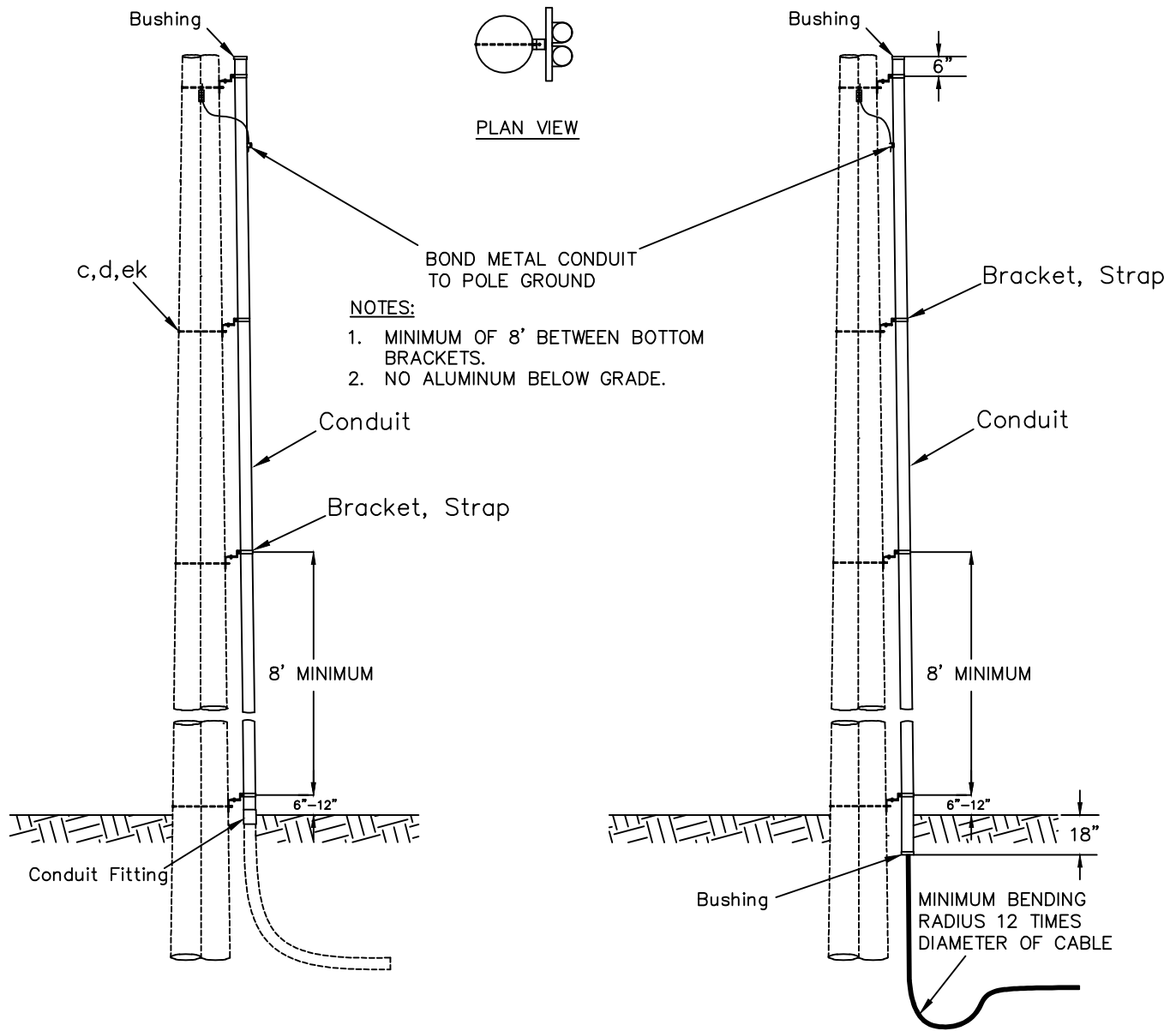
ITEM	QTY.	MATERIAL
		Bracket, Single, as required
		Conduit strap, as required
c		Bolt, machine, 5/8 x required length.
d		Washer, square 2 1/4".
ek		Locknuts, as required.
		Conduit, as required.
		Bushing, as required
		Conduit fitting, as required.

SINGLE CONDUIT RISER WITH
STAND-OFF BRACKETS

AUG 2016

RUS

UP7.B1



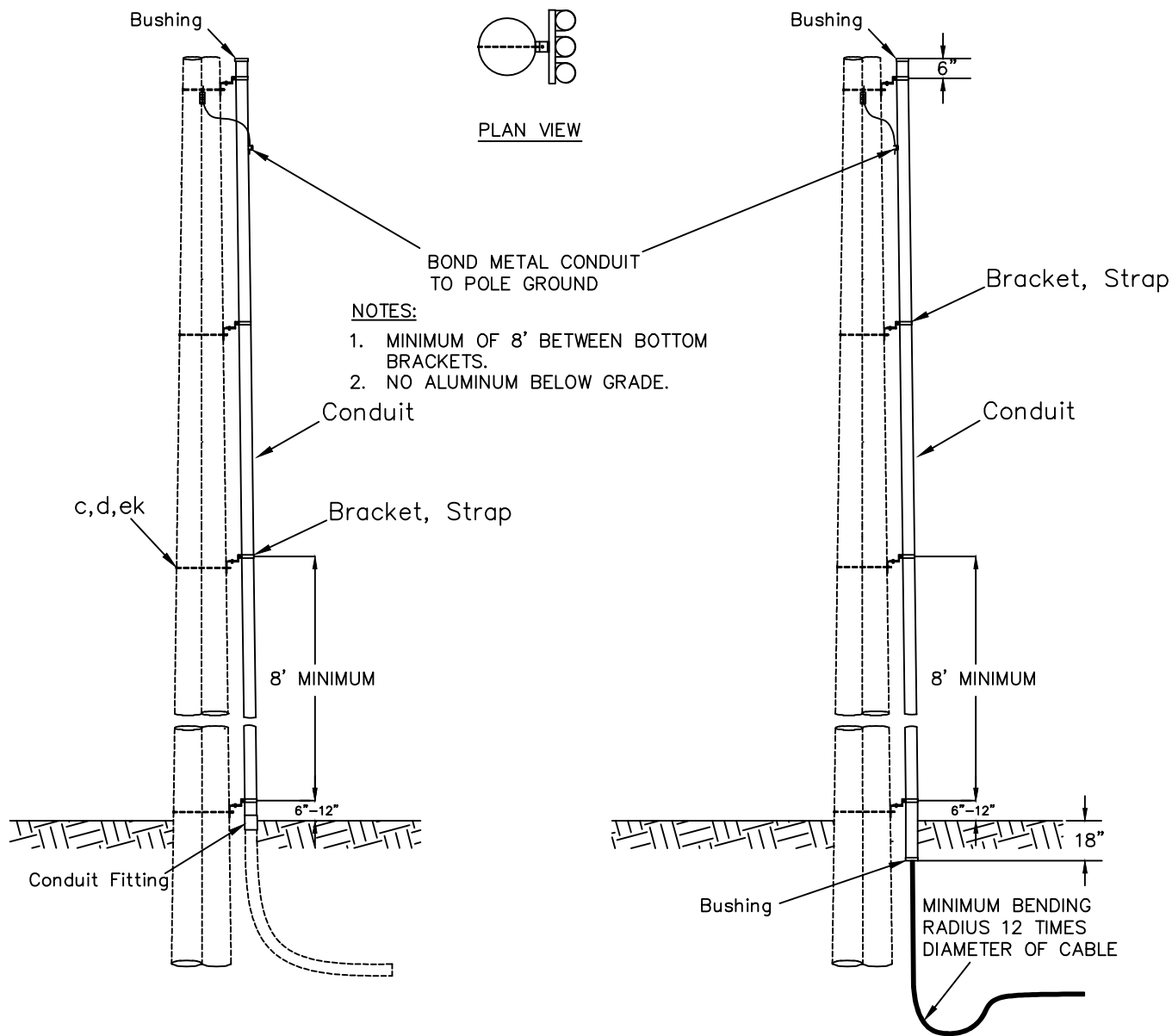
ITEM	QTY.	MATERIAL
		Bracket, Multiple, as required
		Conduit strap, as required
c		Bolt, machine, 5/8 x required length.
d		Washer, square 2 1/4".
ek		Locknuts, as required.
		Conduit, as required.
		Bushing, as required
		Conduit fitting, as required.

TWO CONDUIT RISER WITH
STAND-OFF BRACKETS

AUG 2016

RUS

UP7.B2



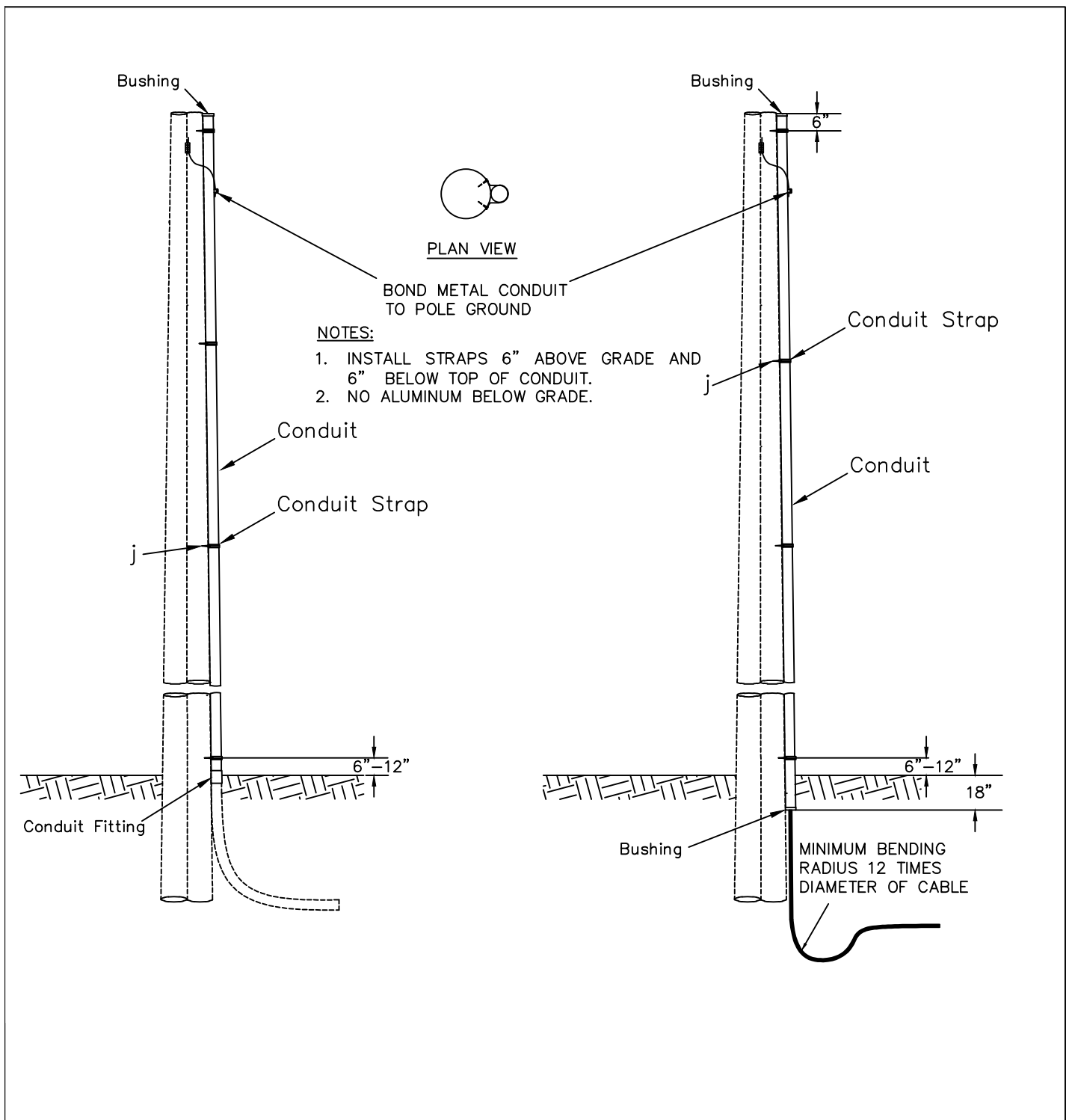
ITEM	QTY.	MATERIAL
		Bracket, Multiple, as required
		Conduit strap, as required
c		Bolt, machine, 5/8 x required length.
d		Washer, square 2 1/4".
ek		Locknuts, as required.
		Conduit, as required.
		Bushing, as required
		Conduit fitting, as required.

THREE CONDUIT RISER WITH
STAND-OFF BRACKETS

AUG 2016

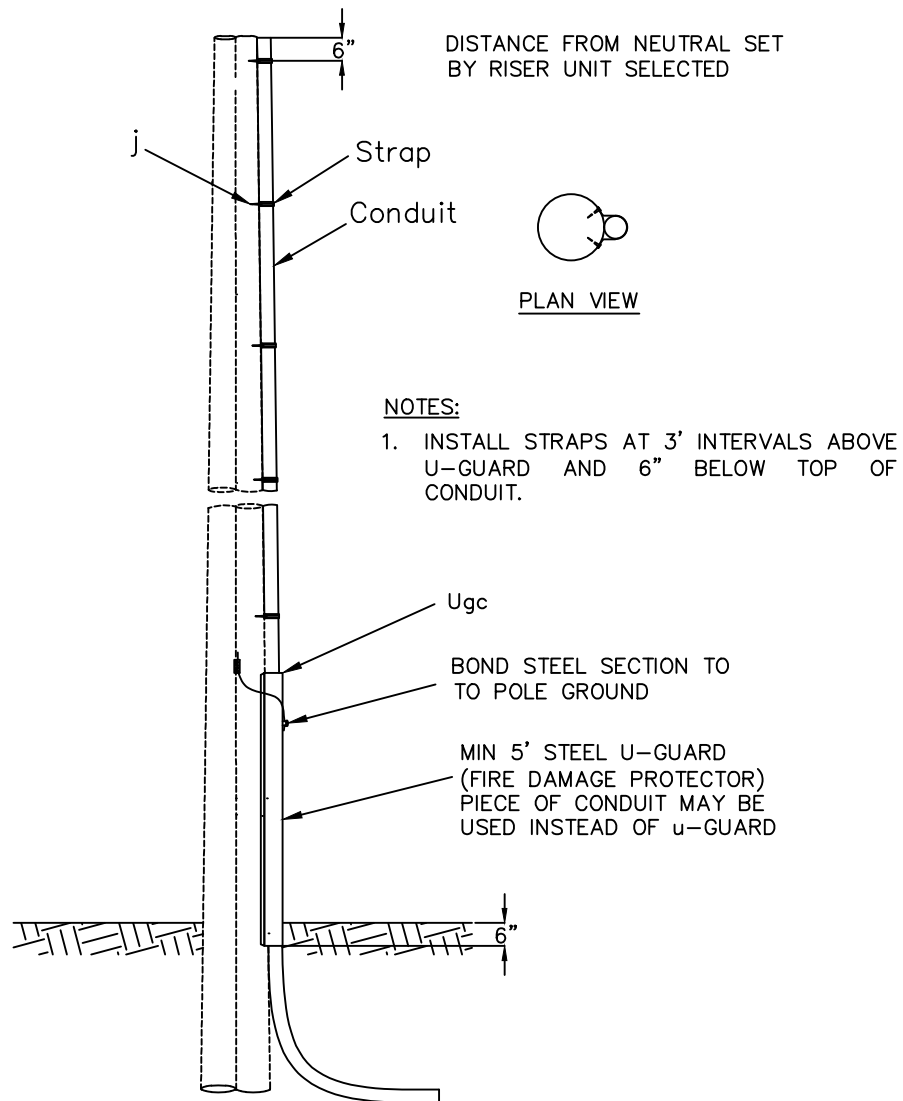
RUS

UP7.B3



ITEM	QTY.	MATERIAL
j		Screw, lag 1/2" x 4" as required
		Conduit strap, as required
		Conduit, as required.
		Bushing, as required
		Conduit fitting, as required.

STRAP ATTACHED CONDUIT RISER		
AUG 2016		
RUS		UP7.C



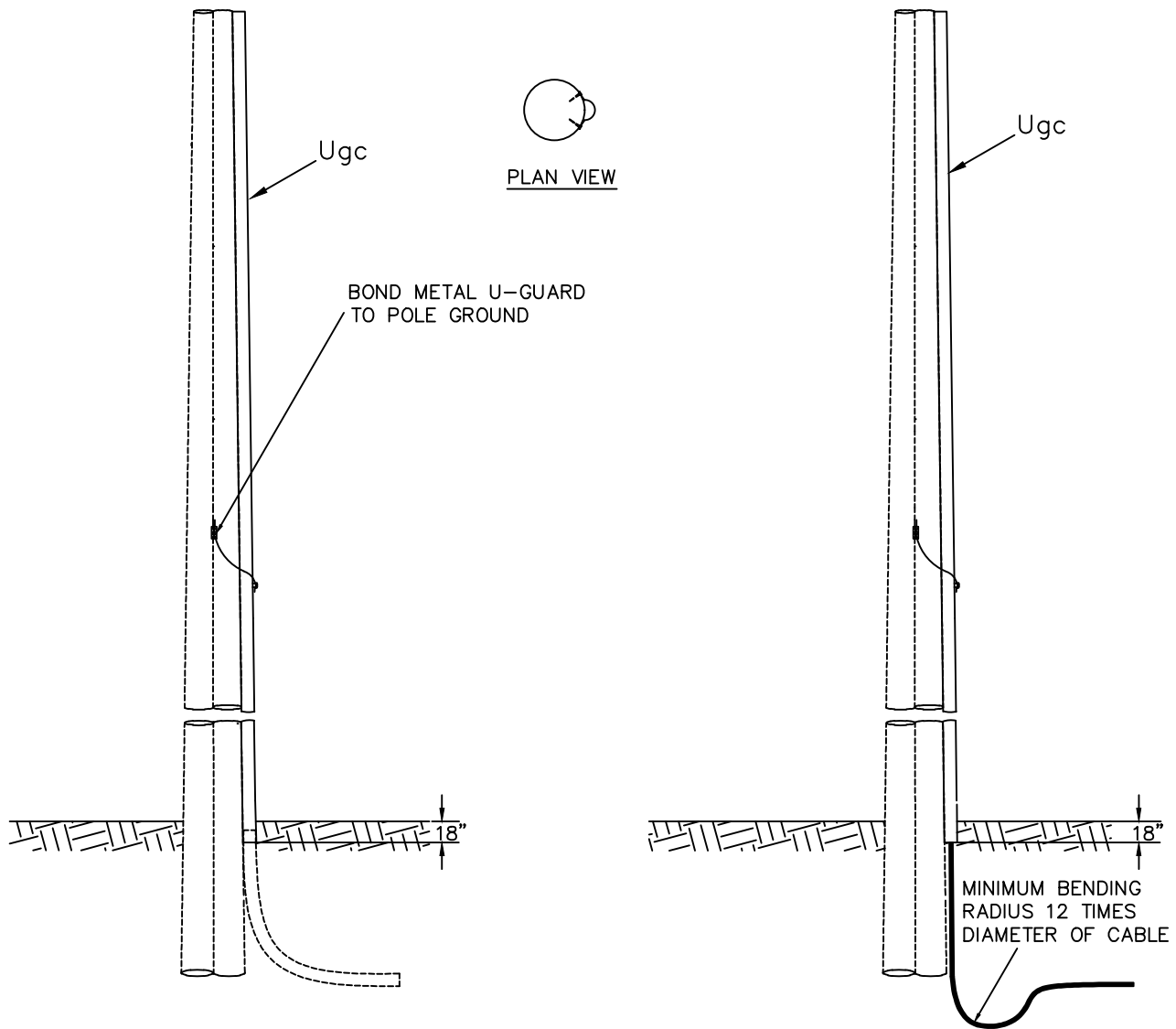
ITEM	QTY.	MATERIAL
j		Screws, lag 1/2" X 4" as required
		Conduit, as required.
		Conduit Strap as required
Ugc	5'	U-Guard,

FLEX CONDUIT RISER

AUG 2016

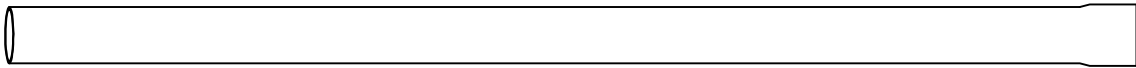
RUS

UP7.FC



ITEM	QTY.	MATERIAL
j		Screw, lag, 1/2" x 4" as required.
Ugc		U-Guard, PVC, as required.

		U-GUARD RISER	
		AUG 2016	
		RUS	UP7.UG



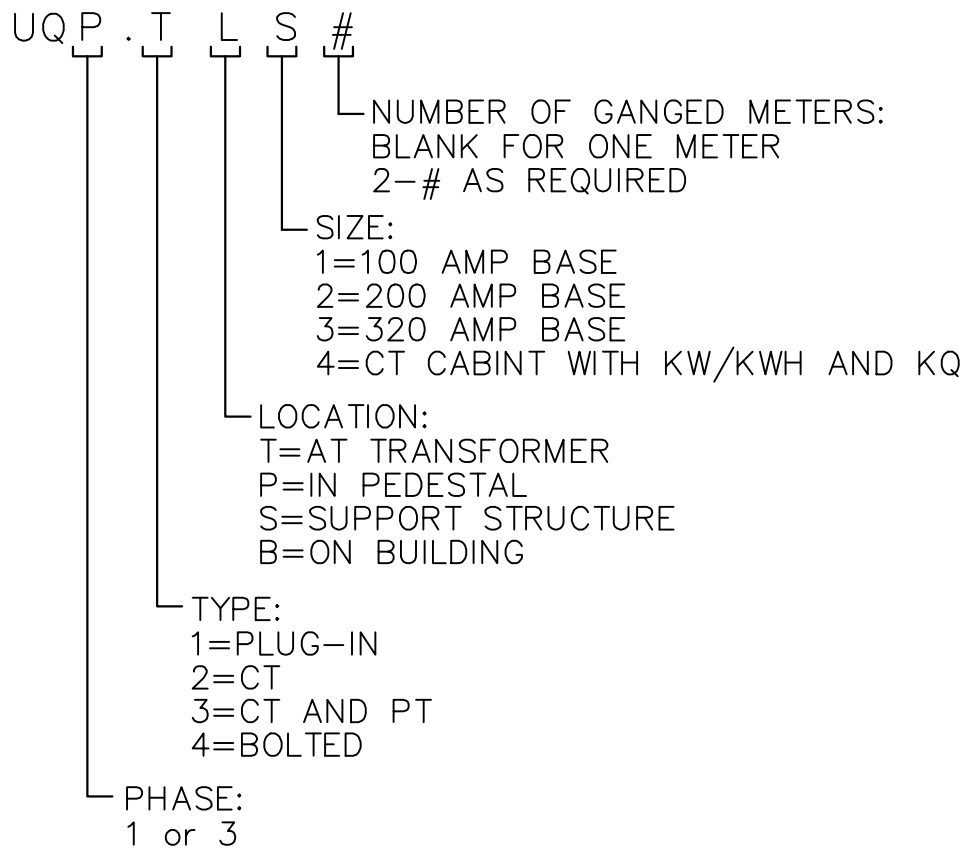
ITEM	QTY.	MATERIAL
Ugc		Conduit, Underground

	UNDERGROUND CONDUIT		
	AUG 2016		
	RUS		UP8

METERING ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806 (New)	1728F-806 (Old)	
UQG		METER OPTIONS GUIDE
UQ_.B_	(UM8)	METER ON BUILDING
UQ_.P_	(UM8-3,-3A)	TROUGH TYPE METER PEDESTAL
UQ_.S_	(UM8-2)	METER PEDESTAL WOOD POST
UQ_.T_	(UM8-4,-4A)	METER PEDESTAL AT TRANSFORMER

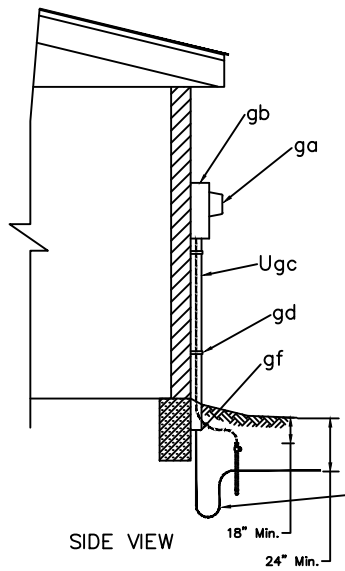
METER OPTIONS:



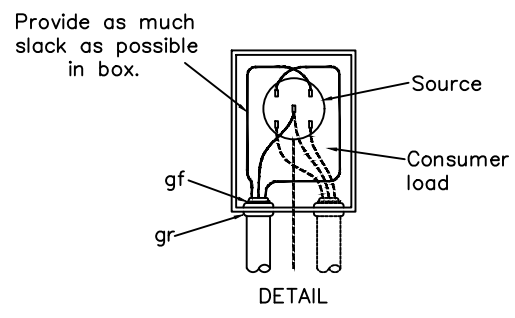
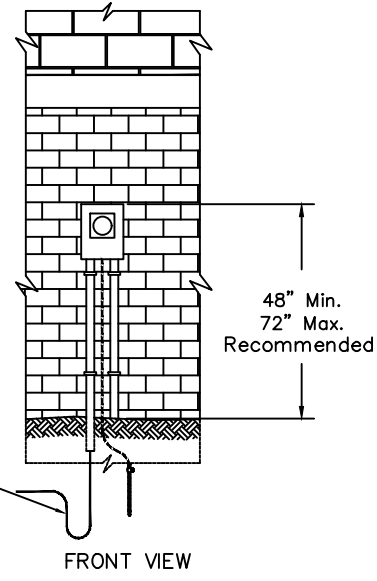
EXAMPLES:

ASSEMBLY UNIT	DESCRIPTION
UQ1.1B24	1 phase, Plug-in, Building, 200A, 4 gang
UQ1.4S3	1 phase, Bolt-in, Support Structure, 320A
UQ1.1P12	1 phase, Plug in, Pedestal, 100A, 2 gang
UQ3.3T4	3 phase, CT & PT, At Transformer, CT cabinet
UQ3.3S2	3 phase, CT & PT, On support structure, 200A

				METER OPTIONS GUIDE	
				AUG 2016	
				RUS	UQG



Slack shall be provided to prevent damaging strain on the cable after backfilling. Hand tamp, preferably with pneumatic tool. Backfill with clean material.



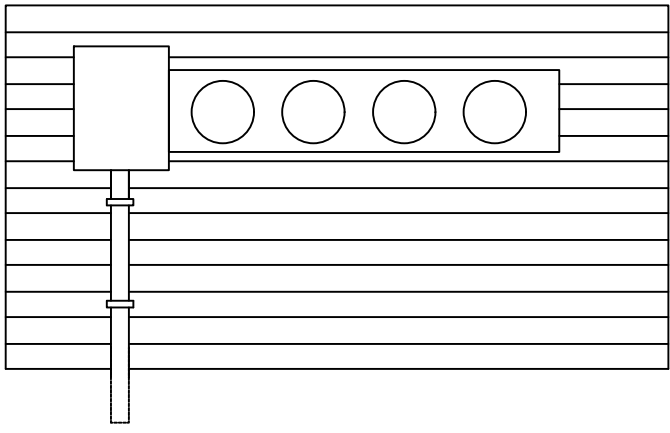
SHOWN: UQ1.1B2
(FORMERLY UM8)
SINGLE PHASE, PLUG-IN, ON BUILDING, 200A

AT BUILDING WILL ALSO WORK FOR THE FOLLOWING:

UQ3.2B2: THREE PHASE, CT, ON BUILDING, 200 AMP

UQ1.2B1: SINGLE PHASE, CT, ON BUILDING, 100 AMP

UQ1.4B3: SINGLE PHASE, BOLT-IN, ON BUILDING, 300 AMP



SHOWN: UQ1.1B24

SINGLE PHASE - PLUG IN-ON BUILDING-200A

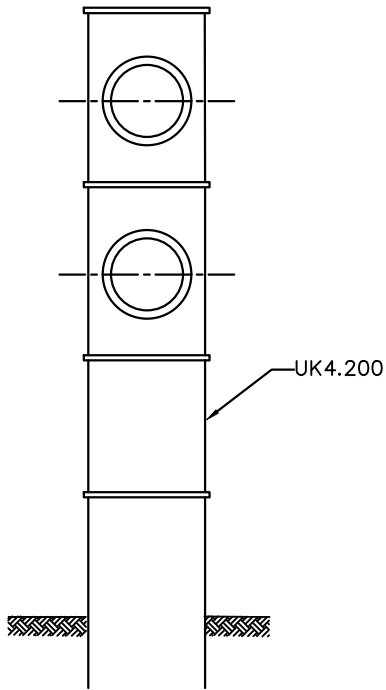
4-GANG FOR QUAD-PLEX

METER ON BUILDING

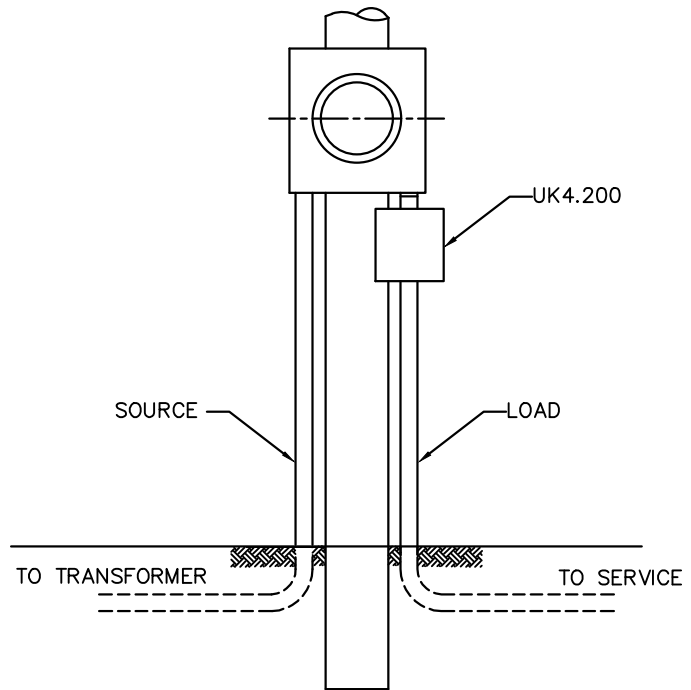
AUG 2016

RUS

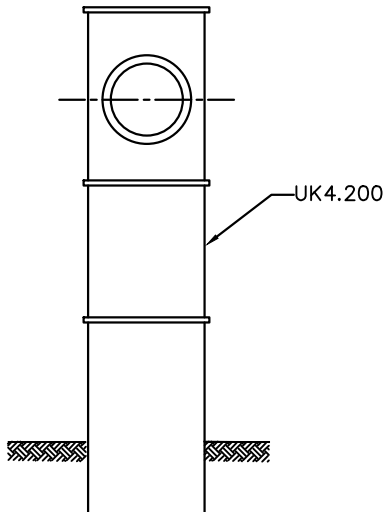
UQ_._B_



UQ1.1P22
(FORMERLY UM8-3A)
ADD BREAKERS 2-UK4.200
TO COMPLETE



UQ1.4S2
(FORMERLY UM8-2)
ADD BREAKER UK4.320
TO COMPLETE



UQ1.1P2
(FORMERLY UM8-3)
ADD BREAKER UK4.200
TO COMPLETE

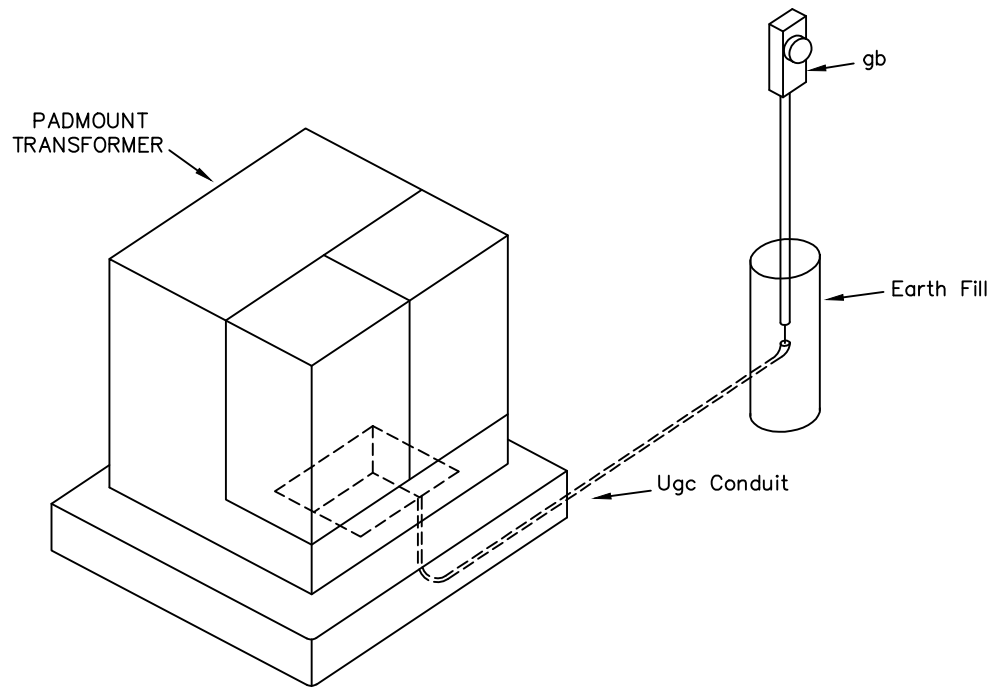
TRough TYPE METER PEDESTAL
AND METER PEDESTAL WOOD POST

AUG 2016

RUS

UQ__P__

UQ__S__



SHOWN: UQ1.2T1

SINGLE PHASE, CT, AT TRANSFORMER WITH 100 AMP METER BASE

AT TRANSFORMER LOCATION WILL ALSO WORK FOR THE FOLLOWING:

UQ3.2T1: THREE PHASE, CT, AT TRANSFORMER WITH 100 AMP METER BASE

UQ3.3T4: THREE PHASE, CT & PT, AT TRANSFORMER WITH CT CABINET

BY ADDING BREAKER (UK4.XXX) AND SECOND CONDUIT TOWARD SERVICE
THE USE OF 200 AMP AND 320 AMP BASES COULD USE THIS METHOD.

UQ1.1T2: SINGLE PHASE, PLUG-IN, AT TRANSFORMER WITH 200 AMP METER BASE

UQ1.4T3: SINGLE PHASE, BOLT-IN, AT TRANSFORMER WITH 320 AMP METER BASE

ITEM	QTY.	MATERIAL
	2	Galvanized angle support
gb	1	Meter base/CT Cabinet
		Insulated Bushings
		Conduit Locknuts
Ugc		Conduit as required

METER PEDESTAL AT TRANSFORMER

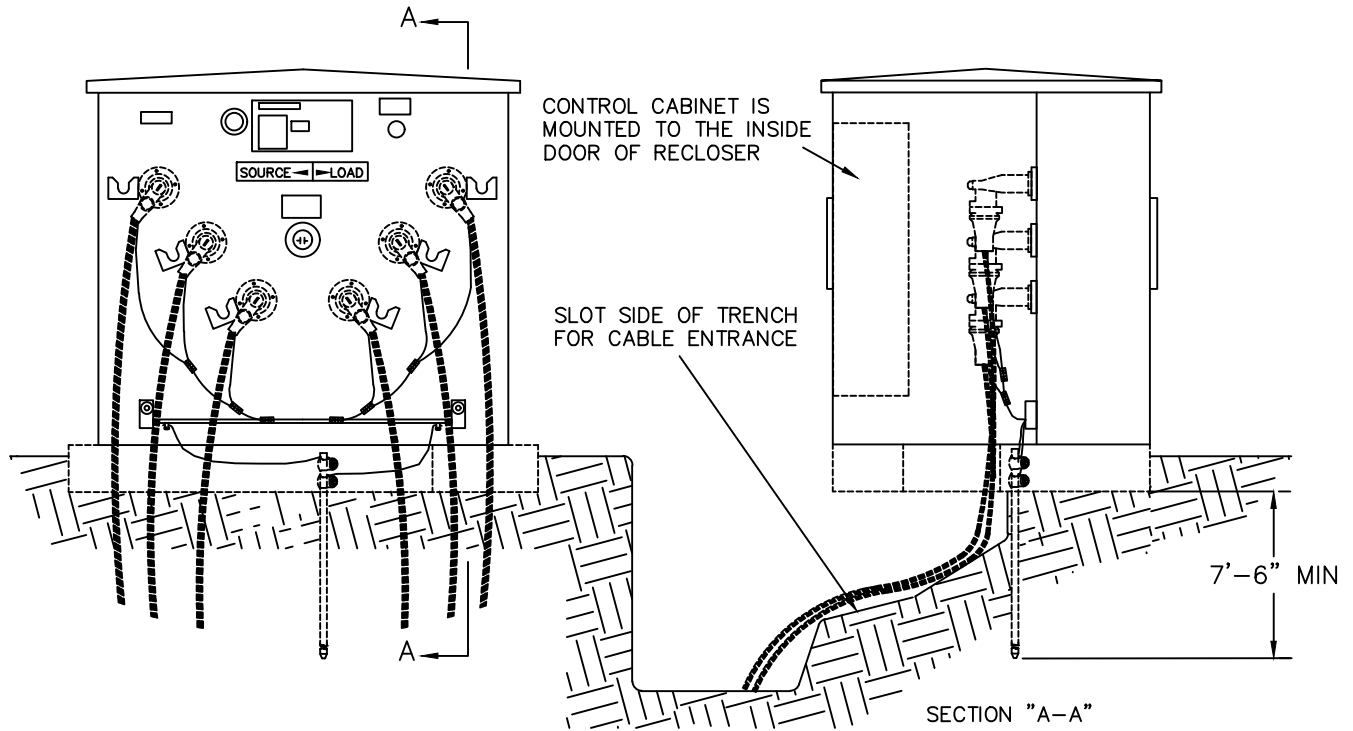
AUG 2016

RUS

UQ_._T_

RECLOSER ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806	1728F-806	
(New)	(Old)	
UR3.--		THREE PHASE PADMOUNTED RECLOSER



ITEM	QTY.	MATERIAL
P		Connectors, as required
av		Jumpers, as required
bu		Connector, equipment ground
Uhw	2	Safety Signs as Required

NOTES:

- THE FOLLOWING UNITS/ASSEMBLIES ARE NOT PART OF THIS UNIT. SPECIFY SEPARATELY:
 - MULTIPOINT TERMINATIONS AND OTHER ACCESSORIES
 - LOADBREAK ELBOWS
 - GROUNDING ASSEMBLY
 - PAD ASSEMBLY
- PROVIDE SUFFICIENT SLACK IN ALL CABLES TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND.
- INSTALL SAFETY SIGN ON OUTSIDE SURFACE OF ENCLOSURE AND SAFETY SIGN ON INSIDE OF ENCLOSURE AS REQUIRED.

THREE PHASE PADMOUNTED
RECLOSER

AUG 2016

RUS

3 - PHASE PRIMARY

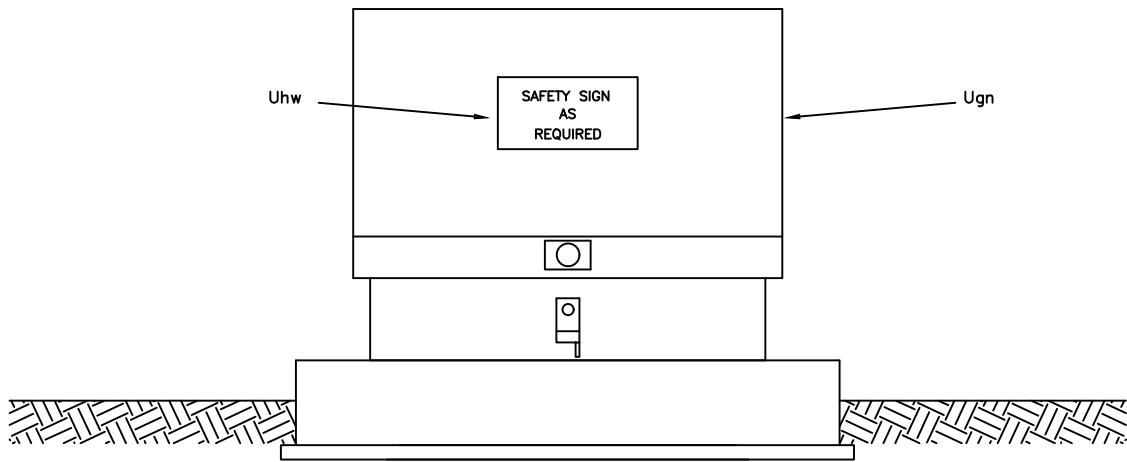
UR3.--

SECTIONALIZING ASSEMBLY UNITS

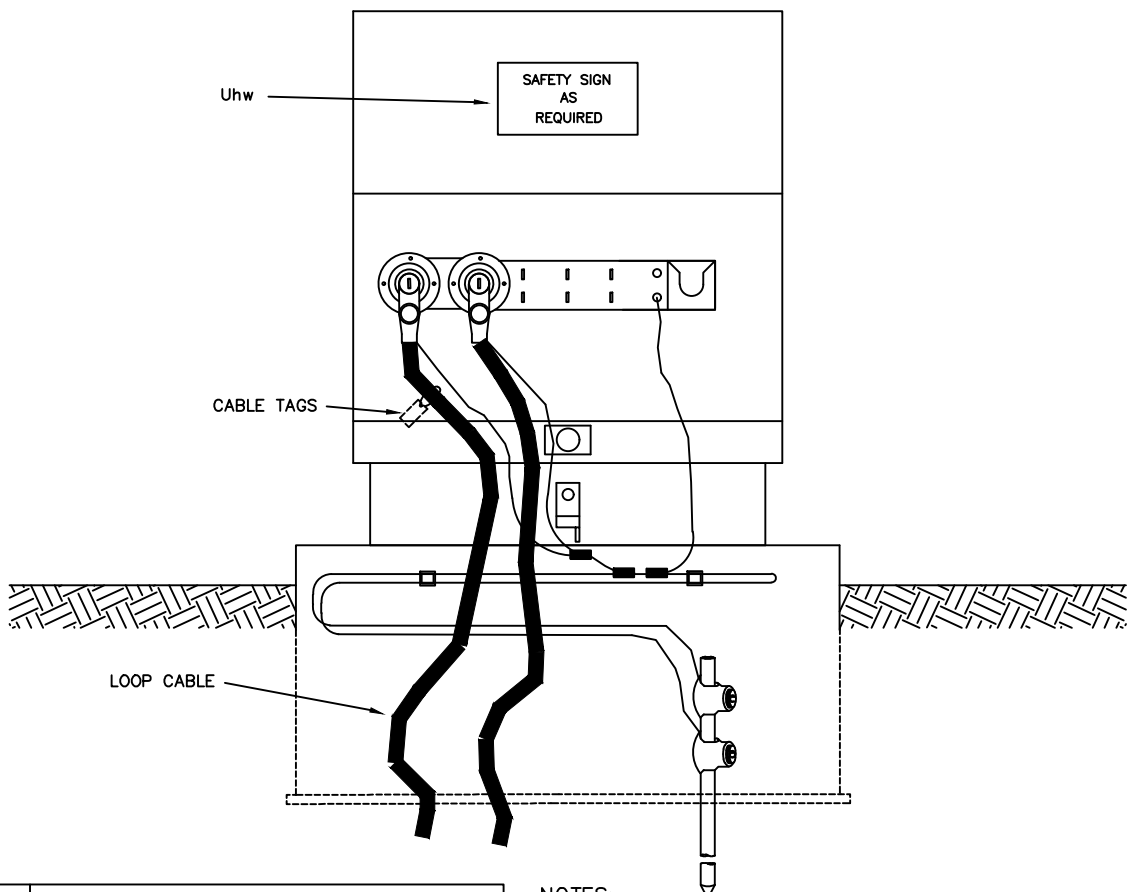
DRAWING NUMBERS
DRAWING TITLE (DESCRIPTION)
1728F-806 **1728F-806**

(New) (Old)

US1.DC		SINGLE PHASE PADMOUNTED TRANSFORMER DEFERRED UNIT CABINET TYPE
US1.DP	(UX2)	SINGLE PHASE PADMOUNTED TRANSFORMER DEFERRED UNIT PEDESTAL TYPE
US1.DV	(UX3)	SINGLE PHASE PADMOUNTED TRANSFORMER DEFERRED UNIT PAD-SLEEVE TYPE
US1.PJ	(UM3-14)	SINGLE AND THREE PHASE PRIMARY JUNCTIONS SINGLE PHASE PRIMARY JUNCTION
US3.PJ	(UM33)	THREE PHASE PRIMARY JUNCTION
US_.SF_	(UM3E-_-_)	SWITCH / FUSE ENCLOSURE INSTALLATION
US1.SF_	(UM3E-1)	SINGLE POLE SWITCHING 200 AMP FUSE ENCLOSURE INSTALLATION
US2.SF_	(UM3E-2)	WIRING DIAGRAMS (SINGLE PHASE AND TWO PHASE)
US3.SF_	(UM3E-3)	FUSE ENCLOSURE (200-600 AMP) WIRING DIAGRAMS (THREE PHASE)



LID OPEN VIEW



ITEM	QTY.	MATERIAL
P		Connectors, as Required
av		Jumpers, as Required
Ugn	1	Primary Junction Enclosure
Uhw	2	Safety Signs as Required

NOTES:

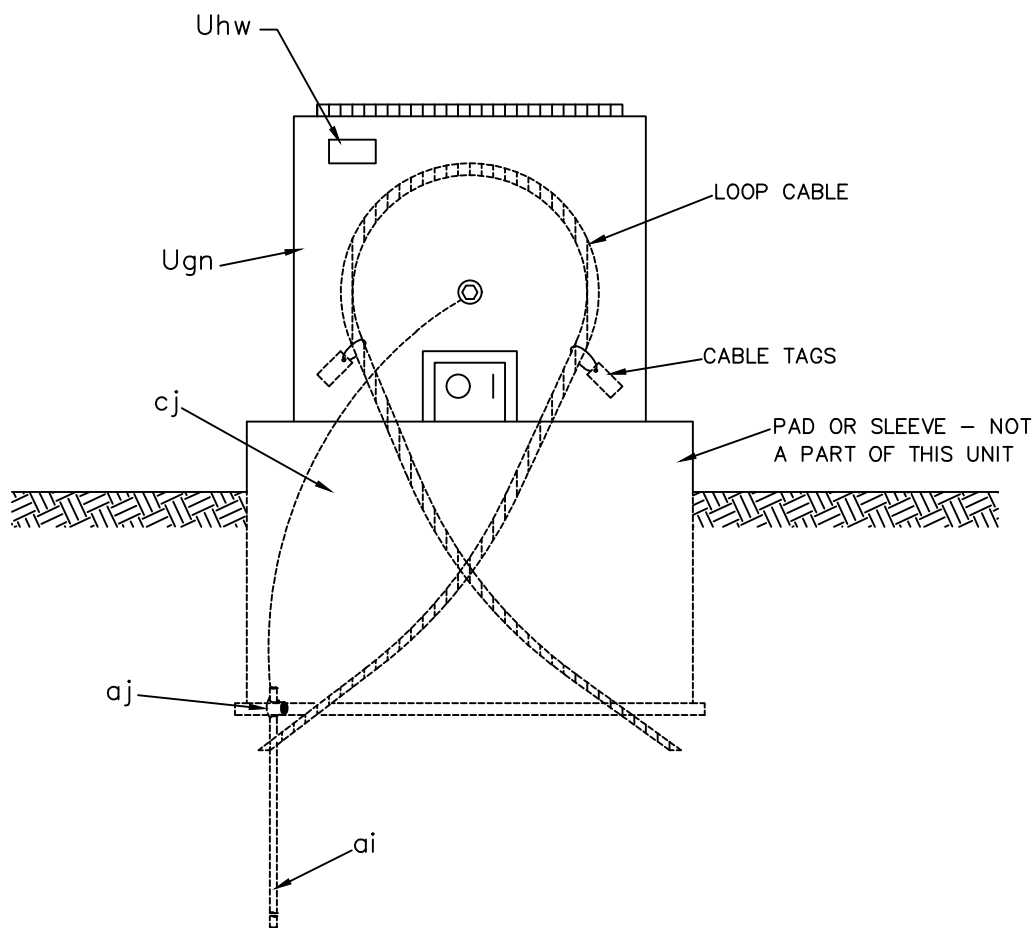
1. LOOP CABLE TO PROVIDE SUFFICIENT LENGTH FOR TERMINATING IN A PAD-MOUNTED TRANSFORMER.
2. INSTALL PHASING TAGS ON CABLE.
3. INSTALL WITH UH1.1
4. SPECIFY PAD UNIT SEPERATELY.

SINGLE PHASE PADMOUNTED
TRANSFORMER DEFERRED UNIT
CABINET TYPE

AUG 2016

RUS

US1.DC



ITEM	QTY.	MATERIAL
ai	1	Ground Rod
aj	1	Clamp, Ground Rod
cj		As Required
Ugn	1	Primary Junction Enclosure
Uhw	2	Safety Signs as Required

NOTES:

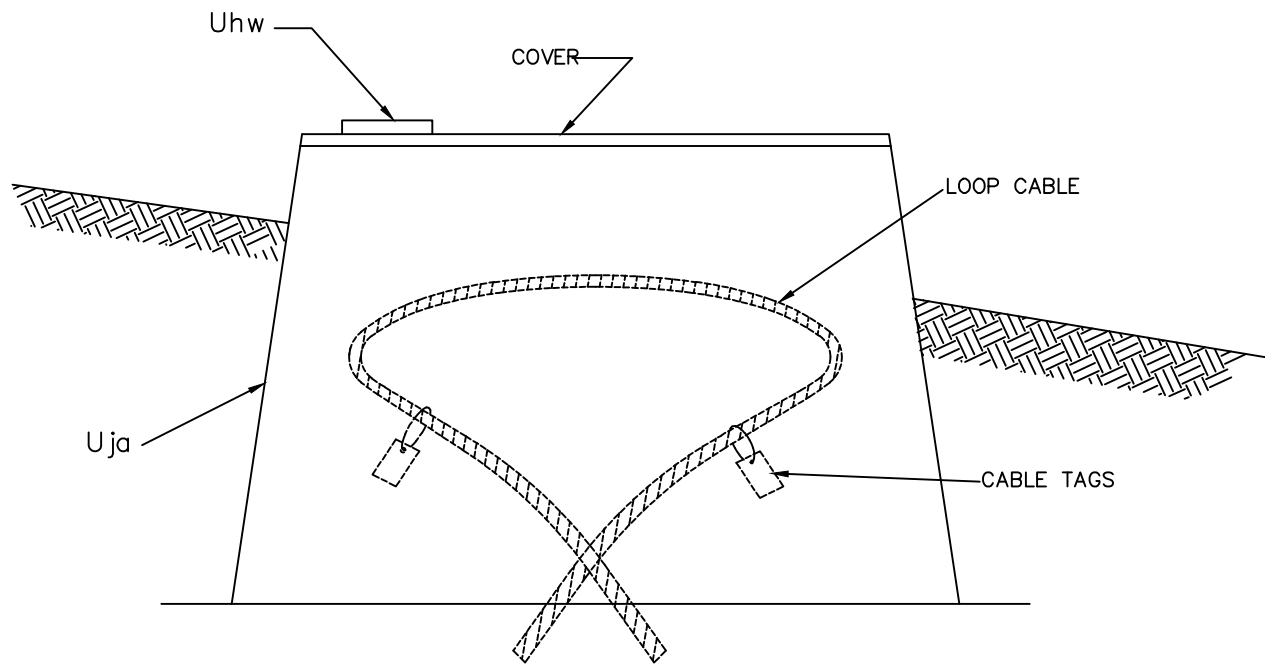
1. LOOP CABLE TO PROVIDE SUFFICIENT LENGTH FOR TERMINATING IN A PAD-MOUNTED TRANSFORMER.
2. INSTALL CABLE TAGS ON CABLE.

SINGLE PHASE PADMOUNTED
TRANSFORMER DEFERRED UNIT
PEDESTAL TYPE

AUG 2016

RUS

US1.DP



ITEM	QTY.	MATERIAL
Uja	1	Transformer Pad-Sleeve Combination
Uja	1	Cover
Uhw	1	Safety Signs as Required

NOTES:

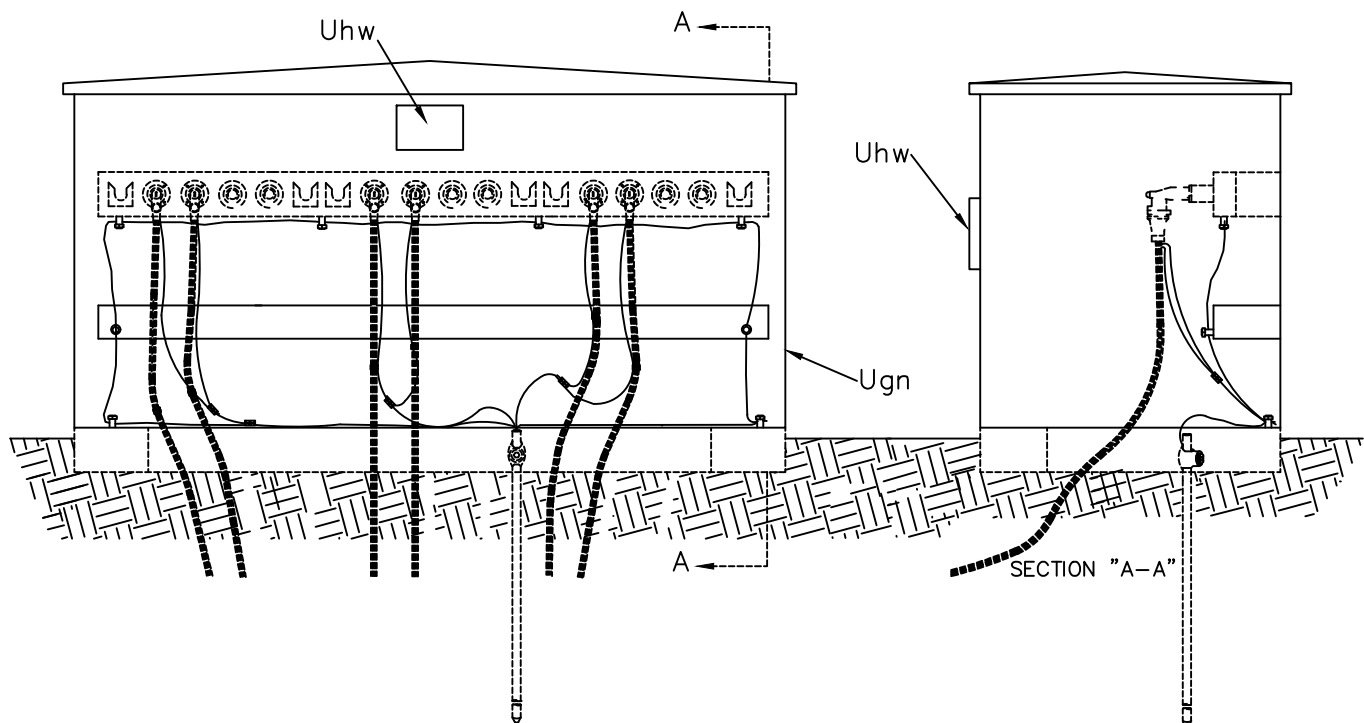
1. LOOP CABLE TO PROVIDE SUFFICIENT LENGTH FOR TERMINATING IN A LOW PROFILE TRANSFORMER.
2. INSTALL CABLE TAGS ON CABLE.
3. COVER, IF METAL, SHALL BE GROUNDED

SINGLE PHASE PADMOUNTED
TRANSFORMER DEFERRED UNIT
PAD-SLEEVE TYPE

AUG 2016

RUS

US1.DV



XXUSX.PJ.XXXX

MODULE DESCRIPTION ONE NUMBER FOR EACH POINT

USE "2" FOR 200 AMP LOAD BREAK

USE "6" FOR 600 AMP DEAD BREAK

PRIMARY JUNCTION

NUMBER OF PHASES

PRIMARY VOLTAGE (PHASE TO PHASE)

EXAMPLES:

15US1.PJ.2222 = 15kV 1 PHASE ENCLOSURE WITH 4 POINT 200 AMP MODULES.

25US3.PJ.6226 = 25kV 3 PHASE ENCLOSURE WITH 4 POINT MODULES WITH
600 AMP IN AND OUT WITH 200 AMP TAPS.

ITEM	1.PJ	3.PJ	MATERIAL
Ugn	1		Single Phase Enclosure
Ugn		1	Three Phase Enclosure
Uhw	1	3	Module as Defined
Uhw	2	2	Safety Signs as Required

NOTES:

1. SPECIFY FOUNDATION, ARRESTERS, ELBOWS, CAPS AND GROUNDING SEPERATELY

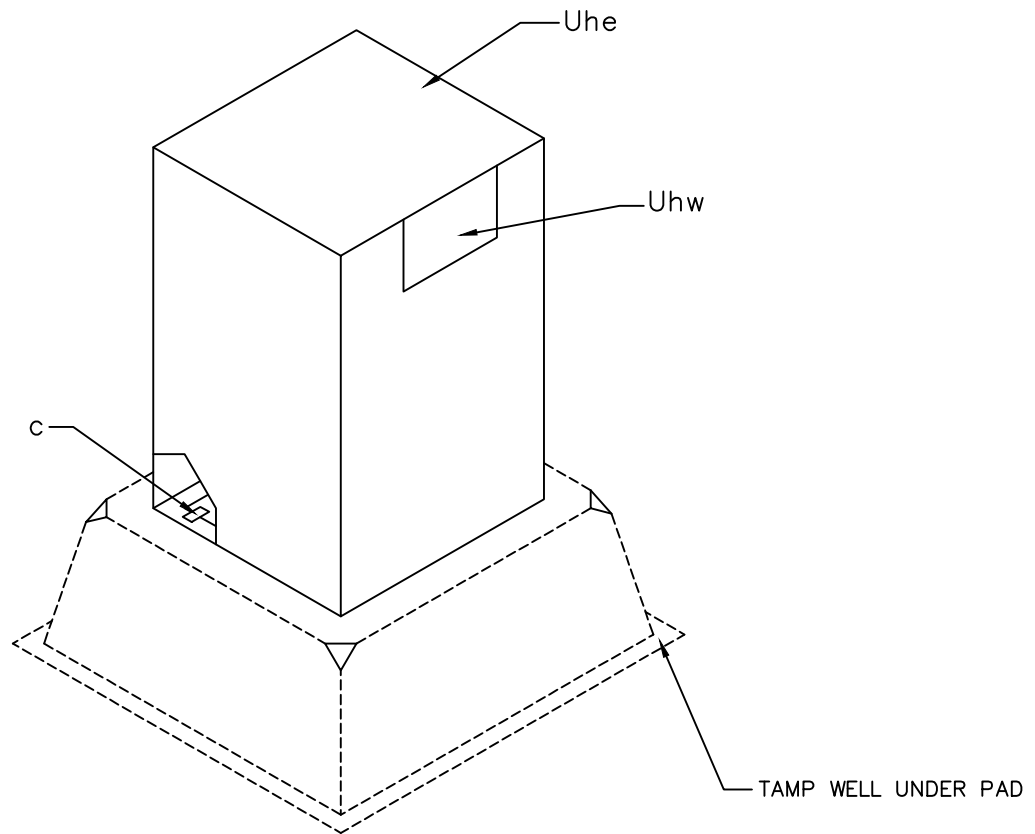
SINGLE AND THREE PHASE
PRIMARY JUNCTIONS

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RUS

US1.PJ.

US3.PJ.



SPECIFICATION NUMBERING CODES:

US.1,2 or 3.SF(FIG. NO.)

SEE WIRING DIAGRAM FOR FIG. NO.

NUMBER OF PHASES

EXAMPLE:

US3.SF3E

FIG. NO. 3E

SWITCH/FUSE ENCLOSURE

THREE PHASE CONFIGURATION

NOTES:

1. PAD OR GROUND SLEEVE LOAD BREAK ELBOWS, STRESS CONES, FUSES OR SWITCH BLADES ARE NOT PART OF THIS ASSEMBLY. THEY SHOULD BE SPECIFIED SEPARATELY ON THE STAKING SHEET.
2. TAMP WELL UNDER SLEEVE. LEAVE SLACK COIL OF CABLE IN GROUND SLEEVE.
3. PLACE 6" OF FILL AGAINST INSIDE EDGE OF GROUND SLEEVE.
4. ON DEAD FRONT FUSE ENCLOSURES USE GROUNDING ASSEMBLY TO BE SPECIFIED SEPARATELY.
5. TOP OF GROUND SLEEVE TO BE INSTALLED 3" ABOVE GROUND LEVEL.
6. INSTALL SAFETY SIGN ON EQUIPMENT INSIDE ENCLOSURE AND ALSO INSTALL SAFETY SIGN ON OUTSIDE SURFACE OF ENCLOSURE AS REQUIRED
7. GROUND SLEEVES ARE SPECIFIED.

ITEM	QTY.	MATERIAL
c		Bolt, machine, as required
Uhe	1	Enclosure, as specified
Uhw	2	Safety signs, as required

SWITCH / FUSE
ENCLOSURE INSTALLATION

AUG 2016

RUS

US_.SF_

FIG. 1A

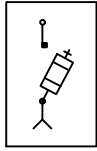
SINGLE PHASE
RADIAL FEED
1 - FUSE

FIG. 1B

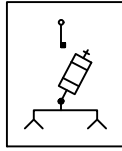
SINGLE PHASE
LOOP FEED
1 - FUSE

FIG. 1C

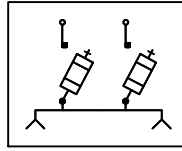
SINGLE PHASE
LOOP FEED
2 - FUSE

FIG. 1D

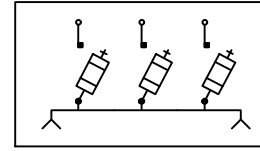
SINGLE PHASE
LOOP FEED
3 - FUSE

FIG. 1E

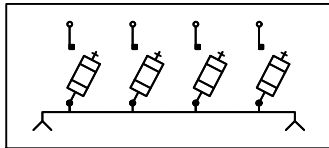
SINGLE PHASE
LOOP FEED
4 - FUSE

FIG. 1F

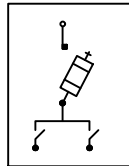
SINGLE PHASE
LOOP FEED
1 - FUSE

FIG. 1G

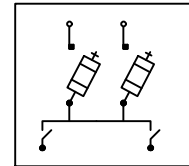
SINGLE PHASE
LOOP FEED
2 - FUSE

FIG. 2A

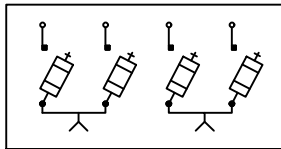
TWO PHASE
RADIAL FEED
2 - FUSE

FIG. 2B

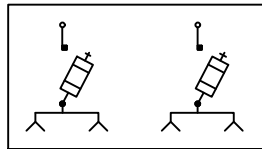
TWO PHASE
LOOP FEED
1 - FUSE

FIG. 2C

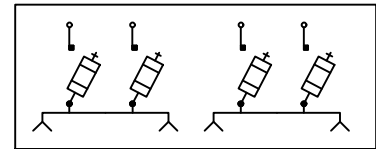
TWO PHASE
LOOP FEED
2 - FUSE

FIG. 2D

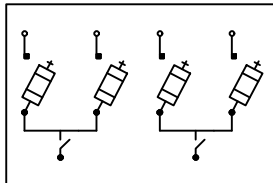
TWO PHASE
RADIAL FEED
2 - FUSE

FIG. 2E

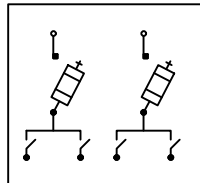
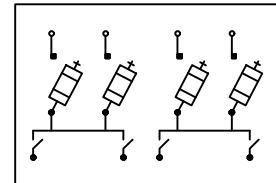
TWO PHASE
RADIAL FEED
1 - FUSE

FIG. 2F

TWO PHASE
LOOP FEED
2 - FUSE

ITEM	QTY.	MATERIAL

NOTES:

—□□— FUSE

- — TERMINATIONS CAN BE WITH ELBOWS, STRESS CONES OR TERMINATORS

^ — LOADBREAK ELBOW LINE SWITCHING

— — SINGLE POLE SOLID BLADE SWITCHING

SINGLE POLE SWITCHING 200 AMP FUSE
ENCLOSURE INSTALLATION WIRING DIAGRAMS
(SINGLE PHASE & TWO PHASE)

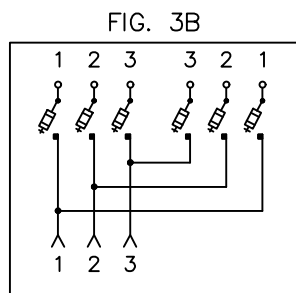
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RUS

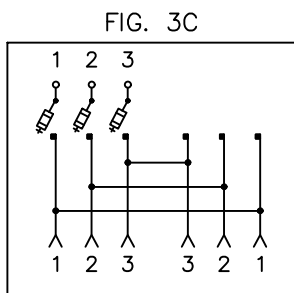
1 & 2 - PHASE PRIMARY

US1.SF_

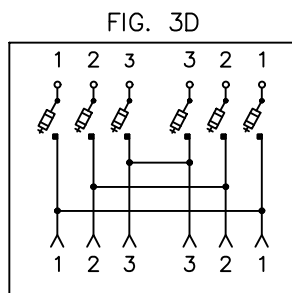
US2.SF_



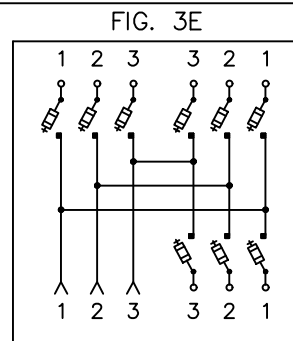
ELBOW SWITCH
2 – FUSE



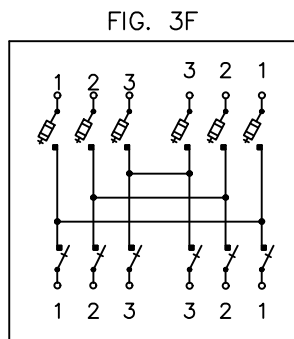
ELBOW SWITCH
1 – FUSE



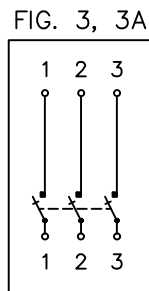
ELBOW SWITCH
2 – FUSE



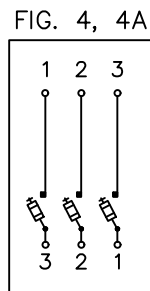
ELBOW SWITCH
3 – FUSE



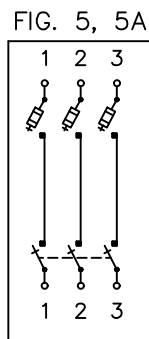
SINGLE POLE SWITCH
2 – FUSE



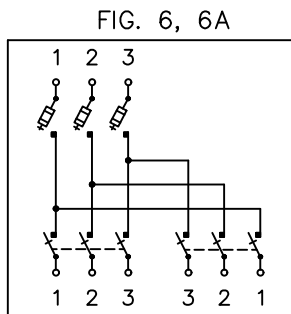
THREE PHASE
SWITCH



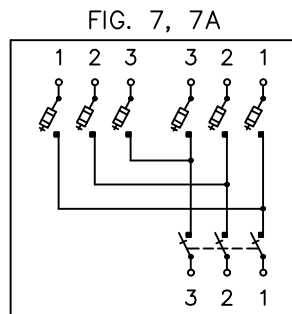
THREE PHASE
SWITCH OR
FUSE



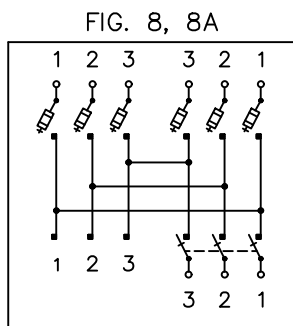
THREE PHASE
SWITCH
1 – FUSE



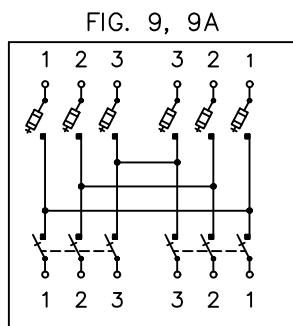
THREE PHASE
SWITCHES
1 – FUSE



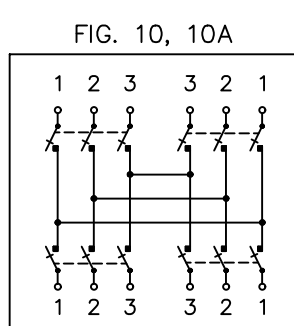
THREE PHASE
SWITCH
2 – FUSE



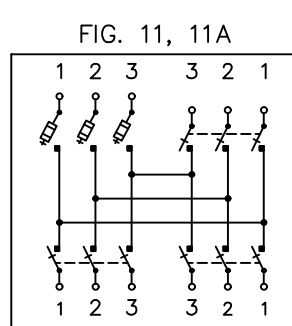
THREE PHASE SWITCH
2 – FUSE
1 – TERMINAL



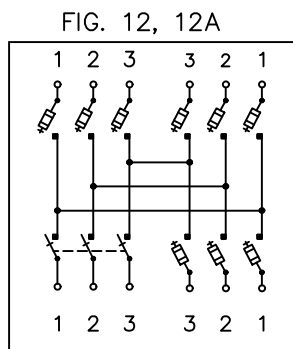
THREE PHASE SWITCHES
2 – FUSES



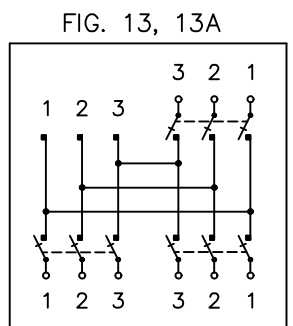
THREE PHASE SWITCHES



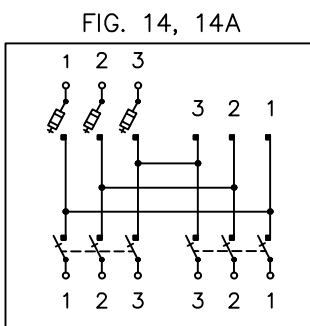
THREE PHASE SWITCHES
1 – FUSE



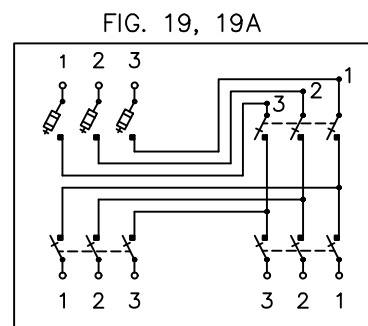
THREE SWITCH
3 – FUSES



THREE PHASE SWITCHES
1 – TERMINAL



THREE PHASE SWITCHES
1 – FUSE
1 – TERMINAL



THREE PHASE SWITCHES
THREE PHASE SWITCHED / FUSE TAP

EXAMPLES:

FIG. 3 = 600 AMP MAIN LINE SWITCH
FIG. 3A = 200 AMP MAIN LINE SWITCH

NOTES:

— FUSE

- - TERMINATIONS CAN BE WITH ELBOWS
STRESS CONES OR TERMINATORS

∧ - LOADBREAK ELBOW LINE SWITCHING

FUSE ENCLOSURE (200–600 AMP) WIRING DIAGRAMS (THREE PHASE)

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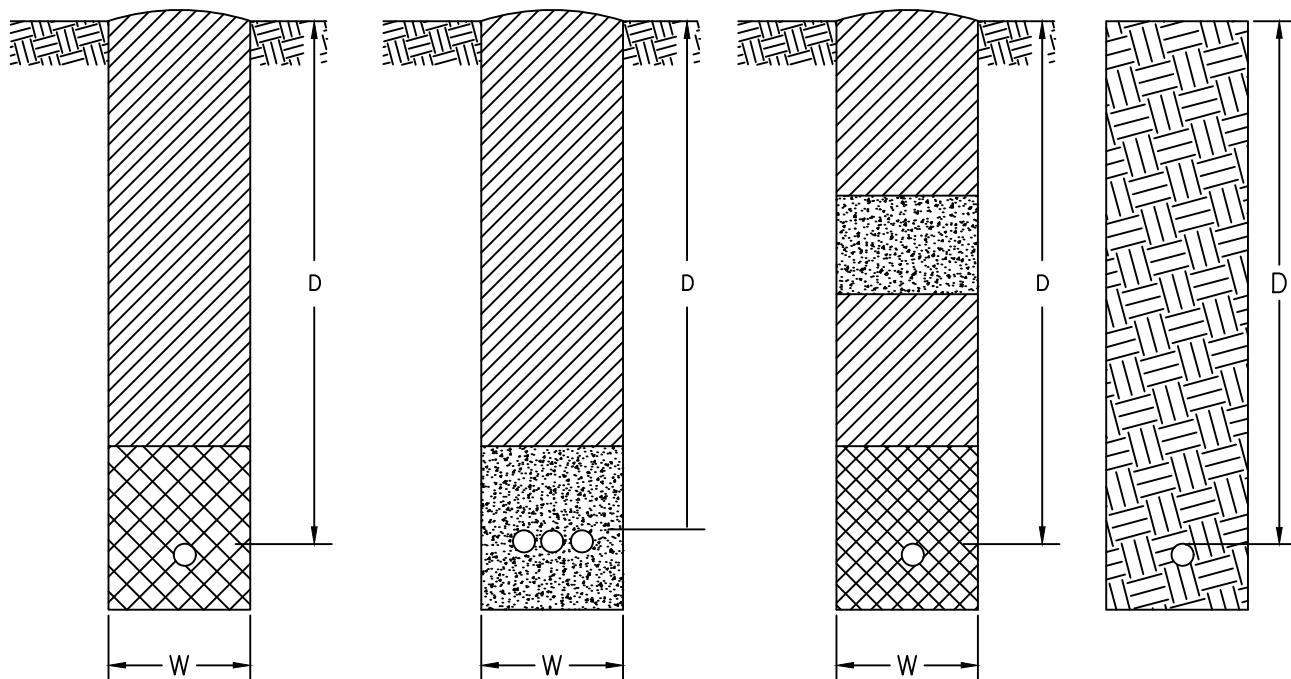
RUS

3 – PHASE PRIMARY

US3.SF_

TRENCH ASSEMBLY UNITS

<u>DRAWING NUMBERS</u>		<u>DRAWING TITLE (DESCRIPTION)</u>
1728F-806	1728F-806	
(New)	(Old)	
UT1	(UR2)	TRENCHES FOR CONDUIT AND DIRECT BURIAL CABLES
UT2		TRENCH
UT3		TRENCH WITH CONCRETE ENCASEMENT
UT4		TRENCH WITH CONCRETE CAP
UT5		TRENCH - DIRECTIONAL BORE
		TRENCH - PLOW



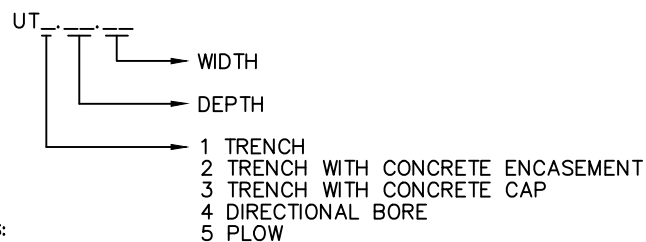
UT1.

UT2.

UT3.

UT4.

UT5.



NOTES:

1. DEPTH AND WIDTH ARE SPECIFIED IN DESCRIPTION OF UNITS.
2. DEPTHS SPECIFIED ARE TO FINISHED GRADE.
3. OVER-EXCAVATE TRENCHES AS NECESSARY TO ALLOW FOR (a) BEDDING, (b) LOOSE, SANDY SOILS, (c) WHERE MORE THAN ONE CABLE WILL BE INSTALLED AND LAYING FIRST CABLE MAY CAUSE TRENCH DAMAGE AND REDUCTION IN DEPTH.
4. BACKFILLING IS PART OF ALL TRENCHING UNITS INCLUDING JOINT-USE TRENCHES UNLESS OTHERWISE SPECIFIED.
5. MAINTAIN 12 INCHES MINIMUM CLEARANCE IN ANY DIRECTION BETWEEN POWER CABLES AND COMMUNICATION CABLES IN JOINT USE TRENCHES.
6. ALL DEPTHS AND CLEARANCES SHALL MEET THE NATIONAL ELECTRICAL SAFETY CODE.

LEGEND

	SAND, GRAVEL OR CLEAN SOIL
	COMPACTED BACKFILL UNLESS OTHERWISE SPECIFIED
	UNDISTURBED EARTH
	CONCRETE

TRENCHES FOR CONDUIT AND DIRECT BURIAL CABLES

AUG 2016

RUS

UT1, UT2

UT3, UT4, UT5

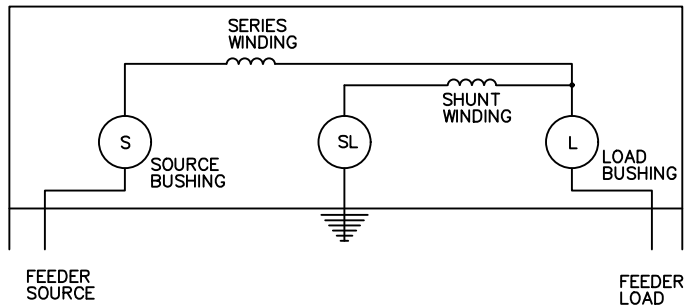
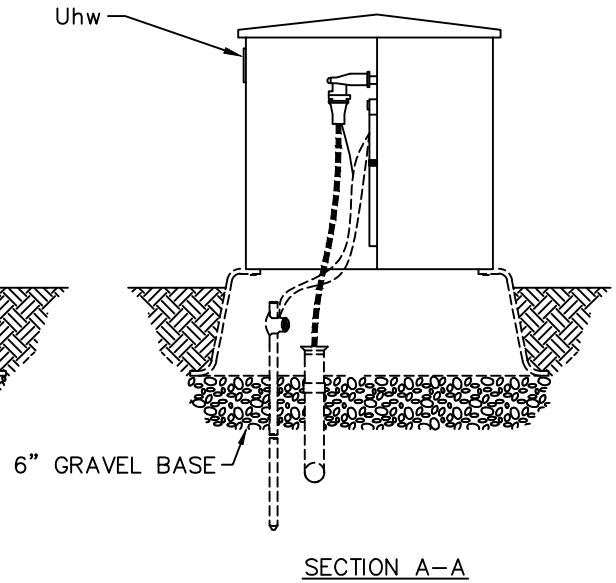
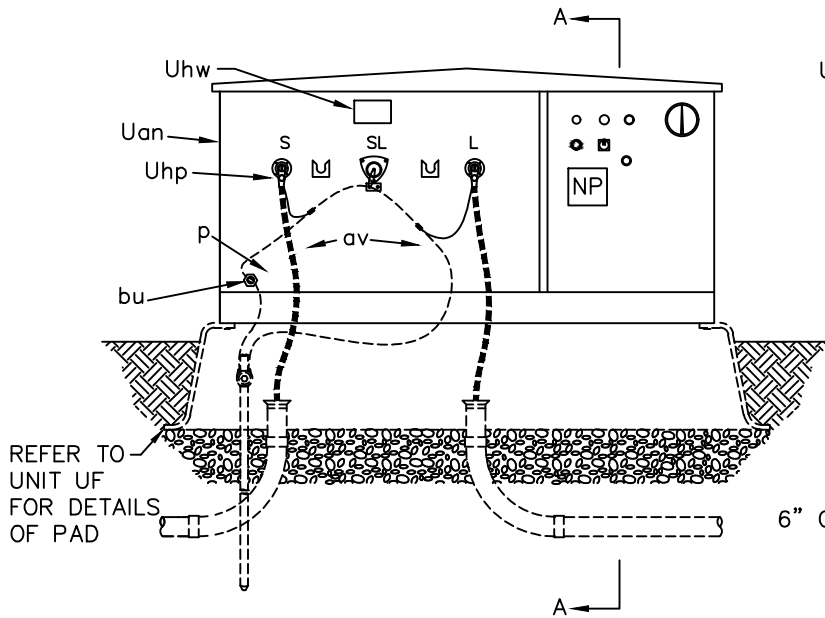
VOLTAGE CONTROL ASSEMBLY UNITS

DRAWING NUMBERS

1728F-806	1728F-806
(New)	(Old)

DRAWING TITLE (DESCRIPTION)

UY1.1XX	SINGLE PHASE PADMOUNTED VOLTAGE REGULATOR WITH NO BYPASS SWITCH
UY1.1.XXSW	SINGLE PHASE PADMOUNTED VOLTAGE REGULATOR WITH BYPASS SWITCH
UY3.2L	THREE PHASE PADMOUNTED SHUNT REACTOR WITH LOOP FEED
UY3.3L	THREE PHASE PADMOUNTED CAPACITOR WITH LOOP FEED



NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1 OR OTHER GROUNDING UNIT.
3. SPECIFY KVA SIZE OF VOLTAGE REGULATOR BEHIND UNIT (XX).
4. SPECIFY PAD OR SLEEVE SEPARATELY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper as required
bu	1	Connector, equipment ground
Uan	1	Regulator, padmounted
Uhp	2	Termination, elbow
Uhw	2	Sign, Safety

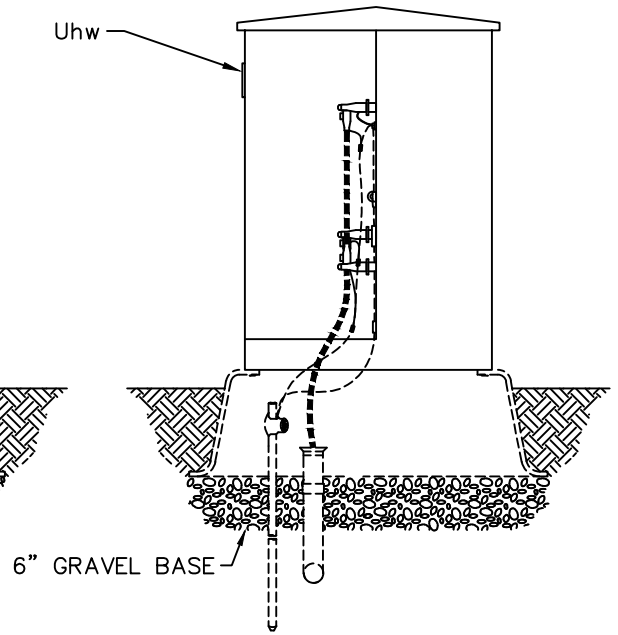
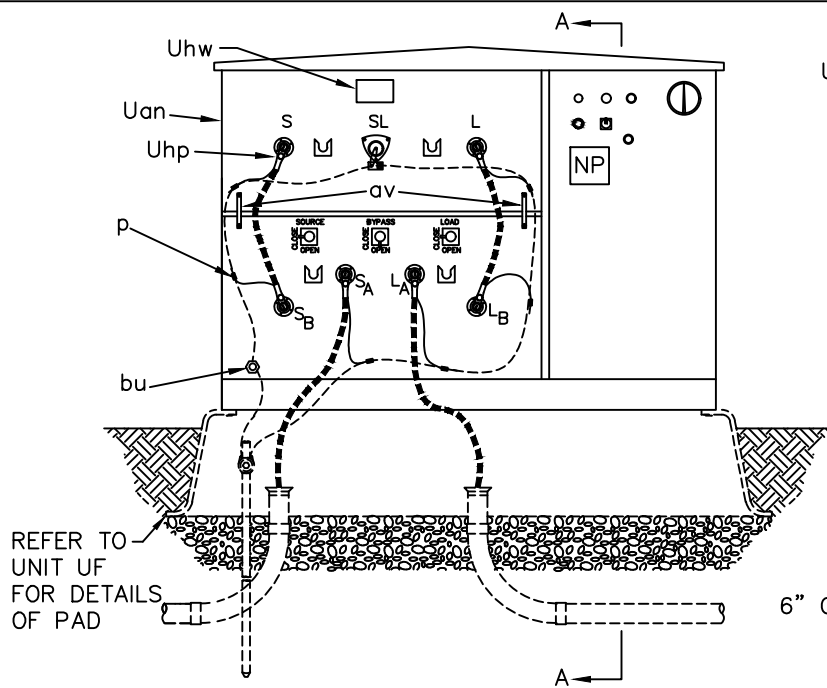
SINGLE PHASE PADMOUNTED
VOLTAGE REGULATOR WITH
NO BYPASS SWITCH

AUG 2016

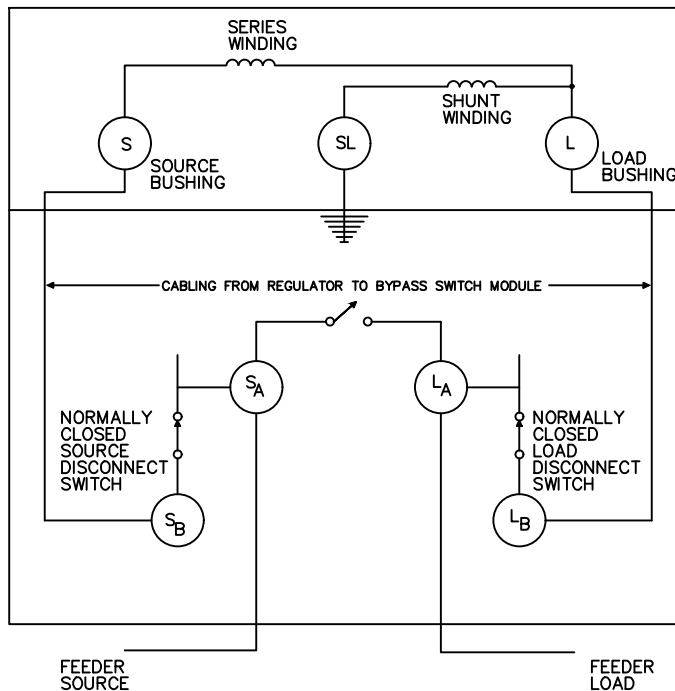
RUS

1 - PHASE PRIMARY

UY1.1.XX



SECTION A-A



NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1 OR OTHER GROUNDING UNIT.
3. SPECIFY KVA SIZE OF VOLTAGE REGULATOR BEHIND UNIT (XX).
4. SPECIFY PAD OR SLEEVE SEPARATELY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper as required
bu	1	Connector, equipment ground
Uan	1	Regulator, padmounted
Uhp	6	Termination, elbow
Uhw	2	Sign, Safety

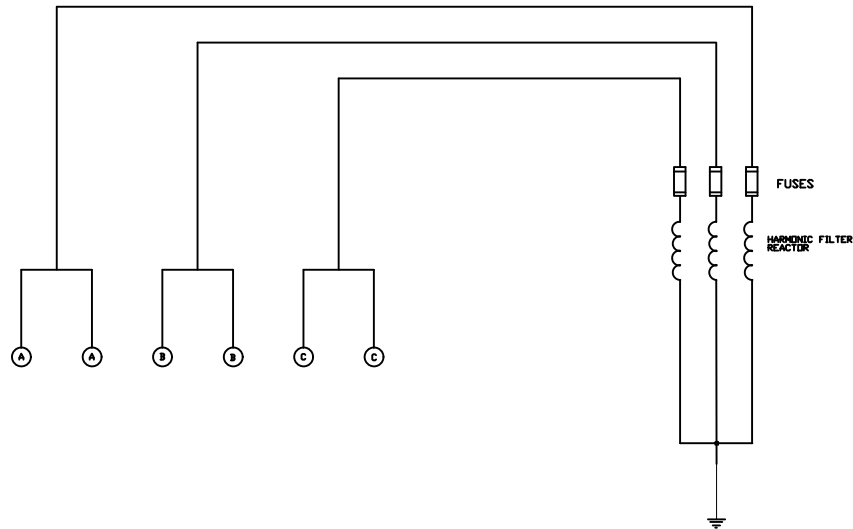
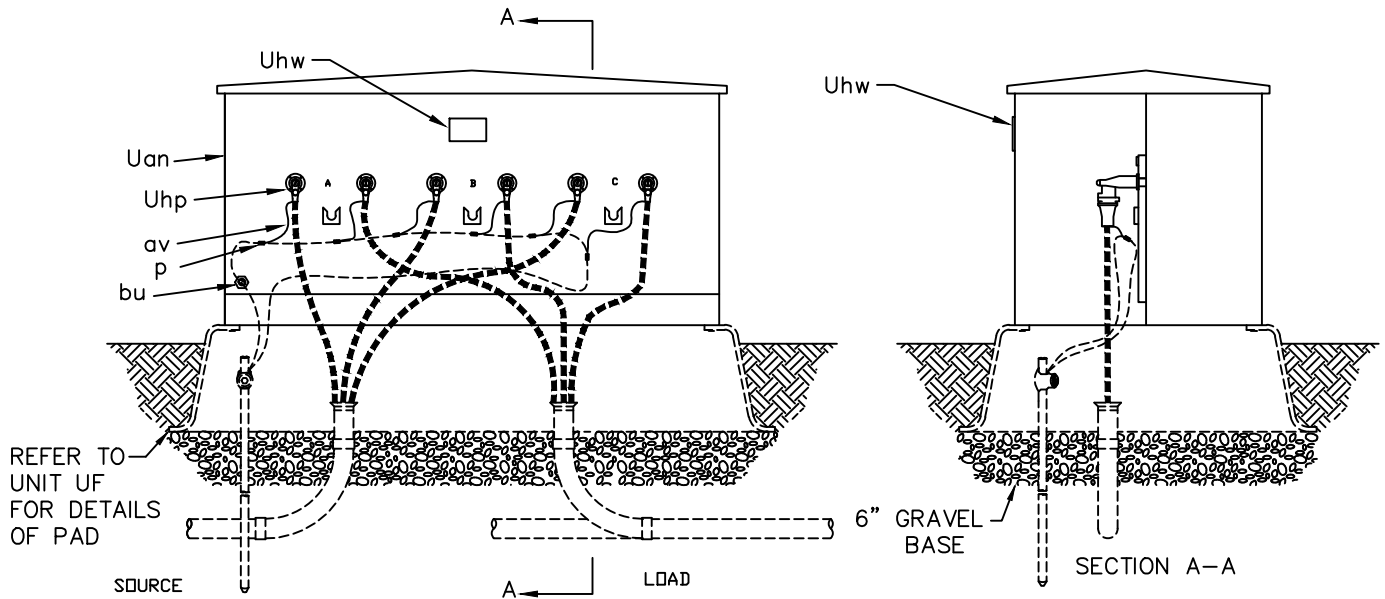
SINGLE PHASE PADMOUNTED
VOLTAGE REGULATOR WITH BYPASS SWITCH

AUG 2016

RUS

1 - PHASE PRIMARY

UY1.1.XXSW



NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1 OR OTHER GROUNDING UNIT.
3. SPECIFY SIZE OF REACTOR.
4. SPECIFY PAD OR SLEEVE SEPARATELY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS..

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper as required
bu	1	Connector, equipment ground
Uan	1	Capacitor bank, padmounted, loop feed
Uhp	6	Termination, elbow
Uhw	2	Sign, Safety

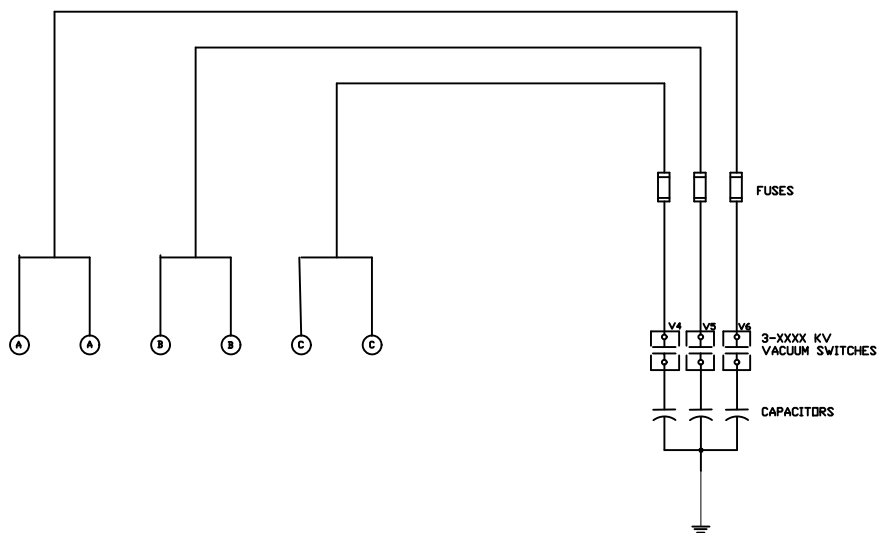
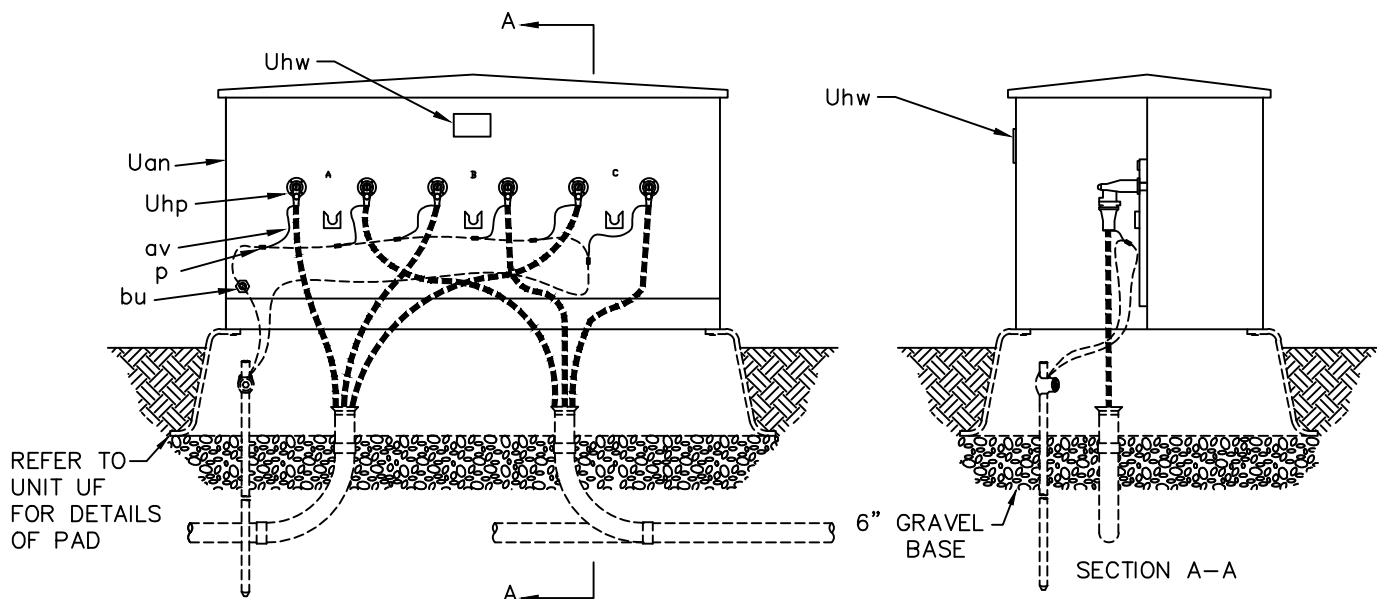
THREE PHASE PADMOUNTED SHUNT REACTOR WITH LOOP FEED

AUG 2016

RUS

3 - PHASE PRIMARY

UY3.2L



NOTES:

1. PROVIDE SUFFICIENT PRIMARY NEUTRAL PIGTAIL AND CABLE SLACK TO PERMIT READY DISCONNECTION OF ELBOW AND MOUNTING ON PARKING STAND. TRAIN CABLES AS SHOWN.
2. INSTALL WITH UNIT UH1 OR OTHER GROUNDING UNIT.
3. SPECIFY KVAR SIZE OF CAPACITOR.
4. SPECIFY PAD OR SLEEVE SEPARATELY.
5. NON-METALLIC SWEEPS SHOULD BE STABILIZED WITH CONCRETE ENCASEMENTS IF PULLING TENSIONS DICTATE.
6. LARGER RADIUS SWEEPS, WHICH MAY BE REQUIRED BY PULLING TENSIONS, MAY INCREASE BURIAL DEPTHS.

ITEM	QTY.	MATERIAL
p		Connector, as required
av		Jumpers, copper as required
bu	1	Connector, equipment ground
Uan	1	Capacitor bank, padmounted, loop feed
Uhp	6	Termination, elbow
Uhw	2	Sign, Safety

THREE PHASE PADMOUNTED CAPACITOR WITH LOOP FEED

AUG 2016

RUS

3 - PHASE PRIMARY

UY3.3L

Disposition of Assemblies in Bulletin D-806

Old Assembly Number (June 2000 1728F-806)	New Assembly Number (1728F-806)	Material Changes and Comments
UA1	UA1	Removed cable riser shield and separated into new UP unit
UA2	UA2	Removed cable riser shield and separated into new UP unit
UA3	UA3	Removed cable riser shield and separated into new UP unit
UB1	UB1	Removed cable riser shield and separated into new UP unit
UB2	UB2	Removed cable riser shield and separated into new UP unit
UB3	UB3	Removed cable riser shield and separated into new UP unit
UB4	UB4	Removed cable riser shield and separated into new UP unit
UC1	UC1	Removed cable riser shield and separated into new UP unit
UC2	UC2	Removed cable riser shield and separated into new UP unit
UC2-1	UC6	Removed cable riser shield and separated into new UP unit
UC2-2	UC6	Removed cable riser shield and separated into new UP unit
UC5-1	UC7.2	Combined deadend and tangent terminal pole units
UC6-1	UC7.2	Combined deadend and tangent terminal pole units
UG6	UG1.1	Add elbow, bushing arrester, and secondary connector blocks
UG7	UG1.3	Add elbows and secondary connector blocks
UG17	UG3.1	Add elbows, bushing arresters, and secondary connector blocks
UG17-2	UG3.3	Add elbows, elbow arresters, and secondary connector blocks
UG17-3	UG3.2	Add elbow arresters and secondary connector blocks
UJ1	UJ1	No Material Changes - Separated Drawings
UJ2	UJ2	No Material Changes - Separated Drawings
UK5	UJ3.1	No material changes
UK6	UJ4.1	No material changes
UM1-5C	UF1.PC	No material changes
UM1-5NC	UF1.PN	No material changes
UM1-6C	UF3.PC	No material changes
UM1-7C	UF1.BC	No material changes
UM1-7NC	UF1.BN	No material changes
UM3-14	US1.PJ	No material changes
UM3-44		Discontinued
UM3-45		Discontinued
UM3-46		Discontinued
UM3E- _ _	US _SF_	No material changes
UM3E-1	US1.SF_	No material changes
UM3E-2	US2.SF_	No material changes
UM3E-3	US3.SF_	No material changes
UM5	UK1.1	Removed cable riser shield and separated into new UP unit
UM5-6		Discontinued
UM5-6A		Discontinued

Disposition of Assemblies in Bulletin D-806

Old Assembly Number (June 2000 1728F-806)	New Assembly Number (1728F-806)	Material Changes and Comments
UM6-1	UM6.EL2	No Material Changes
UM6-2	UM6.EL2F	No Material Changes
UM6-3	UM6.EL6/9	No Material Changes
UM6-4	UM6.FI	No Material Changes
UM6-5	UM6.IN22	No Material Changes
UM6-6	UH1.01	No material changes
UM6-7	UM6.PL2	No Material Changes
UM6-8	UP7.01	No material changes
UM6-9	UP7.03	No material changes
UM6-10	UM6.C2	No Material Changes
UM6-11	UM6.C6	No Material Changes
UM6-12	UM2	No Material Changes
UM6-13	UM6.IN2	No Material Changes
UM6-14	UM6.IN6	No Material Changes
UM6-15	UM6.PK2	No Material Changes
UM6-17	UM6.PL6	No Material Changes
UM6-18	UP7.02	No material changes
UM6-19	UM6.PK22	No Material Changes
UM6-20	UN6.JN22	No Material Changes
UM6-21	UM6.JN222	No Material Changes
UM6-22	UM6.JN2222	No Material Changes
UM6-24	UM6.T	No Material Changes
UM6-26	UM6.TS	No Material Changes
UM6-28	UM6.SP	No Material Changes
UM6-32	UJ1.01	No Material Change
UM6-33	UP1	No Material Change
UM6-34	UP2	No Material Change
UM6-35		Discontinued, refer to Overhead Specifications
UM6-36		Discontinued, refer to Overhead Specifications
UM6-37	UP4	No Material Change
UM6-38	UP3	No Material Change
UM6-39	UH4.1G	Modified guide drawing; no material
UM7-1		Discontinued
UM8	UQ . B	No Material Change
UM8-2	UQ . S	No Material Change
UM8-3	UQ . P	No Material Change
UM8-3A	UQ . P	No Material Change
UM8-4	UQ . T	No Material Change

Disposition of Assemblies in Bulletin D-806

Old Assembly Number (June 2000 1728F-806)	New Assembly Number (1728F-806)	Material Changes and Comments
UM8-4A	UQ . T	No Material Change
UM8-5		Discontinued
UM8-6		Discontinued
UM8-7		Discontinued
UM9-2		Discontinued
UM12		Discontinued, combined with UM2
UM27-1	UP5.2	No material changes
UM27-2	UP5.3	No material changes
UM27-3	UP5.4	No material changes
UM28	UP5.1	No material changes
UM33	US3.PJ	Add junction modules
UM48-1	UH1.1	No material changes
UM48-2	UH1.2	No material changes
UM48-3		Discontinued
UM48-4		Discontinued
UM48-5	UH1.4	No material changes
UM48-6	UH1.7	No material changes
UR2	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-1	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-2	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-3	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-4	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-5	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-NT	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UR2-ST	UT1-UT5	Modified trenching drawing, refer to UT1 - UT5
UX1	UG2.1	Add elbows, elbow arresters, and secondary connector blocks
UX2	US1.DP	No material changes
UX3	US1.DV	No material changes
UX4	UH4.1	Modified guide drawing; added material
UX5	UH3.1	Modified guide drawing; added material
UX7		Discontinued
UX8	UK3.1	No material changes
UX11	UA.G	Arrester connection guide drawing

Bulletin 1728F-806: New Assemblies and Guide Drawings	
NUMBER	ASSEMBLY / GUIDE DRAWING DESCRIPTION
NEW SINGLE PHASE RISER POLE ASSEMBLY UNITS	
UA4	SINGLE PHASE CABLE TERMINAL POLE WITHOUT CUTOUT
UA.G	CABLE TERMINAL POLE ARRESTER CONNECTION GUIDE
UA1.USG	UNDERGROUND SOURCE CONNECTION GUIDE
NEW TWO PHASE RISER POLE ASSEMBLY UNITS	
UB5	TWO PHASE CABLE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UB6	TWO PHASE CABLE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND BRACKET MOUNTING ARRESTERS
NEW THREE PHASE RISER POLE ASSEMBLY UNITS	
UC3	THREE PHASE TERMINAL POLE WITHOUT CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UC4	THREE PHASE TERMINAL POLE WITHOUT CUTOUTS AND BRACKET MOUNTING ARRESTERS
UC5	THREE PHASE TERMINAL POLE WITH UPPER CROSSARM MOUNTING CUTOUTS AND CROSSARM MOUNTING ARRESTERS
UC7.1	BRACKET MOUNTED SWITCHES
UC7.3	VERTICAL SWITCHES MOUNTED ON THREE CROSSARMS
UC7.4	VERTICAL SWITCHES MOUNTED ON FOUR CROSSARMS
UC8.1	THREE PHASE CABLE TERMINAL POLE WITH VERTICAL FRAMING AND TWO BRACKETS PER PHASE
UC8.2	THREE PHASE CABLE TERMINAL POLE WITH VERTICAL FRAMING AND ONE BRACKET PER PHASE
NEW FOUNDATION ASSEMBLY UNITS	
UF.PBC	CONCRETE PRIMARY PULL BOX
UF.PBN	NON-CONCRETE PRIMARY PULL BOX
UF3.BC	CONCRETE BOX PAD FOR THREE PHASE EQUIPMENT
UF3.BN	NON-CONCRETE BOX PAD FOR THREE PHASE EQUIPMENT
UF3.PN	NON-CONCRETE PAD FOR THREE PHASE EQUIPMENT
UF3.VC	CONCRETE VAULT FOR THREE PHASE EQUIPMENT
NEW TRANSFORMER ASSEMBLY UNITS	
UG1.01	SINGLE PHASE ONE BUSHING PADMOUNTED TRANSFORMER ONLY
UG1.02	SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER ONLY
UG1.2	SINGLE PHASE TWO BUSHING PADMOUNTED TRANSFORMER - RADIAL FEED
UG3.01	THREE PHASE THREE BUSHING PADMOUNTED TRANSFORMER ONLY
UG3.02	THREE PHASE SIX BUSHING PADMOUNTED TRANSFORMER ONLY

Bulletin 1728F-806: New Assemblies and Guide Drawings	
NUMBER	ASSEMBLY / GUIDE DRAWING DESCRIPTION
NEW GROUNDING ASSEMBLY UNITS	
UH2.0	COUNTERPOISE GROUNDING
UH2.2	COUNTERPOISE GROUNDING
UH2.7	TRENCH TYPE GROUNDING ASSEMBLY - RISER TO TRANSFORMER OUTSIDE OF CONDUIT
UH4.1G	JACKETED CABLE GROUNDING INSTALLATION (HEAT SHRINK OR COLD SHRINK)
NEW SECONDARY ASSEMBLY UNITS	
UJ3.3	SECONDARY PEDESTAL THREE PHASE UNDERGROUND CABLE
UJ4.3	SECONDARY HANDHOLE THREE PHASE UNDERGROUND CABLE
NEW SERVICE ASSEMBLY UNITS	
UK2.1	SECONDARY RISER BOTTOM CONNECTION
UK2.2	SECONDARY RISER BOTTOM SIDE CONNECTION
UK4	SECONDARY BREAKER
NEW MISCELLANEOUS ASSEMBLY UNITS	
UM1.XX	RIGHT-OF-WAY CLEARING
UM3	SAFETY SIGNS
UM6.JN6226	FOUR POINT TERMINATION, 2-600 AMP DEAD BREAK AND 2-200 AMP LOAD BREAK
UM6.PKGD	ONE POINT GROUND
UM6.RK	HEAT SHRINK OR COLD SHRINK TUBING
NEW OUTDOOR LIGHTING ASSEMBLY UNITS	
UO1	OUTDOOR LIGHT INSTALLATION GUIDE
UO2	LIGHT STRUCTURE INSTALLATION GUIDE
NEW SYSTEM PROTECTION ASSEMBLY UNITS	
UP7.04	CONDUIT ELBOW
UP7.B1	SINGLE CONDUIT RISER WITH STAND-OFF BRACKETS
UP7.B2	TWO CONDUIT RISER WITH STAND-OFF BRACKETS
UP7.B3	THREE CONDUIT RISER WITH STAND-OFF BRACKETS
UP7.C	STRAP ATTACHED CONDUIT RISER
UP7.FC	FLEX CONDUIT RISER
UP7.UG	U-GUARD RISER
UP8	UNDERGROUND CONDUIT
NEW METERING ASSEMBLY UNITS	
UQG	METER OPTIONS GUIDE
NEW RECLOSER ASSEMBLY UNITS	
UR3.--	THREE PHASE PADMOUNTED RECLOSER

Bulletin 1728F-806: New Assemblies and Guide Drawings	
NUMBER	ASSEMBLY / GUIDE DRAWING DESCRIPTION
NEW SECTIONALIZING ASSEMBLY UNITS	
US1.DC	SINGLE PHASE PADMOUNTED TRANSFORMER DEFERRED UNIT - CABINET TYPE
NEW TRENCH ASSEMBLY UNITS	
UT2	TRENCH WITH CONCRETE ENCASEMENT
UT3	TRENCH WITH CONCRETE CAP
UT4	TRENCH - DIRECTIONAL BORE
UT5	TRENCH - PLOW
NEW VOLTAGE CONTROL ASSEMBLY UNITS	
UY1.1XX	SINGLE PHASE PADMOUNTED VOLTAGE REGULATOR WITH NO BYPASS SWITCH
UY1.1.XXSW	SINGLE PHASE PADMOUNTED VOLTAGE REGULATORS WITH BYPASS SWITCH
UY3.2L	THREE PHASE PADMOUNTED SHUNT REACTOR WITH LOOP FEED
UY3.3L	THREE PHASE PADMOUNTED CAPACITOR WITH LOOP FEED

Attachment C

RUS Standard Format and Meaning of Underground Distribution Assembly Numbers

The RUS standard numbering format for underground distribution assemblies is: **UL₁N₁.LN₂**

L₁ 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 underground distribution line. For example, the assemblies in category “C” are pole top riser assemblies that support three primary cables, terminations, arresters and cutouts/switches.

The following table shows the 16 distribution assembly categories and the letter (UL₁) RUS has assigned to represent them.

DESIGNATED MEANINGS of ASSEMBLY CATEGORY NUMBERS (UL₁)		
UA 1-Phase, pole-top riser	UH Grounds	UQ Metering
UB 2-Phase, pole-top riser	UJ Secondaries	UR Reclosers
UC 3-Phase, pole-top riser	UK Services	US Sectionalizing
UF Foundations	UM Miscellaneous	UT Trench
UG Transformers	UO Outdoor Lighting	UY Volt. Alteration Equip.
	UP Protection	

N₁ 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 (UL₁). It may represent selected material and arrangement to accomplish the function or it could represent the number of phases involved to accomplish a similar purpose.

The following table shows the RUS designated meaning of the numbers (N₁) that represent the pole-top riser assembly category “A”.

DESIGNATED MEANINGS of SUBCATEGORY NUMBERS (N₁) for POLE TOP RISER ASSEMBLIES	
1	Single phase cable terminal pole top with two brackets
2	Single phase cable terminal pole top with one bracket
3	Single phase cable terminal pole top with crossarm mounted cutout
4	Single phase cable terminal pole top without cutout

RUS has assigned meanings to the subcategory numbers (N₁) for the remaining 15 (UL₁) categories of underground distribution assemblies, however, the list and meanings of these numbers is long and varied and beyond the scope of this summary exhibit. The index for each section in this bulletin defines the assembly unit for each Construction Assembly Unit.

LN₂, which is either one or two letters or numbers, is defined as the *assembly identification*. This identification is used to differentiate the similar assemblies in a subcategory (N₁) of assemblies. The assigned meanings to assembly identification vary between categories. The use between categories is explained in the Subcategory index.

For example, in underground there are several parts that are used to connect many different pieces of padmounted equipment under several categories. These are grouped under miscellaneous UM6 with letters identifying the type of device and suffixes indicating the number, size and type of interface.

DESIGNATED MEANINGS of ASSEMBLY IDENTIFICATION NUMBERS (N₂) for MISCELLANEOUS ASSEMBLIES (UM6)	
C Cap	PK Parking Stand
EL Elbow	PL Plug
FI Fault Indicator	T Terminator
IN Insert	SP Splice
JN Junction Module	RK Reseal Kit

The prefix “25” in front of a standard assembly number indicates that the assembly is used for 24.9/14.4 kV underground construction. A standard assembly number with prefix “15” indicates that the assembly is used for 12.47/7.2 kV underground construction.

A suffix is an alphabetic character or number placed at the end of a standard assembly number. A suffix describes the type of the assembly. The following are some typical suffixes.

G (Guide drawing, not an assembly)

2 200 Amp Load Break

C (Concrete)**6** 600 Amp Dead Break**N** (Non Concrete)**9** 900 Amp Dead Break

Not all assembly numbers have suffixes and some may have more than one suffix number or letter.

SUMMARY

Each unit will use the same format. The VOLTAGE PREFIX, when required is followed by the ASSEMBLY CATEGORY, a two-letter designation UA through UY which represent single phase primary units through voltage control units. Sometimes numbers complete the assembly category. After the assembly category a DOT (.) is inserted before the ASSEMBLY IDENTIFICATION. The assembly identification uses both numbers and letters to identity a unit within the category. Note subunits use a zero before the number and represents parts for a larger unit. Sometimes a SUFFIX DESIGNATION is required to provide further clarification.

Claverack Specific Non-Standard 15 KV Construction Units



SINGLE SUPPORT, HORIZONTAL POST INSULATOR, TREE CABLE

AP1

Claverack Specific Non-Standard 15 KV Construction Units



DEADEND ANGLE (90° - 150°), TREE CABLE

AP4

Claverack Specific Non-Standard 15 KV Construction Units



SINGLE DEADEND, TREE CABLE

AP5, AP5-2

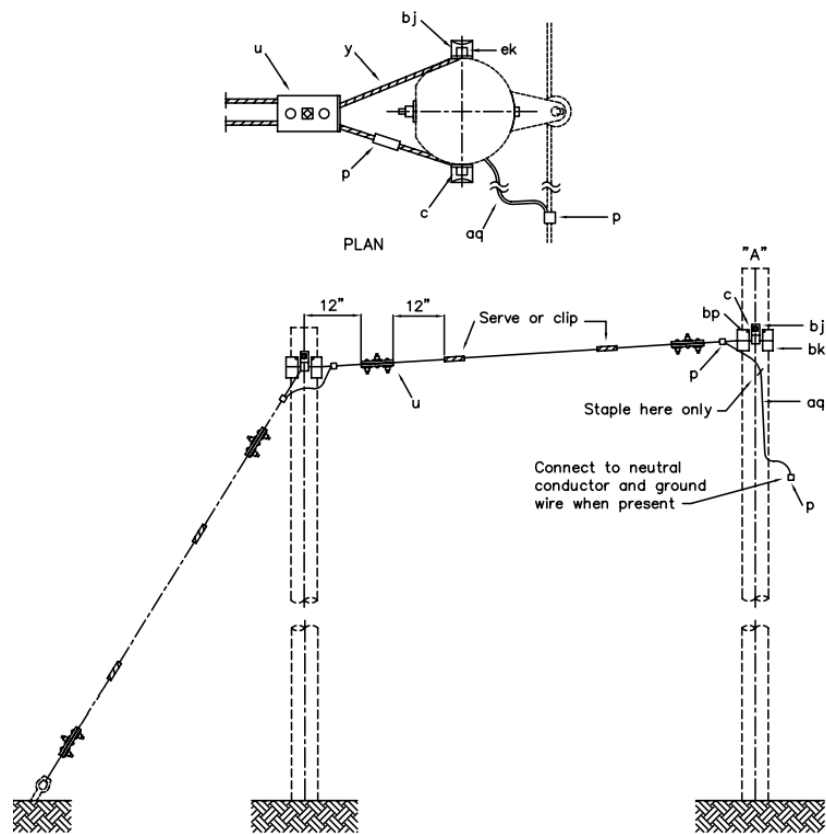
Claverack Specific Non-Standard 15 KV Construction Units



DOUBLE DEADEND, FEED THROUGH, TREE CABLE

AP6

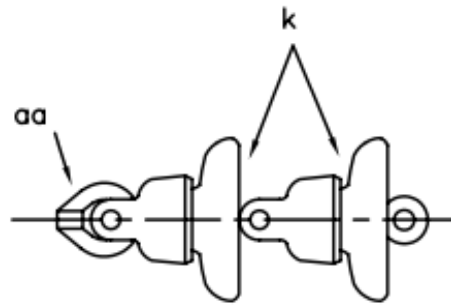
Claverack Specific Non-Standard 15 KV Construction Units



GUY, WRAPPED TYPE

E4-3

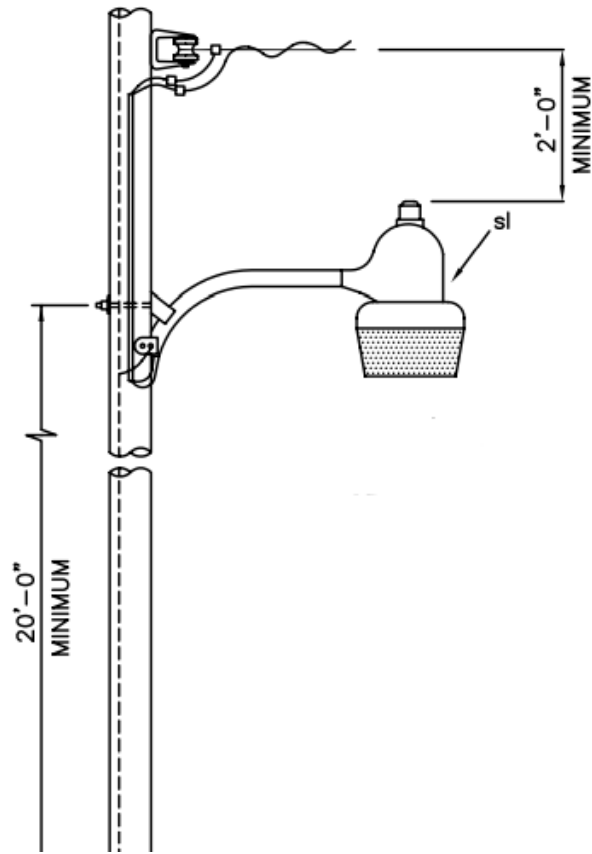
Claverack Specific Non-Standard 15 KV Construction Units



SUSPENSION INSULATOR, IN LINE, FLOATING

M5-20

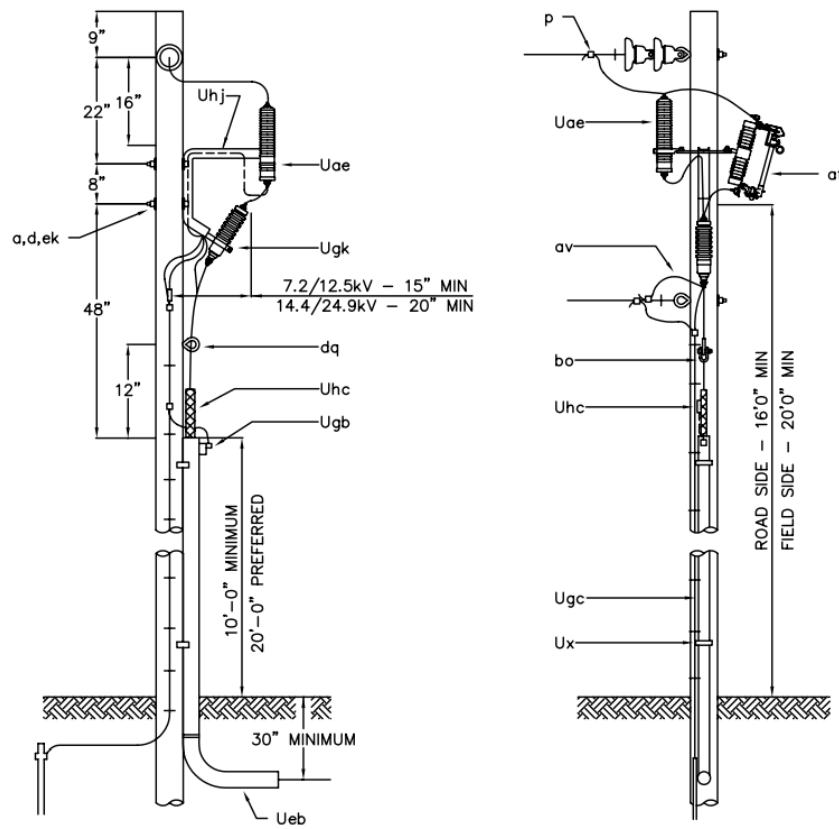
Claverack Specific Non-Standard 15 KV Construction Units



AREA LIGHT, POLE MOUNTED

M63

Claverack Specific Non-Standard 15 KV Construction Units



CABLE TERMINAL POLE

UGT