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Hood Canal-101 Phase Two Broadband Project

BID BINDER

DATE: January 2023

REVISION: 1

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SECTION ONE

BID DOCUMENTS & FORMS

1.1 PROJECT OVERVIEW

PROJECT DESCRIPTION and PROJECT LOCATION

Summary

The Hood Canal-101 Phase Two Broadband Project is a joint project between Hood Canal Communications and Mason County PUD 1 to install Fiber along US Highway 101. Due to the age and size of the PUD's poles, there are 158 poles that have been identified for replacement. This project includes the replacement of 158 utility poles along Highway 101 including the transfer of live power, and existing communications attachments.

The project spans approximately 5.8 miles from North of Forest Dr., Brinnon WA (MP 314.33) to Mt. Walker Rd., Brinnon WA (MP 301.51).

This pole replacement is noncontiguous along US HWY 101. Alternating single lane traffic control will be necessary for all Highway work.

Forty-one poles will be replaced along Dosewallips Rd. A single pole is to be replaced along Duckabush Rd. Both Dosewallips and Duckabush are county owned roadways that will require single lane alternating traffic control.

Transfer of communications attachments will be the responsibility of the contractor. Please see staking cover sheets for attachment count.

Project Storage

Storage of materials and equipment is at the will of the Contractor. The Mason County PUD 1 campus provides 2+ acres of lay-down area that is locked after operating hours. PUD 1 anticipates the majority consumables and equipment will be stored. There is additionally a laydown yard available to the Contractor located on Dark Rd, Brinnon WA. Located just off of Duckabush Rd, this site provides an optimal pole laydown yard as it is centered in the project location, between the two greatest lengths of replacement. This property is fenced and gated. **Contractor to provide own lock**. A map of key locations is attached in Section Two.

For technical questions regarding Utility Pole installation and attachments, please contact James Reyes, PUD 1 Engineering Manager at (360) 877-5249 or email jamesr@mason-pud1.org.

All electronic communications should include a cc: to Kristin Masteller at kristinm@mason-pud1.org.

INVITATION TO BID

January 20, 2022 **ENGINEERS ESTIMATE: $1,480,0000**

Notice is hereby given for the submittal of sealed bids for construction of Hood Canal-101 Phase Two Broadband Project for Mason County PUD No. 1 (Owner) and Hood Canal Communications.
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Forty-one poles will be replaced along Dosewallips Rd. A single pole is to be replaced along Duckabush Rd. Both Dosewallips and Duckabush are county owned roadways that will require single lane alternating traffic control.

The District will provide all poles required for project completion.

All materials, including consumables, will be purchased by the Contractor outside of the materials provided. The Contractor will provide all labor, equipment, testing, and consumable parts to complete the project. The Contractor also will provide conductor, insulators, conduit to complete the project, this is not an exhaustive list.

Bids must be physically received by Mason County PUD 1, at 21971 N. Highway 101, Shelton WA 98584 no later than 4:00 p.m. PST on February 17, 2023, (post marks will not be recognized) at which time all complying bids shall be publicly opened and read aloud at the PUD 1 office at 4:30 p.m. via Zoom. Bid documents may be obtained from the Mason County PUD 1 website by visiting: https://mason-pud1.org/bids/

It is required that prospective bidders visit the project area and visually confim understanding of work and construction. Please check in at the Mason County PUD 1 office when onsite to verify visit.

ANTICIPATED PROJECT SCHEDULE:

January 20, 2023	Bid Documents Available Online/Advertisement
February 3, 2023	Virtual Job Show at 9:00 a.m. PST via Zoom
February 17, 2023	Bid Opening at 4:30 p.m. PST via Zoom
February 21, 2023	Notice of Intent to Award
March 3, 2023	Pre-Construction Conference & Notice to Proceed
June 30, 2023	Construction Complete

Link to Virtual Job Walk-through: (https://us02web.zoom.us/j/85485131825)

Link to Bid Opening: (https://us02web.zoom.us/j/83290884089)

For questions concerning bid documents, submittal requirements, or technical project information contact Engineering Manager James Reyes at (360) 877-5249 or jamesr@mason-pud1.org.

AGREEMENT BETWEEN
OWNER AND CONTRACTOR

The Effective Date of this Contract is:	
The Parties to this Contract are:	
The "Owner"	Mason County Public Utility District No. 1
The "Contractor"	
Project Name:	
The "Architect" or "Engineer:"	
The "Work:"	See "Scope of Work," Exhibit A
Alternates included in the Contract Sum:	
Contract Sum for the Work: *(not including sales tax)*	$ _____
Payments: *(check one)*	□ The Owner will make a single payment to the Contractor within thirty (30) days of Final Acceptance. □ See Supplemental Conditions
Date of Substantial Completion of the Work:	
Date of Final Completion of the Work:	7 days after Substantial Completion
Liquidated Damages:	$1,500 per day for each calendar day beyond the Contract Time that Substantial Completion is not achieved.
Owner's Permit Responsibilities:	
Unit Prices:	
Minimum Required Insurance:	
Commercial General Liability:	At least $1 million per occurrence and general aggregate.
Automobile Liability:	At least $1 million
Workers' Compensation (industrial insurance):	At least the State statutory amount
Employer's Liability:	At least $1 million
Aircraft Liability:	At least $5 million NA
Watercraft Liability:	At least $1 million NA
Property Insurance:	Full insurable value
Boiler and Machinery Insurance:	
Additional Insureds:	Mason County PUD No. 1

The Owner and Contractor agree as set forth below.

ARTICLE 1: THE WORK. The Contractor shall fully execute and complete the entire Work described in the Contract Documents, including the Alternates listed above.

ARTICLE 2: COMMENCEMENT AND SUBSTANTIAL AND FINAL COMPLETION.

2.1 The date of commencement of the Work is the date of this Agreement. The Contract Time is measured from the date of commencement to the date of Substantial Completion specified above, as it may be adjusted under the Contract Documents.

2.2 The Contractor shall achieve Substantial Completion and Final Completion of the entire Work within the dates specified above, subject to adjustments of the Contract Time as provided in the Contract Documents.

ARTICLE 3: THE CONTRACT SUM. The Owner shall pay the Contractor the Contract Sum for the Contractor's performance of this Contract, subject to additions and deductions as provided in the Contract Documents. Sales tax is not included in the Contract Sum.

ARTICLE 4: PAYMENT. The Owner will pay the Contractor within *thirty (30) days* of receipt of an approved Application for Payment in accordance with this Contract. Retainage will be released in accordance with statutory requirements.

ARTICLE 5: PERMITS AND FEES.

5.1 The Owner will secure and pay for only those governmental permits, approvals, fees, licenses, inspections, governmental charges and inspection fees listed on the cover page.

5.2 The Contractor shall secure and pay for all other governmental permits, approvals, fees, licenses, inspections, governmental charges and inspection fees required for the prosecution of the Work.

ARTICLE 6: ENUMERATION OF CONTRACT DOCUMENTS.

6.1 The Contract Documents form this Contract. This Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Owner and a Subcontractor of any tier, between any Architect and the Contractor, or between any persons or entities other than the Owner and the Contractor.

6.2 The Contract Documents are enumerated as follows and, in the event of a conflict or discrepancy among or in the Contract Documents, interpretation shall be governed in the following order of priority:

1. Agreement
2. Supplemental Conditions
3. Prevailing wage rates set by L&I as of the bid date for Mason County (available at http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp)
4. General Conditions
5. Scope of Work (See Exhibit A)
6. Drawings and Specifications (See Bid Binder)
7. Site Conditions and Coordination (See Exhibit A)
8. Additional Information (See Exhibit B)
9. Performance & Payment Bond

OWNER

By _____
(Signature)

_____
(Printed name and title)

CONTRACTOR

By _____
(Signature)

_____
(Printed name and title)

GENERAL CONDITIONS

ARTICLE 7
THE CONTRACT DOCUMENTS

7.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contractor's performance shall be consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

7.2 "Work" means the construction and services required by the Contract Documents and includes all labor, materials, equipment and services to be provided by the Contractor to fulfill its obligations.

7.3 If the Contractor finds a conflict, error or discrepancy in the Contract Documents, the Contractor shall report it to the Owner in writing at once. The Contractor shall not proceed with the affected Work until it receives a written interpretation or clarification from the Owner.

ARTICLE 8
ADMINISTRATION OF THE CONTRACT

8.1 The Owner will provide administration of the Contract. If an Architect or Engineer is also involved, its duties beyond those addressed in these General Conditions will be described in an attachment to this Contract.

8.2 **Authority.** The Owner must approve in writing all changes in the Contract Sum or Contract Time as well as all Change Orders, Construction Change Directives, and payments to the Contractor. The Owner will make any modification or release of any requirement of the Contract Documents, or any approval or acceptance of any portion of the Work, whether or not executed in accordance with the Contract Documents, exclusively in writing.

8.3 **Rejection of Work.** The Owner may reject Work that, in its opinion, does not conform to the Contract Documents. If the Contractor fails to correct Work that is not in accordance with the Contract Documents or fails to carry out the Work in accordance with the Contract Documents, the Owner may order the Contractor in writing to stop the Work, or any portion thereof, until the cause for that order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right.

8.4 **Site Access.** The Owner shall have access to and may visit the Work site at intervals it considers appropriate to the stage of the Work to become generally familiar with the progress and quality of the completed Work, but the Owner will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.

8.5 **Submittals.** The Contractor shall review, approve and submit to the Owner with reasonable promptness shop drawings, product data, samples and similar submittals required by the Contract Documents. The Owner will review and approve or take other appropriate action upon the Contractor's submittals for the limited purpose of checking for conformance with information given and the design concept expressed by the Contract Documents. The Work shall be in accordance with approved submittals. The Owner's review and approval does not relieve the Contractor of responsibility for compliance with the Contract Documents. The Contractor shall submit to the Owner any proposed change to or deviation from previously approved documents or submittals.

ARTICLE 9
THE CONTRACTOR

9.1 Using its best skill and attention, the Contractor shall perform, supervise and direct the Work. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, procedures and personnel, for safety, and for coordinating all portions of the Work under this Contract. The Contractor shall provide and pay for all labor, materials, equipment, tools and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

9.2 **Subcontractors.** A "Subcontractor" is a person or entity that has a direct contract with the Contractor to perform a portion of the Work at the site or to supply materials or equipment. A "Subcontractor of any tier" includes Subcontractors and lower-level subcontractors and suppliers.

9.2.1 Identification. As soon as practicable and no later than *fourteen (14) days* after award of this Contract, the Contractor shall confirm to the Owner in writing the names of the Subcontractors for each portion of the Work.

9.2.2 Subcontracts. Contracts between the Contractor and Subcontractors shall require each Subcontractor to be bound to the Contractor by the terms of the Contract Documents for the Work to be performed by the Subcontractor and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by the Contract Documents, assumes toward the Owner.

9.2.3 Payment. The Contractor shall promptly pay (and secure the discharge of any liens asserted by) all persons properly furnishing labor, equipment, materials or other items in connection with the performance of the Work for which the Owner has paid (including, but not limited to, workers and Subcontractors). The Contractor shall furnish to the Owner releases of liens and claims and other documents that the Owner requests from time to time to evidence such payment (and discharge). Nothing in the Contract Documents shall obligate the Owner to pay or to cause the payment of any moneys due to any Subcontractor of any tier or other person or entity, except as may otherwise be required by law or regulation.

9.3 Workers. The Contractor shall enforce strict discipline and good order among persons carrying out the Work and shall not permit employment of unfit persons or persons not skilled in tasks assigned to them. At no change to the Contract Sum or Contract Time, the Owner may provide written notice requiring the Contractor to remove from the Work any employee or other person carrying out the Work that the Owner considers objectionable.

9.4 Warranty. The Contractor warrants that materials and equipment furnished under this Contract will be of good quality and new, that the Work will be performed in a workmanlike manner, free from defects not inherent in the quality required, and that the Work will conform with the requirements of the Contract Documents.

9.5 Progress Schedule. Within *fourteen (14) days* of execution of this Contract, the Contractor shall submit a schedule of the Work to the Owner ("Progress Schedule"). The Contractor will be responsible for planning, scheduling, managing, and reporting the progress of the Work in accordance with all of the specific methods and submittals described in the Contract Documents. The Contractor shall use the Progress Schedule (as updated) to plan, coordinate, and prosecute the Work in an orderly and expeditious manner.

9.6 Clean-Up. The Contractor shall keep the site and surrounding area free from accumulation of waste materials caused by operations under the Contract.

9.7 Indemnification.

9.7.1 Subject to the following conditions and to the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner and its agents, employees, consultants, successors and assigns (together, the "Indemnified Parties") from and against all claims, damages, losses and expenses, direct and indirect, or consequential, including but not limited to costs, attorneys' fees, and other litigation expenses incurred on such claims and in proving the right to indemnification, arising out of or resulting from the performance of the Work by or any act or omission of the Contractor, its agents, any Subcontractor of any tier, and anyone directly or indirectly employed by them (together, the "Indemnitor").

.1 The Contractor will fully indemnify and defend the Indemnified Parties for the sole negligence of the Indemnitor.

.2 The Contractor will indemnify and defend the Indemnified Parties for the concurrent negligence of the Indemnitor only to the extent of the Indemnitor's negligence. The Contractor agrees to being added by the Owner as a party to any mediation, arbitration or litigation with third parties in which the Owner alleges indemnification or contribution from the Indemnitor. The Contractor agrees that all of its Subcontractors of any tier will similarly stipulate in their subcontracts. To the extent a court or arbitrator strikes any portion of this indemnification provision for any reason, all remaining provisions shall retain their vitality and effect.

9.7.2 After mutual negotiation of the parties, the indemnification obligation shall not be limited by the amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts in claims by an employee of the Contractor or a Subcontractor of any tier against any person or entity indemnified under this Paragraph 9.7. For the sole purpose of effecting the indemnification obligations under this Contract and not for the benefit of any third parties unrelated to the Owner, the Contractor specifically and expressly waives any immunity that may be granted it under Title 51 RCW, "Industrial Insurance." IF THE CONTRACTOR DOES NOT AGREE WITH THIS WAIVER, IT MUST PROVIDE A WRITTEN NOTICE TO THE OWNER PRIOR TO THE DATE FOR THE RECEIPT OF BIDS, OR THE CONTRACTOR WILL BE DEEMED TO HAVE NEGOTIATED AND WAIVED THIS IMMUNITY.

9.8 Records. The Contractor shall maintain and preserve books, ledgers, records, estimates, correspondence, logs, schedules, electronic data and other documents relating or pertaining to the costs and/or performance of the Contract ("records"). Within *seven (7) days* of the Owner's request, the Contractor shall make available at the Contractor's office all records for inspection, audit and reproduction (including electronic reproduction) by the Owner's representatives. These requirements apply to each Subcontractor of any tier. The Contractor agrees, on behalf of itself and Subcontractors of any tier, that the invocation of any rights under RCW 42.56 shall initiate an equivalent right to disclosures from the Contractor and Subcontractors of any tier for the benefit of the Owner.

9.9 Compliance with Law. The Contractor, its employees, Subcontractors of any tier and representatives, shall comply with all applicable laws, ordinances, statutes, rules and regulations, federal and state, county and municipal.

9.9.1 Prevailing Wages. The Contractor shall comply with all applicable provisions of RCW 39.12, including but not limited to submission of approved "Statements of Intent to Pay Prevailing Wage," payment of all Labor & Industries' fees, submission and posting of approved "Statements of Intent to Pay Prevailing Wages" and payment of prevailing wages. The State of Washington prevailing wage rates applicable for this public works project, which is located in Mason and Jefferson Counties, may be found at the following website address of the L&I: http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp. The Contractor shall keep a paper copy at the Project site. The fiber installation portion of Schedule A will be solely owned and operated by Hood Canal Communications, and not by the District, therefore that portion of the work is not applicable to state prevailing wage.

9.9.2 Hours of Labor. The Contractor shall comply with all applicable provisions of RCW 49.28.

9.9.3 Worker's Right to Know. The Contractor shall comply with RCW 49.70 and WAC 296-62-054 regarding workplace surveys and material safety data sheets for "hazardous" chemicals at the Project site.

ARTICLE 10
CONSTRUCTION BY THE OWNER OR BY SEPARATE CONTRACTORS

10.1 The Owner may perform construction or operations related to the Project with its own forces and may award separate contracts in connection with other portions of the Project or other construction or operations on the site under contractual conditions consistent with those of the Contract Documents.

10.2 The Contractor shall afford the Owner and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations.

ARTICLE 11
CHANGES IN THE WORK

11.1 The Owner, without invalidating this Contract, may order changes in the Work consisting of additions, deletions or modifications ("Changes"), and the Contract Sum and Contract Time will be adjusted accordingly. Changes in the Work, in the Contract Sum and/or in the Contract Time shall be authorized only by written Change Order signed by the Owner and the Contractor or by written Construction Change Directive signed by the Owner.

11.1.1 Change Orders. A Change Order is a written instrument signed by the Owner and the Contractor stating their agreement upon a change in the Work, the amount of any adjustment in the Contract Sum, and the extent of any adjustment in the Contract Time.

11.1.2 Construction Change Directives. A Construction Change Directive is a written order prepared and signed by the Owner that directs a change in the Work and states a proposed basis for any adjustment in the Contract Sum and/or Contract Time. It is used in the absence of total agreement on the terms of a Change Order. The Contractor shall promptly proceed with the change in the Work described in the Construction Change Directive. As soon as possible, and within *seven (7) days* of receipt, the Contractor shall advise the Owner in writing of the Contractor's agreement or disagreement with the cost or the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

11.2 Costs of Changes and Claims. If the parties cannot agree on the cost or credit to the Owner from a Construction Change Directive or other Change in the Work, the Contractor and all affected Subcontractors of any tier shall keep and present an itemized accounting with supporting data. The total cost of any Change or Claim shall be limited to the reasonable value of the direct labor costs, material costs, construction equipment usage costs for the actual time equipment appropriate for the Work is used solely on the Change in the Work, the cost of any change in insurance, Subcontractor costs, and a fee for all combined overhead and profit, including impact costs of any kind, limited to twelve percent (12%) of the cost for any materials or work performed by the forces of the Contractor or a Subcontractor and eight percent (8%) of amounts due to Subcontractors.

11.3 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site that are (1) concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found and generally recognized as inherent in activities of the character provided for in the Contract Documents, then the Contractor shall give written notice to the Owner promptly before conditions are disturbed and in no event later than *seven (7) days* after the first observance of the conditions. The Contractor shall make any Claim arising from such condition in accordance with the dispute resolution procedures of Article 19.

ARTICLE 12
TIME

12.1 Delay.

12.1.1 Time. If the Work is delayed by changes ordered in the Work, unanticipated general labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties or any other causes beyond the Contractor's control, then the Contract Time shall be extended by Change Order to the extent the critical path is

affected.

12.1.2 Damages. The Contractor and Sub-contractors shall be entitled to damages for delay only where the Owner's actions or inactions were the actual, substantial cause of the delay and where the Contractor could not have reasonably avoided the delay by the exercise of due diligence.

12.1.3 Contractor Delay. If a delay was caused by the Contractor, a Subcontractor of any tier, or anyone acting on behalf of any of them, the Contractor is not entitled to an increase in the Contract Time or in the Contract Sum.

12.2 Completion and Liquidated Damages. The timely completion of the Project is essential to the Owner. The Owner will incur serious and substantial damages if Substantial Completion of the Work does not occur within the Contract Time. The Contractor is responsible for actual damages for delay unless an amount is inserted on the cover page for liquidated damages, in which case the liquidated damage amount shall apply. Liquidated damages shall not be affected by partial completion, occupancy, or beneficial occupancy.

ARTICLE 13
PAYMENTS AND COMPLETION

13.1 Payments. Payment shall be made as provided in this Contract, including any Supplemental Conditions.

13.2 Withheld Payment. The Owner may withhold payment in whole or in part, or it may nullify the whole or part of a payment previously issued, on account of (1) defective Work not remedied, (2) claims or liens filed by third parties, (3) failure of the Contractor to make payments due to Subcontractors or for labor, materials or equipment, (4) damage to the Owner or another contractor, (5) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum, (6) reasonable evidence that the unpaid balance would not be adequate to cover actual or liquidated damages for delay for which the Contractor is responsible, (7) failure to carry out the Work in accordance with the Contract Documents, or (8) liquidated damages. The Owner will provide the Contractor with written notice of its intent to implement this provision and provide details supporting the Owner's intention. The Contractor will be afforded reasonable time following receipt of such notice to respond to or correct the circumstances provoking this action by the Owner.

13.3 Substantial Completion.

13.3.1 Substantial Completion is the stage in the progress of the Work when the construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can fully utilize the Work (or a designated portion) for its intended use. All Work other than incidental corrective or punchlist work and final cleaning shall have been completed. The Work is not Substantially Complete if all systems and parts affected by the Work are not usable, any required occupancy or use permit has not been issued, or if utilities affected by the Work are not connected and operating normally. The fact that the Owner may use or occupy some or all of the Work does not indicate that the Work is Substantially Complete, nor does it toll or change any liquidated damages due the Owner.

13.3.2 When the Contractor believes that the Work has achieved Substantial Completion, it shall notify the Owner in writing. When the Owner agrees, it will issue a Certificate of Substantial Completion.

13.3.3 Immediately before any occupancy, the Owner will schedule an inspection tour of the area to be occupied. Representatives of the Owner and the Contractor will jointly tour the area and record items still remaining to be finished and/or corrected. The Contractor shall promptly supply and install any such items as well as items missed by the inspection but required or necessary for Final Completion as a part of the Contract Sum.

13.4 Final Completion. After the Contractor has notified the Owner that the Work has been concluded, and the Contractor has submitted the items listed below as may be required at the discretion of the Owner, the Owner will determine in writing that Final Completion has occurred.

.1 A final Application for Payment.

.2 An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or its property might in any way be responsible or encumbered, have been paid or otherwise satisfied.

.3 Consent of surety to final payment.

.4 A certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be cancelled or allowed to expire until at least thirty (30) days' prior written notice has been given to the Owner.

.5 A written statement that the Contractor knows of no substantial reason why the insurance will not be renewable to cover the period required by the Contract Documents.

.6 Other data establishing payment or satisfaction of or protection (satisfactory to the Owner) against all

obligations, such as receipts, releases and waivers of liens and claims.

.7 Pursuant to RCW 39.12.040, an "Affidavit of Wages Paid" from the Contractor and from each Subcontractor certified by the Industrial Statistician of the Department of Labor and Industries, with the fees paid by the Contractor or Subcontractor.

.8 A certified statement that the Contractor has closed all necessary permits or otherwise met the requirements of all governing jurisdictions related to this Project.

.9 Pursuant to RCW 60.28.020, certificates from the Department of Revenue and the Department of Labor and Industries.

.10 Pursuant to RCW 50.24, a certificate from the Department of Employment Security.

.11 All deliverables required by the Contract Documents.

.12 A certification that the materials in the Work are "lead-free" and "asbestos free."

.13 A legible hard copy of the as-built drawings.

13.5 Final Acceptance and Final Payment.

13.5.1 Pursuant to RCW 60.28, completion of the contract Work shall occur after Final Completion has been achieved and the Owner has formally accepted the Project ("Final Acceptance"). Final Payment shall not become due until after Final Acceptance.

13.5.2 If any Subcontractor of any tier refuses to furnish a release or waiver required by the Owner, the Owner may retain an amount to defray the cost of foreclosing the liens of such claims and to pay attorneys' fees, the total of which shall be no less than one hundred fifty percent (150%) of the claimed amount. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

13.6 Waivers.

13.6.1 Final Payment by the Owner. The making of final payment constitutes a waiver of claims by the Owner except those arising from (1) liens, claims, security interests, or encumbrances arising out of the Contract and unsettled; (2) failure of the Work to comply with the requirements of the Contract Documents; (3) Work subsequently found to be substandard and/or deficient; or (4) terms of warranties required by the Contract Documents or law.

13.6.2 Final Payment to the Contractor. Acceptance of final payment by the Contractor constitutes a waiver of Claims except those previously made in writing and specifically identified as unsettled on the final Application for Payment.

13.6.3 Change Orders. The execution of a Change Order constitutes a waiver of Claims by the Contractor arising out of the Work to be performed or deleted pursuant to the Change Order, except as specifically described in the Change Order.

13.6.4 Reservation of Rights. If the Contractor adds to a Change Order, a Construction Change Directive, or any other document a reservation of rights that has not been initialed by the Owner, any amounts previously agreed shall be considered disputed and not yet payable unless the costs are re-negotiated or the reservation is withdrawn or changed in a manner satisfactory to and initialed by the Owner.

13.6.5 Failure to Exercise. The Owner's failure to exercise any of its rights under this Contract shall not constitute a waiver of any past, present or future right or remedy. Any waiver by the Owner of any right or remedy under this Contract must be in writing and shall apply only to the right or remedy specified.

13.7 Warranty of Title. The Contractor warrants and guarantees that title to the Work, materials and equipment covered by an Application for Payment, whether or not incorporated in the Project, will pass to the Owner no later than the time of payment, free and clear of liens.

ARTICLE 14
PROTECTION OF PERSONS AND PROPERTY

14.1 The Contractor shall be solely responsible, and the Owner shall not have responsibility, for all aspects of safety related to this Contract or the Work, including initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take reasonable precautions for the safety of, and shall provide reasonable protection to prevent damage, injury or loss to, persons or property.

14.2 The Contractor shall promptly remedy to the Owner's satisfaction damage or loss to property at the site caused in whole or in part by the Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, except for damage or loss attributable to acts or omissions of the Owner or by anyone for whose acts the Owner may be liable that are not attributable to the fault or negligence of the Contractor or a Subcontractor of any tier.

14.3 The Contractor shall not be required to perform without consent any Work relating to asbestos or polychlorinated biphenyl, unless identified as such in the Contract Documents.

ARTICLE 15
INSURANCE AND BONDS

15.1 The Contractor shall, at its own cost, purchase from a company or companies authorized to do business in the State of Washington possessing a Best's policyholder's rating of A- or better and a financial rating of no less than VII, and reasonably acceptable to the Owner, and maintain during the life of this Contract, at least the following insurance. The Contractor shall also cause its Subcontractors of any tier to secure and maintain at least the following insurance. The insurance shall be in force at the time the Work is commenced and shall remain in force until Substantial Completion, unless a later date is specified below.

15.1.1 Contractor's Liability Insurance. The Contractor shall purchase and maintain an occurrence-based Commercial General Liability Insurance Policy and such other insurance as will provide protection from claims set forth below which may arise out of or result from Contractor's operations under the Contract Documents, whether to be performed or furnished by Contractor, by any Subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefits and other similar employee benefit acts, as required by the laws of the state of Washington, including Contingent Employers Liability (Stop Gap) for all employees of the Contractor and Subcontractors;

.2 If there is an exposure for injury to Contractor's or subcontractors' employees under the United States Longshoremen's and Harbor Workers' Compensation Act, the Jones Act or under laws, regulations or statutes applicable to maritime employees, or any similar laws, regulations or statutes, coverage shall be included for such injuries or claims.

.3 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees and of any person other than the Contractor's employees;

.4 Claims for damages insured by personal injury liability coverage that are sustained (a) by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or (b) by any other person for any other reason.

.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;

.6 Claims arising out of operation of laws or regulations for damages because of bodily injury or death of any person or for damage to property;

.7 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, including coverage for Owned Motor Vehicles, Non Owned Motor Vehicles and Hired or Borrowed Motor Vehicles; and

.8 The comprehensive general liability insurance required by this paragraph must include contractual liability insurance applicable to Contractor's obligations under Paragraph 9.7.

15.1.2 Property Insurance. Unless otherwise provided in the Contract Documents, the Contractor shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof (subject to any deductible amounts that may be provided in the Contract Documents). This insurance shall include the interest in the Work of the Owner, Contractor, Subcontractors of any tier, any Architect and consultants, all of whom shall be listed as insureds or primary, non-contributing additional insured parties. Additional insured status shall be evidenced by internal policy provision or by separate external endorsement. This insurance shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including, without duplication of coverage, theft, vandalism and malicious mischief, collapse, false work and water damage, temporary buildings and debris removal (including demolition occasioned by enforcement of any applicable legal requirements), and such other perils as may be provided in the Contract Documents, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the "all risk" insurance or otherwise provided in the Contract Documents, the Contractor shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment. The Owner shall bear no responsibility for such portions of the Work or the consequences of their damage or loss.

15.1.3 Boiler and Machinery Insurance. The Contractor shall purchase and maintain such boiler and machinery insurance for applicable equipment utilized or contained in the Work, which will include the interests in the Work of the Owner, Contractor, Subcontractors, any Architect, and consultants, all of whom shall be listed as insured or additional insured parties.

15.1.4 Aircraft/Watercraft Insurance. If the performance of the Work requires the use of any aircraft that are owned, leased, rented, or chartered by the Contractor or any of its Subcontractors, the Contractor shall secure and maintain Aircraft Liability Insurance for property damage and bodily injury, including passengers and crew. If the performance of the Work requires the use of any watercraft that are owned, leased, rented or chartered by the Contractor or any of its subcontractors, the Contractor shall secure and maintain Watercraft Liability insurance for property damage and bodily injury.

15.3 The Owner's specification or approval of insurance in this Contract or of its amount shall not relieve, limit or decrease the liability of the Contractor under the Contract Documents or otherwise. Coverages are the minimum to be provided and are not limitations of liability under the Contract, indemnification, or applicable law provisions. The Contractor may, at its expense, purchase larger coverage amounts or additional insurance.

15.4 Waiver of Rights

15.4.1 The Owner and Contractor waive all rights against each other for losses and damages caused by any of the perils covered by the policies of insurance provided in response to Paragraphs 15.1.2 and 15.1.3 and any other property insurance applicable to the Work, and also waive such rights against the Subcontractors, Architect, consultants and other parties named as insureds in such policies for losses and damages so caused. Each subcontract between the Contractor and a Subcontractor will contain similar waiver provisions by the Subcontractor in favor of the Owner, Contractor, Architect, consultants and all other parties named as insureds. None of these waivers shall extend to the rights that any of the insured parties may have to the proceeds of insurance held by the Owner as Trustee or otherwise payable under any policy so issued.

15.4.2 The Owner and Contractor intend that any policies provided in response to Paragraphs 15.1.2 and 15.1.3 shall protect the parties insured and provide primary coverage for losses and damages caused by the perils covered thereby. Accordingly, such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the parties named as insureds or additional insureds, and if the insurers require separate waiver forms to be signed by the Architect or its consultant, the Owner will obtain the same, and if such waiver forms are required of any Subcontractor, the Contractor will obtain the same.

15.5 Any insured loss under the policies of insurance required by Paragraphs 15.1.2 and 15.1.3 will be adjusted with the Owner and made payable to the Owner as Trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause. The 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 agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Contract Modification or Written Amendment, or be a separate contract, at the Owner's option.

15.6 Endorsements.

15.6.1 The Owner, its officer and employees shall be named as a primary, non-contributing additional insured and coverage shall apply on a primary and non-contributory basis on such policies other than Workers' Compensation. Additional insured status shall be evidenced by internal policy provision or by separate external endorsement. Policies shall contain a provision that the Owner shall be given *thirty (30) days'* written notice by certified mail before cancellation of any insurance or reduction of the amount thereof, or any alteration, modification, restriction or material change thereto. No such cancellation, reduction, alteration, modification, restriction or material change in any policy shall relieve the Contractor of its obligation to maintain coverages in accordance with the Contract Documents.

15.6.2 All insurance policies to be maintained by the Contractor shall provide for Waiver of Subrogation in favor of the Owner.

15.6.3 All insurance policies, except Workers' Compensation, to be maintained by the Contractor shall provide Severability of Interests or Cross Liability Clause and provide that the insurance shall be primary and not excess to or contributing with any insurance or self-insurance maintained by the Owner.

15.7 Certificates evidencing that satisfactory coverage of the type and limits set forth in the Contract Documents shall be furnished to the Owner in a form acceptable to the Owner and shall contain provisions consistent with Paragraph 15.6.

15.8 Irrespective of the requirements of the Contract Documents as to insurance to be carried by the Contractor, insolvency, bankruptcy or failure of any insurance company to pay all claims accruing, shall not be held to relieve the Contractor of any of its obligations.

15.9 The Contractor shall defend, indemnify and hold the Owner harmless from any failure of the Contractor or its Subcontractors of any tier to secure and maintain insurance as required by this Contract.

ARTICLE 16
CORRECTION OF WORK

16.1 The Contractor shall promptly correct Work rejected or failing to conform to the requirements of the Contract Documents at any time through a period of *one (1) year* from the date of Substantial Completion of this Contract or by terms of a longer manufacturer's warranty or an applicable special warranty required by the Contract Documents.

16.2 If the Contractor fails to carry out or correct Work that is not in accordance with the Contract Documents, the Owner may, by written order, require the Contractor to stop the Work or any portions thereof until the cause for the order has been eliminated, and the Owner may take over and correct some or all of the non- conforming Work at the Contractor's cost.

16.3 Nothing in this Article shall be construed to establish a period of limitation with respect to other obligations that the Contractor might have under the Contract Documents.

ARTICLE 17
MISCELLANEOUS PROVISIONS

17.1 Applicable Law. This Contract shall be governed by the internal law of the State of Washington, without regard to its choice-of-law provisions.

17.2 Compliance with Law. The Contractor shall give notices and comply with applicable laws, rules, regulations and orders of public authorities, including but not limited to RCW 39.06 and RCW 18.27 (Registration), RCW 49.60 (Discrimination), RCW 70.92 (Aged and Handicapped Persons), WAC 296-155 (Safety Standards), RCW 50.24 (Unemployment Compensation), RCW 51 (Industrial Insurance); RCW 82 (State Excise Tax Registration), RCW 39.12.065(3) (prevailing wage violations), Drug-Free Workplace Act of 1988 (Drug-Free Workplace) and RCW 49.26 (any asbestos removal).

17.3 Assignment. The Contractor shall not let, assign or transfer this Contract, or any interest in it or part of it, without the written consent of the Owner.

17.4 The Owner's Site Rules. The Contractor shall comply with the Owner's site and conduct rules.

17.5 Survival of Clauses. The warranty, dispute resolution, and indemnification provisions of this Contract shall survive the termination, cancellation or expiration of this Contract.

17.6 Writing Required. No addition to or modification of this Contract or waiver of any provisions of this Contract shall be binding on either Party unless explicitly made in writing and executed by the Contractor and the Owner.

ARTICLE 18
TERMINATION OF THE CONTRACT

18.1 Termination for Cause by the Contractor. If the Owner fails to make payment of undisputed amounts for a period of *sixty (60) days* through no fault of the Contractor, the Contractor may, upon *seven (7) additional days'* written notice (during which time the Owner has the right to cure), terminate the Contract and recover from the Owner payment for all Work executed in accordance with the Contract Documents.

18.2 Termination for Cause by the Owner. The Owner may, upon *seven (7) days'* written notice to the Contractor, terminate without prejudice the whole or any portion of the Work for cause, including but not limited to the Contractor's material breach of this Contract; failure to prosecute the Work or any portion thereof with sufficient diligence to ensure the Substantial Completion of the Work within the Contract Time; failure to supply a sufficient number of properly skilled workers or proper materials; material disregard of laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or being adjudged bankrupt, making a general assignment for the benefit of its creditors, or having a receiver appointed on account of the Contractor's insolvency.

18.3 Termination for Convenience by the Owner. The Owner may, at any time upon *seven (7) days'* written notice to the Contractor, terminate (without prejudice to any right or remedy of the Owner) the whole or any portion of the Work for the convenience of the Owner. The Owner shall be liable to Contractor only for the amount reasonably incurred to date and due under Article 13 for the performance of the Work terminated and other pre-approved costs, consistent with the Paragraph 11.2, necessary and reasonably incurred in connection with the termination of the Work.

18.4 Effects of Termination.

18.4.1 The total sum to be paid to the Contractor under this Article 18 shall not exceed the Contract Sum as reduced by the amount of payments otherwise made.

18.4.2 Unless the Owner directs otherwise, after receipt of a notice of termination by the Owner, the Contractor shall promptly stop Work as specified in the notice of termination; place no further orders or subcontracts, except as necessary for completion of non-terminated Work; procure cancellation of all orders and subcontracts to the extent related to the performance of terminated Work; assign to the Owner all of the right, title and interest of the Contractor under all orders and subcontracts; with the Owner's approval, settle outstanding liabilities and claims arising out of such termination of orders and subcontracts not assigned to the Owner; transfer title and deliver to the entity or entities designated by the Owner the fabricated or unfabricated parts, Work in process, partially completed supplies and equipment, materials, parts, tools, dies, jigs and other fixtures, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated, and the completed or partially completed plans, drawings, information and other property related to the Work; take such action as may be necessary or as directed by the Owner to preserve and protect the Work and property related to the Project in the possession of the Contractor in which the Owner has an interest; and continue performance only to the extent not terminated.

18.5 Suspension. The Owner may, at its option and at any time, suspend the Contractor's performance of some or all of the Work. The Owner will give the Contractor notice of any such suspension, including the scope of the suspension and the Owner's estimate of the duration of such suspension. During the period of suspension, the Contractor shall use its best efforts to minimize costs associated with such suspension and to protect and maintain the Work. As full compensation for any such suspension, the Contractor will be eligible for an equitable adjustment, which shall not include consequential or indirect damages. Upon receipt of the Owner's notice to resume the suspended performance, the Contractor shall immediately resume performance to the extent required in the notice.

ARTICLE 19
DISPUTE RESOLUTION

19.1 All claims, disputes and other matters in question of the Contractor, direct or indirect, arising out of, or relating to, the Contract Documents or the breach thereof ("Claims") shall be decided exclusively by the following dispute resolution procedure. Failure to comply with the requirements of this Article 19 shall constitute waiver of the Claim.

19.2 Notice of Claim. The Contractor shall submit notice of all Claims to the Owner in writing within *seven (7) days* of the event giving rise to them and shall include a reasonable description of the event and its probable effect.

19.3 Claim Submission. Within *thirty (30) days* of the effective date of submitting the notice in Paragraph 19.2, the Contractor shall provide the Owner with a written Claim that includes a clear description of the Claim, all changes in cost and in time (direct, indirect, impact, consequential, and otherwise) to which the Contractor and Subcontractors of any tier are entitled, and data supporting the Claim. No act, omission, or knowledge, actual or constructive, of the Owner or any Architect shall in any way be deemed to be a waiver of the requirement for a timely written notice and a timely written Claim unless the Owner and the Contractor sign an explicit, unequivocal written waiver.

19.4 Effective Date. Unless otherwise specified in the Contract Documents, the effective date of any notice or request given in connection with this Contract shall be the date on which it is delivered to the Owner.

19.5 Informal Resolution. The Owner will make a determination of the Claim submitted. If the Contractor disagrees with the determination and wishes to pursue the Claim further, the Contractor must, within *fourteen (14) days* of receipt of the determination, provide the Owner with a written request that a representative of the Contractor, any Architect, and the Owner meet, confer, and attempt to resolve the claim. This meeting will then take place at mutually convenient time and place within *fourteen (14) days* of the Contractor's request.

19.6 Mediation. The Contractor may not bring any litigation against the Owner unless the Claim is first subject to mediation under the Construction Industry Mediation Procedures of the American Arbitration Association ("AAA"). This requirement cannot be waived except by an explicit written waiver signed by the Owner and the Contractor. To initiate the mediation process, the Contractor shall submit a written mediation request to the Owner within thirty (30) days after the meeting undertaken in Paragraph 19.5. If the parties are unable to agree to a mediator within *thirty (30) days* after the Owner's receipt of the written request for mediation, either party may submit a request for mediation to the AAA. An officer of the Contractor and the General Manager or designee of the Owner, both having full authority to settle the Claim, must attend the mediation session. To the extent there are other parties in interest, such as Subcontractors and insurers, their representatives, with full authority to settle the Claim, shall also attend the mediation session. All unresolved Claims in the Project shall be considered at a single mediation session that shall occur prior to Final Acceptance by Owner.

19.7 Litigation. The provisions of Paragraphs 19.1, 19.2, 19.5, and 19.6 are each a condition precedent to the Contractor bringing litigation. All unresolved Claims of the Contractor shall be waived and released unless the Contractor has strictly complied with the time limits of the Contract Documents, and litigation is served and filed within *120 days* after the Date of Substantial Completion as designated in writing by the Owner. This requirement cannot be waived except by an explicit written waiver signed by the Owner and the Contractor. The pendency of mediation shall toll this filing requirement.

19.8 Maintenance of Responsibilities. The parties shall diligently carry on their respective obligations and responsibilities and

maintain the Progress Schedule during any dispute resolution proceedings, unless otherwise agreed by both parties in writing.

19.9 Waiver. The requirements of this Article 19 cannot be waived except by an explicit written waiver signed by the Owner and the Contractor. The fact that the Owner and the Contractor may continue to discuss or negotiate a Claim that has or may have been defective or untimely under the Contract Documents shall not constitute waiver of the provisions of the Contract Documents unless the Owner and Contractor sign an explicit, unequivocal written waiver approved by the Owner's Board of Commissioners.

Supplemental Conditions

1. **Progress Payments.** Progress payments shall be made monthly for Work that is duly approved and performed during the calendar month preceding the Application for Payment according to the following procedure.

1.1 Schedule of Values. Prior to submitting its first Application for Payment, the Contractor shall submit to the Owner a schedule of values allocating the Contract Sum to the various portions that comprise the Work. The schedule of values shall be prepared in such form and supported by such data as the Owner may require. The schedule of values shall allocate at least three percent (3%) of the original Contract Sum to that portion of the Work between Substantial Completion of the Work and Final Completion, which will be earned upon Final Completion and distributed in the final payment.

1.2 Draft Application. Within the first *seven (7) days* of each month, the Contractor shall submit to the Owner a report on the current status of the Work as compared to the Progress Schedule and a draft, itemized Application for Payment for Work performed through the prior calendar month. This shall not constitute a payment request. The Contractor, the Owner and the Architect or Engineer (if any) shall meet within the next *seven (7) days* and confer regarding the current progress of the Work and the amount of payment to which the Contractor is entitled. The Owner may request the Contractor to provide data substantiating the Contractor's right to payment, such as copies of requisitions or invoices from Subcontractors. The Contractor shall not be entitled to make a payment request, nor is any payment due the Contractor, until such data is furnished.

1.3 Payment Request. Within *seven (7) days* after the Contractor and the Owner have met and conferred regarding the draft Application for Payment and the Contractor has furnished all data requested, the Contractor may submit a payment request in the agreed-upon amount, in the form of a notarized, itemized Application for Payment for Work performed during the prior calendar month on a form supplied or approved by the Owner. Among other things, the Application shall state that prevailing wages have been paid in accordance with the pre-filed statement(s) of intent to pay prevailing wages on file with the Owner and that all payments due Subcontractors from the Owner's prior payments have been made. The Application shall constitute the Contractor's representation that (1) all payments due Subcontractors from the Owner's prior payments have been made and (2) the Work is current on the Progress Schedule, unless otherwise noted on the Application. If the Contractor believes it is entitled to payment for Work performed during the prior calendar month in addition to the agreed-upon amount, the Contractor may, within the same time period, submit to the Owner a separate written payment request specifying the exact additional amount due, the category in the schedule of values in which the payment is due, the specific Work for which the additional amount is due, and why the additional payment is due.

1.4 Payments to Subcontractors. No payment request shall include amounts the Contractor does not intend to pay to a Subcontractor. If, after making a request for payment but before paying a Subcontractor for its performance covered by the payment request, the Contractor discovers that part or all of the payment otherwise due to the Subcontractor is subject to withholding from the Subcontractor for unsatisfactory performance, the Contractor may withhold the amount as allowed under the subcontract, but it shall give the Subcontractor and the Owner written notice of the remedial actions that must be taken as soon as practicable after determining the cause for the withholding but before the due date for the Subcontractor payment, and pay the Subcontractor within *eight (8) working days* after the Subcontractor satisfactorily completes the remedial action identified in the notice.

1.5 Retainage. Pursuant to RCW 60.28, the Owner will reserve five percent (5%) from the moneys the Contractor earns on estimates during the progress of the Work, to be retained as a trust fund for the protection and payment of the claims of any person arising under this Contract and the state with respect to taxes imposed pursuant to Title 82 RCW, which may be due from the Contractor. The moneys reserved will be retained in a fund by the Owner until *forty-five (45) days* following formal acceptance of the Project by the Owner ("Final Acceptance"). The Contractor may retain payment of not more than five percent (5%) from the moneys earned by any Subcontractor.

1.6 Upon completion of the Work, Contractor shall submit a Request for Final Payment, Certificate and Release form and itemized invoice to the Owner for approval and payment.

List of Drawings and Specifications

Please refer to the **Section Two** portion of this document for drawings and specifications.

Site Conditions and Coordination

Coordination

Contractor is responsible for coordinating with PUD 1 on potential issues that arise in a timely manner.

Contractor is responsible for coordinating with an independent testing agency for conducting any tests mentioned in project plans and specifications.

Hood Canal Communication (HCC) is simultaneously bidding out the fiber installation work to be performed in tandem with the pole replacement schedule. Their installation will be both underground and overhead. Owner's Project Manager will coordinate with Contractor and HCC's project manager on progress of pole installations to help schedule and expedite fiber installation.

WAIVER AND RELEASE OF LIEN

The undersigned, _____
NAME OF MANUFACTURER, SUPPLIER, OR SUBCONTRACTOR

has furnished to _____
NAME OF CONTRACTOR

the following _____
KIND OF MATERIAL AND/OR SERVICES FURNISHED

for use in the construction of a project owned by _____
NAME OF PROJECT OWNER

and known as _____
NAME OF PROJECT

For and in consideration of $ _____, and other good and valuable consideration, the receipt of which is herby acknowledged, the undersigned does hereby waive and release any and all liens, or right to 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 Contractor for said project.

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

_____
NAME OF MANUFACTURER, SUPPLIER, OR SUBCONTRACTOR

By _____
PRESIDENT, VICE PRESIDENT, PARTNER OR OWNER
(USE DESIGNATION APPLICABLE)

Obtain an approved Statement of Intent to Pay Prevailing Wages from each and every contractor and subcontractor at all tiers of subcontracting prior to any payment for work by that contractor or subcontractor.

RCW 39.12.040

Statement of intent to pay prevailing wages, affidavit of wages paid — Alternative procedure.

(1) Except as provided in subsection (2) of this section, before payment is made by or on behalf of the state, or any county, municipality, or political subdivision created by its laws, of any sum or sums due on account of a public works contract, it shall be the duty of the officer or person charged with the custody and disbursement of public funds to require the contractor and each and every subcontractor from the contractor or a subcontractor to submit to such officer a "Statement of Intent to Pay Prevailing Wages". For a contract in excess of ten thousand dollars, the statement of intent to pay prevailing wages shall include:

(a) The contractor's registration certificate number; and

(b) The prevailing rate of wage for each classification of workers entitled to prevailing wages under RCW 39.12.020 and the estimated number of workers in each classification.

Each statement of intent to pay prevailing wages must be approved by the industrial statistician of the department of labor and industries before it is submitted to said officer. Unless otherwise authorized by the department of labor and industries, each voucher claim submitted by a contractor for payment on a project estimate shall state that the prevailing wages have been paid in accordance with the prefiled statement or statements of intent to pay prevailing wages on file with the public agency. Following the final acceptance of a public works project, it shall be the duty of the officer charged with the disbursement of public funds, to require the contractor and each and every subcontractor from the contractor or a subcontractor to submit to such officer an "Affidavit of Wages Paid" before the funds retained according to the provisions of RCW 60.28.011 are released to the contractor. Each affidavit of wages paid must be certified by the industrial statistician of the department of labor and industries before it is submitted to said officer.

(2) As an alternate to the procedures provided for in subsection (1) of this section, for public works projects of two thousand five hundred dollars or less and for projects where the limited public works process under RCW 39.04.155(3) is followed:

(a) An awarding agency may authorize the contractor or subcontractor to submit the statement of intent to pay prevailing wages directly to the officer or person charged with the custody or disbursement of public funds in the awarding agency without approval by the industrial statistician of the department of labor and industries. The awarding agency shall retain such statement of intent to pay prevailing wages for a period of not less than three years.

(b) Upon final acceptance of the public works project, the awarding agency shall require the contractor or subcontractor to submit an affidavit of wages paid. Upon receipt of the affidavit of wages paid, the awarding agency may pay the contractor or subcontractor in full, including funds that would otherwise be retained according to the provisions of RCW 60.28.011. Within thirty days of receipt of the affidavit of wages paid, the awarding agency shall submit the affidavit of wages paid to the industrial statistician of the department of labor and industries for approval.

(c) A statement of intent to pay prevailing wages and an affidavit of wages paid shall be on forms approved by the department of labor and industries.

(d) In the event of a wage claim and a finding for the claimant by the department of labor and industries where the awarding agency has used the alternative process provided for in subsection (2) of this section, the awarding agency shall pay the wages due directly to the claimant. If the contractor or subcontractor did not pay the wages stated in the affidavit of wages paid, the awarding agency may take action at law to seek reimbursement from the contractor or

subcontractor of wages paid to the claimant, and may prohibit the contractor or subcontractor from bidding on any public works contract of the awarding agency for up to one year.

(e) Nothing in this section shall be interpreted to allow an awarding agency to subdivide any public works project of more than two thousand five hundred dollars for the purpose of circumventing the procedures required by RCW 39.12.040(1).

RCW 39.04.260

Private construction performed pursuant to contract for rental, lease, or purchase by state — Must comply with prevailing wage law.

Any work, construction, alteration, repair, or improvement, other than ordinary maintenance, that the state or a municipality causes to be performed by a private party through a contract to rent, lease, or purchase at least fifty percent of the project by one or more state agencies or municipalities shall comply with chapter 39.12 RCW.

Notes

- The prevailing wage rate in effect on the bid due date are the prevailing wage rates that apply to that construction contract project, unless the award was delayed more than 6 months. In that case, the prevailing wage rates in effect on the date of the award shall apply for the duration of the contract.
- Prevailing wage rates are published twice per year – First business day of February and August – effective 30 days after publication.
- Prevailing wage rates and other info http://www.lni.wa.gov/tradeslicensing/prevwage/
- Historically, prevailing wages were required to be included in the Contract Document set.
- Bid specifications now may provide the required prevailing wage rate information in this alternate format:
    - Provide the URL to the Dept of L&I's prevailing wage rates
    - Identify the exact wage publication date to use
    - State the county in which the public works project is located
    - Specify a copy is available for viewing in the agency office
    - Explain that the agency will mail a hard copy upon request
    - Retain a printed version of the rates for records

1.6 DIVISION OF RESPONSIBILITY

1.6.1 OVERVIEW

1.6.2 The Hood Canal-101 Phase Two Broadband Project is a joint project between Hood Canal Communications and Mason County PUD 1 to install Fiber along US Highway 101. Due to the age and size of the PUD's poles, there are 158 poles that have been identified for replacement. This project includes the replacement of 158 utility poles along Highway 101 including the transfer of live power, and existing communications attachments.

The project spans approximately 5.8 miles from North of Forest Dr., Brinnon WA (MP 314.33) to Mt. Walker Rd., Brinnon WA (MP 301.51). This pole replacement is noncontiguous along US HWY 101. Alternating single lane traffic control will be necessary for all Highway work.

Forty-one poles will be replaced along Dosewallips Rd. A single pole is to be replaced along Duckabush Rd. Both Dosewallips and Duckabush are county owned roadways that will require single lane alternating traffic control.

1.6.3 MASON COUNTY PUD NO. 1 (PUD1) (Owner)

1.6.3.1 Respond to information requests regarding the project.

1.6.3.2 Attend construction meetings.

1.6.3.3 Provide all poles for replacement.

1.6.3.4 Operation of reclosure/ protections daily.

1.6.3.5 Inspect final work before approving payment vouchers.

1.6.4 CONTRACTOR RESPONSIBILITIES

1.6.4.1 Obtain locates of all utilities through one call.

1.6.4.2 Provide all materials. labor, clearing, equipment, concrete, fasteners, adhesives, bolts, nuts, washers, etc. to complete the project. This is not an exhaustive list.

1.6.4.3 Comply with easements and landowner requests.

1.7.1.1 Construct the distribution build according to project plans and specifications.

1.7.1.2 Maintain a tidy work environment.

1.7.1.3 Keep a safe work environment for crews and support staff.

1.7.1.4 Work closely with and notify Owner of any discrepancies in the plan or unexpected issues that arise.

1.7.1.5 Promptly Owner of any discrepancies or issues.

1.7.1.6 Send an electronic certified payroll to Katie Arnold (PUD1), karnold@mason-pud1.org.

1.7.1.7 Initial set up of staging areas prior to construction and then clean up and restoration of the site and staging areas after construction.

1.7.1.8 Provide all tools, manpower, and equipment necessary for construction.

1.7.1.9 Maintain erosion that occurs from construction activities. Sediment to not leave project site when conducting earthwork activities.

1.7.1.10 Communicate transformer relocations to the Owner forty-eight hours prior to work to ensure customers are notified of temporary outages.

1.7.1.11 Maintain, protect, and store all Contract Drawings, Specifications, Addenda, Reviewed Shop Drawings, Change Orders, Other Modifications to Contract, and Field Test Records on the job site and make available to the Project Engineer and PUD1.

1.7.1.12 Maintain a current red-line as-built drawing at all times on the job site. Provide a clean copy of all project documents to PUD1 at the end of the project. Smartsheets format is preferred.

1.7.1.3 Trim vegitation in applicable areas to accommodate new structures. Minimum of six foot clearance.

1.8 INSTRUCTIONS TO BIDDERS

OBTAINING OF DOCUMENTS

1.8.1.1 Bidders are advised to attend a pre-bid virtual job show and must be prequalified prior to receiving documents.

1.8.1.2 Pre-qualification was solicited, completed and then approved on January 24, 2023.

1.8.1.3 All necessary forms are available for bidders and may be obtained on the Mason County PUD 1 website located at mason-pud1.org/bids.

1.8.2 PROPOSAL SUBMITTALS

1.8.2.1 Bids will be received by Mason County PUD 1, 21971 N. Highway 101, Shelton, WA 98584 until 4:00 p.m. PST on February 17, 2023, (postmarks will not be recognized) at which time all complying bids shall be publicly opened and read out loud at the PUD 1 office via virtual bid opening on Zoom at 4:30 p.m. on February 17, 2023.

1.8.2.2 Bids shall be submitted on the Bid Proposal form contained in the Bid Documents, then addressed and mailed, or delivered in a sealed envelope plainly marked **"CONFIDENTIAL SEALED BID: Mason PUD No. 1 – Hood Canal - 101 Phase Two"** along with the name and address of the bidder. The District's server clock will serve as the official date and time stamp.

1.8.2.3 Proposals and all supporting instruments must be submitted on the forms furnished by the Owner and must be delivered as stated above. Bids will be publicly opened at the designated time; call-in information is provided in this bid document.

1.7.2.4 **ANTICIPATED PROJECT SCHEDULE:**

January 20, 2023	Bid Documents Available Online/Advertisement
February 3, 2023	Virtual Job Show at 9:00 a.m. PST via Zoom
February 17, 2023	Bid Opening at 4:30 p.m. PST via Zoom
February 21, 2023	Notice of Intent to Award
March 3, 2023	Pre-Construction Conference & Notice to Proceed
June 30, 2023	Construction Complete

Link to Virtual Job Walk-through: (https://us02web.zoom.us/j/85485131825)

Link to Bid Opening: (https://us02web.zoom.us/j/83290884089)

1.8.3 Examination of Contract Documents

1.8.3.1 It is the responsibility of each Bidder before submitting a Proposal to make, and shall be deemed to have made, a careful and thorough examination of the project site and Plans, Specifications, Reports, Permits, and forms of Contractor's Proposal and Contractor's Bond, and shall review the location and nature of the proposed construction, the transportation facilities, the type and character of soil and terrain to be encountered, the type of facilities required before and during project construction, general local conditions, environmental and historic preservation considerations, and all other matters that may affect the cost and time of project completion.

1.8.3.2 In addition, each Bidder must:

1.8.3.2.1 Consider federal, state, and local laws and regulations that may affect cost, progress, performance or furnishings of the material;

1.8.3.2.2 Study and carefully correlate Bidder's knowledge and observations with the contract documents and such other related data;

1.8.3.2.3 Promptly notify Mason County PUD 1(Owner) of any conflicts, errors, ambiguities or discrepancies which Bidder has discovered in or between the contract documents and such other related documents; and

1.8.3.2.4 Comply with rules, and regulations applicable to its performance, including those pertaining to the licensing of contractors, and the Anti Kick-Back Act of 1986 (41 U.S.C. 51 et seq).

1.8.4 BID PROPOSAL

1.8.4.1 Bid Proposals will only be accepted by those prequalified bidders.

1.8.4.2 The Bid Proposal form is included.

1.8.4.3 All blanks on the Bid Proposal form must be completed by typing or printing in ink. In case of discrepancy between written amounts and figures, the written amounts shall govern.

1.8.4.4 Any signature must be by an authorized agent of the Bidder. All names must be typed or printed in ink below the signature.

1.8.4.5 The Bid shall contain an acknowledgment of receipt of all addenda (the numbers of which must be filled in on the Bid Proposal form) and a copy of the addenda attached to the Bid Proposal form.

1.8.4.6 The address, telephone and e-mail address (if available) for communications regarding the Bid must be shown.

1.8.4.7 Evidence of authority to conduct business as an out-of-state corporation in the state of Washington shall be provided if applicable.

1.8.5 BID BOND

1.8.5.1 Each Proposal must be accompanied by a Bid Bond in the form attached hereto or a certified check on a bank that is a member of the Federal Deposit Insurance Corporation, payable to the order of the Owner, in an amount equal to five percent (5%) of the maximum bid price. Each Bidder agrees, provided its Proposal is one of three Proposals, that are identified by the owner as receiving and considering as most qualified Proposals, said Proposal shall be firm and binding upon each such Bidder and such Bid Bond or check shall be held by the Owner until a Proposal is accepted and a satisfactory contractors Bond is furnished (where required) by the successful Bidder and such acceptance has been approved by the Administrator, or for a period not to exceed sixty (60) days from the date hereinbefore set for the opening of Proposals, whichever period shall be the shorter. If such Proposal is not one of the three qualified Proposals, the Bid Bond or check will be returned in each instance within a period of fifteen (15) days to the Bidder furnishing same.

1.8.6 OPENING OF BIDS

1.8.6.1 All Bids received prior to the scheduled closing time, which are not returned unopened for failure to meet the Bid requirements, and which are not withdrawn as above provided, will be publicly opened and read aloud even though there may be irregularities or informalities therein.

1.8.6.2 All times and deadlines are noted in the invitation to bid and section 1.7.2.4.

1.8.7 AWARD OF CONTRACT

1.8.7.1 Owner reserves the right to reject any or all bids, including without limitation the right to reject any or all nonconforming, nonresponsive, unbalanced, or conditional bids. Owner reserves the right to waive minor irregularities or minor errors in any bid if it appears to the Owner that such irregularities or errors were made through inadvertence.

1.8.7.2 In evaluating bids, Owner will consider the history, price, and most qualified Contractor.

1.8.8 INTERPRETATION OF DOCUMENTS

1.8.8.1 If any person contemplating submitting a Proposal is in doubt as to the true meaning of any part of the Bid Documents, or finds discrepancies in or omissions from the

drawings or specifications, he/she may submit to the Owner a written request for an interpretation or correction thereof. To be given consideration, such request must be received at least five (5) days prior to the date fixed for opening Proposals. The person submitting the request will be responsible for its prompt delivery. Any interpretation or correction of the documents will be made only by addendum duly issued, and a copy of the addendum will be posted to the online Bid Center. Neither Owner nor the Owner will be responsible for any other explanation or interpretation of the Bid Documents. Failure on the Bidder's part to request clarification on any part of the contract documents shall obligate the Bidder to abide by the Owner's decision as to the intended meaning of any part of the specifications.

1.8.9 SUBSTITUTION OF MATERIAL

1.8.9.1 Any addenda issued during the time of Bidding will be in the form of written addenda to the specifications and will whenever a material, article, or piece of equipment is identified on the Proposal form by reference to manufacturer or vendor names, trade names, catalog numbers, part numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable, provided the material, article, or piece of equipment so proposed is, in the opinion of the Engineer and the Owner, of equal substance, performance, and function. It shall not be purchased or provided by the Seller without the Engineer's prior written approval.

1.8.9.2 Any proposed substitution shall include the proposed manufacturer's catalog number and strength rating of the proposed substitution if a strength rating has been listed in the approved plans or specifications. Proposed substitutions must be clearly identified on the Proposal form where space has been made available, the item description, cut sheets and a catalog page describing comparable replacement and substitution must be included.

1.8.10 ADDENDA

1.8.10.1 Any addenda issued during the time of bidding will be in the form of written addenda to the specifications and will be posted to the PUD's website. All registered Bidders will receive a notification that new documents have been posted for download. All addenda so issued shall become a part of the Contract Documents.

1.8.10.2 IT SHALL BE THE PROSPECTIVE BIDDER'S RESPONSIBILITY TO ENSURE THAT THEY HAVE RECEIVED ALL ADDENDA TO THE BID DOCUMENTS PRIOR TO THE BID OPENING BY ACKNOWLEDGING RECEIPT OF THE ADDENDA IN THE SPACES PROVIDED ON THE PROPOSAL FORM.

1.8 BID PROPOSAL

The undersigned Bidder offers to enter into a contract with **Mason County Public Utility District No. 1**, hereinafter referred to as the Owner, to provide all qualified professional personnel, labor, supervision, construction equipment and tools for the earthwork and construction, as shown on, or called for, by the Contract Documents (including the Instructions to Bidders, Division of Responsibility, and Construction Contract documents) and specified herein including all addenda, and according to the requirements of the Engineer for the **"Hood Canal – 101 Phase Two"** project**.**

The following prices are submitted with the understanding that the amount of the bid covers all work including labor, equipment, and tools to complete the work specified in the Contract Documents.

All bidders are required to furnish the Owner, as part of the bid proposal, any required submittals that are to be evaluated as part of the bid award process.

The undersigned agrees not to withdraw the proposal for a period of forty five (45) calendar days after the bid opening date.

The Bidder agrees to complete the work for the sum of:

Hood Canal – HWY 101 Phase Two

Cost to complete the project as proposed in the bid documents. Subtotal for each phase:

Mobilization in and out (LS)	$_____
Installation of Utility Poles (LS)	$_____
Traffic Control (LS).....	$_____
Allowance for potential extra work (LS)	$_____
(i.e. Relocate 3rd party attachments)	

SUBTOTAL BID PRICE, EXCLUDING TAX	**$_____**
TAX	**$_____**
TOTAL BID AMOUNT	**$_____**

TOTAL BID AMOUNT IN WORDS

Bidder's guaranteed project completion date, based on Notice to Proceed date given in Invitation to Bid:

Please attach a proposed construction schedule.

The undersigned Bidder declares that he/she has carefully examined the Contract Documents, and addendum(s) that he/she has made an examination of the plans for the proposed work and has made such investigations necessary to determine the conditions to be encountered independently of those indicated on the drawings; that if his/her proposal is accepted he/she will furnish all necessary bonds required by the specifications and will contract with the Owner, in the forms bound herein, to provide all materials, equipment, tools and labor required to complete the work according to these Contract Documents; that he/she will comply with all laws of the state in which the project resides, even though such laws may not have been quoted or referred to in the specifications, that he/she will do all the work as required by the Contract Documents and this Proposal.

Respectively submitted: _____
Signature

_____
Title

_____
Date

Bidder's Name (printed)_____

Bidder's Company Name_____

Bidder's Address _____

_____

_____

Federal Tax Identification No. _____

Bidder's Telephone Number_____

Bidder's E-mail Address _____

The Bidder Acknowledges receipt of addenda numbers: _____

Bidder is *(check applicable classification):*

_____Resident Bidder or ____Non-Resident Bidder, Resident State_____

Bidder's License Number _____

List of Subcontractors

Name of Company	Type of Work

List of References of 3 similar projects in the USA, in the last 5 years.

- Name/description of project
- Utility
- Contact info
- When project constructed

1.9 BID BOND

KNOW ALL MEN BY THESE PRESENTS, that _____

hereinafter called the PRINCIPAL and, _____

a corporation duly organized under the laws of the State of _____

having its principal place of business at _____

in the State of _____, and authorized to do business in the State of Washington, as SURETY, are held and firmly bound unto Mason County Public Utility District No.1 (PUD 1), a Municipal Utility of the County of Mason, hereinafter called the OBLIGEE, in the penal sum of

_____

_____Dollars ($_____) for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS BOND IS SUCH THAT:

NOW, THEREFORE, if the Bid Proposal submitted by the PRINCIPAL is accepted, and the Contract awarded to the PRINCIPAL, and if the PRINCIPAL shall execute the proposed Contract and shall furnish such Performance Bond as required by the Contract Documents within the time fixed by the Documents, then this obligation shall be void; if the PRINCIPAL shall fail to execute the proposed Contract and furnish the bond, the SURETY hereby agrees to pay to the OBLIGEE the penal sum as liquidated damages, within ten (10) days of such failure.

Signed and sealed this _____day of _____20___.

_____
Principal

Countersigned: _____

_____ _____
Resident Agent Surety

1.10 PERFORMANCE & PAYMENT BOND

WASHINGTON PERFORMANCE & PAYMENT BOND

BOND NO._____
AMOUNT: $_____

KNOW ALL MEN BY THESE PRESENTS, that _____

_____

as CONTRACTOR (Principal), and_____

_____
a corporation, duly authorized to do a general surety business in
the State of Washington, as SURETY, are jointly and severally held and bound unto

_____

_____

the OWNER (Obligee) herein, in the sum of _____

_____Dollars ($_____),
for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

This bond is executed under the authority of RCW Title 39, Chapter 39.08 of the State of Washington, the provisions of which are hereby incorporated into this bond and made a part hereof.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT:

WHEREAS,_____

the CONTRACTOR entered into a certain Contract with _____

_____

for _____

IN WITNESS:

NOW, THEREFORE, if the CONTRACTOR shall faithfully perform all the provisions of

such Contract for the duration thereof, including the guarantee period, and promptly pay all laborers, mechanics, subcontractors, material men, and all persons who shall supply such work and services, and save harmless the OWNER, its officers, agents, and employees from all claims therefor, or from any claim for damages or injury to property or persons arising by reason of the work; and shall, in the time and manner, and under the terms and conditions prescribed, well and faithfully do, perform, and furnish all matters and things as by them in the Contract undertaken, and as by law, local, state, and federal, prescribed, then this obligation shall be void; otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER:

In no event shall the SURETY be liable for a greater sum than the obligation of this bond.

The SURETY for the value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Contract, or to the work to be performed thereunder, or the Specifications accompanying the same, shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the Contract, or to the work, or to the Contract Documents.

Signed and sealed this_____day of _____, 20____.

_____(SEAL)

_____
CONTRACTOR

_____
SURETY

By_____
Attorney-In-Fact

NON-COLLUSION AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF MASON

_____(name), being first duly sworn upon his/her oath, says that he/she is the ____ _____ (title) of the Bidder submitting the above Bid, and that the Bid above submitted is genuine and not a sham or collusive Bid, or made in the interest of any person not therein named; and he/she further says that the said Bidder has not directly or indirectly induced or solicited any Bidder on the above work or supplies to put in a sham Bid, or any other person or corporation to refrain from bidding; and that said Bidder has not in any manner sought by collusion to secure to_____(him/her/it) self an advantage over any other Bidder or Bidders.

_____
(Firm Name of Contractor)

_____
(Signature of Contractor)

SUBSCRIBED AND SWORN TO before me this_____day of_____, 20 ____.

Notary Public in and for the State

of_____, residing at

(Notary Seal)

_____.

My commission expires:_____.

NOTE:
THIS FORM MUST BE COMPLETED AND INCLUDED IN THE BID ENVELOPE.

END OF NON-COLLUSION AFFIDAVIT

ADDENDA RECEIVED

Addendum No.	Date Received	Name of Recipient

NOTE: Bidder shall acknowledge receipt of all addenda. Bidder is responsible for verifying the actual number of addenda issued prior to submitting a Proposal.

Subject to any extensions of the Contract Time granted under the Contract, the undersigned agrees to substantially complete the Work required under this Contract within 35 working days (the Substantial Completion Date) and to physically complete the Work required under this contract within 60 calendar days (the Physical Completion Date) from when Contract Time begins.

The undersigned has reviewed and fully understands the provisions in the Contract regarding liquidated damages and agrees that liquidated damages shall be $1,500.00 per day for each and every working day beyond the Contract Time allowed for substantial completion until the Substantial Completion Date is achieved and $500.00 for each and every working day required beyond the Contract Time for physical completion until the Physical Completion Date is achieved.

The undersigned is, and will remain in, full compliance with all Washington State administrative agency requirements including, but not limited to registration requirements of Washington State Department of Labor & Industries for contractors, including but not limited to requirements for bond, proof of insurance and annual registration fee. The undersigned's Washington State:

Dept. of Labor and Industries Workman's Compensation Account No. is_____;
Dept. of Licensing Contractor's Registration No. is_____;
Unified Business Identifier Number is_____;
Excise Tax Registration Number is_____; and
Employment Security Account Number is_____.

The undersigned has reviewed all insurance requirements contained in the Contract and has verified the availability of and the undersigned's eligibility for all required insurance. The undersigned verifies that the cost for all required insurance, has been included in this Proposal.

In relation to claims related in whole or in part to workplace injuries to employees, the undersigned waives any immunity granted under the State Industrial Insurance Law, RCW Title 51. This waiver has been specially negotiated by the parties, which is acknowledged by the undersigned in signing this Proposal.

By signing the proposal, the undersigned declares, under penalty of perjury under the laws of the United States and the State of Washington, that the following statements are true and correct:

SAMPLE ADDENDUM

Project:

Date:

To:

From:

Cc:

ADDENDUM

Bidder shall sign and attach a copy of this Addendum with Bid Proposal.

Changes and clarifications to the Bid Documents for the above-referenced project are as follows:

1.

2.

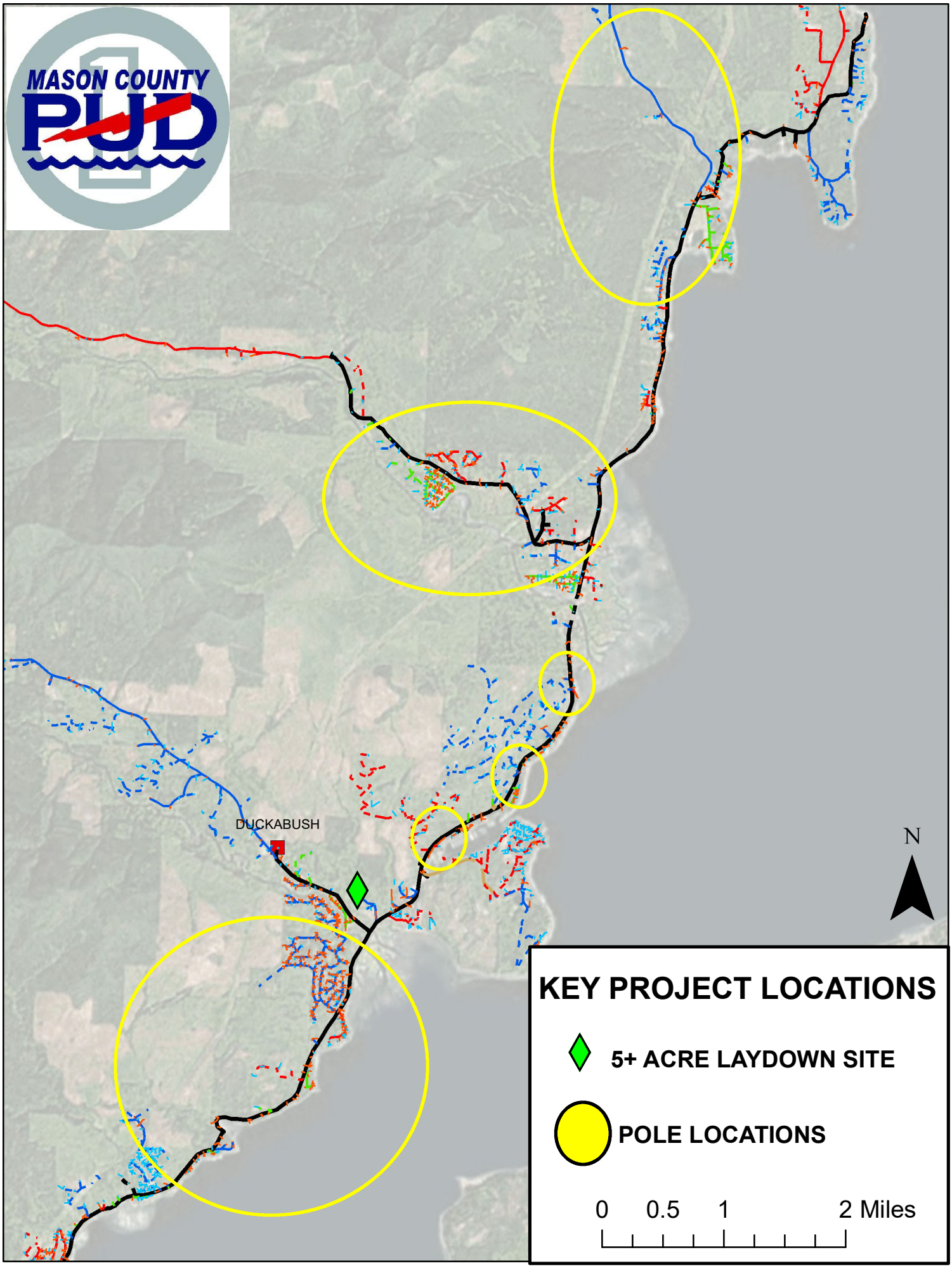
3.

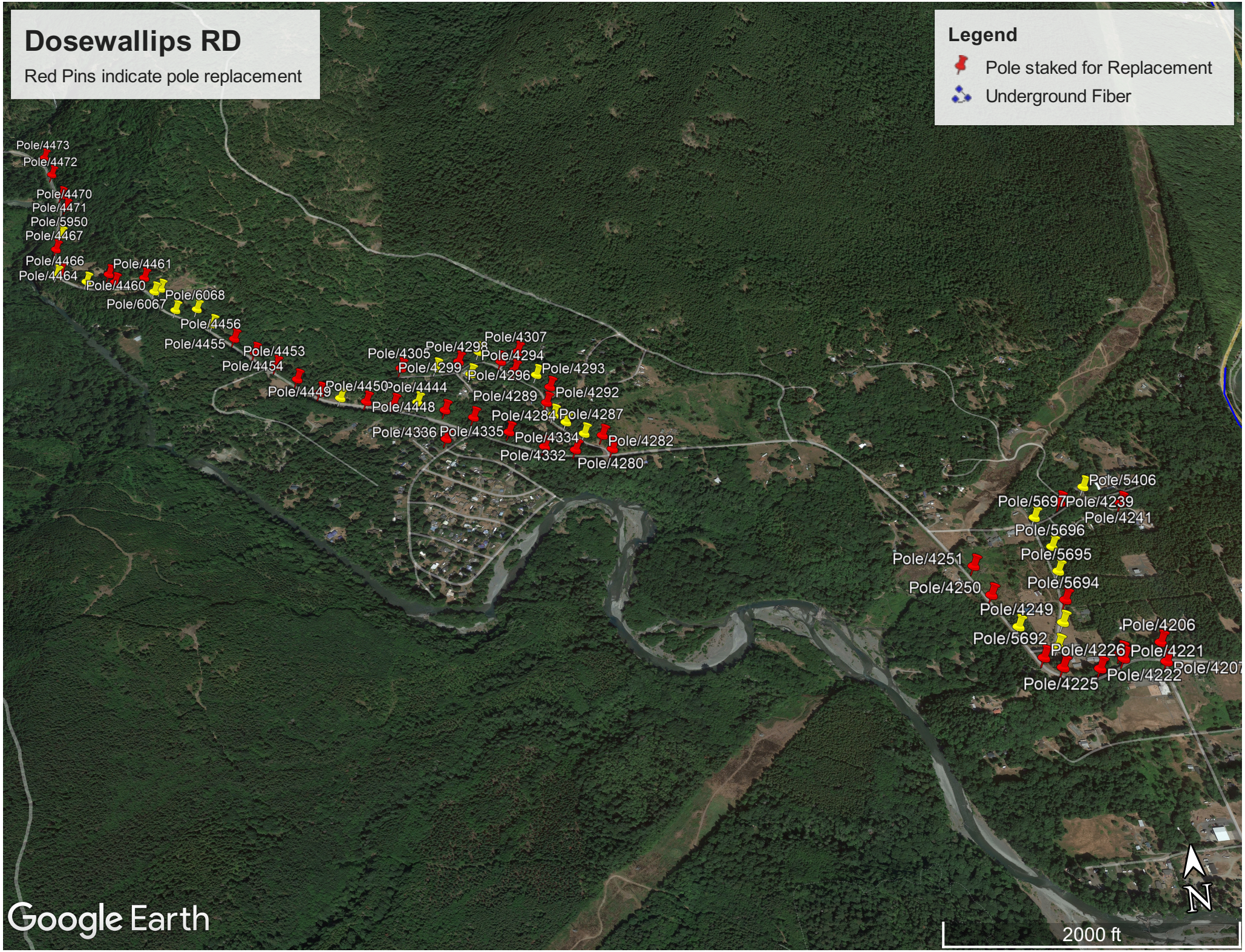
Acknowledgement of receipt of Addendum: _____

SIGNATURE OF BIDDER

END OF SECTION ONE

SECTION TWO


MASON COUNTY
PUD 1
DUCKABUSH
N
KEY PROJECT LOCATIONS
5+ ACRE LAYDOWN SITE
POLE LOCATIONS
0 0.5 1 2 Miles


Dosewallips RD
Red Pins indicate pole replacement
Legend
Pole staked for Replacement
Underground Fiber
Pole/4473
Pole/4472
Pole/4470
Pole/4471
Pole/5950
Pole/4467
Pole/4466
Pole/4464
Pole/4461
Pole/4460
Pole/6068
Pole/6067
Pole/4456
Pole/4455
Pole/4453
Pole/4454
Pole/4449
Pole/4450
Pole/4444
Pole/4448
Pole/4307
Pole/4298
Pole/4305
Pole/4294
Pole/4299
Pole/4296
Pole/4293
Pole/4289
Pole/4292
Pole/4284
Pole/4287
Pole/4336
Pole/4335
Pole/4334
Pole/4282
Pole/4332
Pole/4280
Pole/5406
Pole/5697
Pole/4239
Pole/4241
Pole/5696
Pole/5695
Pole/4251
Pole/5694
Pole/4250
Pole/4249
Pole/4206
Pole/5692
Pole/4226
Pole/4221
Pole/4222
Pole/4225
Google Earth
N
2000 ft

PROJECT HWY 101- HOOD CANAL PHASE TWO WO # LINE: DOSEWALLIPS

UG LOCATE TICKET # BY DETAIL MAP COUNTY SCHOOL DISTRICT

STAKED BY REYES DATE 1/11/23
REVISED BY BRAGER DATE 1/19/23

TWSP RANGE SECTION

NOTES

CHECKED BY ROLOW DATE 1/19/23

NOTES

The staking sheets and construction units may not include all necessary material needed to fully construct.
It is assumed that the contractor will provide all necessary material for the implied design excluding poles.
Use double coil spring washers in lieu of lock nuts, where shown.
All lightning arrestors shall be 10 kV MOV 8.4 kV MCOV.
All jumpers to be covered conductor.
All strength requirements shown are the minimum acceptable
Install cut-out covers on cut-outs.
Install arrester covers on arresters.
Guying shall be insulated per NESC.
Re-use existing anchors where practical such that the integrity of the existing installation has not been compromised and is in accordance with best practices.
Anchor/guy lead length must shall meet minimum specified lead lengths or may be amended to meet provided guy anchor look-up tables.
New anchors shall be either G2A or G3A (Screw anchors), G3 (Expanding), or G4 (Cross plate) and shall be installed to meet or exceed a 21kip holding capacity.
Transformers to be transferred from existing poles unless otherwise specified.
All transformer assemblies to include 4-way or 6-way covered connector blocks as required.
Transfer existing street and area lights to new poles.
At least two communications attachers to be transferred to new poles

DOSEWALLIPS

Mason PUD 1
21971 N. Hwy. 101
Shelton, WA 98584

REV	DATE	DESCRIPTION	DESIGNER	REVIEWER
0	1/11/2023	DOSEWALLIPS	JR	
	19-Jan		RB	

NOTES:
ACTION column:
A=Add
E=Existing
R=Remove
M=Move from Removal to Addition

ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	4206	N540L5	40	4	DF		251					2	E1.1L		1	F2.12			S1.1							
A	4206	N540L5	50	2	DF	CAL 2 A5.4NG						2	E1.1L		1	F2.12	H.1.									
E	4206	N540L5			DF			3 1	1/0																	
R	4207	N540L5L1	40	6	DF		146													G1.4	50					
A	4207		50	2	DF	A1.3											H.1.									
E								2	1/0																	MOVE STREETLIGHT
R	4222	N540L7	45	3	DF		270					2	E1.1L		1	F2.12										
A			50	2	DF							2	E1.1L		1	F2.12	H.1.									
E								4	1/0																	
R	4225	N540L8	40	4	DF	C1.9N	281					2	E1.1L		1	F2.12										
A			45	2	DF							2	E1.1L		1	F2.12	H.1.									
E								4	1/0																	
R	4226	N540L9	45	3	DF	CAL 2 A5.1 C6.91	128					2	E1.1L		1	F2.12			S1.1	G1.4	10					U81 SECONDARY RISER
A			50	2	DF							2	E1.1L		1	F2.12	H.1.									
E								4	1/0																	
R	5694	N540L9R3	45	4		CAL 8	219					2	E1.1L		1	F2.12				G1.4	25					
A			50	2	DF							2	E1.1L		1	F2.12	H.1.									
E								1	1/0																	
R	4250	N540L10	35	4	DF	CAL 2	329					1	E1.1L		1	F2.12										
A			40	2	DF							1	E1.1L		1	F2.12	H.1.									
E								4	1/0																	
R	4251	N540L11	40	3	DF		288					2	E1.1L		2	F2.12			S1.1	G1.4	15					
A			45	2	DF	CAL 2 A4.2						2	E1.1L		2	F2.12	H.1.									

DOSEWALLIPS

Mason PUD 1
21971 N. Hwy. 101
Shelton, WA 98584

REV	DATE	DESCRIPTION	DESIGNER	REVIEWER
0	1/11/2023	DOSEWALLIPS	JR	
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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR			GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
E								4	1/0																	
R	4239	N540L9R6A	35	5	DF		302					1	E1.1L	20	1	F2.12				G1.4	15					
A			40	2	DF	A2.3 U1						1	E1.1L	20	1	F2.12	H.1.									
E								2	1/0																	
R	4241	N540L9R7R1	30	5	DF		323																			MOVE STREETLIGHT
A			40	2	DF	A1.3											H.1.									
E								2	1/0																	
R	4280	N540L21	35	4	DF		248	4	1/0			1	E1.1L	25	1	F2.12				G2.1	5 15					MOVE STREETLIGHT
A			45	2	DF	CAL 2						1	E1.1L	25	1	F2.12	H.1.									
E																										
R	4282	N540L21R1	40	4	DF		179	4	1/0			6	E1.1L	12	2	F2.12			R1.1							MOVE OCB RECLOSURE
A			45	2	DF	A6.1						6	E1.1L	12	2	F2.12	H.1.									
E																										
R	4332	N540L22	40	4	DF		270	4	1/0			1	E1.1L	20	1	F2.12										
A			50	2	DF	CAL 2						1	E1.1L	20	1	F2.12	H.1.									
E																										
R	4289	N540L21R5	40	4	DF		141	2	1/0			2	E1.1L	15	1	F2.12										
A			45	2	DF	A2.3						2	E1.1L	15	1	F2.12	H.1.			G1.4	25					TRANSFER 2" RISER
E																										TRANSFER STREETLIGHT
R	4292	N540L21R6	40	4	DF		158																			
A			45	2		A2.3		2	1/0			2	E1.1L	15	1	F2.12	H.1.			G1.4	25					TRANSFER 2" RISER

DOSEWALLIPS

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
E																										
R	4294	N540L21R8	40	4	DF		180																			
A			45	2	DF	A2.1		2	1/0			3	E1.1L	12	1	F2.12	H.1.			G1.4	15					TRANSFER 2" RISER
E																										
R	4296	N540L21R9	40	4	DF		180		1/0																	
A			45	2	DF	A2.1 A5.2G					10	4	E1.1L	15	1	F2.12	H.1.									
E																										
R	4307	N540L21R9R2	40	4	DF		179																			
A			50	2	DF	A2.1 U1			1/0			3	E1.1L	12	1	F2.12	H.1.			G1.4	15					2'RISER FOR UNDERGROUND TAP FUSED
E																										
R	4298	N540L21R10	45	4	DF		207																			
A		N540L21R10	50	2	DF	A2.3 A5.2G			1/0			2	E1.1L	15	1	F2.12	H.1.									
E																										
R	4305	N540L21R13	40	4	DF				1/0																	
A		N540L21R13	45	2	DF	A5.1						1	E1.1L		1	F2.12	H.1.									SINGLE PHASE DEADEND
E																										MOVE SECONDARY RISERS
R	4333	N540L23	40	3	DF	CAL 2	376																			
A		N540L23	50	2	DF							2	E1.1L	20	1	F2.12	H.1.									
E								4	1/0																	
R	4334	N540L25	40	3	DF		335																			
A		N540L25	50	2	DF	CAL 2		4	1/0			2	E1.1L	20	1	F2.12	H.1.			G1.4	7.5					
E																										

DOSEWALLIPS

Mason PUD 1
21971 N. Hwy. 101
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REV	DATE	DESCRIPTION	DESIGNER	REVIEWER
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	19-Jan		RB	

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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	4335	N540L26	40	4	DF		350																			
A		N540L26	45	2	DF	CAL 1 A5.2G		4	1/0		0						H.1.									TRANSFER STREETLIGHT
E																										
R	4336	N540L26L1	45	4	DF		280																			
A		N540L26L1	50	2	DF	A1.1 A5.2G		2	1/0		0	1	E1.1L	15	1	F2.12	H.1.									#2 SERVICE WIRE CONNECTED
E																										
R	4443	N540L27	40	4	DF		266																			
A		N540L27	45	2	DF	CAL 8		4	1/0			2	E1.1L	30	2	F2.12	H.1.									
E																										
R	4445	N540L28	40	4	DF		260																			
A		N540L28	50	2	DF	CAL 2		4	1/0		7	1	E1.1L	20	1	F2.12	H.1.			G1.4	15					
E																						1	#2	100		
R	4448	N540L29	35	4	DF		216																			
A		N540L29	45	2	DF	CAL 2		4	1/0		7	2	E1.1L	15	2	F2.12	H.1.									
E																										
R	4450	N540L31	40	3	DF		217																			
A		N540L31	45	2	DF	CAL 2		4	1/0		10	2	E1.1L	15	1	F2.12	H.1.			G1.4	15					
E																										
R	4452	N540L32	35	4	DF		274																			
A		N540L32	45	2	DF	CAL 1		4	1/0			2	E1.1L		1	F2.12	H.1.									
E																										
R	4453	N540L33	35	4	DF		272																			
A		N540L33	45	2	DF	CAL 1		4	1/0								H.1.			G1.4	25					TRANSFER 2" CONDUIT
E																										

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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	4454	N540L34	35	4	DF		275	4																		
A		N540L34	45	2	DF	CAL 1 U1			1/0								H.1.									UNDERGROUND TAP
E																										
R	4455	N540L34A	40	4	DF		274																			
A		N540L34A	45	2	DF	CAL 1 U1		4	1/0								H.1.									
E																										
R	4461	N540L37	40	3	DF		231																			
A		N540L37	45	2	DF	C1.9N		4	1/0		30	2	E1.1L	20	1	F2.12	H.1.									
E																										
R	4462	N540L37A	40	3	DF		276																			
A		N540L37A	45	2	DF	CAL 2 A5.01		4	1/0		0	1	E1.1L	12	1	F2.12	H.1.		S1.1							SINGLE PHASE RISER
E																										
R	4463	N540L37AR1	35	4	DF		130																			
A		N540L37AR1	45	2	DF	A5.01 U1		2	1/0			1	E1.1L	10	1	F2.12	H.1.									
E																										
R	4465	N540L39	40	3	DF		338																			
A		N540L39	45	2	DF	C1.9N						3	E1.4L		1		H.1.			G1.4	15					2" SECONDARY RISER
E								4	1/0																	
R	4467	N540L40	35	4	DF		283																			
A		N540L40	50	2	DF	CAL 2					12	2	E1.1L	15	2	F2.12	H.1.									
E								4	1/0																	
R	4470	N540L43	40	3	DF		243																			
A		N540L43	45	2	DF	CAL 2					10	1	E1.1L	10	1	F2.12	H.1.									
E								4	1/0																	

DOSEWALLIPS

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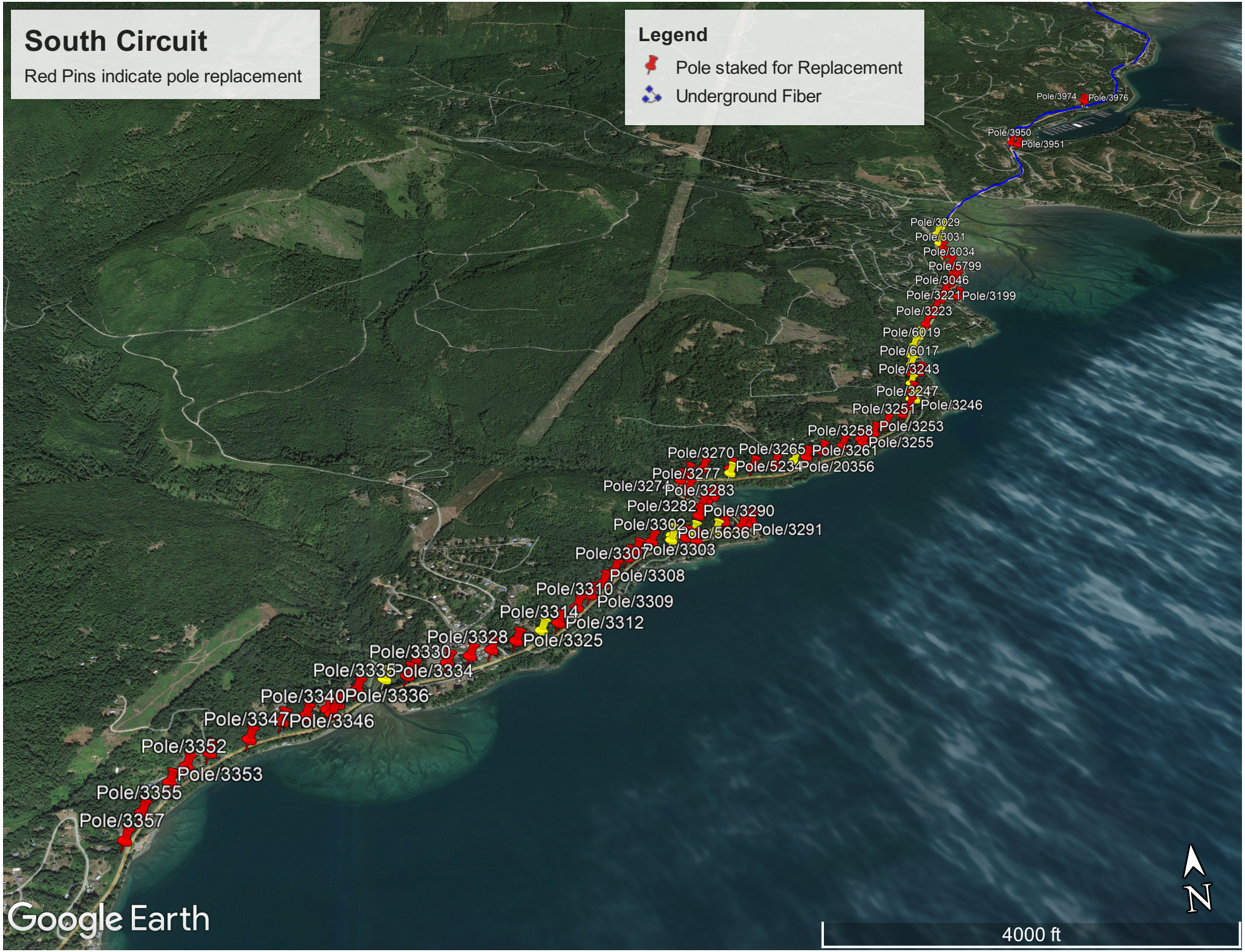
ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	4471	N540L44	40	3	DF		282																			
A		N540L44	45	2	DF	CAL 1											H.1.									
E								4	1/0																	
R	4472	N540L45	40	4	DF		369																			
A		N540L45	45	2	DF	CAL 1											H.1.									
E								4	1/0																	
R	4473	N540L45A	40	3	DF		379																			
A		N540L45A	45	2	DF	CAL 3					5	1	E1.4L	30			H.1.									
E								4	1/0																	


South Circuit
Red Pins indicate pole replacement
Legend
Pole staked for Replacement
Underground Fiber
Pole/3974
Pole/3976
Pole/3950
Pole/3951
Pole/3029
Pole/3031
Pole/3034
Pole/5799
Pole/3046
Pole/3221
Pole/3199
Pole/3223
Pole/6019
Pole/6017
Pole/3243
Pole/3247
Pole/3251
Pole/3246
Pole/3258
Pole/3253
Pole/3255
Pole/3270
Pole/3265
Pole/3261
Pole/5234
Pole/20356
Pole/3277
Pole/3274
Pole/3283
Pole/3282
Pole/3290
Pole/3302
Pole/5636
Pole/3291
Pole/3307
Pole/3303
Pole/3308
Pole/3310
Pole/3309
Pole/3314
Pole/3312
Pole/3328
Pole/3325
Pole/3330
Pole/3335
Pole/3334
Pole/3340
Pole/3336
Pole/3347
Pole/3346
Pole/3352
Pole/3353
Pole/3355
Pole/3357
Google Earth
N
4000 ft

PROJECT HWY 101- HOOD CANAL PHASE TWO WO # LINE: DUCKABUSH SOUTH

UG LOCATE TICKET # BY DETAIL MAP COUNTY SCHOOL DISTRICT

STAKED BY REYES DATE 1/11/2023
REVISED BY BRAGER DATE 1/19/2023
CHECKED BY ROLOW DATE 1/20/2023

TWSP RANGE SECTION

NOTES

NOTES

The staking sheets and construction units may not include all necessary material needed to fully construct.
It is assumed that the contractor will provide all necessary material for the implied design.
Use double coil spring washers in lieu of lock nuts, where shown.
All lightning arrestors shall be 10 kV MOV 8.4 kV MCOV.
All jumpers to be covered conductor.
All strength requirements shown are the minimum acceptable
Install cut-out covers on cut-outs.
Install arrester covers on arresters.
Guying shall be insulated per NESC.
Re-use existing anchors where practical such that the integrity of the existing installation has not been compromised and is in accordance with best practices.
Anchor/guy lead length must shall meet minimum specified lead lengths or may be amended to meet provided guy anchor look-up tables.
New anchors shall be either G2A or G3A (Screw anchors), G3 (Expanding), or G4 (Cross plate) and shall be installed to meet or exceed a 21kip holding capacity.
Transformers to be transferred from existing poles unless otherwise specified.
All transformer assemblies to include 4-way or 6-way covered connector blocks as required.
Transfer existing street and area lights to new poles.
Up to two communications attatchers per pole to be transferred

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	3360	N397	40	4	DF		294					2	E1.4L	60			H.1.									
A		N397	50	2	DF	CAL 2											H.1.									
E		N397			DF			3 1	3/0 1/0																	
R	3361	N397GS	30	6	DF								E1.1L			F2.12									
A		N397GS	40	2	DF								E1.1L			F2.12									
E		N397GS							3/0 1/0				E1.1L			F2.12									
R	3358	N398	40	4	DF		216					2	E1.1L		1	F2.12									
A		N398	50	2	DF	CAL 2						2	E1.1L	18	1	F2.12	H.1.									
E		N398						3 1	3/0 1/0																	
R	3357	N399	40	4	DF		341					2	E1.1L		1	F2.12									
A		N399	50	2	DF	CAL 2						2	E1.1L	10	2	F2.12	H.1.									
E		N399						3 1	3/0 1/0																	
R	3355	N400	40	5	DF		348					2	E1.1L		1	F2.12									
A		N400	50	2	DF	CAL 2						2	E1.1L		1	F2.12	H.1.									
E		N400						3 1	3/0 1/0																	
R	3353	N401	40	4	DF		331					2	E1.1L		1	F2.12									
A		N401	45	2	DF	CAL 2 A5.4											H.1.		S1.1							
E		N401						3 1	3/0 1/0																	
R	3352	N402	40	4	DF		261					1	E1.1L		1	F2.12									
A		N402	45	2	DF	CAL 2						1	E1.1L		1	F2.12	H.1.									
E		N402						3 1	3/0 1/0																	
R	3348	N403	45	4			293					2	E1.1L		2	F2.12									
A		N403	50	2		CAL 2 A5.1						2	E1.1L		2	F2.12	H.1.		S1.1						

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
E		N403						3 1	3/0 1/0											G1.4	25					SECONDARY RISER CONDUIT
R	3347	N404	45	4			391																			
A		N404	50	2		CAL 1																				
E		N404						3 1	3/0 1/0																	
R	3346	N405	45	4	DF		292																			
A		N405	50	2	DF	CAL 3 U1						2	E1.1L		2	F2.12	H.1.									
E		N405						3 1	3/0 1/0											G1.4	25					
R	3340	N406	35	4	DF		207					1	E1.1L	25	1	F2.12										
A		N406	45	2	DF	CAL 8						2	E1.1L	25	2	F2.12	H.1.									
E		N406						3 1	3/0 1/0											G1.4	15					SECONDARY RISER 2"
R	3339	N407GS	30	7	DF		60					1	E1.1L	12	1	F2.12										
A		N407GS	35	2	DF							1	E1.1L		1	F2.12										
E		N407GS										1		15	1											
R	3338	N407	40	4	DF		208					1	E1.1L	20	1	F2.12										
A		N407	45	2	DF	CAL 3						1	E1.1L	15			H.1.									
E		N407						3 1	3/0 1/0																	
R	3336	N408	40	4	DF		193																			
A		N408	45	2	DF	CAL 2 A5.1						1	E1.4L				H.1.		S1.1							
E		N408						3 1	3/0 1/0																	
R	3335	N409	40	6	DF		326																			
A		N409	50	2	DF	CAL 2 A5.1						2	E1.1L	15	1	F2.12	H.1.		S1.1							

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
E		N409						3 1	3/0 1/0																	
R	3332	N411R1	35	4	DF		70																			
A		N411R1	40	2	DF	A5.1 U1											H.1.									
E		N411R1						2	1/0											G1.4	10					TRANSFER 2" RISER
R	3330	N411	45	4	DF		310																			UC2-3P UNDERGROUD TAP WWITH CUTOUTS
A		N411	55	2	DF	CAL 2 UC2						2	E1.1L	15	1	F2.12	H.1.		A5.4 S1.1							SINGLE PHASE TAP FUSED
E		N411						3 1	3/0 1/0																	
R	3329	N413	40	4	DF		322																			
A		N413	45	2	DF	CAL 2						1					H.1.									
E		N413						3 1	3/0 1/0																	REUSE PUSH POLE
R	3328	N414	40	4	DF		301																			
A		N414	50	2	DF	CAL 2						1					H.1.									
E		N414						3 1	3/0 1/0																	REUSE PUSH POLE
R	3327	N415	40	4	DF		283																			
A		N415	50	2	DF	CAL 2 U1						1					H.1.									REUSE PUSH POLE
E		N415						3 1	3/0 1/0																	MOVE SECONDARY RISERS
R	3325	N416	50	3	DF		270																			
A		N416	55	2	DF	CAL 1 U1											H.1.			G1.4	10					SINGLE PHASE UNDERGROUND TAP
E		N416						3 1	3/0 1/0																	MOVE SECONDARY UNDERGROUND
R	3312	N418	45	5	DF		233																			
A		N418	50	2	DF	CAL 2											H.1.									
E		N418						3 1	3/0 1/0		15	3	E1.4L													

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	3310	N419	40	6	DF		268																			
A		N419	45	2	DF	CAL 2											H.1.									
E		N419						3 1	3/0 1/0		2	3	E1.4L													
R	3309	N420	40	4	DF		370																			
A		N420	45	2	DF	CAL 1					0						H.1.									
E		N420						3 1	3/0 1/0			1	E1.1L	15	1	F2.12										
R	3308	N421	35	4	DF		307																			
A		N421	45	2	DF	CNE-1 A5.1											H.1.		S1.1							
E		N421						3 1	3/0 1/0																	
R	3307	N422	40	6	DF		260																			
A		N422	50	2	DF	CAL 1											H.1.									
E		N422						3 1	3/0 1/0																	
R	3306	N423	40	4	DF		216																			
A		N423	45	2	DF	CAL 1 A4.1						2	E1.1L	15	2	F2.12	H.1.									
E		N423						3 1	3/0 1/0											G1.4	25					
R	3303	N424	40	4	DF		270																			
A		N424	45	2	DF	CAL 3					5	1	E1.1L	10	1	F2.12	H.1.			G1.4	15					
E		N424						3 1	3/0 1/0																	
R	3302	N425	40	5	DF		286																			
A		N425	45	2	DF	CAL 2					9	1	E1.1L	10	1	F2.12	H.1.			G1.4	15					
E		N425						3 1	3/0 1/0																	
R	3298	N426R1	35	5	DF		142																			
A		N426R1	45	2	DF	A6.1											H.1.			G1.4	10			30		
E		N426R1						2	#4																	

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	5454	N426R2	40	2	DF		196																			DEADEND
A		N426R2	50	2	DF	A5.1						2	E1.1L		1	F2.12	H.1.			G1.4	25					TRANSFER STREETLIGHT
E		N426R2						2	#4																	TRANSFER SECONDARY CONDUIT
R	3296	N427R1L1	30	4	DF		254																			SINGLE PHASE DEADEND
A		N427R1L1	40	2	DF	A6.5						2	E1.1L		1	F2.12	H.1.			G1.4	25					TRANSFER SECONDARY CONDUIT
E		N427R1L1						2	#4																	
R	3290	N427R2	35	5	DF		416																			
A		N427R2	45	2	DF	A1.1					30	2	E1.1L	20	1	F2.12	H.1.									
E		N427R2						2	#4																	
R	3291	N427R3	35	5	DF		66																			
A		N427R3	40	2	DF	A5.1					0						H.1.									
E		N427R3						2	#4																	
R	3292	N427R4	30	4	DF		91																			
A		N427R4	40	2	DF	A6.1											H.1.									
E		N427R4						2	#4											G1.4	25					
R	3284	N438	35	5	DF		332																			
A		N438	45	2	DF	CAL 2						1	E1.1L		1	F2.12	H.1.									2" SECONDARY RISER
E		N438						3 1	3/0 1/0											G1.4	15					
R	3283	N429	35	5	DF		307																			
A		N429	45	2	DF	CAL 2					5	3	E1.1L	15	2	F2.12	H.1.									
E		N429						3 1	3/0 1/0											G1.4	15					2" SECONDARY RISER
R	3282	N430	40	4	DF		130																			
A		N430	50	2	DF	CAL 1																				
E		N430						3 1	3/0 1/0																	

HWY 101- DUCKBUSH SOUTH CIRCUIT

Mason PUD 1
21971 N. Hwy. 101
Shelton, WA 98584

REV	DATE	DESCRIPTION	DESIGNER	REVIEWER
0	1/11/2023	HWY 101	JR	RB

NOTES:
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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR			GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type					Unit	KVA	#	Size	Span (Ft)	Unit	
R	3281	N431GS	30	4	DF		40																				
A		N431GS	35	2	DF							3	E1.1L	15	2	F2.12											
E		N431GS																									
R	3280	N431	55	4	DF		369																				
A		N431	55	2	DF	C4						3	E1.4L														VERTICAL DOUBLE DEADEND
E		N431						3 1	3/0 1/0																		
R	3277	N432	50	4	DF		138																				TRANSFER STREETLIGHT
A		N432	55	2	DF	C3						2	E1.1L	30	1	F2.12	H.1.									VERTICAL ANGLE- 6"BELLS
E		N432						3 1	3/0 1/0																		
R	3274	N433	50	4	DF		332																				TRANSFER STREETLIGHT
A		N433	55	2	DF	C3						2	E1.1L	30	1	F2.12	H.1.			G1.4	10					VERTICAL ANGLE- 6"BELLS
E		N433						3 1	3/0 1/0																		
R	3271	N434	45	4	DF		268																				TRANSFER STREETLIGHT
A		N434	50	2	DF	C3						1	E1.1L	30	1	F2.12	H.1.			G1.4	10					VERTICAL ANGLE- 6"BELLS
E		N434						3 1	3/0 1/0																		
R	3270	N435	40	4	DF		285																				
A		N435	50	2	DF	CAL 2						1	E1.1L	30	1	F2.12											
E		N435						3 1	3/0 1/0																		
R	3268	N436	40	4	DF		314																				
A		N436	45	2	DF	CAL 2						2	E1.4L	60		STUBB	H.1.										
E		N436						3 1	3/0 1/0																		
R	3267	N437	40	4	DF		275																				

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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
A		N437	45	2	DF	CAL 2						1	E1.1L	10	1	F2.12	H.1.									
E		N437						3 1	3/0 1/0																	
R	3265	N438	35	5	DF		259																			
A		N438	45	2	DF	CAL 2						2	E1.4L	60		STUBB	H.1.									
E		N438						3 1	3/0 1/0																	
R	3261	N440	35	4	DF		301																			
A		N440	45	2	DF	CAL 1																				
E		N440						3 1	3/0 1/0																	
R	3260	N441	40	4	DF		314																			
A		N441	50	2	DF	CAL 1														G1.4	15					
E		N441						3 1	3/0 1/0																	
R	3258	N442	40	4	DF		309																			
A		N442	50	2	DF	CAL 2 U1						1	E1.1L	10	1	F2.12	H.1.			G1.4	10					
E		N442						3 1	3/0 1/0																	
R	3254	N443	40	4	DF		358																			
A		N443	45	2	DF	CAL 3						1	E1.4L	60		STUBB	H.1.									
E		N443						3 1	3/0 1/0																	
R	3255	N443GS	30	6	DF																					
A		N443GS	35	2	DF							1	E1.1L	15	1	F2.12										
E		N443GS																								
R	3253	N444	40	6	DF		197																			
A		N444	45	2	DF	CAL 1																				
E		N444						3 1	3/0 1/0																	
R	3251	N445	40	6	DF		365																			

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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
A		N445	45	2	DF	CAL 2						2	E1.1L	15	1	F2.12										
E		N445						3 1	3/0 1/0											G1.4	15					
R	3249	N446	40	6	DF		313																			
A		N446	50	2	DF	CAL 2						1	E1.4L	60		STUBB	H.1.									
E		N446						3 1	3/0 1/0											G1.4	10					
R	3247	N447	40	6	DF		237																			
A		N447	45	2	DF	CAL 2						2	E1.4L	60		STUBB	H.1.									
E		N447						3 1	3/0 1/0											G1.4	15					
R	3244	N449	40	4	DF		274																			
A		N449	45	2	DF	CAL 1																				
E		N449						3 1	3/0 1/0																	
R	3233	N451	40	4	DF		260																			
A		N451	50	2	DF	CAL 1 A5.4													S1.1							SINGLE PHASE TAP FUSED
E		N451						3 1	3/0 1/0											G1.4	15					
R	3235	N451R1	40	4	DF		275																			
A		N451R1	40	2	DF	A6.2						2	E1.1L	15	1	F2.12	H.1.									
E		N451R1						2	#2											G1.4	25					
R	3223	N456	45	4	DF		400																			
A		N456	50	2	DF	CAL 1																				
E		N456						3 1	3/0 1/0																	
R	3222	N457	40	4	DF		378																			
A		N457	45	2	DF	CAL 1																				
E		N457						3 1	3/0 1/0																	
R	3221	N458	40	4	DF		272																			
A		N458	45	2	DF	CAL 1																				
E		N458						3 1	3/0 1/0																	
R	3220	N458A	40	4	DF		273																			

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ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
A		N458A	50	2	DF	CAL 8						1	E1.1L	10	1	F2.12	H.1.		R2.1							TRANSFER OCB RECLOSURES
E		N458A						3 1	3/0 1/0																	BYPASS SWITCHES
R	3046	N459	40	1	DF																					TRANSFER STREETLIGHT
A		N459	45	2	DF	CAL 1 A4.1 (2)													S1.1 (2) R2.1							TRANSFER OCB RECLOSURES
E		N459						3 1	3/0 1/0																	
R	3199	N459R1	45	4	DF		177																			
A		N459R1	50	2	DF	A2.3						1	E1.1L	10	1	F2.12	H.1.									
E		N459R1						2	1/0											G1.4	25					
R	3043	N460	30	4	DF		164																			
A		N460	40	2	DF	CAL 1																				
E		N460						3 1	3/0 1/0											G1.4	15					
R	3041	N461	40	4	DF		249																			
A		N461	50	2	DF	CAL 1																				
E		N461						3 1	3/0 1/0											G1.4	15					
R	3039	N462	40	4	DF		215																			
A		N462	50	2	DF	CAL 2																				
E		N462						3 1	3/0 1/0		15	1	E1.4L	10		STUBB	H.1.			G1.4	25					
R	5799	N462GS	30	3	DF																					
A		N462GS	40	2	DF							1	E1.1L	15	1	F2.12										
E		N462GS																								
R	6012	N463	45	3	DF		270																			
A		N463	50	2	DF	CAL 2					15	1	E1.4L	10		STUBB	H.1.									
E		N463						3 1	3/0 1/0																	
R	3038	N463GS	30	6	DF																					
A		N463GS	35	2	DF							1	E1.1L	15	1	F2.12										
E		N463GS																								
R	3034	N464	40	5	DF		305																			
A		N464	50	2	DF	CAL 2																				
E		N464						3 1	3/0 1/0		7	1	E1.4L	10		STUBB	H.1.			G1.4	25					
R	3033	N465	40	4	DF		374																			
A		N465	45	2	DF	CAL 1																				
E		N465						3 1	3/0 1/0																	
R	3031	N466	40	4	DF		287																			
A		N466	45	2	DF	CAL 1											H.1.									
E		N466						3 1	3/0 1/0											G1.4	25					
R	3950	N486	45	4	DF		338																			TRANSFER STREETLIGHT
A		N486	50	2	DF	CAL 2 C6.21						2	E1.1L	10	1	F2.12	H.1.									3P TAP ON DOUBLE DEADEND
E		N486						3 1	3/0 1/0																	

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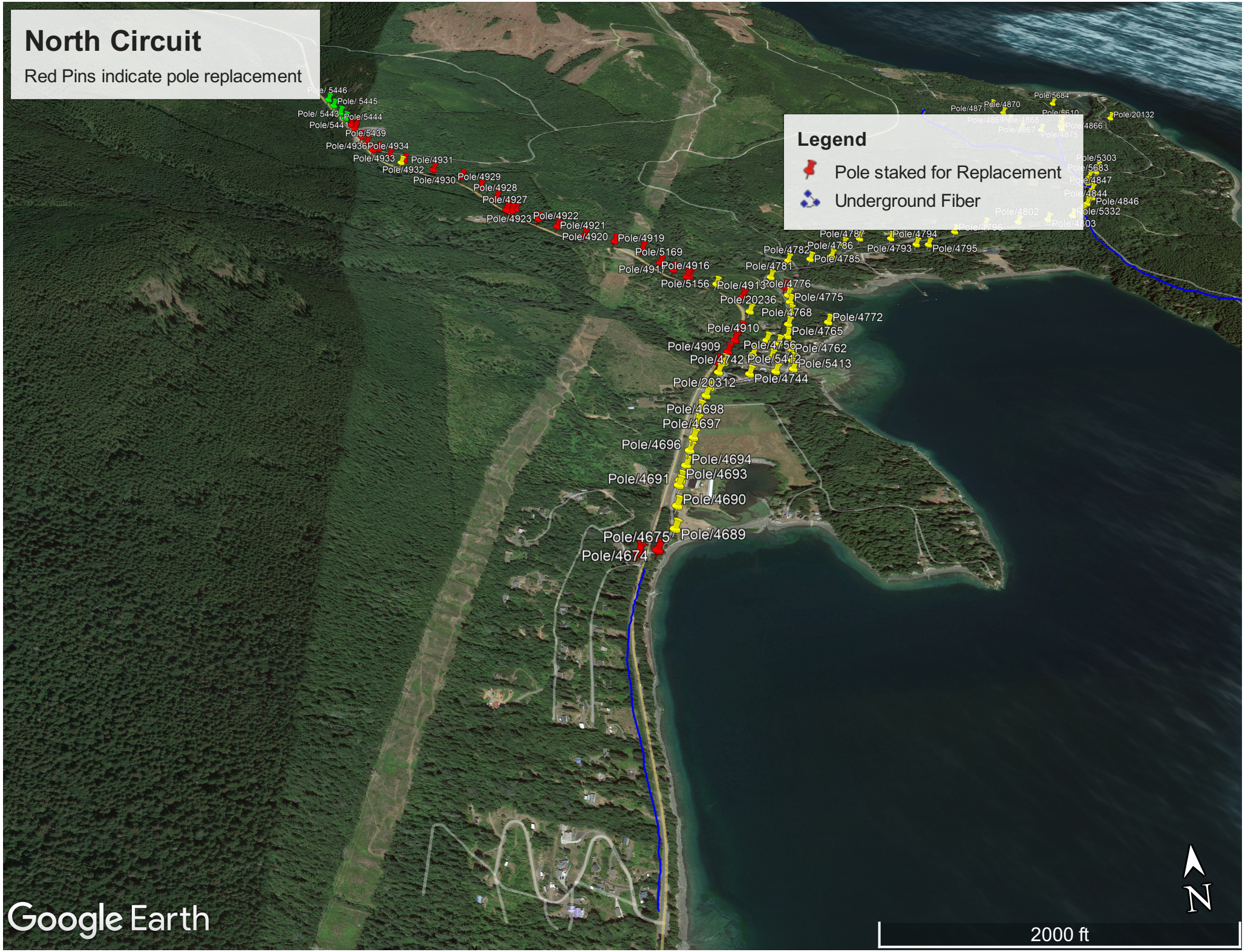
ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	3951	N486R1	40	4	DF		126.0																			C8- 3P DBL XARM DBL DE - 6" BELLS
A		N486R1	50	2	DF	C8 B7						2	E1.1L	10	1	F2.12	H.1.			G3.3						B7- 2P SINGLE DE DBL XARM
E		N486R1						3 1	3/0 1/0																	TRANSFER STREETLIGHT
R	3974	N497	40	4	DF		343																			
A		N497	50	2	DF	CAL 8 A4.2											H.1.									
E		N497						3 1	3/0 1/0										S1.1							
R	3976	N497R1	35	6	DF		315																			TRANSFER STREETLIGHT
A		N497R1	45	2	DF	A5.4											H.1.									
E		N497R1						2	1/0											G1.4	37.5					
R	4017	N510	40	3	DF		226																			
A		N510	50	2	DF	CAL 1 U1											H.1.									
E		N510						3 1	3/0 1/0											G1.4	15					
R	4018	N510SP	35	6	DF																					
A		N510SP	45	2	DF																					TRANSFER SECONDARY
E		N510SP																								
R	4019	N510SPA	35	6	DF																					
A		N510SPA	45	2	DF																					TRANSFER SECONDARY
E		N510SPA																								


North Circuit
Red Pins indicate pole replacement
Legend
Pole staked for Replacement
Underground Fiber
Pole/ 5446
Pole/ 5445
Pole/ 5443
Pole/5444
Pole/5441
Pole/5439
Pole/4936
Pole/4934
Pole/4933
Pole/4931
Pole/4932
Pole/4930
Pole/4929
Pole/4928
Pole/4927
Pole/4923
Pole/4922
Pole/4921
Pole/4920
Pole/4919
Pole/5169
Pole/4917
Pole/4916
Pole/5156
Pole/4913
Pole/20236
Pole/4910
Pole/4909
Pole/4742
Pole/20312
Pole/4698
Pole/4697
Pole/4696
Pole/4694
Pole/4693
Pole/4691
Pole/4690
Pole/4675
Pole/4674
Pole/4689
Pole/4776
Pole/4775
Pole/4768
Pole/4772
Pole/4765
Pole/4756
Pole/4762
Pole/5412
Pole/5413
Pole/4744
Pole/4781
Pole/4782
Pole/4786
Pole/4785
Pole/4793
Pole/4794
Pole/4795
Pole/4871
Pole/4870
Pole/5684
Pole/5610
Pole/20132
Pole/4866
Pole/5303
Pole/5683
Pole/4847
Pole/4844
Pole/4846
Pole/5332
Pole/4802
Google Earth
2000 ft
N

PROJECT HWY 101- HOOD CANAL PHASE TWO WO # LINE: HOODSPORT NORTH

UG LOCATE TICKET # BY DETAIL MAP COUNTY SCHOOL DISTRICT

STAKED BY REYES DATE 1/11/2023
REVISED BY BRAGER DATE 1/19/2023
CHECKED BY ROLOW DATE 1/20/2023

TWSP RANGE SECTION

NOTES

NOTES

The staking sheets and construction units may not include all necessary material needed to fully construct.
It is assumed that the contractor will provide all necessary material for the implied design.
Use double coil spring washers in lieu of lock nuts, where shown.
All lightning arrestors shall be 10 kV MOV 8.4 kV MCOV.
All jumpers to be covered conductor.
All strength requirements shown are the minimum acceptable
Install cut-out covers on cut-outs.
Install arrester covers on arresters.
Guying shall be insulated per NESC.
Re-use existing anchors where practical such that the integrity of the existing installation has not been compromised and is in accordance with best practices.
Anchor/guy lead length must shall meet minimum specified lead lengths or may be amended to meet provided guy anchor look-up tables.
New anchors shall be either G2A or G3A (Screw anchors), G3 (Expanding), or G4 (Cross plate) and shall be installed to meet or exceed a 21kip holding capacity.
Preformed not included with secondary unit J3.1. Refer to staking sheets for overhead secondary wire size.
Transformers to be transferred from existing poles unless otherwise specified.
All transformer assemblies to include 4-way or 6-way covered connector blocks as required.
At least one communications attacher to be tranferred to new pole

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	3360	N397	40	4	DF		294					2	E1.4L	60		STUBB	H.1.									
A		N397	50	2	DF	CAL 2											H.1.									
E		N397			DF			3 1	3/0 1/0																	
R	4647	N575	50	2	DF		164																			TRANSFER STREETLIGHT
A		N575	55	2	DF	CNE-1 A5.2											H.1.		S1.1	G1.4	15					
E		N575						3 1	3/0 1/0																	
R	4674	N586	45	2	DF		390																			
A		N586	50	2	DF	CAL 2 A5.2											H.1.		S1.1							
E		N586						3 1	3/0 1/0																	
R	4675	N586L1	40	4	DF		341																			
A		N586L1	45	2	DF	A1.3 U1																				SINGLE PHASE TAP
E		N586L1						2	1/0																	
R	4780	BEE	35	6	DF		225																			
A		BEE	45	2	DF	C2						2	E1.1L		1	F2.12	H.1.									C2- SINGLE PHASE TANGENT DBL XARM
E		BEE						2	1/0																	
R	4908	N596	40	2	DF		25					2	E1.1L		1	F2.12										
A		N596	50	2	DF	A4.1						2	E1.1L		1	F2.12	H.1.									
E		N596						2	#6																	
R	4909	N597	40	2	DF	A1.1	271																			
A		N597	50	2	DF	A1.3																				
E		N597						2	#6																	
R	4910	N597A	40	2	DF		191					1	E1.1L		1	F2.12										
A		N597A	50	2	DF	A2.1						2	E1.1L	10	1	F2.12										

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
E		N597A						2	#6																	
R	4911	N598	40	2	DF		261					1	E1.1L		1	F2.12										
A		N598	45	2	DF	A6.2						2	E1.1L	10	2	F2.12										
E		N598						2	#6																	
R	4913	N600	45	5	DF		307																			
A		N600	50	2	DF	A3.4						2	E1.1L	5	1	F2.12										
E		N600						2	#6																	
R	4916	N602GS	30	6	DF		60					1	E1.4L	10	1	F2.12										
A		N602GS	45	2	DF							2	E1.4L	5	1	F2.12										
E		N602GS																								
R	5018	N602	40	6	DF	A1.1	310																			
A		N602	50	2	DF	A1.3						2	E1.4L													
E		N602						2	#6																	
R	4917	N602A	35	4	DF	A2.1	220																			
A		N602A	45	2	DF	A2.3											H.1.									
E		N602A						2	#6																	
R	5169	N603	35	4	DF	A1.1	110					1	E1.1L	10	1	F2.12										
A		N603	45	2	DF	A1.3						2	E1.1L	5	1	F2.12										
E		N603						2	#6																	
R	4919	N604	35	4	DF																					
A		N604	45	2	DF	A3.4																				

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	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
E		N604						2	#6																	
R	4920	N605	30	4	DF		381																			
A		N605	45	2	DF	A3.4						1	E1.1L	5	1	F2.12	H.1.									
E		N605						2	#6																	
R	4921	N606	35	6	DF	A2.1	347																			
A		N606	45	2	DF	A2.3																				
E		N606						2	#6																	
R	4922	N607	35	5	DF	A2.1	309					1	E1.1L	10	1	F2.12										
A		N607	45	2	DF	A2.3						2	E1.1L	5	1	F2.12										
E		N607						2	#6																	
R	4923	N608	35	6	DF	A1.1	290																			
A		N608	45	2	DF	A1.3																				
E		N608						2	#6																	
R	4924	N609	40	2	DF		343					1	E1.1L	10	1	F2.12										SINGLE PHASE TAP FUSED
A		N609	45	2	DF	A2.3 A5.2						2	E1.1L	5	1	F2.12	H.1.		S1.1							
E		N609						2	#6																	
R	4925	N609L1	35	4	DF		83					1	E1.1L	10	1	F2.12										
A		N609L1	40	2	DF	A4.2						1	E1.1L	10	1	F2.12	H.1.			G1.4	15					
E		N609L1						2	#6																	
R	4928	N610	35	6	DF	A1.1	386																			
A		N610	45	2	DF	A1.3																				
E		N610						2	#6																	

HWY 101- DUCKBUSH NORTH CIRCUIT

Mason PUD 1
21971 N. Hwy. 101
Shelton, WA 98584

REV	DATE	DESCRIPTION	DESIGNER	REVIEWER
0	1/11/2023	HWY 101	JR	RB

NOTES:
ACTION column:
A=Add
E=Existing
R=Remove
M=Move from Removal to Addition

ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	4929	N611	35	6	DF	A2.3	371																			
A		N611	45	2	DF	A2.3																				
E		N611						2	#6																	
R	4930	N612	35	6	DF		371																			
A		N612	45	2	DF	A2.3						1	E1.1L	10	1	F2.12	H.1.									
E		N612						2	#6																	
R	4931	N613	35	6	DF	A1.1	393																			
A		N613	45	2	DF	A1.3																				
E		N613						2	#6																	
R	4932	N614	35	6	DF		409																			
A		N614	45	2	DF	A2.3						1	E1.4L			STUBB										
E		N614						2	#6																	
R	4934	N615	35	6	DF	A2.1	238																			
A		N615	45	2	DF	A2.3						1	E1.1L	10	1	F2.12	H.1.									
E		N615						2	#6																	
R	4935	N616	35	7	DF		272																			
A		N616	45	2	DF	A6.2																				FEEDTHROUGH DOUBLE DEADEND
E		N616																								
R	4936	N616GS	35	7	DF																					
A		N616GS	45	2	DF							2	E1.4L	10	1	F2.12										
E		N616GS						2	#6 & 4ACSR																	
R	5439	N617	45	4	DF		271																			
A		N617	45	2	DF	A6.2						1	E1.1L	10	1	F2.12	H.1.									
E		N617						2	4 ACSR																	

HWY 101- DUCKBUSH NORTH CIRCUIT

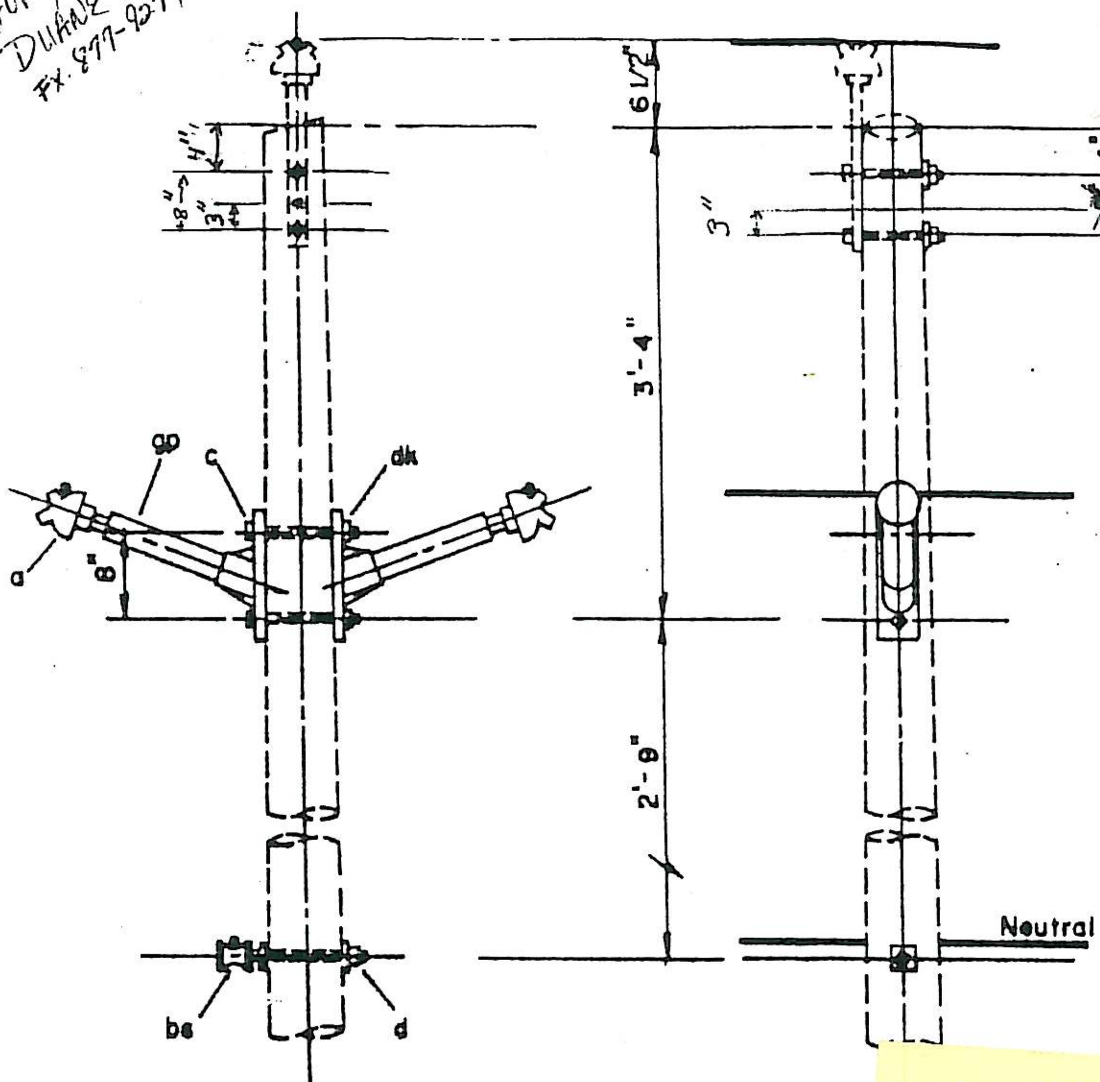
Mason PUD 1
21971 N. Hwy. 101
Shelton, WA 98584

REV	DATE	DESCRIPTION	DESIGNER	REVIEWER
0	1/11/2023	HWY 101	JR	RB

NOTES:
ACTION column:
A=Add
E=Existing
R=Remove
M=Move from Removal to Addition

ACTION	POLES					UNIT / DRAWING	CONDUCTOR			ROW Clear	LINE ANGLE (Deg)	GUY			ANCHOR		GROUND	#	MISC.	TRANSFORMER		SECONDARY				REMARKS
	PLS Str #	Mile / Str #	HT	CL	TYPE		Back Span (Ft)	#	Size Type			#	Type	Lead (Ft)	#	Type				Unit	KVA	#	Size	Span (Ft)	Unit	
R	5440	N618	40	2	DF	A1.1	232																			
A		N618	45	2	DF	A1.3																				
E		N618						2	4 ACSR																	
R	5441	N619	40	2	DF	A1.1	290																			TRANSFER STREETLIGHT
A		N619	45	2	DF	A1.3														G1.4	15					
E		N619						2	4 ACSR																	
R	5442	N620	45	4	DF	A1.1	223																			
A		N620	45	2	DF	A1.3														G1.4	25					
E		N620						2	4 ACSR																	
R	5448	N620SP	30	4	DF																					SECONDARY POLE
A		N620SP	45	2	DF																					3-WAY CONNECTOR BLOCK
E		N620SP																								

7-15-94
To: Gordy
FRM: Duane Nault
FX. 877-9274



Make CAL1-1
2° - 5°, change bs to da (insulated bracket)
CAL1 - 0°-2°

For 4/0 ACSR max. conductor 2844 lbs. max. tension at 0° F, 1/2" ice

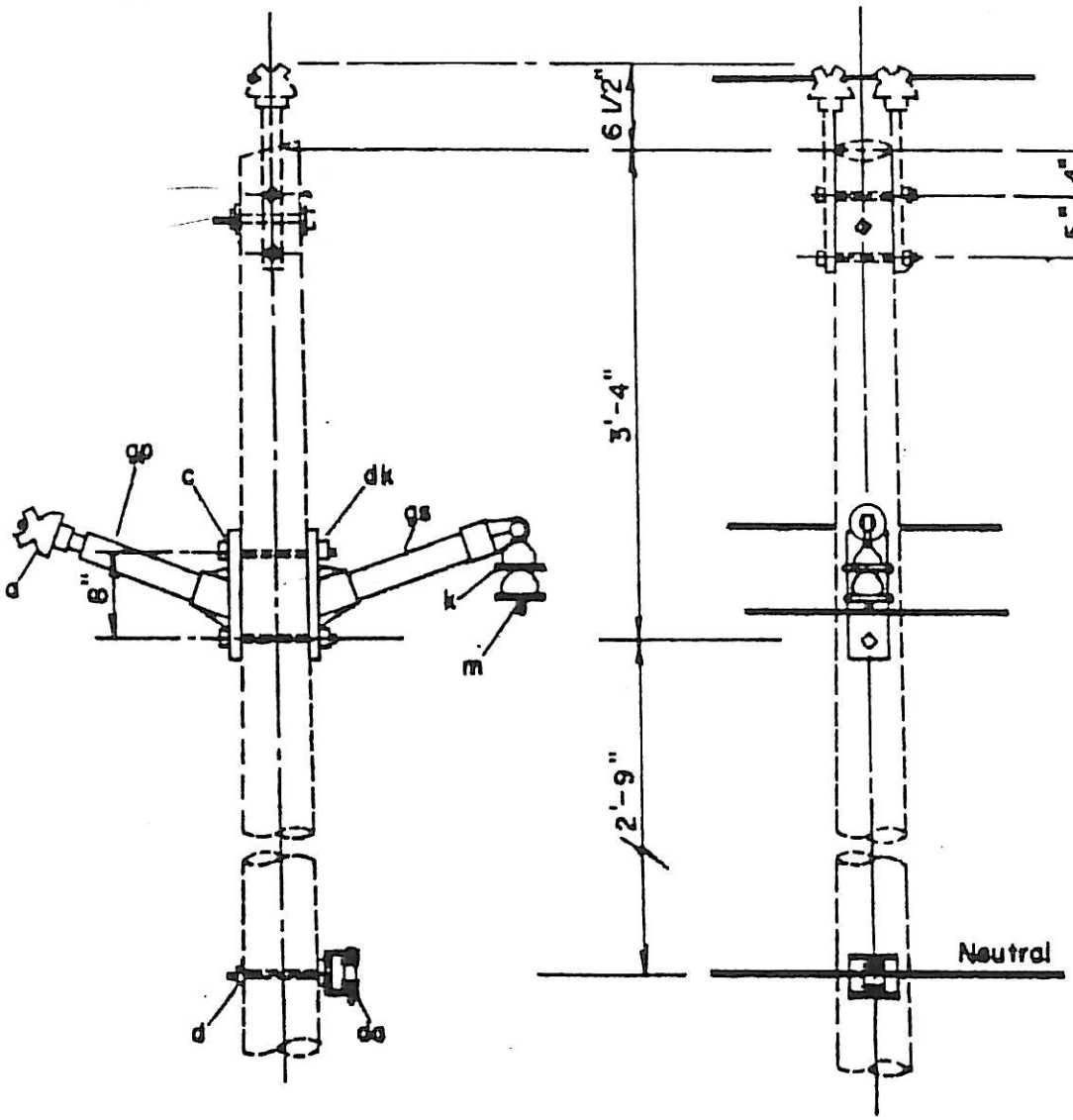
ITEM	NO	MATERIAL	ITEM	NO	MATE[RIAL]
a	2	Insulator, pin type, 15 kv, gray glaze	dk	2	Washer, spring 11/16" ø
gp	2	Epoxy stand-off assembly Chance C653-0241			
c	2	Bolt, machine 5/8" x req'd length			
bs	1	Bolt, upset w/insulator			
d	1	Washer, 2 1/4" x 2 1/4" x 3/16", 13/16" ø			

DATE	REVISION	APP'D

7.2/12.5 KV 3-PHASE
ARMLESS CONSTRUCTION
PRIMARY SUPPORT ON 0° TO 5° LINE ANGLE

APP'D DATE

MASON COUNTY P.U.D. NO. 1 | CAL 1



For 4/0 ACSR max conductor 2844lbs.
max. tension at 0° F, 1/2 ice

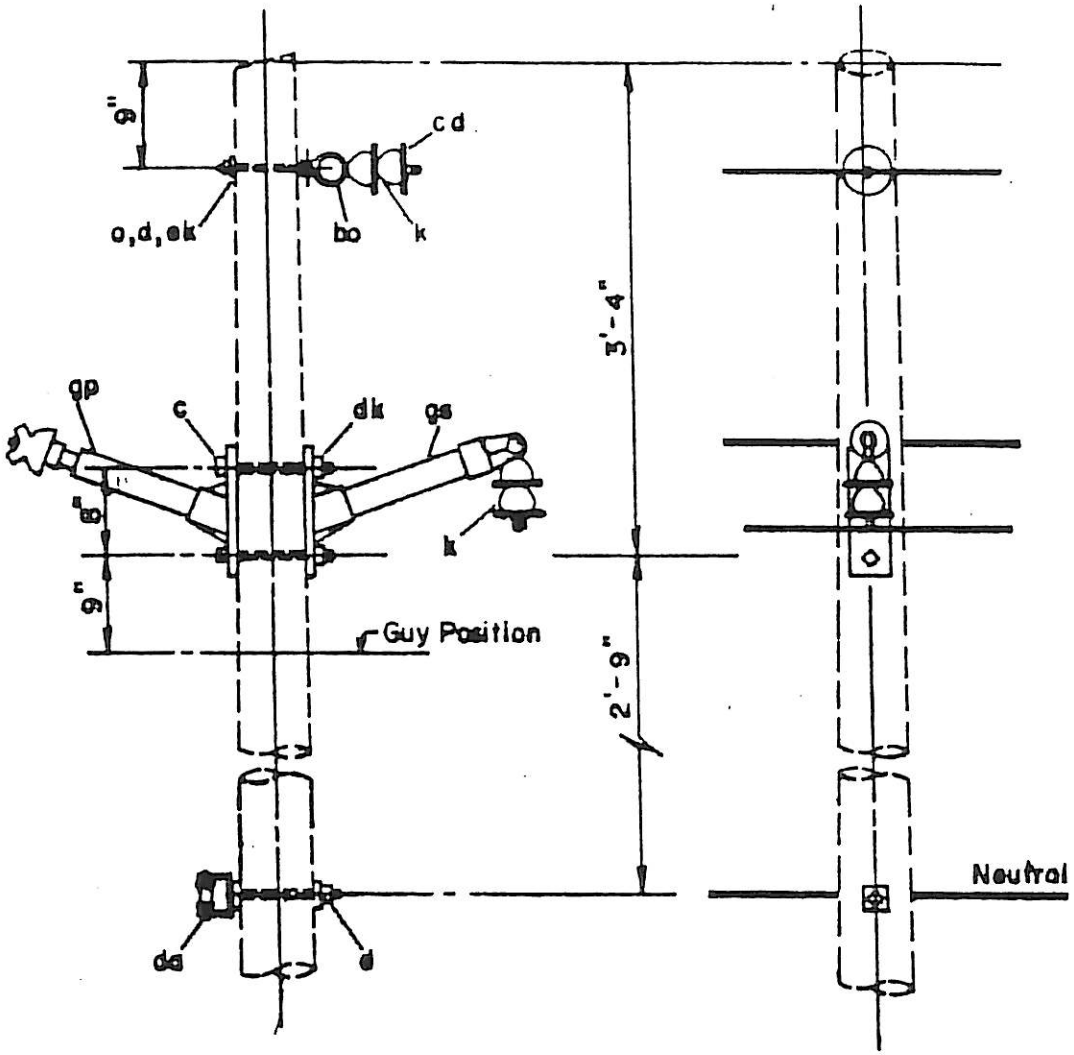
ITEM	NO	MATERIAL	ITEM	NO	MATERIAL
a	1	Insulator, pin type, 15 KV, gray glaze	dk	2	Washer, spring 11/16" ø
	2	PIN Pole Top	gs	1	Epoxy stand-off assembly, Chance C653-0291
gp	1	Epoxy stand-off assembly, Chance C653-0241	k	2	Insulator, suspension, gray glaze
c	2	Bolt, machine 5/8" x req'd. length	m	1	Clamp, suspension
da	1	Bracket, insulated			
d	1	Washer, 2 1/4" x 2 1/4" x 3/16", 13/16" ø			

DATE	REVISION	APP'D

7.2/12.5 KV 3-PHASE
ARMLESS CONSTRUCTION
PRIMARY SUPPORT ON 5° TO 18° LINE ANGLE

APP'D DATE

MASON COUNTY P.U.D. NO.1 | CAL2



For 4/0 ACSR max. conductor 2844 lbs.
max. tension at 0° F, 1/2" ice
475 lbs. min. tension at 120° F

Class 4 pole for 18°-21° angles
Class 3 pole for 22°-29° angles

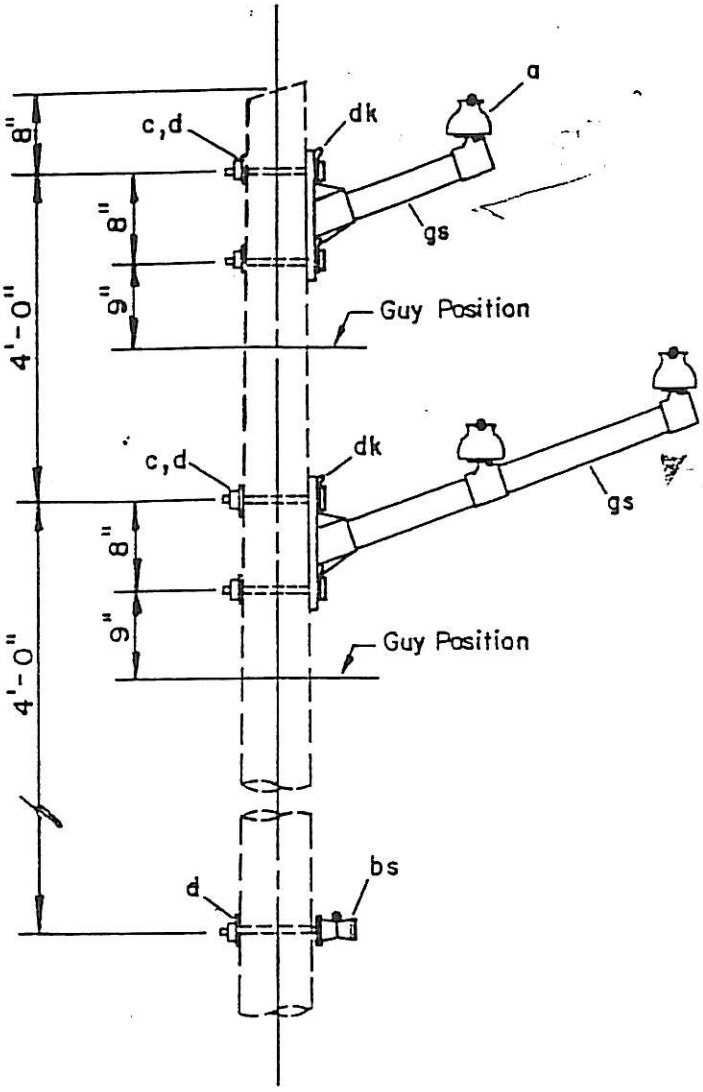
ITEM	NO	MATERIAL	ITEM	NO	MATERIAL
a	1	Insulator, pin type, 15kv gray glaze	dk	2	Washer, spring 11/16" ø
bo	1	Shackle, anchor	gs	1	Epoxy stand-off assembly Chance C653-029
gp	1	Epoxy stand-off assembly Chance C653-0241	k	4	Insulator, suspension, gray glaze
c	4	Bolt machine 5/8"x req'd length	cd	1	Angle assembly, primary
da	1	Bracket, insulated	ek		Lockouts
d	2	Washer, 2 1/4"x 2 1/4"x 3/16", 13/16" ø	o	1	Bolt, eye, 5/8"x req'd length

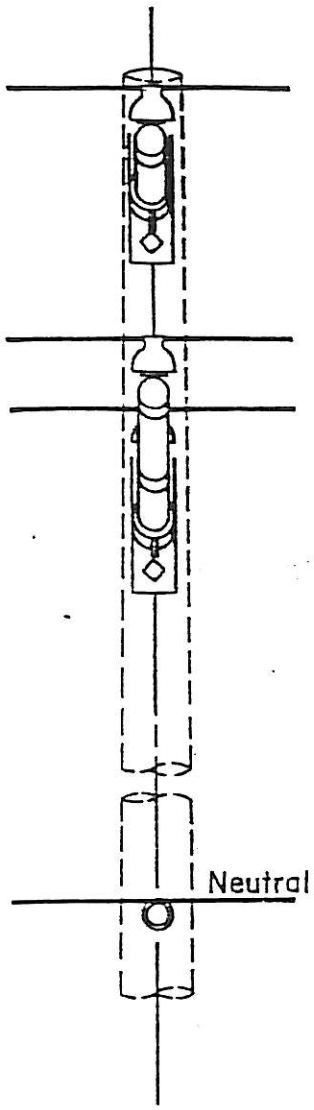
DATE	REVISION	APP'D

7.2/12.5 KV 3-PHASE ARMLESS CONSTRUCTION PRIMARY SUPPORT ON 18° TO 29° LINE ANGLE

APP'D DATE

MASON COUNTY P.U.D. NO.1 | CAL 3





For 4/0 ACSR max. conductor 2844 lbs.
max. tension at 0° F. 1/2" ice

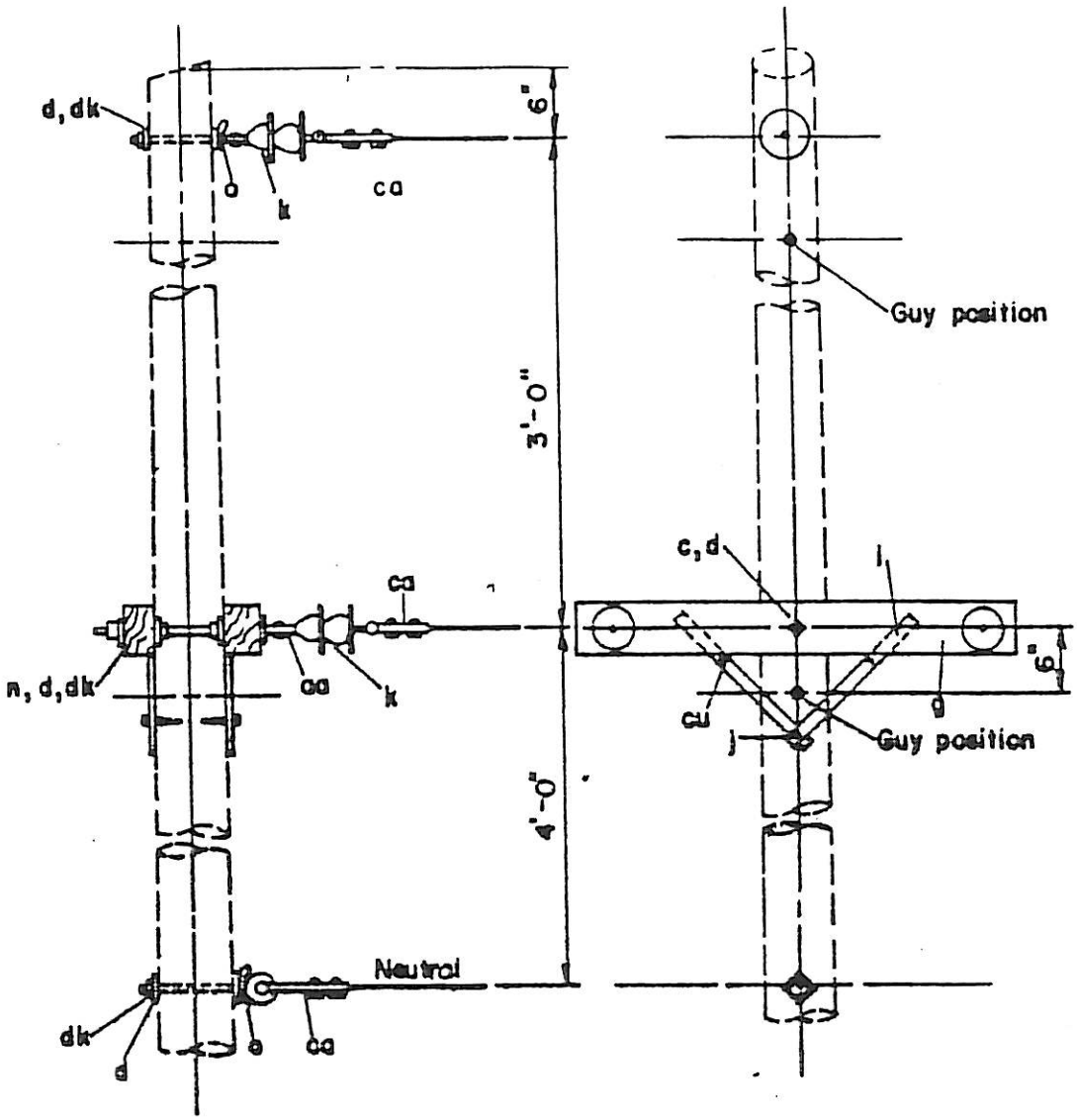
ITEM	NO.	MATERIAL	ITEM	NO.	MATERIAL
a	3	Insulator, pin type, 15KV, gray	dk	4	Washer, spring 11/16" hole
bs	1	Bolt, upset, w/ insulator	ek		Locknuts
c	4	Bolt, machine, 5/8"x req'd length	gs	1	Epoxy stand-off assem. Shakespeare 81C
d	5	Washer, 2 1/4"x2 1/4"x 3/16", 13/16" hole	gs	1	Epoxy stand-off assem. Shakespeare 89C

DATE	REVISION	APP'D

7.2/12.5 KV 3-PHASE
ARMLESS CONSTRUCTION
PRIMARY SUPPORT ON 0° TO 2° LINE ANGLE

APP'D DATE 5-83

MASON COUNTY P.U.D. NO. 1 | CAL 5



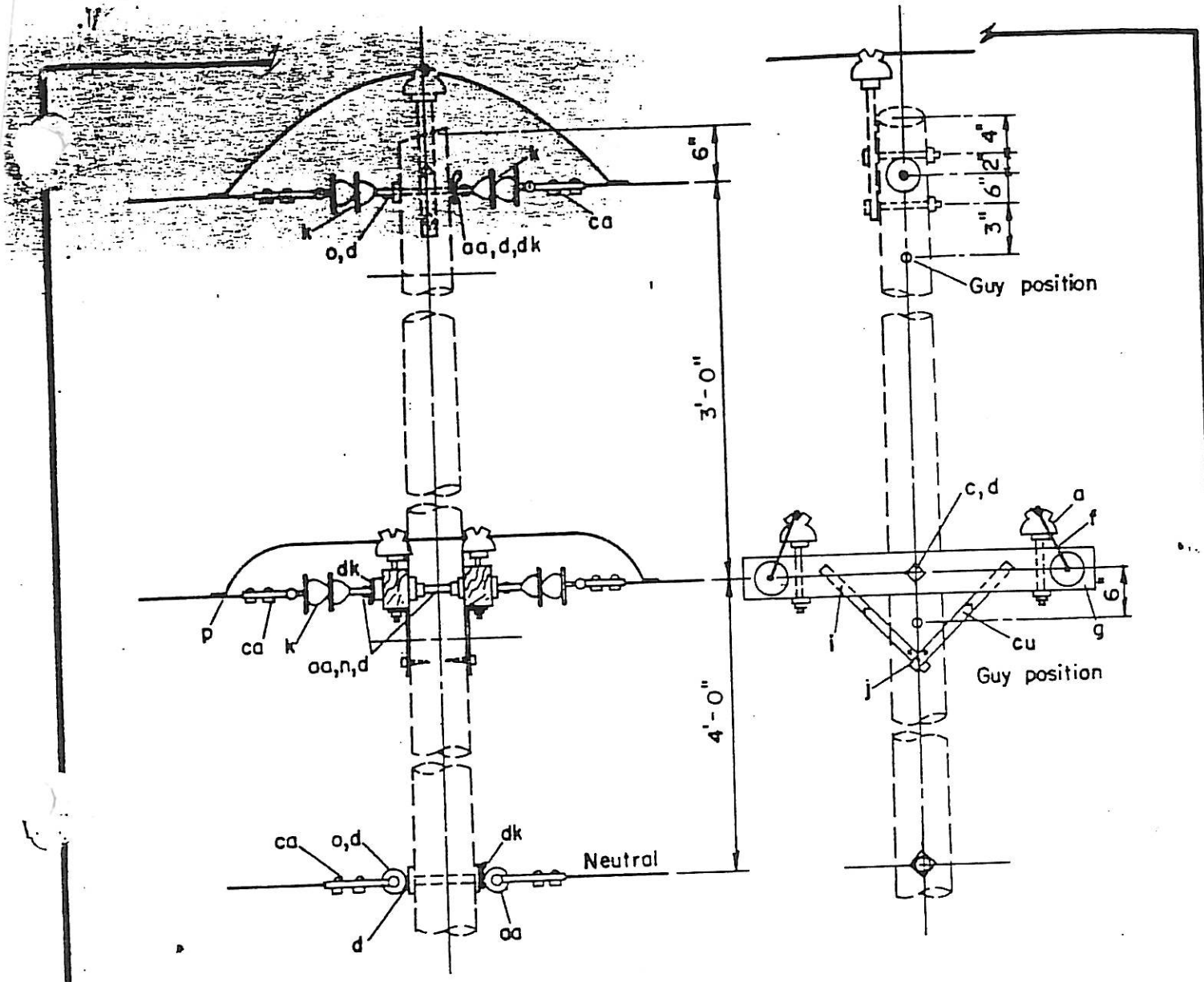
ITEM	NO	MATERIAL	ITEM	NO	MATERIAL
ca	4	Clamp, D.E. shoe, 2 bolts	n	2	Bolt, double arming 5/8" x req'd length
aa	2	Nut, eye, 5/8"	o	2	Bolt eye, 5/8" x req'd length
g	2	Crossarm, 3 3/4" x 4 3/4" x 72"	j	2	Screw, lag 1/2" x 4 1/2"
dk	4	Washer, spring 11/16" ø	l	4	Bolt, carriage, 3/8" x 4 1/2"
d	13	Washer, 2 1/4" x 2 1/4" x 3/16, 13/16" ø	cu	4	Brace, wood, 28"
c	1	Bolt, machine 5/8" x req'd length	k	6	Insulator, suspension, gray glaze

DATE	REVISION	APP'D

7.2/12.5 KV 3-PHASE
ARMLESS CONSTRUCTION
DEADEND (SINGLE)

APP'D DATE

MASON COUNTY P.U.D. NO.1 | CAL 7S



ITEM	NO	MATERIAL
aa	6	Nut, eye, 5/8"
f	4	Pin insulator, steel 5/8"
d	14	Washer, 2 1/4"x 2 1/4"x 3/16", 13/16" Ø
c	1	Bolt, machine, 5/8"x req'd length
dk	4	Washer, spring 11/16" Ø
a	4	Insulator, pin type, 15kv, gray glaze
k	12	Insulator, suspension, gray glaze

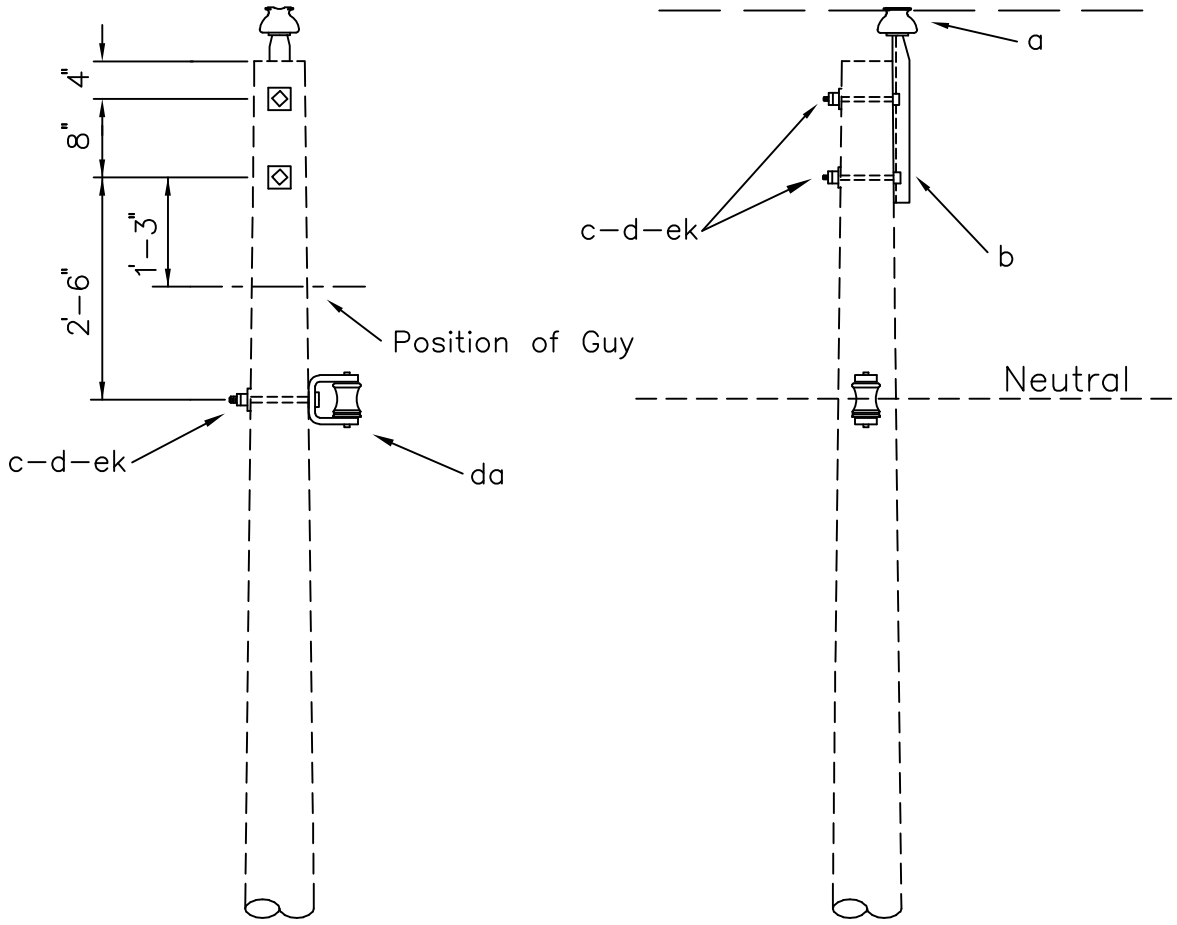
ITEM	NO	MATERIAL
ca	8	Clamp, D.E. shoe, 2 bolts
n	2	Bolt, double arming 5/8"x req'd, length
p		Connector, as req'd.
o	2	Bolt, eye, 5/8" x req'd. length
j	2	Screw, lag 1/2"x 4 1/2"
i	4	Bolt, carriage, 3/8"x 4 1/2"
cu	4	Brace, wood, 28"
g	2	Crossarm, 3 3/4"x 4 3/4"x 60"

DATE	REVISION	APP'D
4/25/73	SPACING	LWH

7.2/12.5 KV 3-PHASE ARMLESS CONSTRUCTION DEADEND (DOUBLE)

APP'D DATE

MASON COUNTY P.U.D. NO. 1 | CAL 8



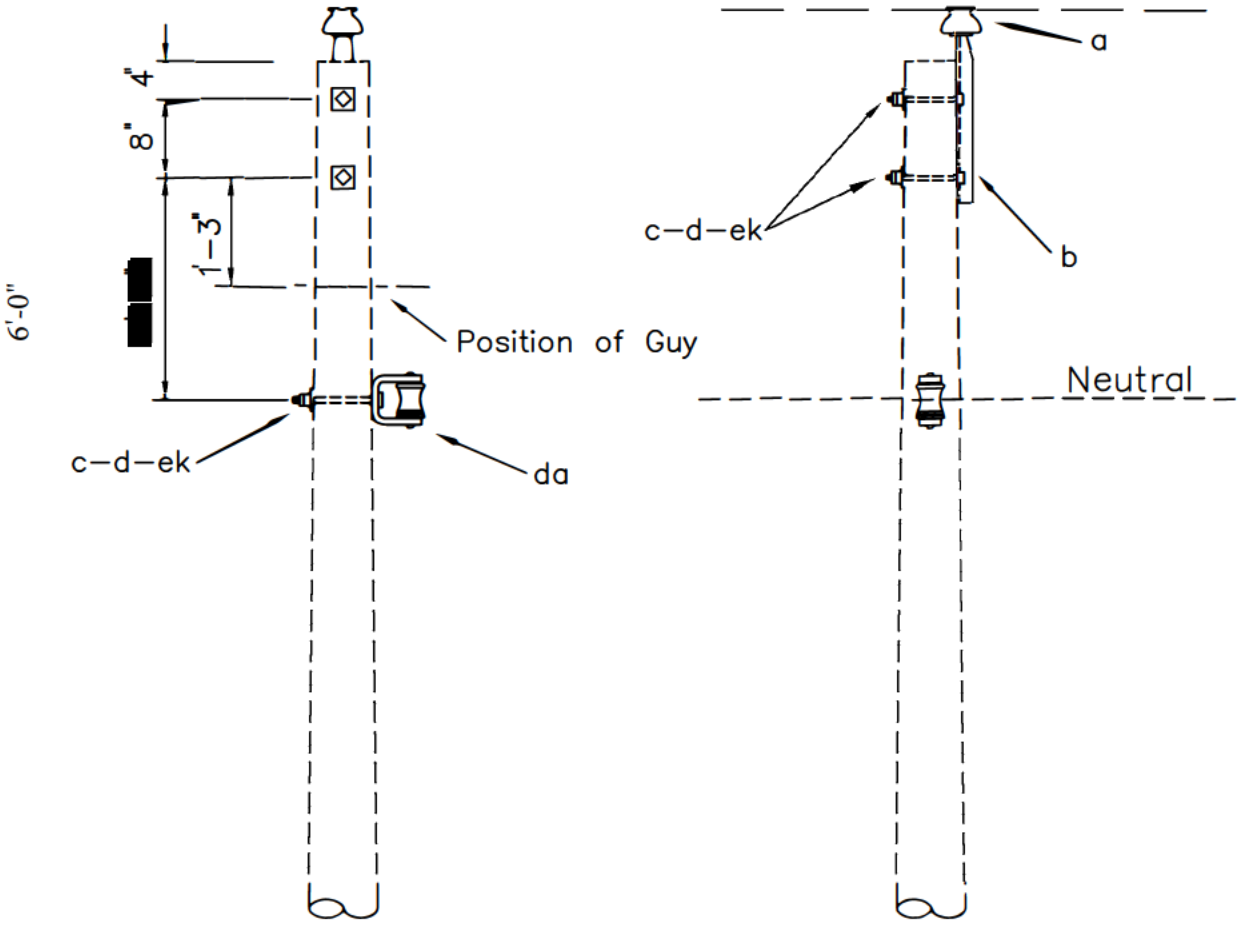
ITEM	QTY	MATERIAL
a	1	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20"
c	3	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	3	Locknuts

DESIGN PARAMETERS:

See TABLE I

SINGLE SUPPORT

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



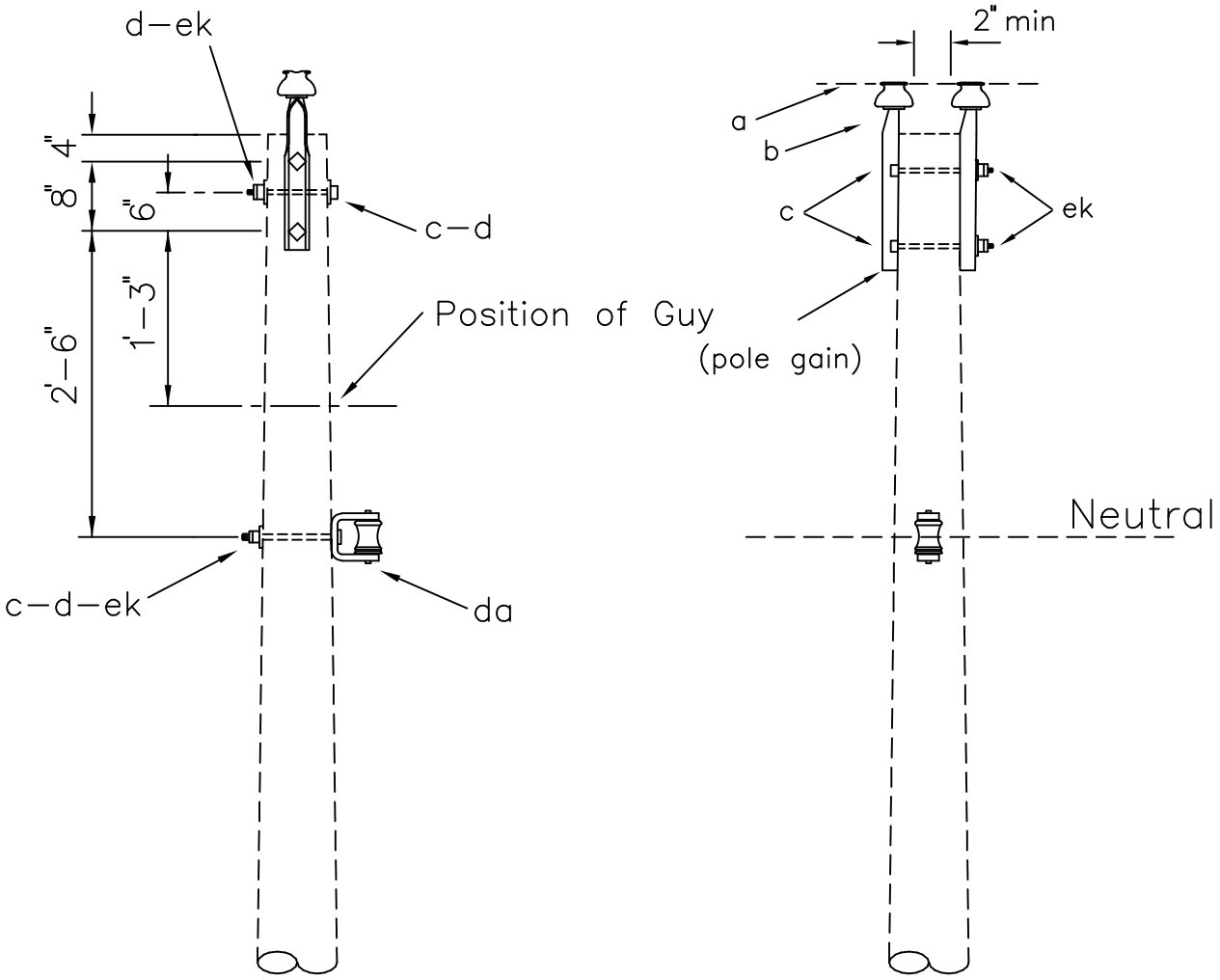
ITEM	QTY	MATERIAL
a	1	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20"
c	3	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	3	Locknuts

DESIGN PARAMETERS:

See TABLE I

SINGLE SUPPORT

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



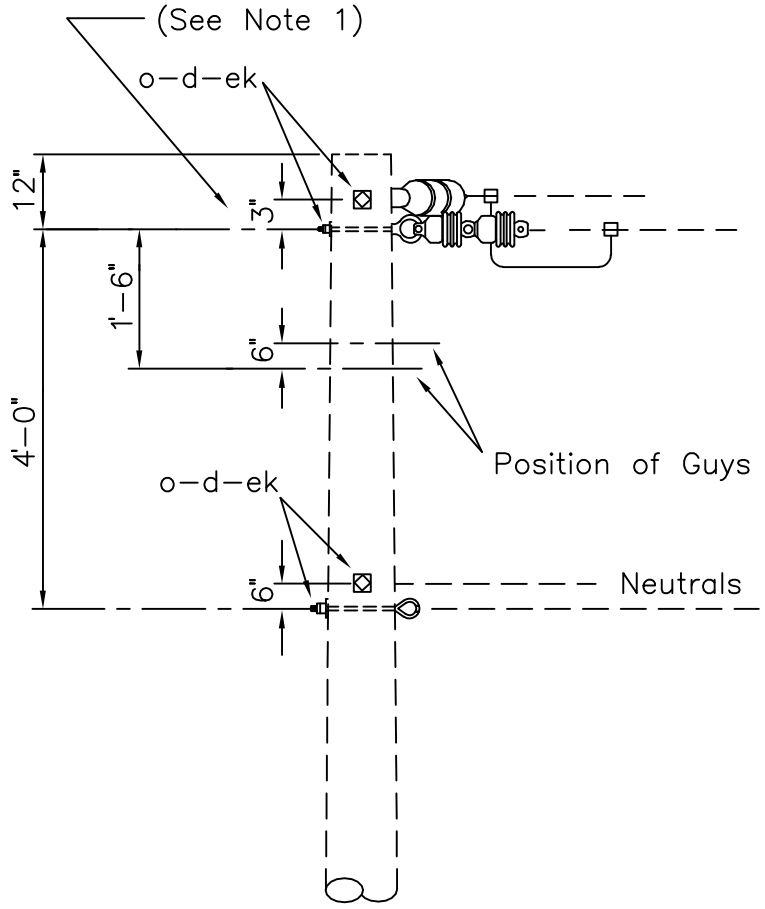
ITEM	QTY	MATERIAL
a	2	Insulator, pin type (12.47/7.2 kV)
b	2	Pin, pole top
c	4	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	4	Locknuts

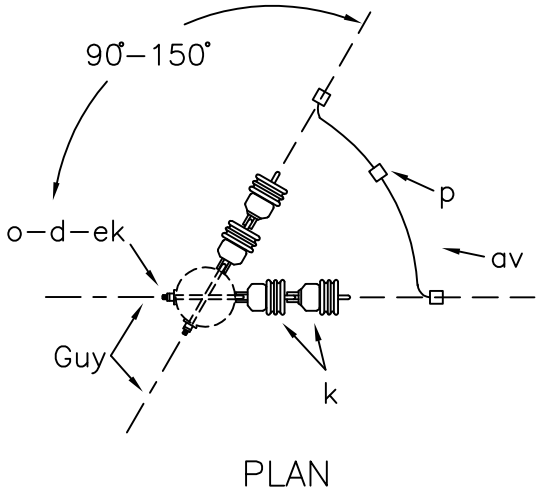
DESIGN PARAMETERS:

See TABLE III

DOUBLE SUPPORT

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





PLAN

NOTES:

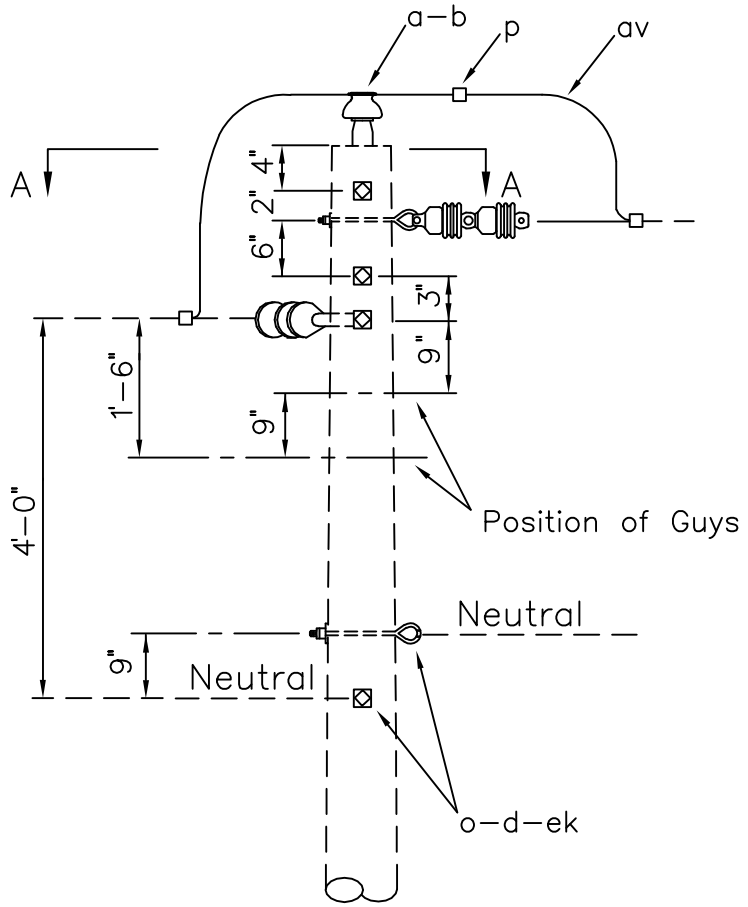
1, Separate 6" (top position only) when angle equals 90°.
2. Other combinations of deadend assemblies (A5.1 through A5.9) may be used, (e.g., two A5.3's; or one A5.1 plus one A5.7). Record alternative assemblies separately on staking sheets. CAUTION: Use the appropriate permitted longitudinal loads.

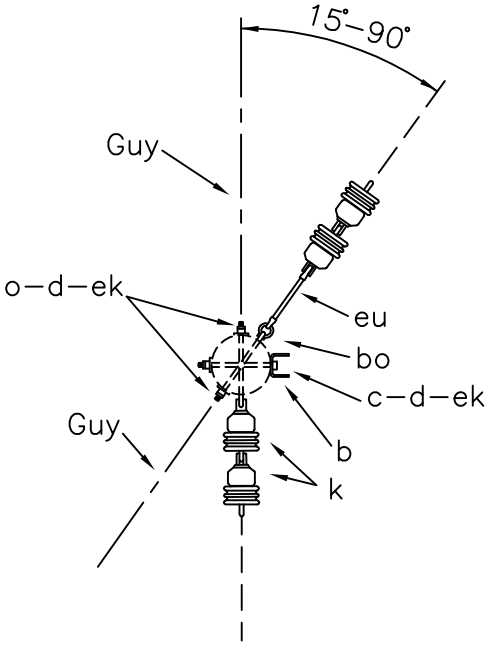
ITEM	QTY	MATERIAL
d	4	Washer, square, 3", curved
k	4	Insulator, suspension, 4 1/4"
o	4	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
av		Jumpers, as req'd
ek	4	Locknuts

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

DEADEND ANGLE (90°–150°)

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





SECTION A–A

NOTES:

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

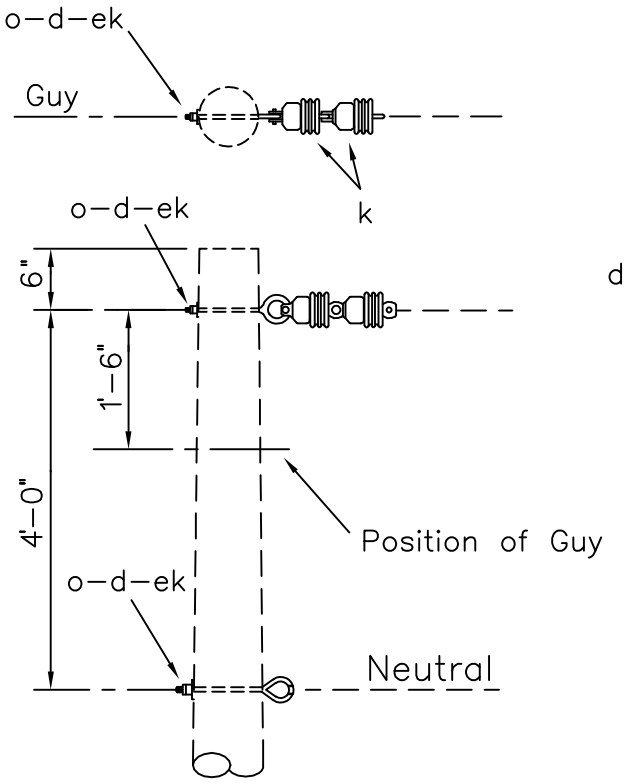
ITEM	QTY	MATERIAL
a	1	Insulator, pin type" "(12.47/7.2 kV)
b	1	Pin, pole top, 20 "
c	2	Bolt, machine, 5/8 x req'd length
d	2	Washer, square, 2 1/4 "
d	4	Washer, square, 3, curved
k	4	Insulator, suspension, 4 1/4
o	4	Bolt, eye, 5/8 x req'd length
p		Connectors, as req'd
av		Jumpers, as req'd
bo	1	Shackle,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

DESIGN PARAMETERS:

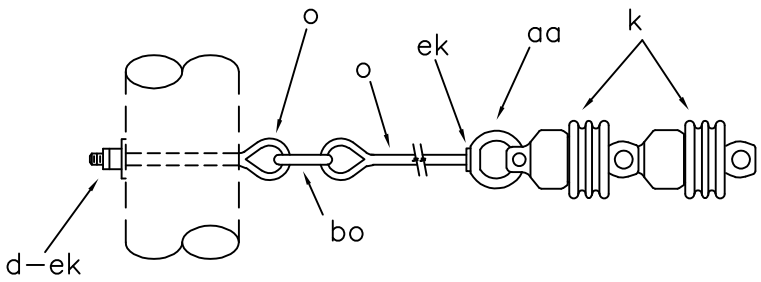
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE (15°–90°)

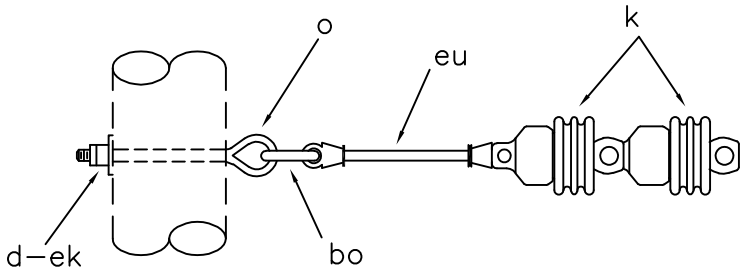
APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A4.2



A5.1



A5.2



A5.3

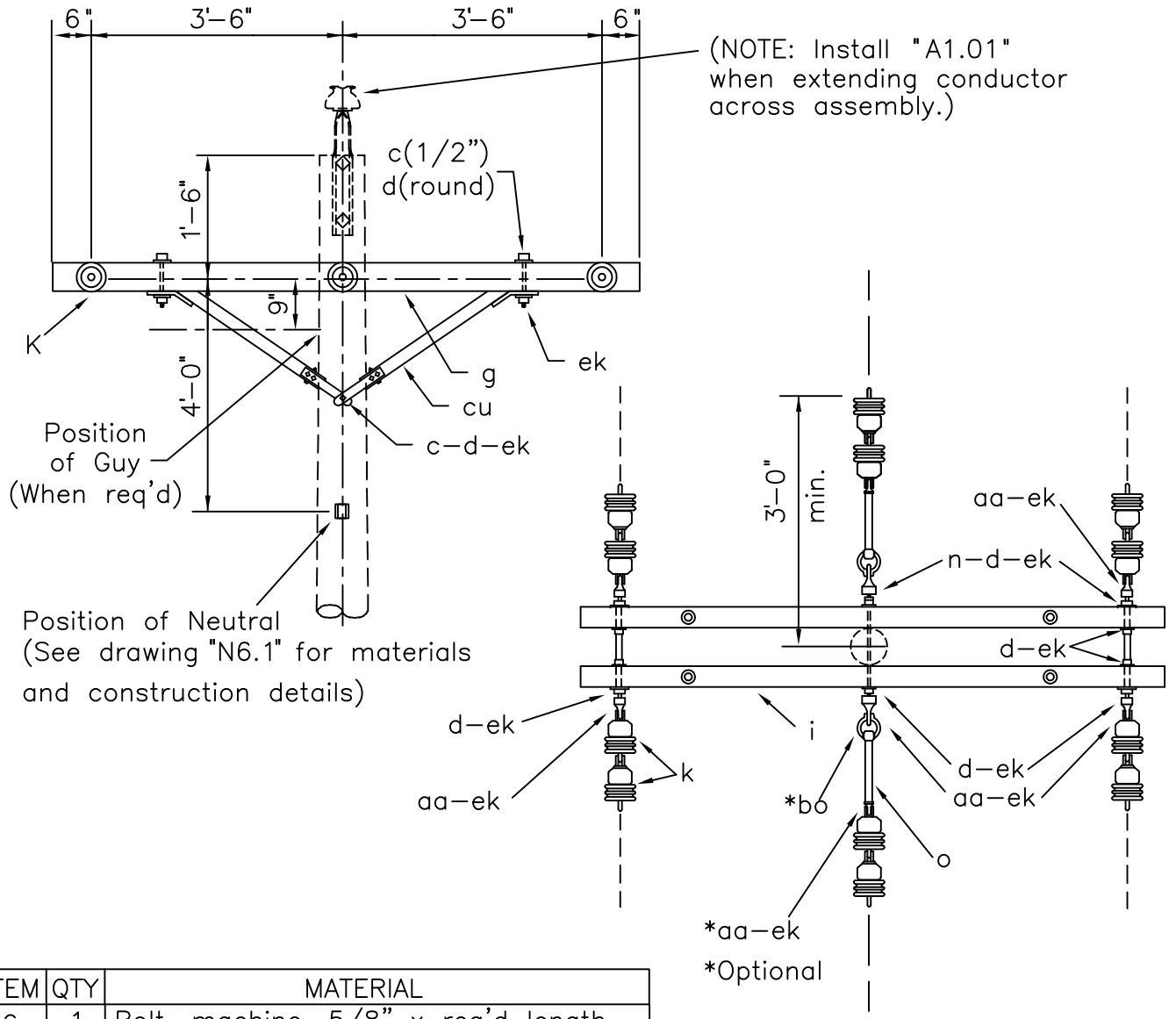
NOTE: When connecting to existing bolt end, use eyenut "aa" and locknut "ek" instead of eyebolt subassembly "o–d–ek".

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

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

SINGLE DEADENDS

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



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

NOTES:

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

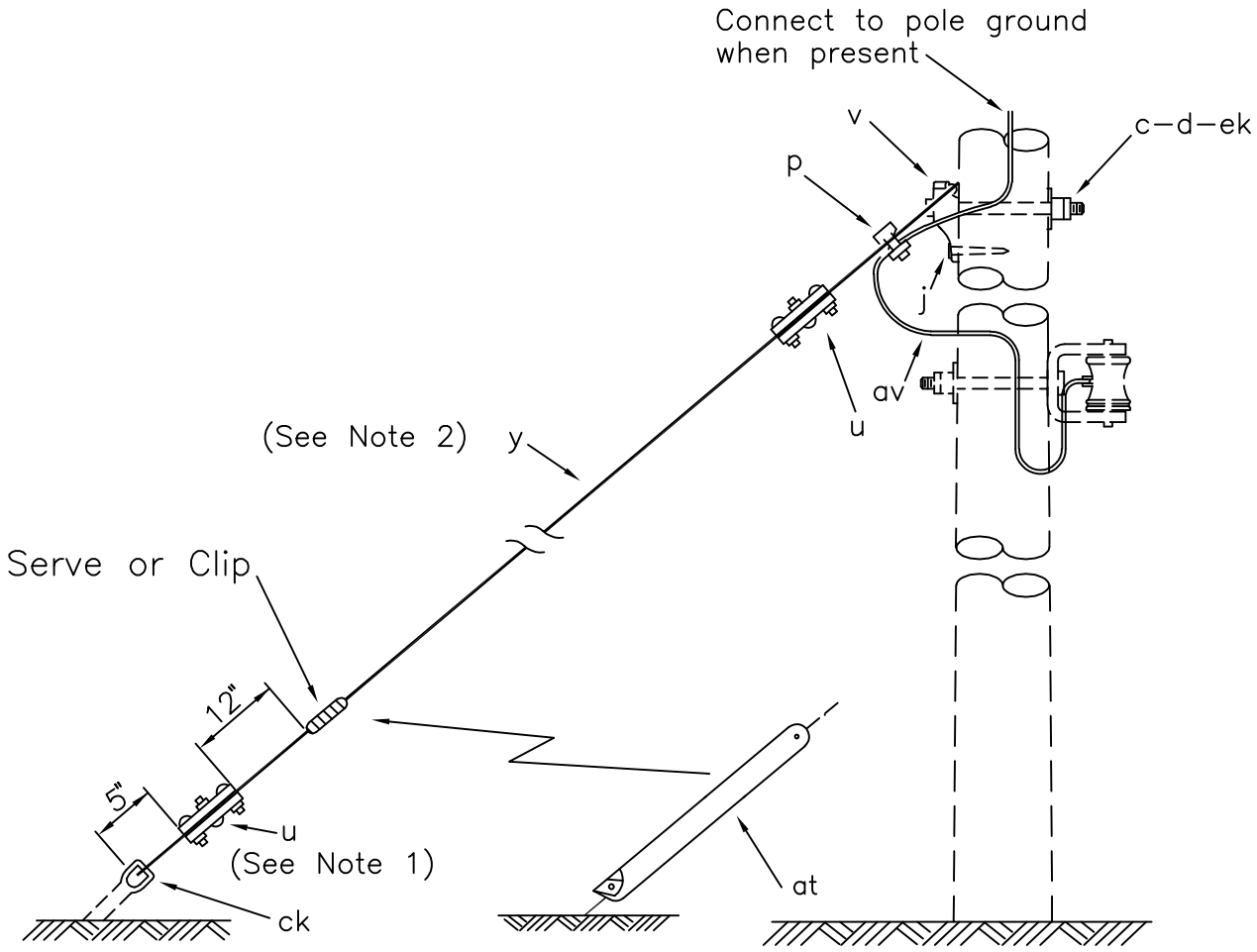
DESIGN PARAMETERS:

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

MAXIMUM LINE ANGLE = 5°
(See Note 2)

DOUBLE DEADEND ON CROSSARMS (LARGE CONDUCTORS)

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



NOTES:

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

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

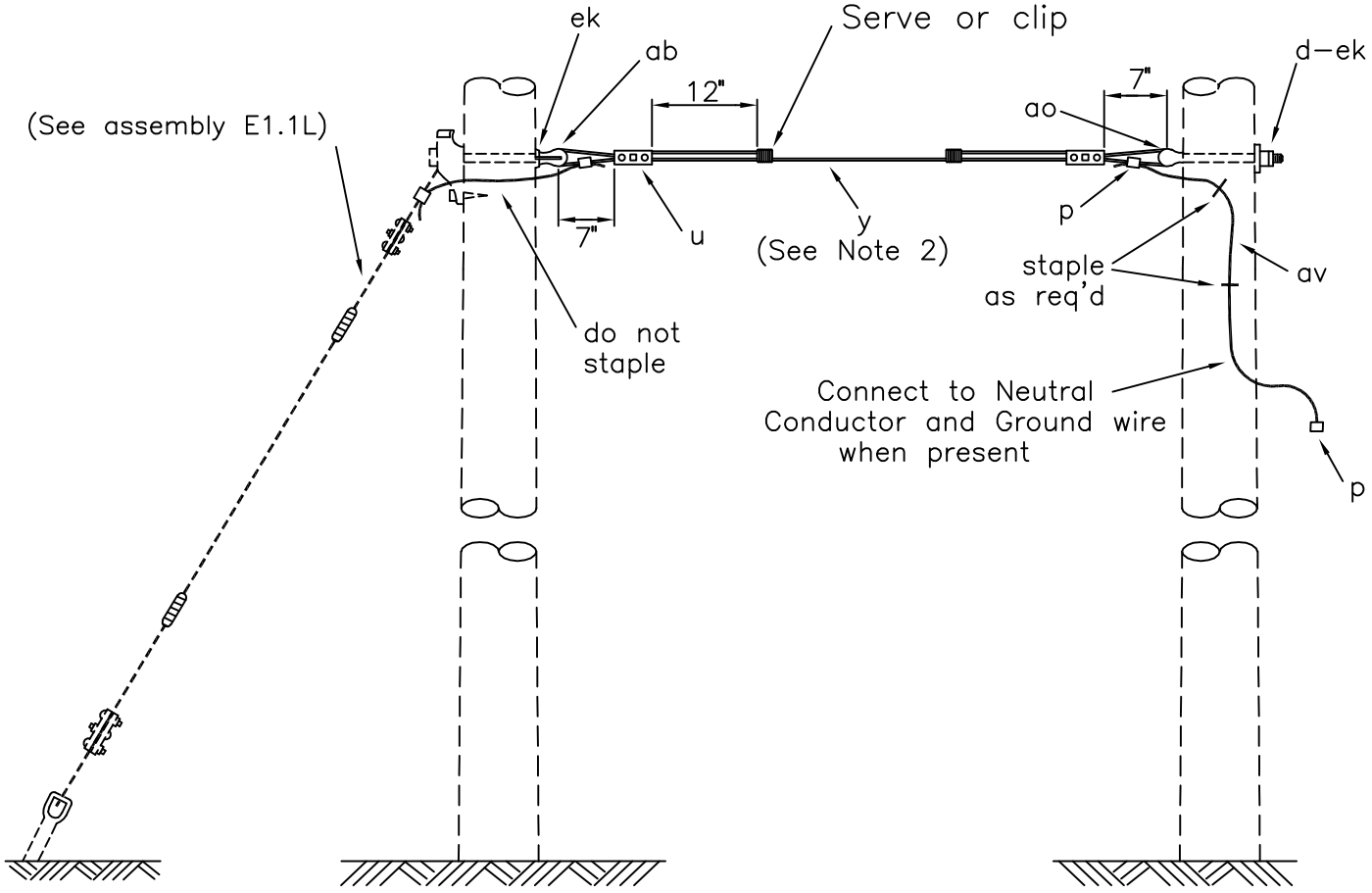
3. 2–5/8 machine bolts and 2–3 square curved washers may be used to install guy attachment.
4. Specify guy wire size, type and required length.

DESIGN PARAMETERS:

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

SINGLE DOWN GUY – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005		E1.1L
RUS		(E1–3)



NOTES:

1. Other accepted and equivalent, 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.

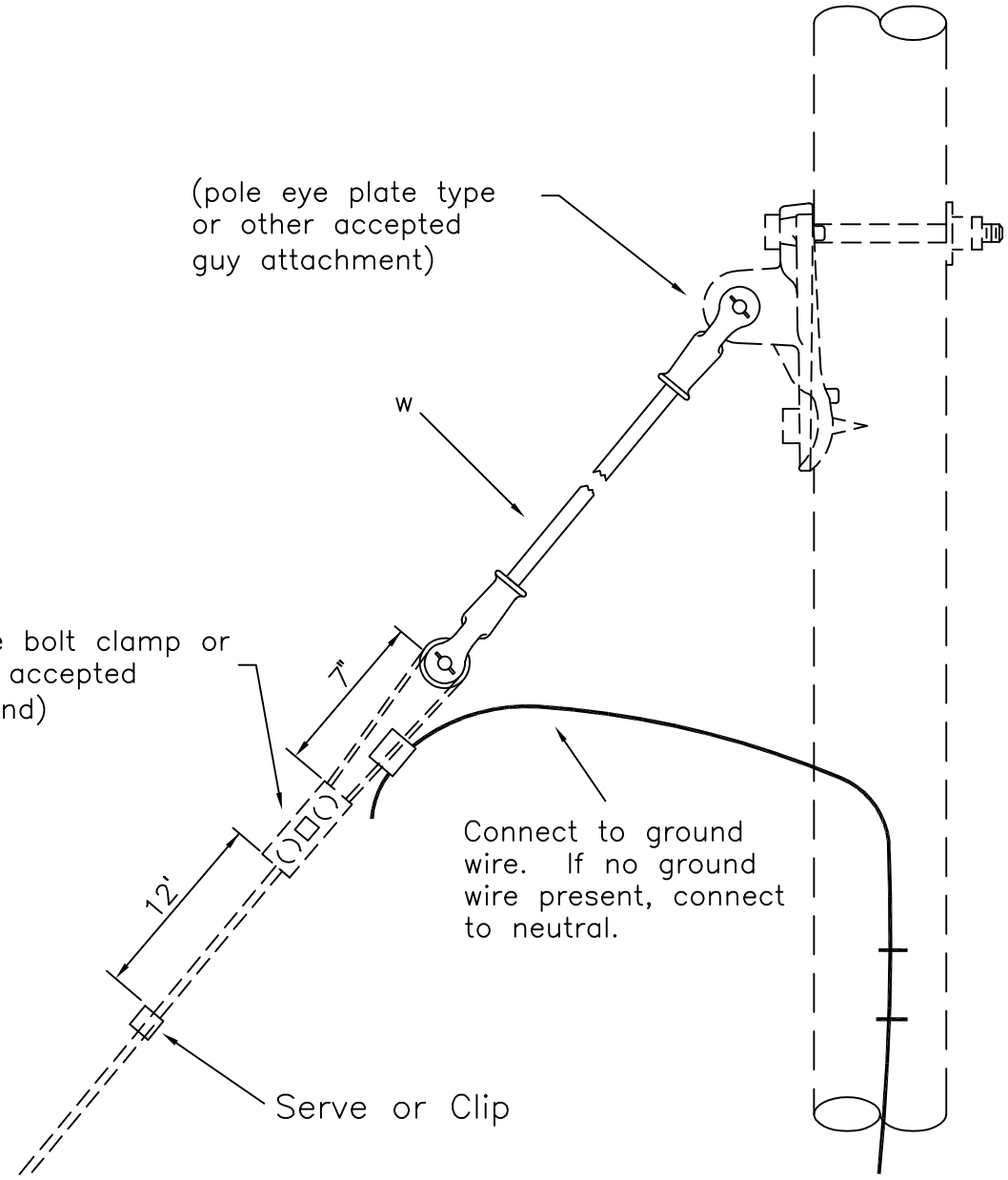
ITEM	QTY	MATERIAL
d	1	Washer, 4" square, curved
p		Connectors, guy bond and as req'd
u	2	Guy Grip, 3/8" EHS, Preformed
y	60'	Guy Grip, 3/8" EHS, Automatic
ab	1	Nut, thimble eye type, 3/4"
ao	1	Bolt, thimble eye, 3/4"x req'd length
av		Jumpers, as req'd
ek	2	Double Coil Spring Lock Washer 3/4"

DESIGN PARAMETERS:

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

SINGLE OVERHEAD GUY – HEAVY DUTY (THROUGH BOLT TYPE)

APRIL 2005		E1.4L (E2–3)
RUS		



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

ITEM	MATERIAL
w	Insulator, Guy Strain, 21,000 lbs. Ultimate

DESIGN PARAMETERS:

PERMITTED LOAD = 8,500 lbs.

GUY STRAIN INSULATOR

APRIL 2005		
RUS		E1.5

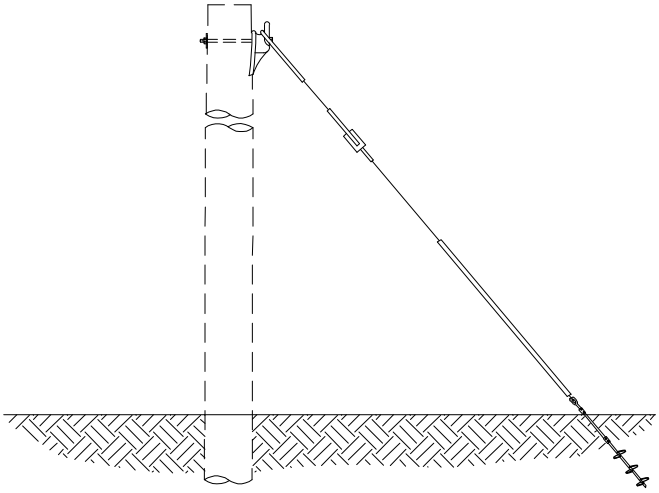
SCOPE

This section covers selection of down guys, span guys, sidewalk guys, push braces and anchors. The selections are based upon wood strengths, guy component strengths, anchor strengths and soil holding power of anchors.

DEFINITIONS (Taken from The Lineman's and Cableman's Handbook, Seventh Edition)

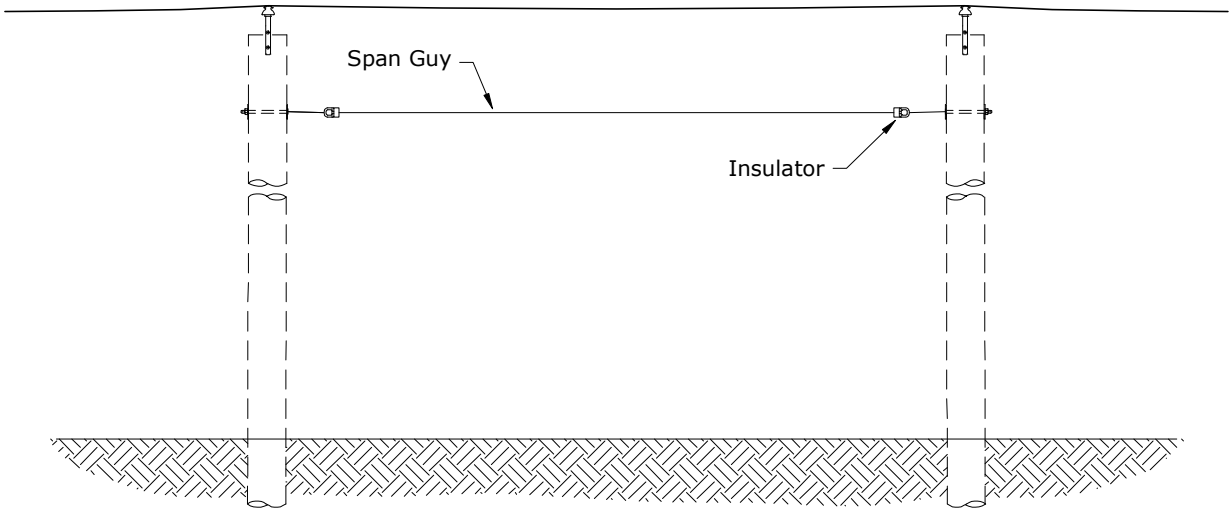
1. Down Guy-

Consists of a wire running from the attachment near the top of the pole to a rod and anchor installed in the ground.



2. Span Guy-

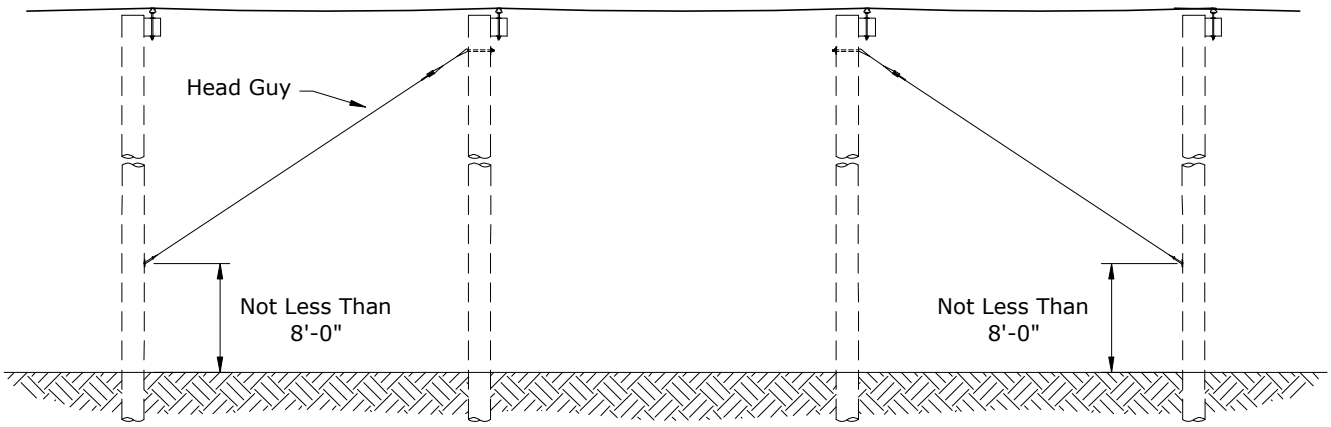
Consists of a guy wire installed from the top of a pole to the top of an adjacent pole to remove the strain from the line conductors.



Rev 2: Added definitions and updated to 2007 NESC.

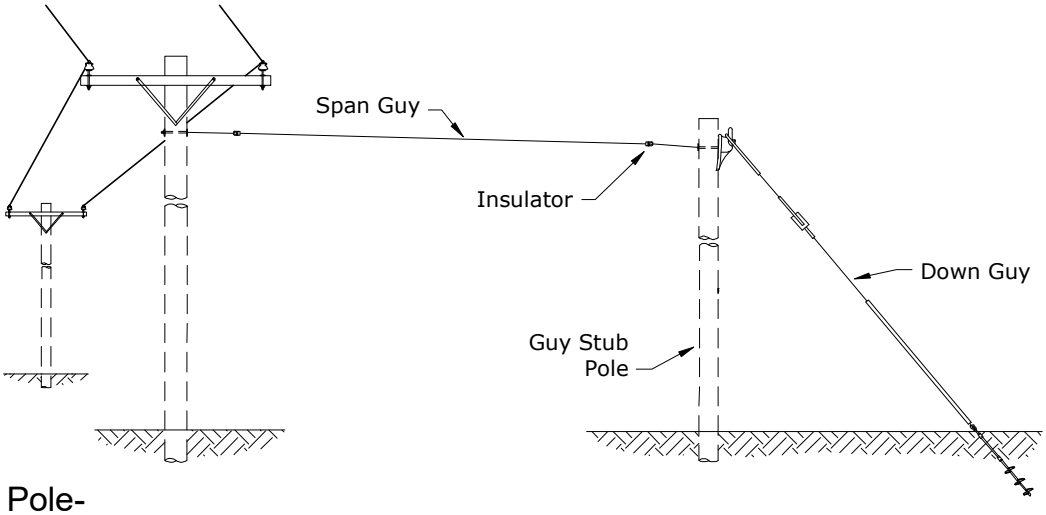
3. Head Guy-

A guy wire running from the top of a pole to a point below the top of the adjacent pole.



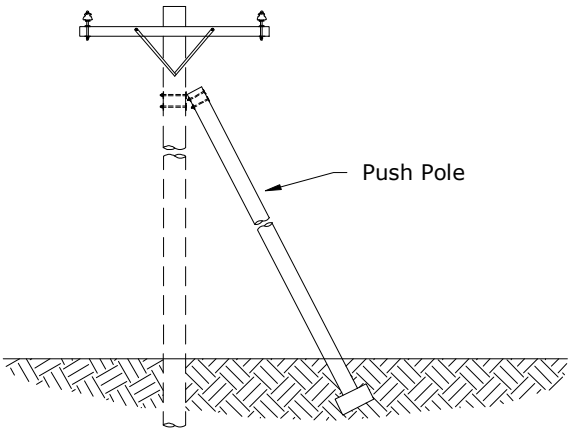
4. Guy Stub-

A guy wire installed between a line pole and a stub pole. The span guy, guy stub pole, and the down guy make up the guy stub.



5. Push Pole-

A pole used as a brace to a line pole.



Rev 2: Added definitions and updated to 2007 NESC.

GENERAL

1. Guying

a) Guying assemblies include down, span and sidewalk types. A push brace consisting of a pole and attachment fittings may be used in place of tensioned wire guying only where tension guying is impossible by reason of location or rights-of-way.

b) Guying requirements can often be advantageously combined on a deadend pole, a span or more away by extending the circuit or by use of span guys in order to provide a reduced combined guying load on the same pole. A sidewalk guy is an expensive method of guying and provides limited support, particularly on taller poles, due to the comparatively short guy lead. DO NOT use a sidewalk guy if a down or span guy is possible.

c) Guy assemblies are designed for the maximum allowable load which may be supported by the pole and the related hardware. Heavy duty guying will normally require the use of multiple guying attachments.

d) A guy marker shall be used on all down guy and sidewalk guy locations. A minimum of one marker per anchor is required. It should be noted that guy markers DO NOT PROTECT OR "GUARD" a down/sidewalk guy, but rather warn the public of its presence.

2. Sidewalk Guy Insulation

Sidewalk guys shall have guy insulators installed in the guy strand above the horizontal guy strut. The breakers should be at a point that will allow at least 6" clearance between the breaker and the strut attachment to the pole, should the guy wire become broken.

3. Grounded Guys

Grounded guys shall not be used. All guys on transmission and distribution circuits shall have insulation sections (Johnny balls or fiberglass rods) installed on all new and rebuilt circuits. Grounded guys are to be replaced by insulated guys when work is done on that pole.

4. Application of Guy Insulators

It is impractical to show every NESC requirement for applying guy strain insulators. A clear understanding of the rules will provide for the correct applications. These guidelines will help in understanding the requirements.

Guideline 1 (see figure #1) - All down guys shall have a minimum of one guy insulator. (NESC 215C2)

Guideline 2 - All span guys will have a minimum of two guy insulators. (NESC 215C5)

Guideline 3 (see figure #2) - On jointly used poles, down guys that pass within 12 inches of supply conductors, and also pass within 12 inches of communication cables, shall be insulated with a guy insulator at a point below the lowest supply conductor and above the highest communication cable. (NESC 235I)

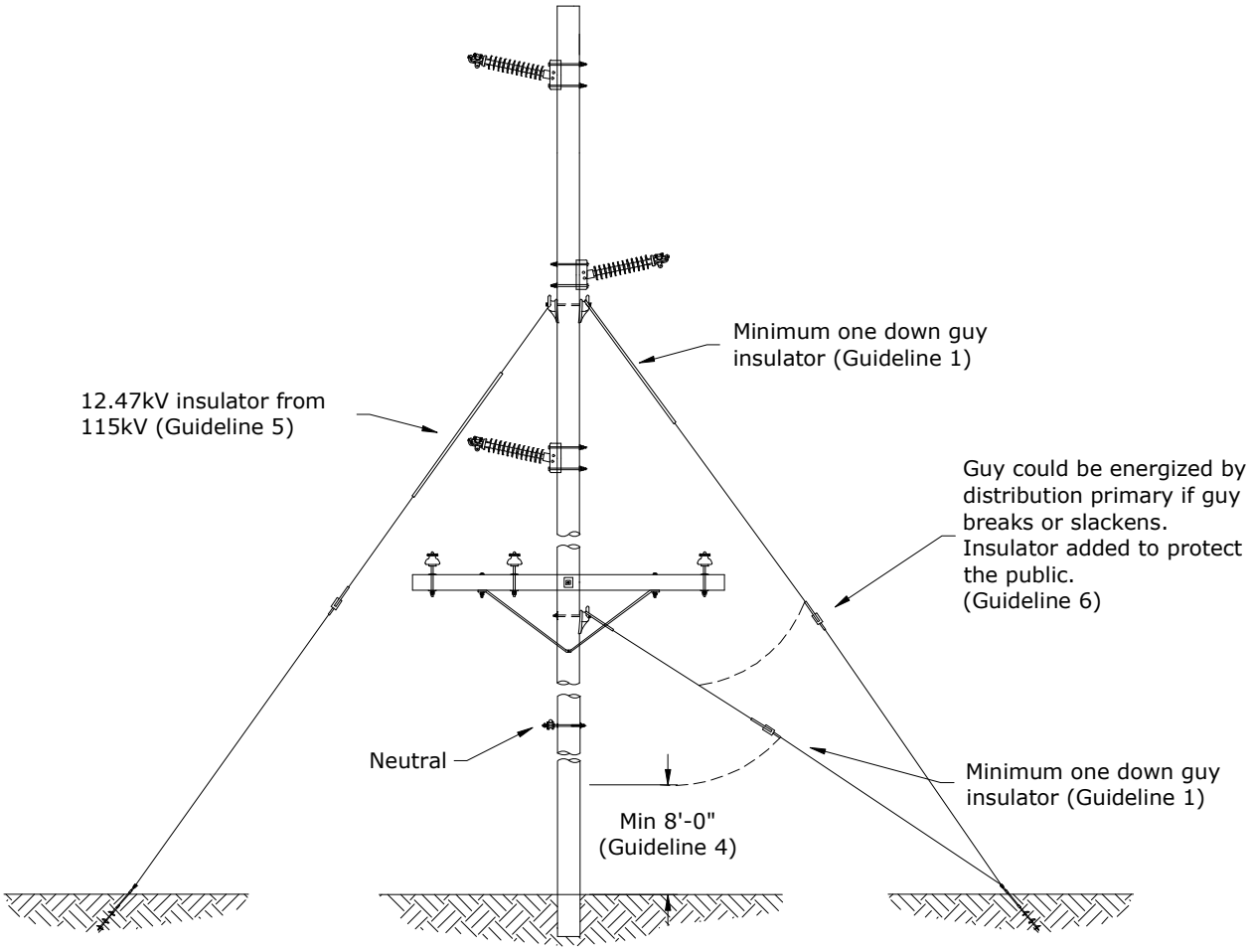
Guideline 4 (see figure #1) - All guy insulators shall be located at least 8 feet above the ground including when the guy would sag or break. (NESC 215C5a)

Rev 2: Added definitions and updated to 2007 NESC.

Guideline 5 (see figure #1) - Guy insulators shall be placed so that in case any guy wire contacts, or is contacted by an energized conductor or part, the voltage will not be transferred to other facilities on the structure. (NESC 215C5b)

Guideline 6 (see figure #3) - Guys may sag or break, bringing them into contact with energized conductors, jumpers, or bushings to create a hazard to the public. Guy insulators shall be placed so that when any guy sags down or falls upon another facility, the insulators will remain effective. (NESC 215C5c)

Figure 1: Guidelines 1, 4, 5, and 6



Rev 2: Added definitions and updated to 2007 NESC.

Figure 2: Guying near communication cable (Guideline 3)

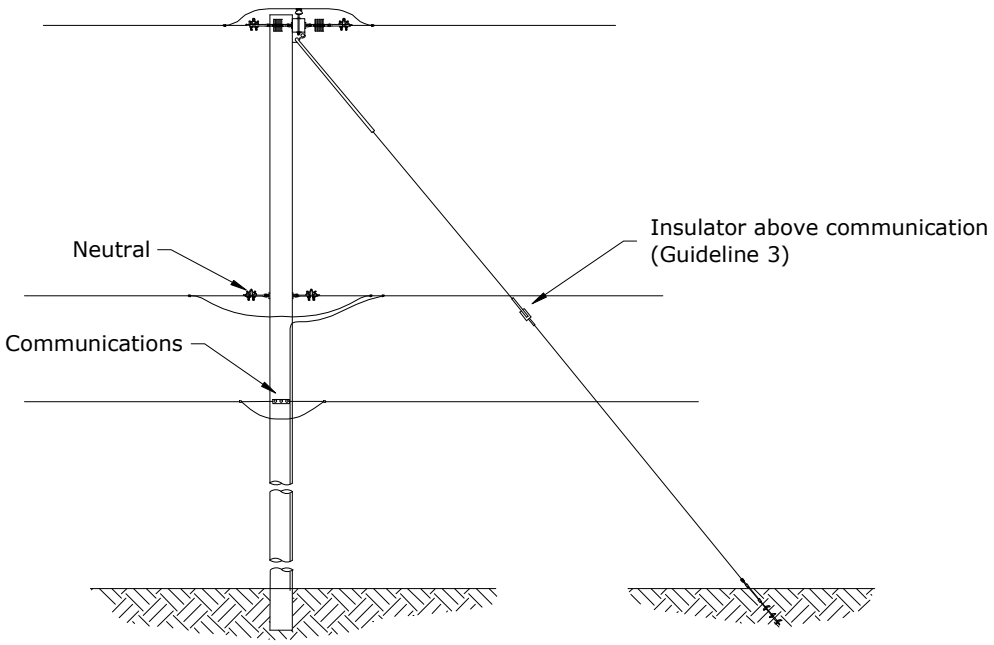
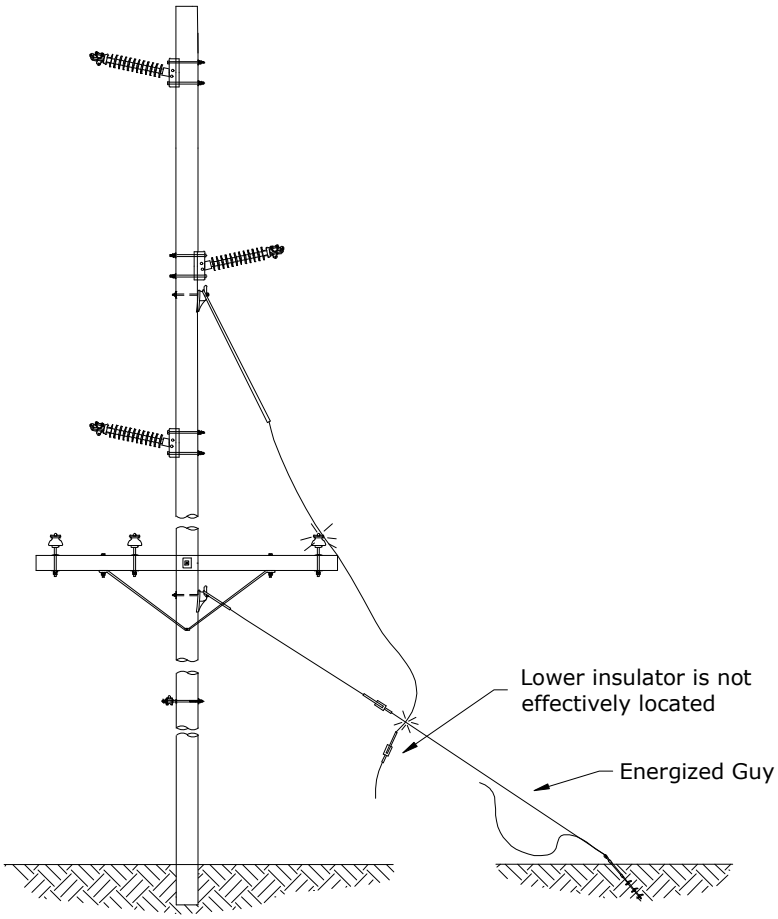
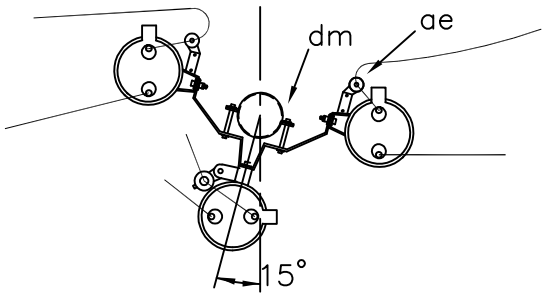


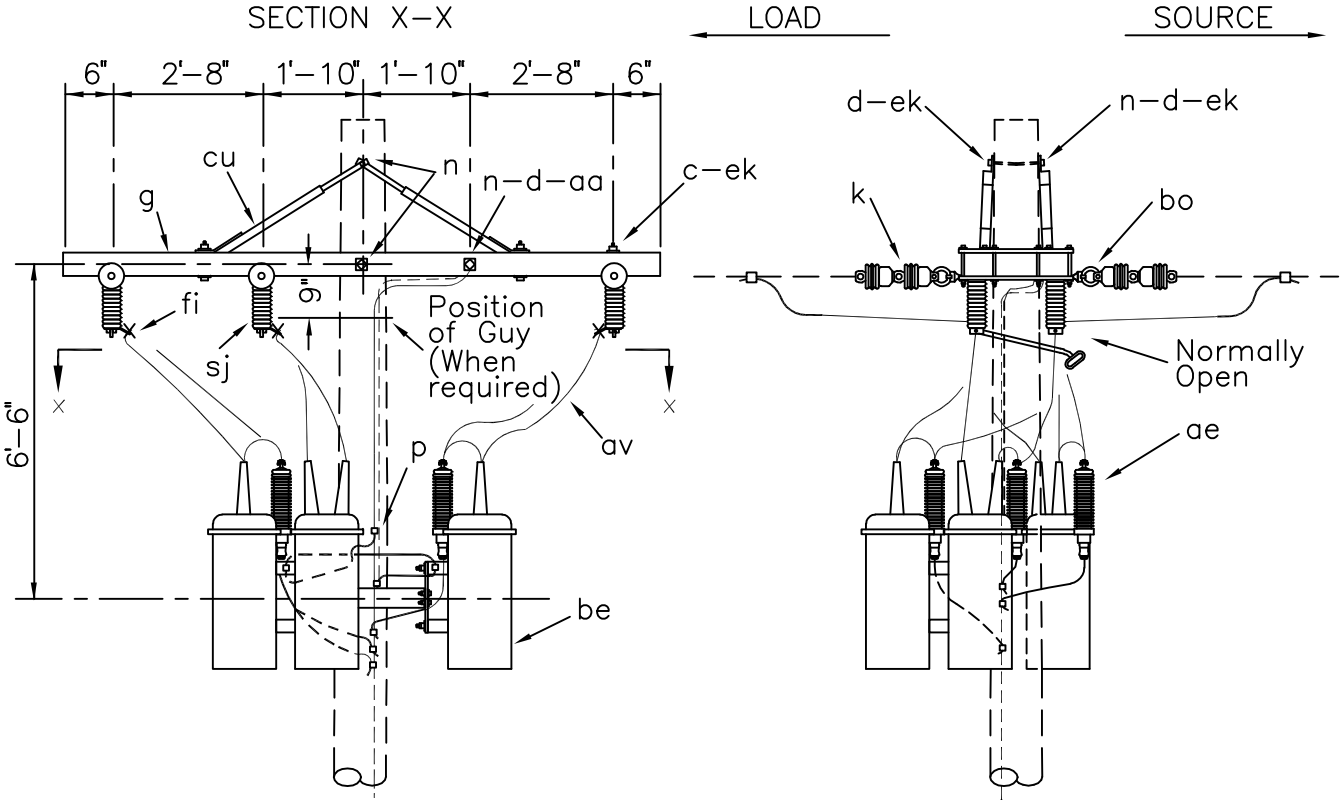
Figure 3: Allow for guys to sag or break (Guideline 6)



Rev 2: Added definitions and updated to 2007 NESC.



SECTION X–X



NOTES:

1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. For 2–phase installations, omit recloser and related items on center phase and designate as "R2.2".
3. Each recloser tank shall have two connections to ground.

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	14	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	10	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 10'–0"
k	12	Insulator, suspension, 4 1/4"
n	3	Bolt, double arm, 5/8" x req'd length
p		Connectors, as required
aa	2	Nut, eye, 5/8"
ae	3	Arresters, surge, (9 kV)

ITEM	QTY	MATERIAL
av		Jumpers, stranded, as req'd
be	3	Recloser, oil circuit (12.47 kV)
bo	6	Shackle, anchor
cu	2	Brace, wood, 60" span
dm	1	Bracket, cluster type with 14"adapter
		plate
ek	28	Locknuts
fi	6	Connector, hot line
sj	3	Switch, OCR, by–pass, (15 kV)

(THREE) OIL CIRCUIT RECLOSERS (WITH BYPASS SWITCHES)

APRIL 2005	3 – PHASE PRIMARY	R2.2,R3.2
RUS	12.47/7.2 kV	(M3–24A),(M3–25A)

INDEX A

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

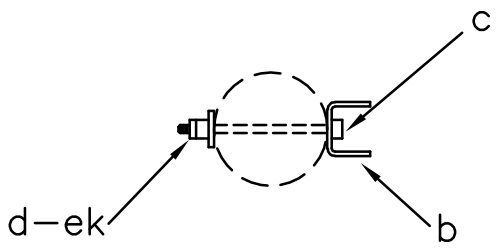
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804	**Bulletin 50-3**	
(New)	(Old)	
A1.01	(M5-2)	SINGLE SUPPORT - PRIMARY
A1.01P	(M5-18)	
A1.011	(M5-5)	
A1.011P	(M5-7)	
A1.011L		
A1.04N		SINGLE SUPPORT – NARROW PROFILE
A1.04NP		
A1.1	(A1)	SINGLE SUPPORT (TANGENT)
A1.2	(A1A)	
A1.1P	(A1P)	SINGLE SUPPORT (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

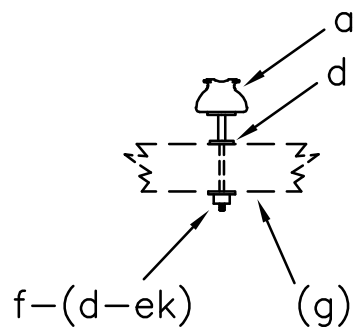
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
A2.1P	(A1-1P)	DOUBLE SUPPORT (TANGENT) (POST INSULATORS)
A2.2P	(A1-1AP)	
A2.3	(A2)	DOUBLE SUPPORT
A2.3P	(A2P)	DOUBLE SUPPORT (POST INSULATORS)
A2.4N		DOUBLE SUPPORT – NARROW PROFILE (TANGENT)
A2.5N		
A2.4NP		DOUBLE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

SINGLE-PHASE PRIMARY POLE TOP ASSEMBLY UNITS

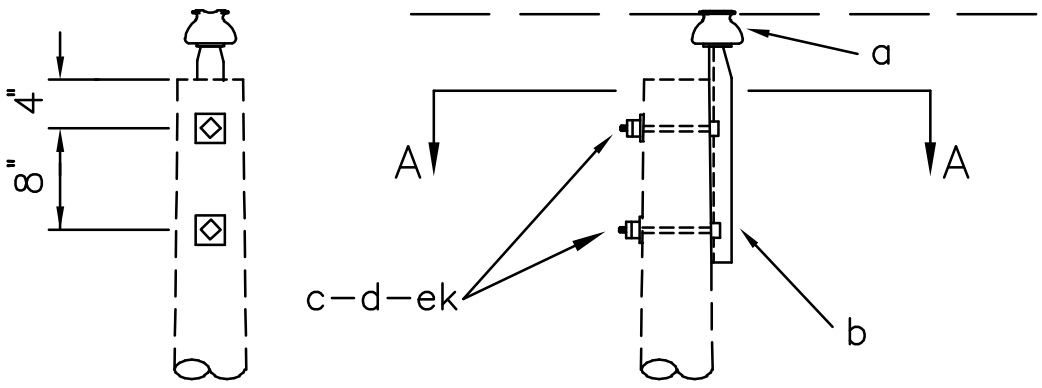
DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-804 (New)	**Bulletin 50-3** (Old)	
A5.4		SINGLE DEADENDS
A5.5		
A5.6		
A5.7		
A5.8		
A5.9		
A5.2G		SINGLE PHASE TAP GUIDE
A5.3NG		SINGLE PHASE TAP GUIDE – NARROW PROFILE
A5.4NG		SINGLE PHASE TAP GUIDE – NARROW PROFILE (WITH CUTOUT AND ARRESTER)
A5.21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



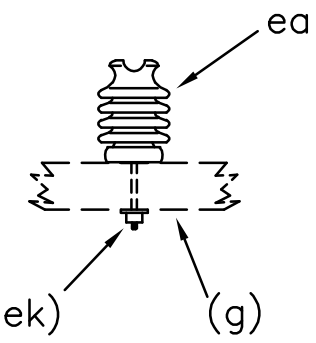
SECTION A–A



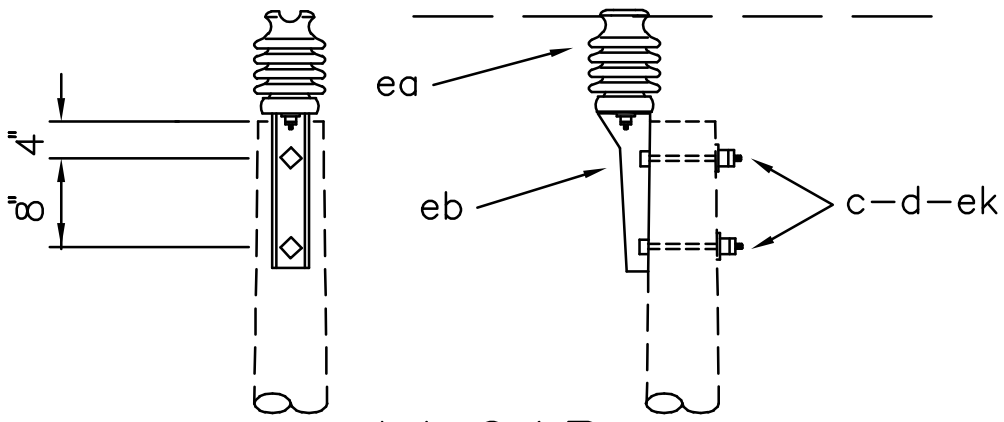
A1.011



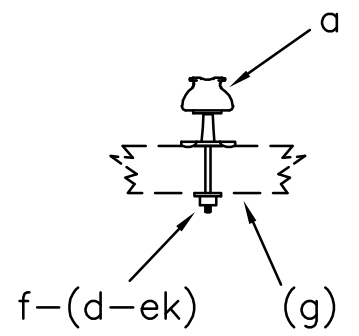
A1.01



A1.011P



A1.01P



A1.011L

ASSEMBLY: A1.

ITEM	MATERIAL	01 QTY	01P QTY	011 QTY	011P QTY	011L 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			

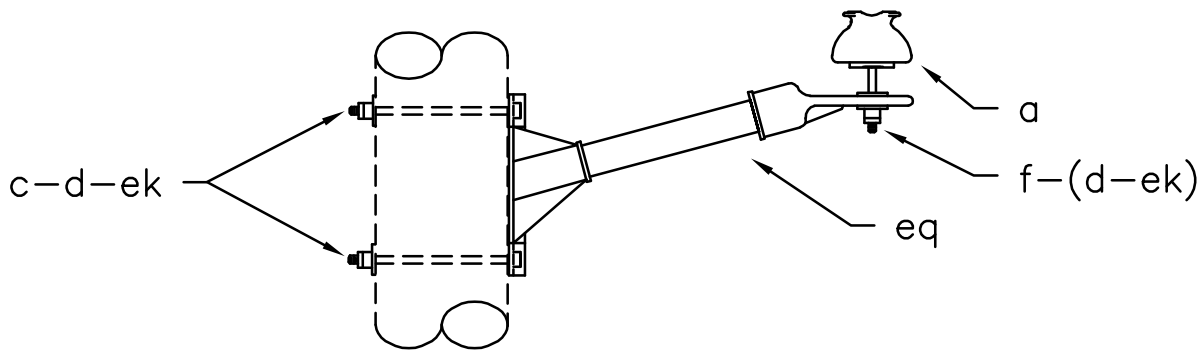
ASSEMBLY NUMBERS	
NEW	(OLD)
A1.01	(M5–2)
A1.01P	(M5–18)
A1.011	(M5–5)
A1.011P	(M5–7)
A1.011L	

DESIGN PARAMETERS:

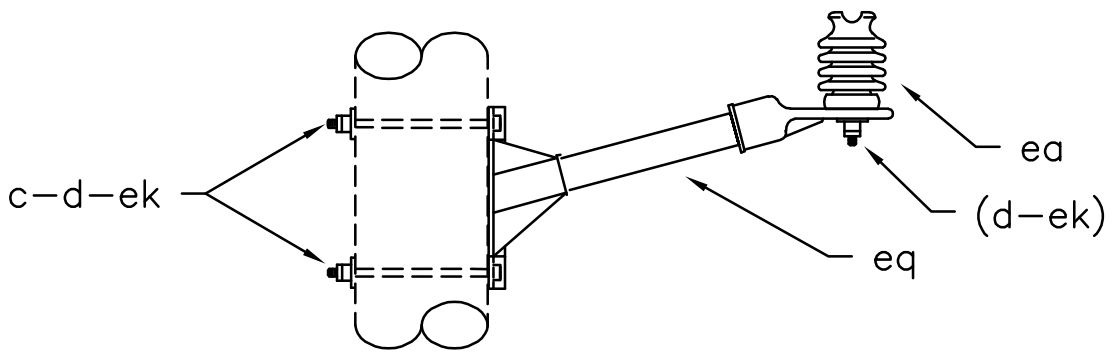
A1.01: See TABLE I
A1.01P: See TABLE II
A1.011: See TABLE II
A1.011P: See TABLE II
A1.011L: See TABLE III

SINGLE SUPPORT–PRIMARY

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



A1.04N



A1.04NP

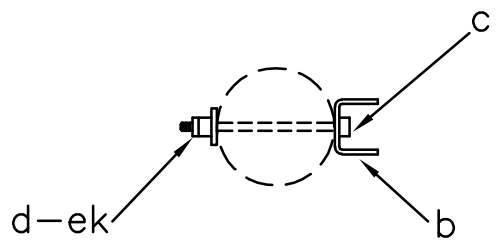
ASSEMBLY: A1.		04N	04NP	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	1		
c	Bolt, machine, 5/8" x req'd length	2	2	
d	Washer, square 2 1/4"	2	2	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)		(If req'd)
ea	Insulator, post type (12.47/7.2kV)		1	
ek	Locknuts	2	2	
eq	Bracket, insulator/equipment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

Design Parameters:

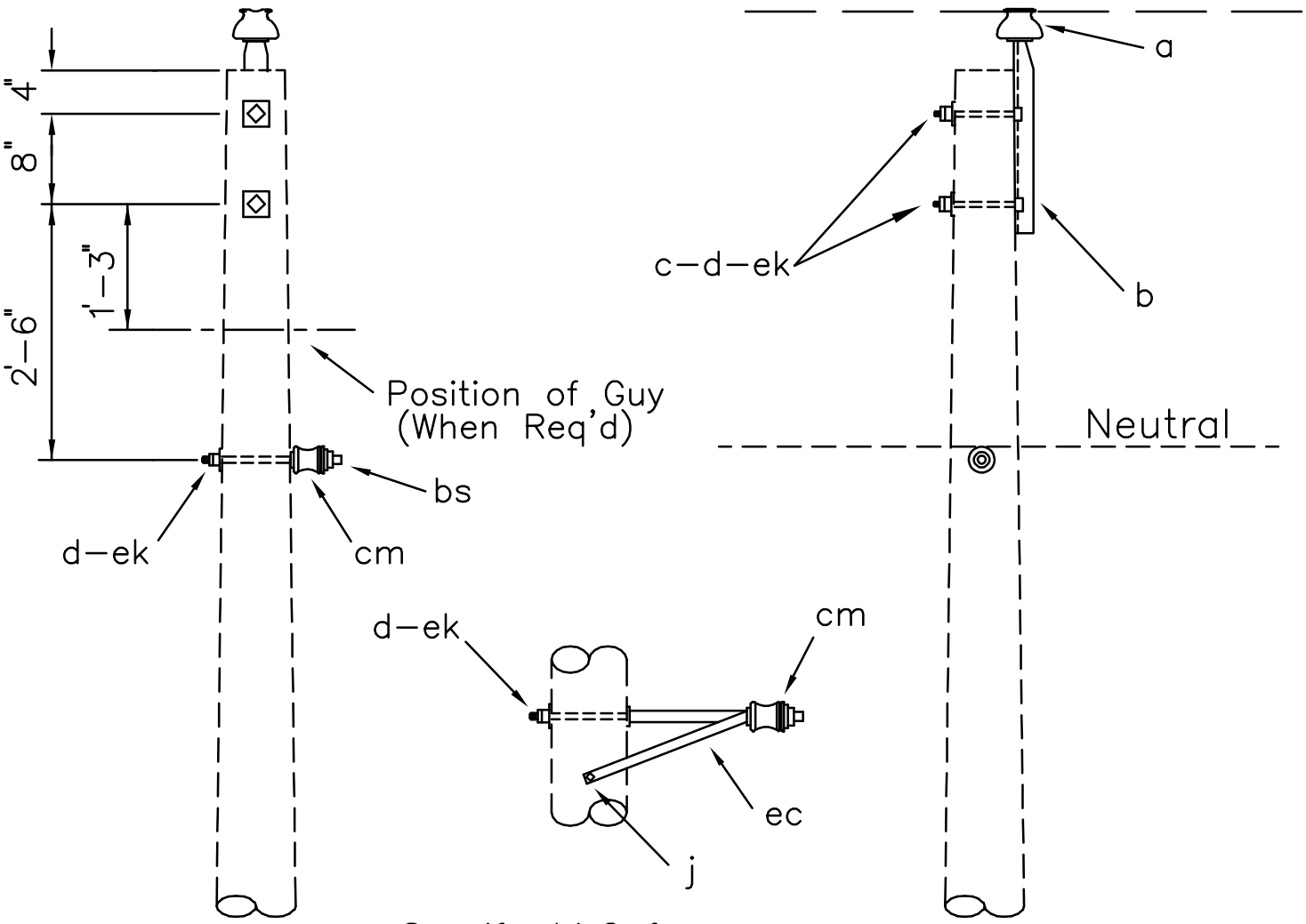
MAXIMUM LINE ANGLES:
See Table II

SINGLE SUPPORT–NARROW PROFILE

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



PLAN



Specify A1.2 for
offset neutral assembly

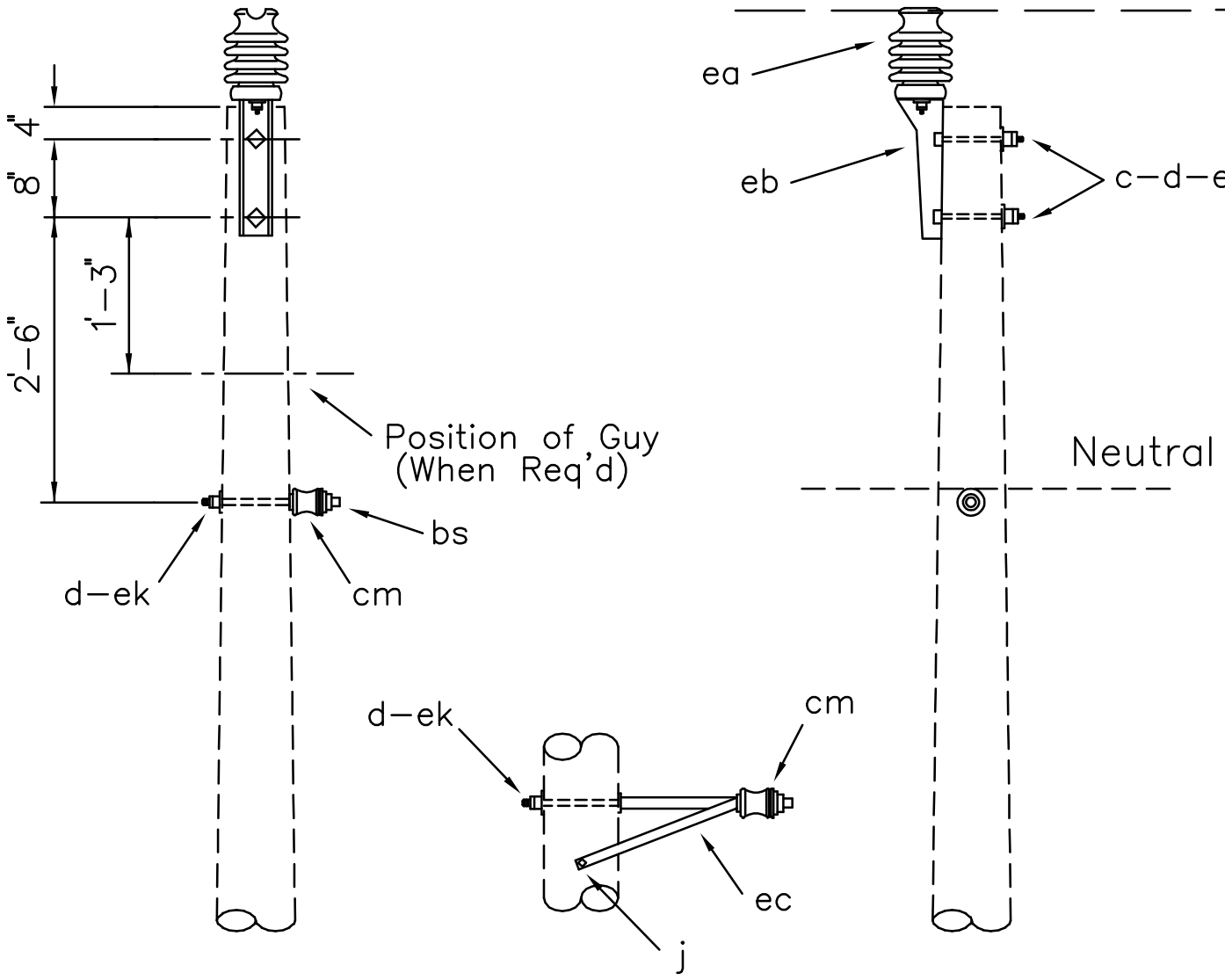
ASSEMBLY:		A1.1	A1.2
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	1	1
b	Pin, pole top, 20"	1	1
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts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

DESIGN PARAMETERS:

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

SINGLE SUPPORT (TANGENT)

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



Specify A1.2P for
offset neutral assembly

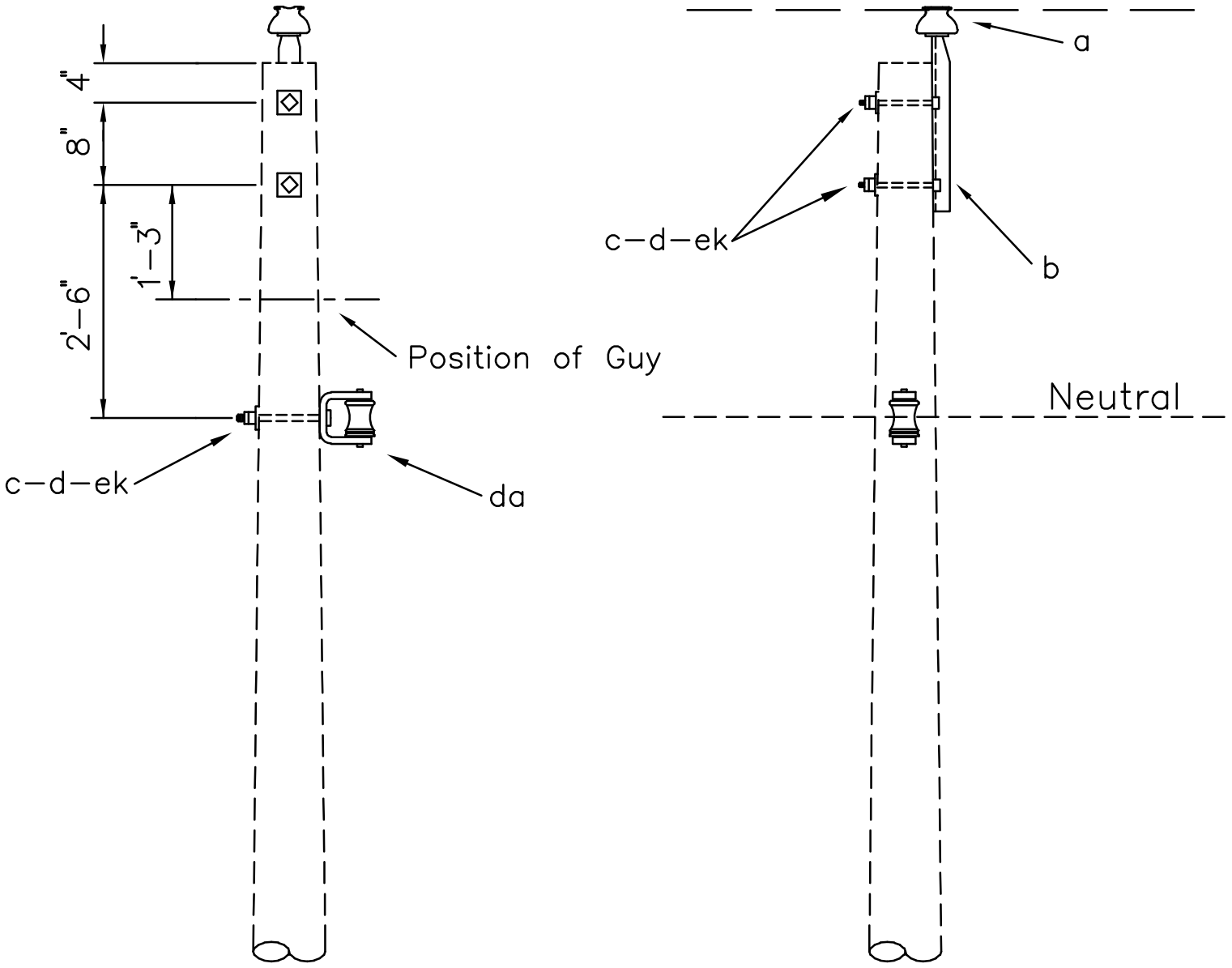
ASSEMBLY: A1		.1P	.2P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	3	3
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	1	1
eb	Bracket, pole top	1	1
ec	Bracket, offset neutral		1
ek	Locknuts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

DESIGN PARAMETERS:

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

SINGLE SUPPORT (TANGENT)
(POST INSULATORS)

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



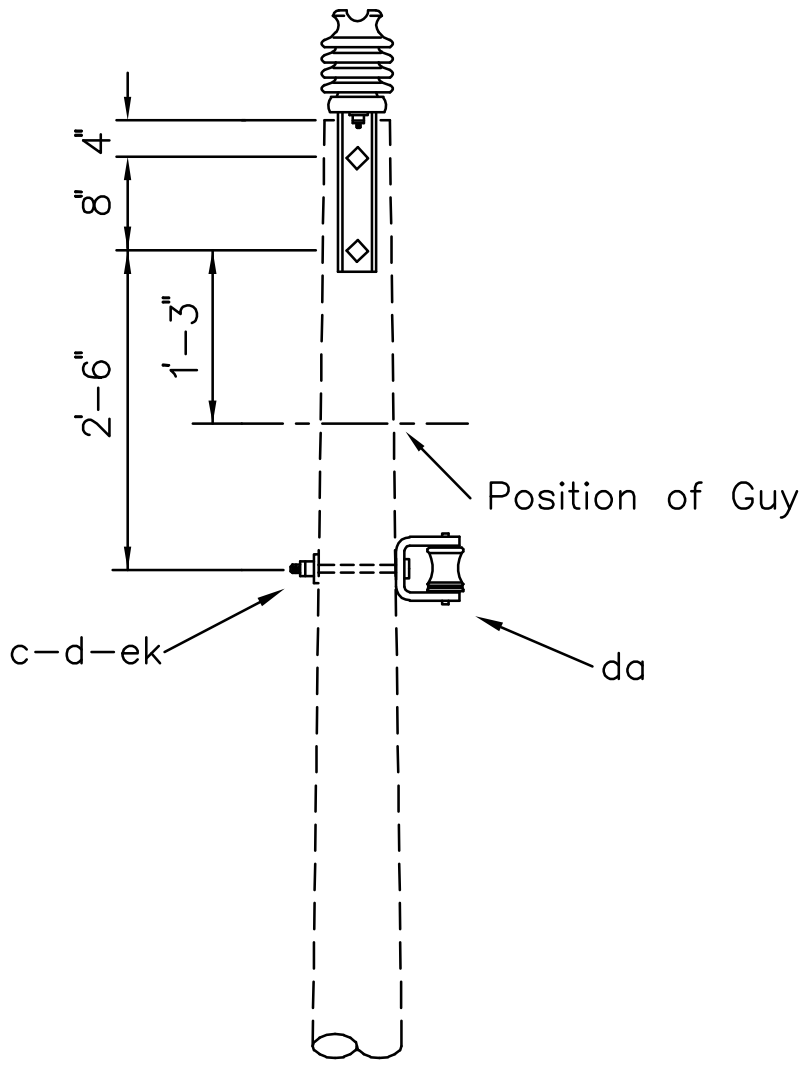
ITEM	QTY	MATERIAL
a	1	Insulator, pin type (12.47/7.2 kV)
b	1	Pin, pole top, 20"
c	3	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	3	Locknuts

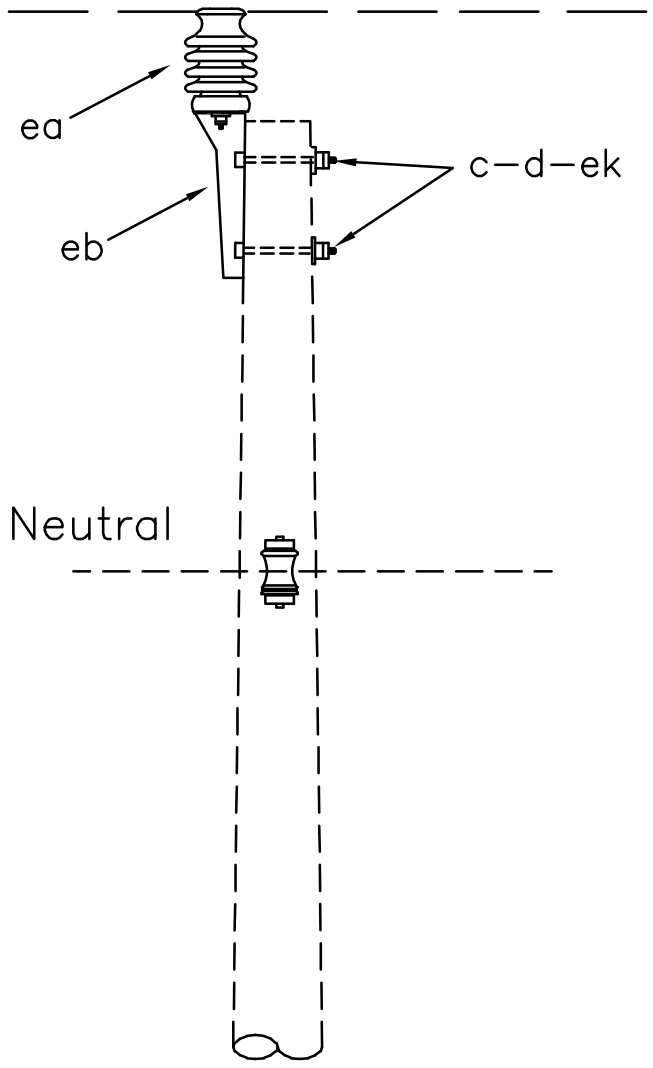
DESIGN PARAMETERS:

See TABLE I

SINGLE SUPPORT

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





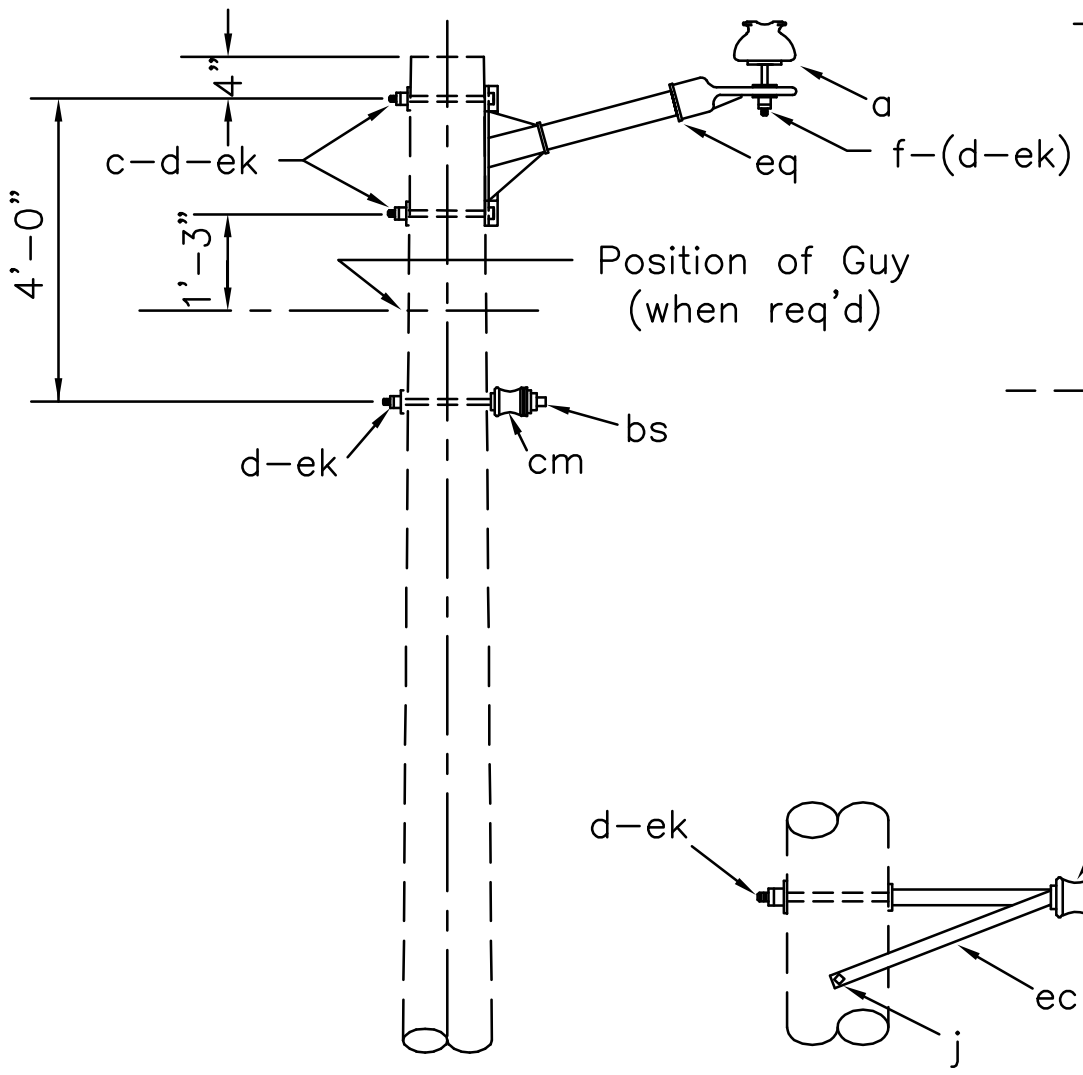
ITEM	QTY	MATERIAL
c	3	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ea	1	Insulator, post type (12.47/7.2 kV)
eb	1	Bracket, pole top
ek	3	Locknuts

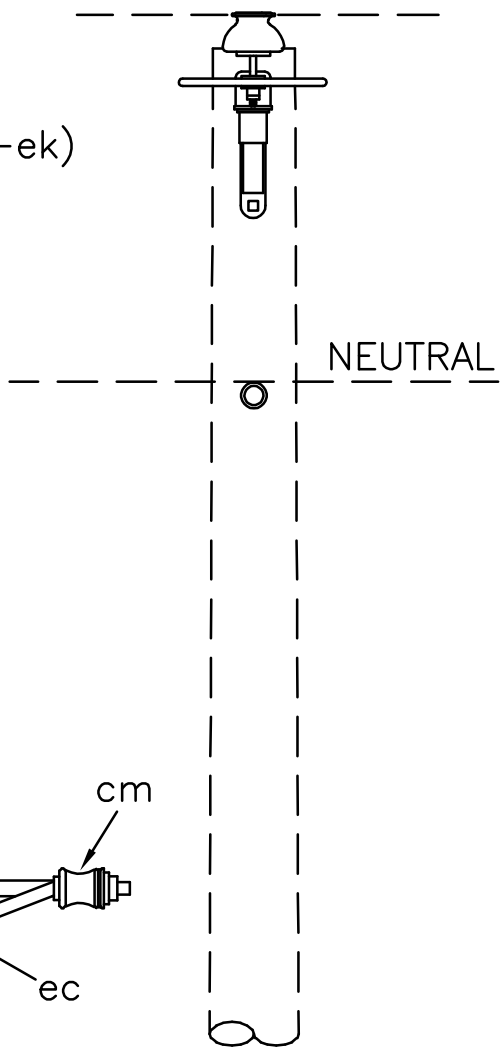
DESIGN PARAMETERS:

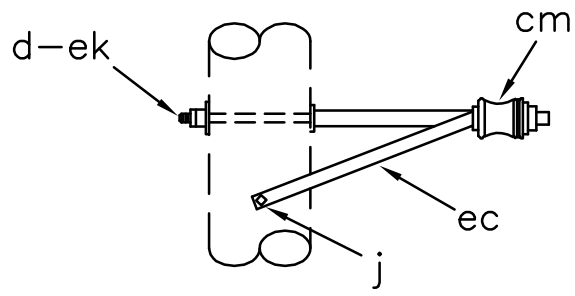
See TABLE II

SINGLE SUPPORT
(POST INSULATORS)

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







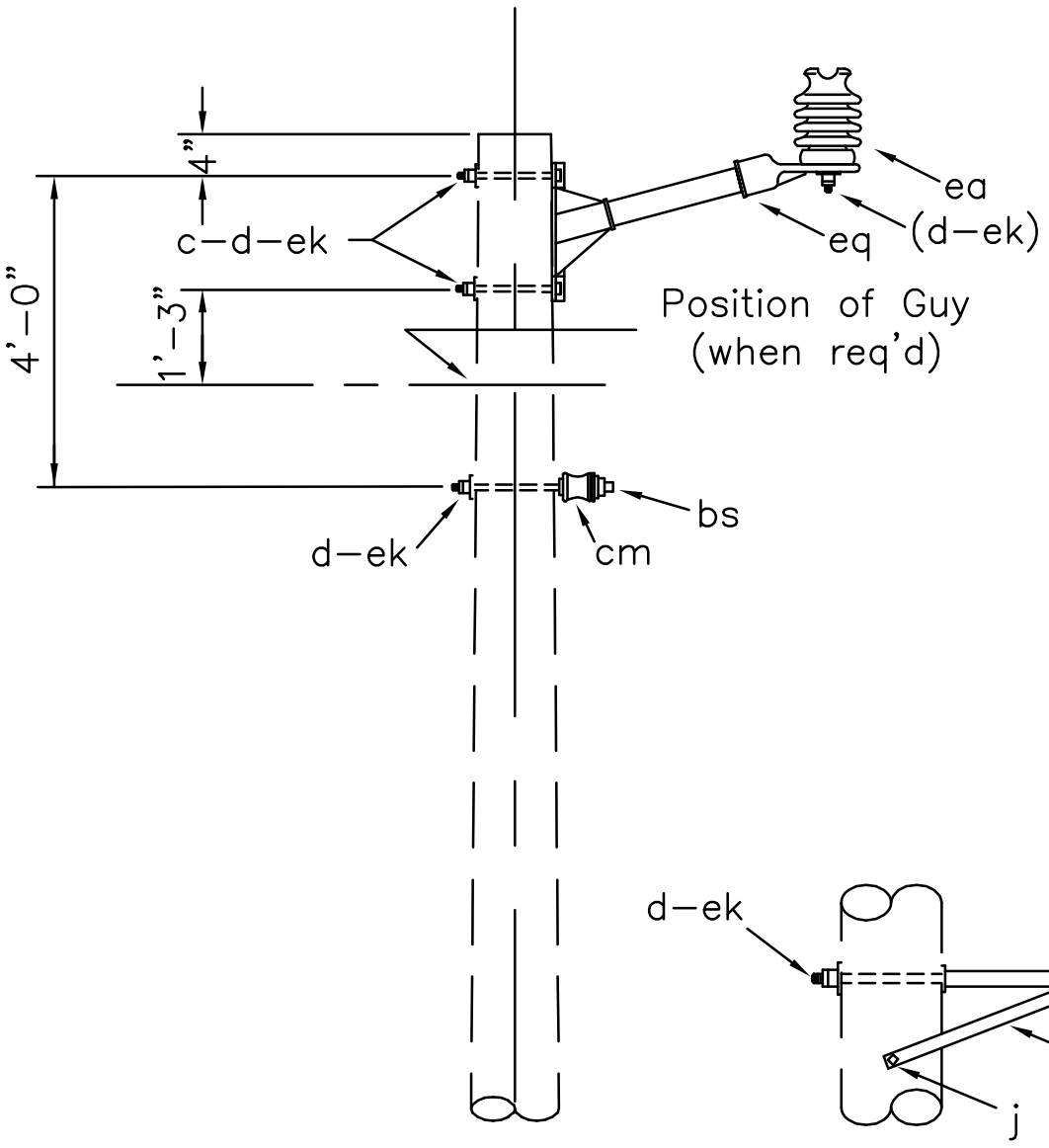
Specify A1.5N for
offset neutral assembly

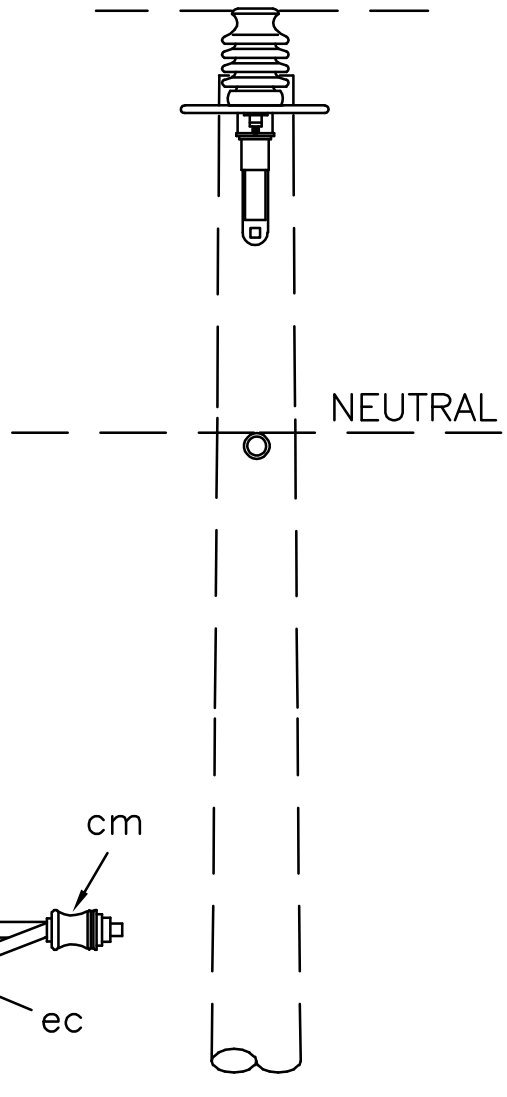
Assembly: A1.		4N	5N	
ITEM	MATERIAL	QTY	QTY	
a	Insulator, pin type (12.47/7.2 kV)	1	1	
c	Bolt, machine, 5/8" x req'd length	2	2	
d	Washer, square 2 1/4"	3	3	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)	(1)	(If req'd)
j	Screw, lag, 1/2" x 4"		2	
bs	Bolt, single, upset	1		
cm	Insulator, spool, 3"	1	1	
ec	Bracket,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

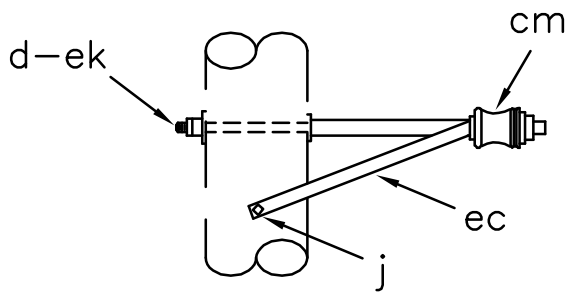
Design Parameters:
Maximum Line Angles
5° – Small Conductors
2° – Larger than #1/0

SINGLE SUPPORT–NARROW PROFILE (TANGENT)

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







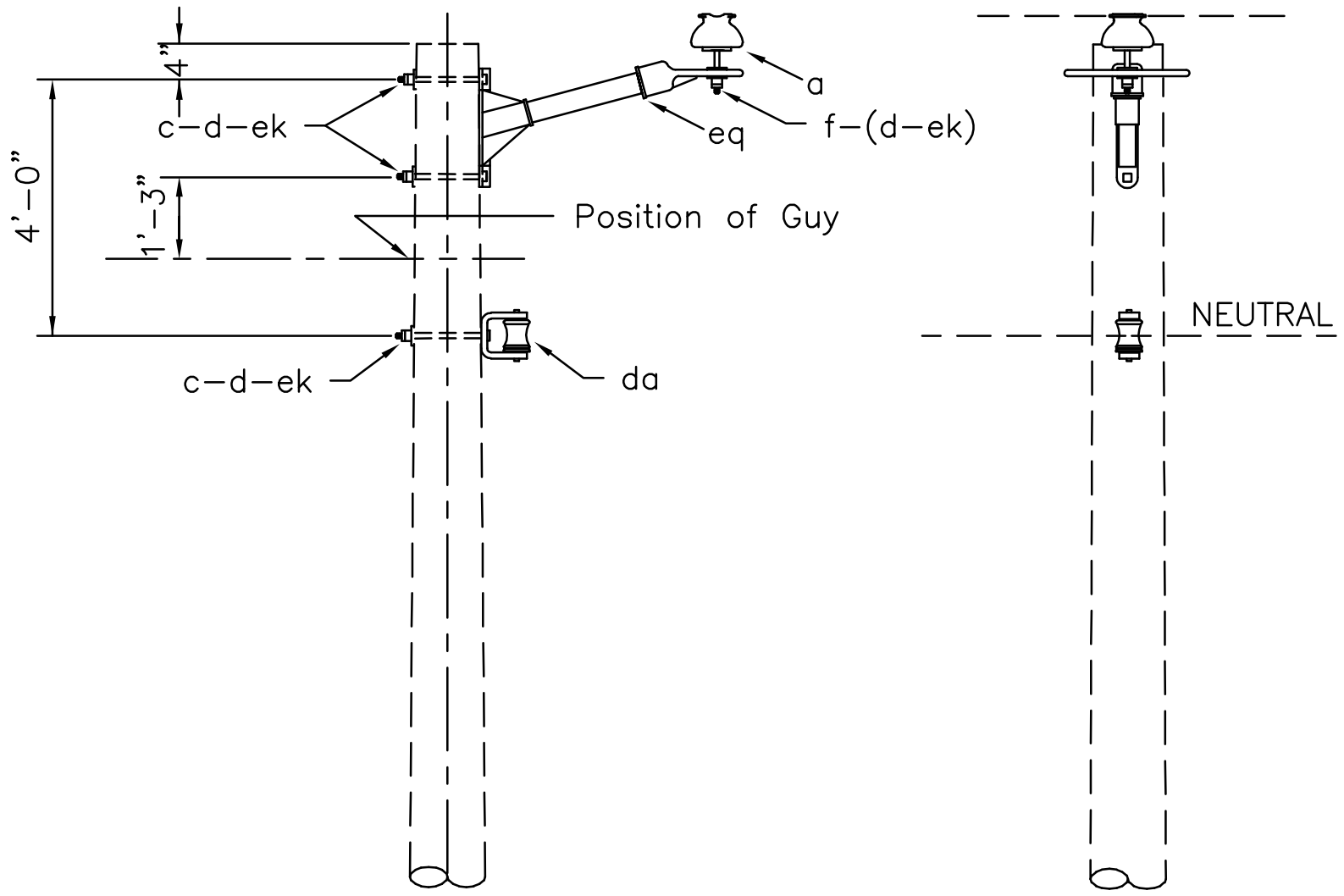
Specify VA1.5NP for
offset neutral assembly

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

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

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

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

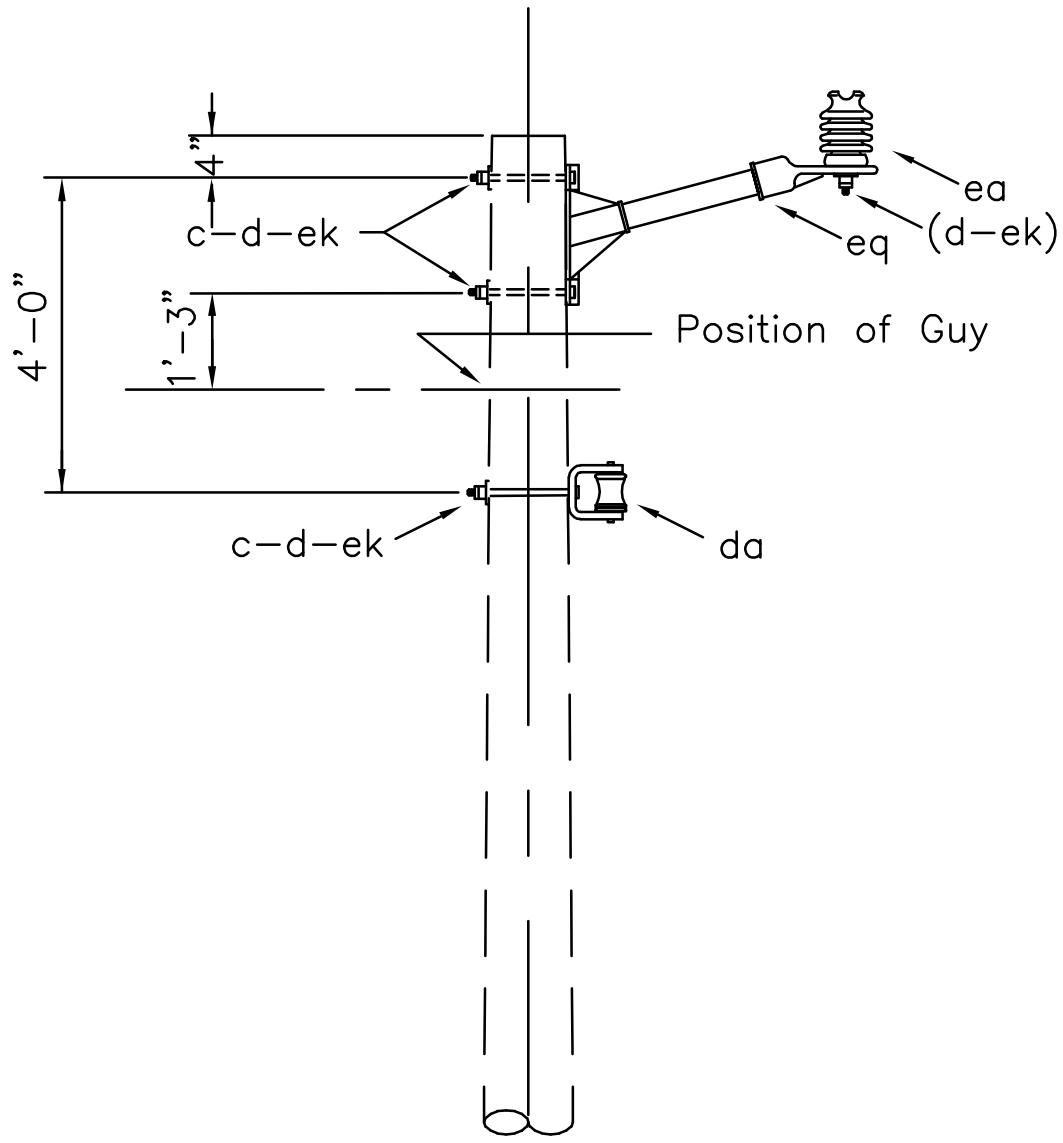


Assembly: A1.		6N	
ITEM	MATERIAL	QTY	
a	Insulator, pin type (12.47/7.2 kV)	1	
c	Bolt, machine, 5/8" x req'd length	3	
d	Washer, square 2 1/4"	3	
(f)	(Pin, crossarm, 5/8" x 6 1/2")	(1)	(If req'd)
da	Bracket, insulated	1	
ek	Locknuts	3	
eq	Bracket, insulator/equipment	1	

Design Parameters:
Maximum Line Angles
See TABLE II

SINGLE SUPPORT–NARROW PROFILE

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



Assembly: A1. 6NP

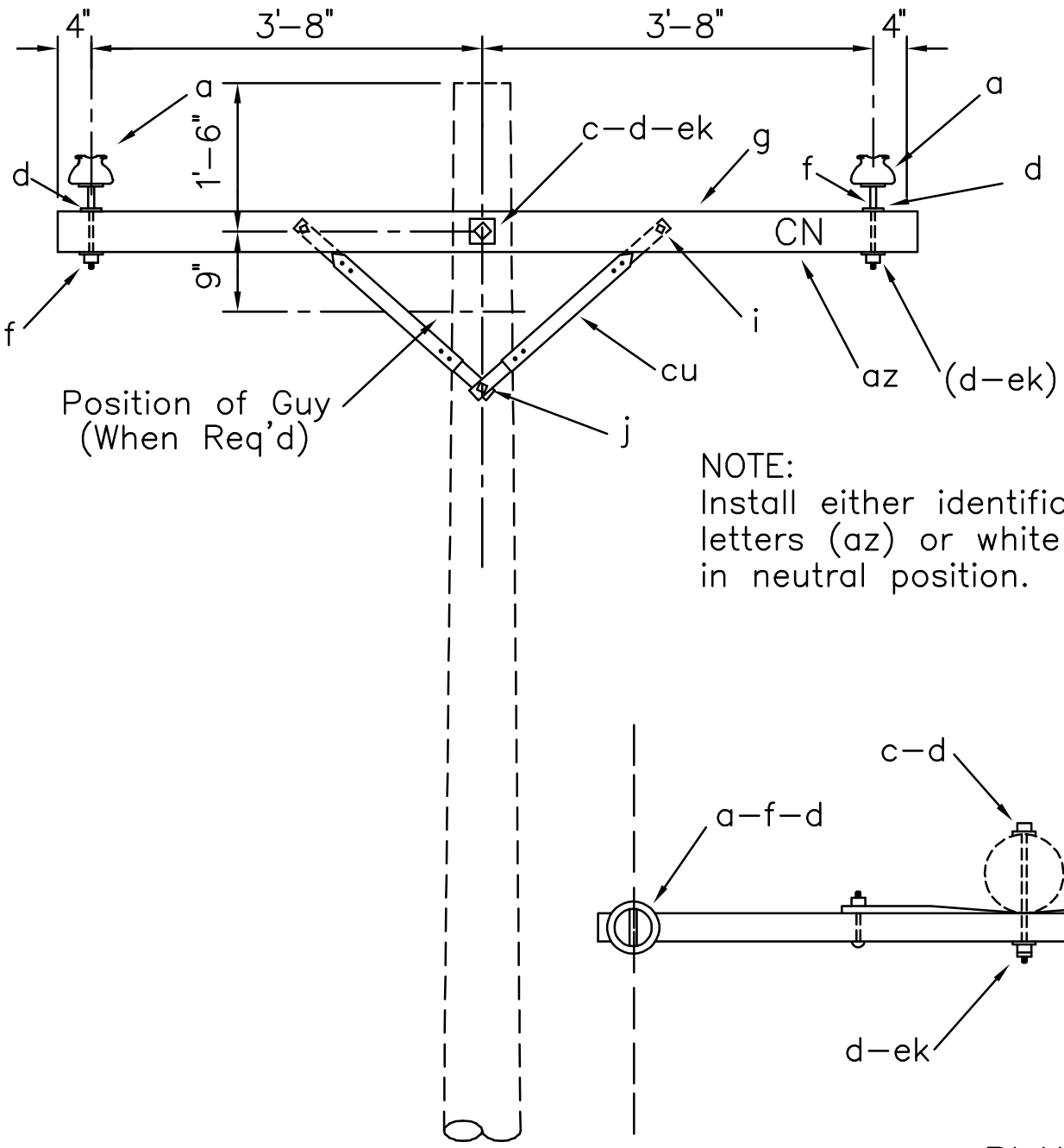
ITEM	MATERIAL	QTY
c	Bolt, machine, 5/8" x req'd length	3
d	Washer, square 2 1/4"	3
da	Bracket, insulated	1
ea	Insulator, post type (12.47/7.2 kV)	1
ek	Locknuts	3
eq	Bracket, insulator/equipment	1

Design Parameters:

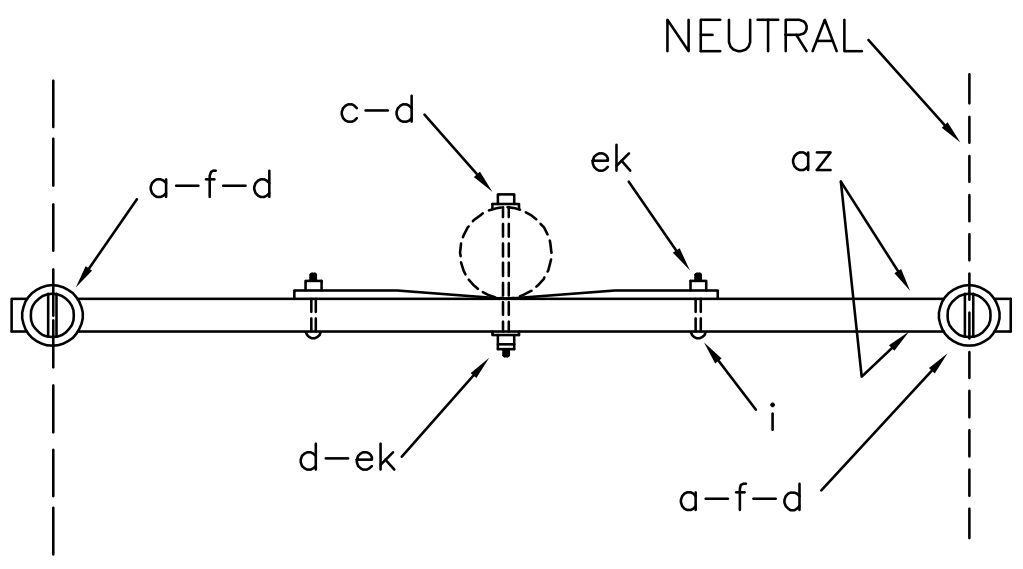
MAXIMUM LINE ANGLES:
See TABLE II

SINGLE SUPPORT–NARROW PROFILE (POST INSULATORS)

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



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



PLAN

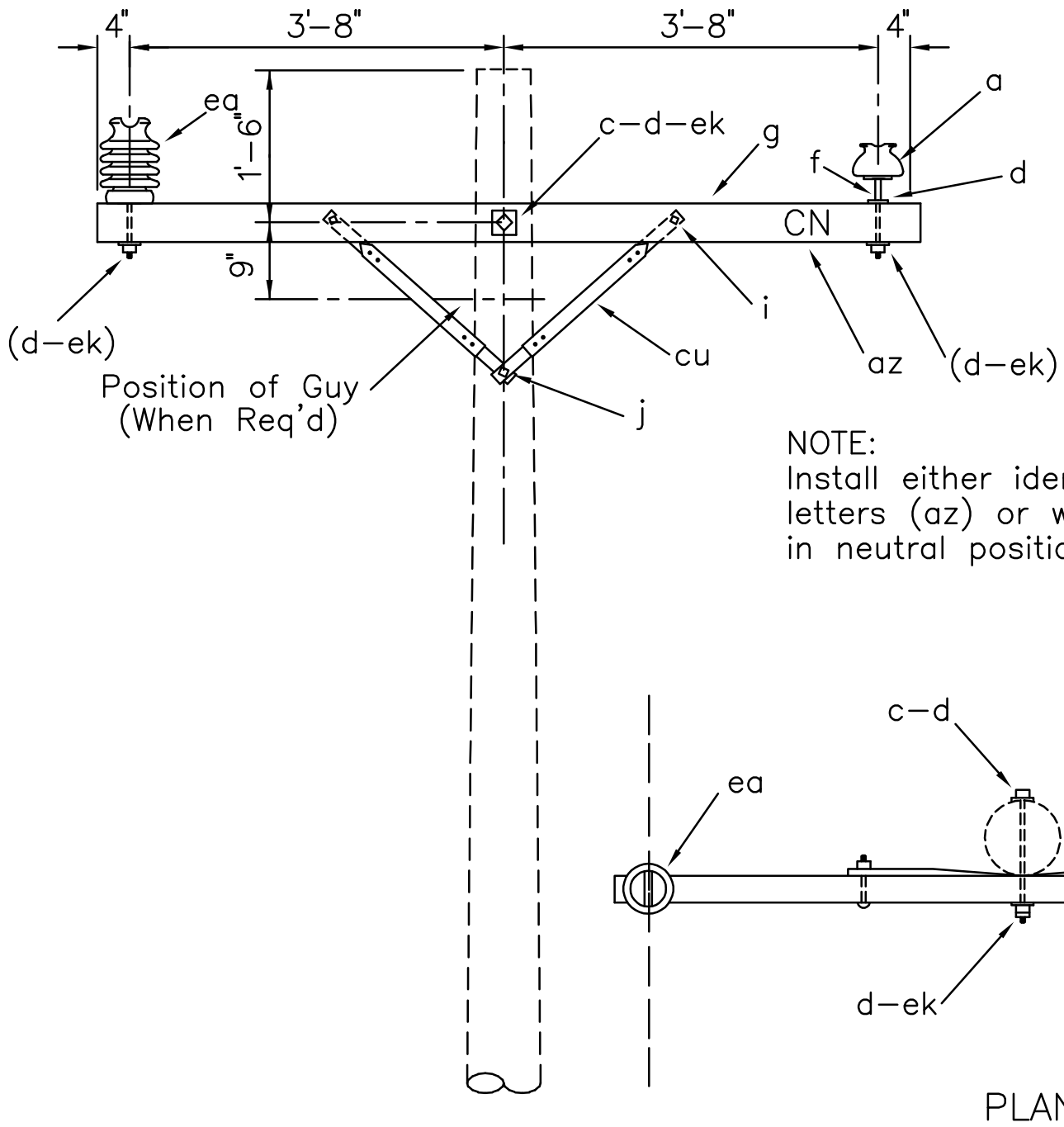
ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
a	1	Insulator, pin type (12.47/7.2 kV)
c	1	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' – 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"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

DESIGN PARAMETERS:

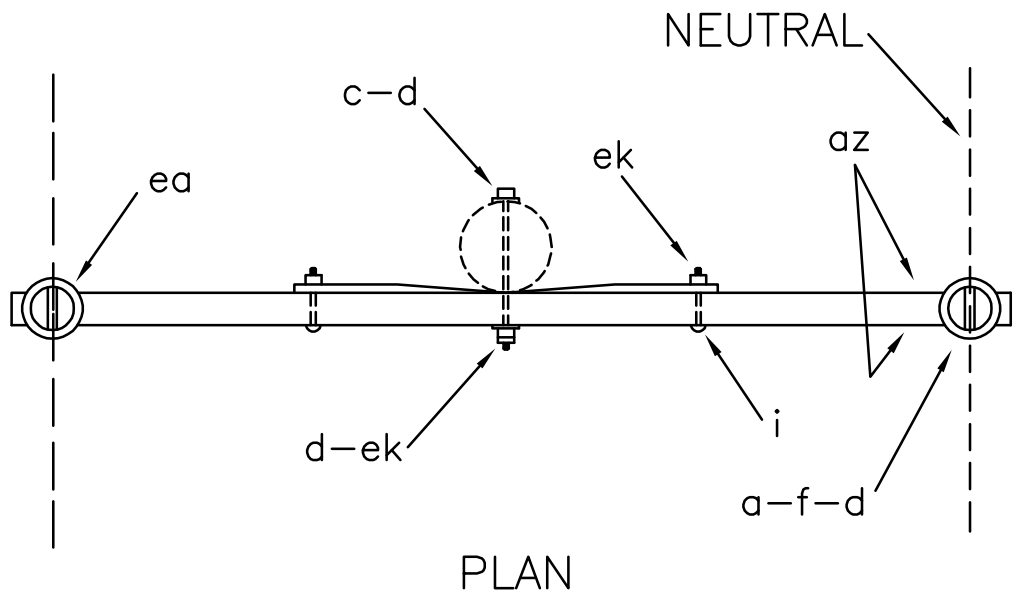
See TABLE II

SINGLE SUPPORT ON CROSSARM

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



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



PLAN

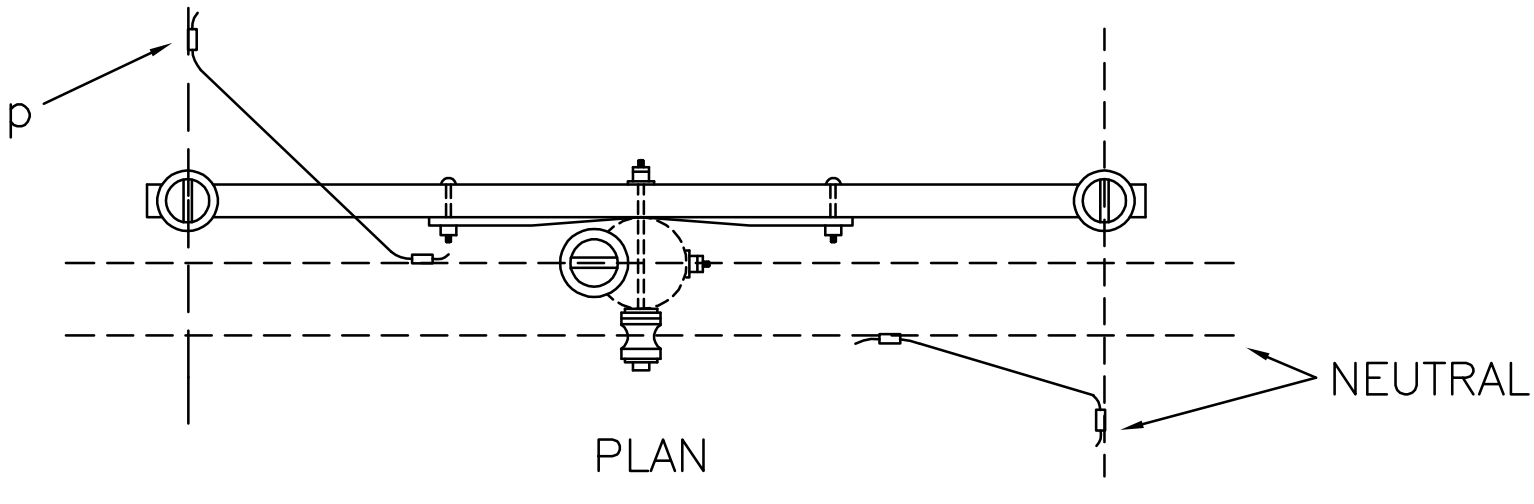
ITEM	QTY	MATERIAL
a	1	Insulator, pin type, 15 kV, white
c	1	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
f	1	Pin, crossarm, steel, 5/8" x 10 3/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8' – 0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
az	4	Letters, 2" C, 2" N, with 1" nails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

DESIGN PARAMETERS:

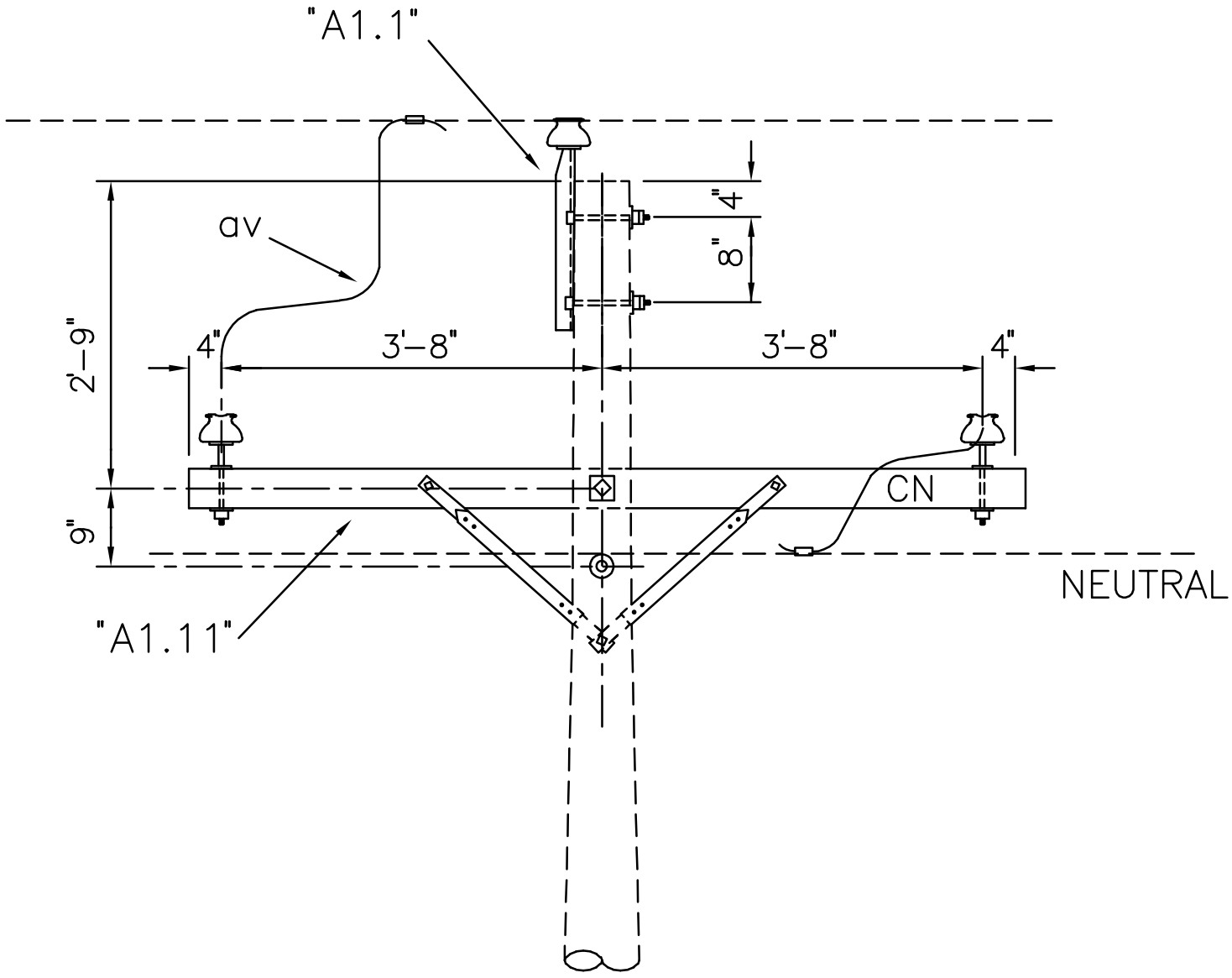
See TABLE II

SINGLE SUPPORT ON CROSSARM
(POST INSULATORS)

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



PLAN



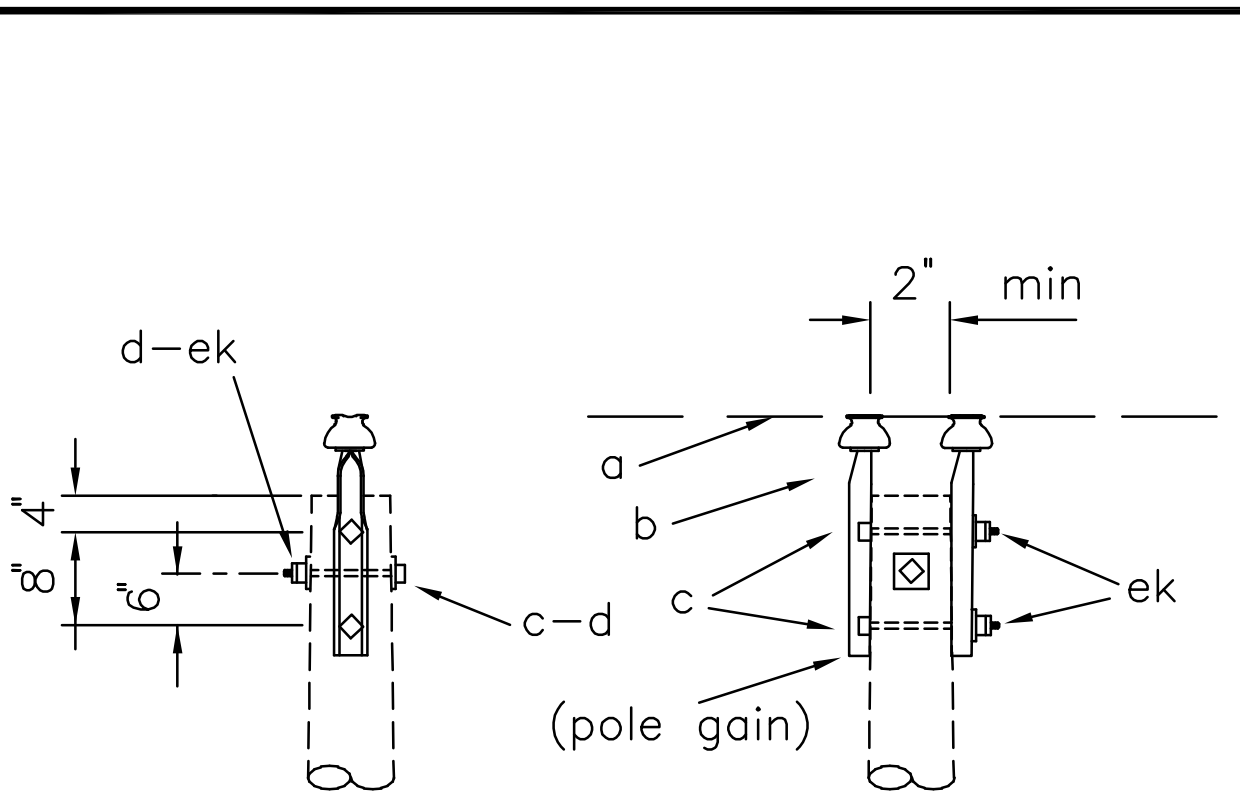
ITEM	QTY	MATERIAL
	1	A1.1 Primary Assembly
	1	A1.11 Primary Assembly
p		Connectors, as req'd
av		Jumpers, as req'd

DESIGN PARAMETERS:

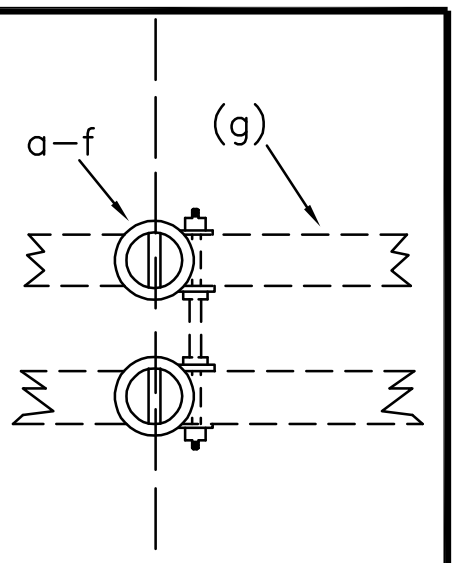
See: "A1.1"
"A1.11"

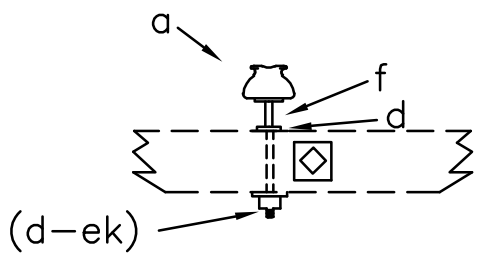
SINGLE PHASE JUNCTION GUIDE

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

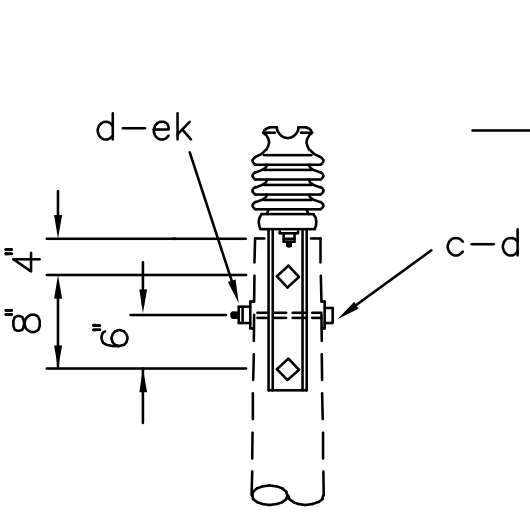


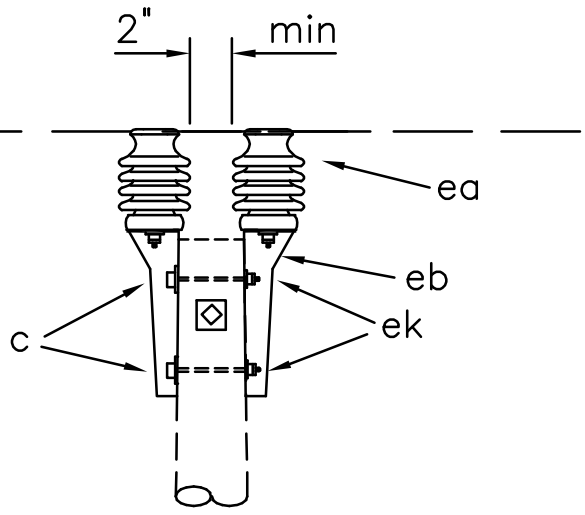
A2.01



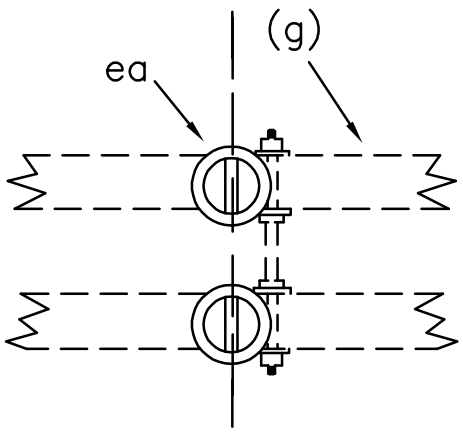


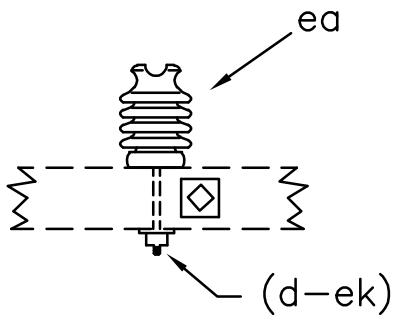
A2.021





A2.01P





A2.021P

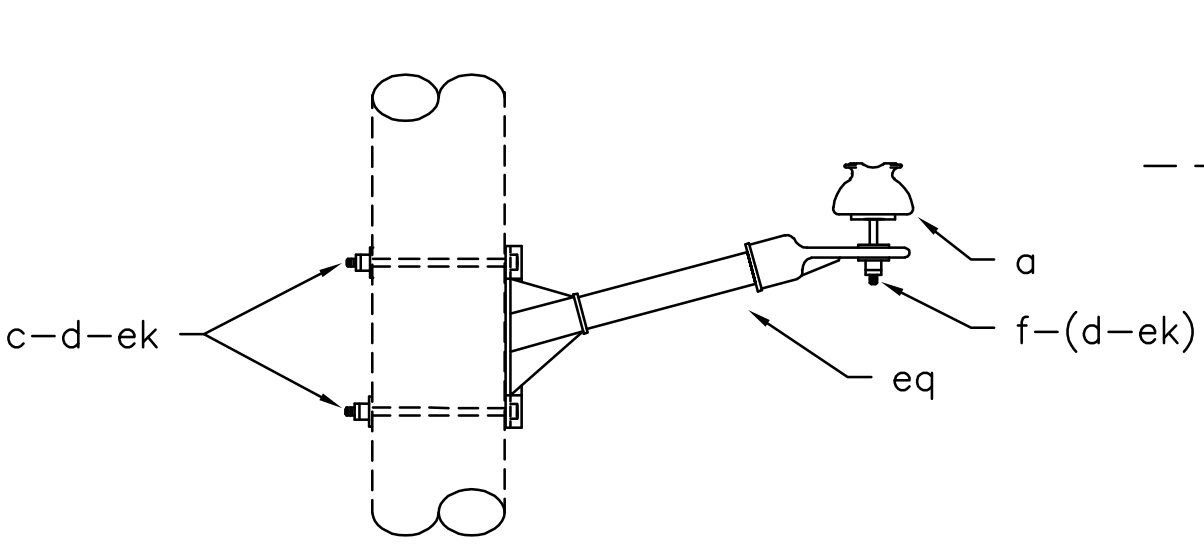
ASSEMBLY: A2.		01	01P	021	021P
ITEM	MATERIAL	QTY	QTY	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2		2	
b	Pin, pole top, 20	2			
c	Bolt, machine, 5/8" x req'd length	3	3		
d	Washer, square, 2 1/4"	2	2	2	
f	Pin, crossarm steel, 5/8" x 10 3/4"			2	
ea	Insulator, post type (12.47/7.2 kV)		2		2
eb	Bracket,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

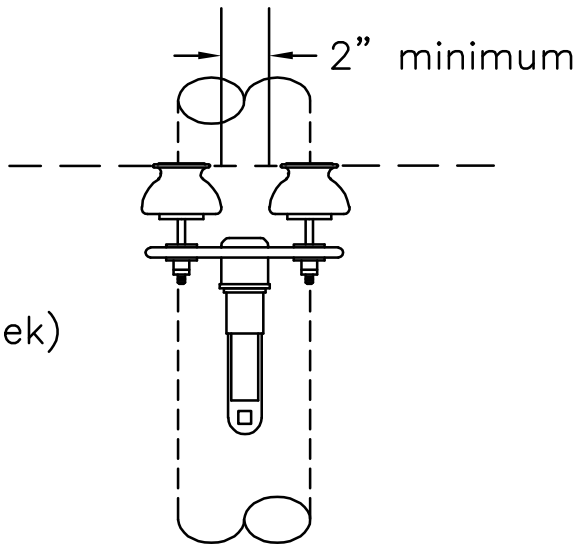
DESIGN PARAMETERS:

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

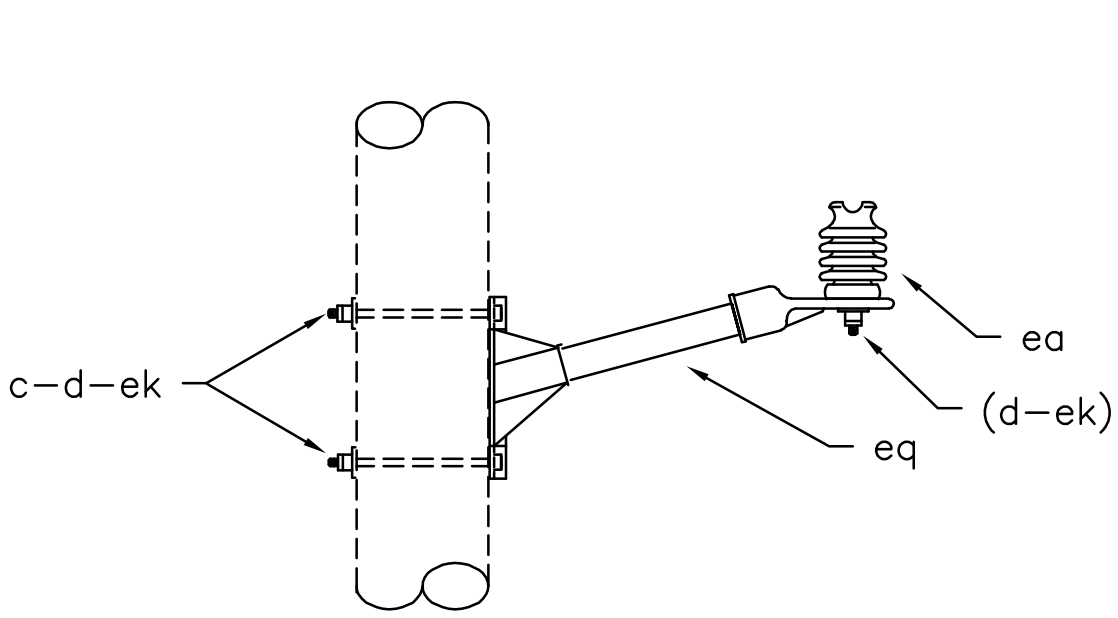
DOUBLE SUPPORT–PRIMARY

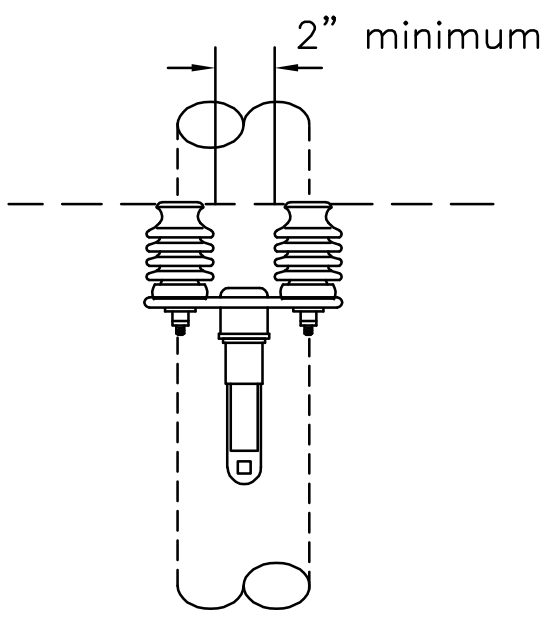
APRIL 2005	1 – PHASE PRIMARY	A2.01,A2.01P
RUS	12.47/7.2 kV	A2.021,A2.021P





A2.04N





A2.04NP

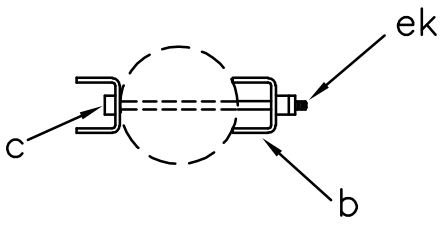
ASSEMBLY: A2.		04N	04NP
ITEM	MATERIAL	QTY	QTY
a	Insulator, pin type (12.47/7.2 kV)	2	
c	Bolt, machine, 5/8” x req’d length	2	2
d	Washer, square 2 1/4”	2	2
f	Pin, crossarm, 5/8” x 6 1/2”	2	
ea	Insulator, post type (12.47/7.2kV)		2
ek	Locknuts	2	2
eq	Bracket, insulator/equipment	1	1

Design Parameters:

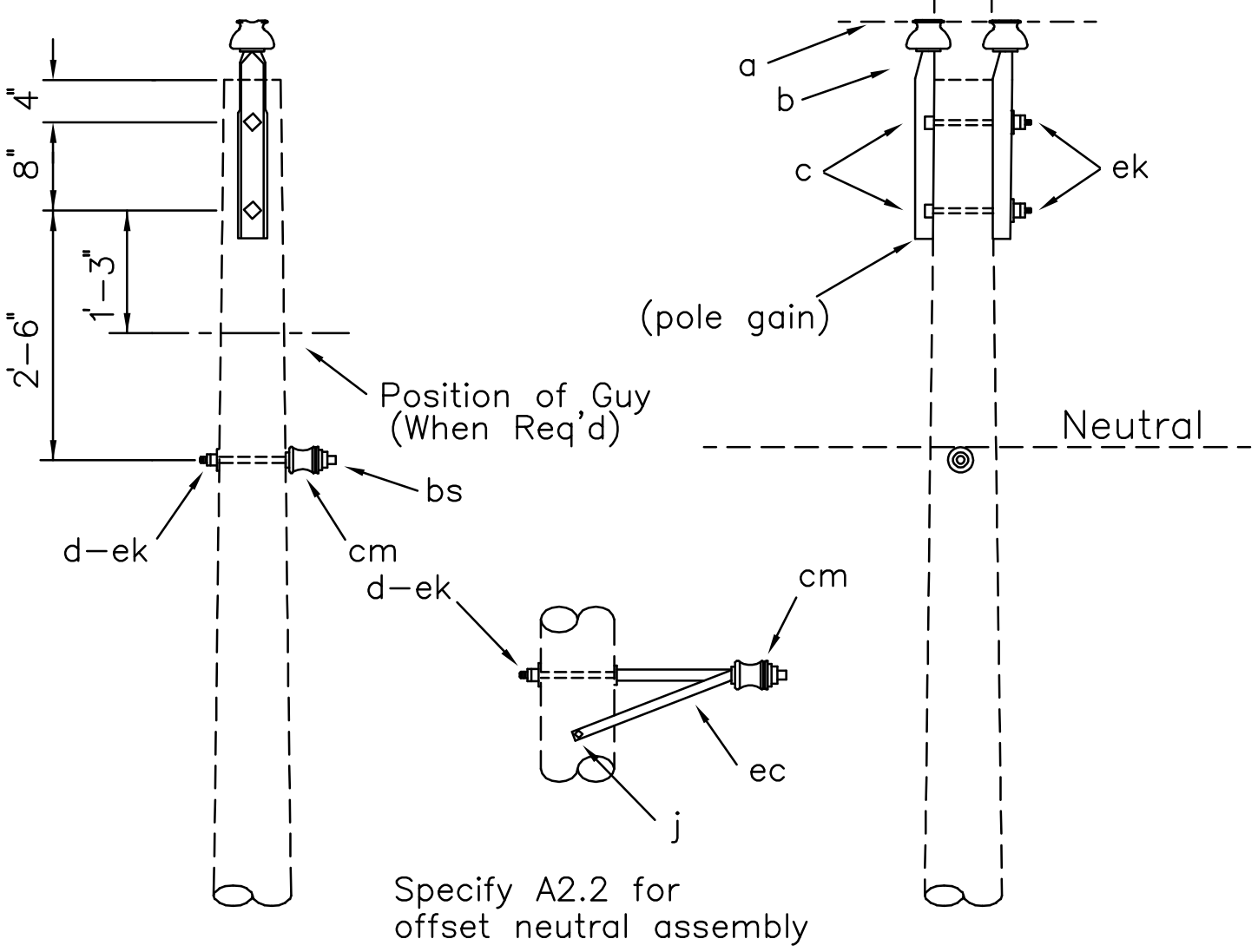
MAXIMUM LINE ANGLES:
See Table IV

DOUBLE SUPPORT–NARROW PROFILE

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



PLAN



Specify A2.2 for
offset neutral assembly

NOTE: These assemblies used for NESC Grade B construction.

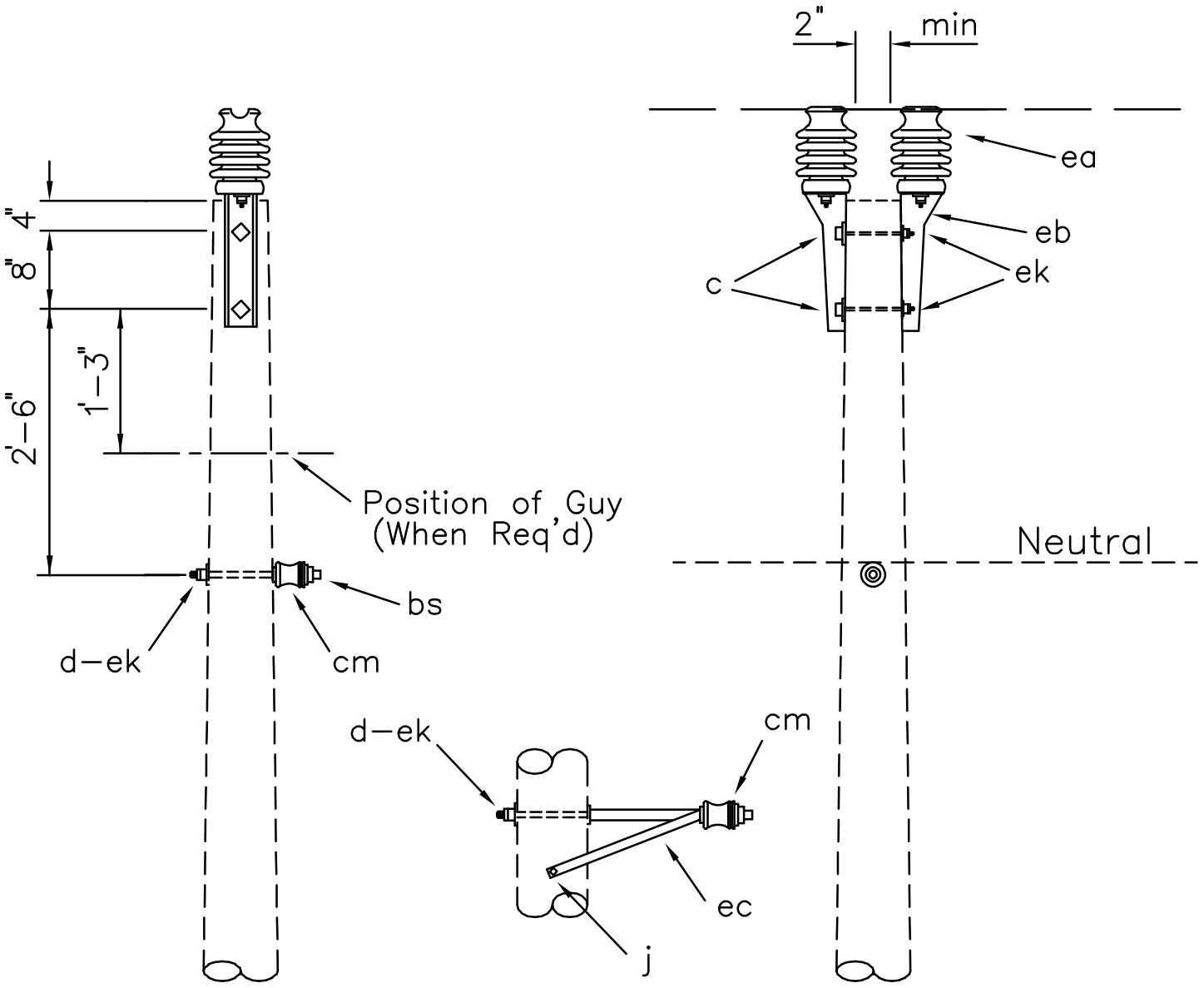
ITEM	MATERIAL	ASSEMBLY: A2.1 QTY	A2.2 QTY
a	Insulator, pin type (12.47/7.2 kV)	2	2
b	Pin, pole top	2	2
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	1	1
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ec	Bracket, offset neutral		1
ek	Locknuts	3	3

DESIGN PARAMETERS:

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

DOUBLE SUPPORT (TANGENT)

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



Specify A2.2P for
offset neutral assembly

NOTE: These assemblies used for NESC Grade B construction.

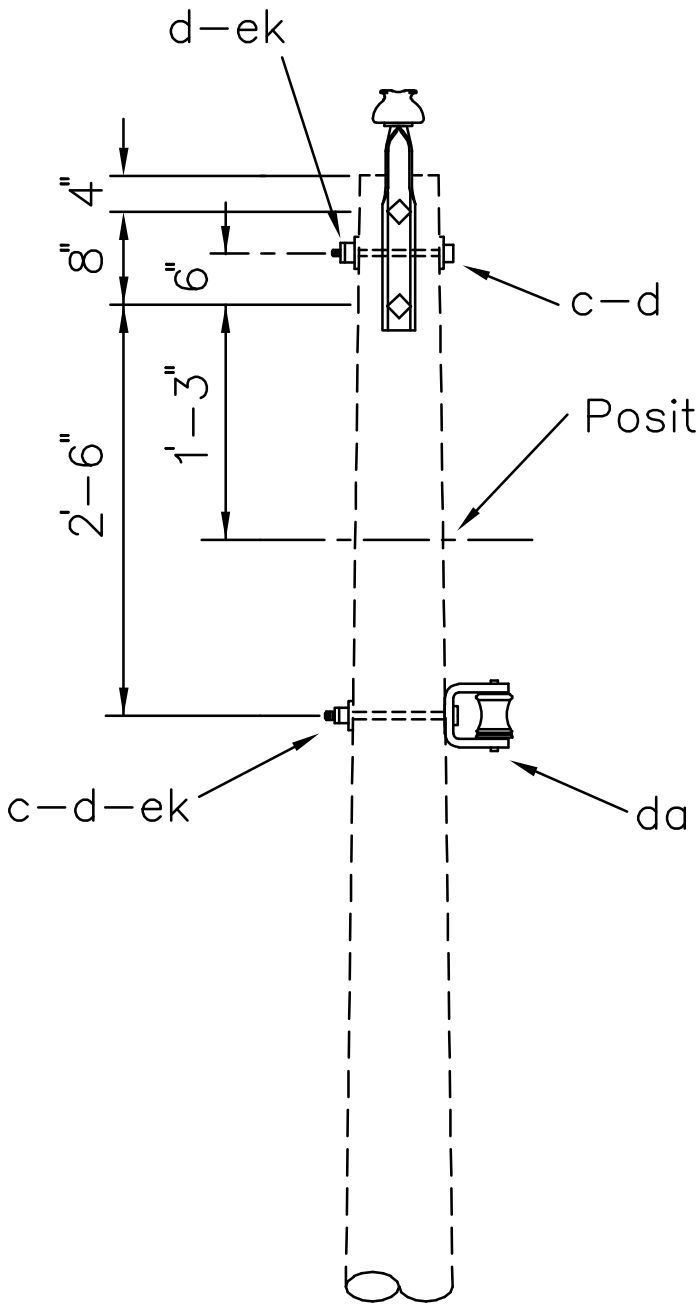
ASSEMBLY: A2		.1P	.2P
ITEM	MATERIAL	QTY	QTY
c	Bolt, machine, 5/8" x req'd length	2	2
d	Washer, square 2 1/4"	1	1
j	Screw, lag, 1/2" x 4"		2
bs	Bolt, single, upset	1	
cm	Insulator, spool, 3"	1	1
ea	Insulator, post type (12.47/7.2 kV)	2	2
eb	Bracket, pole top	2	2
ec	Bracket, offset neutral		1
ek	Locknuts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

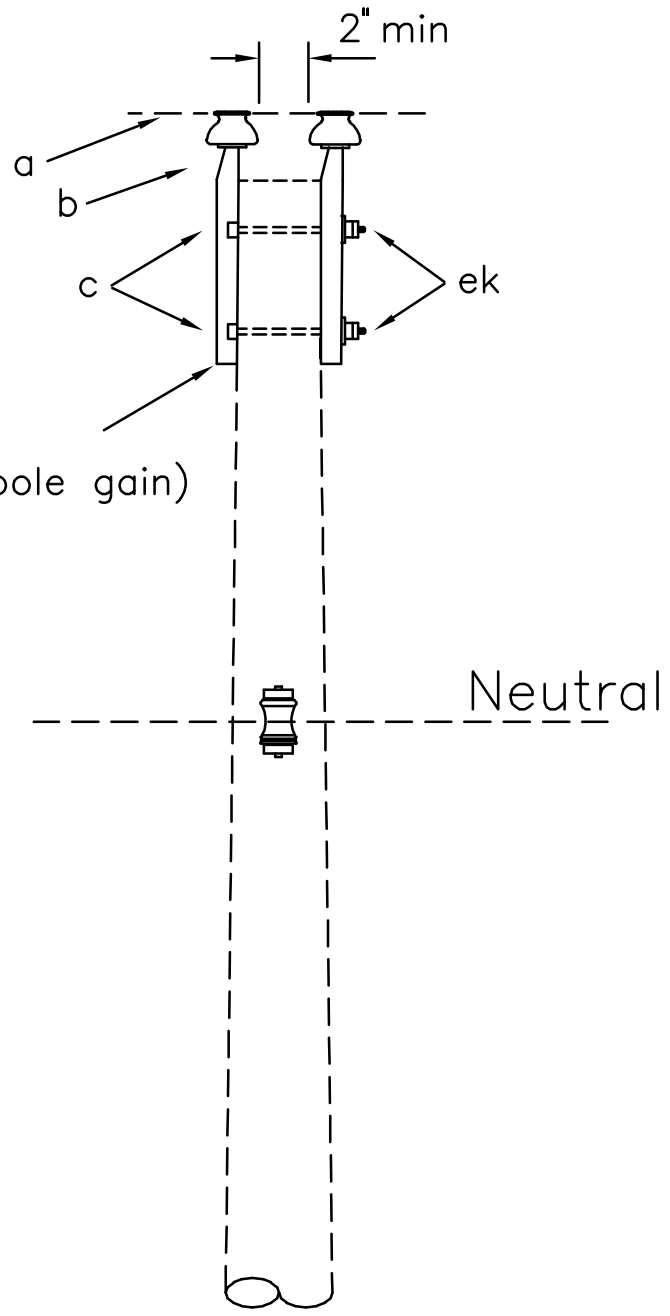
DESIGN PARAMETERS:

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

DOUBLE SUPPORT – (TANGENT) (POST INSULATORS)

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





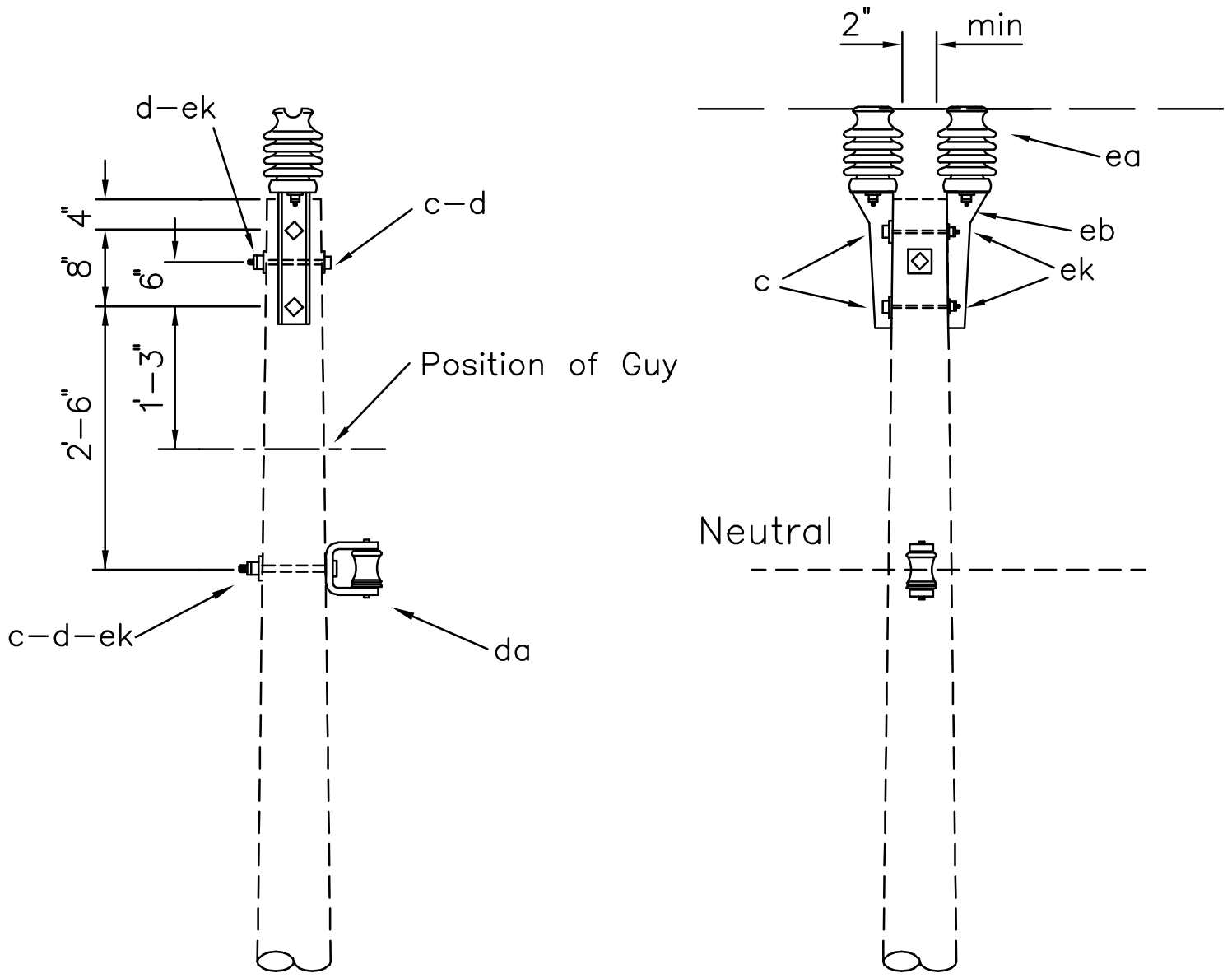
ITEM	QTY	MATERIAL
a	2	Insulator, pin type (12.47/7.2 kV)
b	2	Pin, pole top
c	4	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ek	4	Locknuts

DESIGN PARAMETERS:

See TABLE III

DOUBLE SUPPORT

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



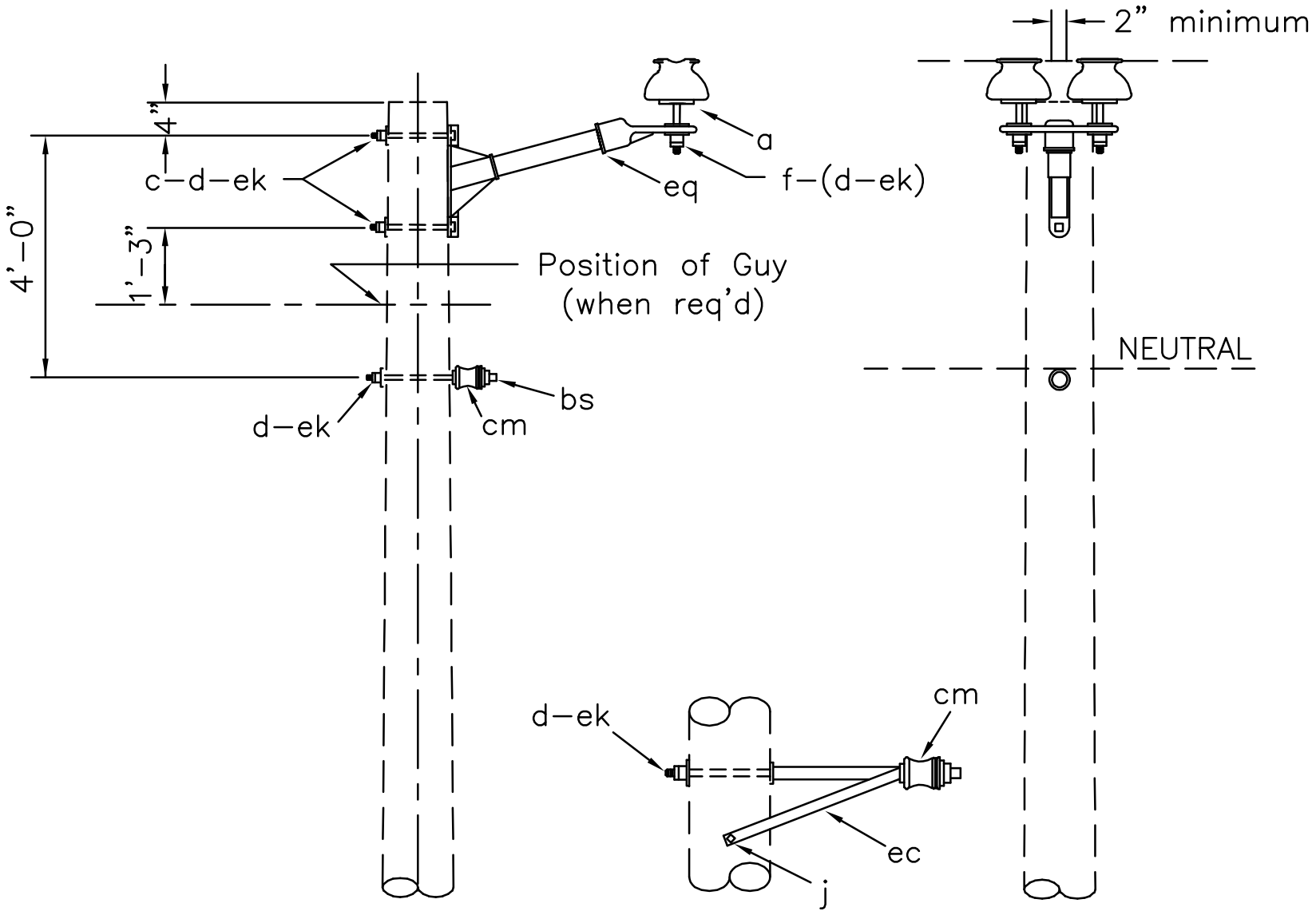
ITEM	QTY	MATERIAL
c	4	Bolt, machine, 5/8" x req'd length
d	3	Washer, square, 2 1/4"
da	1	Bracket, insulated
ea	2	Insulator, post type (12.47/7.2 kV)
eb	2	Bracket, pole top
ek	4	Locknuts

DESIGN PARAMETERS:

See TABLE IV

DOUBLE SUPPORT
(POST INSULATORS)

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



Specify A2.5N for
offset neutral assembly

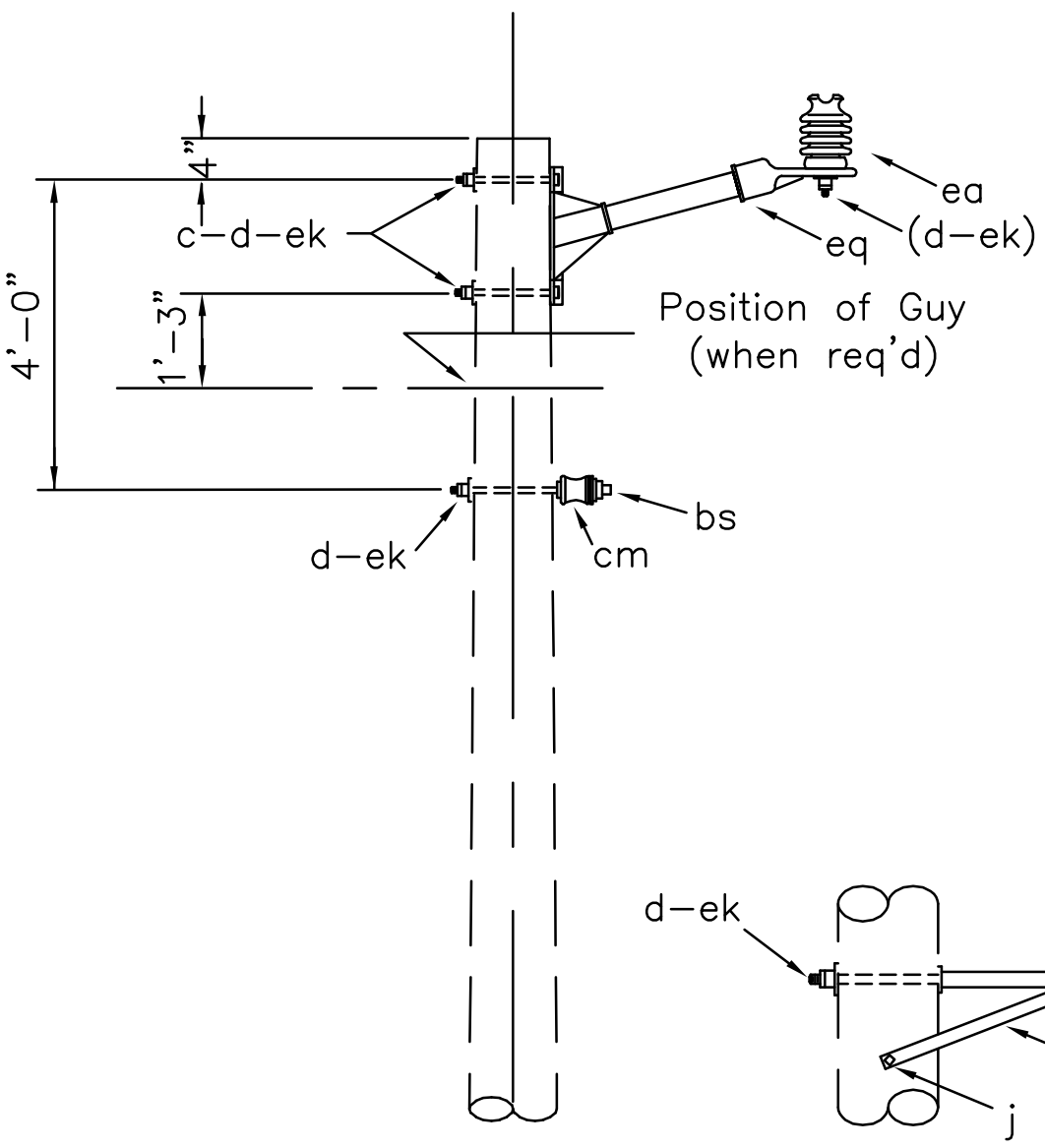
NOTE: These assemblies used for NESC Grade B construction.

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

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

DOUBLE SUPPORT–NARROW PROFILE (TANGENT)

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



Specify A2.5NP for
offset neutral assembly

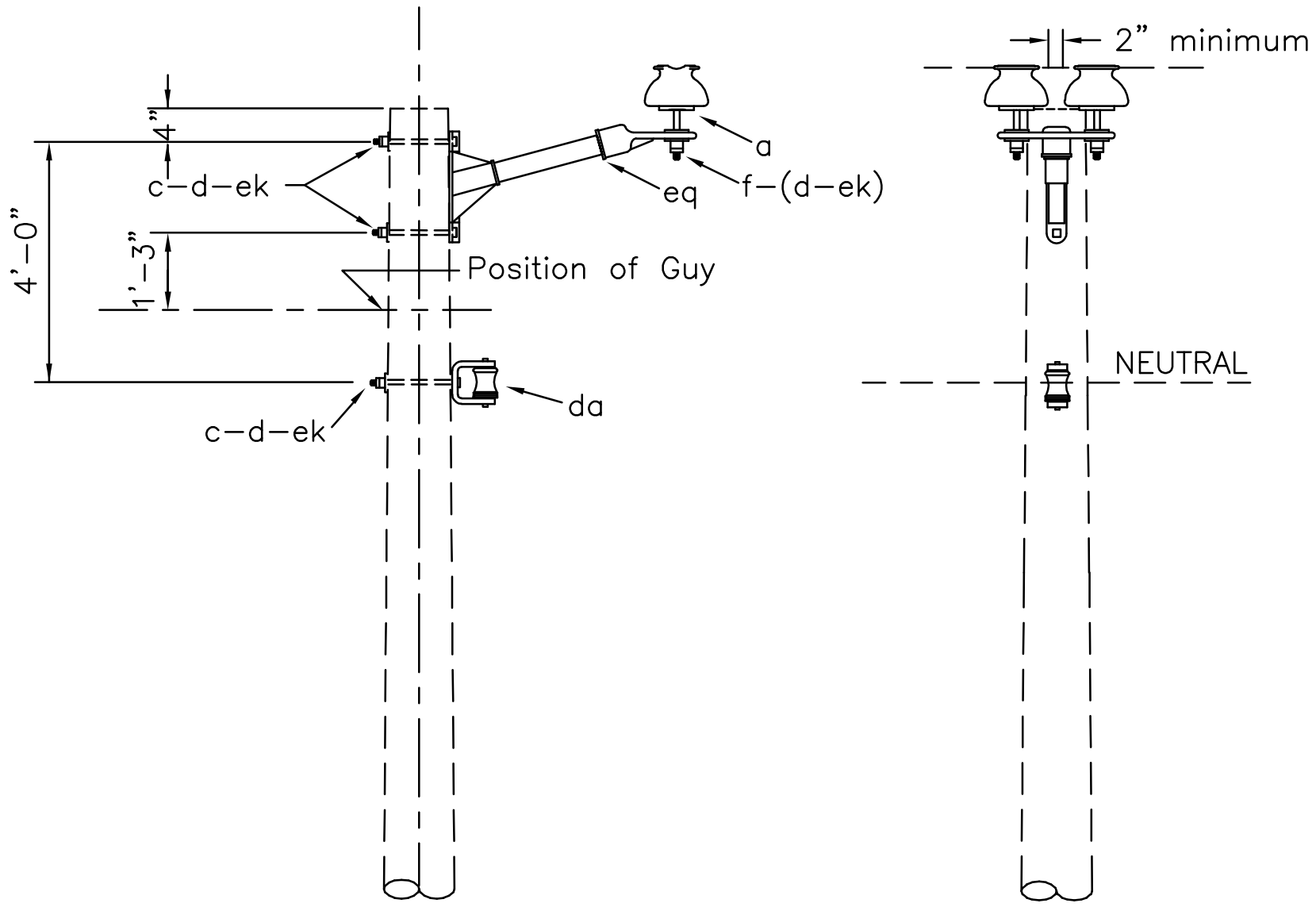
NOTE: These assemblies used for NESC Grade B construction.

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

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

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

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



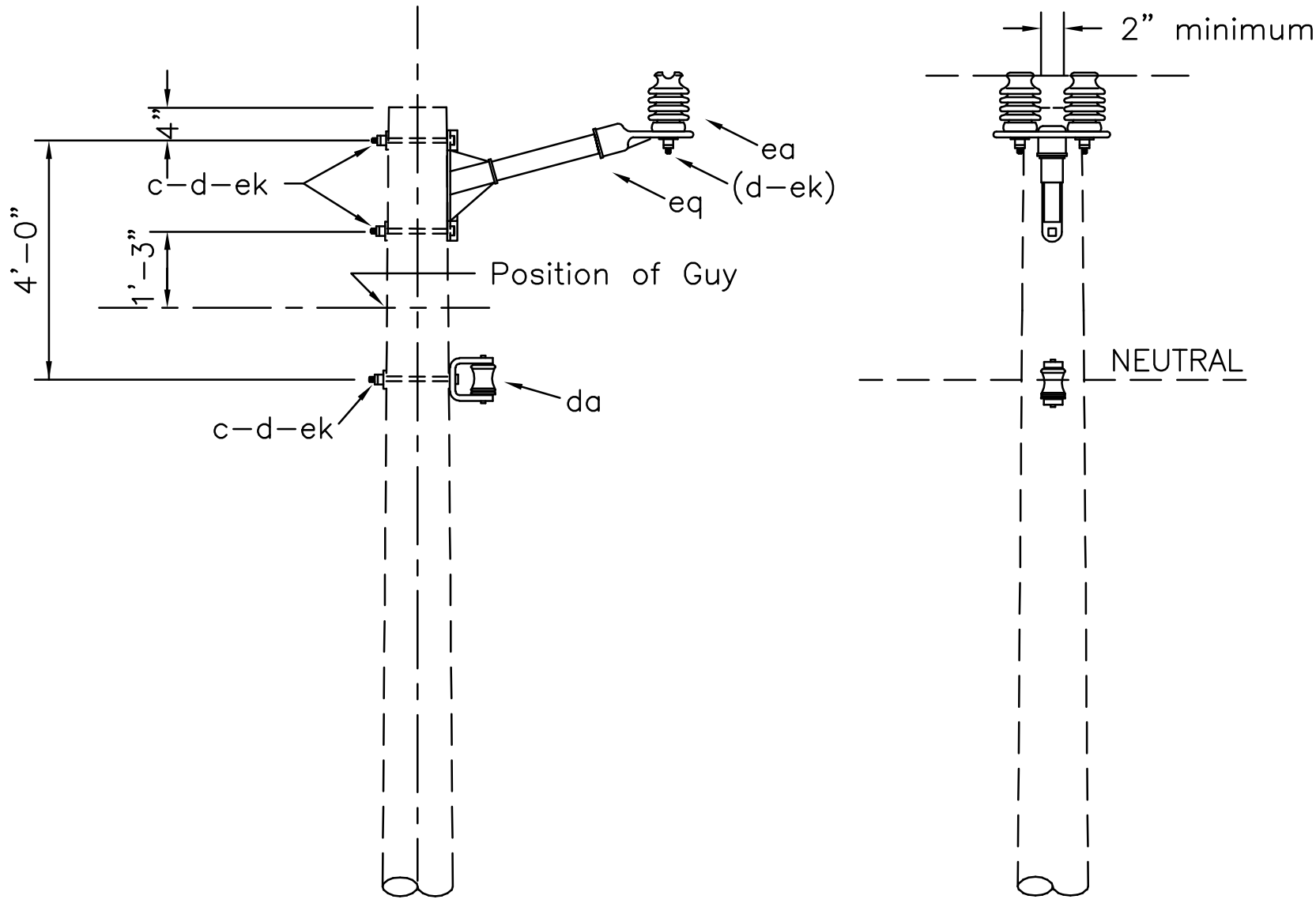
Assembly: A2. 6N

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

Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE

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



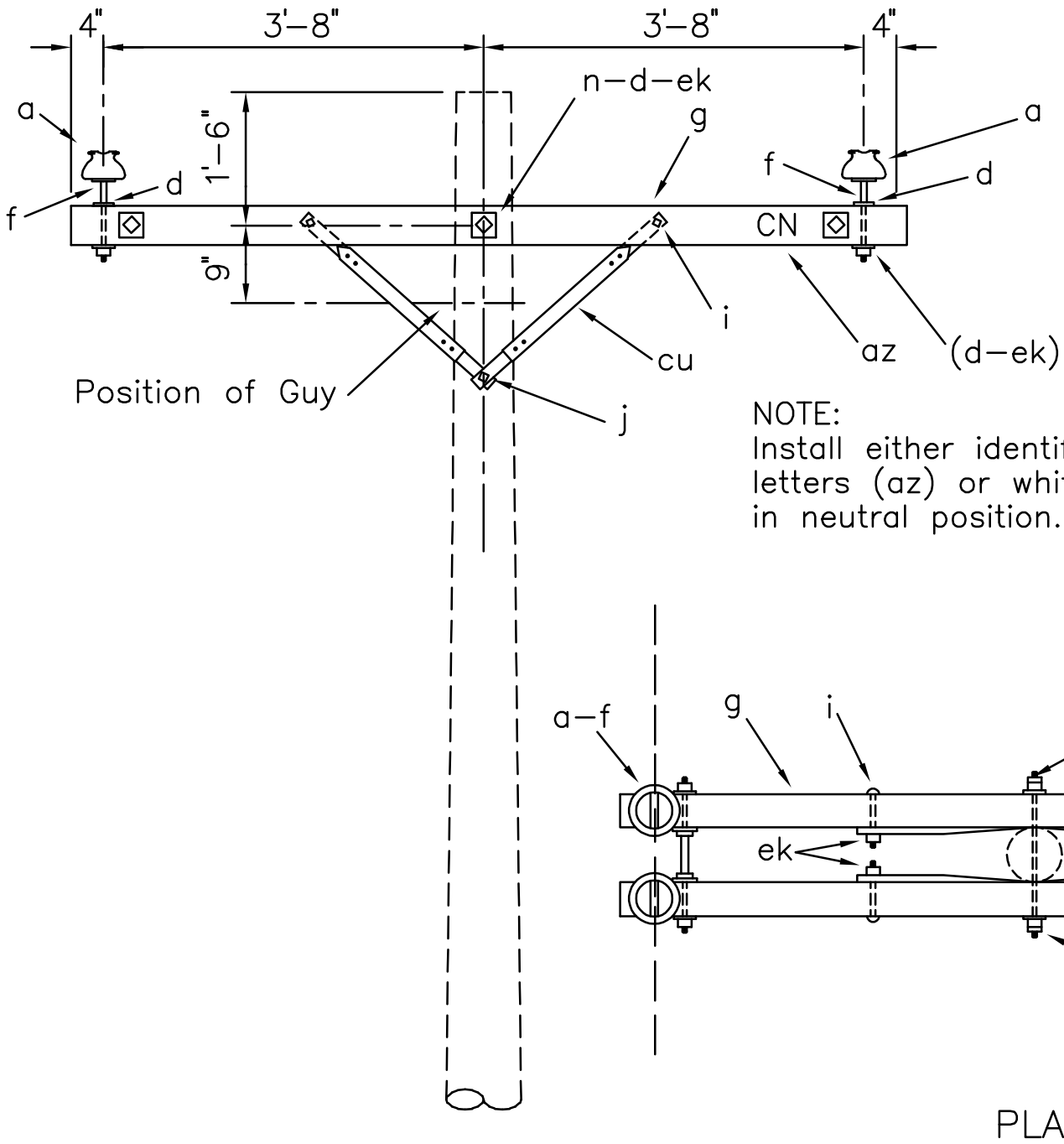
Assembly: A2. 6NP

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

Design Parameters:
Maximum Line Angles
See TABLE IV

DOUBLE SUPPORT–NARROW PROFILE (POST INSULATORS)

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



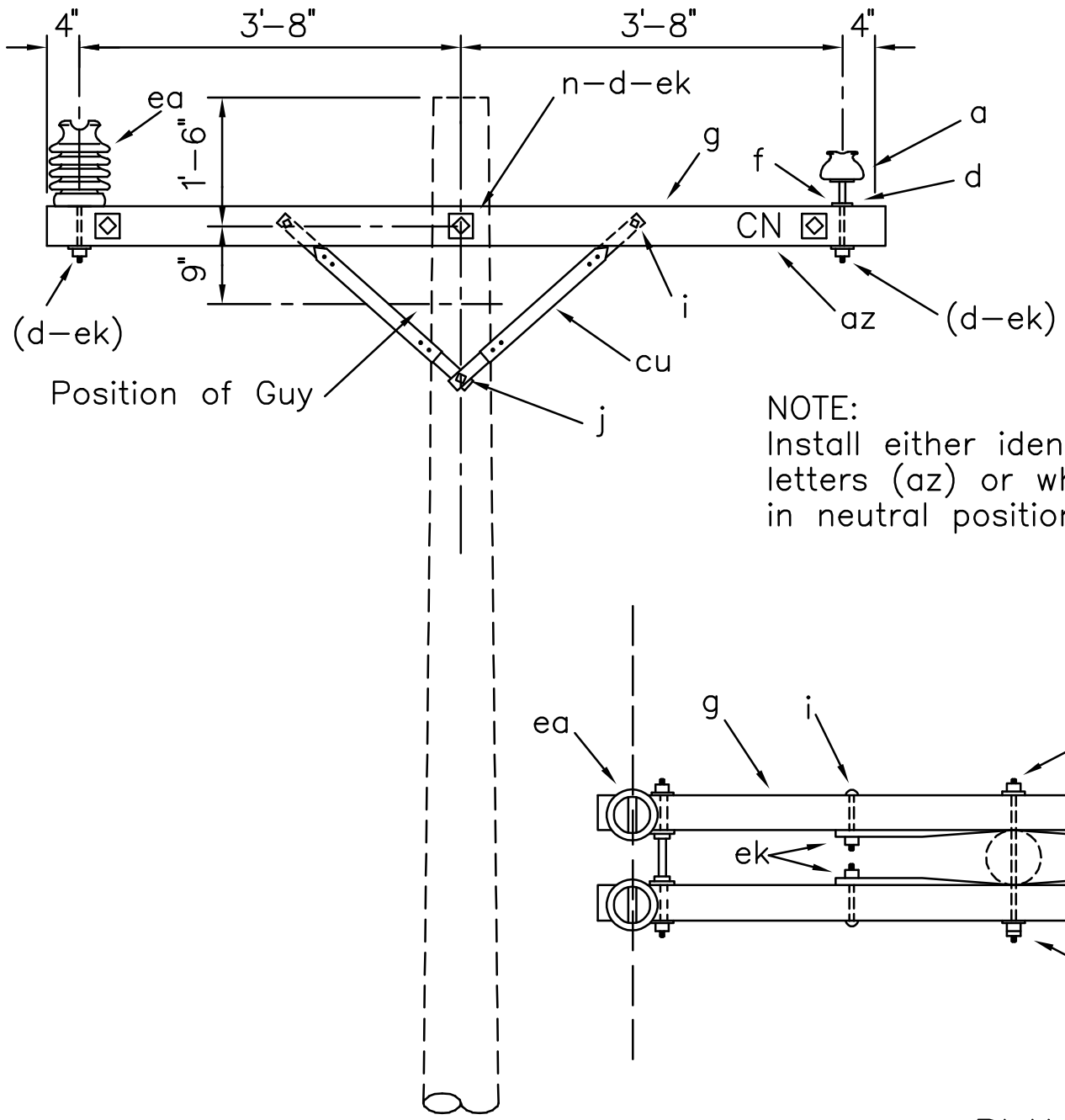
ITEM	QTY	MATERIAL
a	2	Insulator, pin type 15 kV white
a	2	Insulator, pin type (12.47/7.2 kV)
d	14	Washer, square, 2 1/4"
f	4	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arm, 5/8" x req'd length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

DESIGN PARAMETERS:

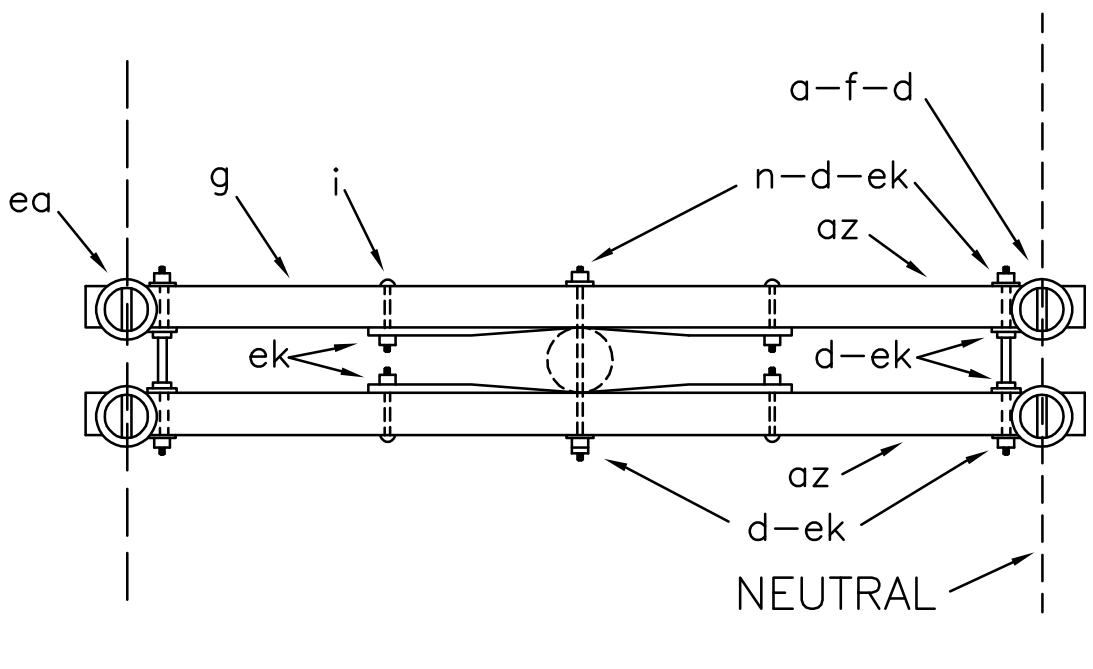
See TABLE IV

DOUBLE SUPPORT ON CROSSARMS

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



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



PLAN

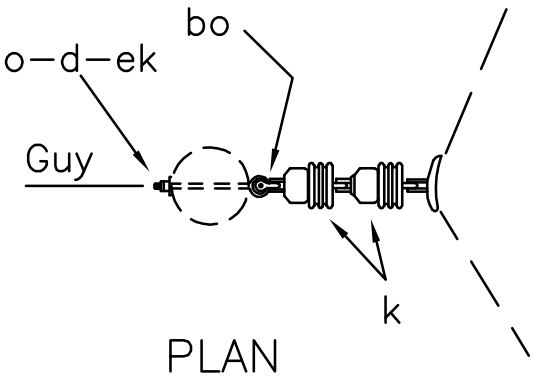
ITEM	QTY	MATERIAL
a	2	Insulator, pin type, 15 kV, white
d	12	Washer, square, 2 ¨1/4"
f	2	Pin, crossarm, steel, 5/8" x 10 3/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8' 0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
n	3	Bolt, double arm, 5/8" x req'd length
az	4	Letters, 2" C, 2" N, with 1" nails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

DESIGN PARAMETERS:

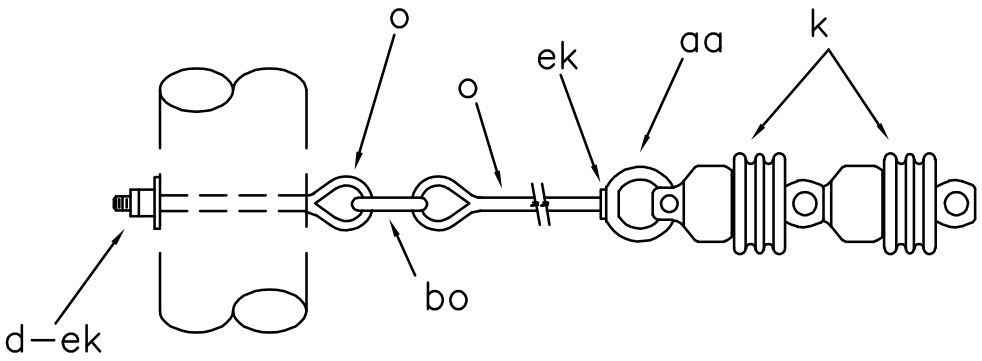
See TABLE IV

DOUBLE SUPPORT ON CROSSARMS
(POST INSULATORS)

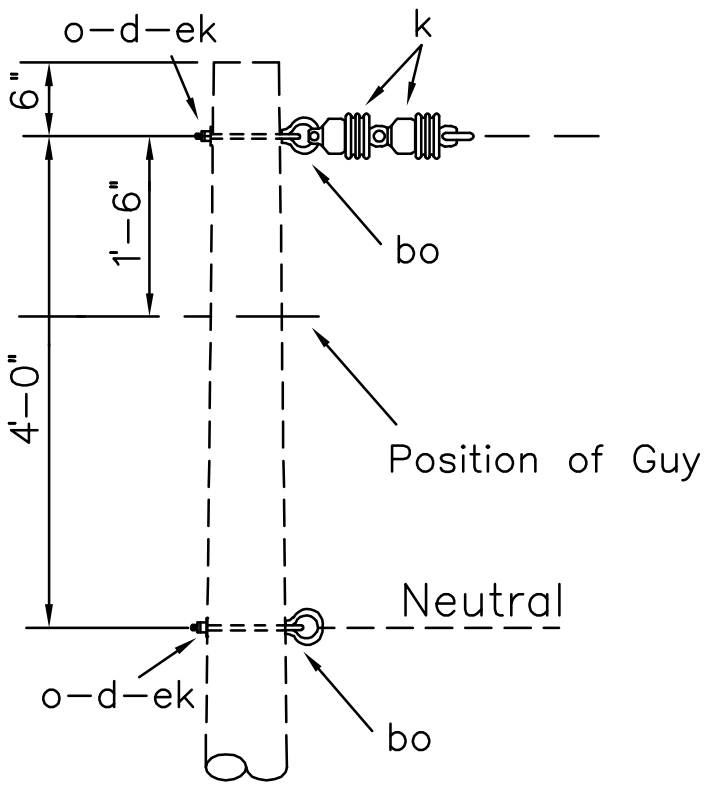
APRIL 2005	1 – PHASE PRIMARY	
RUS	12.47/7.2 kV	A2.21P (A9P)



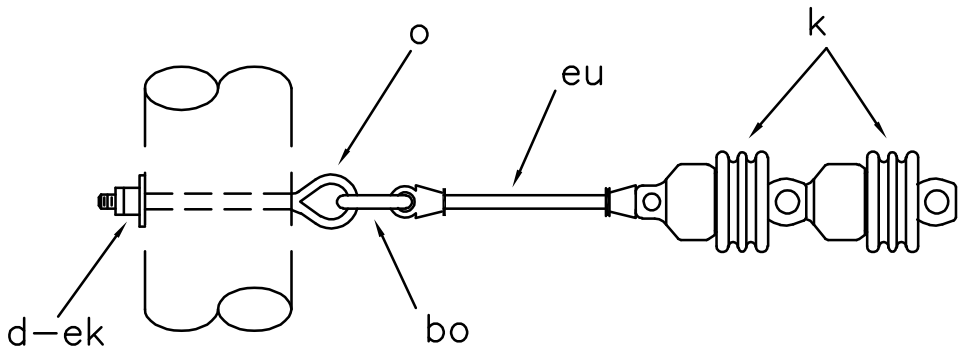
PLAN



A3.2



A3.1



A3.3

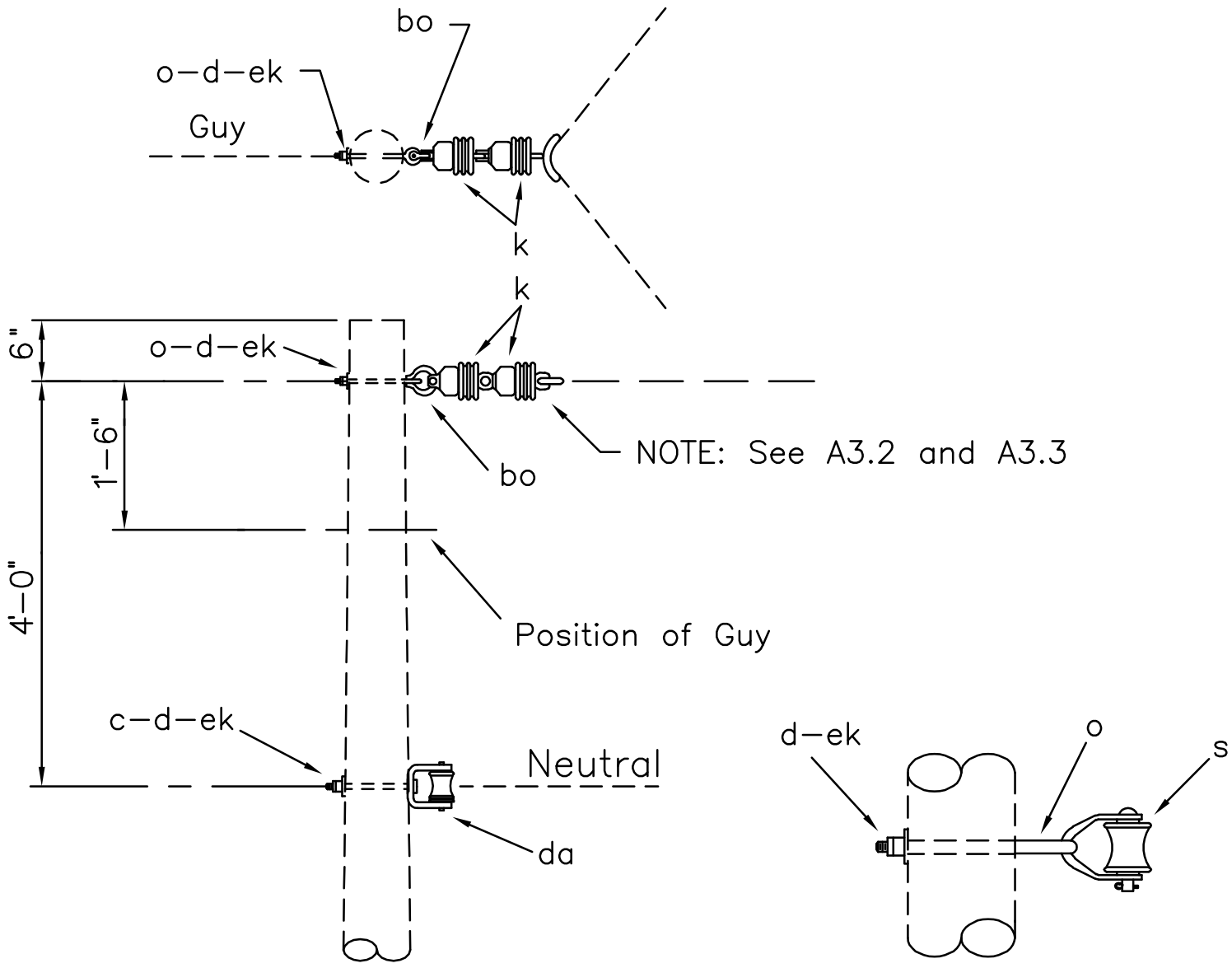
ASSEMBLY: A3		.1	.2	.3
ITEM	MATERIAL	QTY	QTY	QTY
d	Washer, square, 3", curved	2	2	2
k	Insulator, suspension, 4 1/4"	2	2	2
o	Bolt, eye, 5/8"x req'd length	2	3	2
aa	Nut, eye		1	
bo	Shackle, anchor	2	2	2
ek	Locknuts	2	3	2
eu (du)	Link, extension, insulated (Link, extension) – (optional)			1 (1)

DESIGN PARAMETERS:

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

SUSPENSION ANGLE

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



A3.4

A3.7

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

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

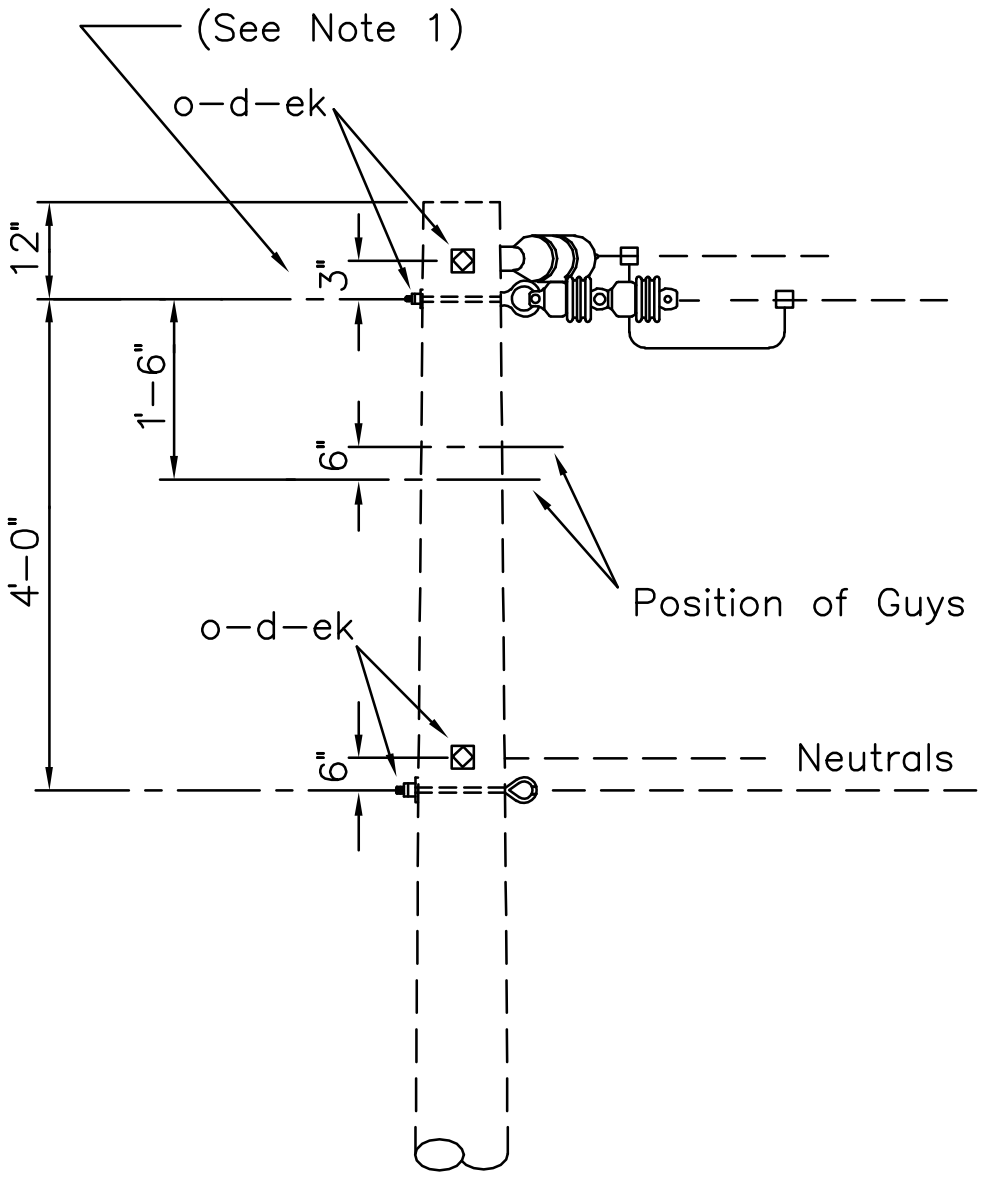
DESIGN PARAMETERS:

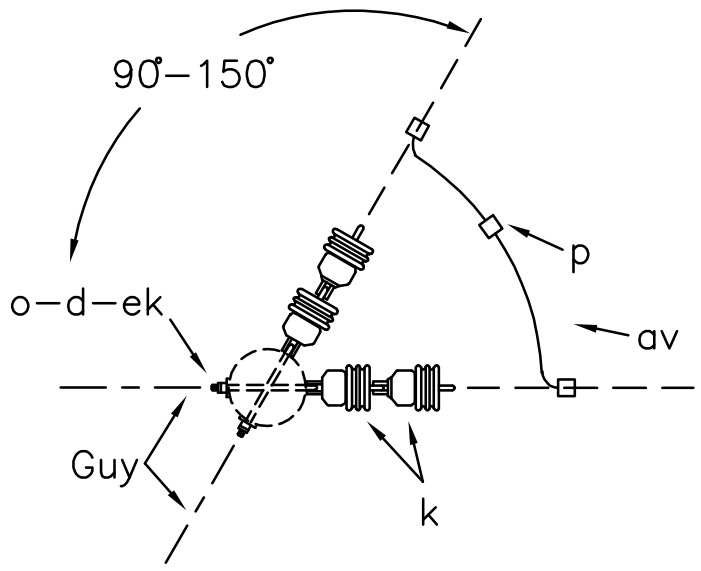
For ANSI Class 53–2 Spool Insulator (1 3/4") See Table VI

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

SUSPENSION ANGLE

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





PLAN

NOTES:

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

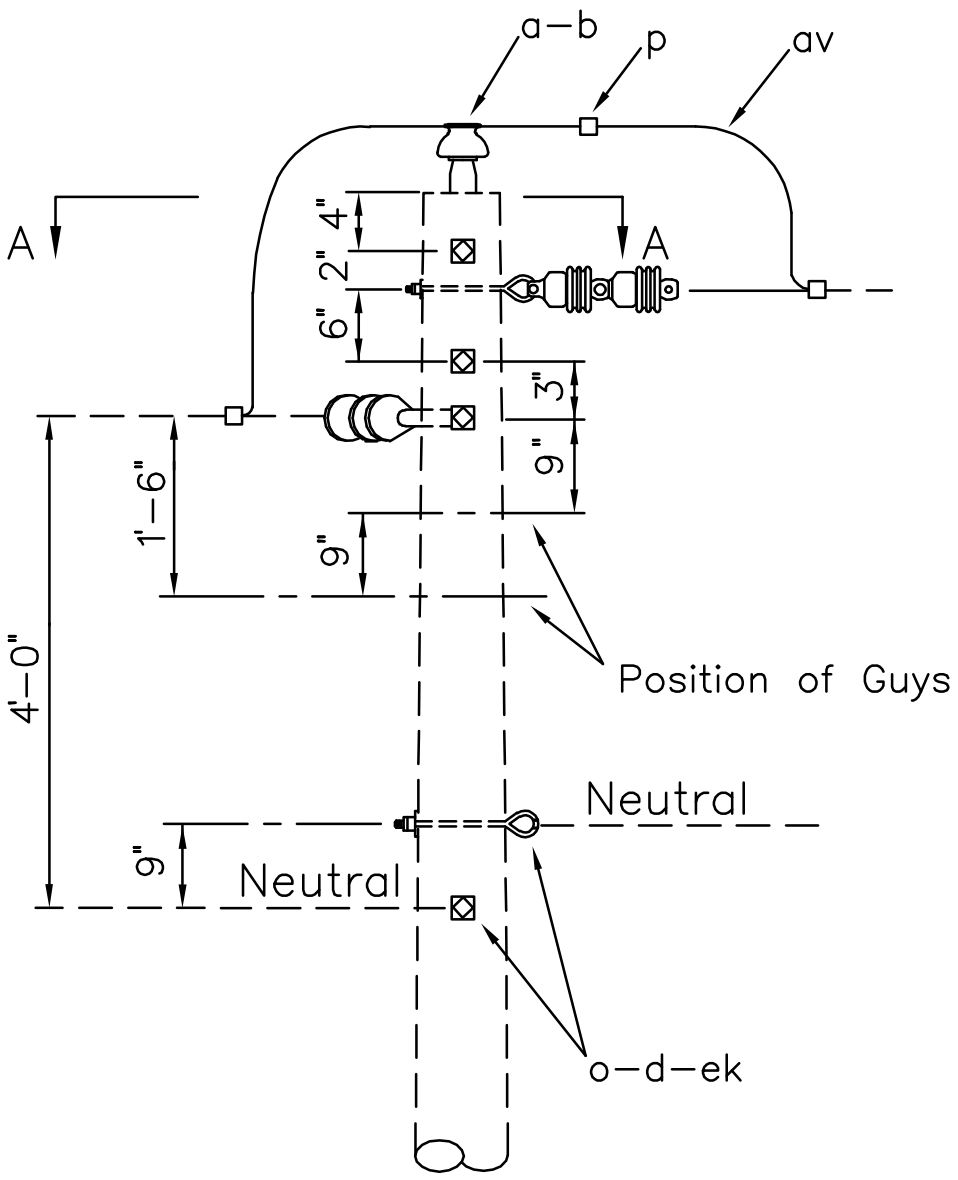
ITEM	QTY	MATERIAL
d	4	Washer, square, 3", curved
k	4	Insulator, suspension, 4 1/4"
o	4	Bolt, eye, 5/8" x req'd length
p		Connectors, as req'd
av		Jumpers, as req'd
ek	4	Locknuts

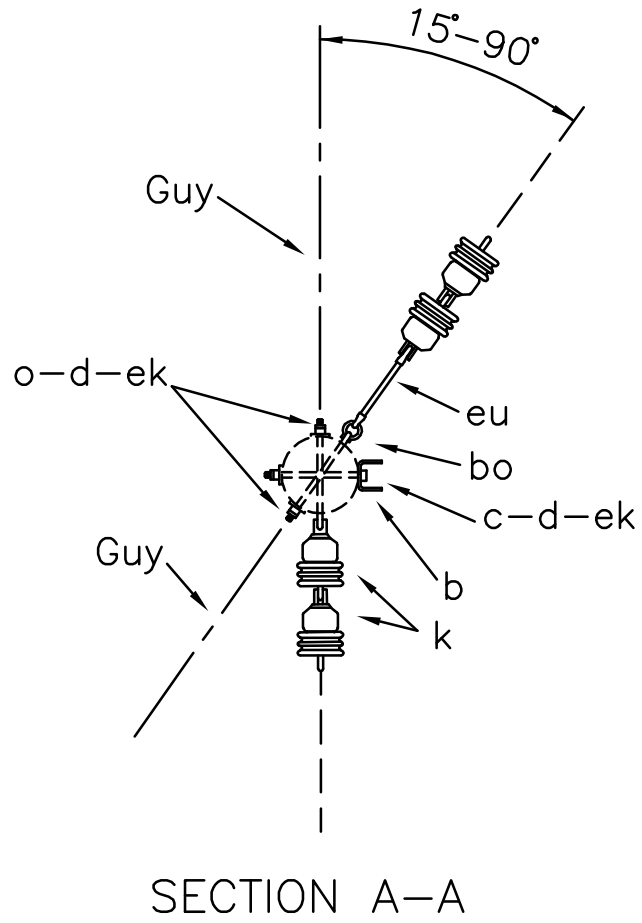
DESIGN PARAMETERS:

PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE (90°–150°)

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





SECTION A–A

NOTES:

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

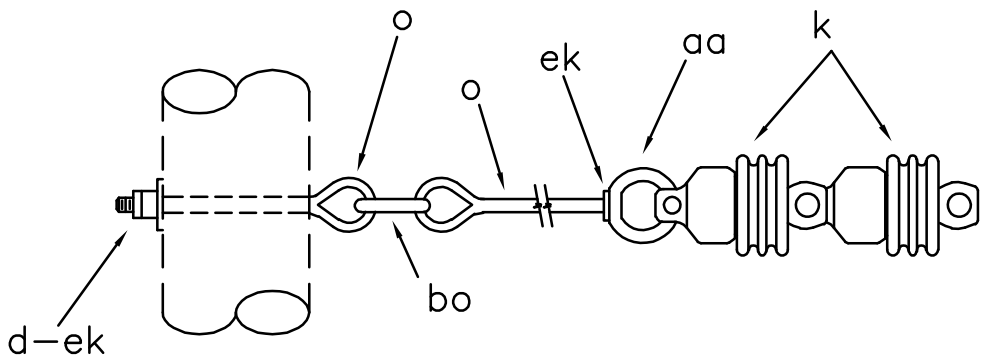
ITEM	QTY	MATERIAL
a	1	Insulator, pin type "(12.47/7.2 kV)
b	1	Pin, pole top, 20 "
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4 "
d	4	Washer, square, 3, curved
k	4	Insulator, suspension, 4 1/4
o	4	Bolt, eye, 5/8 x req'd length
p		Connectors, as req'd
av		Jumpers, as req'd
bo	1	Shackle,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

DESIGN PARAMETERS:

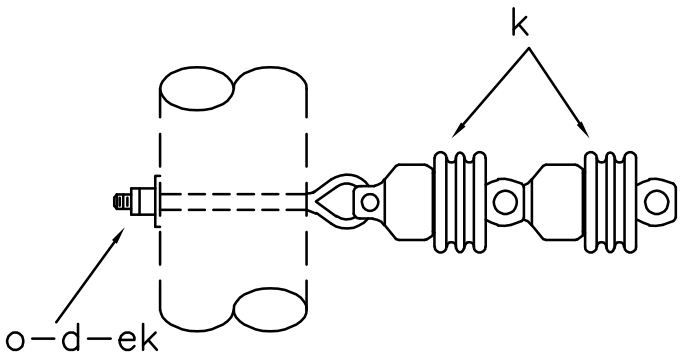
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

DEADEND ANGLE (15°–90°)

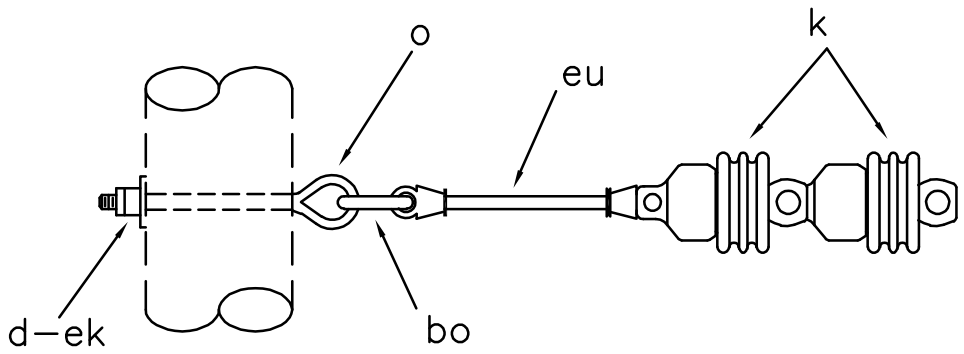
APRIL 2005	1 – PHASE PRIMARY 12.47/7.2 kV	
RUS		A4.2



A5.02



A5.01



A5.03

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

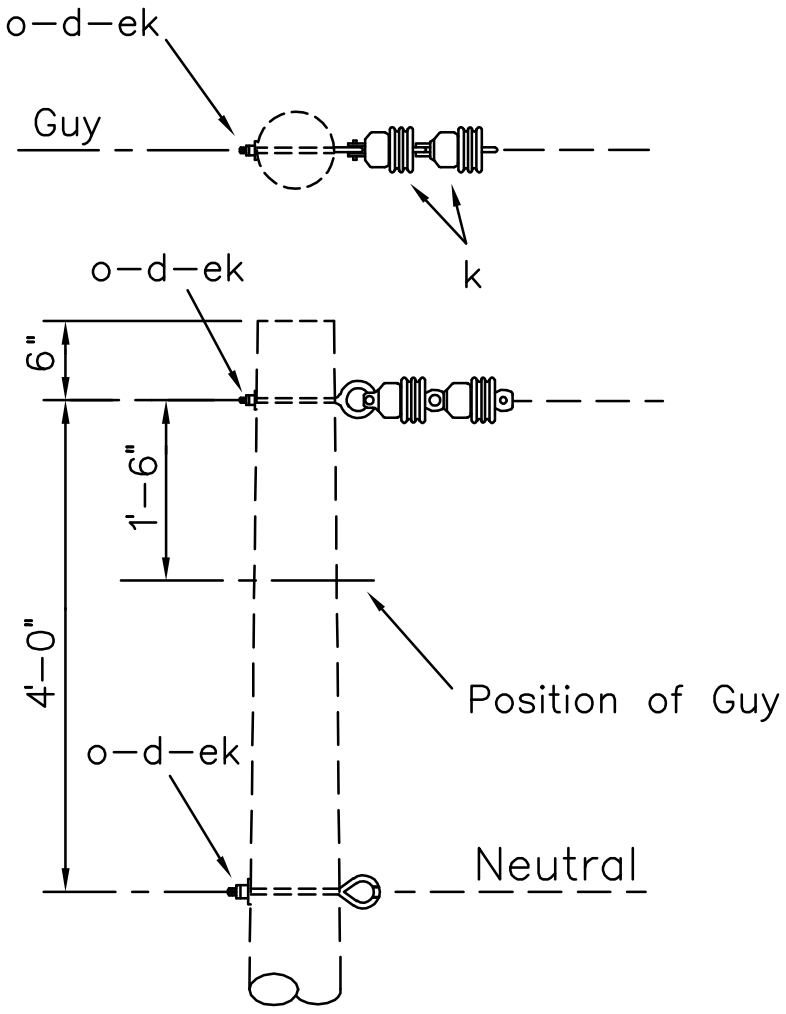
ASSEMBLY: A5	.01	.02	.03
ITEM — MATERIAL	QTY	QTY	QTY
d — Washer, square, 3", curved	1	1	1
k — Insulator, suspension, 4 1/4"	2	2	2
o — Bolt, eye, 5/8"x req'd length	1	2	1
aa — Nut, eye		1	
bo — Shackle, anchor		1	1
ek — Locknuts	1	2	1
eu — Link, extension, insulated			1
(du) — (Link, extension) – (optional)			(1)

DESIGN PARAMETERS:

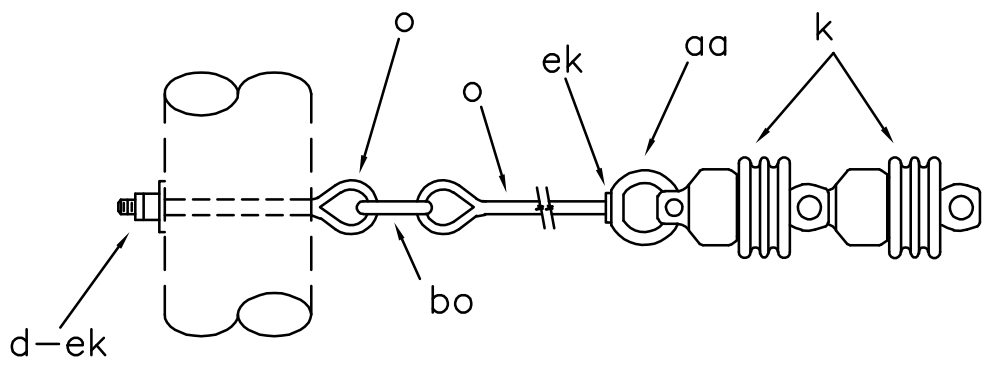
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

SINGLE DEADENDS

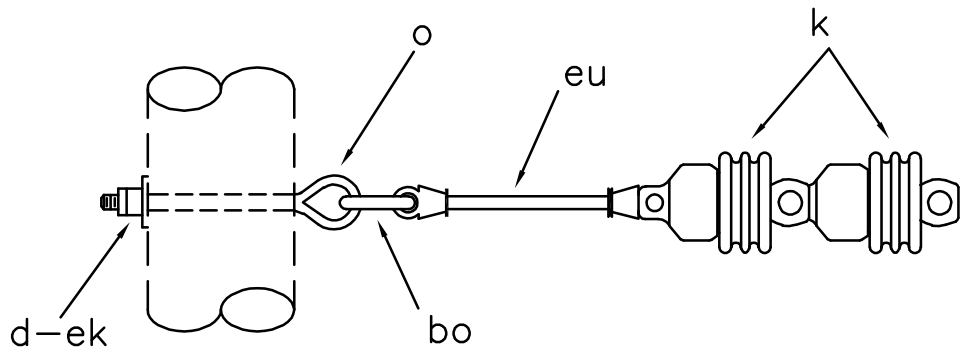
APRIL 2005 RUS	1 – PHASE PRIMARY 12.47/7.2 kV	A5.01,A5.02,A5.03 (M5–24),(M5–8)



A5.1



A5.2



A5.3

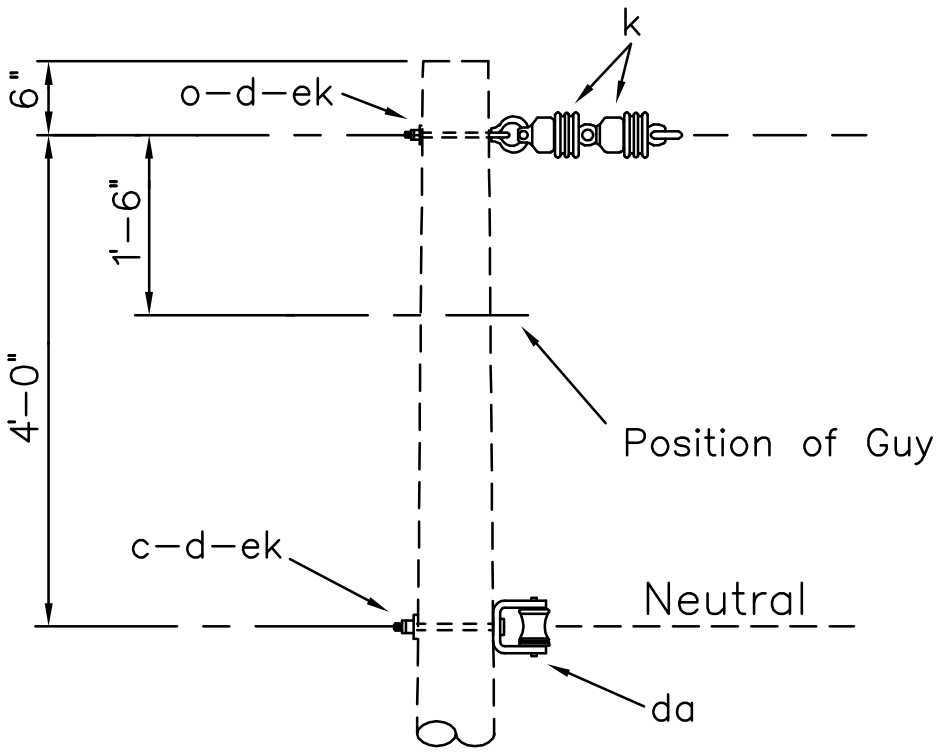
NOTE: When connecting to existing bolt end, use eyenut "aa" and locknut "ek" instead of eyebolt subassembly "o–d–ek".

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

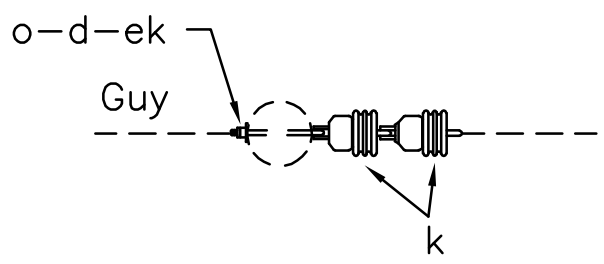
DESIGN PARAMETERS:
PERMITTED LONGITUDINAL LOAD = 5000 lbs./Conductor

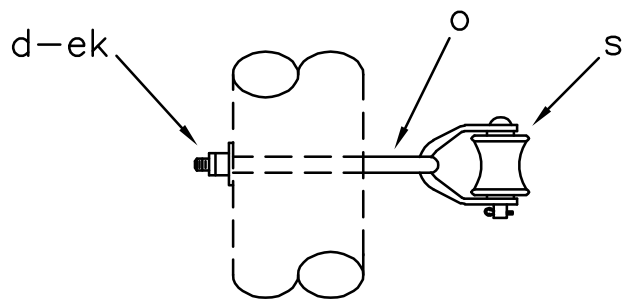
SINGLE DEADENDS

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



A5.4





A5.7

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

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

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

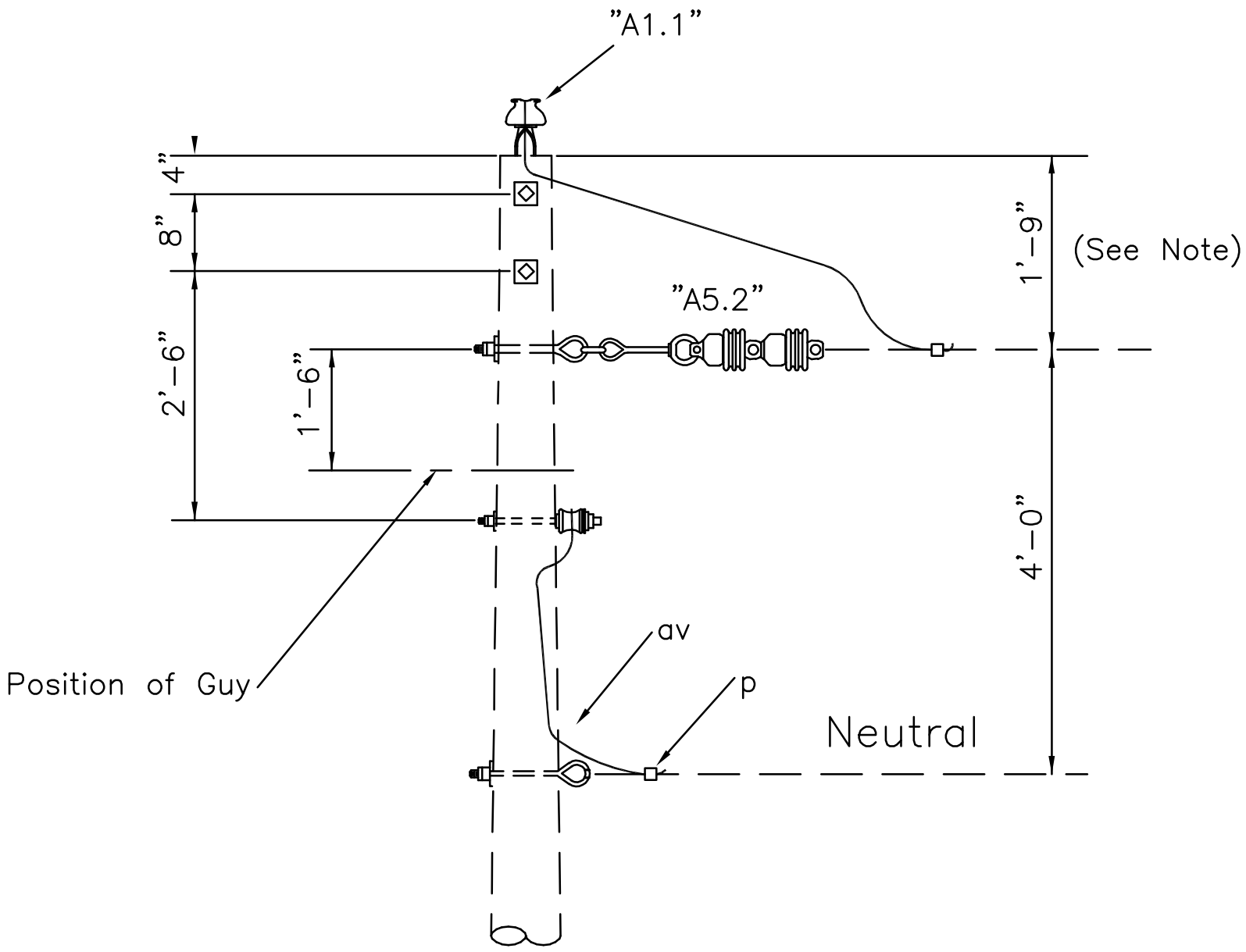
DESIGN PARAMETERS:

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

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

SINGLE DEADENDS

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



NOTES:

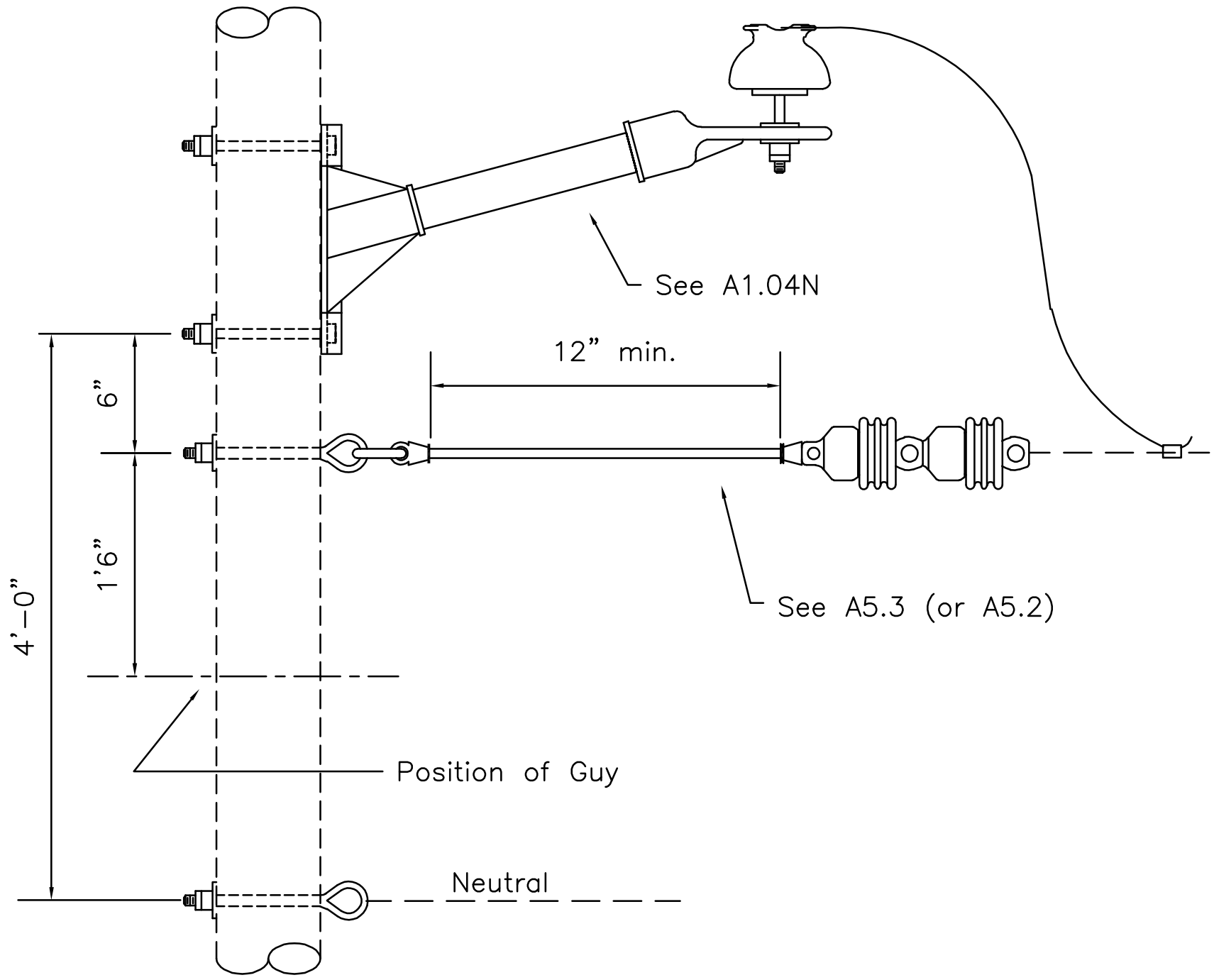
1. Tap assembly may be installed 6" from top of pole when perpendicular to line. Raise neutral and guy attachemnt 15" also.
2. Any deadend assembly, A5.1 through A5.9, may be used.

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

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

SINGLE PHASE TAP GUIDE

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



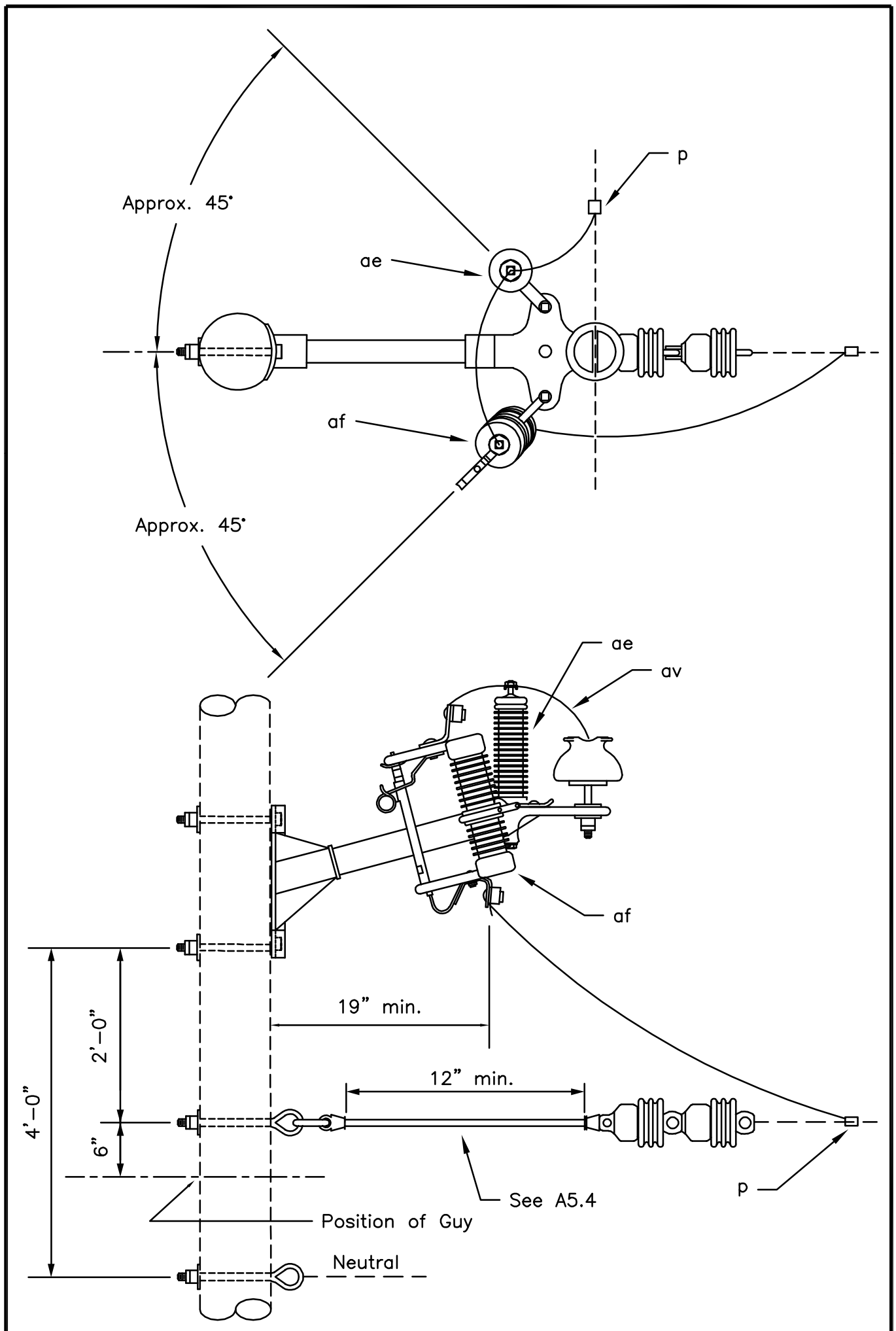
ITEM	MATERIAL	QTY
	A1.04N Primary Assembly (Narrow Profile)	1
	A5.3 Primary Assembly	1
p	Connectors, as req'd	
av	Jumpers, as req'd	

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL
LOAD = 5000 lbs./Conductor

SINGLE PHASE TAP GUIDE

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



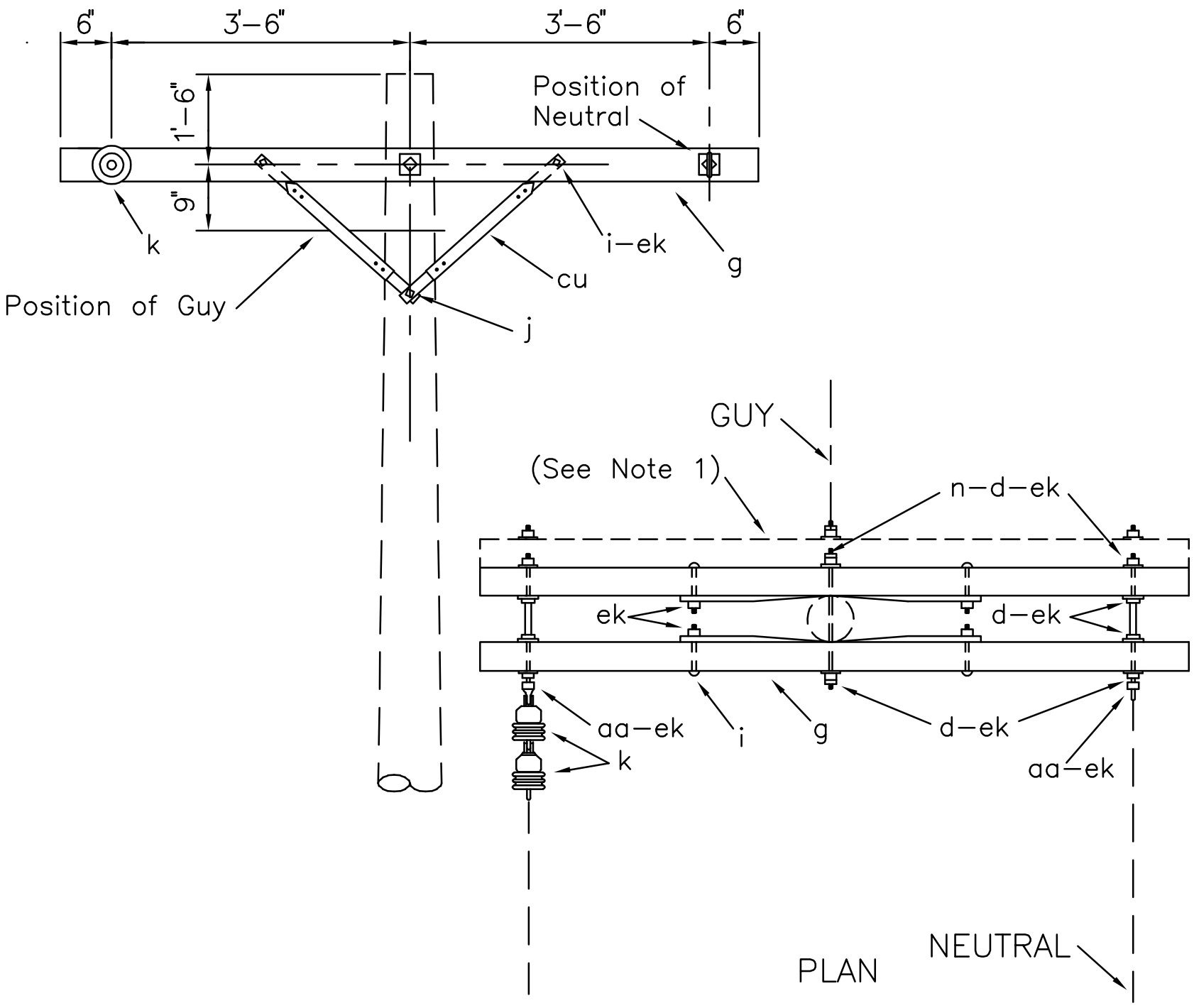
ITEM	MATERIAL	QTY
	A1.04N Primary Assembly (Narrow Profile)	1
	A5.4 Primary Assembly	1
p	Connectors, as req'd	
ae	Arrester, surge (9kV)	1
af	Cutout, dist. open (15kV)	1
av	Jumpers, as req'd	

DESIGN PARAMETERS:

PERMITTED LONGITUDINAL
LOAD = 5000 lbs./Conductor

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

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



NOTES:

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

ITEM	QTY	MATERIAL
d	10	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
k	2	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
aa	2	Nut, eye, 5/8"
cu	4	Brace, 28"
ek	16	Locknuts

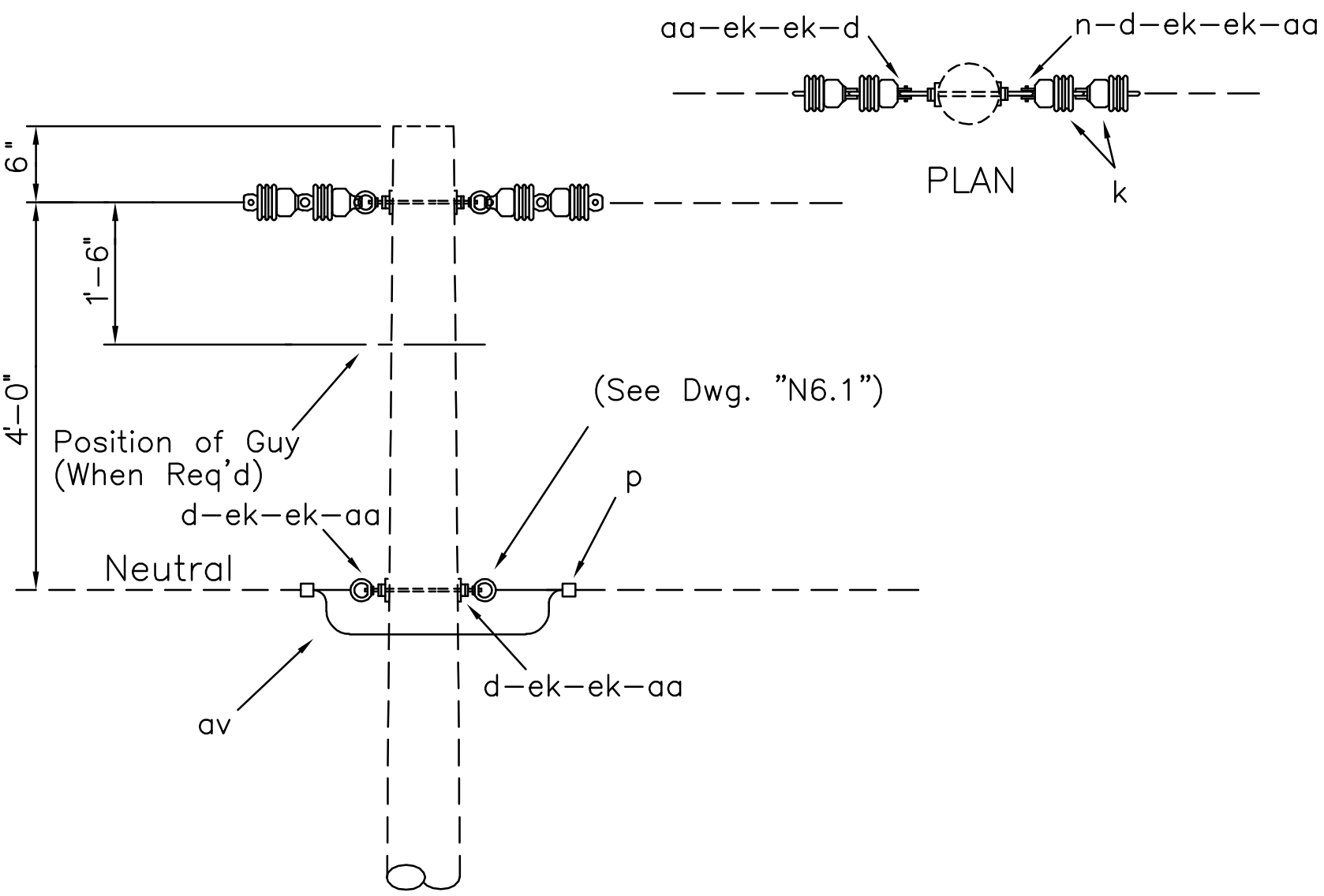
DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

SINGLE DEADEND ON CROSSARMS

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



NOTES:

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

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

* Optional – Quantity as req'd

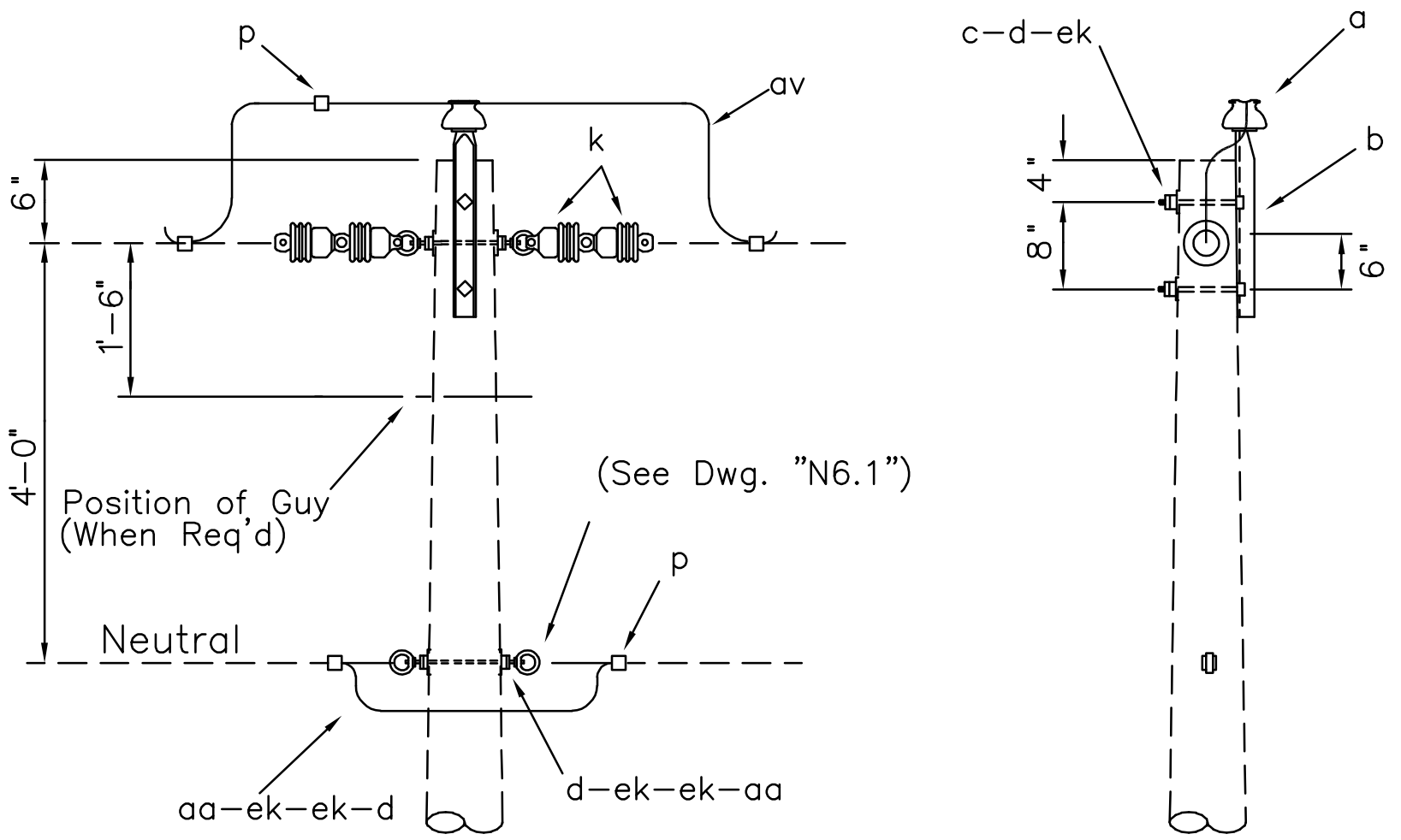
DESIGN PARAMETERS:

PERMITTED
LONGITUDINAL LOAD=
5000 lbs./Conductor

MAXIMUM LINE
ANGLE = 5° (See Note)

DOUBLE DEADEND (STRAIGHT)

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



NOTES:

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

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

* Optional – Quantity as req'd

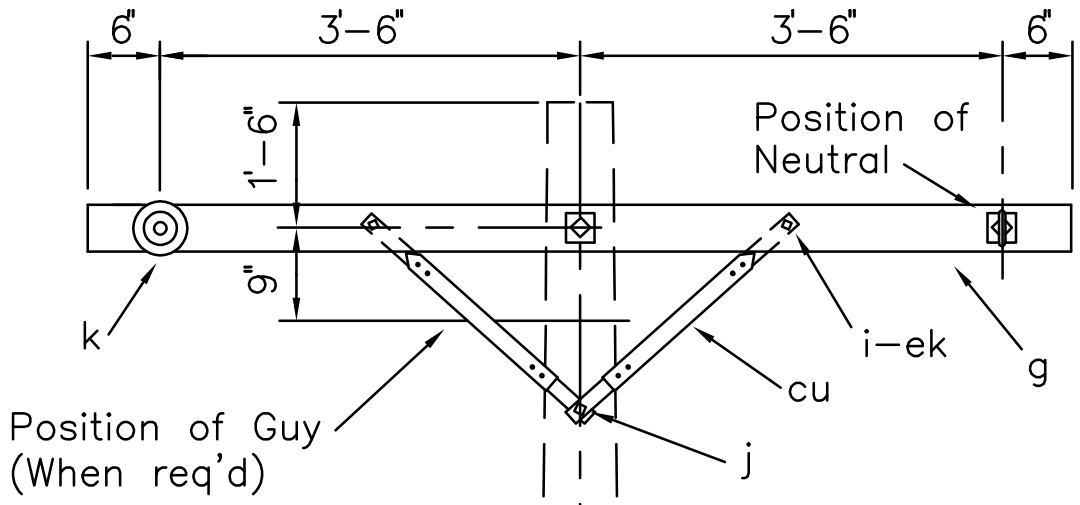
DESIGN PARAMETERS:

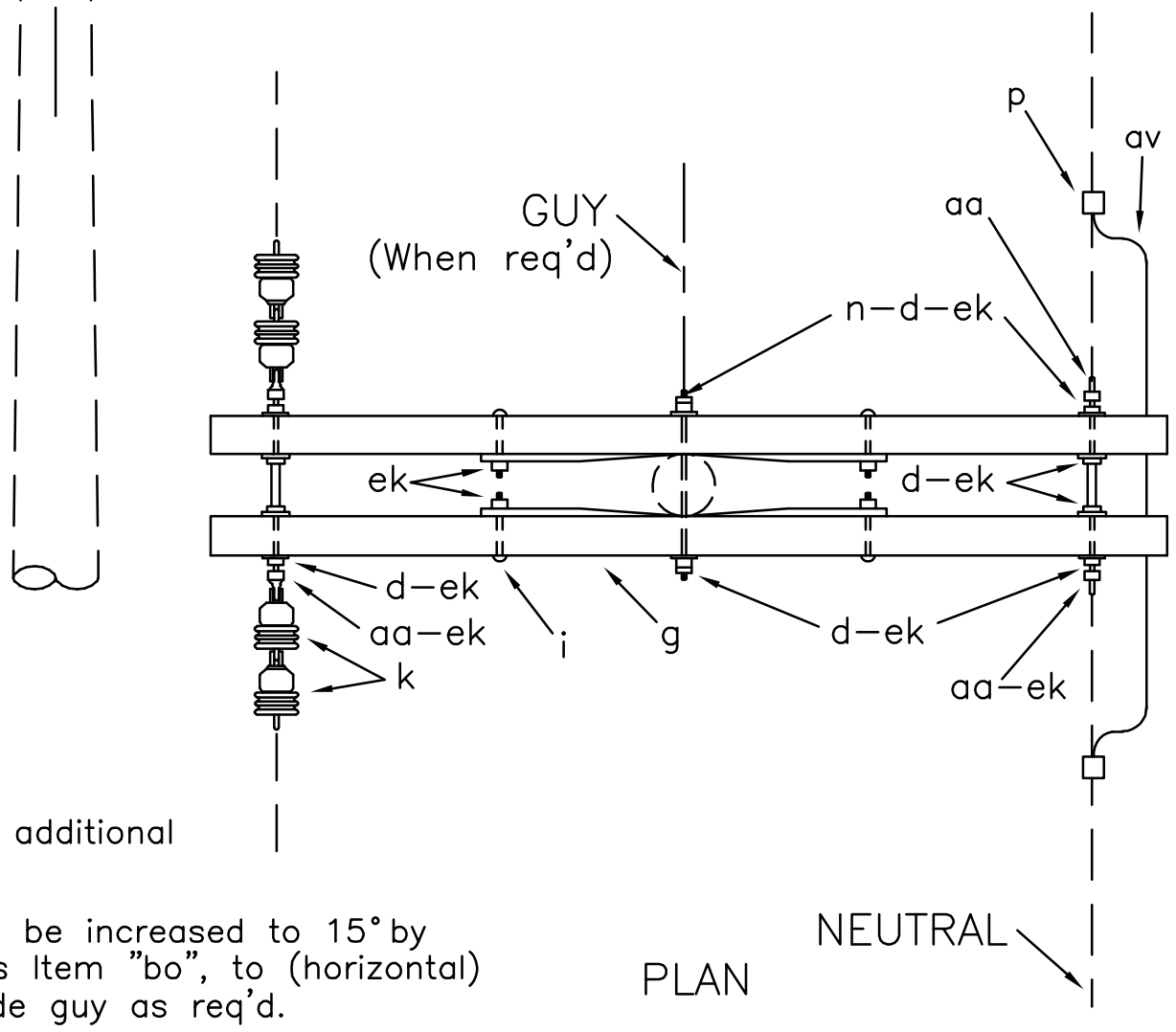
PERMITTED
LONGITUDINAL LOAD=
5000 lbs./Conductor

MAXIMUM LINE
ANGLE = 5° (See Note)

DOUBLE DEADEND (FEED THROUGH)

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





NOTES:

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

ITEM	QTY	MATERIAL
d	10	Washer, square, 2 1/4"
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'0"
i	4	Bolt, carriage, 3/8" x 4 1/2"
j	2	Screw, lag, 1/2" x 4"
k	4	Insulator, suspension, 4 1/4"
n	3	Bolt,double arming,5/8" x req'd length
p		Connectors, as req'd
aa	4	Nut, eye, 5/8"
av		Jumpers, as req'd
cu	4	Brace, wood, 28"
ek	18	Locknuts

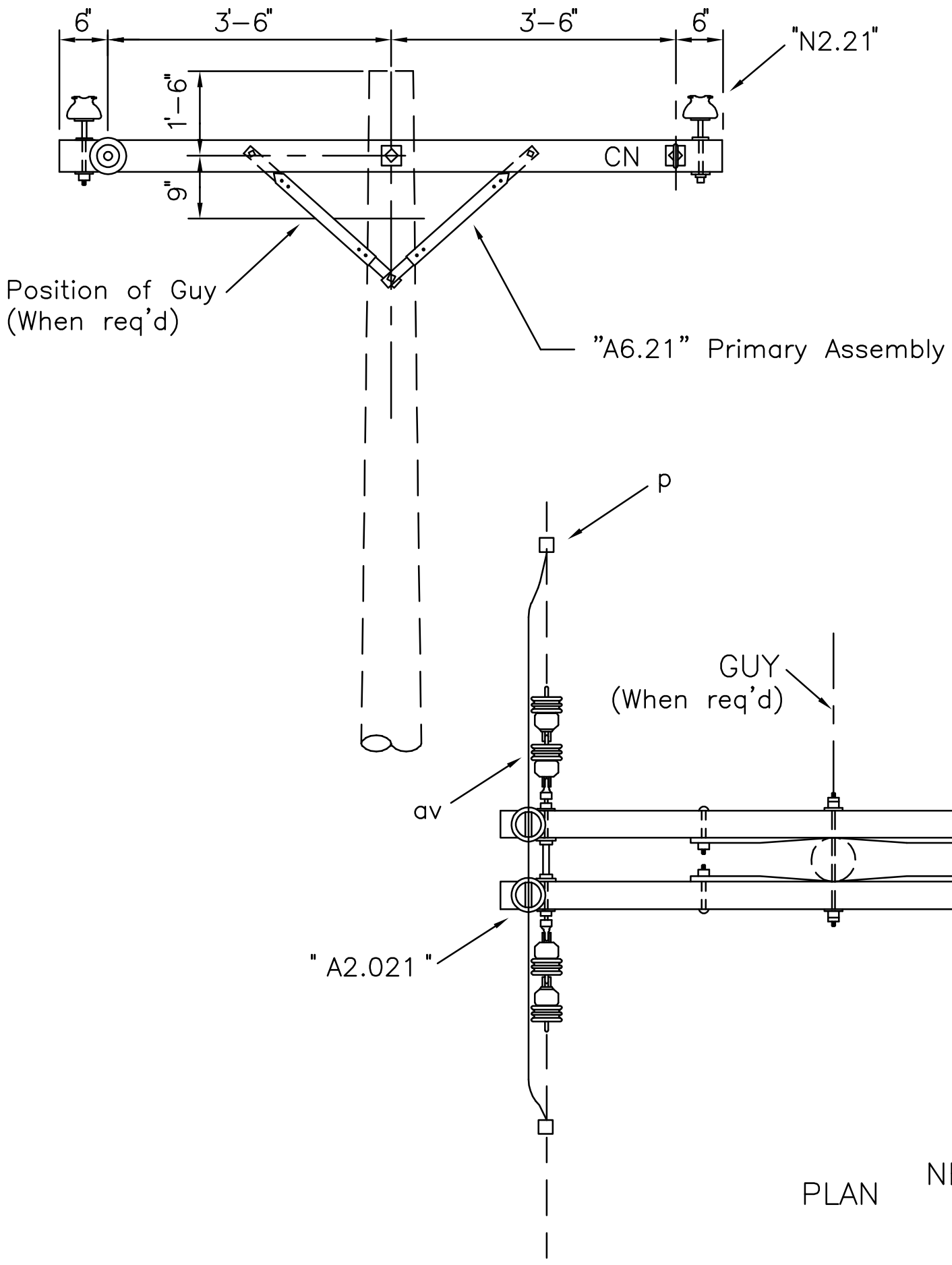
DESIGN PARAMETERS:

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

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

DOUBLE DEADEND ON CROSSARMS

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



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

DESIGN PARAMETERS:

PERMITTED UNBALANCED CONDUCTOR TENSION:

See Table A (Exhibit 2)

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

DOUBLE DEADEND GUIDE (FEED THROUGH ON CROSSARMS)

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

INDEX G

TRANSFORMER ASSEMBLY UNITS

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

TRANSFORMER ASSEMBLY UNITS

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

CONSTRUCTION SPECIFICATIONS FOR TRANSFORMERS

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

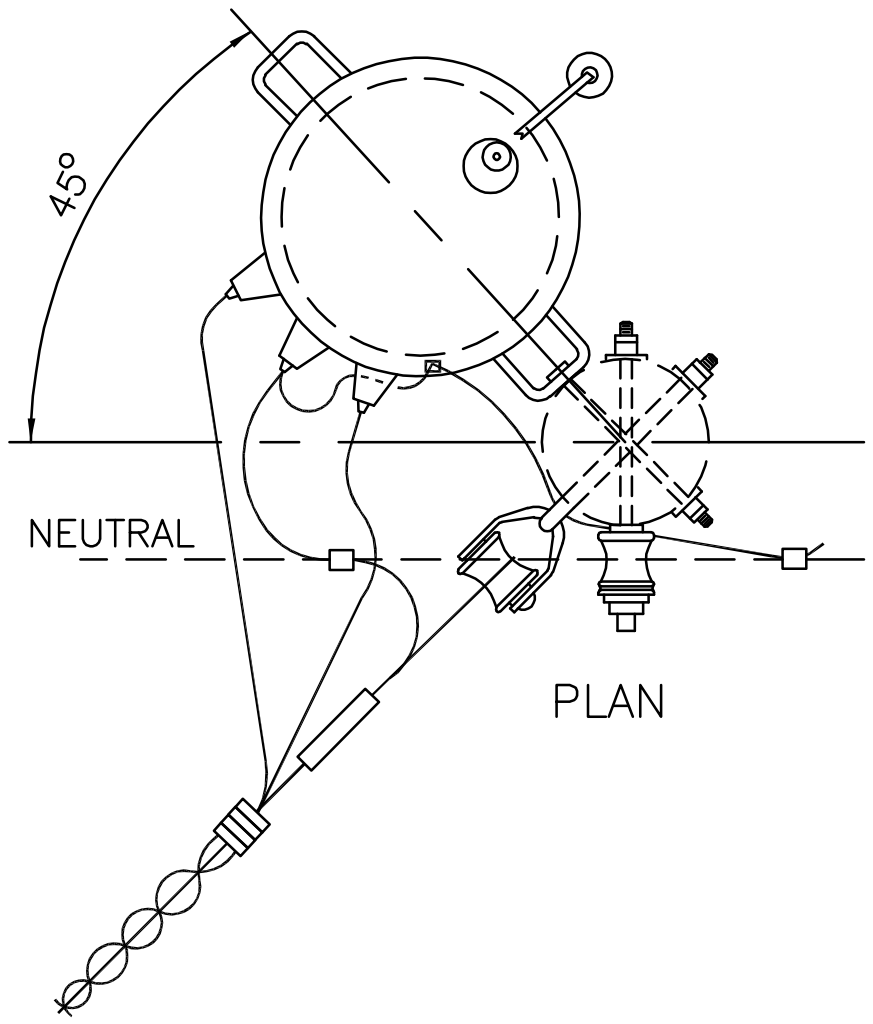
Where applicable, the external gap on surge arresters shall be set according to the manufacturer's recommended spacing.

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

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

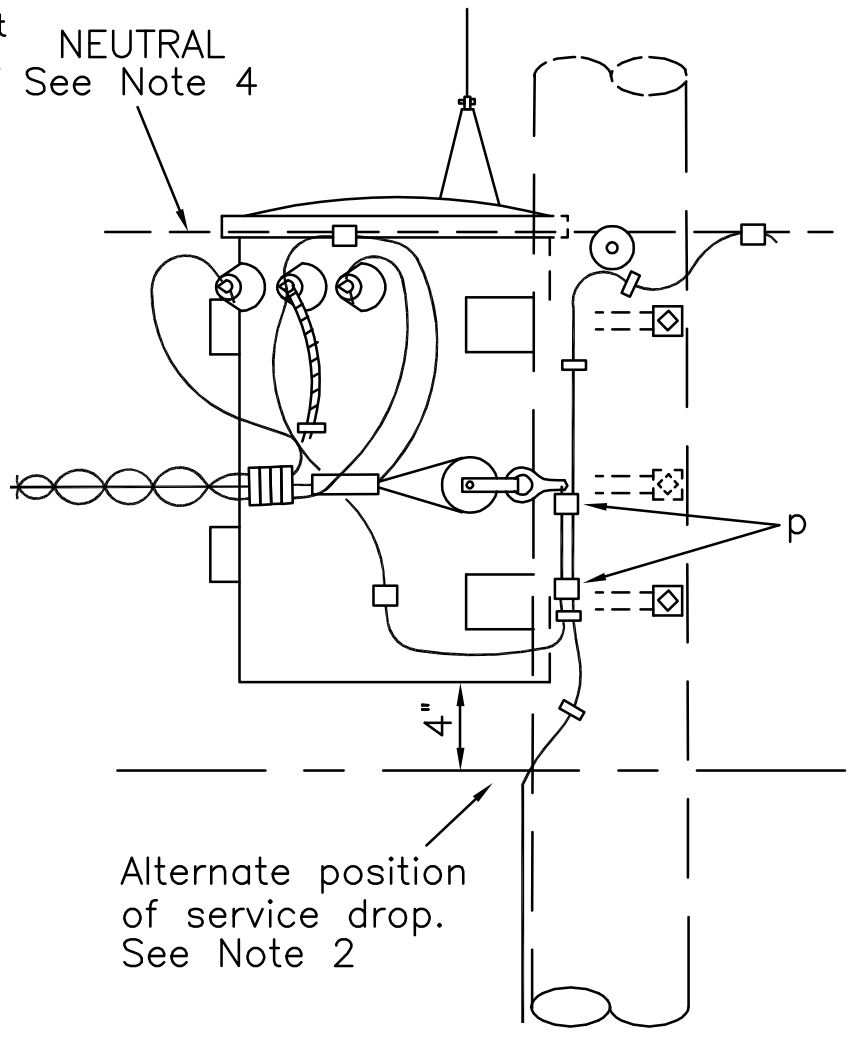
Tank-mounted arresters provide maximum surge protection to transformers because of the arresters' minimum lead lengths. However, when arresters are mounted directly on transformer tanks, the fused cutouts have less surge protection and are subject to more frequent operations. Nuisance operations on fused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

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



NOTES:

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

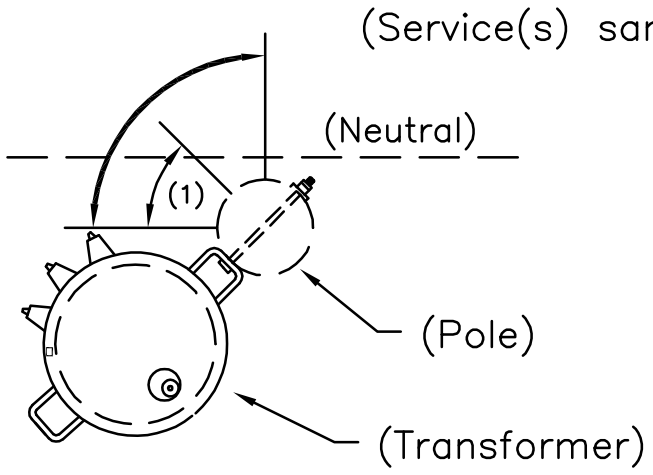


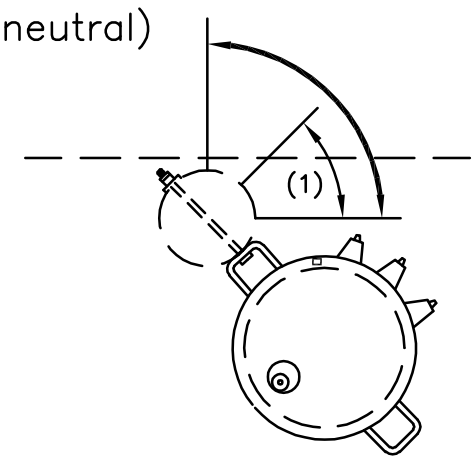
TRANSFORMER INSTALLATION GUIDE
SINGLE–PHASE, POLE–TYPE TRANSFORMER

APRIL 2005		G1.1G
RUS		(M27–1A)

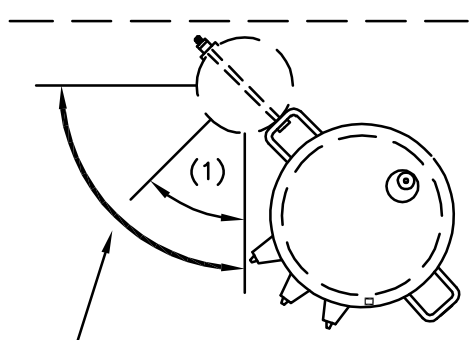
TANGENT POLES

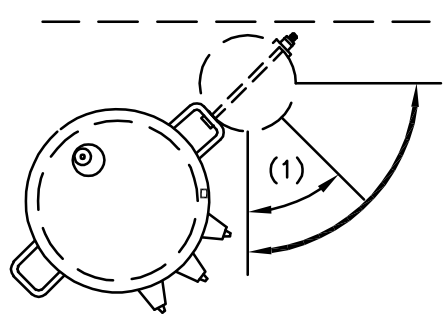
(Service(s) same as neutral)





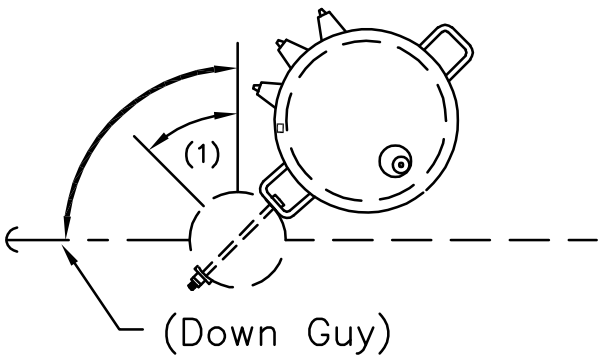
(Service(s) opposite side of neutral)

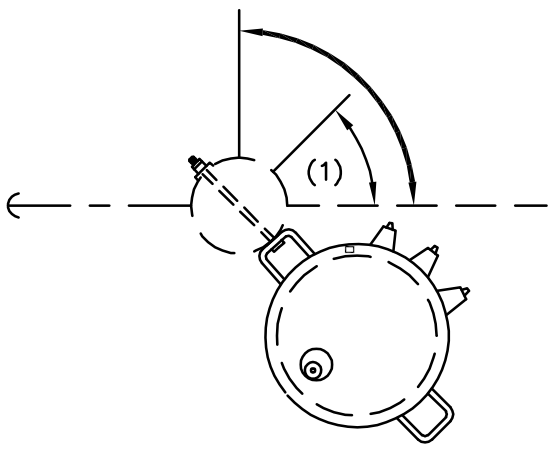


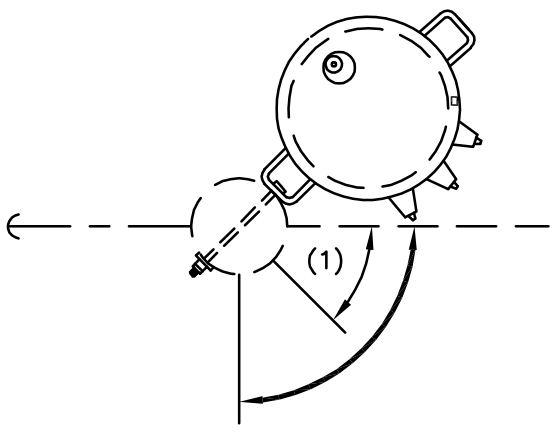


DEADEND POLES

(See Note 2)





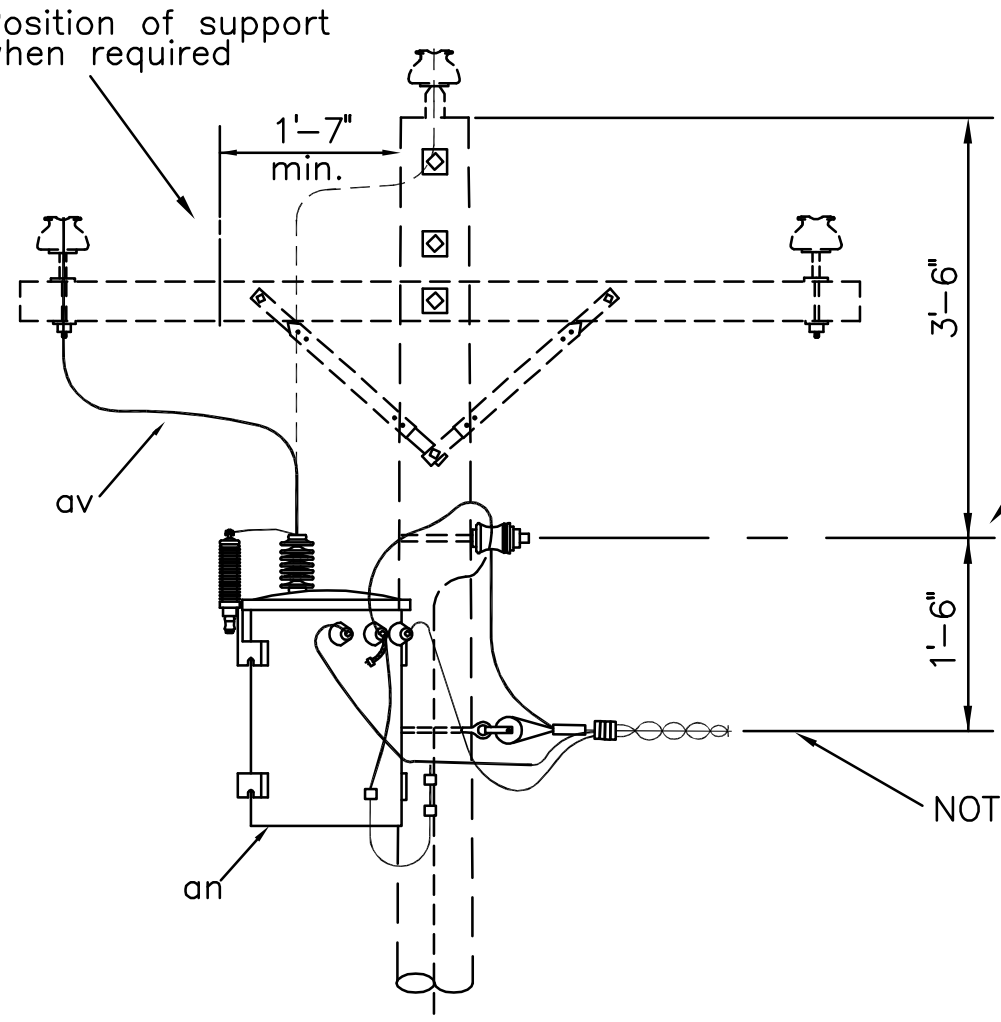


NOTES:

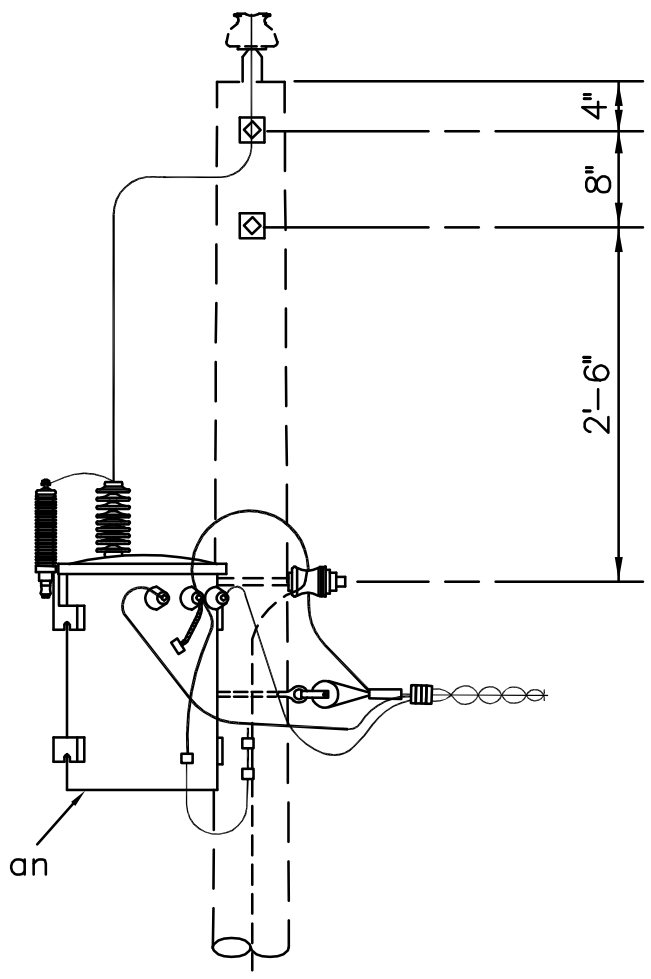
1. Lower service(s) to 4 inches below transformer if necessary for adequate clearances.
2. Lower transformer so that neutral is 3 inches above transformer lid.

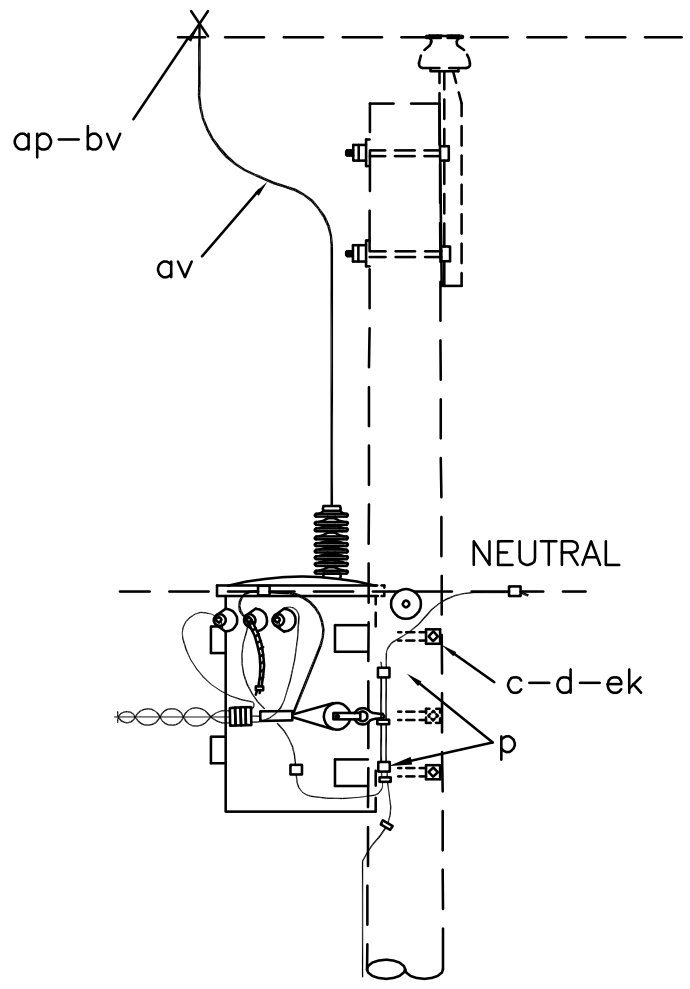
POLE TYPE TRANSFORMER LOCATION GUIDE

APRIL 2005		G1.2G
RUS		



NOTE: Position service takeoff midway between transformer hanger brackets.





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

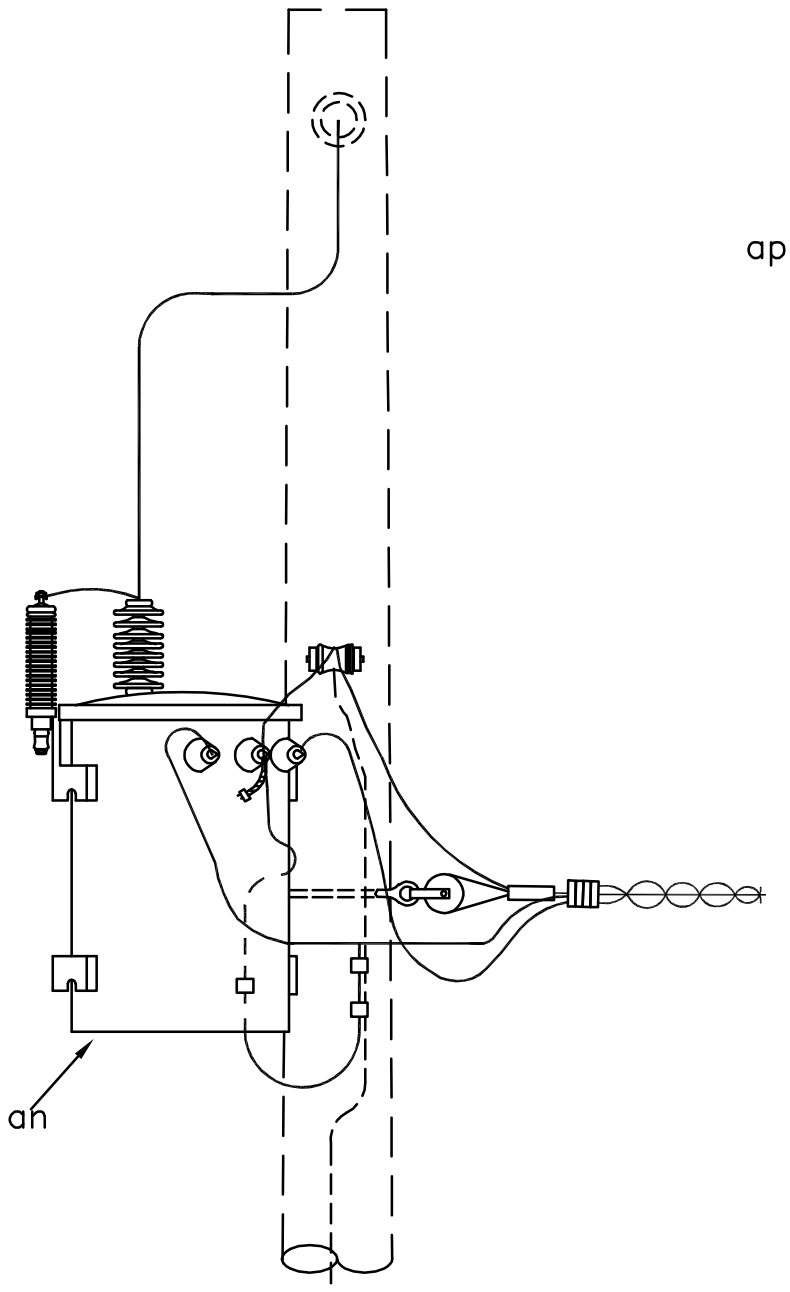
ITEM	QTY	MATERIAL
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CSP TRANSFORMER (TANGENT POLE)

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



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

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

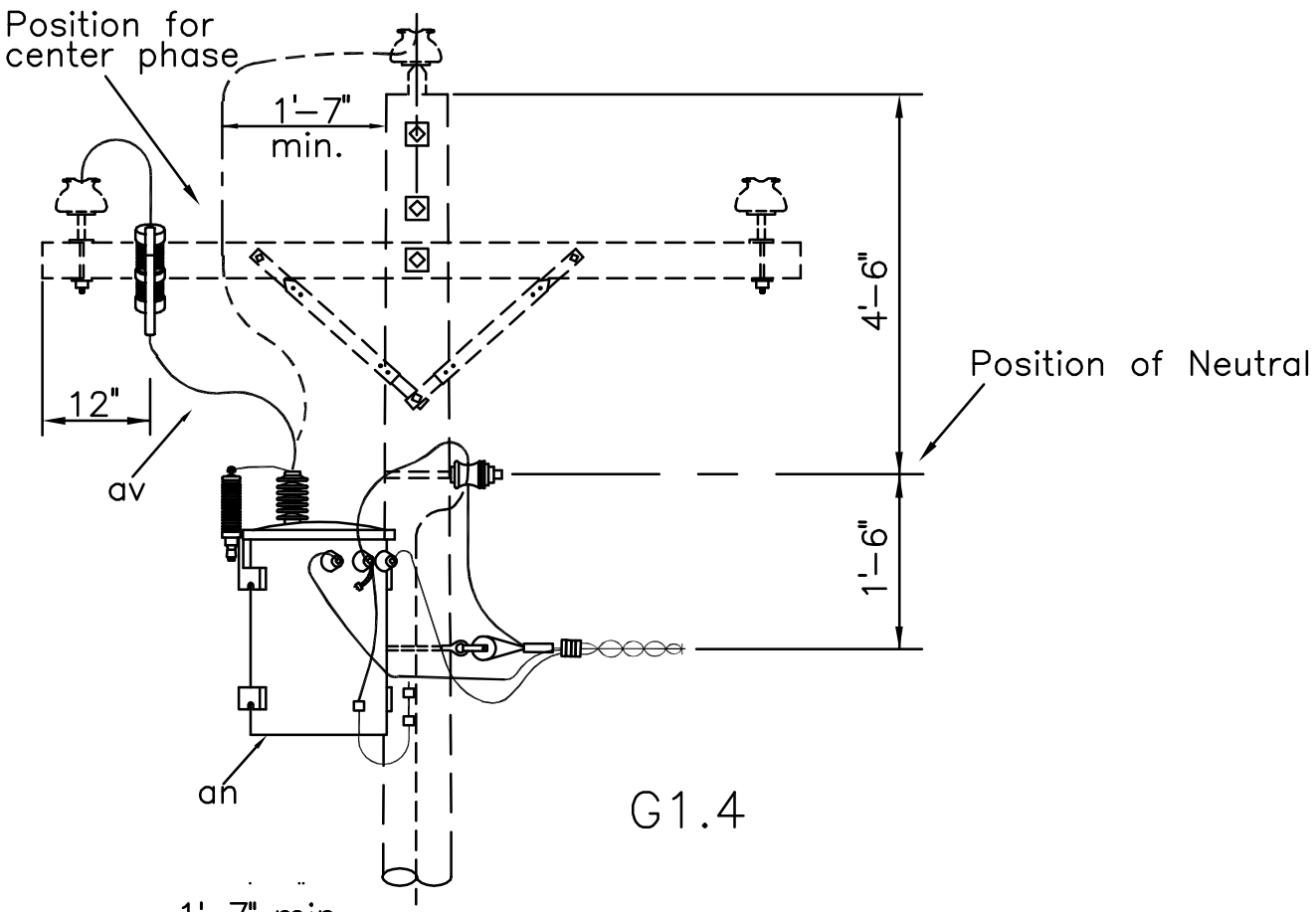
ITEM	QTY	MATERIAL
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

DESIGN PARAMETERS:

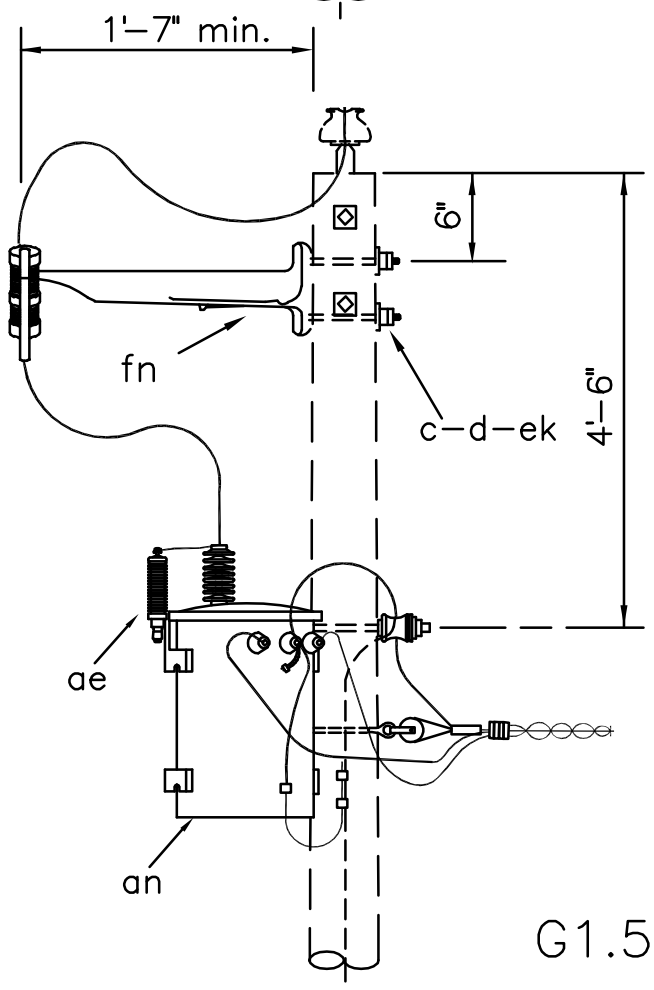
See Guide Drawing "G1.1G"

SINGLE–PHASE, CSP TRANSFORMER (DEADEND POLE)

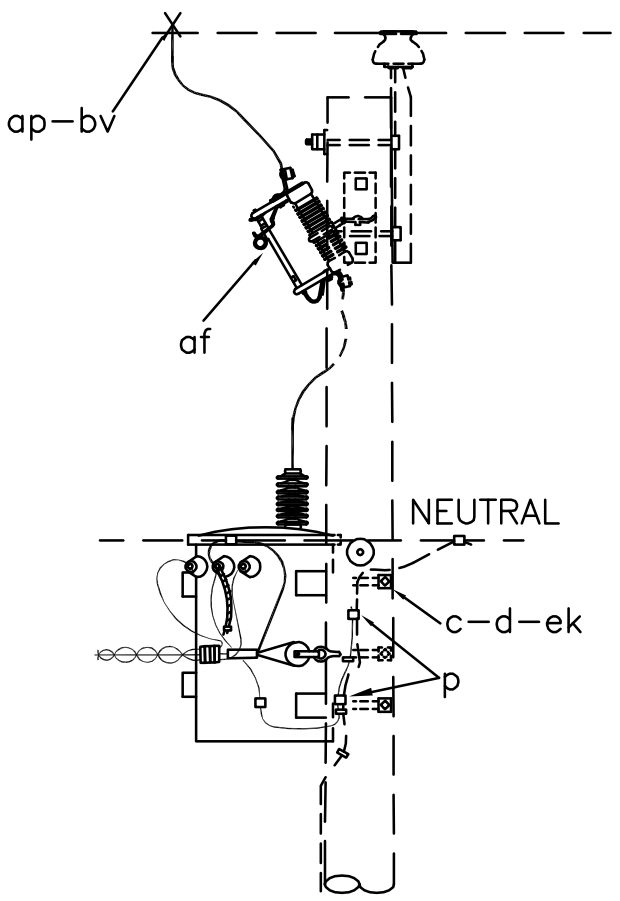
APRIL 2005		G1.3
RUS	12.47/7.2 kV	(G106–)



G1.4



G1.5



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

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

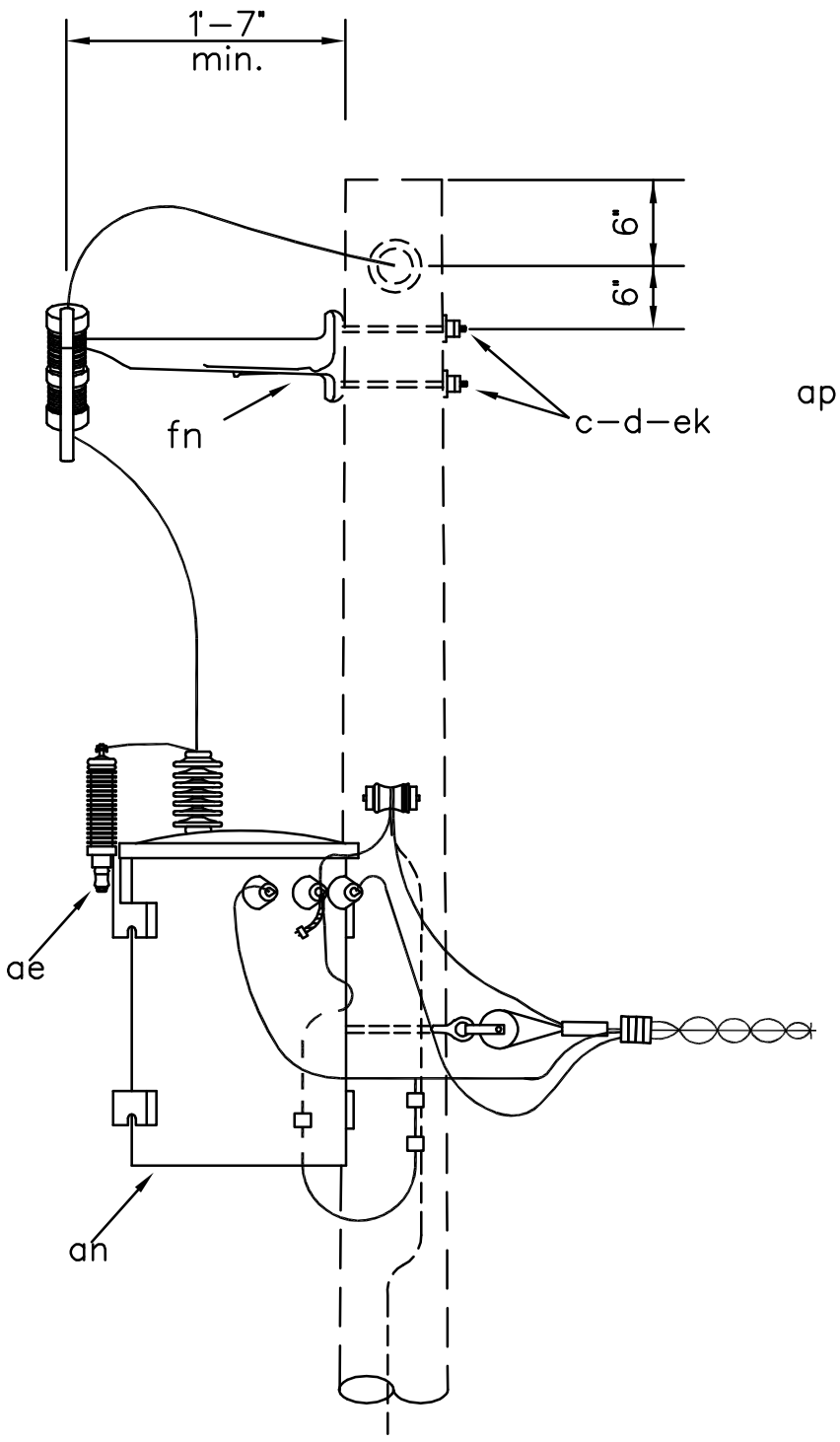
ASSEMBLY: G1		.4	.5
ITEM	MATERIAL	QTY	QTY
ap	Clamp, hot line	1	1
av	Jumpers, stranded, as req'd		
bv	Rod, armor, as req'd		
ek	Locknuts,	2	4
fn	Bracket, extension		1

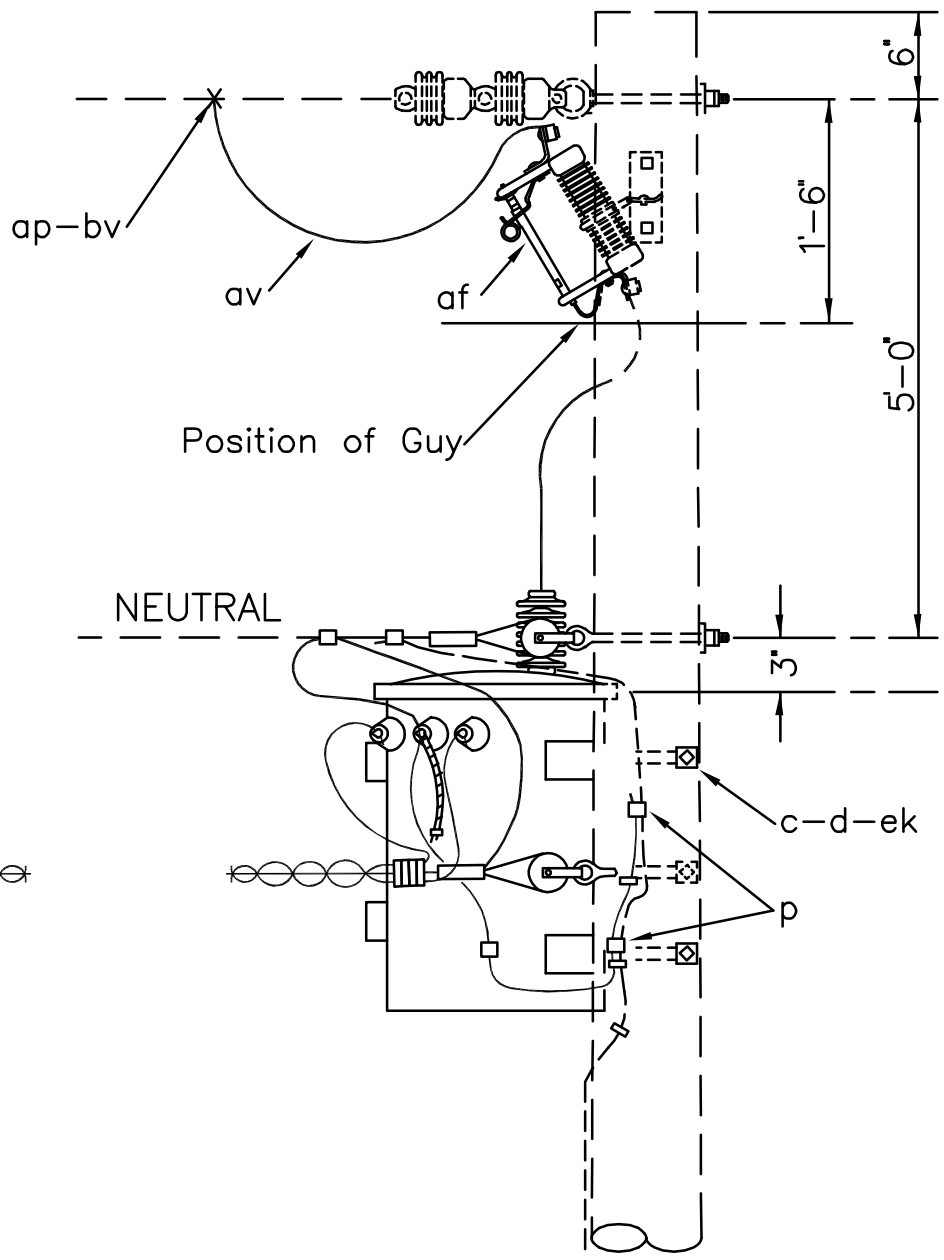
DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)

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





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

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

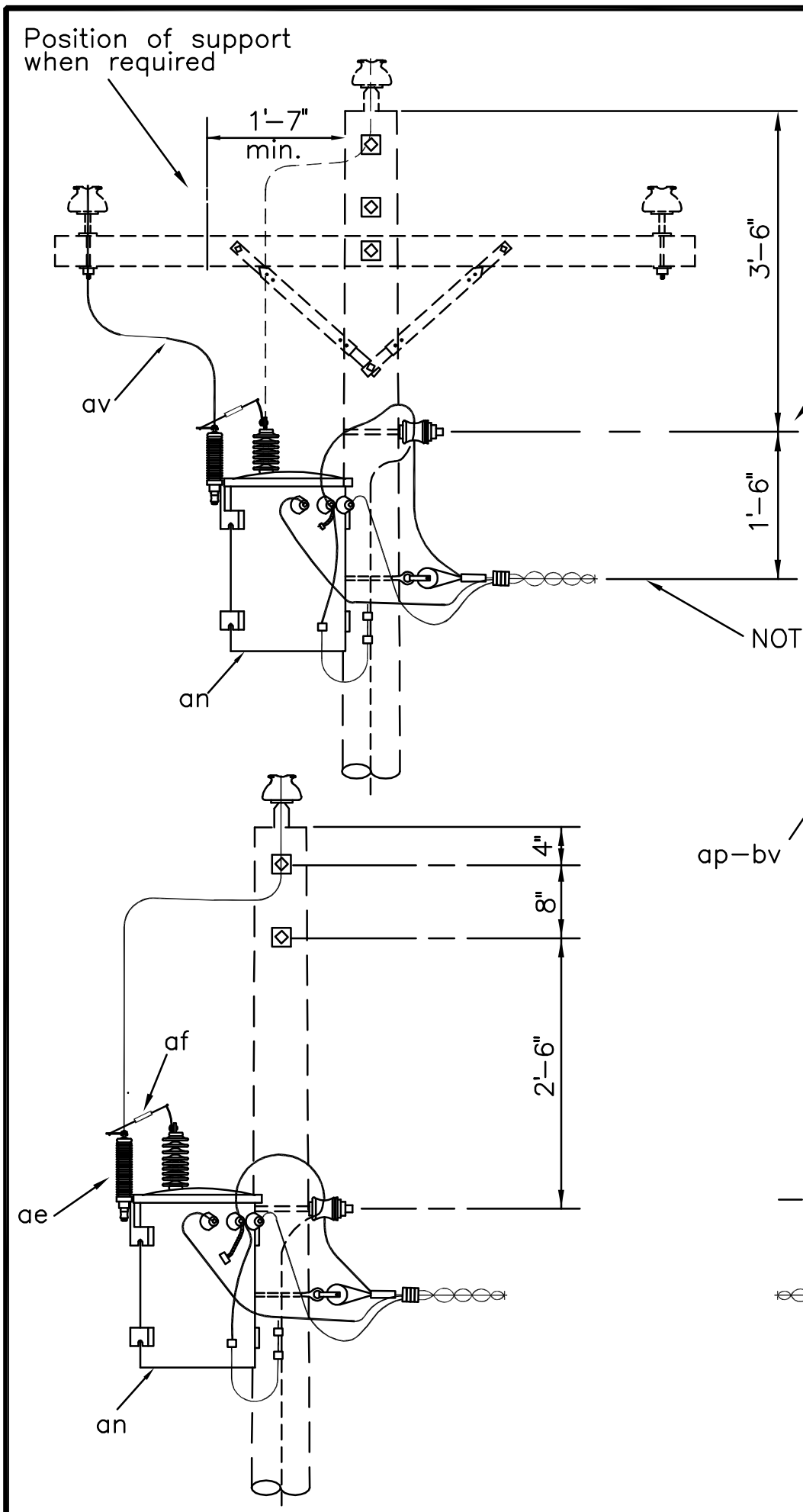
ITEM	QTY	MATERIAL
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor as req'd
ek	4	Locknuts
fn	1	Bracket, extension

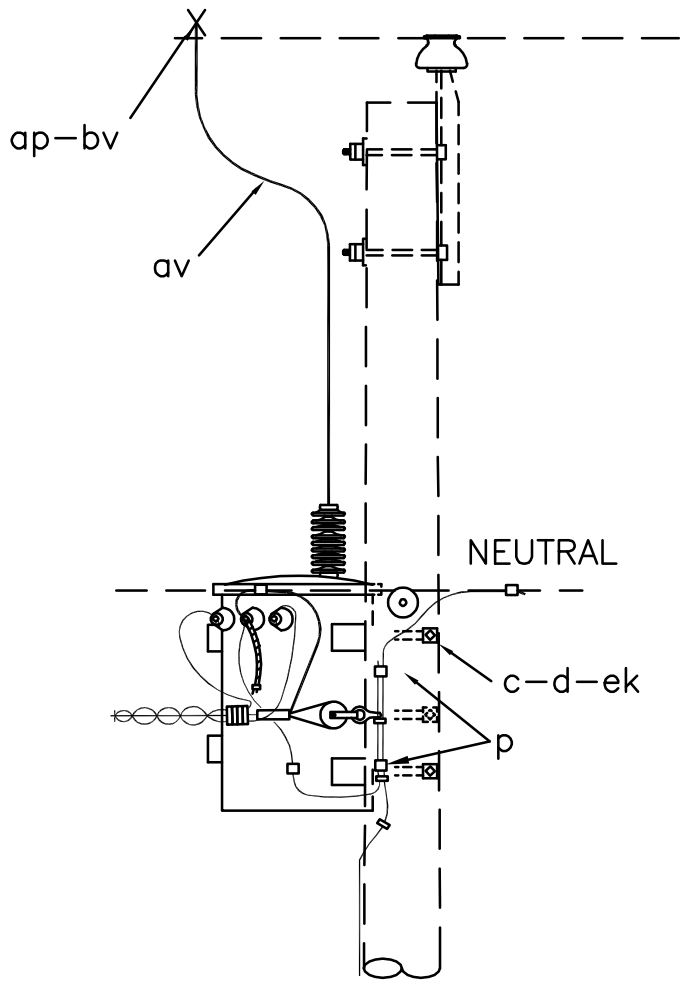
DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)

APRIL 2005		
RUS	12.47/7.2 kV	G1.6





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

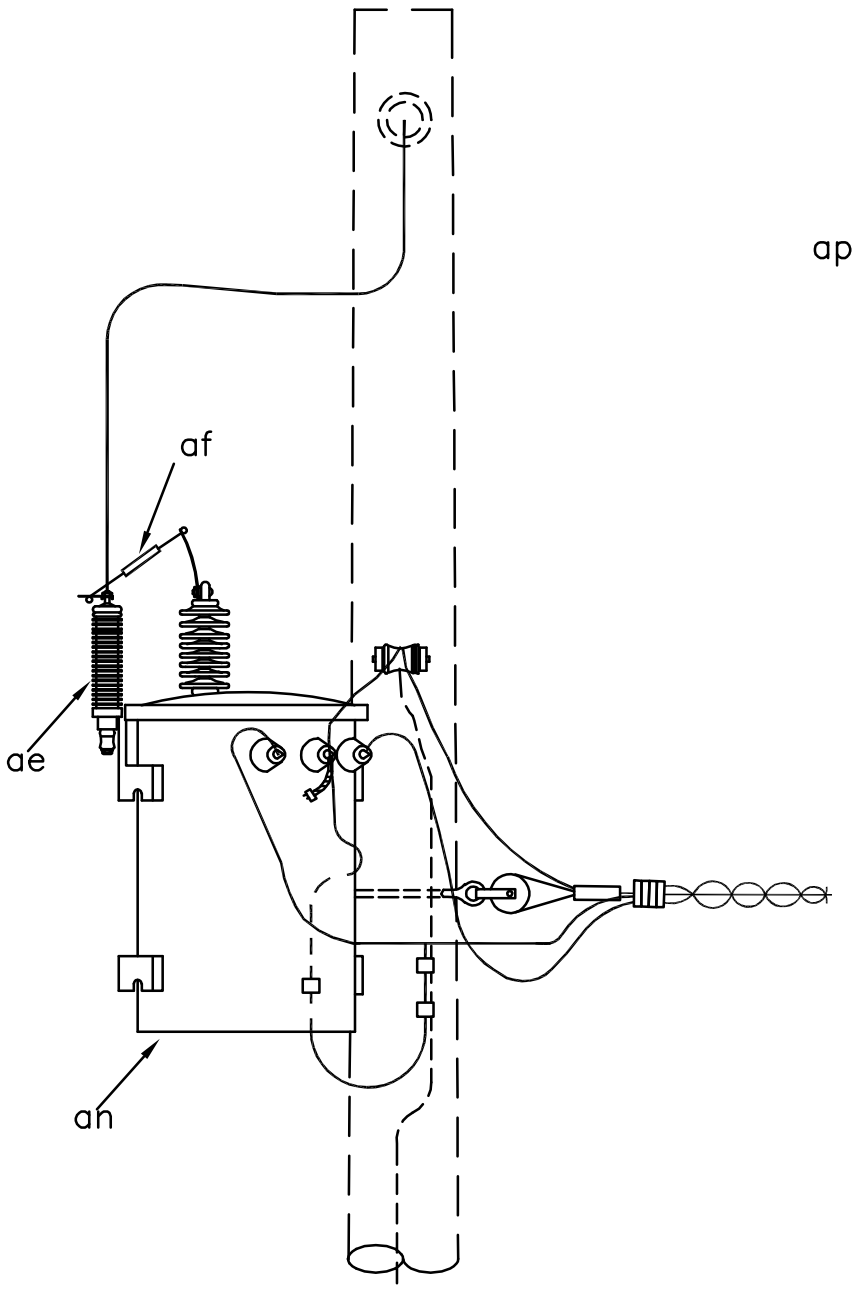
ITEM	QTY	MATERIAL
af	1	Cutout, fuse, open link
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

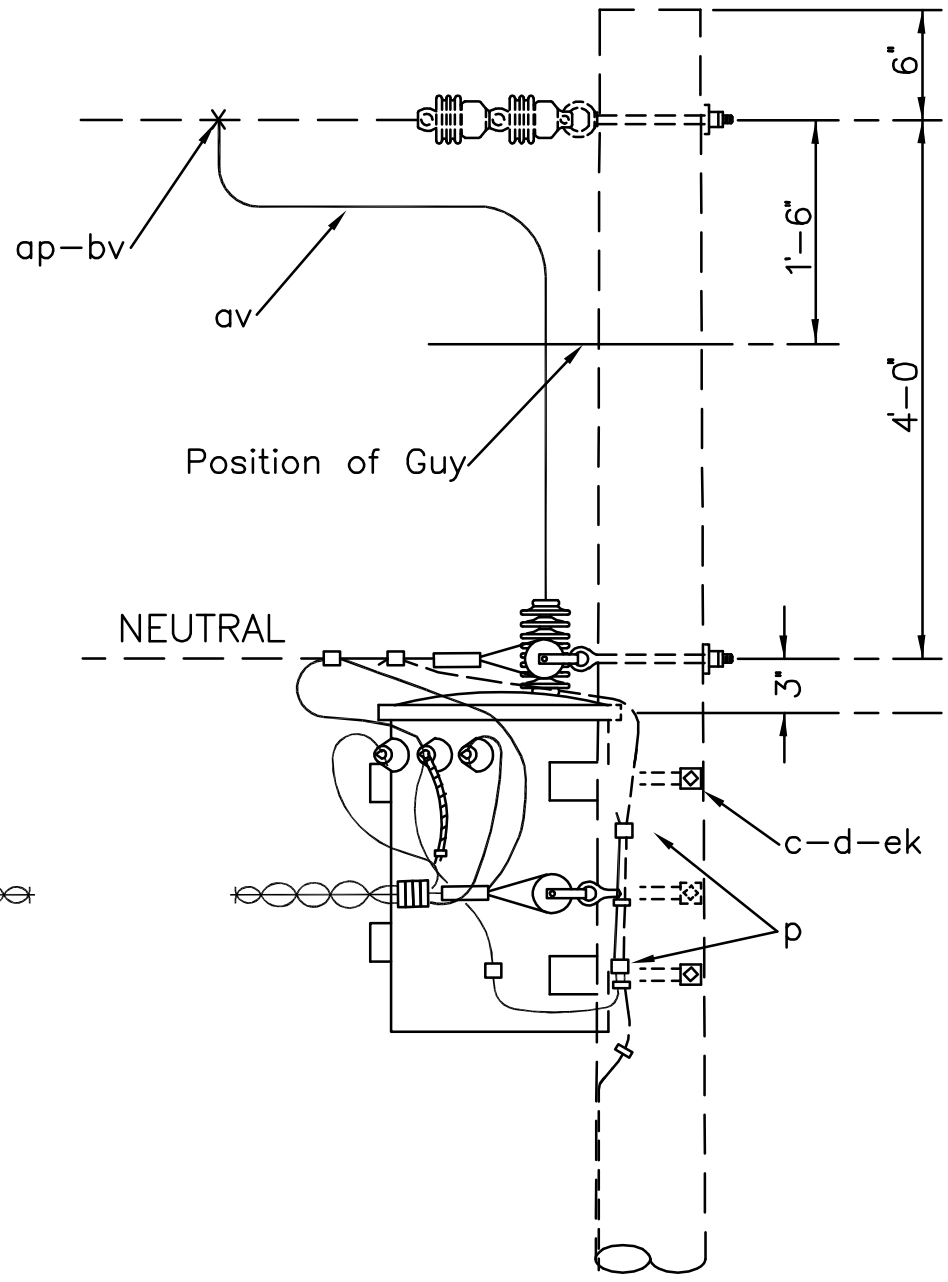
DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CONVENTIONAL TRANSFORMER (TANGENT POLE)

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





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

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

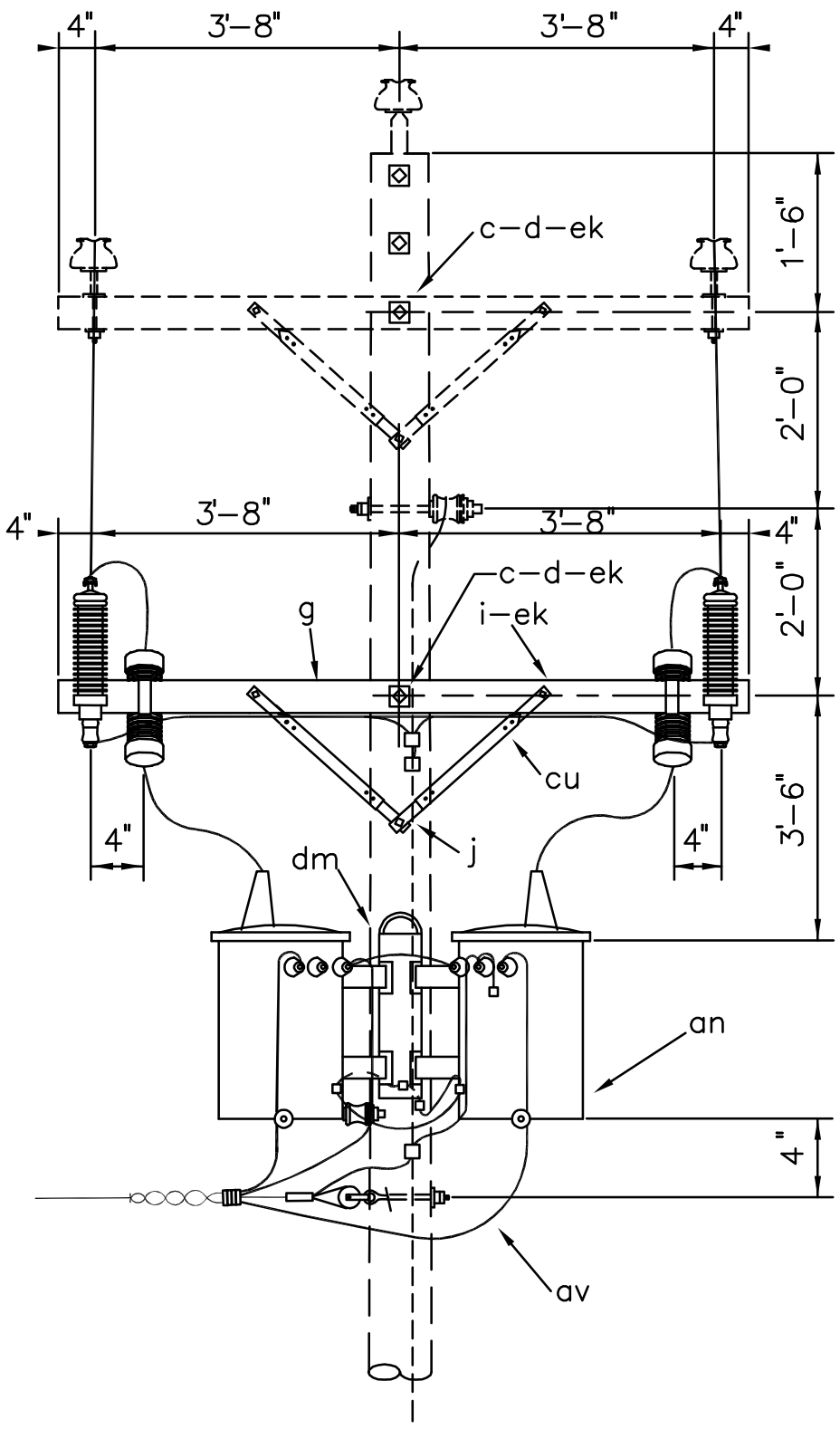
ITEM	QTY	MATERIAL
af	1	Cutout, fuse, open link
ap	1	Clamp, hot line
av		Jumpers, stranded, as req'd
bv	1	Rod, armor (as req'd)
ek	2	Locknuts

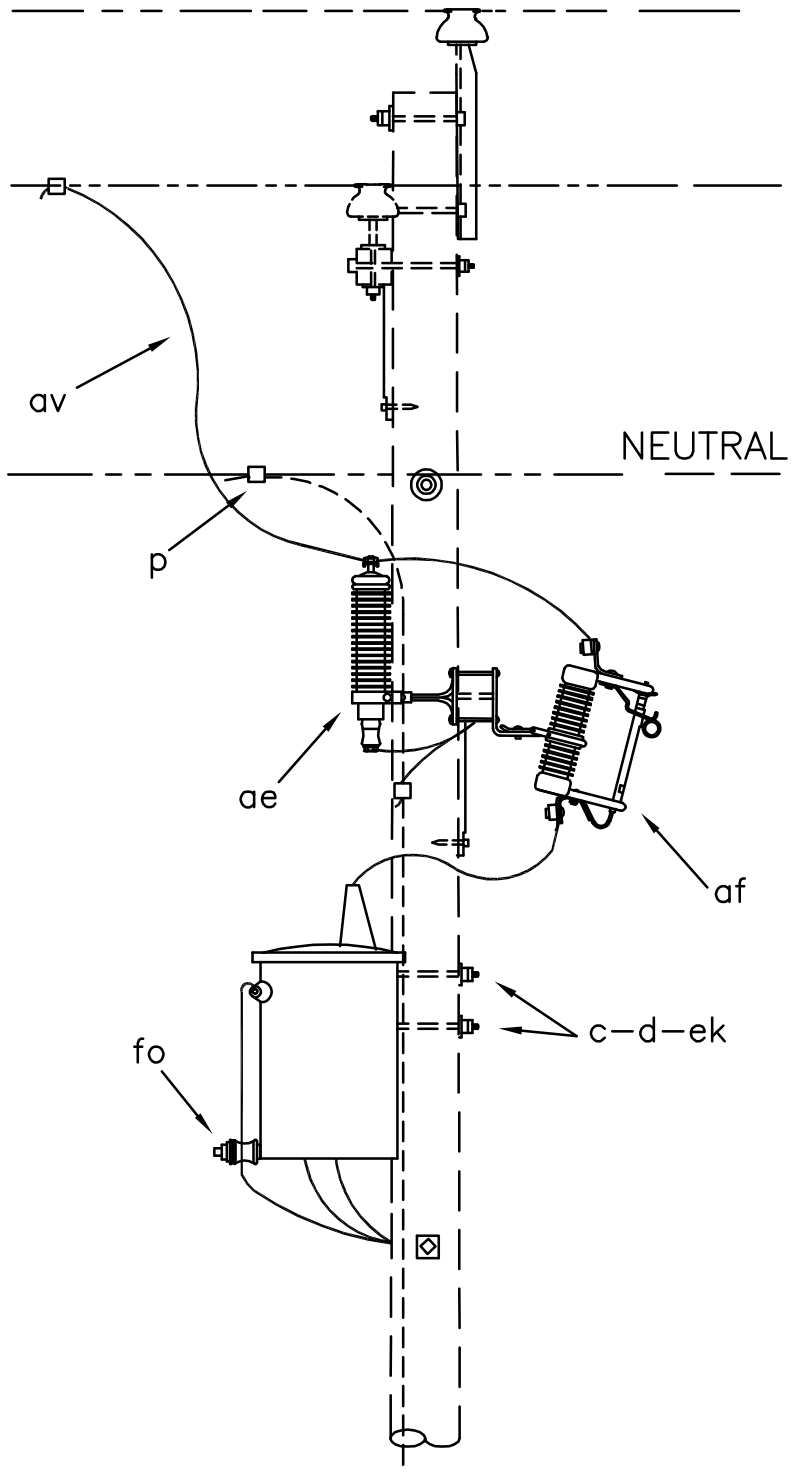
DESIGN PARAMETERS:

See Guide Drawing "G1.1G"

SINGLE–PHASE, CONVENTIONAL TRANSFORMER (DEADEND POLE)

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





ITEM	QTY	MATERIAL
c	3	Bolt, machine, 5/8" x req'd length
d	4	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j	1	Screw, lag, 1/2" x 4"
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	2	Arrester, surge, (9 kV)

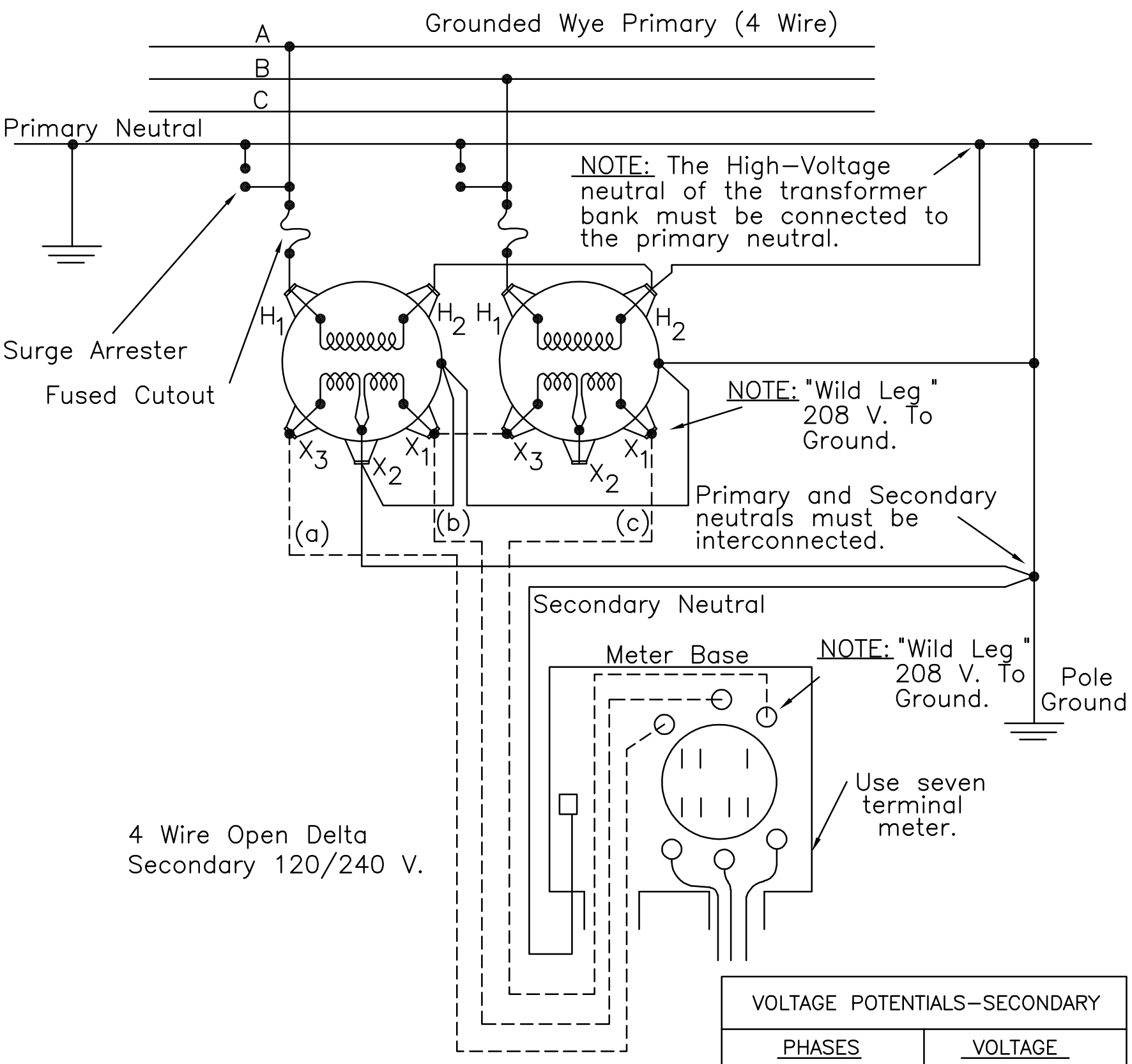
ITEM	QTY	MATERIAL
af	2	Cutout, dist. open (15 kV)
an	2	Transformer, 12.47 kV, conv.
av		Jumpers, bare, stranded, as req'd
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer
ek	5	Locknuts
fo	2	Bracket, transformer, insul.

DESIGN PARAMETERS:

See Guide Drawing "G2.1G"

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

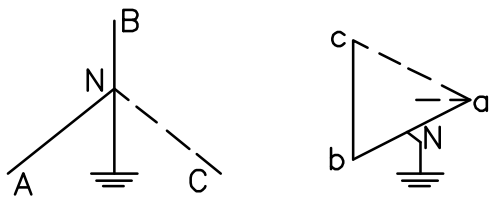
APRIL 2005		
RUS	12.47/7.2 kV	G2.1 (G210–)



4 Wire Open Delta
Secondary 120/240 V.

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

210° ANGULAR DISPLACEMENT



(Additive Polarity–See TRANSFORMER SPECIFICATIONS)

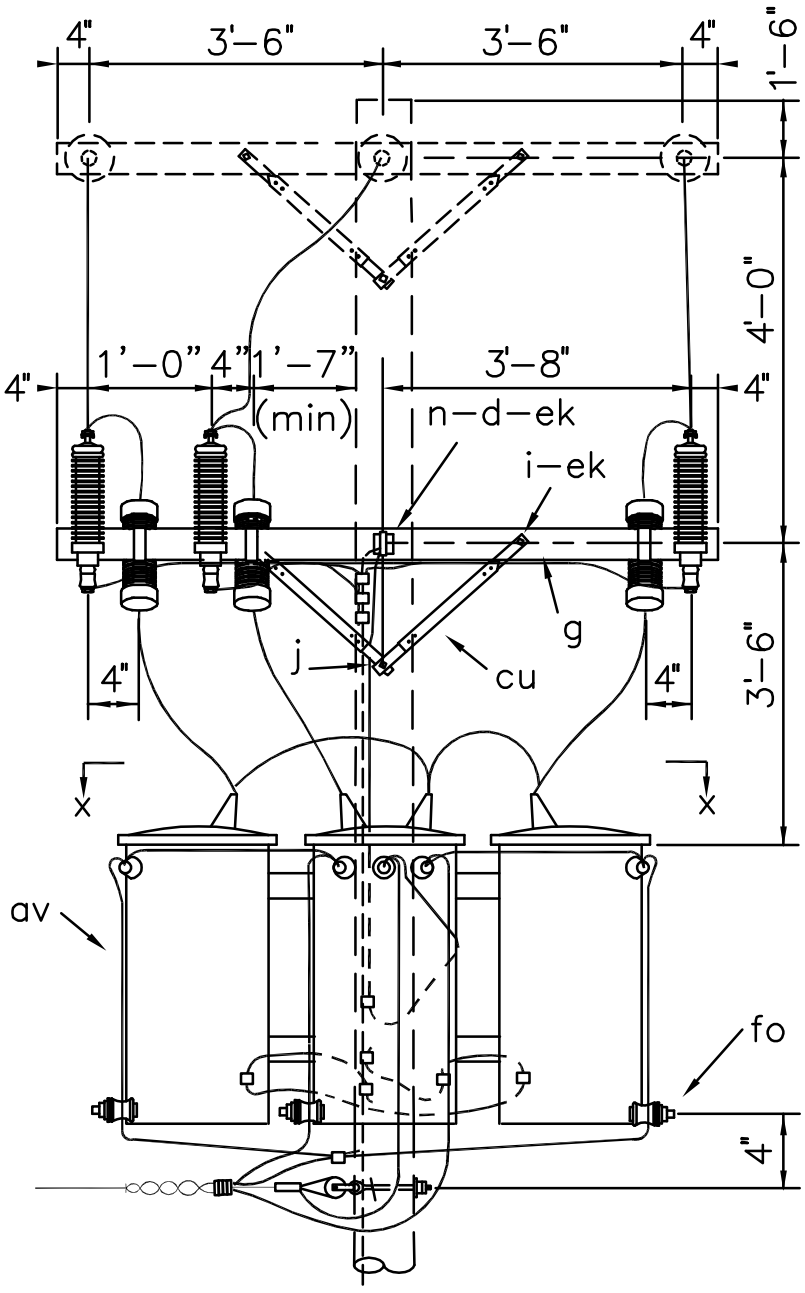
APPLICATION: Used to supply large single–phase, 120/240 volt loads with small amount of three phase loads. Also used when only two phases of primary are available or during emergencies when one unit of a four–wire, wye–delta bank is disabled.

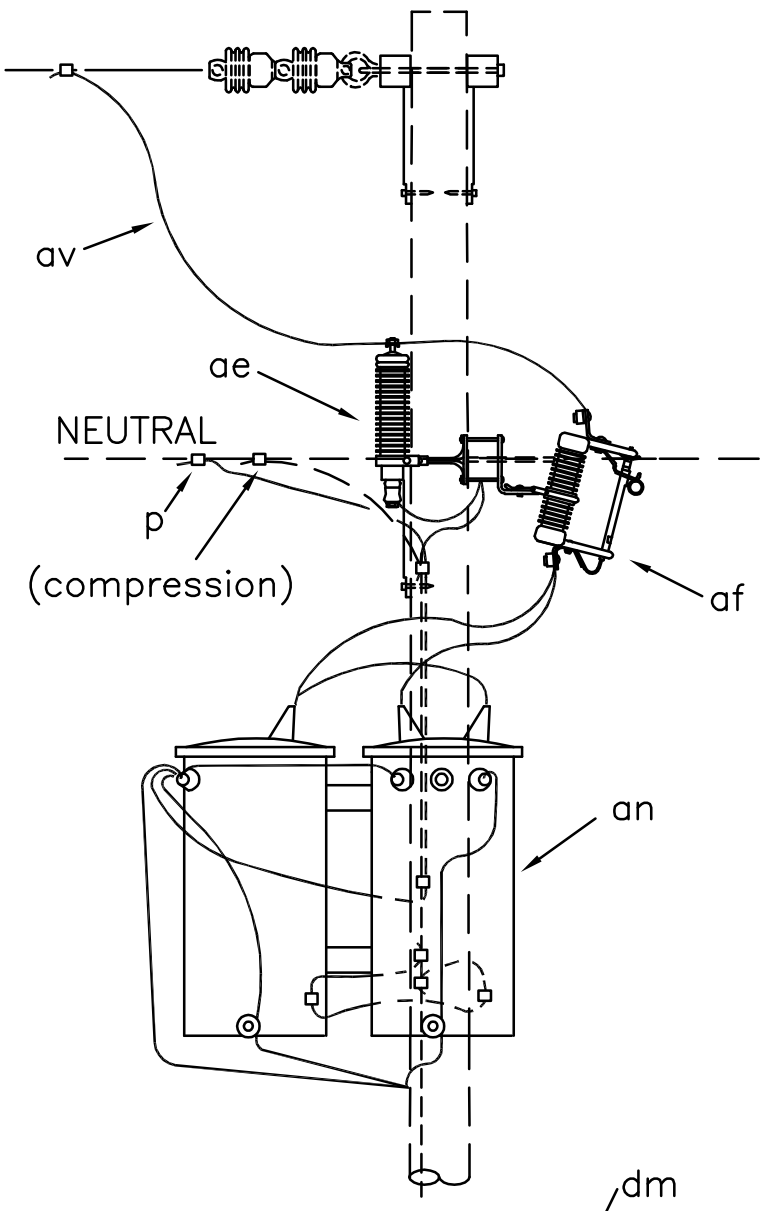
See drawing "G2.1" or "VG2.1" for construction details. One–bushing or two–bushing transformers may be used. Usually transformers of different KVA sizes are used.

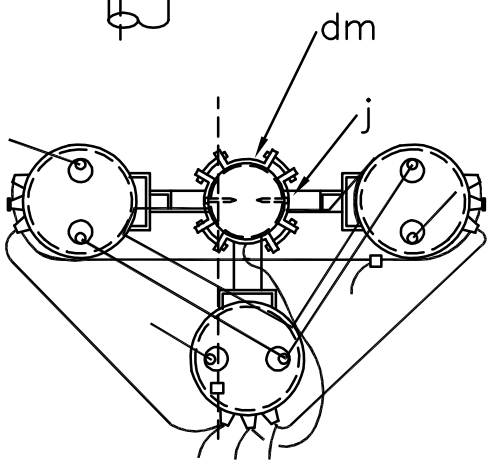
BANK RATING: This bank has only 86.6% of the rating of the two units making up the three–phase bank and only 57.7% of the three–phase rating of a closed delta–delta bank of three transformers. Thus, it is relatively inefficient where three–phase loads predominate.

TRANSFORMER/METER CONNECTION GUIDE
THREE–PHASE, OPEN–WYE – OPEN DELTA
FOR 120/240 VOLT POWER LOADS

APRIL 2005		
RUS		G2.1G







SECTION X–X

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

ITEM	QTY	MATERIAL
d	2	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4" as req'd
n	1	Bolt, dble arm, 5/8 x req'd length
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge, (9 kV)

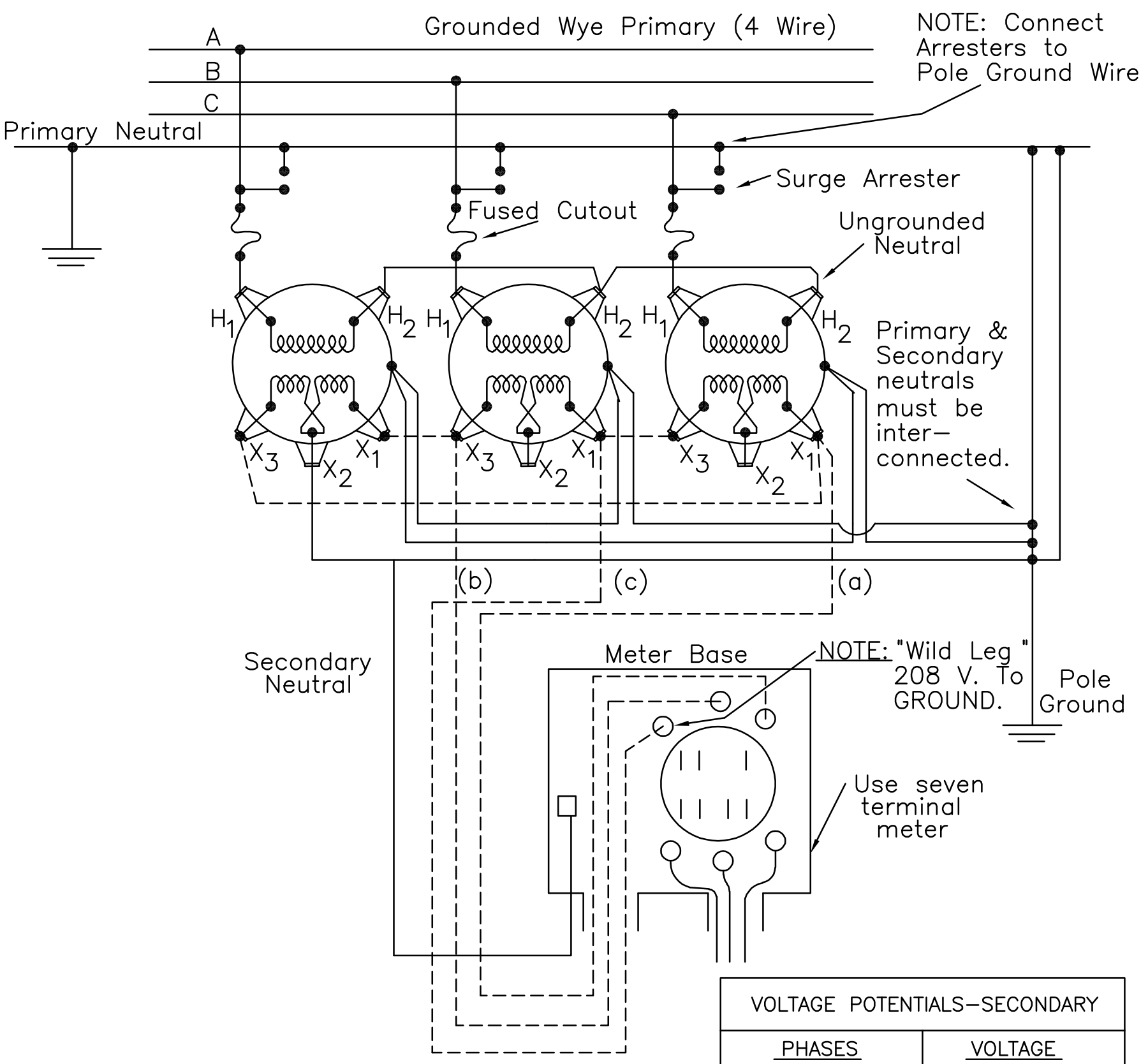
ITEM	QTY	MATERIAL
af	3	Cutout, dist. open (15 kV)
an	3	Transformer, 12.47 kV, conventional
av		Jumpers, bare, stranded
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer, cluster with
		adapter plates as req'd
ek	5	Locknuts
fo	3	Bracket, transformer, insulated

DESIGN PARAMETERS:

See Guide Drawing "G3.1G"

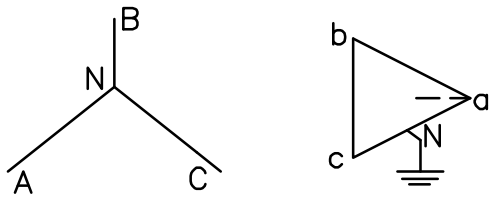
THREE–PHASE TRANSFORMER BANK
UNGROUNDED–WYE PRIMARY
CENTER–TAP GROUNDED DELTA, 4 WIRE SECONDARY

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



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

210° ANGULAR DISPLACEMENT



(Additive Polarity–See TRANSFORMER SPECIFICATIONS)

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

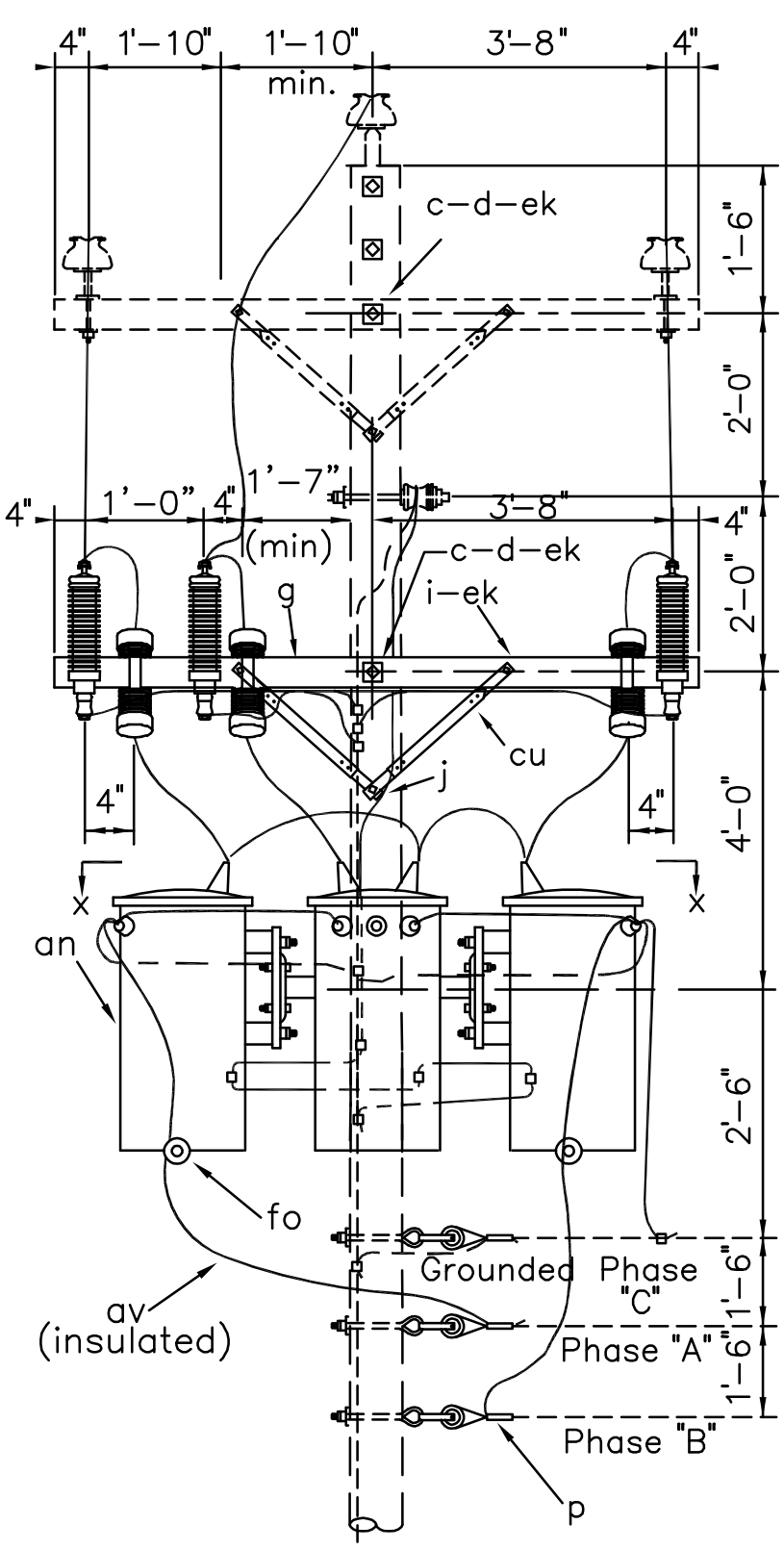
See drawing "G3.1" or "VG3.1" for construction details.

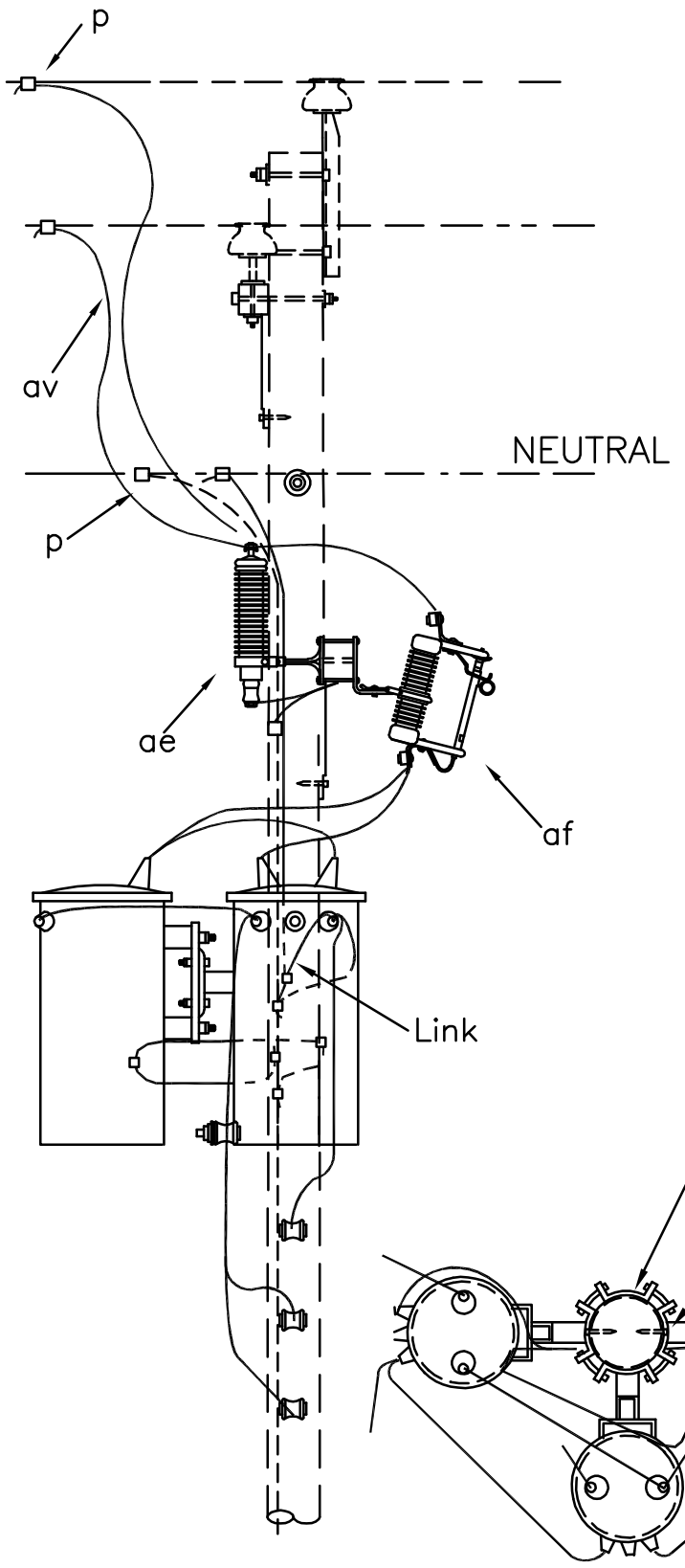
CAUTION: Only ground one secondary neutral bushing of the three transformers.
Connecting the high–voltage neutral to the system neutral may cause the transformer bank to burn out.
Largest transformer capacity should not be more than 2 times the smallest transformer kVA.

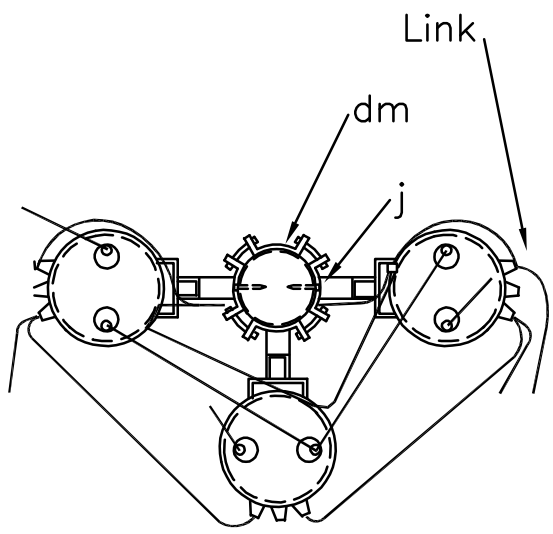
BANK RATING: The center tapped transformer carries 2/3 of the 120/240 volt single–phase load; each of the three units carry 1/3 of the 240 volt three–phase load.

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

APRIL 2005	3 – PHASE PRIMARY	
RUS		G3.1G







SECTION X–X

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

ITEM	QTY	MATERIAL
d	2	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4", as req'd
n	1	Bolt, dble arm, 5/8" x req'd length
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge, (9 kV)

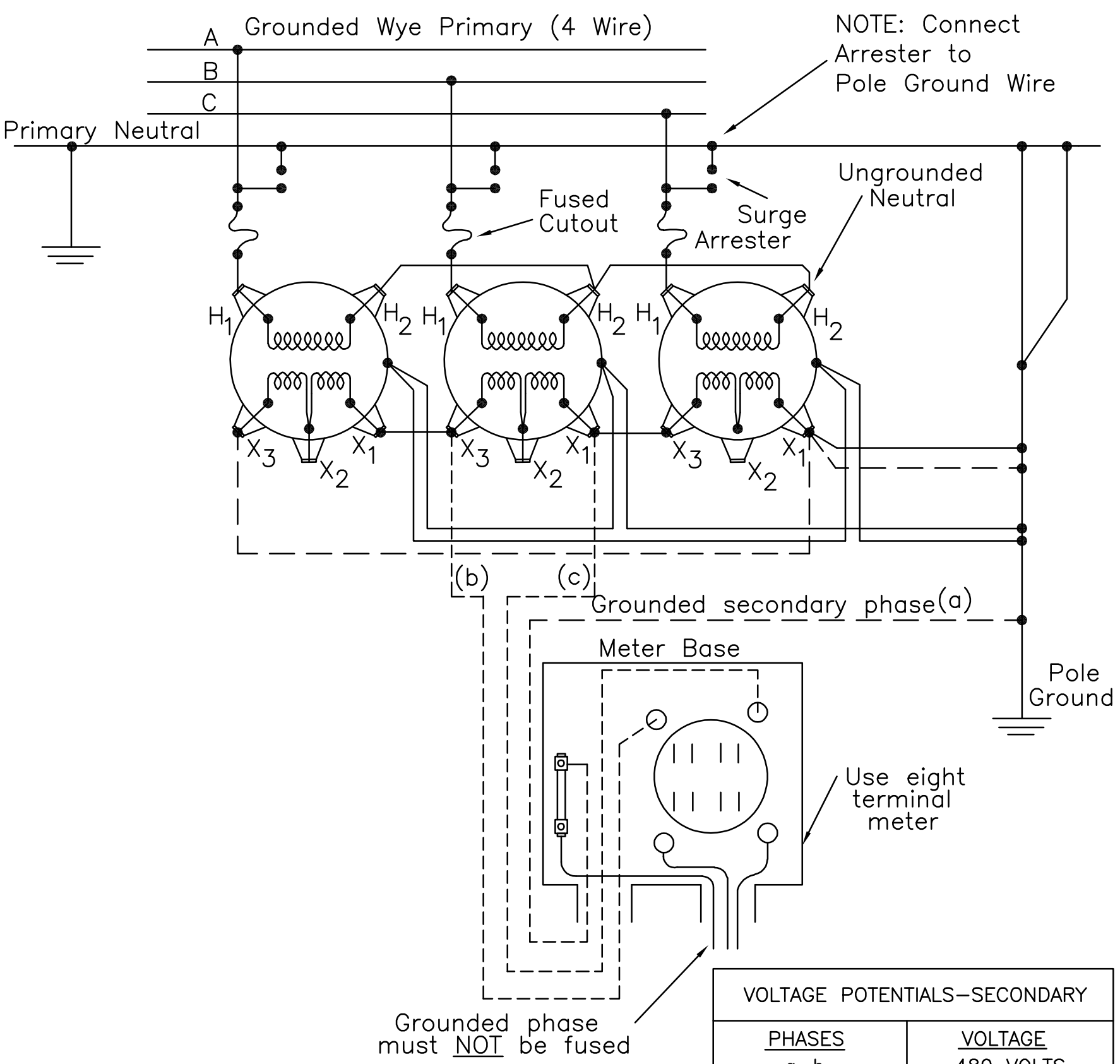
ITEM	QTY	MATERIAL
af	3	Cutout, dist. open (15 kV)
an	3	Transformer, 12.47 kV, conventional
av		Jumpers, bare, stranded
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer, cluster with
		adapter plates as req'd
ek	5	Locknuts
fo	3	Bracket, transformer, insulated

DESIGN PARAMETERS:

See Guide Drawing "G3.2G"

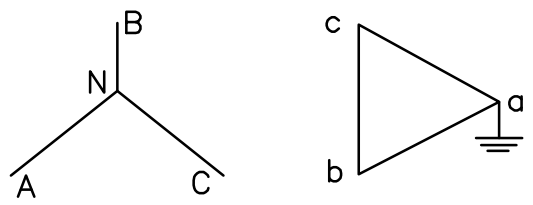
THREE–PHASE TRANSFORMER BANK
UNGROUNDED–WYE PRIMARY
CORNER GROUNDED DELTA, 3 WIRE SECONDARY

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



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

210° ANGULAR DISPLACEMENT



(Additive Polarity—
See TRANSFORMER SPECIFICATIONS)

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

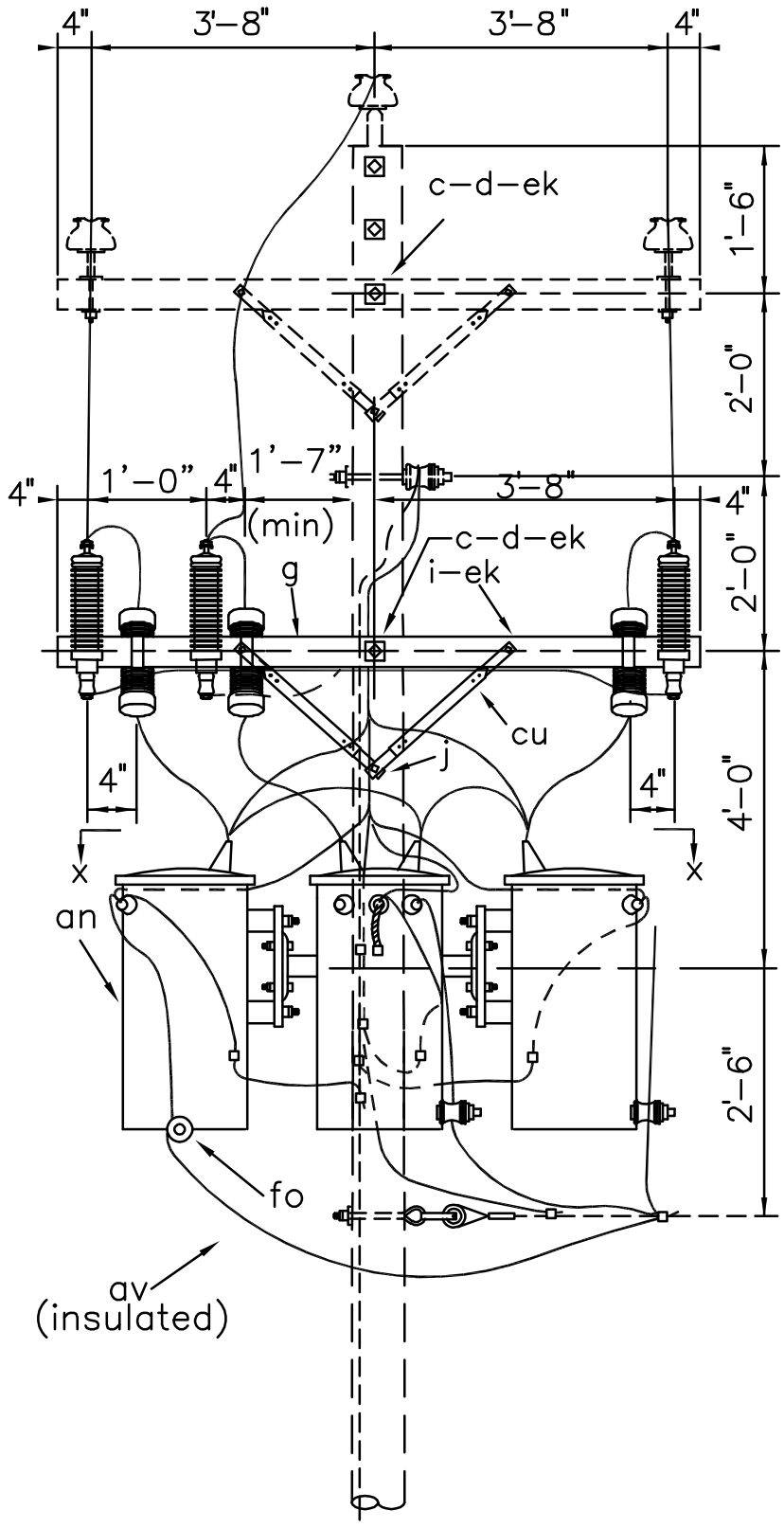
See drawing "G3.2" or "VG3.2" for construction details.

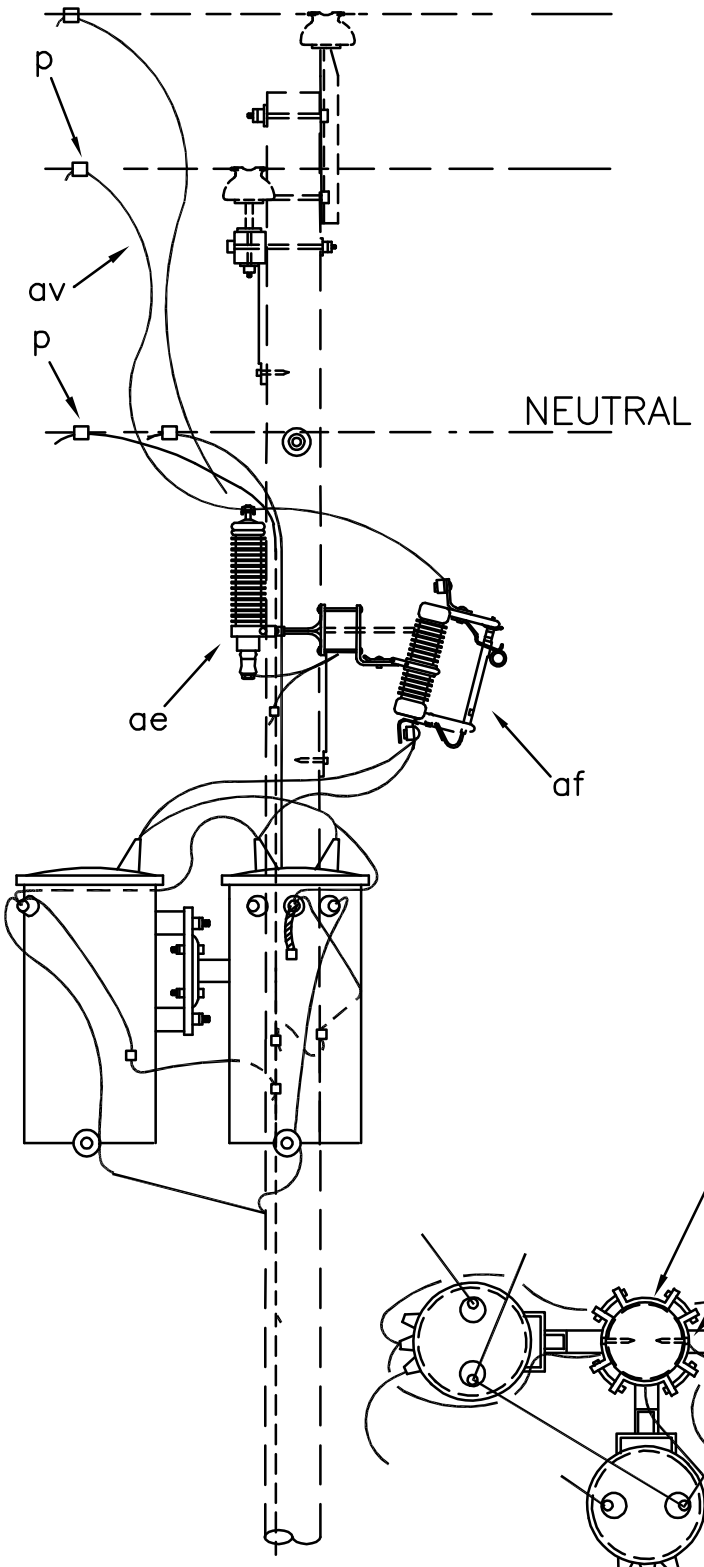
BANK RATING: The maximum safe kVA rating of the bank is three times the kVA rating of the smallest transformer.

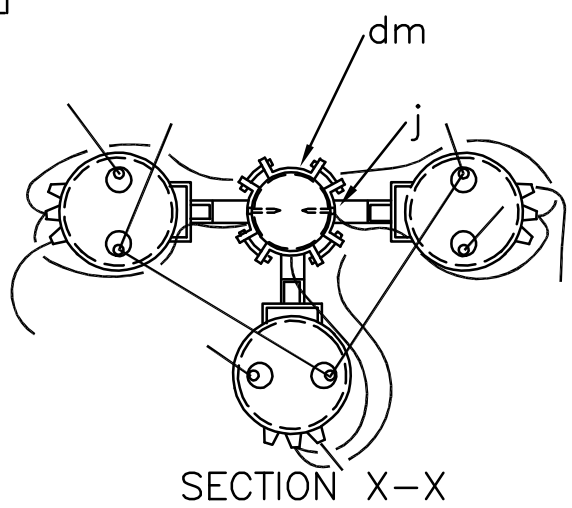
NOTES:
One—half of the above voltages apply when a 240 volt bank is used.
All tanks to be grounded.
Disconnect all secondary neutrals from tank and do not ground.
Do not ground bank on primary side. (If grounded, the bank would be a grounding bank for the entire circuit.)
The grounding secondary wire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

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

APRIL 2005	3 — PHASE PRIMARY	
RUS		G3.2G







SECTION X–X

NOTES:

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

ITEM	QTY	MATERIAL
d	2	Washer, square, 2 1/4"
g	1	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
i	2	Bolt, carriage, 3/8" x 4 1/2"
j		Screw, lag, 1/2" x 4", as req'd
n	1	Bolt, dble arm, 5/8" x req'd length
p		Connectors, as req'd
p		Connectors, compression, as req'd
ae	3	Arrester, surge, (9 kV)

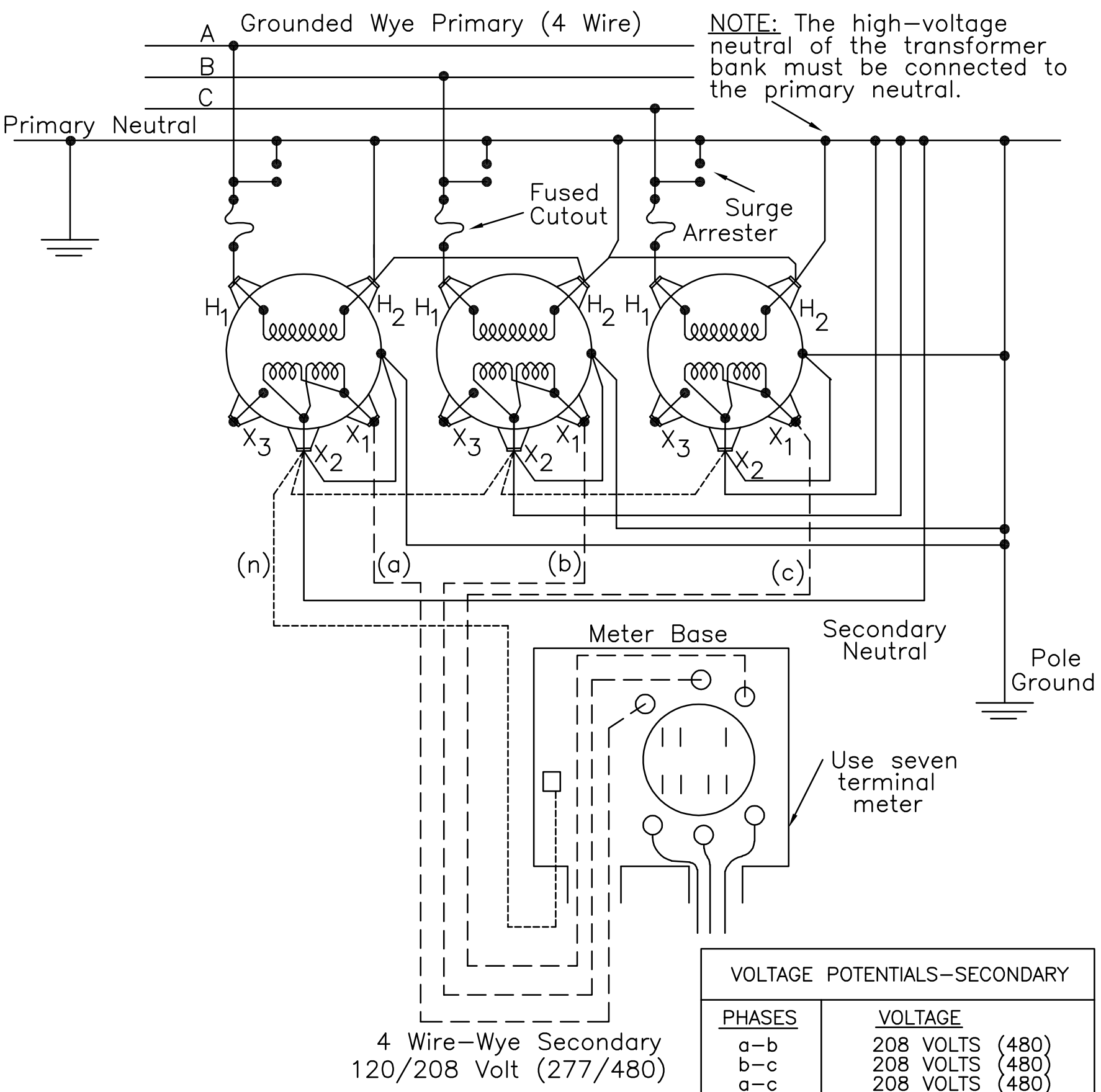
ITEM	QTY	MATERIAL
af	3	Cutout, dist. open (15 kV)
an	3	Transformer, 12.47 kV, conventional
av		Jumpers, bare, stranded
av		Jumpers, service, as req'd
cu	2	Brace, 28"
dm	1	Bracket, transformer, cluster with
		adapter plates as req'd
ek	5	Locknuts
fo	3	Bracket, transformer, insulated

DESIGN PARAMETERS:

See Guide Drawing "G3.3G"

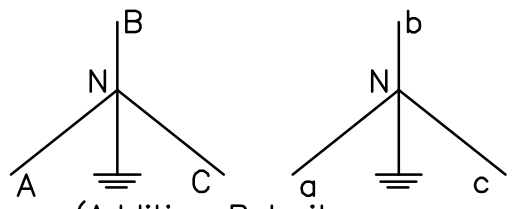
THREE–PHASE TRANSFORMER BANK
GROUNDED–WYE PRIMARY
GROUNDED WYE, 4 WIRE SECONDARY

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



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

0° ANGULAR DISPLACEMENT



(Additive Polarity–
See TRANSFORMER SPECIFICATIONS)

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

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

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

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

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

APRIL 2005	3 – PHASE PRIMARY	
RUS		G3.3G

INDEX H

GROUNDING ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
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.

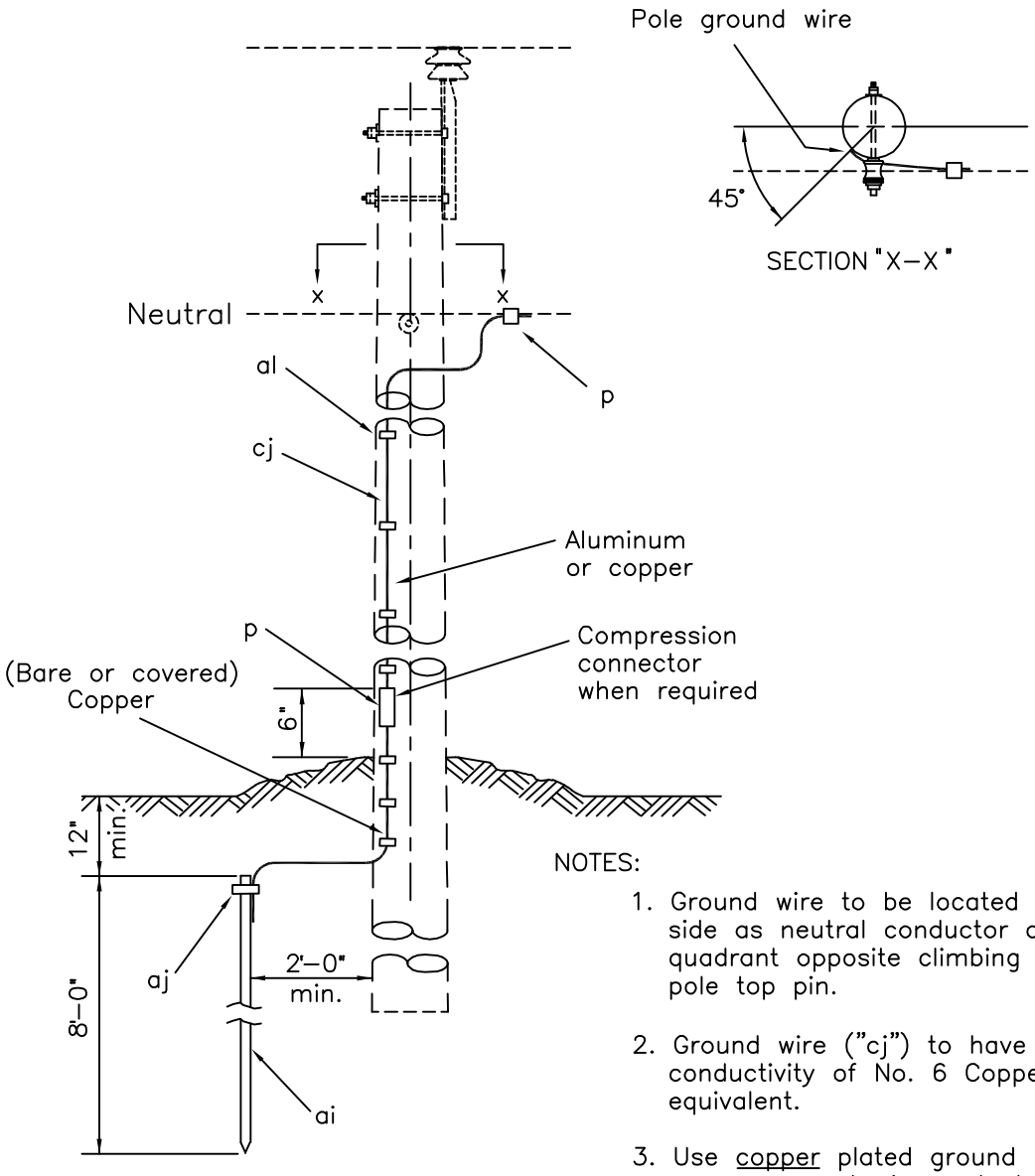
The connection between the ground rod and the system neutral should be made by one continuous piece of conductor (the pole ground wire), and shall be installed in the shortest and most direct path according to the construction drawings. Splices, if required, shall be made using a compression type connector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

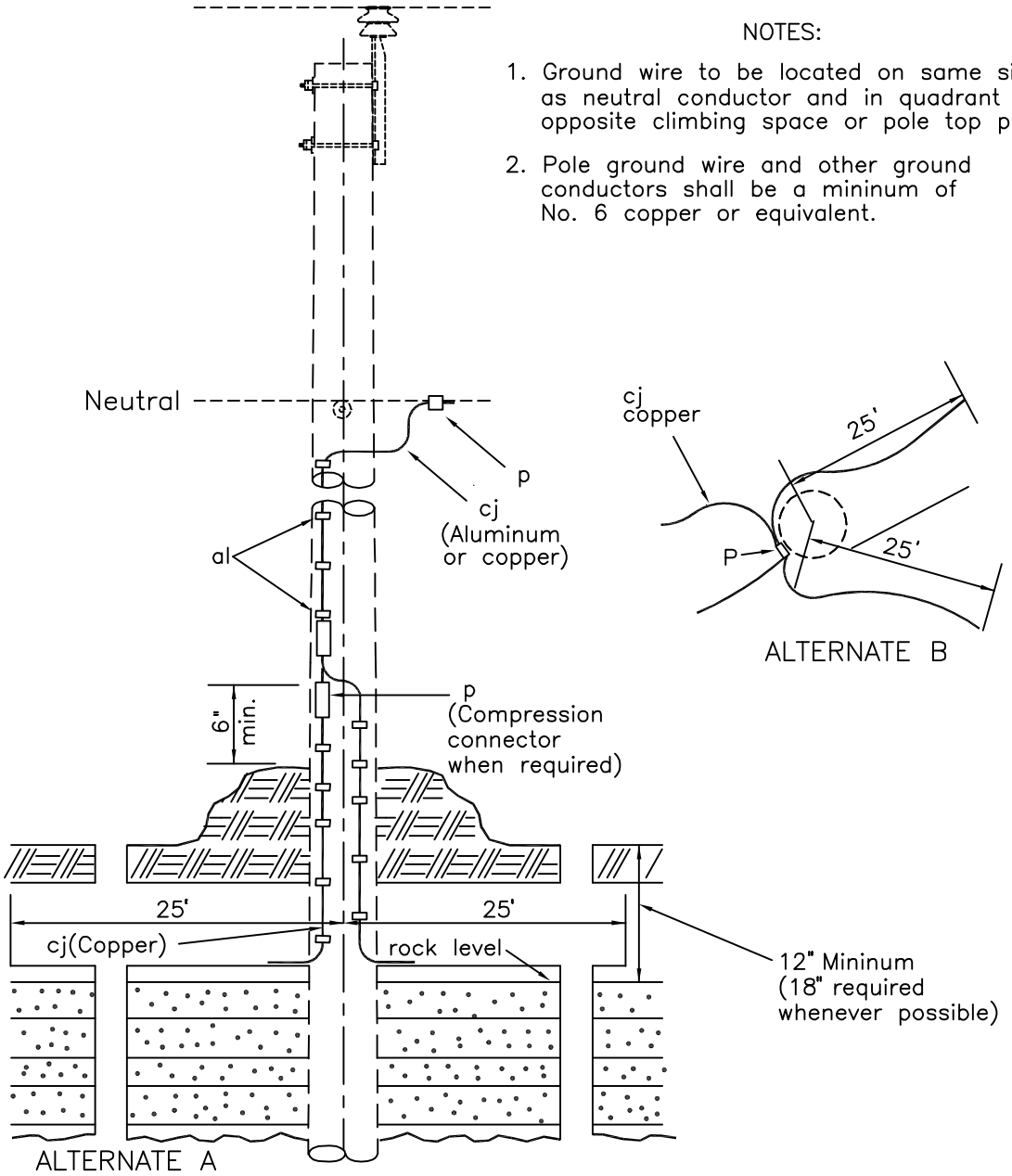
ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
ai	1	Rod, ground, 5/8" min. diameter
aj	1	Clamp, ground rod
al		Staple, ground wire, as reg'd
cj	40'	Conductor, Ground #4 Cu equivalent

GROUNDING ASSEMBLY – GROUND ROD TYPE

APRIL 2005		H1.1
RUS		(M2–11)

NOTES:

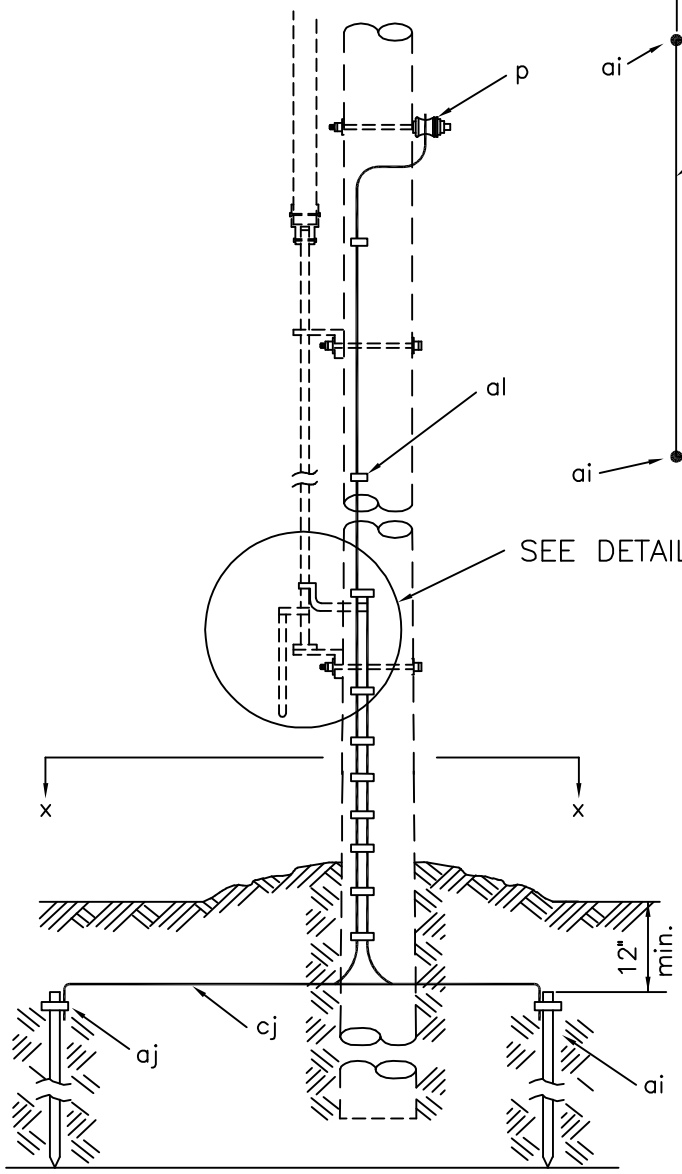
1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Pole ground wire and other ground conductors shall be a mininum of No. 6 copper or equivalent.

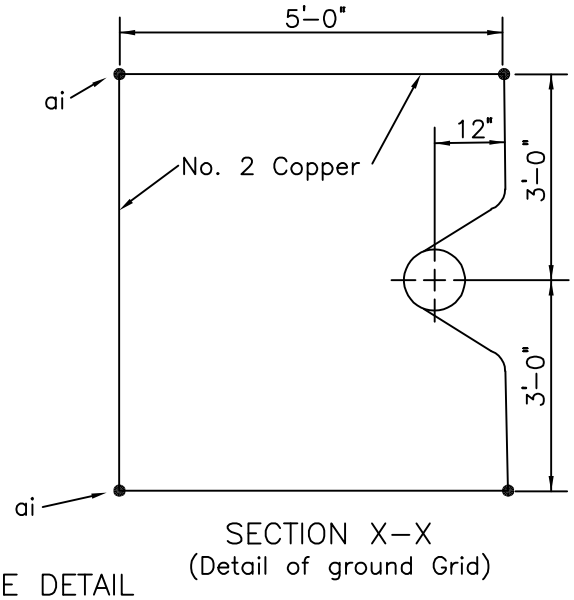


ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
al		Staple, ground wire, as req'd
cj		Wire pole ground as req'd See Note 3 on Drawing H1.1

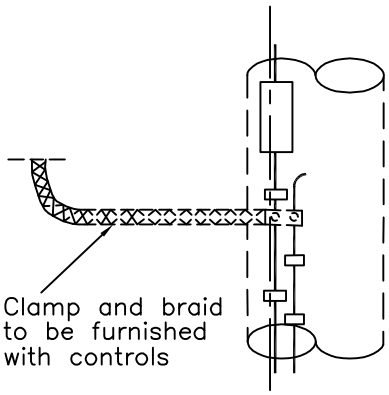
GROUNDING ASSEMBLY — TRENCH TYPE

APRIL 2005 RUS		H2.1 (M2–13)





SECTION X–X
(Detail of ground Grid)



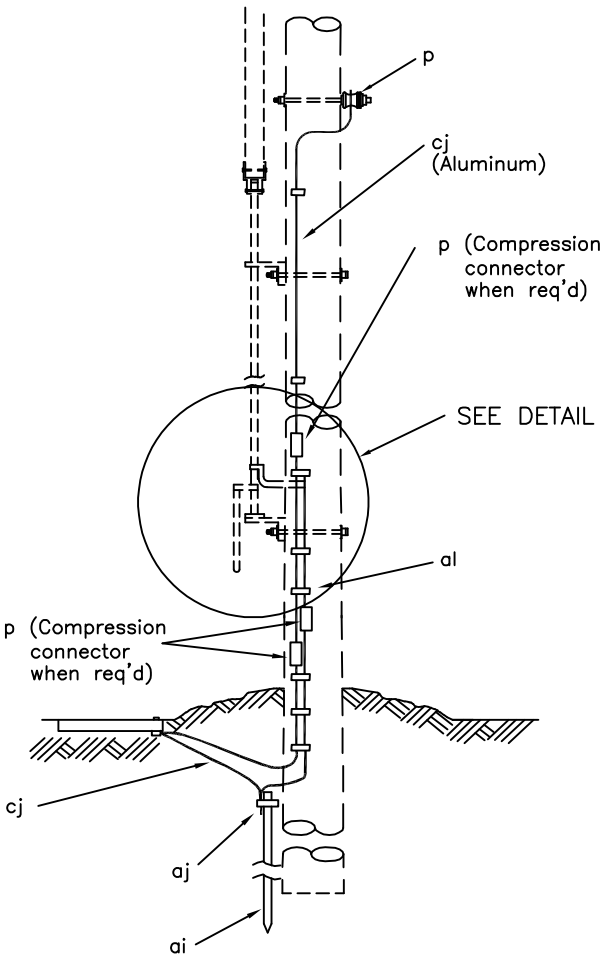
DETAIL

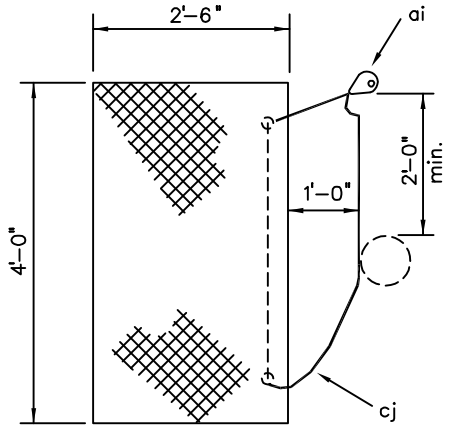
ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
ai	4	Rod, ground, 5/8" min. dia., copper covered
aj	4	Clamp, ground rod
al		Staple, ground wire, (copper),as req'd
cj		Wire, pole ground, #2 S.D. Copper, as req'd

CAUTION: Rubber gloves should be worn when operating switch.

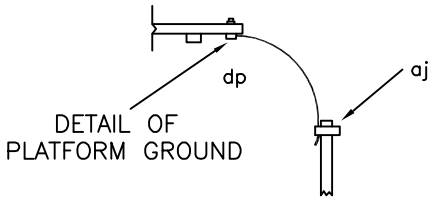
GROUNDING ASSEMBLY – GROUND ROD TYPE (FOR SECTIONALIZING AIRBREAK SWITCH)

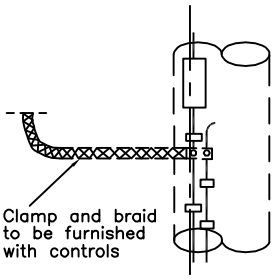
APRIL 2005		H3.1
RUS		(M2–15)





DETAIL OF PLATFORM





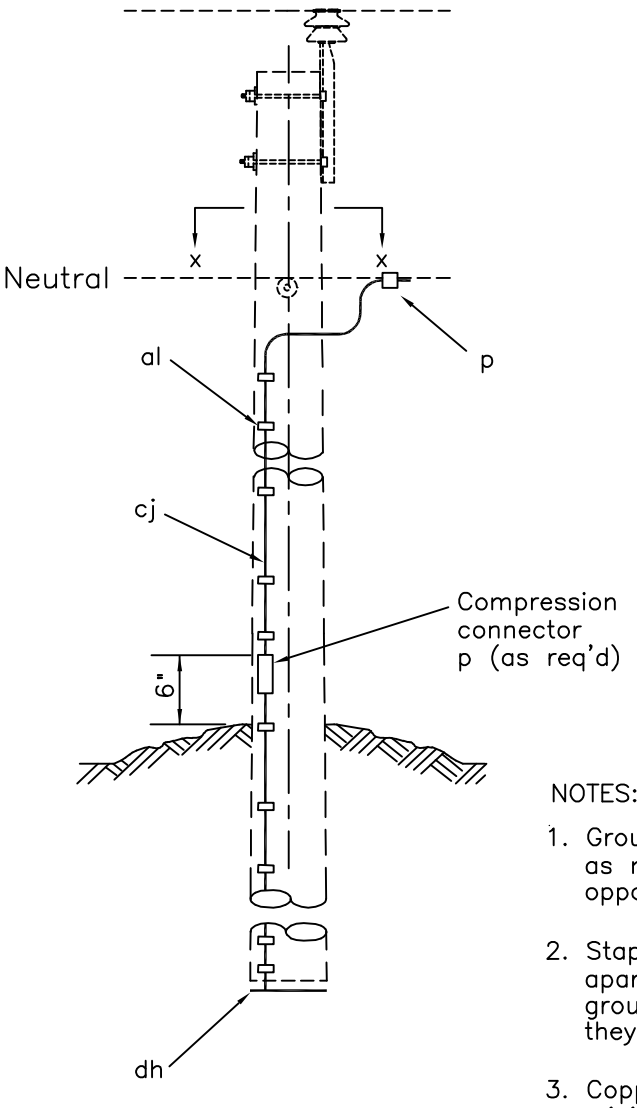
DETAIL

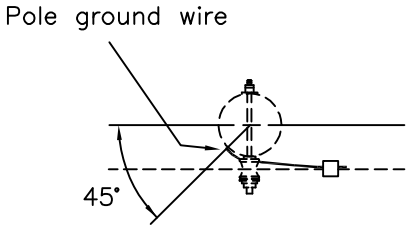
ITEM	QTY	MATERIAL
p		Connector, compression, as req'd
ai	1	Rod, ground, 5/8 min. dia., (galv.)
aj	1	Clamp, ground rod, (galvanized steel)
al		Staple, ground wire, (galv.), as req'd
cj		Wire pole ground, as req'd Soft annealed iron, 5/16" with class C galvanizing
dp	2	Clamp, ground wire, with lock washer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

NOTE: Wear rubber gloves when operating switch.

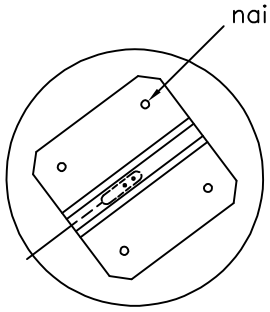
GROUNDING ASSEMBLY – PLATFORM TYPE (FOR SECTIONALIZING AIRBREAK SWITCH)

APRIL 2005		H4.1
RUS		(M2–15A)





SECTION "X–X"



Plan View
Grounding plate (dh)

NOTES:

1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Staples on ground wire shall be 2'–0" apart except for a distance of 8' above ground and 8' from top of pole where they shall be 6" apart.
3. Copper ground wire ("cj") to have a minimum conductivity of No. 6 Copper or equivalent.

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

DESIGN PARAMETERS:

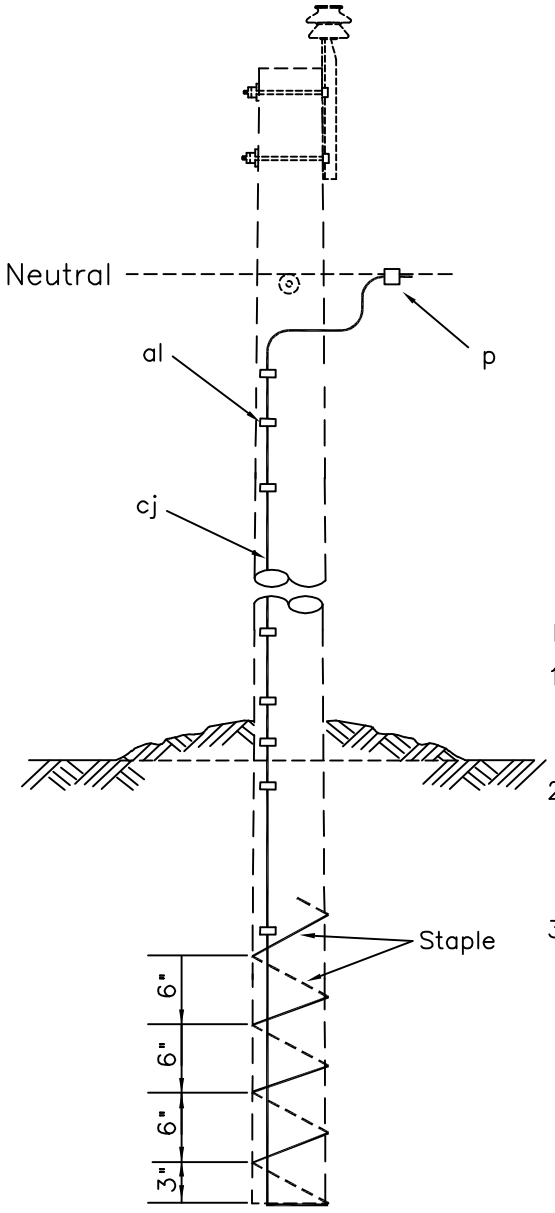
RUS SPECIFIES THAT THIS ASSEMBLY CAN NOT BE COUNTED AS A SYSTEM GROUNDING ELECTRODE REQUIRED BY THE NESC BUT RECOMMENDS ITS USE FOR OVERALL SYSTEM GROUNDING IMPROVEMENT.

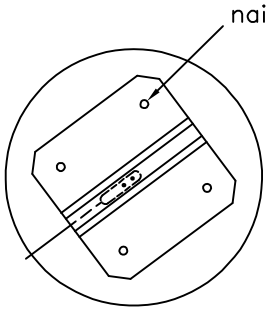
GROUNDING IMPROVEMENT ASSEMBLY – PLATE TYPE

APRIL 2005

RUS

H5.1
(M2–12)





Plan View
Grounding plate (dh)

Designate assembly with grounding plate as "H2.3"

NOTES:

1. Ground wire to be located on same side as neutral conductor and in quadrant opposite climbing space or pole top pin.
2. Staples on ground wire shall be 2'–0" apart except for a distance of 8' above ground and 8' from top of pole where they shall be 6" apart.
3. Copper ground wire ("cj") to have a minimum conductivity of No. 6 Copper or equivalent.

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

DESIGN PARAMETERS:

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

GROUNDING IMPROVEMENT ASSEMBLY – WRAP–AROUND TYPE

APRIL 2005		H5.2,H5.3 (M2–12A)
RUS		

INDEX J

SECONDARY ASSEMBLY UNITS

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

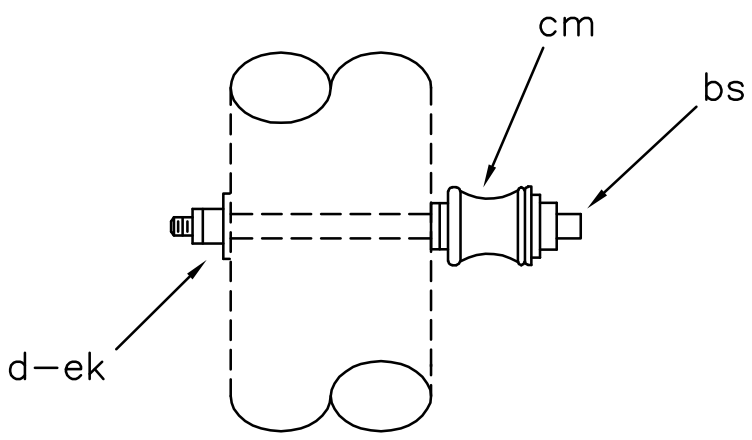
CONSTRUCTION SPECIFICATIONS FOR SECONDARY CONDUCTORS AND SERVICE DROPS

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

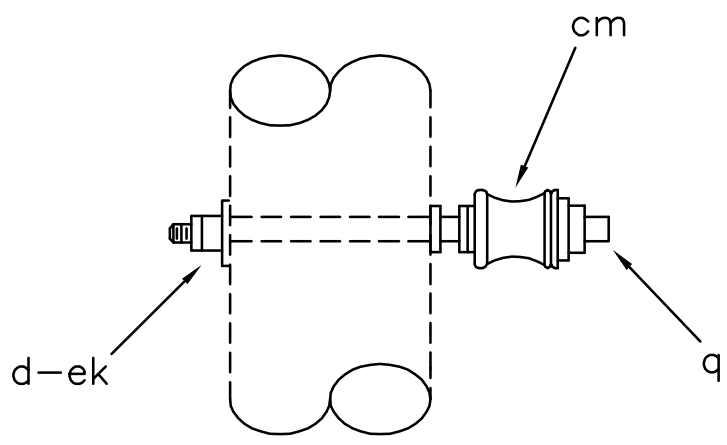
Conductors for secondary underbuild on primary lines may be bare wires, except in those circumstances where conditions may necessitate that covered wires or service cable be used. Service drop conductors shall be covered wires or service cable in accordance with NESC Rule 234C3.

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

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



J1.1



J1.2

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

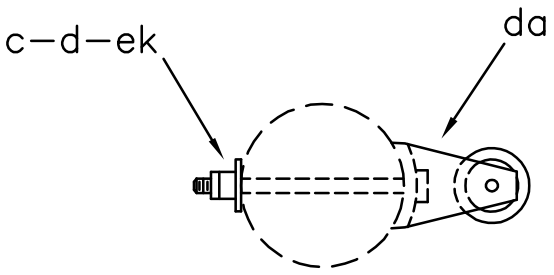
DESIGN PARAMETERS:

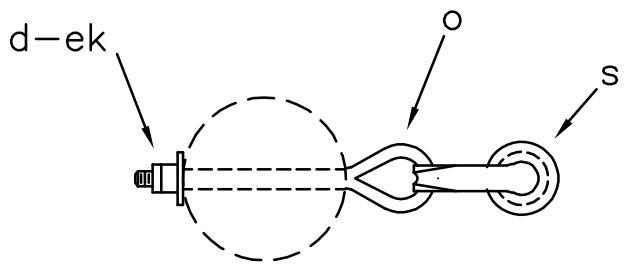
MAXIMUM LINE ANGLES

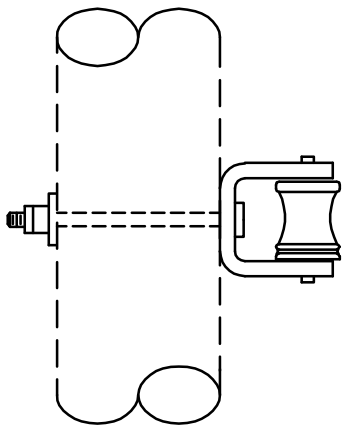
5° – Small Conductors
2° – Larger than #1/0

SECONDARY ASSEMBLIES
(SMALL ANGLE)

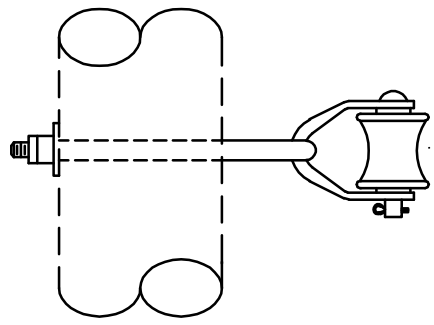
APRIL 2005		J1.1,J1.2
RUS		(J8),(J5)







J2.1



J2.2

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

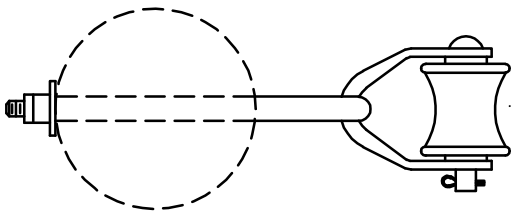
DESIGN PARAMETERS:

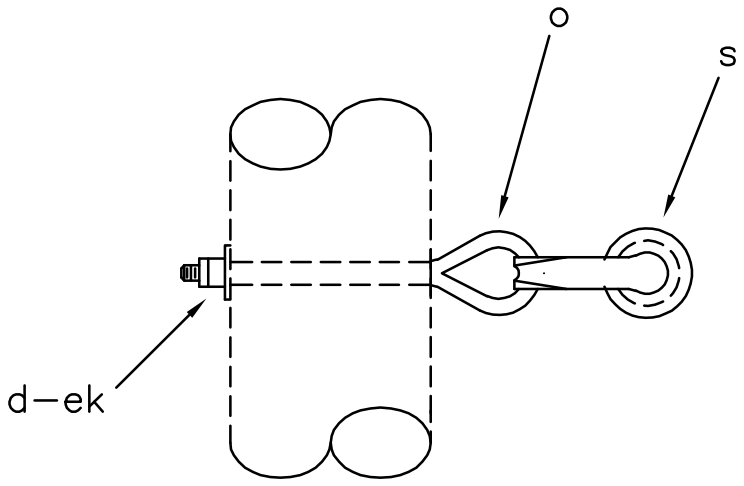
MAXIMUM LINE ANGLES

J2.1: 60°
J2.2: 60°

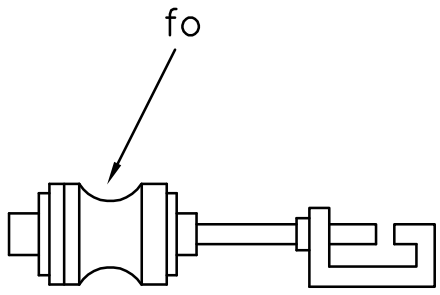
SECONDARY ASSEMBLIES (LARGE ANGLE)

APRIL 2005		J2.1,J2.2
RUS		(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		J3.1,J4.1
RUS		(J6,J11),(J12)

Calculation of Maximum Line Angles

The following formula and the data tabulated below were used to calculate the maximum line angles on pin and spool insulator assemblies:

$$Sin(\theta/2) = \frac{P-(Fw\times Sw\times Ww)}{2\times Ft\times T} \qquad \theta = 2\times Arc\sin\left[\frac{P-(Fw\times Sw\times Ww)}{2\times Ft\times T}\right]$$

Where:

θ = Maximum Line Angle (calculated): [Degrees]
P = Designated Maximum Transverse Load (allowed on pin or insulator): [lbs]
Fw = Wind Overload Factor for Transverse Loads
Ft = Wire Tension Overload Factor for Transverse Loads
Sw = Wind Span (equals ½ sum of adjacent spans): [ft]
Ww = Wind Load on Conductor: [lbs/ft] *(See Table Below)*
T = Design Tension of Conductor: [lbs] *(See Table Below)*

From NESC Table 253-1 for Grade C Construction:

Fw = 1.75 for non-crossing spans (Footnote 4 to Table 253-1)
= 2.20 for crossing spans
Ft = 1.30

CONDUCTOR SIZE & TYPE	Strength	Maximum Tension	Design Tension *(T)(lbs)*
4 ACSR (7/1)	2360	60%	1416
2 ACSR (6/1)	2850	60%	1710
2 ACSR (7/1)	3640	60%	2184
1/0 ACSR (6/1)	4380	60%	2628
123.3 AAC (7)	4460	60%	2676
2/0 ACSR (6/1)	5310	50%	2655
3/0 ACSR (6/1)	6620	50%	3310
4/0 ACSR (6/1)	8350	40%	3340
246.9 AAC (7)	8560	40%	3424
336.4 ACSR (18/1)	8680	40%	3472
336.4 ACSR (26/7)	14100	35%	4935

	WIND LOAD (*Ww*) *(lbs/ft)* by NESC Loading District		
	LIGHT	MEDIUM	HEAVY
4 ACSR (7/1)	0.1928	0.2523	0.4190
2 ACSR (6/1)	0.2370	0.2720	0.4387
2 ACSR (7/1)	0.2438	0.2750	0.4417
1/0 ACSR (6/1)	0.2985	0.2993	0.4660
123.3 AAC (7)	0.2985	0.2993	0.4660
2/0 ACSR (6/1)	0.3353	0.3157	0.4823
3/0 ACSR (6/1)	0.3765	0.3340	0.5007
4/0 ACSR (6/1)	0.4223	0.3543	0.5210
246.9 AAC (7)	0.4223	0.3543	0.5210
336.4 ACSR (18/1)	0.5130	0.3947	0.5613
336.4 ACSR (26/7)	0.5408	0.4070	0.5737

TABLE I

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 500 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	14	13	13	12	12	11
2 ACSR (6/1)	11	11	10	10	9	9
2 ACSR (7/1)	9	8	8	8	7	7
1/0 ACSR (6/1)	7	7	6	6	5	5
123.3 AAAC (7)	7	7	6	6	5	5
2/0 ACSR (6/1)	7	6	6	5	5	4
3/0 ACSR (6/1)	5	5	4	4	4	3
4/0 ACSR (6/1)	5	5	4	4	3	3
246.9 AAAC (7)	5	5	4	4	3	3
336.4 ACSR (18/1)	5	4	3	3	2	2
336.4 ACSR (26/7)	3	3	2	2	2	1
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	14	13	12	11	11	10
2 ACSR (6/1)	11	10	10	9	9	8
2 ACSR (7/1)	9	8	8	7	7	6
1/0 ACSR (6/1)	7	7	6	6	5	5
123.3 AAAC (7)	7	7	6	6	5	5
2/0 ACSR (6/1)	7	6	6	6	5	5
3/0 ACSR (6/1)	5	5	5	4	4	4
4/0 ACSR (6/1)	5	5	5	4	4	3
246.9 AAAC (7)	5	5	4	4	4	3
336.4 ACSR (18/1)	5	5	4	4	3	3
336.4 ACSR (26/7)	4	3	3	3	2	2
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	12	11	10	9	8	6
2 ACSR (6/1)	10	9	8	7	6	5
2 ACSR (7/1)	8	7	6	5	5	4
1/0 ACSR (6/1)	6	6	5	4	4	3
123.3 AAAC (7)	6	6	5	4	4	3
2/0 ACSR (6/1)	6	6	5	4	3	3
3/0 ACSR (6/1)	5	4	4	3	3	2
4/0 ACSR (6/1)	5	4	4	3	2	2
246.9 AAAC (7)	5	4	4	3	2	2
336.4 ACSR (18/1)	4	4	3	3	2	1
336.4 ACSR (26/7)	3	3	2	2	1	1

TABLE II

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction (Re-calculate for NESC Grade B)

Designated Maximum Transverse Load = 750 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	22	21	21	20	20	19
2 ACSR (6/1)	18	17	17	16	16	15
2 ACSR (7/1)	14	13	13	13	12	12
1/0 ACSR (6/1)	11	11	10	10	10	9
123.3 AAAC (7)	11	11	10	10	9	9
2/0 ACSR (6/1)	11	11	10	10	9	9
3/0 ACSR (6/1)	9	8	8	7	7	6
4/0 ACSR (6/1)	8	8	7	7	6	6
246.9 AAAC (7)	8	8	7	7	6	6
336.4 ACSR (18/1)	8	7	7	6	6	5
336.4 ACSR (26/7)	5	5	5	4	4	3
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	21	21	20	19	19	18
2 ACSR (6/1)	18	17	16	16	15	14
2 ACSR (7/1)	14	13	13	12	12	11
1/0 ACSR (6/1)	11	11	10	10	10	9
123.3 AAAC (7)	11	11	10	10	9	9
2/0 ACSR (6/1)	11	11	10	10	9	9
3/0 ACSR (6/1)	9	8	8	8	7	7
4/0 ACSR (6/1)	9	8	8	7	7	7
246.9 AAAC (7)	8	8	8	7	7	6
336.4 ACSR (18/1)	8	8	7	7	6	6
336.4 ACSR (26/7)	6	5	5	5	4	4
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	20	19	18	17	15	14
2 ACSR (6/1)	16	15	14	13	12	11
2 ACSR (7/1)	13	12	11	10	10	9
1/0 ACSR (6/1)	11	10	9	8	8	7
123.3 AAAC (7)	10	10	9	8	8	7
2/0 ACSR (6/1)	10	10	9	8	8	7
3/0 ACSR (6/1)	8	8	7	6	6	5
4/0 ACSR (6/1)	8	7	7	6	6	5
246.9 AAAC (7)	8	7	7	6	6	5
336.4 ACSR (18/1)	8	7	6	6	5	5
336.4 ACSR (26/7)	5	5	4	4	4	3

TABLE III

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 1,000 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	30	29	29	28	28	27
2 ACSR (6/1)	24	24	23	23	22	22
2 ACSR (7/1)	19	19	18	18	17	17
1/0 ACSR (6/1)	16	15	15	14	14	13
123.3 AAAC (7)	15	15	14	14	13	13
2/0 ACSR (6/1)	15	15	14	14	13	13
3/0 ACSR (6/1)	12	12	11	11	10	10
4/0 ACSR (6/1)	12	11	11	10	10	9
246.9 AAAC (7)	11	11	11	10	10	9
336.4 ACSR (18/1)	11	10	10	9	9	8
336.4 ACSR (26/7)	8	7	7	6	6	6
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	29	29	28	27	27	26
2 ACSR (6/1)	24	23	23	22	22	21
2 ACSR (7/1)	19	18	18	17	17	16
1/0 ACSR (6/1)	16	15	15	14	14	13
123.3 AAAC (7)	15	15	14	14	13	13
2/0 ACSR (6/1)	15	15	14	14	13	13
3/0 ACSR (6/1)	12	12	11	11	11	10
4/0 ACSR (6/1)	12	12	11	11	10	10
246.9 AAAC (7)	12	11	11	10	10	10
336.4 ACSR (18/1)	11	11	11	10	10	9
336.4 ACSR (26/7)	8	8	7	7	7	6
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	28	27	26	24	23	22
2 ACSR (6/1)	23	22	21	20	19	18
2 ACSR (7/1)	18	17	16	16	15	14
1/0 ACSR (6/1)	15	14	13	13	12	11
123.3 AAAC (7)	14	14	13	12	12	11
2/0 ACSR (6/1)	15	14	13	12	12	11
3/0 ACSR (6/1)	12	11	10	10	9	9
4/0 ACSR (6/1)	11	11	10	10	9	8
246.9 AAAC (7)	11	11	10	9	9	8
336.4 ACSR (18/1)	11	10	10	9	8	8
336.4 ACSR (26/7)	8	7	7	6	6	5

TABLE IV

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 1,500 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	46	46	45	45	44	44
2 ACSR (6/1)	38	37	37	36	35	35
2 ACSR (7/1)	29	29	28	28	28	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	17	17	17
4/0 ACSR (6/1)	18	18	17	17	16	16
246.9 AAAC (7)	18	17	17	17	16	16
336.4 ACSR (18/1)	17	17	16	16	15	15
336.4 ACSR (26/7)	12	12	11	11	10	10
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	46	45	44	44	43	42
2 ACSR (6/1)	37	37	36	36	35	34
2 ACSR (7/1)	29	29	28	28	27	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	18	17	17
4/0 ACSR (6/1)	19	18	18	17	17	17
246.9 AAAC (7)	18	18	17	17	17	16
336.4 ACSR (18/1)	18	17	17	16	16	16
336.4 ACSR (26/7)	12	12	12	12	11	11
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	44	43	42	41	39	38
2 ACSR (6/1)	36	35	34	33	32	31
2 ACSR (7/1)	28	27	27	26	25	24
1/0 ACSR (6/1)	23	23	22	21	20	20
123.3 AAAC (7)	23	22	21	21	20	19
2/0 ACSR (6/1)	23	22	22	21	20	19
3/0 ACSR (6/1)	18	18	17	17	16	15
4/0 ACSR (6/1)	18	17	17	16	16	15
246.9 AAAC (7)	18	17	16	16	15	15
336.4 ACSR (18/1)	17	17	16	15	15	14
336.4 ACSR (26/7)	12	12	11	11	10	10

TABLE V

MAXIMUM LINE ANGLES (Degrees)
PIN and POST TYPE INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

Designated Maximum Transverse Load = 2,000 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	52	51	50	50	49	49
2 ACSR (7/1)	40	39	39	38	38	38
1/0 ACSR (6/1)	33	32	32	31	31	30
123.3 AAAC (7)	32	32	31	31	30	30
2/0 ACSR (6/1)	32	32	31	31	30	30
3/0 ACSR (6/1)	26	25	25	24	24	23
4/0 ACSR (6/1)	25	25	24	24	23	23
246.9 AAAC (7)	25	24	24	23	23	22
336.4 ACSR (18/1)	24	23	23	22	22	21
336.4 ACSR (26/7)	17	16	16	15	15	15
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	60	60	60	60	60	59
2 ACSR (6/1)	51	51	50	49	49	48
2 ACSR (7/1)	40	39	39	38	38	37
1/0 ACSR (6/1)	33	32	32	31	31	30
123.3 AAAC (7)	32	32	31	31	30	30
2/0 ACSR (6/1)	32	32	31	31	30	30
3/0 ACSR (6/1)	26	25	25	24	24	24
4/0 ACSR (6/1)	25	25	25	24	24	23
246.9 AAAC (7)	25	24	24	24	23	23
336.4 ACSR (18/1)	24	24	23	23	22	22
336.4 ACSR (26/7)	17	17	16	16	16	15
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	60	60	59	58	57	55
2 ACSR (6/1)	50	49	48	47	46	45
2 ACSR (7/1)	39	38	37	36	35	35
1/0 ACSR (6/1)	32	31	30	30	29	28
123.3 AAAC (7)	31	31	30	29	29	28
2/0 ACSR (6/1)	31	31	30	29	29	28
3/0 ACSR (6/1)	25	24	24	23	23	22
4/0 ACSR (6/1)	25	24	24	23	22	22
246.9 AAAC (7)	24	24	23	22	22	21
336.4 ACSR (18/1)	24	23	22	22	21	21
336.4 ACSR (26/7)	17	16	16	15	15	14

TABLE VI

MAXIMUM LINE ANGLES (Degrees) ON SPOOL INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

(ANSI Clss 53-2 Spool Insulator)

Designated Maximum Transverse Load = 1,500 Lbs./Conductor

Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	46	46	45	45	44	44
2 ACSR (6/1)	38	37	37	36	35	35
2 ACSR (7/1)	29	29	28	28	28	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	17	17	17
4/0 ACSR (6/1)	18	18	17	17	16	16
246.9 AAAC (7)	18	17	17	17	16	16
336.4 ACSR (18/1)	17	17	16	16	15	15
336.4 ACSR (26/7)	12	12	11	11	10	10
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	46	45	44	44	43	42
2 ACSR (6/1)	37	37	36	36	35	34
2 ACSR (7/1)	29	29	28	28	27	27
1/0 ACSR (6/1)	24	24	23	23	22	22
123.3 AAAC (7)	24	23	23	22	22	21
2/0 ACSR (6/1)	24	23	23	22	22	21
3/0 ACSR (6/1)	19	18	18	18	17	17
4/0 ACSR (6/1)	19	18	18	17	17	17
246.9 AAAC (7)	18	18	17	17	17	16
336.4 ACSR (18/1)	18	17	17	16	16	16
336.4 ACSR (26/7)	12	12	12	12	11	11
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	44	43	42	41	39	38
2 ACSR (6/1)	36	35	34	33	32	31
2 ACSR (7/1)	28	27	27	26	25	24
1/0 ACSR (6/1)	23	23	22	21	20	20
123.3 AAAC (7)	23	22	21	21	20	19
2/0 ACSR (6/1)	23	22	22	21	20	19
3/0 ACSR (6/1)	18	18	17	17	16	15
4/0 ACSR (6/1)	18	17	17	16	16	15
246.9 AAAC (7)	18	17	16	16	15	15
336.4 ACSR (18/1)	17	17	16	15	15	14
336.4 ACSR (26/7)	12	12	11	11	10	10

TABLE VII

MAXIMUM LINE ANGLES (Degrees) ON SPOOL INSULATOR ASSEMBLIES

NESC Grade C Construction ***(Re-calculate for NESC Grade B)***

(ANSI CIss 53-4 Spool Insulator)

Designated Maximum Transverse Load = 2,250 Lbs./Conductor

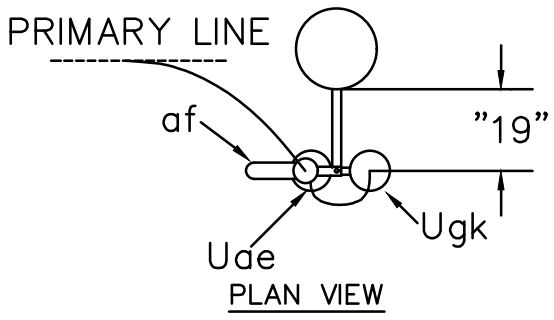
Note: Decrease line angle by 1 degree for poles adjacent to a crossing span.

WIND SPAN (feet)	150	200	250	300	350	400
CONDUCTOR SIZE	**LIGHT LOADING DISTRICT**					
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	59	58	58	57	57	56
2 ACSR (7/1)	45	45	44	44	43	43
1/0 ACSR (6/1)	37	37	36	36	35	35
123.3 AAAC (7)	36	36	35	35	35	34
2/0 ACSR (6/1)	37	36	35	35	34	34
3/0 ACSR (6/1)	29	28	28	28	27	27
4/0 ACSR (6/1)	29	28	28	27	27	26
246.9 AAAC (7)	28	27	27	26	26	25
336.4 ACSR (18/1)	27	27	26	25	25	24
336.4 ACSR (26/7)	19	18	18	18	17	17
	MEDIUM LOADING DISTRICT					
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	59	58	57	57	56	55
2 ACSR (7/1)	45	45	44	44	43	42
1/0 ACSR (6/1)	37	37	36	36	35	35
123.3 AAAC (7)	36	36	35	35	35	34
2/0 ACSR (6/1)	37	36	36	35	35	34
3/0 ACSR (6/1)	29	29	28	28	27	27
4/0 ACSR (6/1)	29	28	28	27	27	27
246.9 AAAC (7)	28	28	27	27	26	26
336.4 ACSR (18/1)	28	27	27	26	26	25
336.4 ACSR (26/7)	19	19	19	18	18	18
	HEAVY LOADING DISTRICT					
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	57	56	55	54	53	52
2 ACSR (7/1)	44	43	42	42	41	40
1/0 ACSR (6/1)	36	36	35	34	33	33
123.3 AAAC (7)	36	35	34	34	33	32
2/0 ACSR (6/1)	36	35	34	34	33	32
3/0 ACSR (6/1)	29	28	27	27	26	26
4/0 ACSR (6/1)	28	28	27	26	26	25
246.9 AAAC (7)	27	27	26	26	25	24
336.4 ACSR (18/1)	27	26	26	25	24	24
336.4 ACSR (26/7)	19	18	18	17	17	17

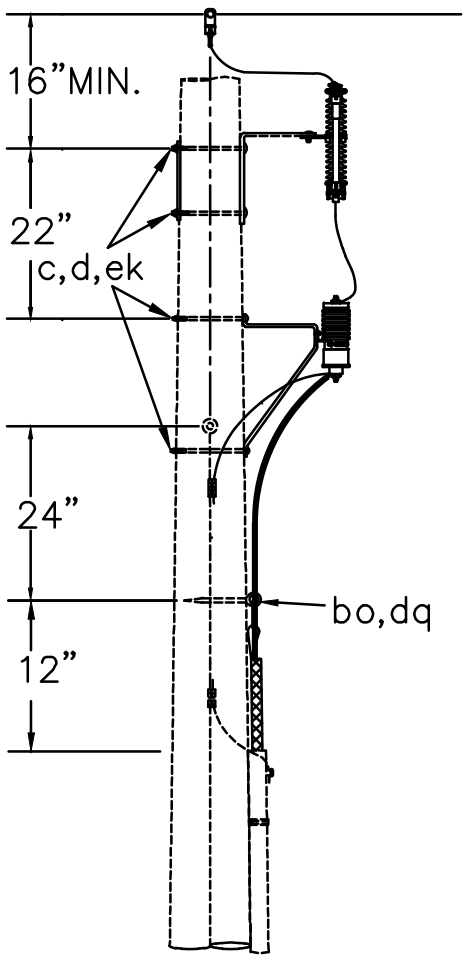
INDEX UA

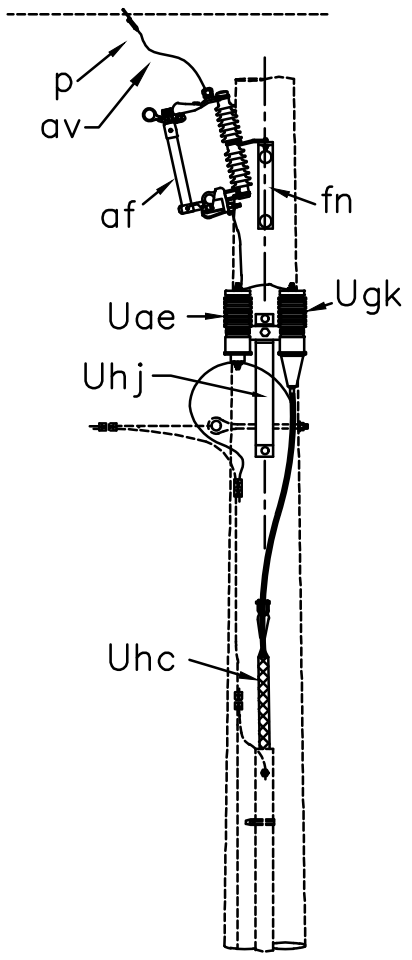
SINGLE PHASE RISER POLE ASSEMBLY UNITS

DRAWING NUMBERS		**DRAWING TITLE (DESCRIPTION)**
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



PLAN VIEW





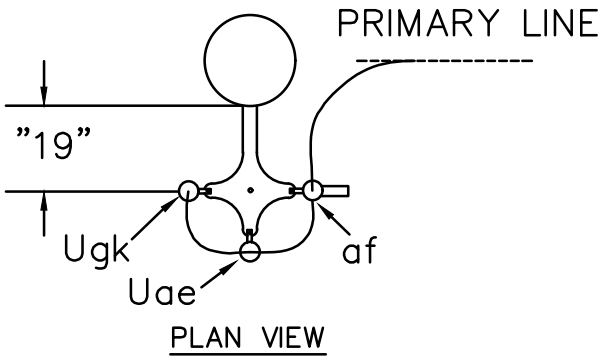
ITEM	QTY.	MATERIAL
c	4	Bolt, machine, 5/8" x required length.
d	4	Washer, square 2 1/4".
p		Connectors, as required.
af	1	Fuse link.
af	1	Cutout
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive
		hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	4	Locknuts
fn	1	Bracket, cutout extension.
Uae	1*	Surge arrester
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

NOTES:

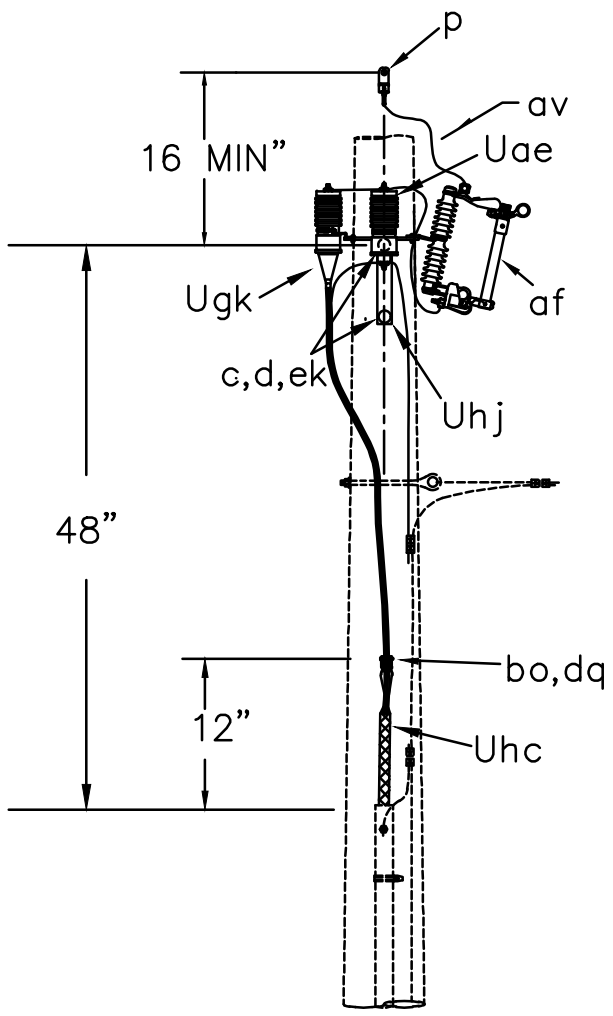
1. TOTAL ARRESTER LEAD LENGTH MUST BE UNDER 3'.
2. NO BENDS PERMITTED WITHIN 6" OF CABLE TERMINAL BASE.
3. MINIMUM 4" BETWEEN BOLTS.

SINGLE PHASE CABLE TERMINAL POLE WITH TWO BRACKETS

AUG 2016	1 – PHASE PRIMARY	
RUS		UA1



PLAN VIEW



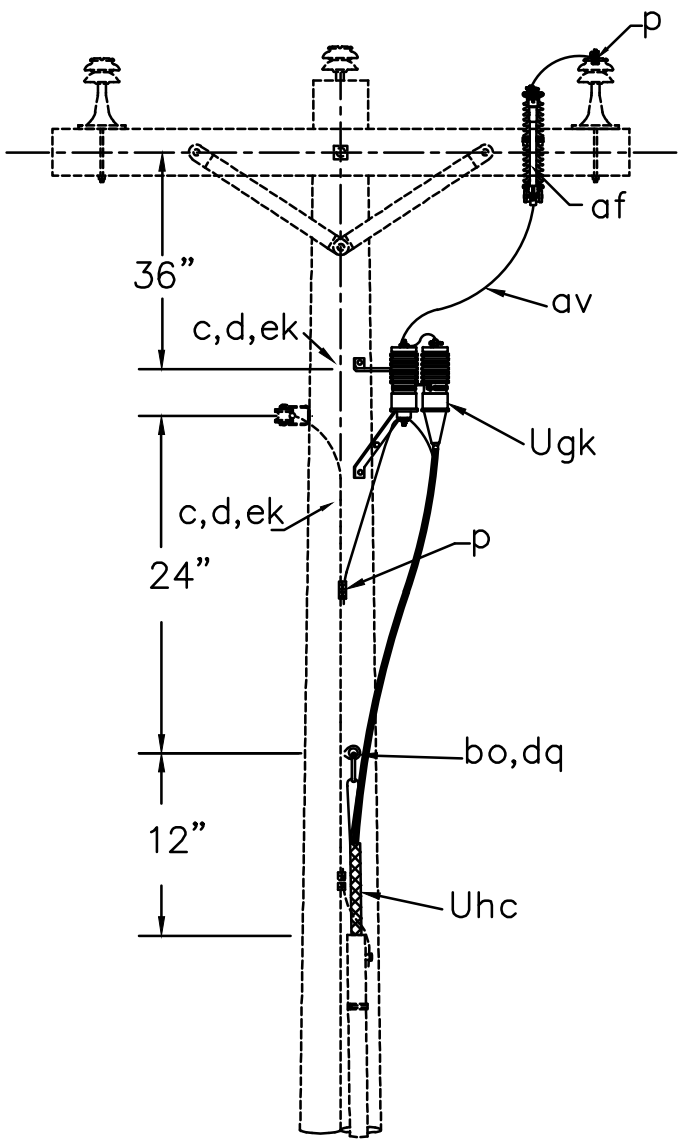
ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8" x required length.
d	2	Washer, square 2 1/4".
p		Connectors, as required.
af	1	Fuse link.
af	1	Cutout
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive
		hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	2	Locknuts
fn	1	Bracket, cutout extension.
Uae	1*	Surge arrester
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

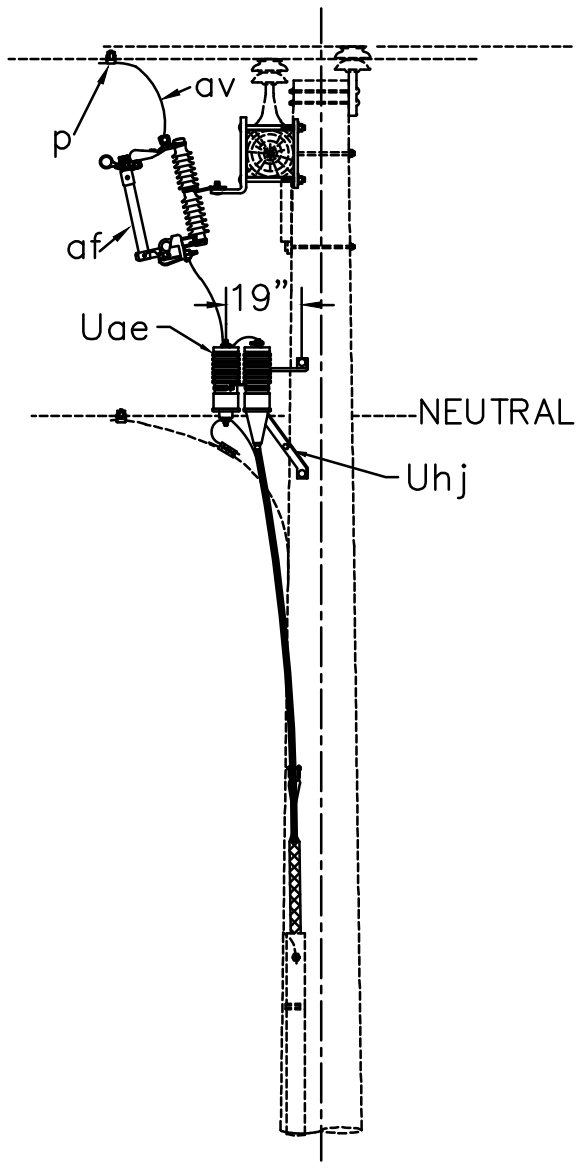
NOTES:

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	1 – PHASE PRIMARY	
RUS		UA2





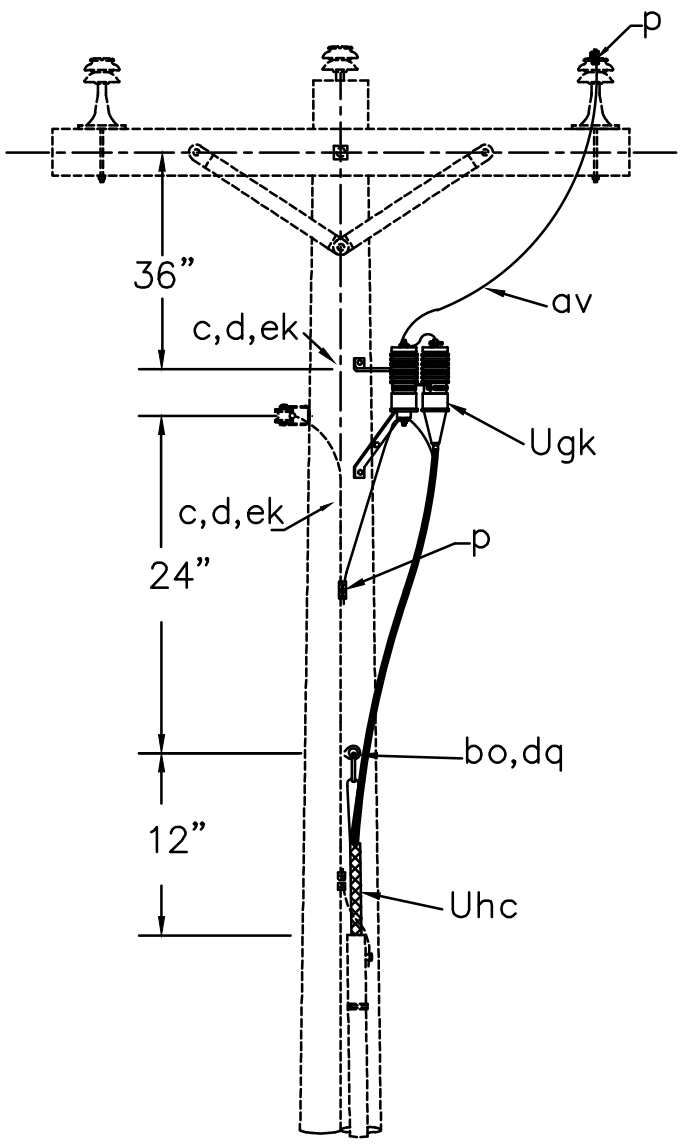
ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8” x required length.
d	2	Washer, square 2 1/4”.
j		Screw, lag 1/2” x 4” as required.
p		Connectors, as required.
af	1	Fuse link.
af	1	Cutout.
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive
		hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	2	Locknuts.
Uae	1*	Surge arrester.
Ugk	1	Cable termination.
Uhc	1	Cable support.
Uhj	1	Bracket combination.

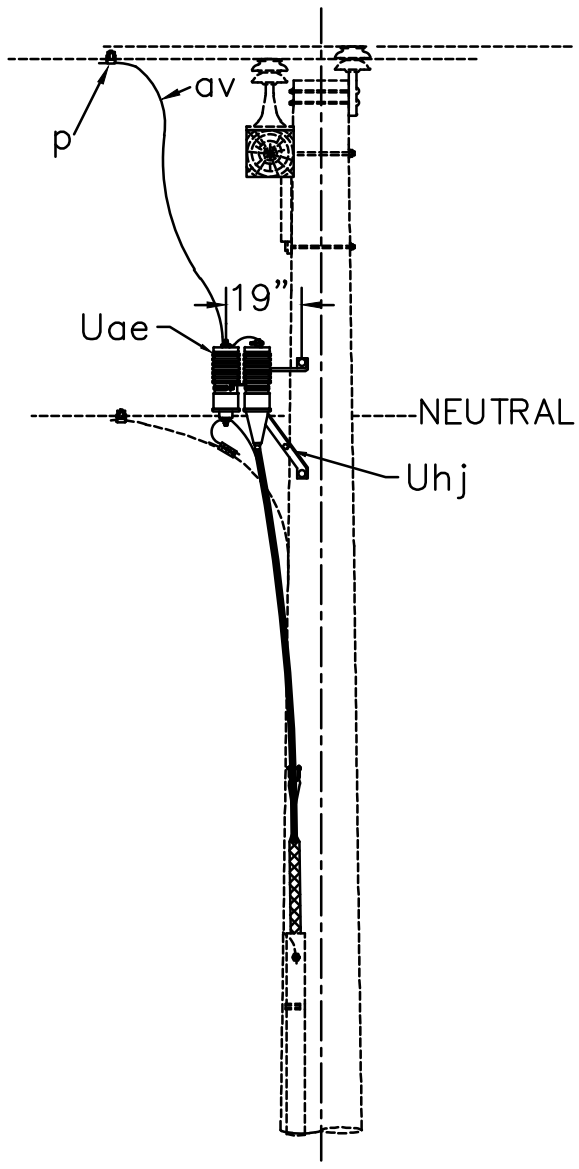
NOTES:

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	1 – PHASE PRIMARY	
RUS		UA3





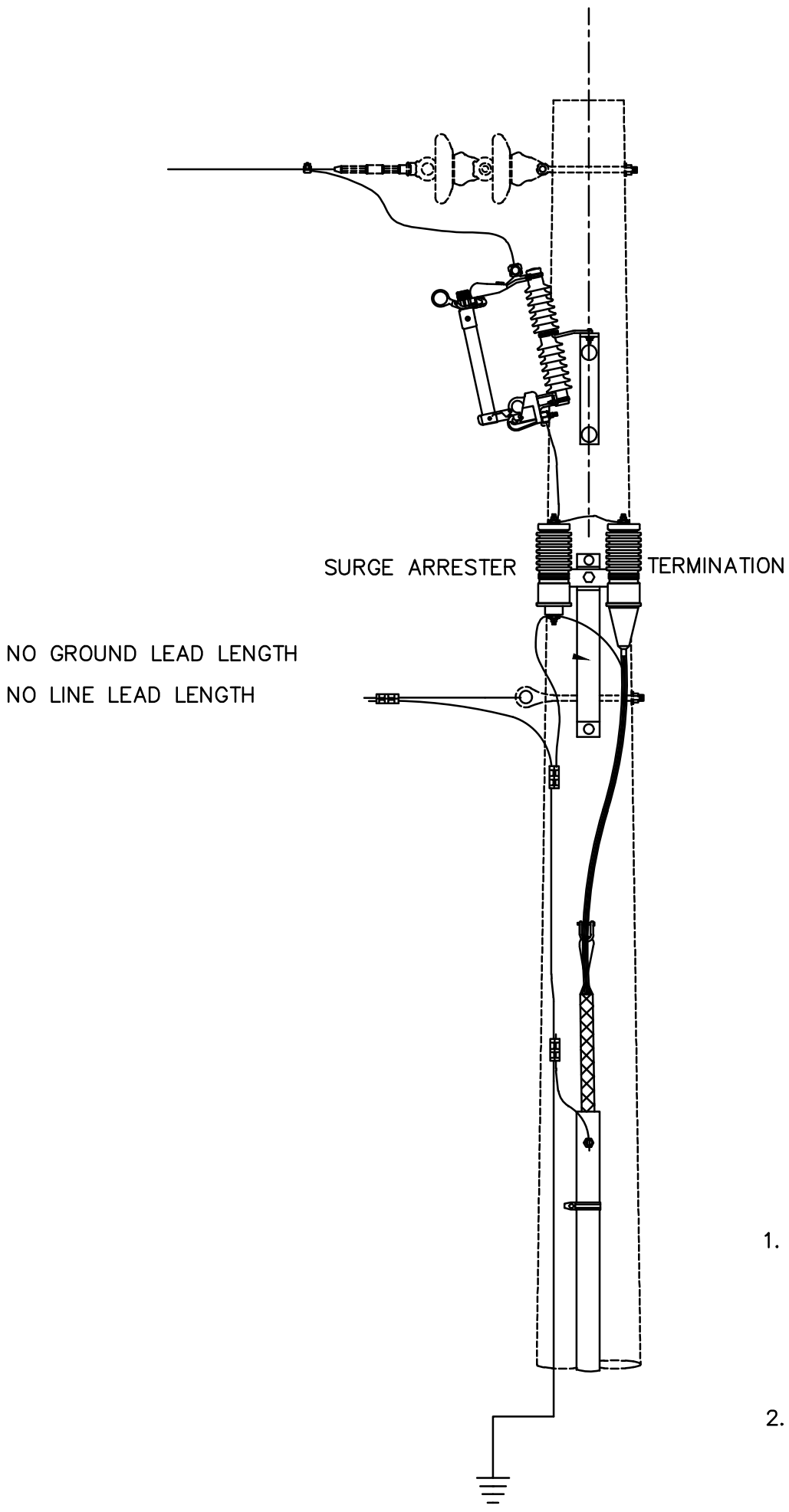
ITEM	QTY.	MATERIAL
c	2	Bolt, machine, 5/8” x required length.
d	2	Washer, square 2 1/4”.
j		Screw, lag 1/2” x 4” as required.
p		Connectors, as required.
af	1	Fuse link.
av		Jumpers, as required.
bo	1	Anchor, shackle. Do not use if drive
		hook is used.
dq	1	Eye screw, elliptical or drive hook.
ek	2	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	1 – PHASE PRIMARY	
RUS		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

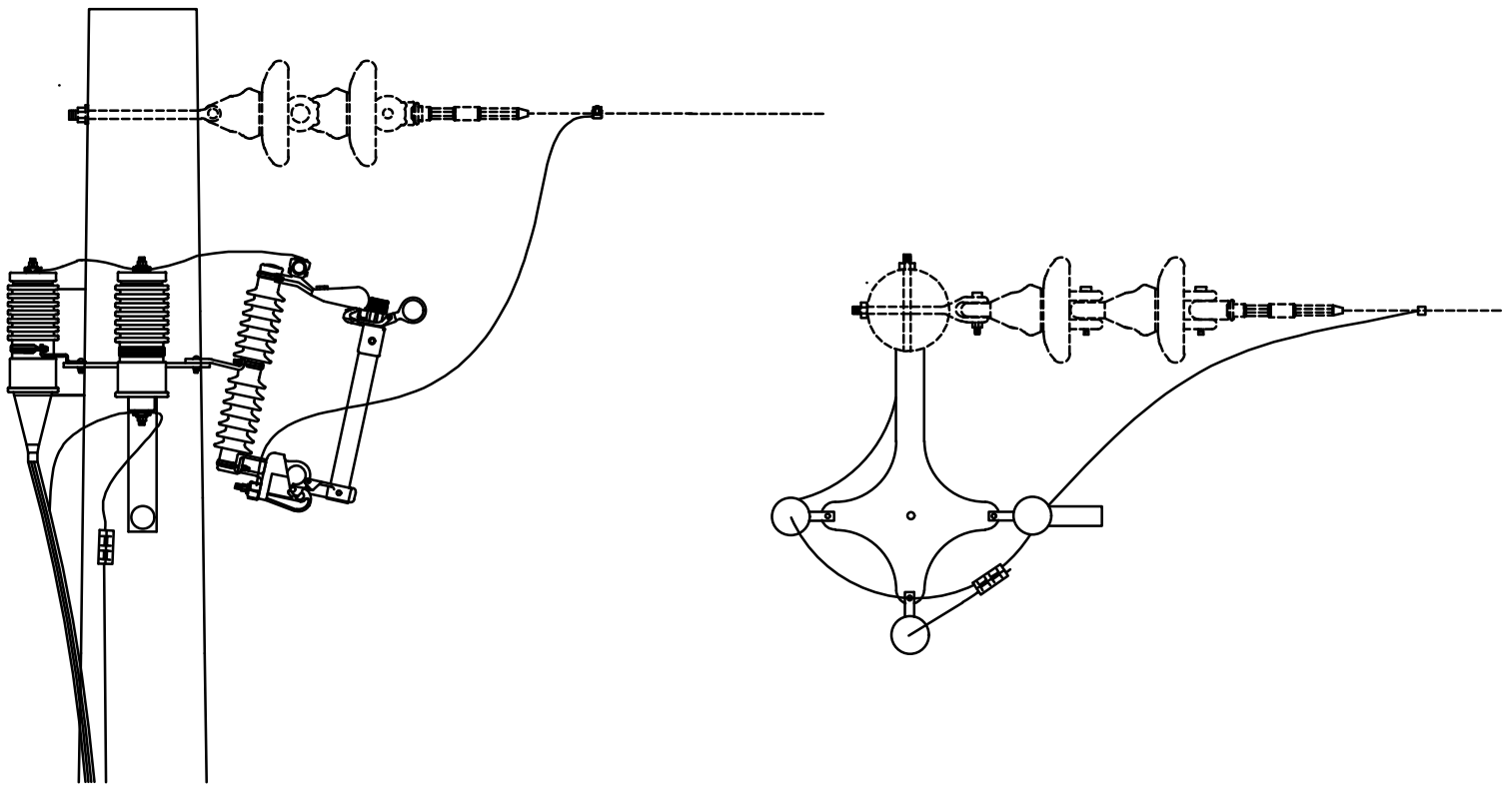
CABLE TERMINAL POLE ARRESTER CONNECTION GUIDE

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

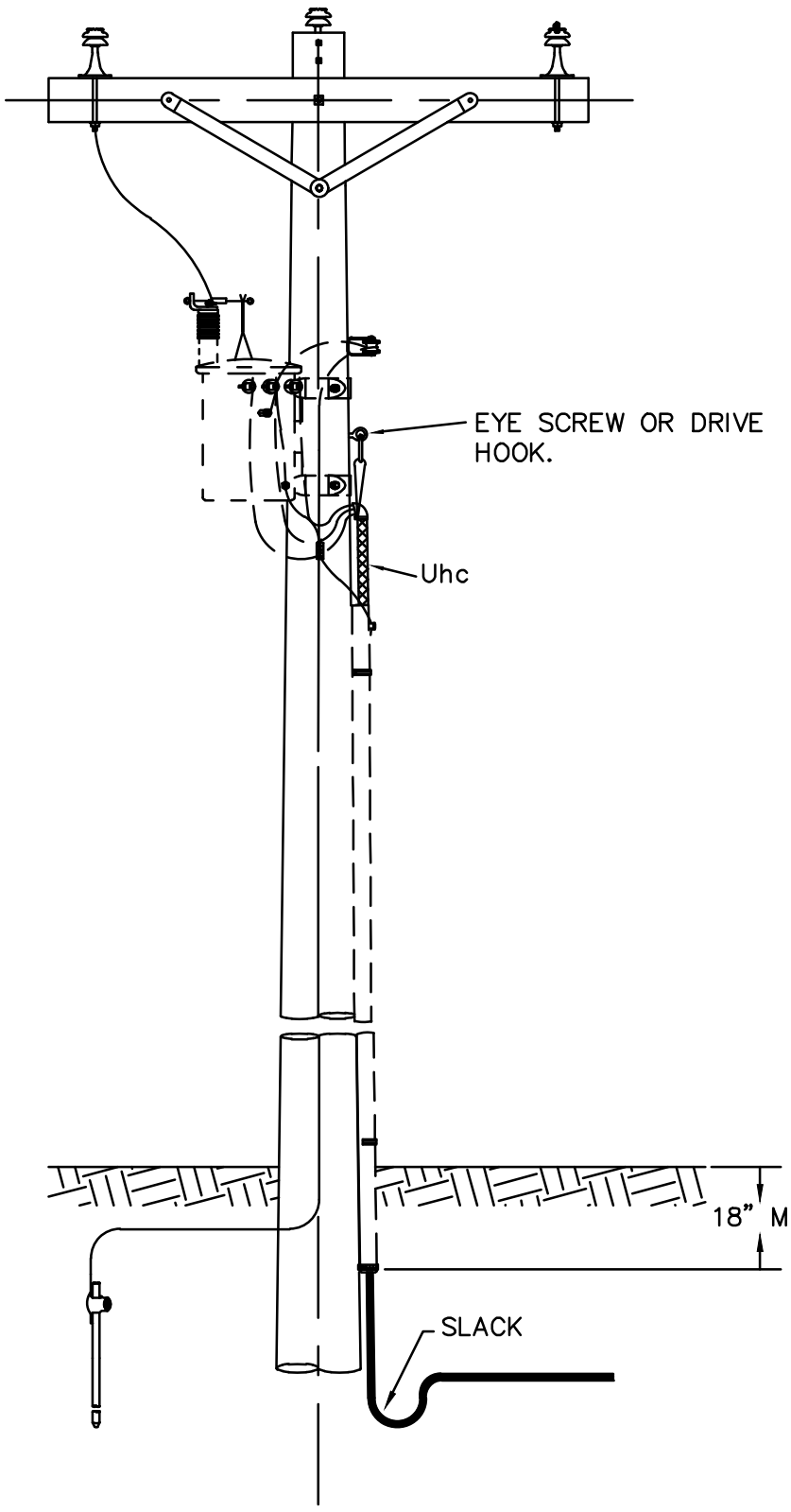


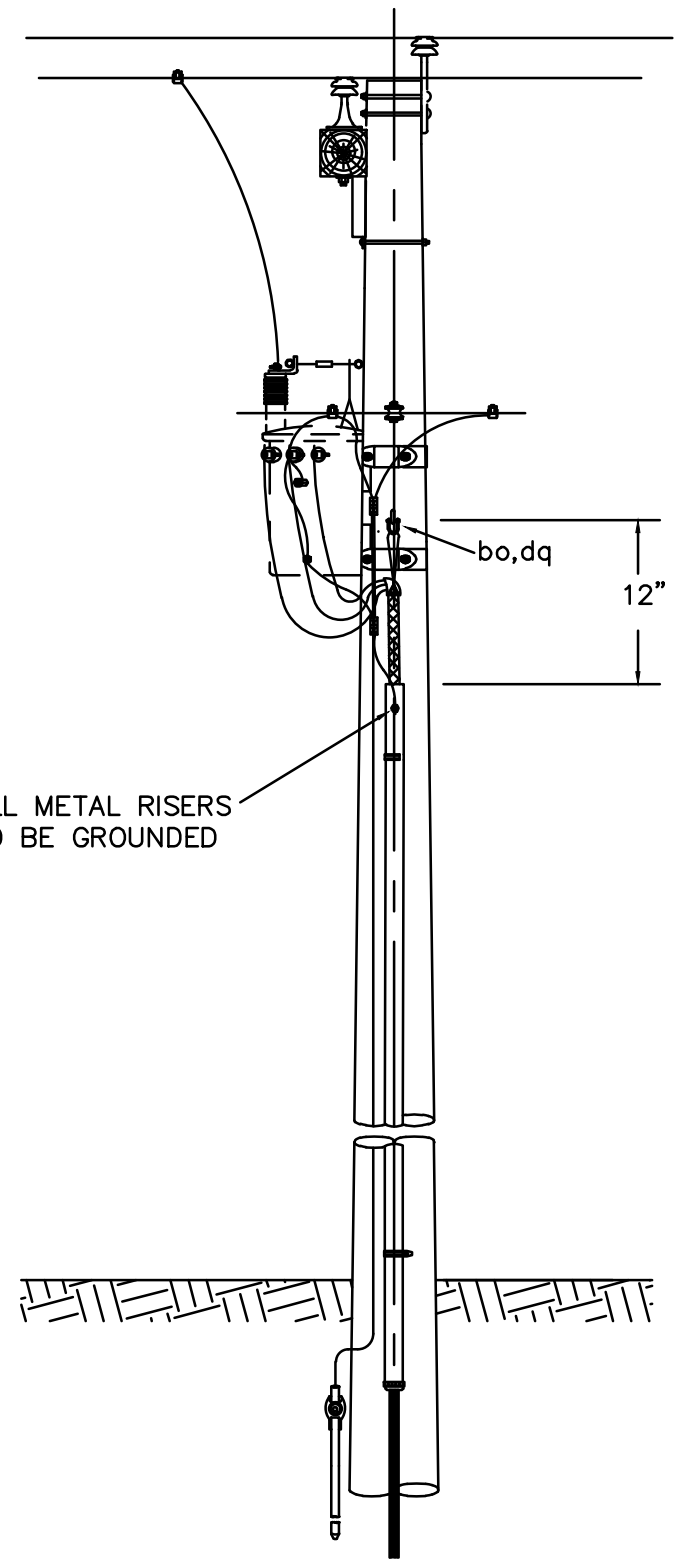
	ALTERNATE CONNECTION FOR UNDERGROUND SOURCE GUIDE		
	AUG 2016		
	RUS		UA1.USG

INDEX UK

SECONDARY SERVICE ASSEMBLY UNITS

DRAWING NUMBERS		DRAWING TITLE (DESCRIPTION)
1728F-806 (New)	**1728F-806** (Old)	
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





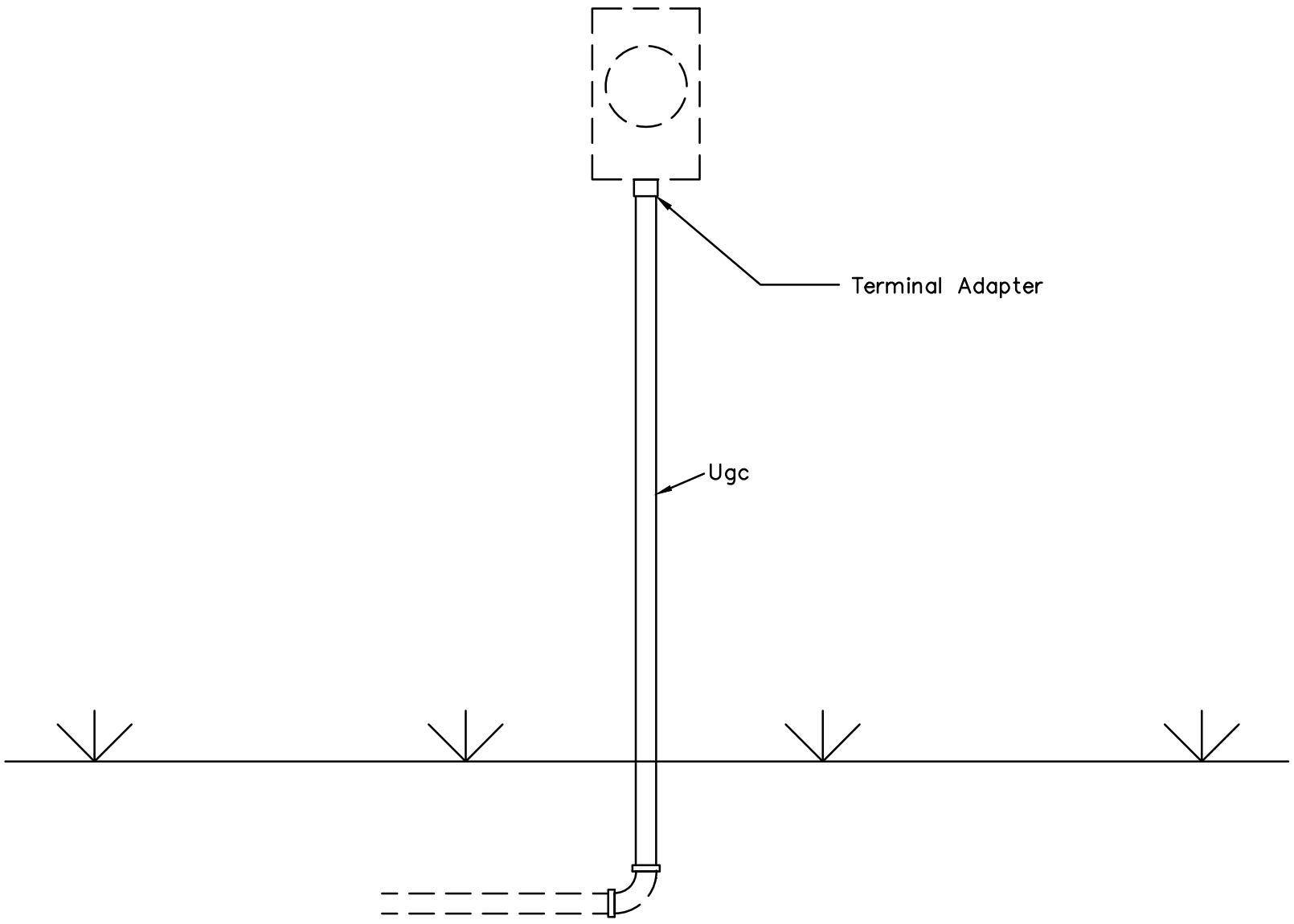
ITEM	QTY.	MATERIAL
bo	1	Shackle, anchor
dq	1	Eye Screw, Elliptical or Drive Hook
Uhc	1	Cable Support

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

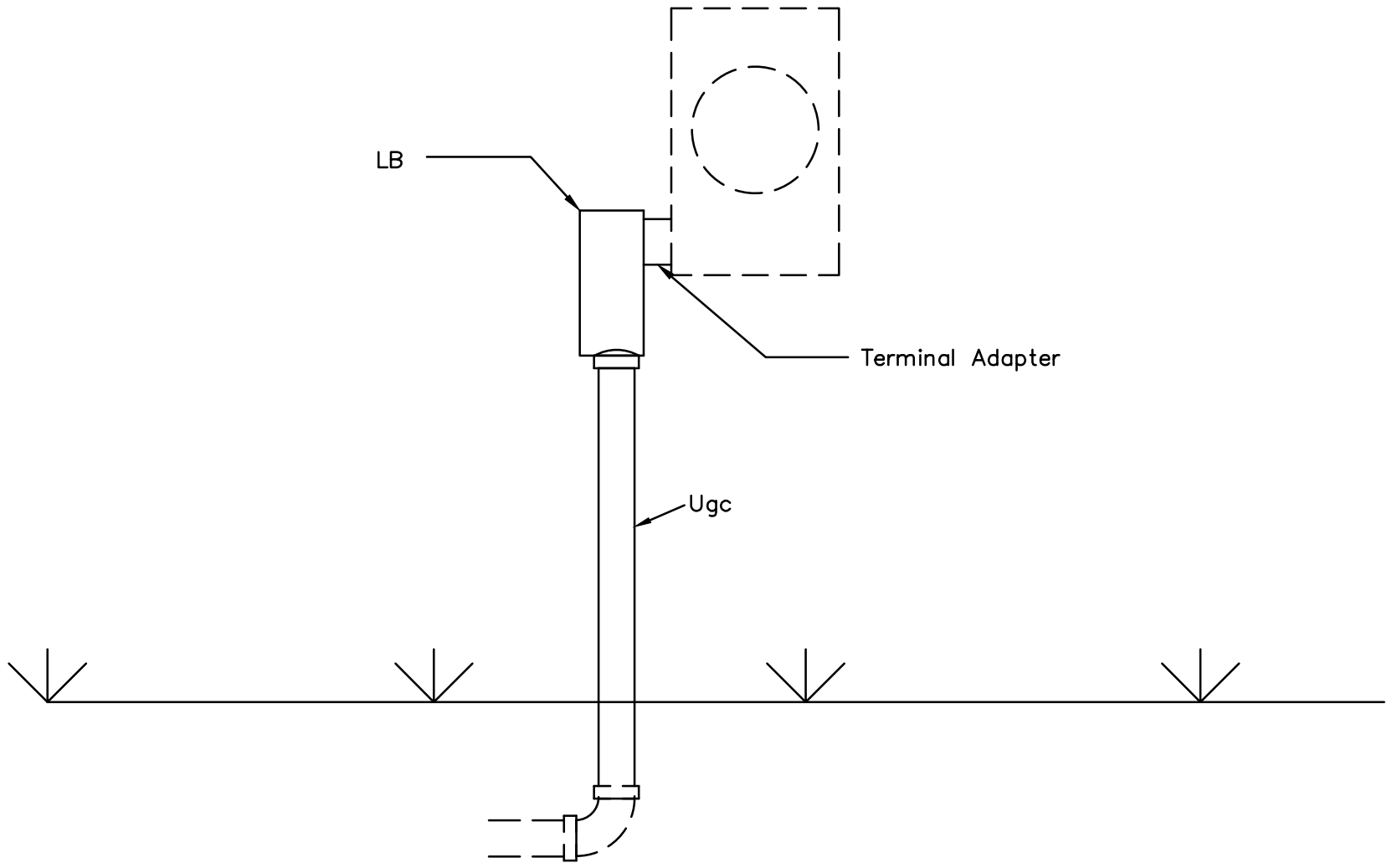
AUG 2016		
RUS		UK1.1



ITEM	QTY.	MATERIAL
Ugc		Conduit, as required
	1	Conduit terminal adapter

SECONDARY RISER
BOTTOM CONNECTION

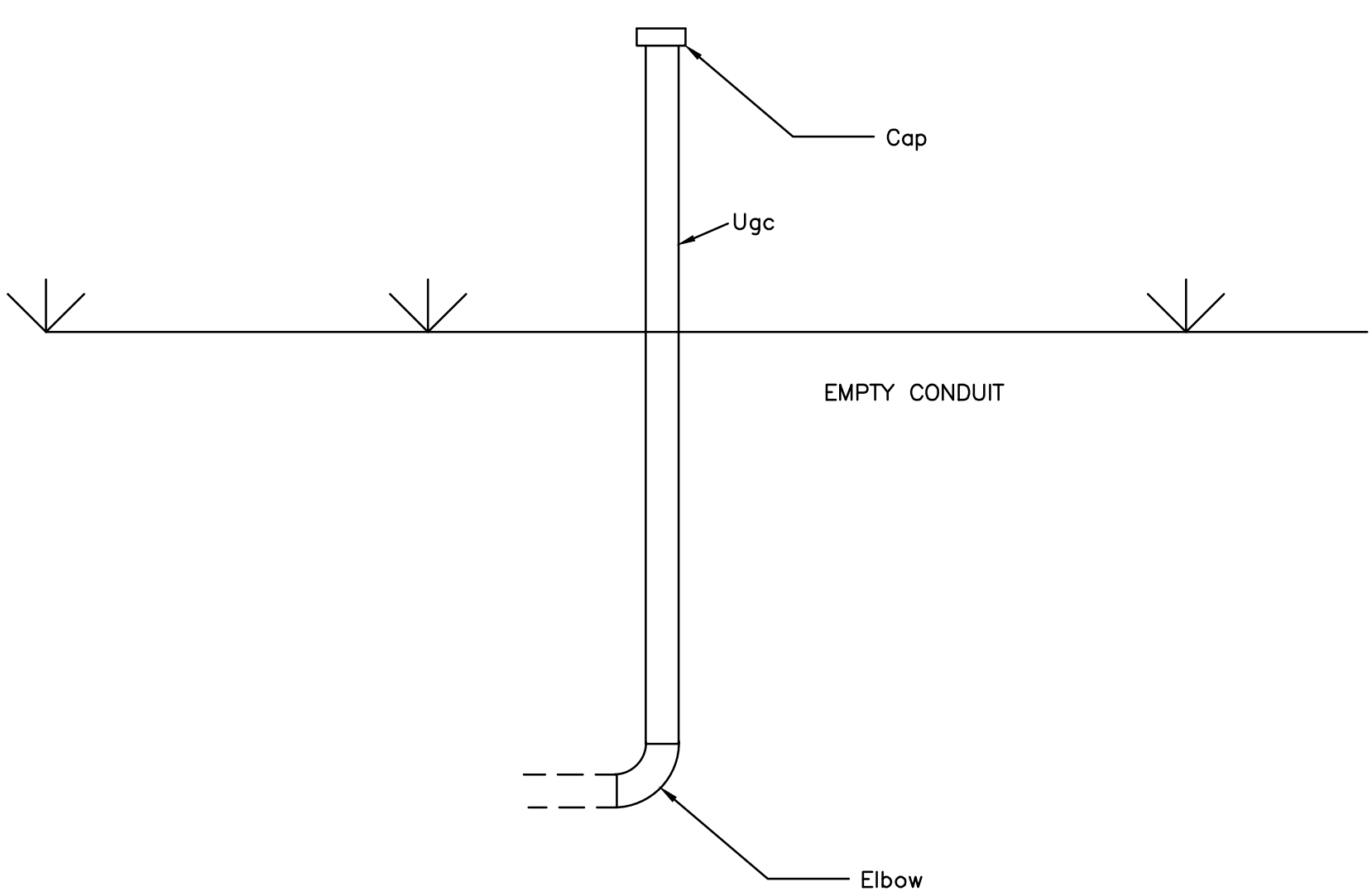
AUG 2016		
RUS		UK2.1



ITEM	QTY.	MATERIAL
Ugc		Conduit, as required
	1	Conduit terminal adapter
	1	Conduit LB

SECONDARY RISER
BOTTOM SIDE CONNECTION

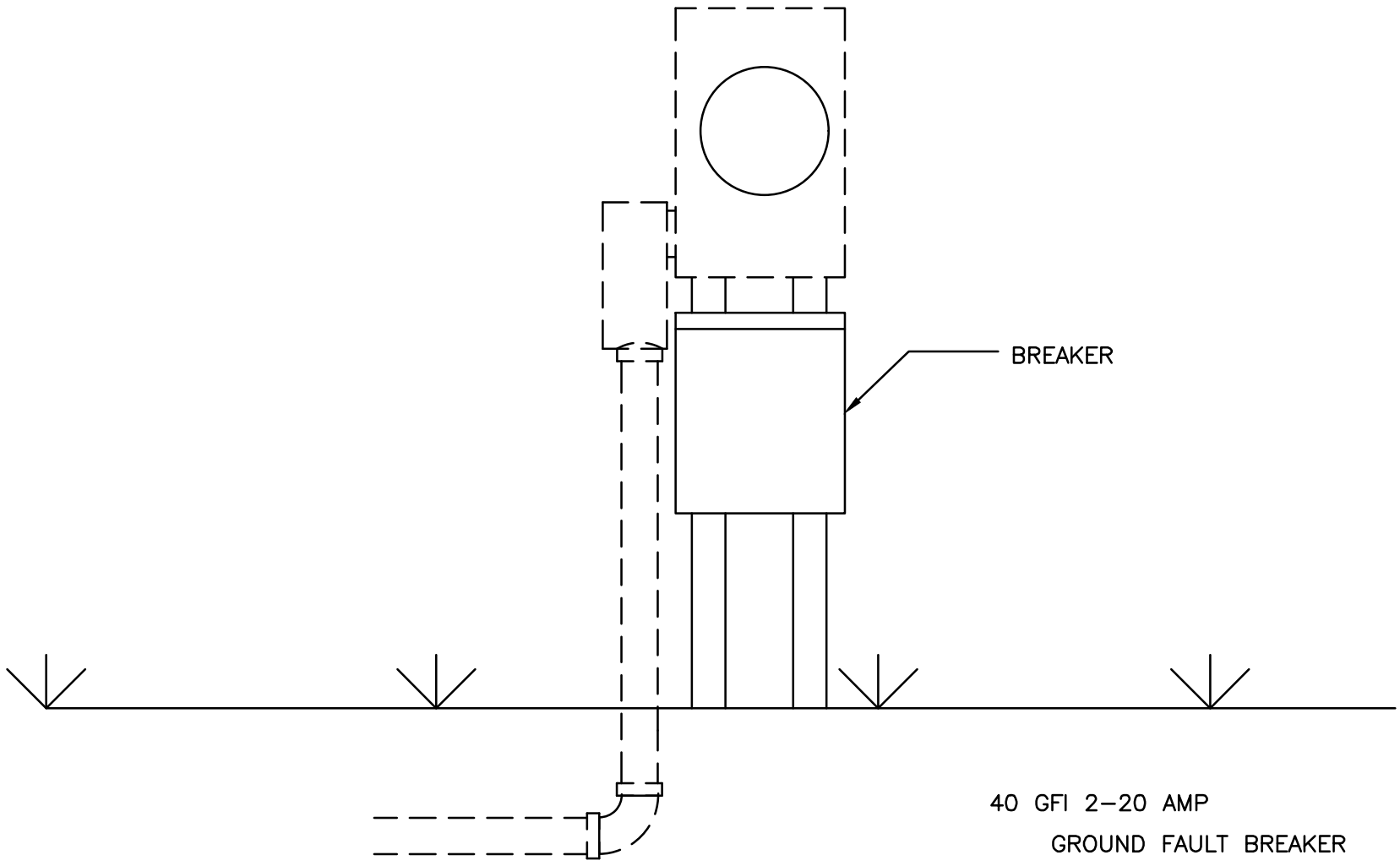
AUG 2016		
RUS		UK2.2



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

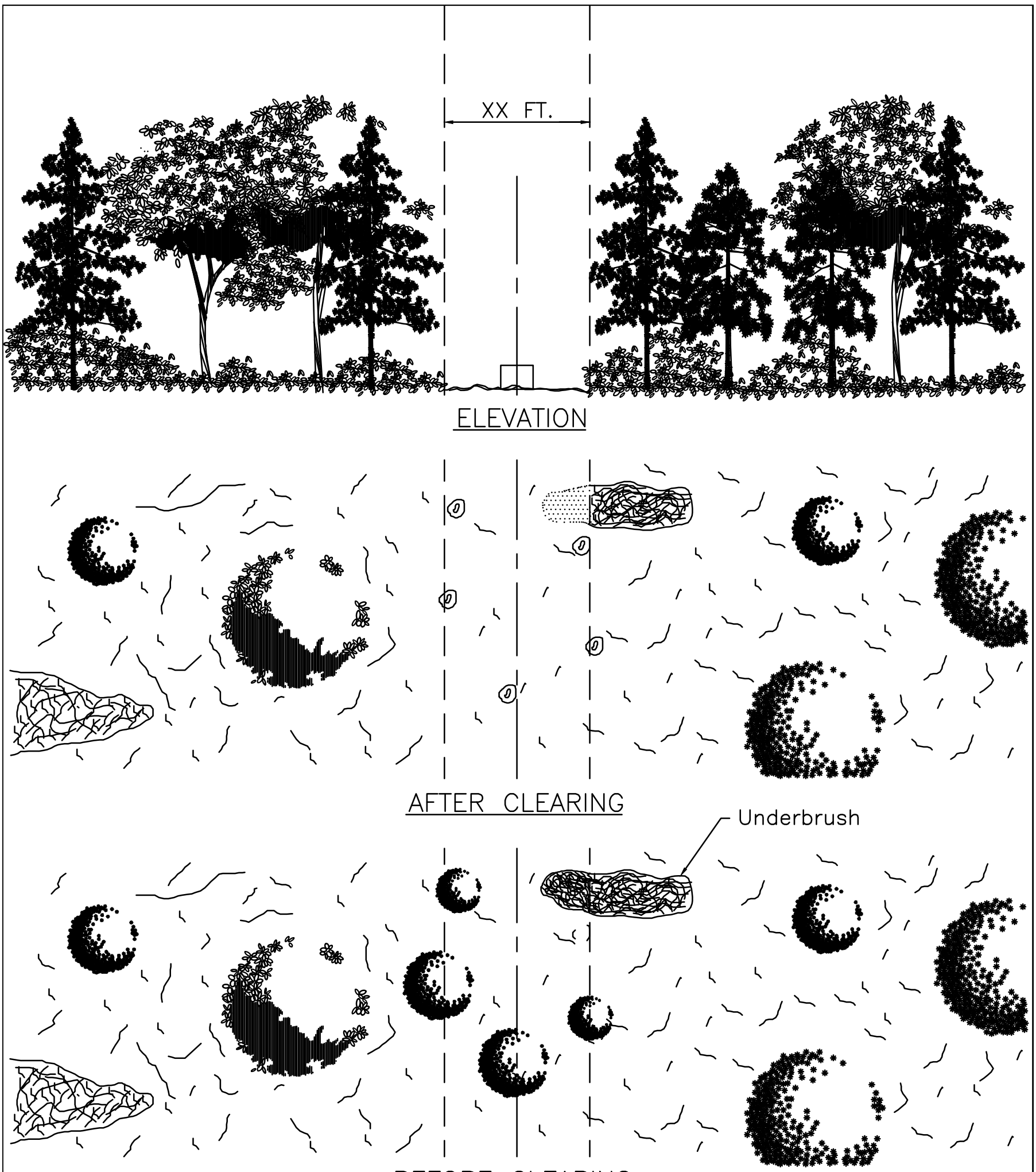
AUG 2016		
RUS		UK4

MISCELLANEOUS ASSEMBLY UNITS

DRAWING NUMBERS		**DRAWING TITLE (DESCRIPTION)**
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

DRAWING NUMBERS 1728F-806 (New)	DRAWING NUMBERS 1728F-806 (Old)	DRAWING TITLE (DESCRIPTION)
		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

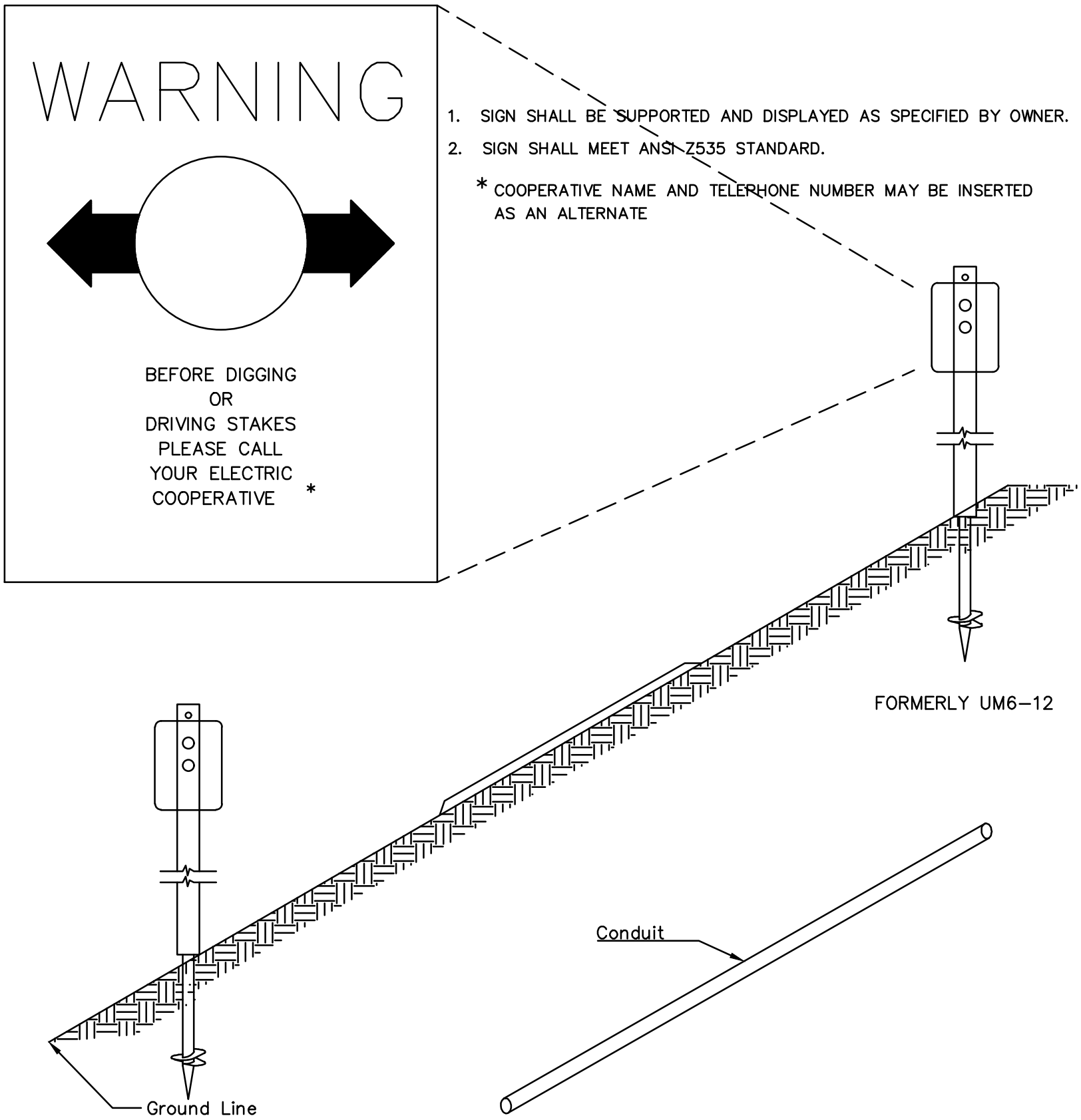
AFTER CLEARING

Underbrush

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



ITEM	QTY.	MATERIAL
Uhx	1	Cable Route Marker

CABLE ROUTE MARKER

AUG 2016		
RUS		UM2

DANGER
HIGH VOLTAGE

WARNING

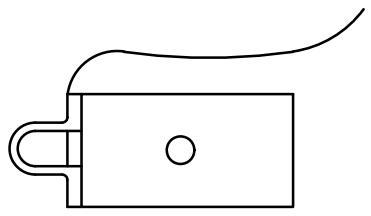
ITEM	QTY.	MATERIAL
Uhw	1	Safety Signs

NOTES:

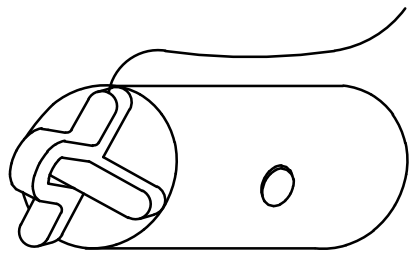
1. ALL SIGNAGE SHALL BE IN ACCORDANCE WITH ANSI Z535.

SAFETY SIGNS

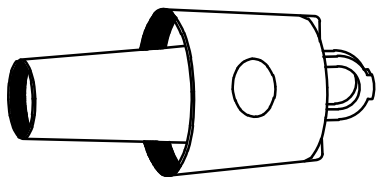
AUG 2016		
RUS		UM3



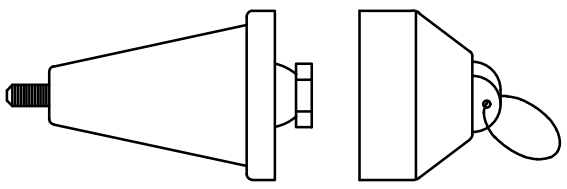
UM6.C2 INSULATED PROTECTIVE CAP
200 AMP LOAD BREAK (FORMERLY UM6–10)



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

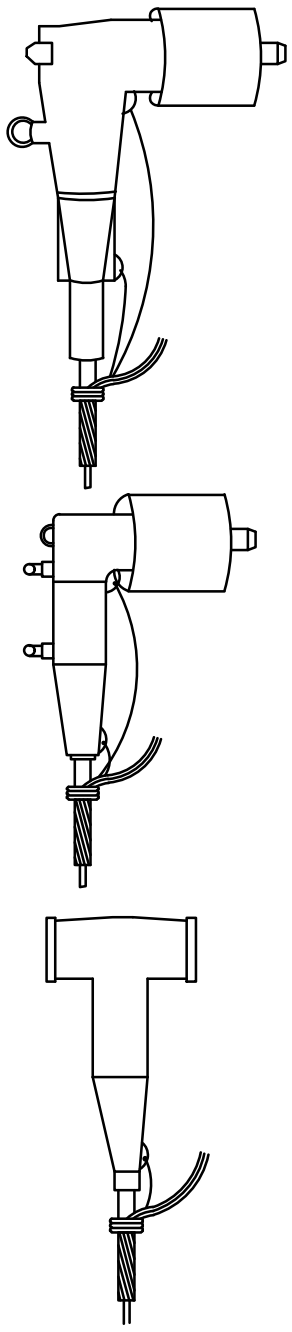
ITEM	MATERIAL	UM6.C2	UM6.C6	UM6.PL2	UM6.PL6
Uhb	Insulated protective cap, 200 AMP	1			
Uhb	Insulated protective cap, 600 AMP		1		
Uhb	Bushing well plug, 200 AMP			1	
Uhb	Insulating plug tee connector, 600 AMP				1

CAPS AND PLUGS

AUG 2016

RUS

UM6.C
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

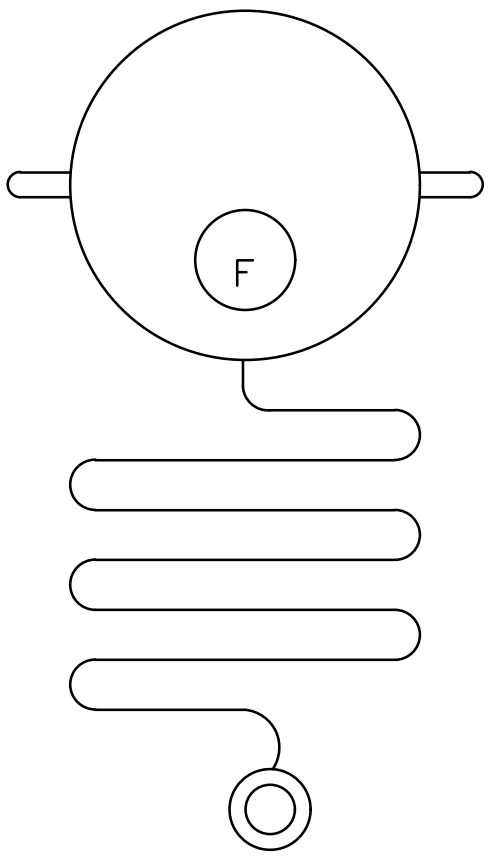
ITEM	MATERIAL	UM6.EL2	UM6.EL2F	UM6.EL6	UM6.EL9
Uhp	Elbow, 200 AMP, load break	1			
Uhp	Fused elbow, 200 AMP, load break		1		
Uhb	Dead break termination, 600 AMP			1	
Uhb	Dead break termination, 900 AMP				1

ELBOWS

AUG 2016

RUS

UM6.EL



UM6.FIMR FAULT INDICATOR

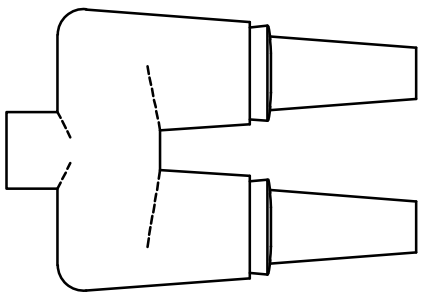
(FORMERLY UM6–4)

ITEM	QTY.	MATERIAL
Ugo	1	Fault indicator

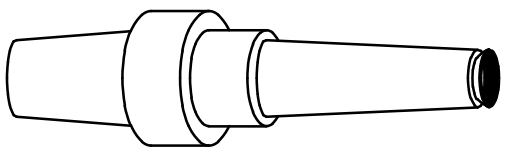
NOTES:
MR–MANUAL RESET
VR–VOLTAGE RESET
TR–TIME RESET
RR–REMOTE RESET

FAULT INDICATORS

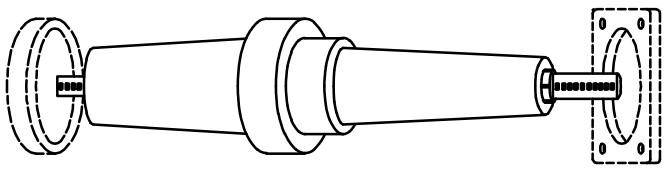
AUG 2016		
RUS		UM6.FI



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

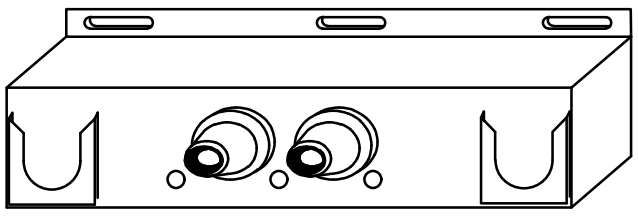
ITEM	MATERIAL	UM6.IN22	UM6.IN2	UM6.IN6
Uhb	Feed through insert, 200 AMP	1		
Uhb	Load break insert, 200 AMP		1	
Uhb	Dead break insert, 600 AMP			1

INSERTS

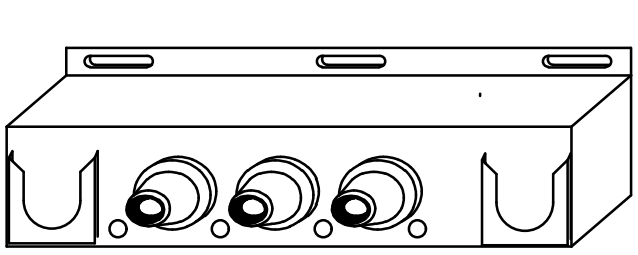
AUG 2016

RUS

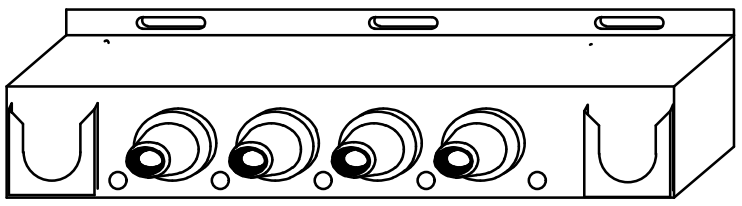
UM6.IN



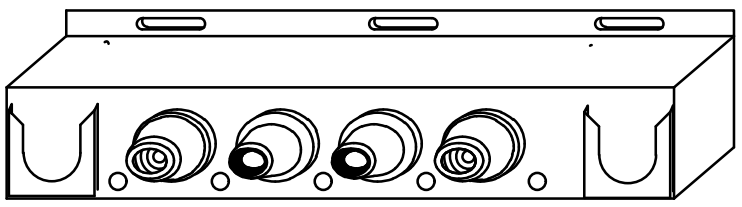
UM6.JN22 TWO POINT TERMINATION
2–200 AMP LOAD BREAK (FORMERLY UM6–20)



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)



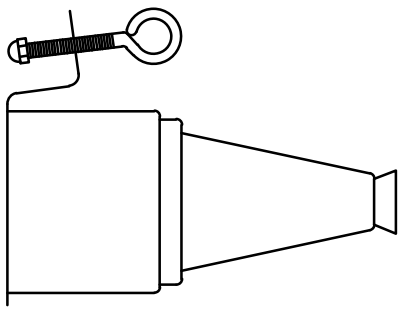
UM6.JN6226 FOUR POINT TERMINATION
2–600 AMP DEAD BREAK
2–200 AMP LOAD BREAK

ITEM	QTY.	MATERIAL
Uhq	1	Multipoint junction

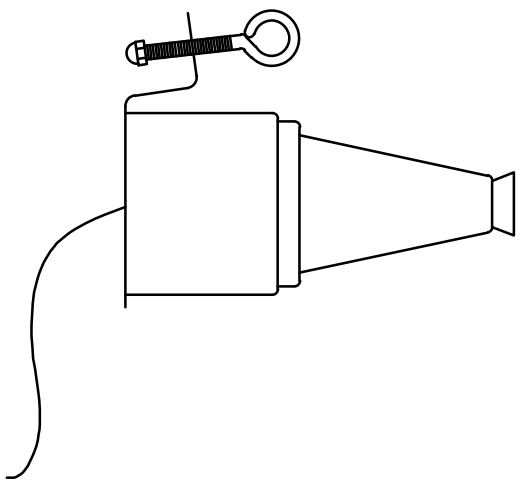
DEFINE THE NUMBER OF POINTS
AND TYPE OF POINT FOR EACH MODULE
2 FOR 200 AMP LOAD BREAK
6 FOR 600 AMP DEAD BREAK
9 FOR 900 AMP DEAD BREAK

MULTIPOINT JUNCTIONS

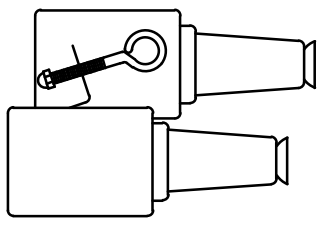
AUG 2016		
RUS		UM6.JN



UM6.PK2 STAND OFF INSULATOR
INSULATED (FORMERLY UM6–15)



UM6.PKGD ONE POINT GROUND
GROUNDED



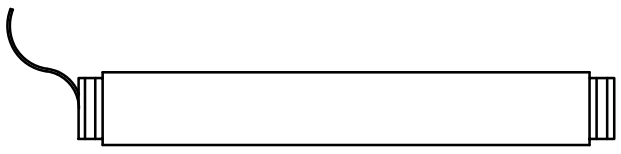
UM6.PK22 STAND–OFF INSULATOR
FEED THROUGH 200 AMP (FORMERLY UM6–19)

ITEM	QTY.	MATERIAL
Uhq	1	Parking stand

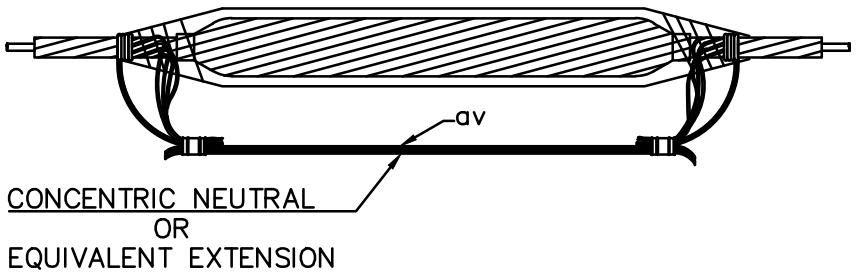
DEFINE THE NUMBER AND TYPE OF POINTS FOR EACH MODULE
2 FOR 200 AMP LOAD BREAK
6 FOR 600 AMP DEAD BREAK
GP FOR POINT WITH GROUND JUMPER
22 FOR 200 AMP FEED THROUGH

PARKING STANDS

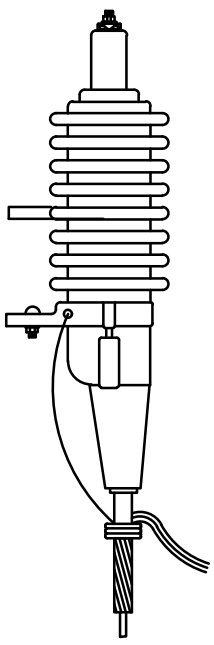
AUG 2016		
RUS		UM6.PK



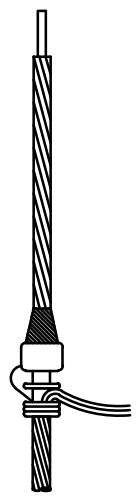
HEAT SHRINK OR
COLD SHRINK TUBING
UM6.RK



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

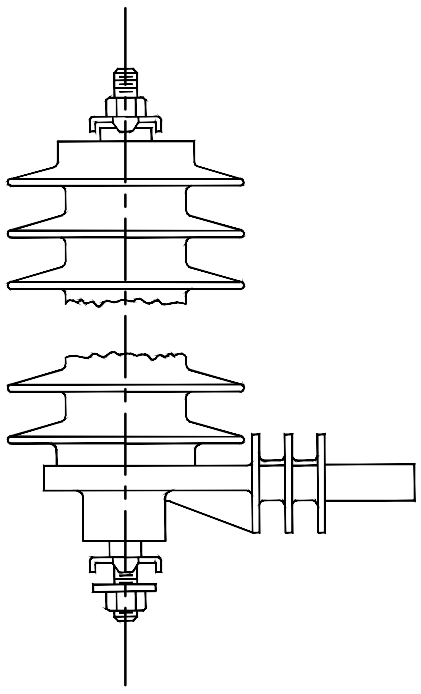
PRIMARY TERMINATIONS

AUG 2016		UM6.RK, UM6.SP
RUS		UM6.T, UM6.TS

INDEX UP

SYSTEM PROTECTION ASSEMBLY UNITS

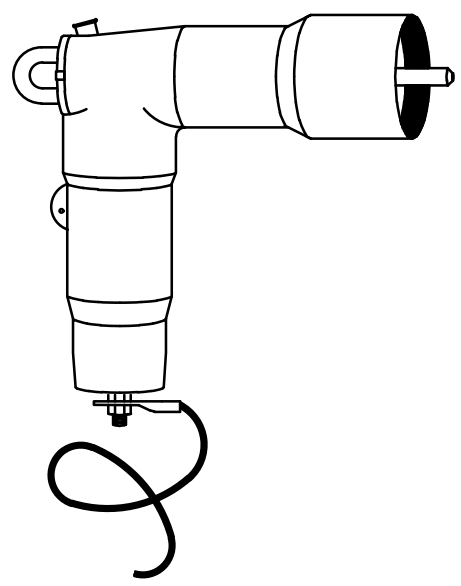
DRAWING NUMBERS		**DRAWING TITLE (DESCRIPTION)**
1728F-806 (New)	**1728F-806** (Old)	
		ARRESTERS
UP1	(UM6-33)	RISER POLE ARRESTER
UP2	(UM6-34)	ELBOW ARRESTER
UP3	(UM6-38)	BUSHING ARRESTER
		ARRESTERS AND ANODES
UP4	(UM6-37)	PARKING STAND ARRESTER
UP5	(UM27-1,-2,-3) (UM28)	SACRIFICAL ANODES
UP7.01	(UM6-8)	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

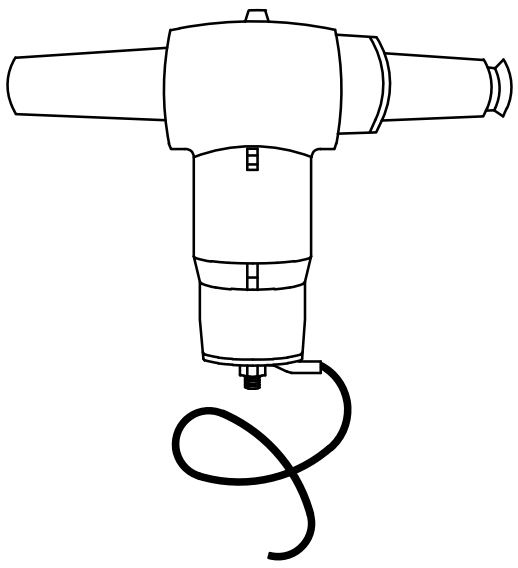
- X = 01=SUBUNIT ARRESTER ONLY
- X = 1=REPLACE OH SINGLE ARRESTER WITH RISER POLE
- X = 3=REPLACE OH THREE ARRESTERS WITH RISER POLE
- UP1 = RISER POLE ARRESTER



UP2 – ELBOW ARRESTER

UP2 . X

- X = 2=200 AMP LOAD BREAK
- UP2 = ELBOW ARRESTER

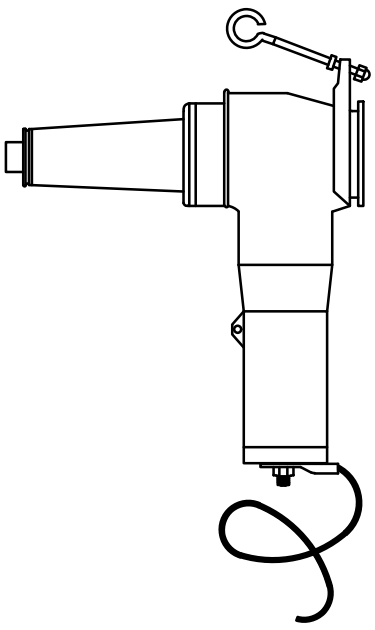


UP3 – BUSHING ARRESTER

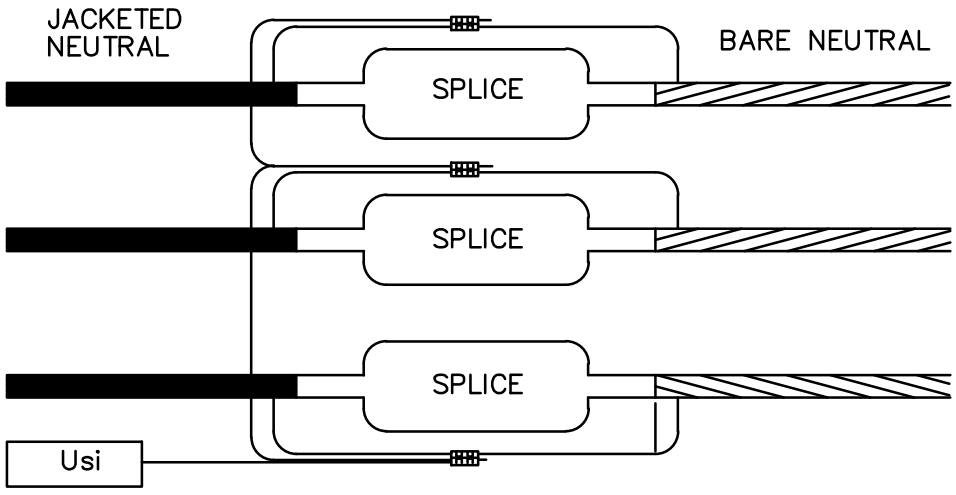
UP3 . X

- X = 2=LOAD BREAK INTERFACE
- X = 6=DEAD BREAK INTERFACE
- UP3 = BUSHING ARRESTER

	ARRESTERS		
	AUG 2016		UP1, UP2
	RUS		UP3



UP4 – PARKING STAND ARRESTER



UP5 – SACRIFICIAL ANODES

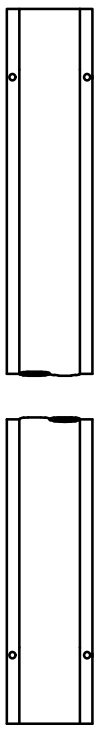
UP4 . X

- X: 2=LOAD BREAK INTERFACE; 6=DEAD BREAK INTERFACE
- UP4: BUSHING ARRESTER

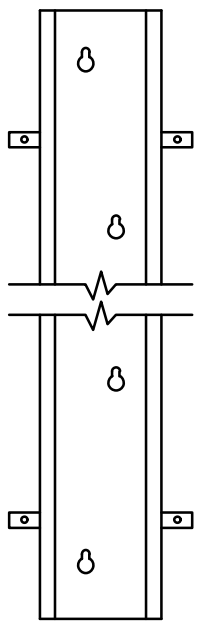
UP5 . X

- X: 1=TEST STATION; 2=AT 3 PH SPLICE; 3=PAD MOUNTED EQUIP.; 4=AT GROUND ROD
- UP5: SACRIFICIAL ANODE

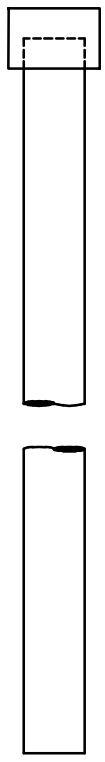
	ARRESTERS AND ANODES	
	AUG 2016	UP4
	RUS	UP5



UP7.01
RISER SHIELD (U GUARD)
(FORMERLY UM6–8)



UP7.02
BACKING PLATE FOR
U–GUARD RISER SHIELD
(FORMERLY UM6–18)

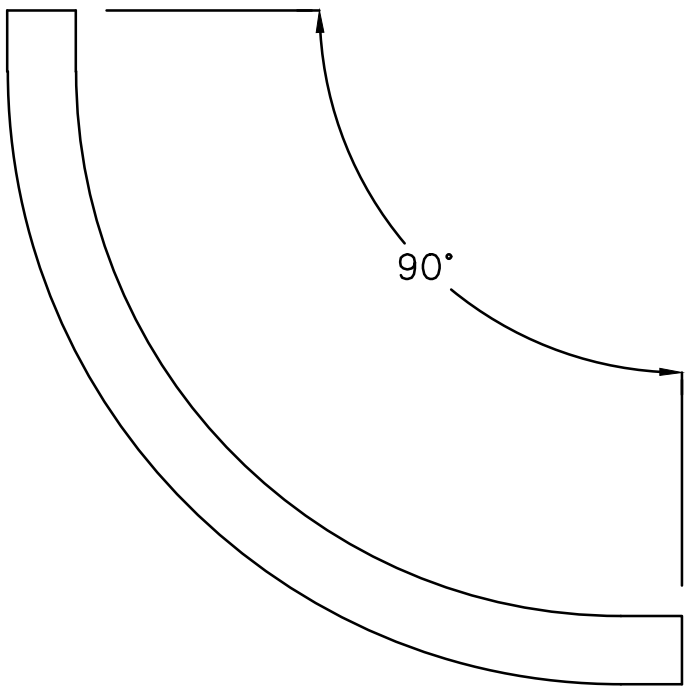


UP7.03
CONDUIT CABLE RISER
(FORMERLY UM6–9)

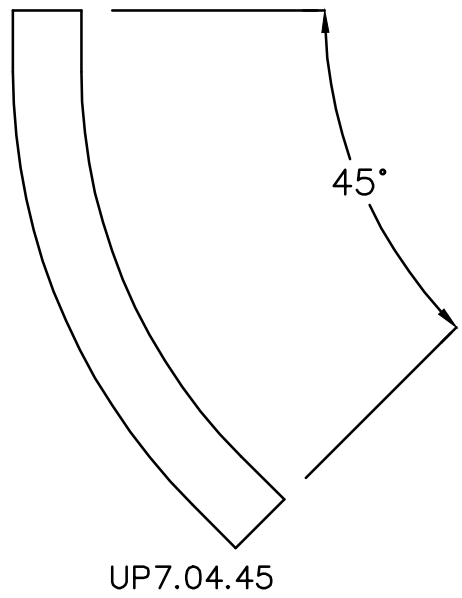
ITEM	MATERIAL	UP7.01	UP7.02	UP7.03
	Riser shield	1		
	Riser shield, back plate		1	
	Conduit riser			1

RISER SHIELD
BACK PLATE
CONDUIT CABLE RISER

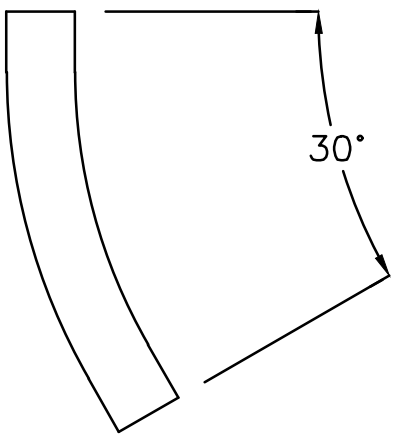
AUG 2016		UP7.01
RUS		UP7.02, UP7.03



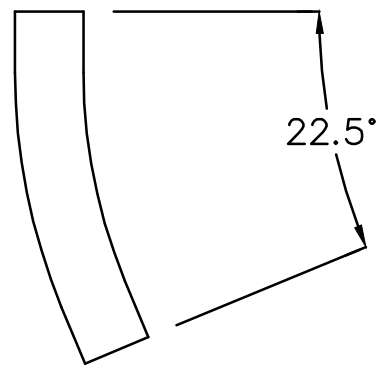
UP7.04.90



UP7.04.45



UP7.04.30



UP7.04.22

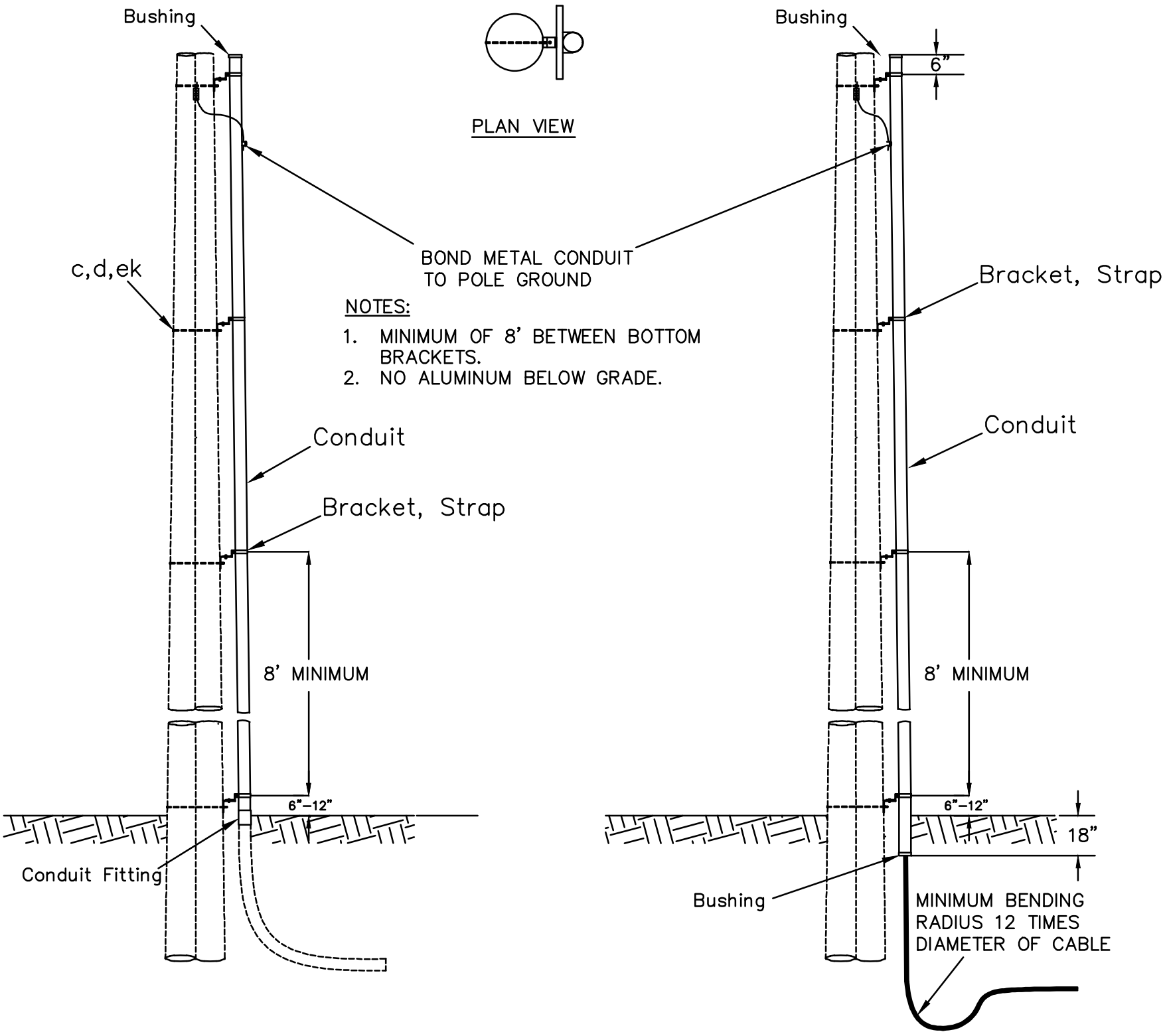
ITEM	QTY.	MATERIAL
	1	Conduit, elbow

DESIGN PARAMETERS:

SEE SECTION 8.1 FOR MINIMUM BENDING RADIUS.

CONDUIT ELBOW

AUG 2016		
RUS		UP7.04



NOTES:

1. MINIMUM OF 8' BETWEEN BOTTOM BRACKETS.
2. NO ALUMINUM BELOW GRADE.

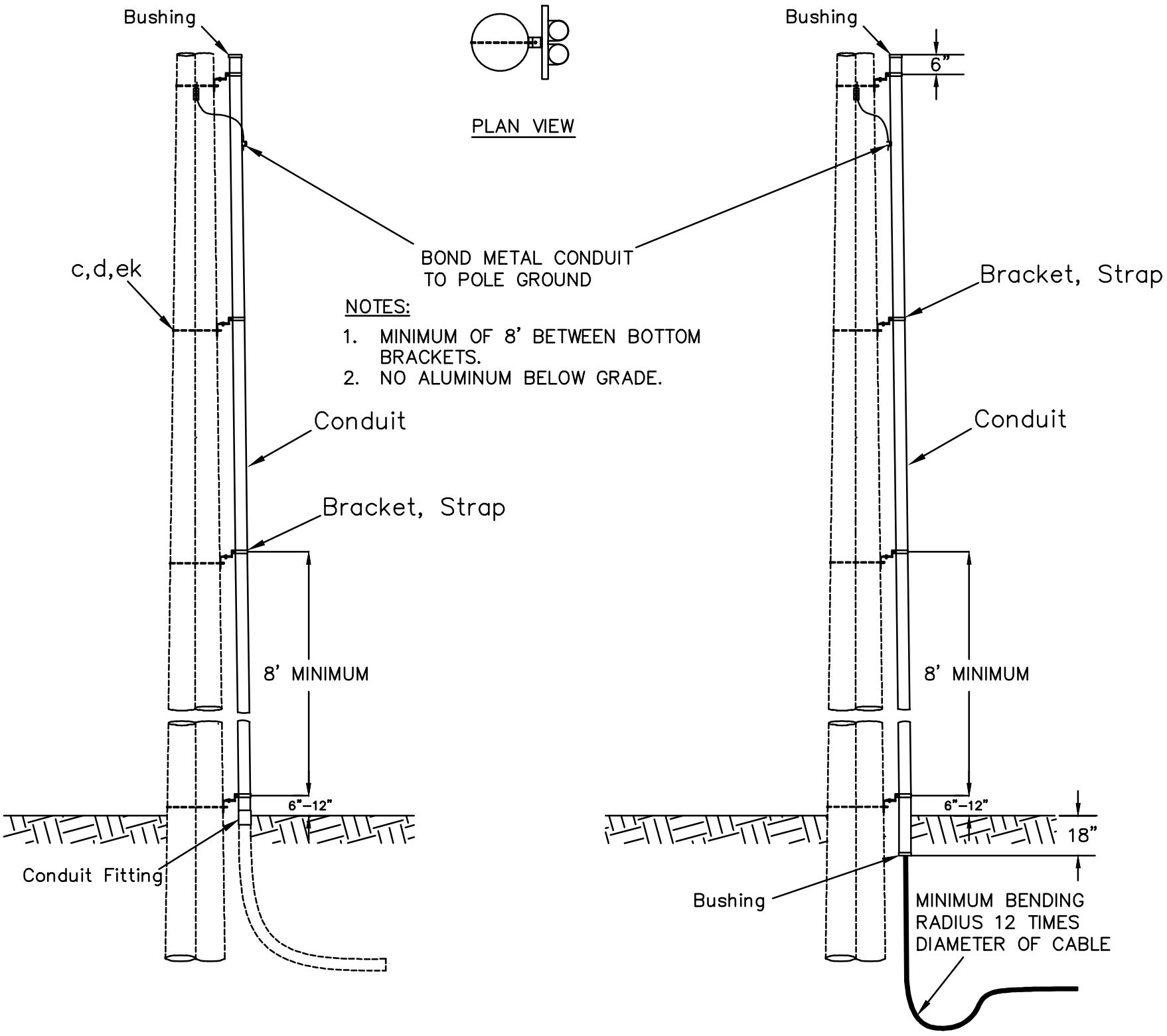
ITEM	QTY.	MATERIAL
		Bracket, Single, as required
		Conduit strap, as required
c		Bolt, machine, 5/8 x required length.
d		Washer, square 2 1/4".
ek		Locknuts, as required.
		Conduit, as required.
		Bushing, as required
		Conduit fitting, as required.

SINGLE CONDUIT RISER WITH STAND–OFF BRACKETS

AUG 2016

RUS

UP7.B1



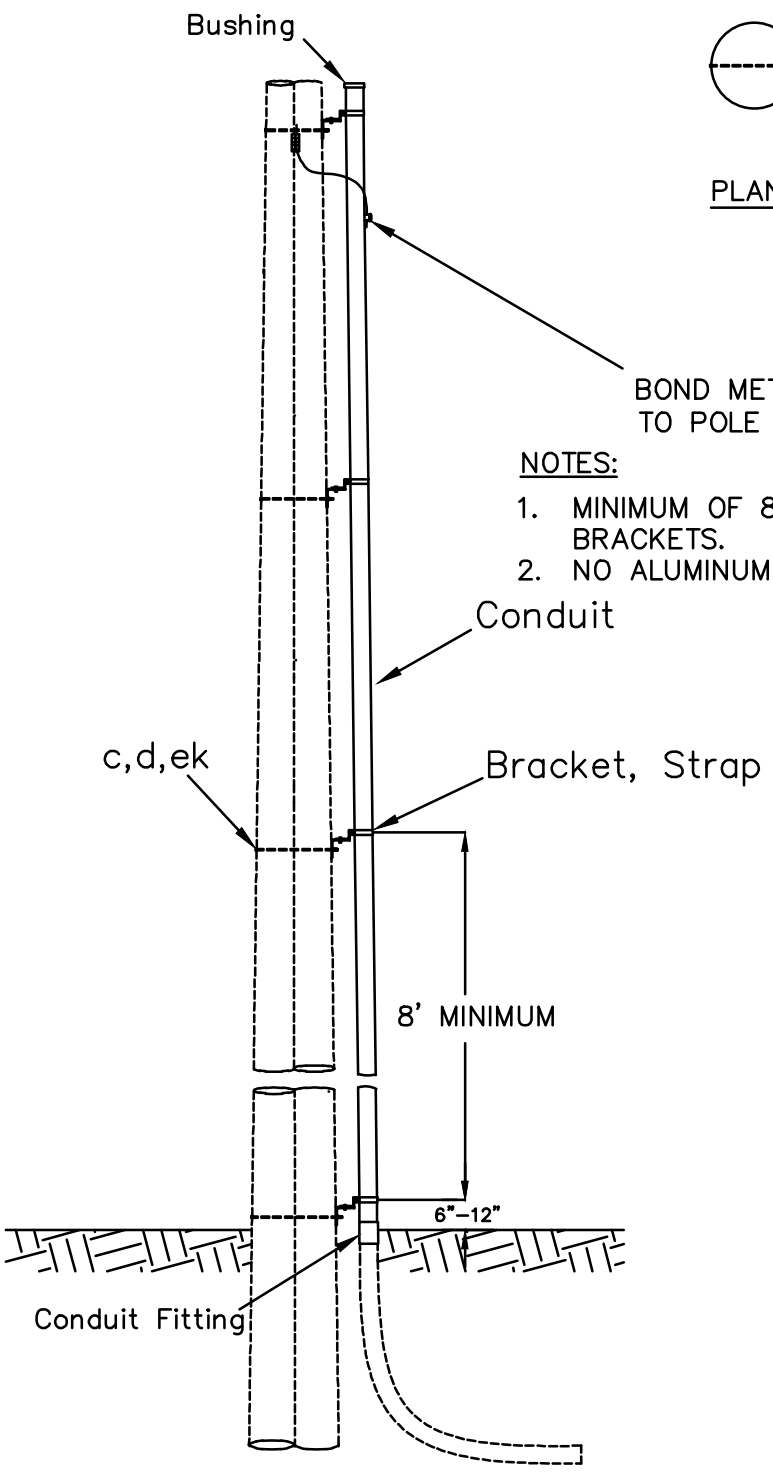
NOTES:

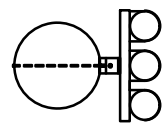
1. MINIMUM OF 8' BETWEEN BOTTOM BRACKETS.
2. NO ALUMINUM BELOW GRADE.

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



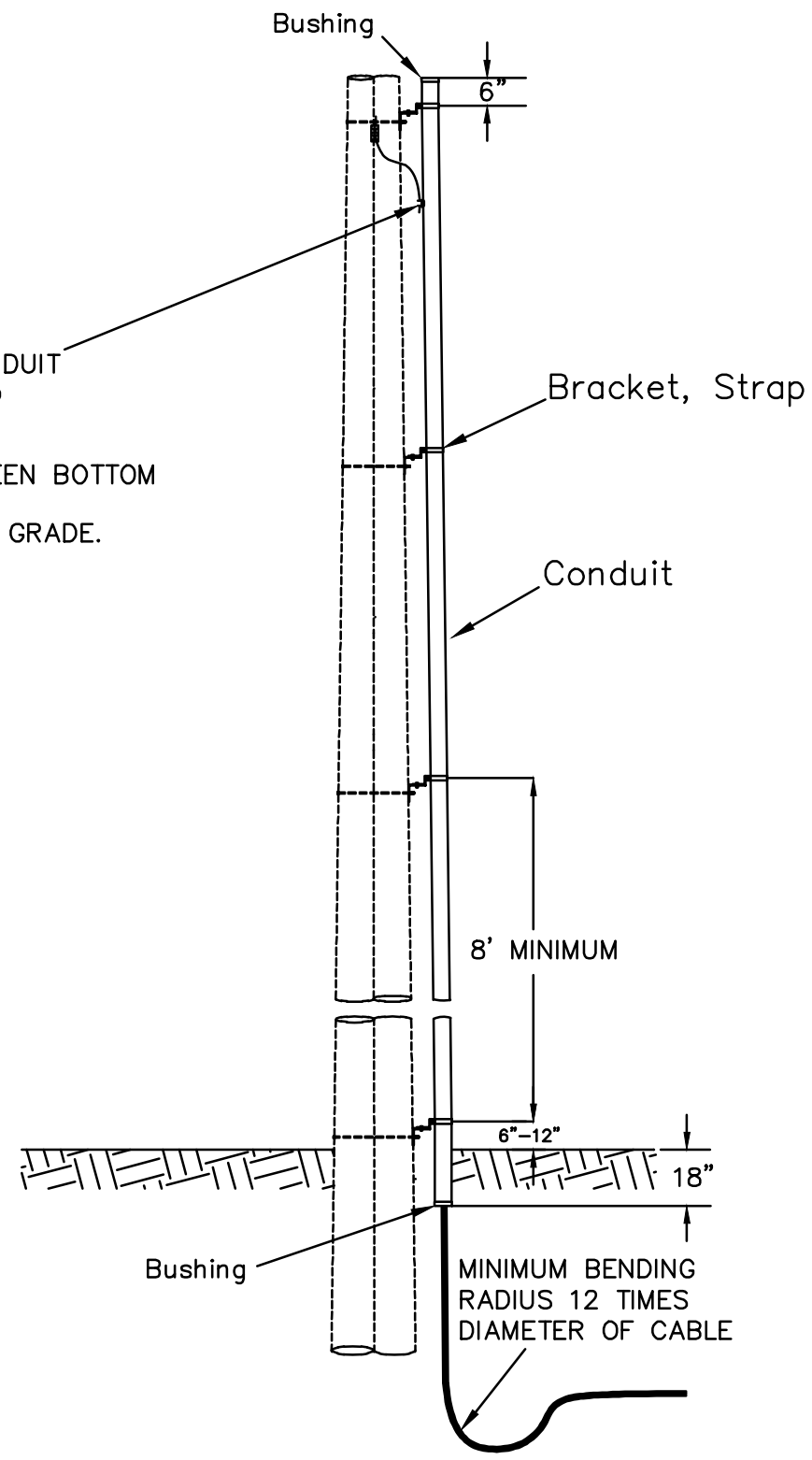


PLAN VIEW

BOND METAL CONDUIT
TO POLE GROUND

NOTES:

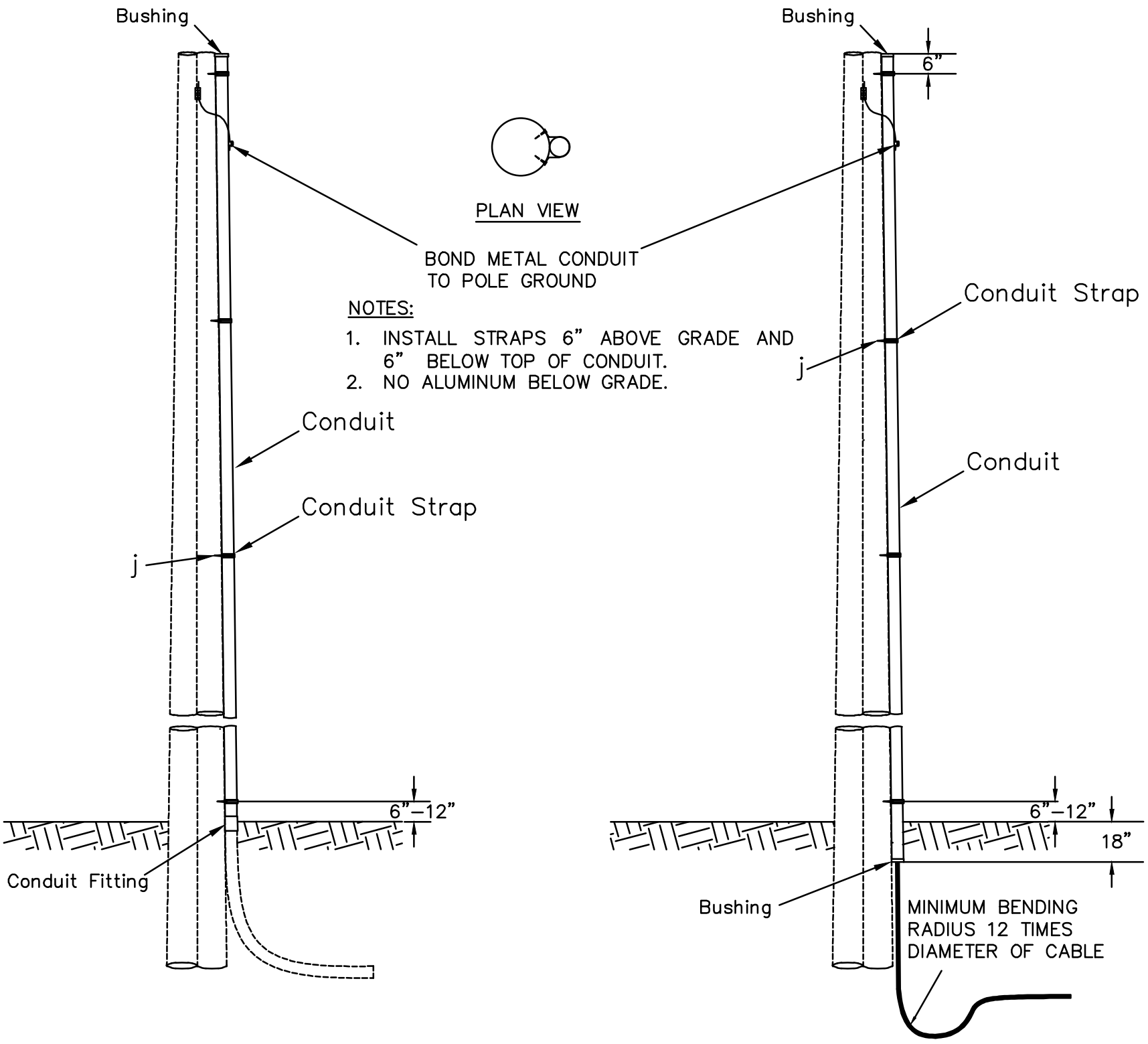
1. MINIMUM OF 8' BETWEEN BOTTOM BRACKETS.
2. NO ALUMINUM BELOW GRADE.



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

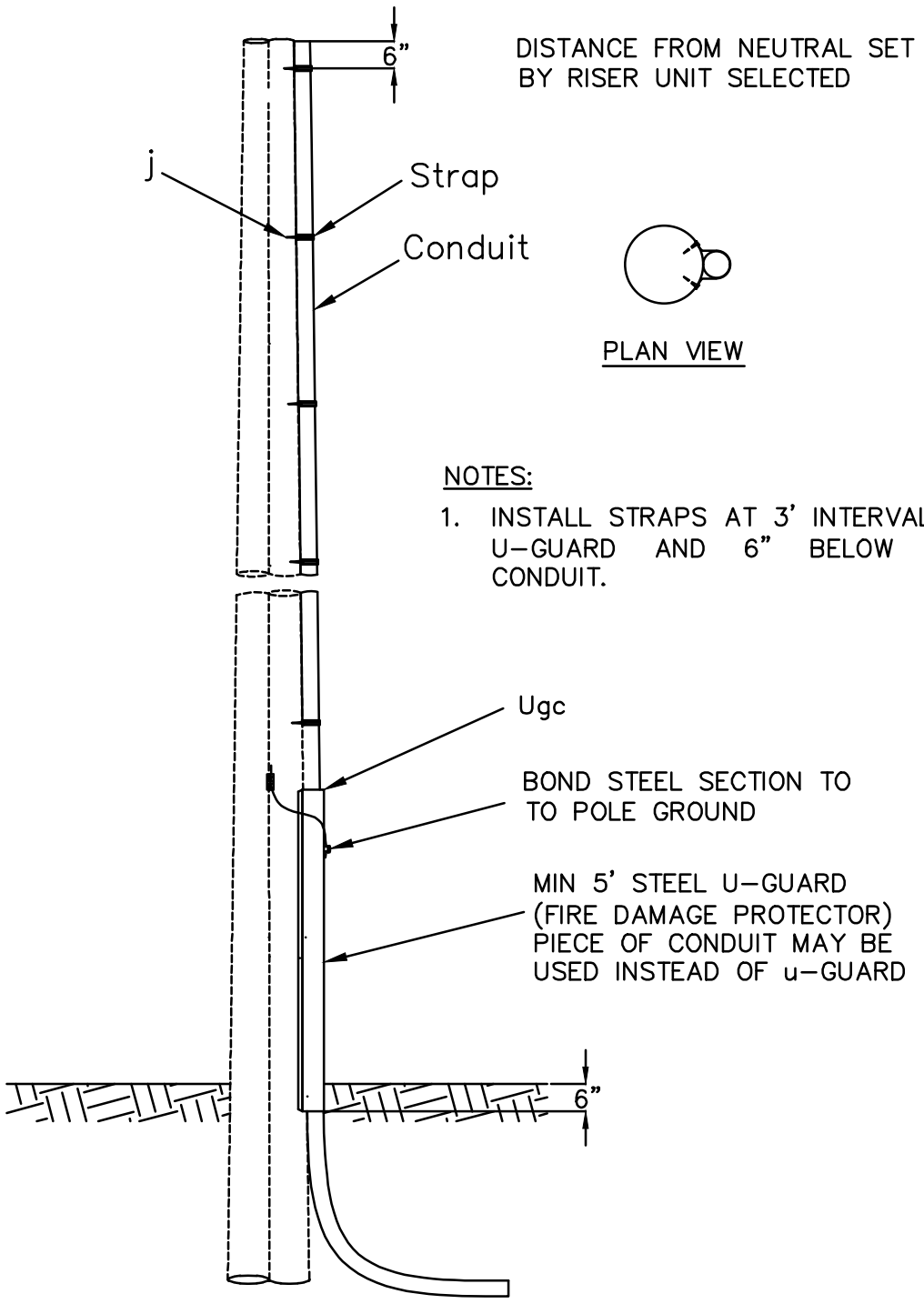
AUG 2016		
RUS		UP7.B3



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

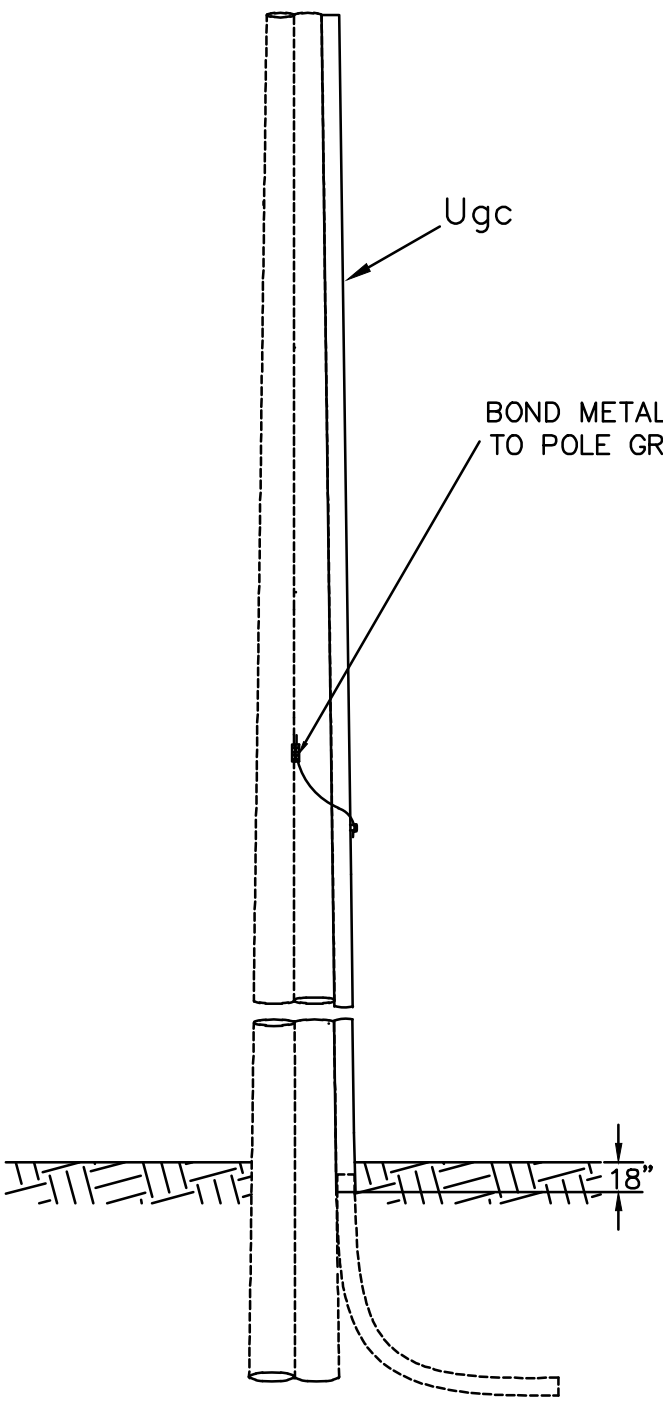
AUG 2016		
RUS		UP7.C

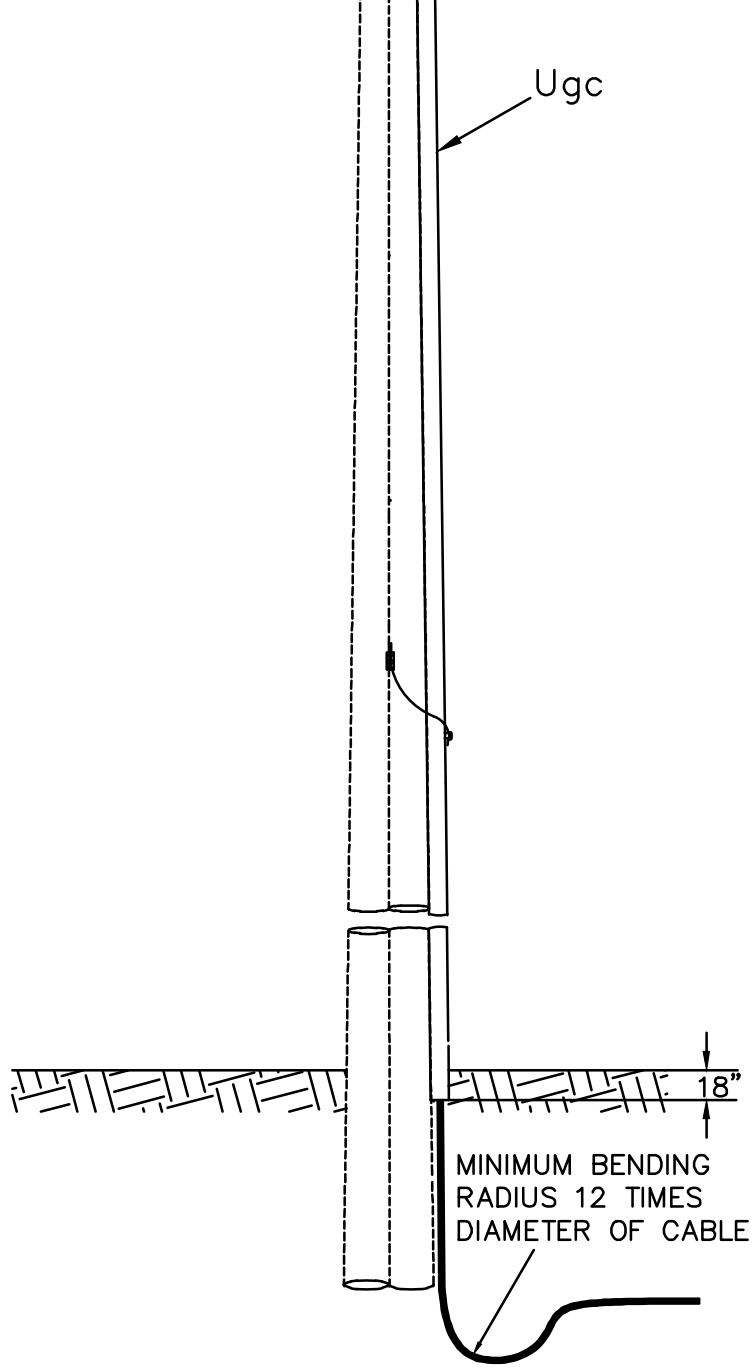


ITEM	QTY.	MATERIAL
j		Screws, lag 1/2" X 4" as required
		Conduit, as required.
		Conduit Strap as required
Ugc	5'	U–Guard,

FLEX CONDUIT RISER

AUG 2016		
RUS		UP7.FC

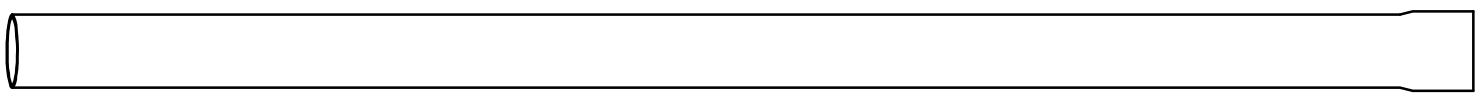




ITEM	QTY.	MATERIAL
j		Screw, lag, 1/2" x 4" as required.
Ugc		U–Guard, PVC, as required.

U–GUARD RISER

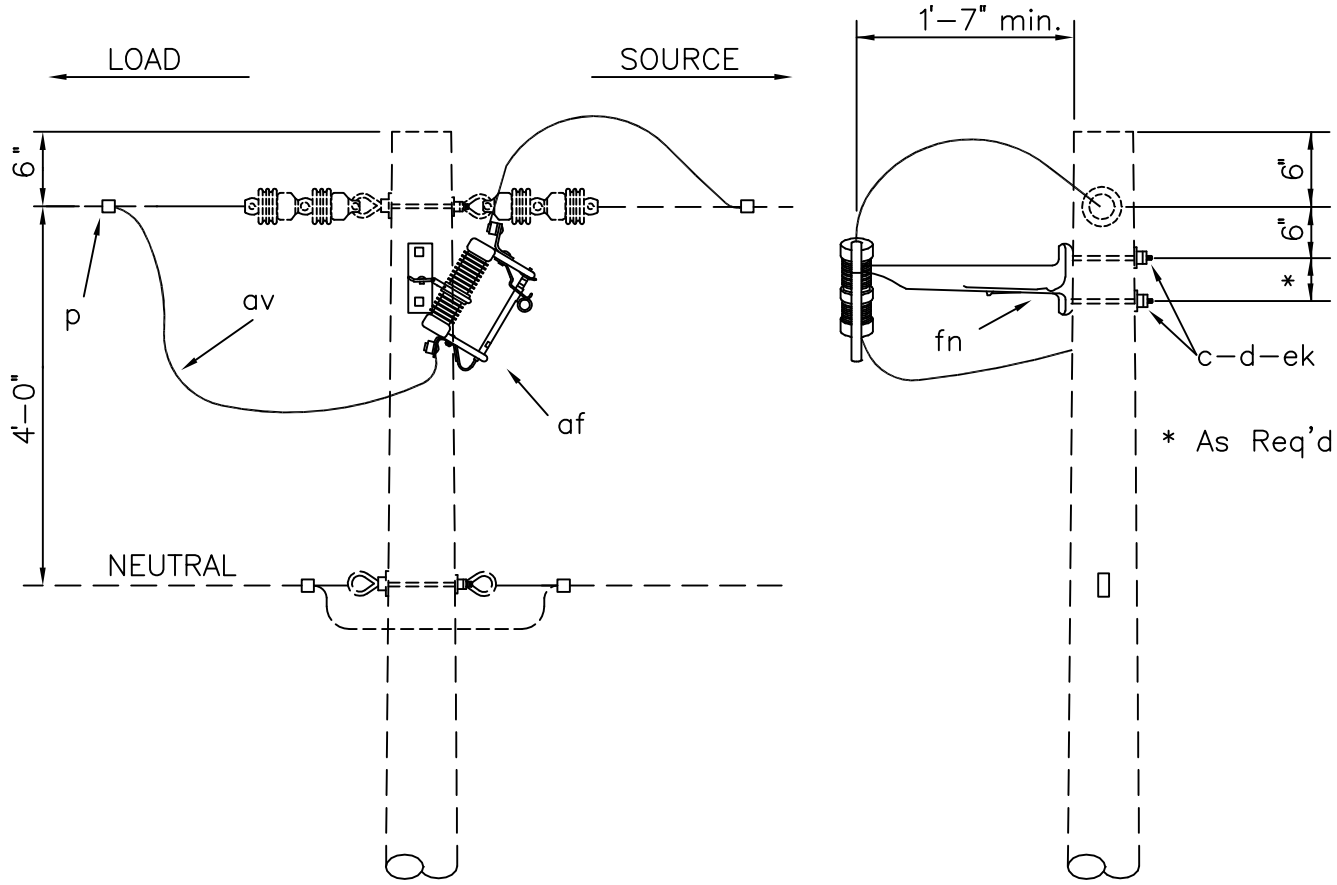
AUG 2016		
RUS		UP7.UG



ITEM	QTY.	MATERIAL
Ugc		Conduit, Underground

UNDERGROUND CONDUIT

AUG 2016		
RUS		UP8

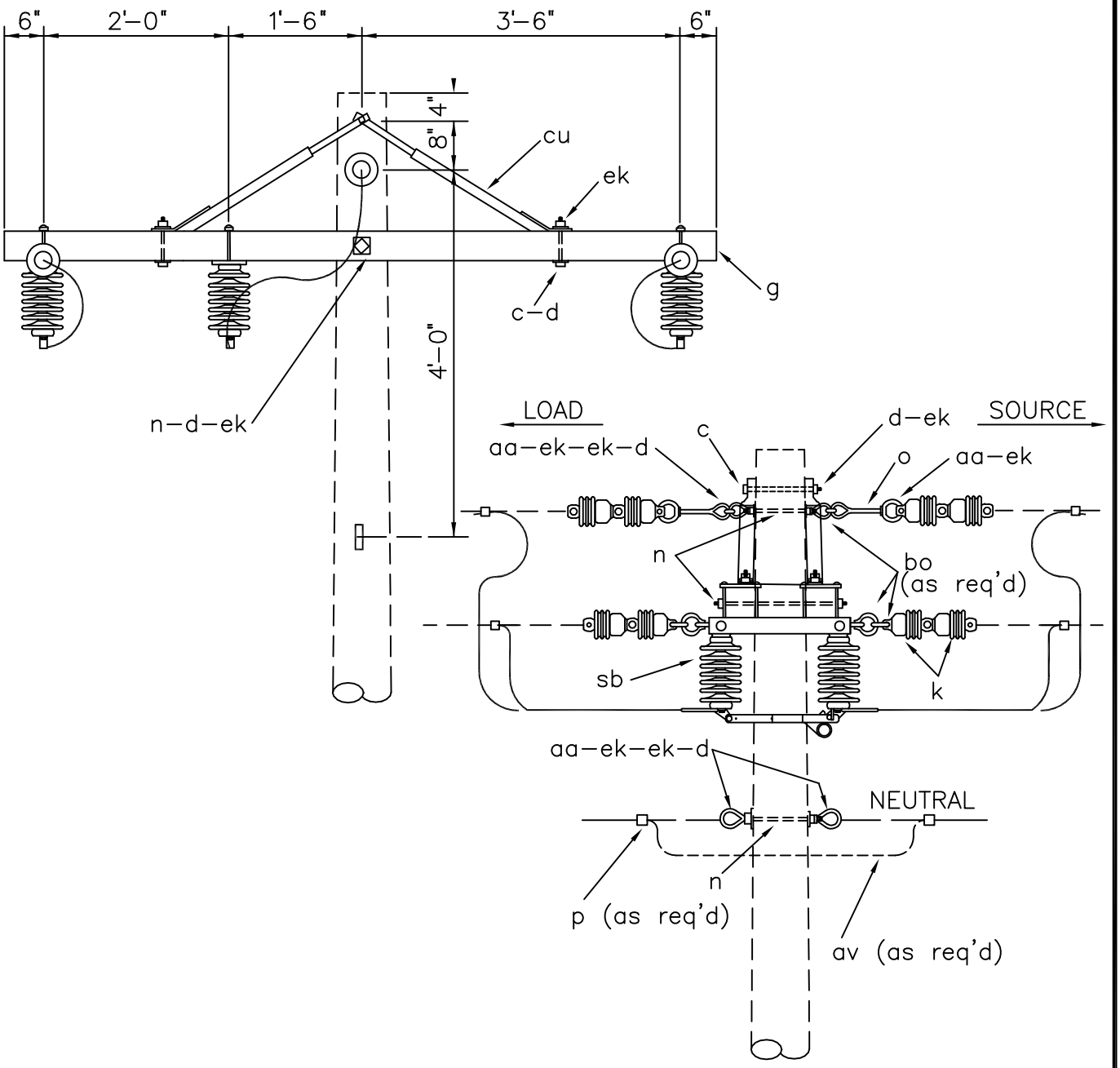


NOTE: Specify fuse size or solid blade

ITEM	QTY	MATERIAL
c	2	Bolt, machine, 5/8" x req'd length
d	2	Washer, square, 2 1/4"
p	2	Connector, compression type
af	1	Cutout, distribution, open (15 kV)
av		Jumpers, as required
ek	2	Locknuts
fn	1	Bracket, extension

CUTOUT – SINGLE PHASE

APRIL 2005		S1.1
RUS	12.47/7.2 kV	(M3–4)



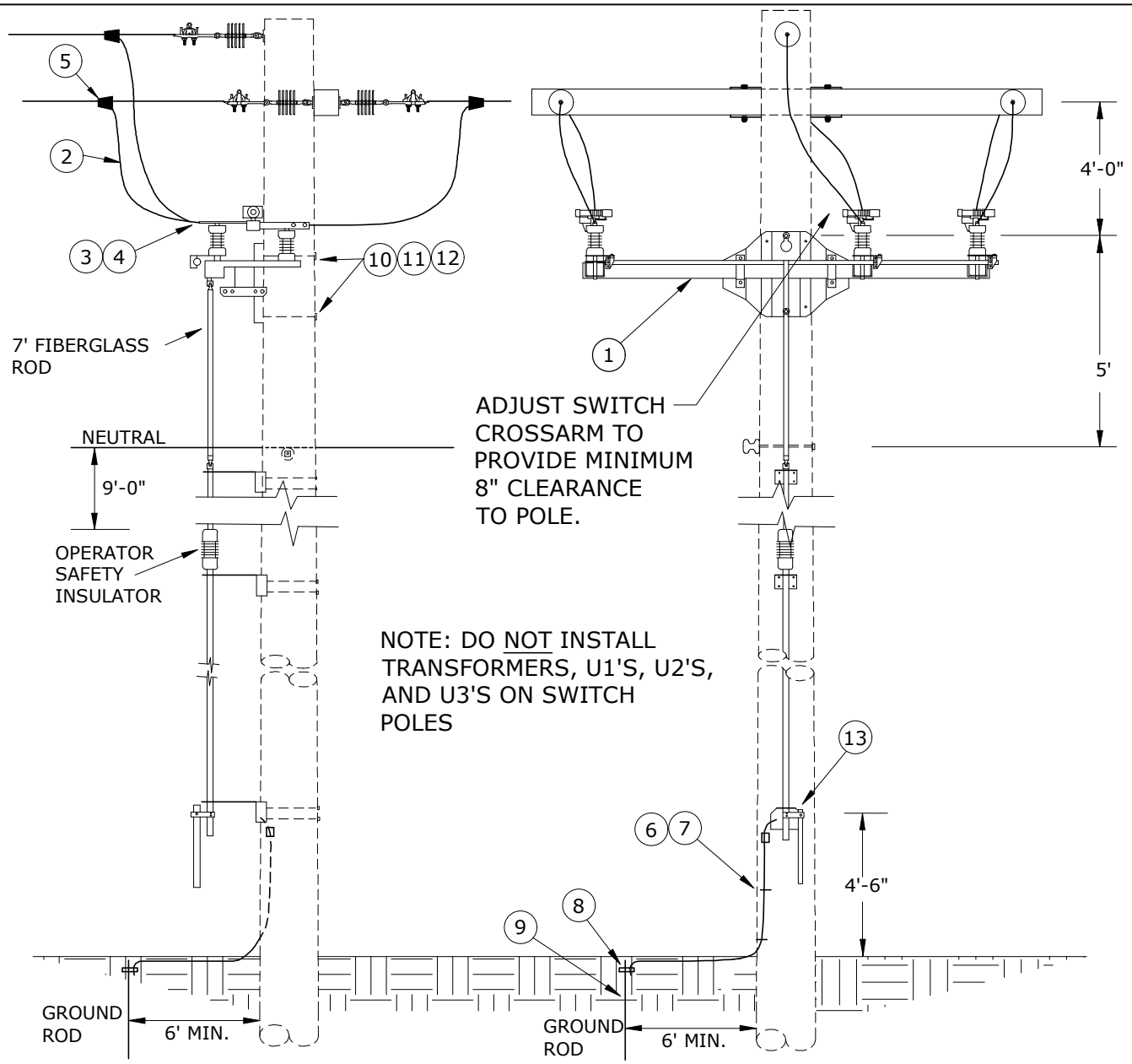
NOTE: For 2–phase installations, omit switch and related items on center phase and designate as "S2.21."

ITEM	QTY	MATERIAL
c	4	Bolt, machine, 1/2" x req'd length
c	1	Bolt, machine, 5/8" x req'd length
d	4	Washer, round, 1 3/8"
d	11	Washer, square, 2 1/4"
d	4	Washer, square, 3", curved
g	2	Crossarm, 3 5/8" x 4 5/8" x 8'–0"
k	12	Insulator, suspension, 4 1/4"
n	5	Bolt, double arm, 5/8" x req'd length

ITEM	QTY	MATERIAL
o	2	Bolt, eye, 5/8" x req'd length
p		Connectors, compression as required
aa	6	Nut, eye, 5/8"
av		Jumpers, as required
bo	6	Shackle, anchor
cu	2	Brace, wood, 60" span
sb	3	Switch, disconnect, 15 kV,
		with mounting hardware

DISCONNECT SWITCHES (TWO or THREE SINGLE–PHASE)

APRIL 2005		S2.21,S2.31
RUS	12.47/7.2 kV	(M3–2A),(M3–3A)



Rev 2: Changed drawing to deadend assembly, removed tree wire jumpers, material corrections, and updated rating of switch.

ITEM NO.	DESCRIPTION	SW6 QTY.	SW6 S/N
1	Switch, loadbreak, horizontal, 900A, 15kV	1	2432
2	Conductor, OH, 397 MCM AL, Bare	60	367 ☼
3	Connector, Clamp, 397 to NEMA 2-Hole	6	438
4	Bolt, Nut, Washer, SS, 1/2" x 2", Assembly	12	1389
5	Connector, Tap, Power Booster, 397-397	6	2501
6	Conductor, #4 CU, covered	20	390
7	Staples, Ground wire	5	1228
8	Clamp, Ground rod, 5/8", Bronze, Small	1	281
9	Rod, Ground, 8'	1	1124
10	Bolt, Machine, Galv., 3/4" x 16"	2	175
11	Washer, Curved, Cast 4" x 4" x 13/16" Hole	2	1910
12	Washer, Spring, 3/4"	2	2218
13	Lock, Padlock, Hardened Stainless Steel	1	2564

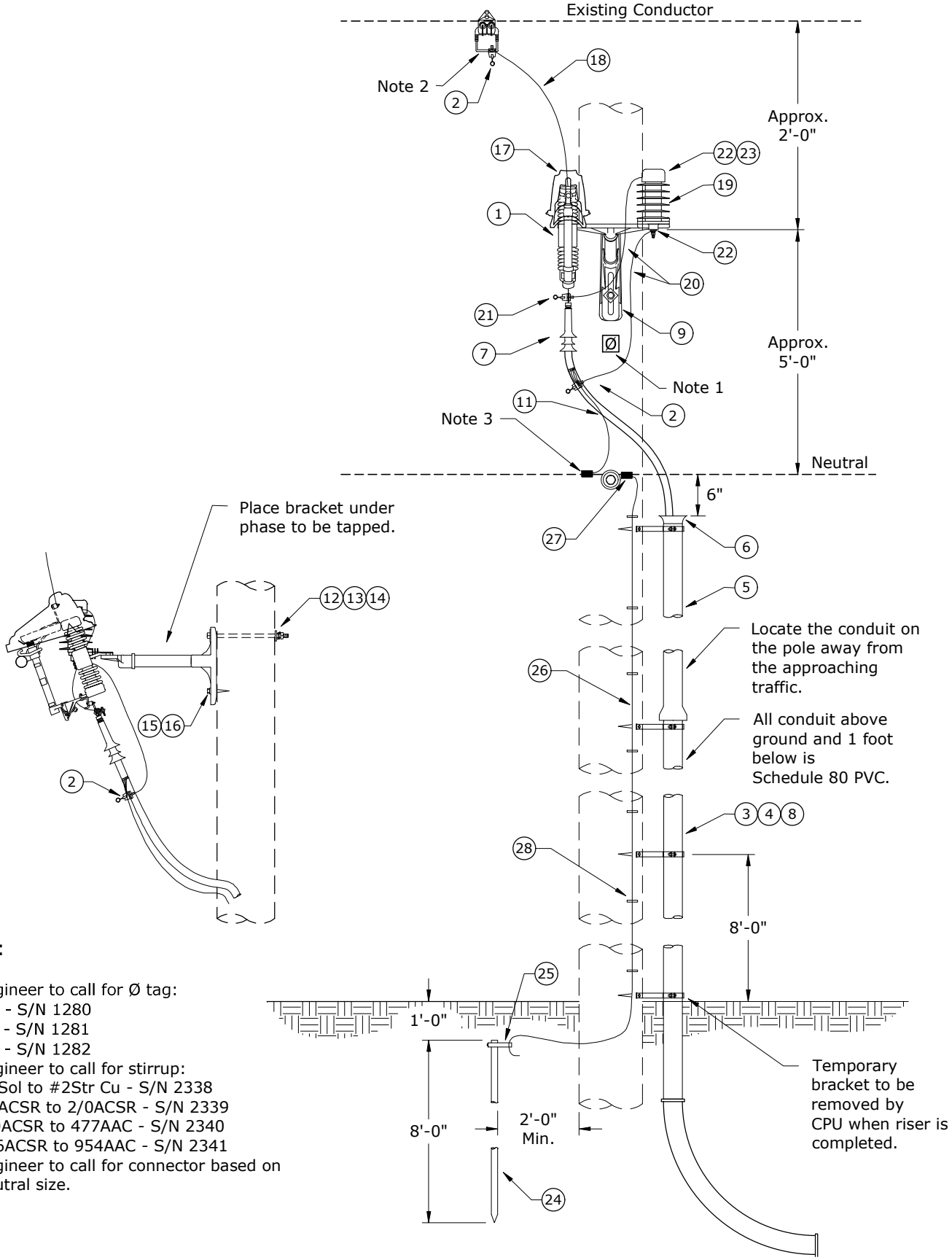
MASON COUNTY PUD 1

CONSTRUCTION STANDARDS

3Ø SWITCH
UNDERSLUNG
900A

REVISIONS			
R	DATE	ENGR	OPS
0	2/23/00	HWH	MA
1	11/10/05	LB	AH
2	12/14/09	KJP	

PAGE:		CAD FILE:	APP: JEH	SECTION
1 of 1	SW6	SW6	DATE: 2/22/00	800



Notes:

1. Engineer to call for Ø tag:
   AØ - S/N 1280
   BØ - S/N 1281
   CØ - S/N 1282
2. Engineer to call for stirrup:
   #6Sol to #2Str Cu - S/N 2338
   #6ACSR to 2/0ACSR - S/N 2339
   1/0ACSR to 477AAC - S/N 2340
   336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 6 - Corrected drawing and material.

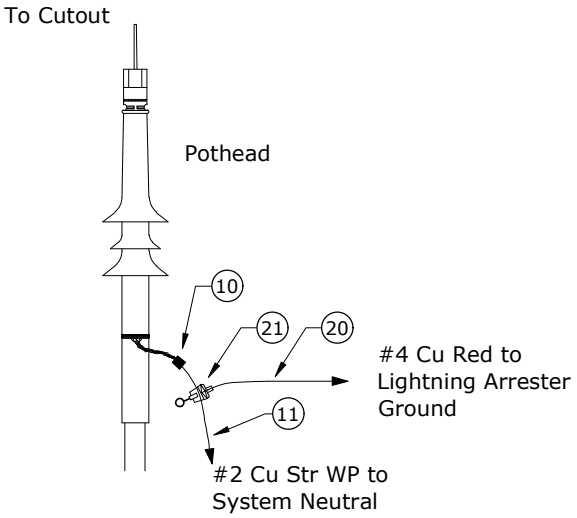
MASON COUNTY PUD

CONSTRUCTION STANDARDS

SINGLE PHASE
PRIMARY RISER

REVISIONS			
R	DATE	ENGR	OPS
3	12/29/04	LB	AH
4	12/14/09	KJP	
5	10/31/17	CM	DK
6	1/16/19	CM	DK

PAGE:		CAD FILE:	APP: ELM	SECTION
1 of 2	U1	U1	DATE: 1/31/80	1300



Pothead Connection Detail

Notes:

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 6 - Corrected drawing and material.

ITEM NO.	DESCRIPTION	U1 Additional Material QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	1	2532
2	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	1✡	283
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 2" X 10', Sch 80	30✡	2205
6	End Bell, 2", Sch 40	1✡	2206
7	Terminator, 15kV, Cold-Shrink JCN & CN, 1/0	1	2214
8	Clamp, Standoff Bracket, Conduit, 2"	3	295
9	Bracket, Arrester/Cutout Mounting, 1ø Fiberglass 18"	1	2537
10	Connector, Crimpet, Cu 2/2 - 2/2 (2C2)	1	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	10	393
12	Bolt, Machine, 5/8" x 12", 12,400 lbs. Ultimate Tensile	1	155
13	Washer, Curved, Square, Cast, 3" x 3" x 3/8" Thick x 13/16" Hole	1	1392
14	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	1	1132
16	Washer, Flat, Round Galv., 1/2"	1	1394
17	Guard, Wildlife, Cutout, Polymer	1	2928 ✡
18	Conductor, Cu 1/C #2, 7-Str, 600V, Red, THW	3	2513

ITEM NO.	DESCRIPTION	LA2 QTY.	S/N
19	Arrester, Surge, 9kV, MOV, Riser Pole	1	58
20	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	7	2512
21	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	2	283
22	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	2	2548
23	Guard, Wildlife, Polymer Arrester	1	2583

ITEM NO.	DESCRIPTION	N1 QTY.	S/N
24	Rod, Ground, 5/8" x 8'	1	1124
25	Clamp, Ground Rod, 5/8", Bronze Small	1	281
26	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
27	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
28	Staple, Ground, Barbed, Galv. 1 1/2"	24	2707

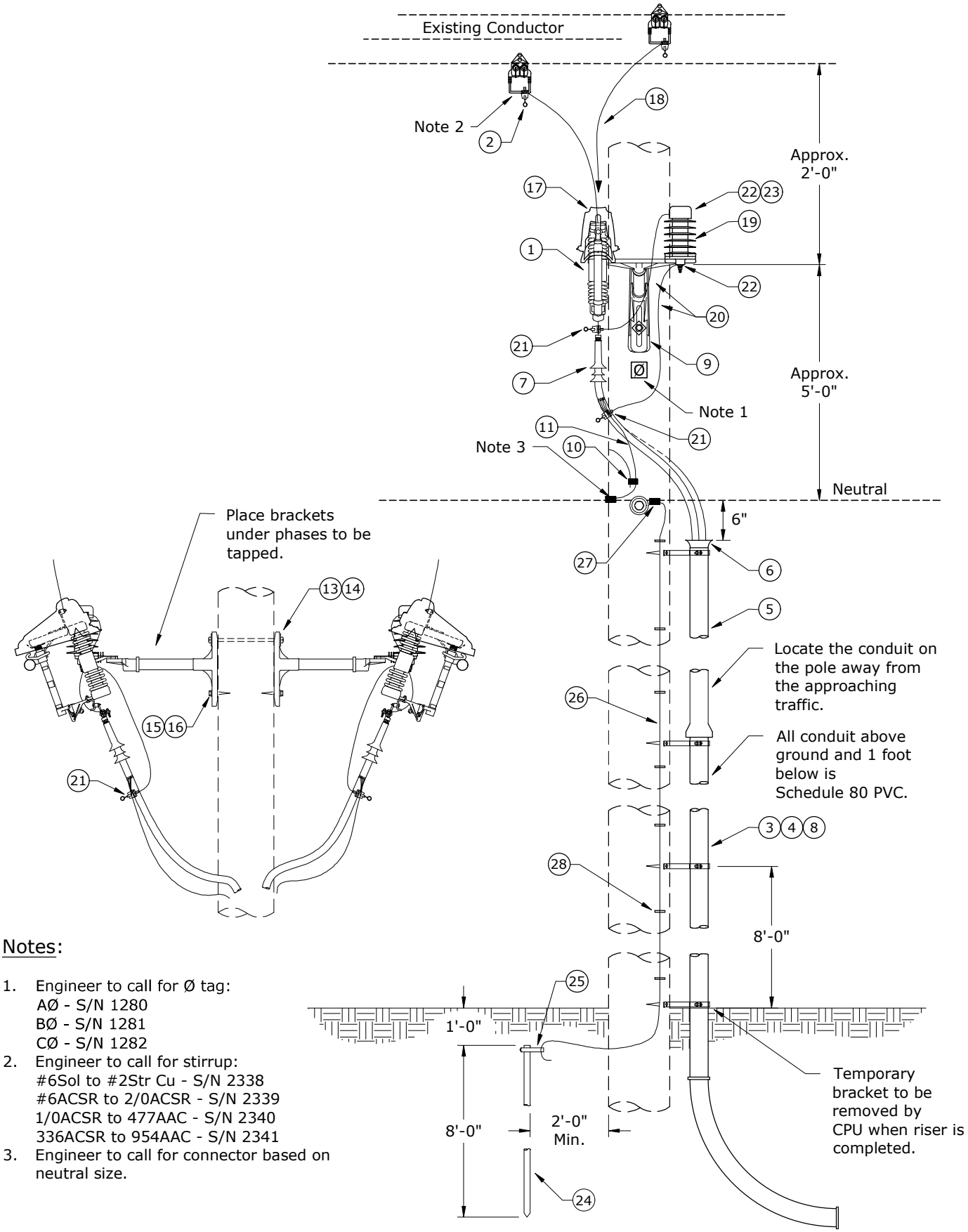
MASON COUNTY PUD 1

CONSTRUCTION STANDARDS

SINGLE PHASE
PRIMARY RISER

REVISIONS			
R	DATE	ENGR	OPS
3	12/29/04	LB	AH
4	12/14/09	KJP	
5	10/31/17	CM	DK
6	1/16/19	CM	DK

PAGE:		CAD FILE:	APP: ELM	SECTION
2 of 2	U1	U1	DATE: 1/31/80	1300



Notes:

1. Engineer to call for Ø tag:
   AØ - S/N 1280
   BØ - S/N 1281
   CØ - S/N 1282
2. Engineer to call for stirrup:
   #6Sol to #2Str Cu - S/N 2338
   #6ACSR to 2/0ACSR - S/N 2339
   1/0ACSR to 477AAC - S/N 2340
   336ACSR to 954AAC - S/N 2341
3. Engineer to call for connector based on neutral size.

Rev. 5 - Corrected drawing and material issue.

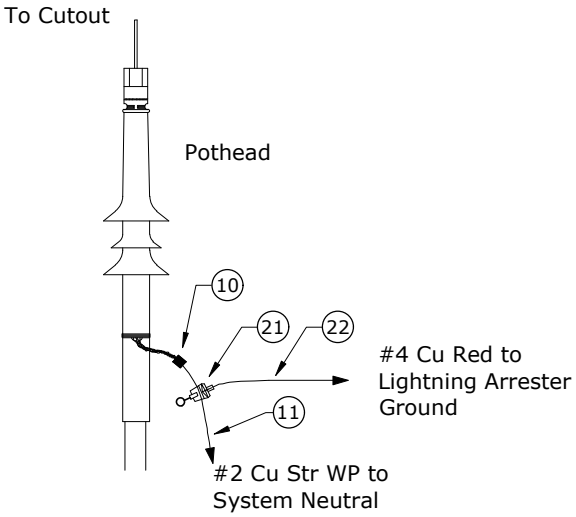
MASON COUNTY PUD 1

CONSTRUCTION STANDARDS

TWO PHASE
PRIMARY RISER

REVISIONS			
R	DATE	ENGR	OPS
2	12/29/04	LB	AH
3	12/14/09	KJP	
4	10/31/17	CM	DK
5	1/16/19	CM	DK

PAGE:		CAD FILE:	APP: ELM	SECTION
1 of 2	U2	U2	DATE: 2/22/00	1300



Pothead
Connection Detail

Notes:

4. Connect concentric neutrals to arrester ground using #4 Cu, Red.
5. Make arrester ground terminal-to-concentric neutral jumper as short as possible.

Rev. 5 - Corrected drawing and material.

ITEM NO.	DESCRIPTION	U2 Additional Material QTY.	S/N
1	Cutout, Polymer, Universal, 100A, 16kA Asym.	2	2532
2	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	2✡	283
3	Screw, Lag, 1/2" x 3", Fetter Drive, Drive Point	6	1131
4	Bracket, Standoff Riser, 10 1/2"	3	226
5	Conduit, PVC, 4" X 10', Sch 80	30✡	2203
6	End Bell, 4", Sch 40	1✡	2204
7	Terminator, 15kV, Cold-Shrink JCN & CN, 1/0	2	2214
8	Clamp, Standoff Bracket, Conduit, 4"	3	297
9	Bracket, Arrester/Cutout Mounting, 1ø Fiberglass 18"	2	2537
10	Connector, Crimpet, Cu 2/2 - 2/2 (2C2)	2	455
11	Conductor, Cu #2, 1/C, 7-Str, SD, 600V, HMP	20	393
13	Bolt, Machine, 5/8" x 14", 12,400 lb Ultimate	1	156
14	Washer, Lock, Spring, Double Coil, Galv. 5/8"	1	2217
15	Screw, Lag, 1/2" x 4 1/2", Twist Drive, Drive Point	2	1132
16	Washer, Flat, Round Galv., 1/2"	2	1394
17	Guard, Wildlife, Cutout, Polymer	2	2928 ✡
18	Conductor, Cu 1/C #2, 7-Str, 600V, Red, THW	6	2513

ITEM NO.	DESCRIPTION	LA2(2) QTY.	S/N
19	Arrester, Surge, 9kV, MOV, Riser Pole	2	58
20	Conductor, Cu 1/C #4, 7-Str, 600V, Red, THW	14	2512
21	Clamp, Hotline, GP 1520, #8 to 2/0 Str, Cu Only	4	283
22	Connector, Compression Lug, #4, Cu/Al, One-Hole, Tin-Plated, For Arrester	4	2548
23	Guard, Wildlife, Polymer Arrester	2	2583

ITEM NO.	DESCRIPTION	N1 QTY.	S/N
24	Rod, Ground, 5/8" x 8'	1	1124
25	Clamp, Ground Rod, 5/8", Bronze Small	1	281
26	Conductor, Copper-Clad Steel, #4 Cu Equivalent, Covered	40	1512
27	Connector, Cabelok, Al/Cu, #2-2/0 Run, #6-#1 Tap	1	413
28	Staple, Ground, Barbed, Galvanized, 1 1/2"	24	2707

MASON COUNTY PUD

CONSTRUCTION STANDARDS

TWO PHASE
PRIMARY RISER

REVISIONS

R	DATE	ENGR	OPS
2	12/29/04	LB	AH
3	12/14/09	KJP	
4	10/31/17	CM	DK
5	1/16/19	CM	DK

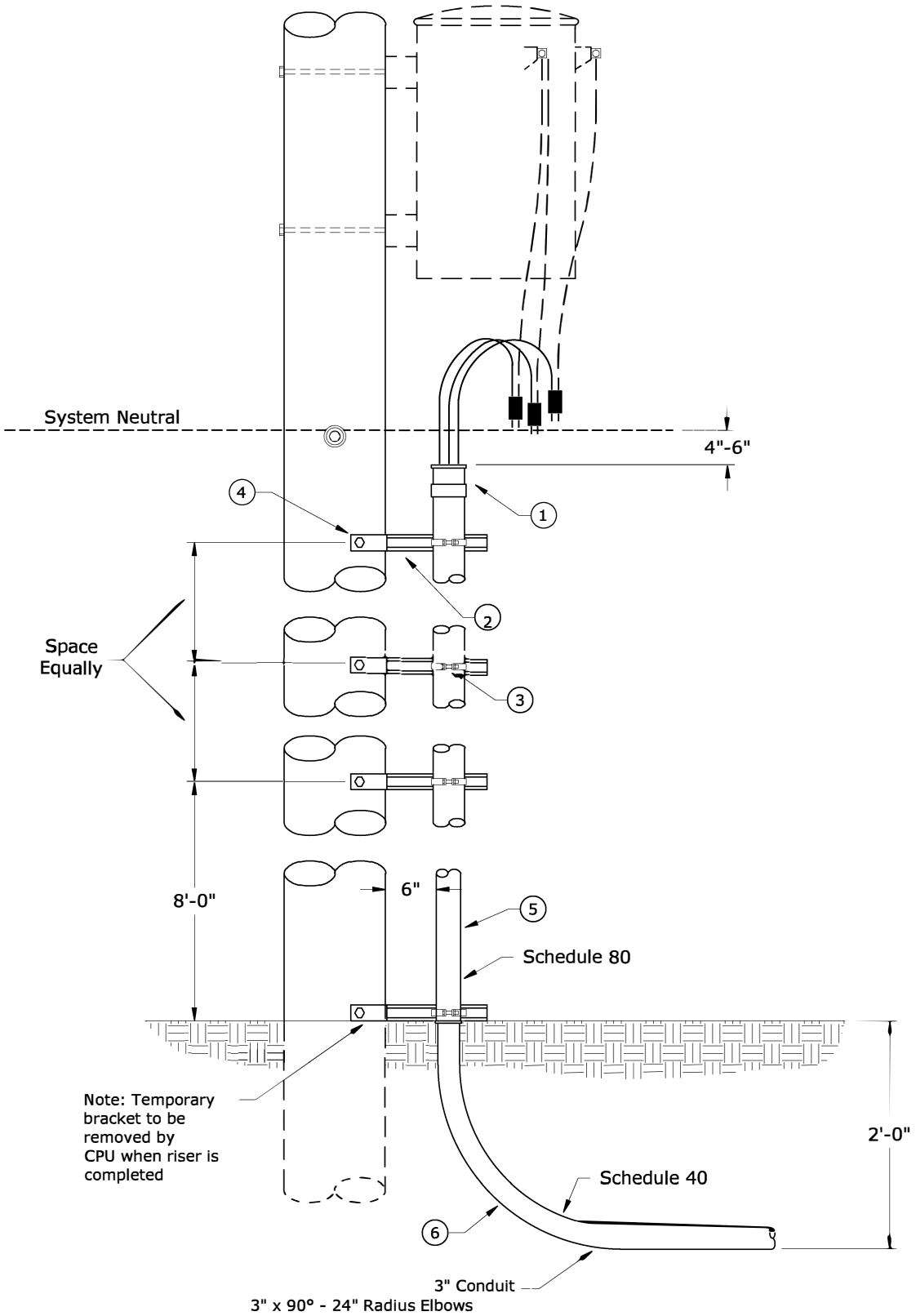
PAGE: 2 of 2

U2

CAD FILE: U2

APP: ELM
DATE: 2/22/00

SECTION 1300



Rev 2: Material corrections.

MASON COUNTY PUD

CONSTRUCTION STANDARDS

SECONDARY OVERHEAD TO UNDERGROUND RISER ASSEMBLY

REVISIONS			
R	DATE	ENGR	OPS
1	5/30/07	LB	AH
2	6/8/18	KJP	

PAGE:		CAD FILE:	APP: KJP	SECTION
1 of 2	U83,U84	U83	DATE: 12/29/04	1300

Rev 2: Material corrections.

ITEM NO.	DESCRIPTION	U83	
		QTY.	S/N
1	End Bell, 3", Sch 40	1	2317
2	Bracket, Standoff Riser 10 1/2"	3	226
3	Clamp, Standoff Bracket, 3" Conduit	3	296
4	Screw, Lag 1/2" X 3", Fetter Drive, Drive Point	6	1131
5	Conduit, PVC, 3" x 10', Sch 80	30	2313
6	Elbow, PVC, 3", 90°, 24" Radius, Sch 40	1	2574

ITEM NO.	DESCRIPTION	U84	
		QTY.	S/N
1	End Bell, 4", Sch 40	1	2204
2	Bracket, Standoff Riser 10 1/2"	3	226
3	Clamp, Standoff Bracket, 4" Conduit	3	297
4	Screw, Lag 1/2" X 3", Fetter Drive, Drive Point	6	1131
5	Conduit, PVC, 4" x 10', Sch 80	30	2203
6	Elbow, PVC, 4", 90°, 24" Radius, Sch 40	1	1536

MASON COUNTY PUD

CONSTRUCTION STANDARDS

SECONDARY OVERHEAD TO
UNDERGROUND RISER ASSEMBLY

REVISIONS

R	DATE	ENGR	OPS
1	5/30/07	LB	AH
2	6/8/18	KJP	

PAGE:		CAD FILE:	APP: KJP	SECTION
2 of 2	U83,U84	U83	DATE: 12/29/04	1300

GUYING AND ANCHORING

Mason PUD 1

12/01/21

Conductor size & type	3/0 ACSR 6/1 Pigeon	
Maximum conductor tension	3310	Lbs
Number of conductors	4	
Telephone	No	
Phase to neutral distance	7	Ft
NESC Grade of Construction	C	
Working guy tension	13860	Lbs
Working anchor tension	21200	Lbs

Number of Guy Leads and Anchors

Dead-end		Pole Height	
Shortest lead length	40	45	50
5	*N/A*	*N/A*	*N/A*
10	*3,3*	*N/A*	*N/A*
15	*3,3*	*3,3*	*3,3*
20	*3,2*	*3,3*	*3,3*
25	*2,2*	*2,2*	*3,3*
35	*2,2*	*2,2*	*2,2*
40	*2,2*	*2,2*	*2,2*

Angles		Pole Height= 40 Ft							
Shortest lead length	Angle=	5	10	15	20	33	40	50	60
5		*1,1*	*2,1*	*2,2*	*2,2*	*3,3*	*3,3*	*N/A*	*N/A*
10		*1,1*	*1,1*	*2,1*	*2,1*	*2,2*	*3,3*	*3,3*	*3,3*
15		*1,1*	*1,1*	*1,1*	*2,1*	*2,2*	*2,2*	*3,3*	*3,3*
20		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,1*	*2,2*	*3,2*
25		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,1*	*2,2*	*2,2*
35		*1,1*	*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,1*	*2,2*

Angles		Pole Height= 45 Ft							
Shortest lead length	Angle=	5	10	15	20	33	40	50	60
5		*1,1*	*2,1*	*2,2*	*2,2*	*3,3*	*N/A*	*N/A*	*N/A*
10		*1,1*	*1,1*	*2,1*	*2,1*	*3,3*	*3,3*	*3,3*	*N/A*
15		*1,1*	*1,1*	*1,1*	*2,1*	*2,2*	*2,2*	*3,3*	*3,3*
20		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,2*	*2,2*	*3,3*
25		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,1*	*2,2*	*2,2*
35		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,1*	*2,1*	*2,2*

Angles		Pole Height= 50 Ft							
Shortest lead length	Angle=	5	10	15	20	33	40	50	60
5		*1,1*	*2,2*	*2,2*	*3,3*	*3,3*	*N/A*	*N/A*	*N/A*
10		*1,1*	*1,1*	*2,1*	*2,2*	*3,3*	*3,3*	*3,3*	*N/A*
15		*1,1*	*1,1*	*1,1*	*2,1*	*2,2*	*3,3*	*3,3*	*3,3*
20		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,2*	*3,3*	*3,3*
25		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,2*	*2,2*	*3,3*
35		*1,1*	*1,1*	*1,1*	*1,1*	*2,1*	*2,1*	*2,2*	*2,2*

Output information is in the format of <# of down guys>,<# of anchors>. Minimum guy spacing is 5'.

OVERHEAD VERTICAL WIRE CLEARANCES OVER GROUND
lowest point on the conductor during worst case sag condition

Nature of surface underneath wires, conductors, or cables	Insulated communications cable, multi-grounded neutrals, grounded guys, and triplex service cable	Insulated communications cable, ungrounded guys exposed to 750V	Noninsulated communications wire, insulated supply cables (0-750V), 15KV**	Supply conductors over 750V to 15KV ungrounded guys exposed to 750V to	Supply conductors over 15KV to 22KV, ungrounded guys exposed to 15KV to 22KV**	69KV Circuits	115KV Circuits	
1. Track rails of railroads (except electrified railroads using overhead trolley conductors)	23.5	24	24.5	26.5	27.2	28.5	NESC
	25.5	*26*	26.5	*28.5*	*29.7*	*30.6*	*RUS*
	27	**27.5**	***28.5***	**30**	**31.2**	**32**	**MASON 1**
2. Public roads, streets, alleys and other areas subject to truck traffic.	15.5	16	18.5	18.5	19.2	20.5	NESC
	17.5	*18*	*20.5*	*20.5*	*21.7*	*22.6*	*RUS*
	19	**19**	**20.5**	**20.5**	**22.7**	**24**	**MASON 1**
3. Private roads and other land traversed by vehicles (cultivated, grazing, forest, etc.)	15.5	16	18.5	18.5	19.2	20.5	NESC
	17.5	*18*	*20.5*	*20.5*	*21.7*	*22.6*	*RUS*
	17.5	**18**	**20.5**	**20.5**	**21.7**	**22.6**	**MASON 1**
4. Spaces and ways for pedestrians only (cannot ride horses). Spaces created by fences/gates do not qualify. **DO NOT USE; Limited Exception***	9.5	12	14.5	14.5	15.2	16.5	NESC
	11.5	*14*	*16.5*	*16.5*	*17.7*	*18.6*	*RUS*
	11.5	**14**	**16.5**	**16.5**	**19.2**	**20**	**MASON 1**
5. State Highways and interstates (Crossing)***	24	24	30	32	34	34	WSDOT
	24	**24**	**30**	**32**	**34**	**34**	**MASON 1**
Where wires, conductors, or cables run along and within the limits of highways or other road rights-of-way but do not overhang the roadway							
6. Public roads, streets or alleys	15.5	16	18.5	18.5	19.2	20.5	NESC
	17.5	*18*	*20.5*	*20.5*	*21.2*	*22.5*	*RUS*
	18	**19**	**20.5**	**20.5**	**22.7**	**24**	**MASON 1**
7. State Highways and interstates (Longitudinal)***	20	24	27	32	32	32	WSDOT
	20	**24**	**27**	**32**	**32**	**32**	**MASON 1**

* These spaces must be the result of a physical terrain feature (a steep bank) where vehicles or horses cannot traverse or a man made feature not easily modified for vehicles (a cat walk)

** Voltage is phase-to-ground for grounded systems

*** ODOT requires NESC clearances; however, BKI will assume ODOT will adopt clearances similar to WSDOT. These clearances apply to state highways within municipalities

GUY AND ANCHOR ASSEMBLY STRENGTH SUMMARY

Mason PUD 1

12/01/21

Hardware Description	Manufacturer Name	Part #	Ultimate Strength (lbs.)	Grade B Strength Factor	Grade B Working Strength (lbs.)	Grade C Strength Factor	Grade C Working Strength (lbs.)
Guy working strength							
Guy Hook			25,400	0.65	16510	0.85	21590
(2) Washer, Curved 4"x4", 13/16" Hole			28,400	0.80	22720	0.85	24140
(2) Bolt, 3/4"			36,700	1	36700	1	36700
Guy Grip Deadend	Preformed		15,400	0.9	***13860***	0.9	***13860***
Guy Grip Deadend	Automatic		15,400	0.9	***13860***	0.9	***13860***
3/8" EHS			15,400	0.9	***13860***	0.9	***13860***
Fiberglass Extension Links			21,000	1	21000	1	21000
Anchor working strength							
Anchor Rod, 1"			36,000	1	36000	1	36000
10" Single Helix Screw Anchor installed at 3,000 ft-lb torque			21,200	1	***21200***	1	***21200***
14" Single Helix Screw Anchor installed at 3,000 ft-lb torque			24,100	1	24100	1	24100
20" Cross Plate Anchor 3/4" Rod (class 5 soil assumed) 24" cross-plate anchors (for 3/4" rod)	Chance		24,000	1	24000	1	24000

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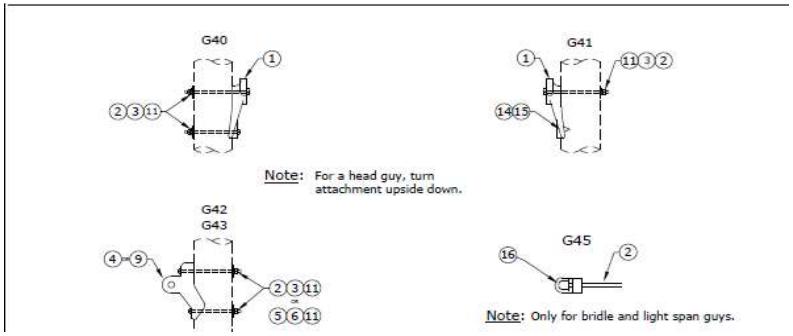

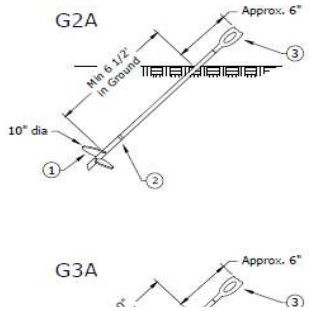

ULTIMATE HOLDING CA		
	G2A	
Torque (ft-lbs)	10" Helix 1" x 7' Rod	(lbs 1" x
500	4,200	
1,000	7,600	
1,500	11,000	
2,000	14,400	
2,500	17,800	
3,000	21,200	
3,500	24,600	
4,000	28,000	
4,500	31,400	
5,000	34,800	

MAXIMUM LINE ANGLES FOR INSULATORS

Mason PUD 1

1/11/2022

Conductor size and type	3/0 ACSR 6/1 Pigeon	
Maximum conductor tension	3310	Lbs
NESC loading area	M	

Type of insulator	Maximum allowed transverse force (pounds)
Single pole top pin	720
Single pin on crossarm	750
Single post	750
Single saddle-clamp	1000
ANSI class 53-2 spool insulator	1500
ANSI class 53-4 spool insulator	2250
Maximum unguyed angle (degrees)	1.00

Maximum Allowed Line Angles

	Grade B		Grade C	
With one pole top pin insulator	4.5	Degrees	6.2	Degrees
With two pole top pin insulators	12.1	Degrees	15.8	Degrees
With one pin insulator on crossarm	4.8	Degrees	6.6	Degrees
With two pin insulators on crossarm	12.7	Degrees	16.6	Degrees
With one post insulator	4.8	Degrees	6.6	Degrees
With two post insulators	12.7	Degrees	16.6	Degrees
With one saddle clamp	7.4	Degrees	9.9	Degrees
With two saddle clamps	18.0	Degrees	23.4	Degrees
ANSI class 53-2 spool insulator	12.7	Degrees	16.6	Degrees
ANSI class 53-4 spool insulator	20.7	Degrees	26.8	Degrees
Horizontal spool (<= 1/0 ACSR)	5.0	Degrees	5.0	Degrees
Horizontal spool (> 1/0 ACSR)	2.0	Degrees	2.0	Degrees

comment: tie top post insulators are rated 2000 lb in cantilever. This is a stronger assembly than a single pin. This is also limited by the wood crushing force on the crossarm due to the insulator; see RUS limits.
comment: The peaker bracket is usually cast Iron/w cleats - much more transverse strength than a formed p

Input Instructions:
1. Verify proper allowed maximum horizontal force [see discussion below].

Calculation Notes:
1. The maximum span on the input tab is used.
2. Maximum angle calculations follow the formula in RUS bulletin #1728F-804, Exhibit 1.
3. Per RUS calculation guidelines, following are the maximum allowable transverse loads:
 a) Single pole top pin: 500 pounds
 b) Single crossarm mounted pin: 750 pounds
 c) Single post insulator: 750 pounds
 d) Single saddle clamp: 1000 pounds
 e) ANSI class 53-2 spool insulator: 1500 pounds
 f) ANSI class 54-2 spool insulator: 2250 pounds
 g) Neutral spools arranged horizontally are limited by the tie wire holding capacity to keep the conductor from slipping out of the groove.
 h) Two of an item doubles the holding capacity
4. The maximum unguyed angle is from the wood pole tab. If the allowed angle is less than the maximum unguyed angle, N/A is shown in the box, meaning the specified configuration is not allowed even for tangent structures.
5. Maximum angle for single insulators is 30 degrees; 60 degrees maximum for double insulators.
6. RUS has no standard explaining the above derivation of numbers, but they do take into account:
 a) Maximum crushing force allowed with a 2.25" washer on the bottom of a pin (or bolt for a post insulator) is 4,200 pounds.
 b) Maximum lateral force with a 5/8" bolt or pin to prevent the wood from splitting is 2,630 pounds assuming a maximum allowed 910 psi end grain bearing pressure for a 3-5/8" x 4-5/8" wood crossarm.
 c) Cantilever strengths of insulators vary; higher voltage can have lower ratings due to the longer length. Pin types are typically 2500 pounds [working force of 1000 pounds] and post types are 2000 pounds [working force of 800 pounds].
 d) Pole top pin maximum transverse load needs to be included for the pin and crushing of fibers. Hughes Bros. 2770- series is rated for 1500 pounds with a derated working rating of 975 pounds (using 0.65 material derating). Other pole top pins can be as low as 900 pounds ultimate (720 pounds working).
 e) For a 20" pole top pin with (2) 5/8" bolts 8" apart, the maximum lateral tension to prevent excessive crushing of wood fibers is 1300 pounds (maximum 910 psi against wood fibers).
 f) Shear strength of 5/8" bolt cannot be exceeded: This is 8330 x 0.65 = 5,400 pounds through the threads with material derating factors included.

›ole top pin.

WOOD POLE CLASS

Mason PUD 1

12/1/2021

Conductor size & type	#2 ACSR 7/1 Sparate	
Maximum conductor tension	1454	LB
Number of conductors	2	
Phase to neutral distance	7.00	FT
Maximum unguyed angle	1.00	Degrees
NESC loading area	M	

	GRADE B			GRADE C		
Pole height (feet) ->	40	45	50	40	45	50
	Minimum class for lateral force [without telco]					
Minimum class size [without telco]	6	6	5	6	6	5
	Minimum class for tangent poles (with telco)					
	5	5	5	6	6	5
Shortest guy lead length (ft)	**Minimum class for guyed poles (with telco)**					
5	5	4	3	6	5	4
10	5	5	5	6	6	5
15	5	5	5	6	6	5
20	5	5	5	6	6	5
25	5	5	5	6	6	5
35	5	5	5	6	6	5

Input Instructions :

1. No required input on this tab; one optional input.
2. The maximum unguyed angle must include a slight angle for staking inconsistencies. The minimum value is 0.5 degrees. 1.0 degrees is typical.

Calculation notes:

1. This tab lists the minimum pole class to use for the stated pole length.
2. Additional loading assumes (3) 100kVA single-phase transformers on the pole.
3. Calculations are based on RUS bulletin #1724E-150 for tangent poles and bulletin #1724E-153 for buckling.
4. All calculations use the data on the Pole Data tab, which is for Douglas fir. If cedar poles are used, change the Pole Data tab to reflect cedar poles.
5. Horizontal force due to wind on the conductor uses the maximum span length included on the Input tab.
6. Buckling calculations are for dead-ends and 60 degree angles.
Lead length noted for buckling calculations is the shortest guy lead for a pole.
7. Buckling calculations include a telephone conductor tension equal to the phase conducors.
8. Buckling calculations assume the lowest guy is at the neutral conductor elevation, since telephone does not always install down guys. This is a conservative assumption, since buckling will not be as bad if a guy is attached

WOOD POLE CLASS

Mason PUD 1

12/1/2021

Conductor size & type	3/0 ACSR 6/1 Pigeon	
Maximum conductor tension	3310	LB
Number of conductors	4	
Phase to neutral distance	7.00	FT
Maximum unguyed angle	1.00	Degrees
NESC loading area	M	

	GRADE B			GRADE C		
Pole height (feet) ->	40	45	50	40	45	50
	Minimum class for lateral force [without telco]					
Minimum class size [without telco]	3	3	3	5	5	5
	Minimum class for tangent poles (with telco)					
	2	2	2	4	4	4
Shortest guy lead length (ft)	**Minimum class for guyed poles (with telco)**					
5	1	H2	H4	2	H1	H2
10	2	2	H1	4	3	2
15	2	2	2	4	4	3
20	2	2	2	4	4	4
25	2	2	2	4	4	4
35	2	2	2	4	4	4

Input Instructions :

1. No required input on this tab; one optional input.
2. The maximum unguyed angle must include a slight angle for staking inconsistencies. The minimum value is 0.5 degrees. 1.0 degrees is typical.

Calculation notes:

1. This tab lists the minimum pole class to use for the stated pole length.
2. Additional loading assumes (3) 100kVA single-phase transformers on the pole.
3. Calculations are based on RUS bulletin #1724E-150 for tangent poles and bulletin #1724E-153 for buckling.
4. All calculations use the data on the Pole Data tab, which is for Douglas fir. If cedar poles are used, change the Pole Data tab to reflect cedar poles.
5. Horizontal force due to wind on the conductor uses the maximum span length included on the Input tab.
6. Buckling calculations are for dead-ends and 60 degree angles.
Lead length noted for buckling calculations is the shortest guy lead for a pole.
7. Buckling calculations include a telephone conductor tension equal to the phase conducors.
8. Buckling calculations assume the lowest guy is at the neutral conductor elevation, since telephone does not always install down guys. This is a conservative assumption, since buckling will not be as bad if a guy is attached

POLE HEIGHTS AND CLEARANCES

Mason PUD 1

12/01/21

Conductor size and type	3/0 ACSR 6/1 Pigeon	
Span #1, Max sag at 250' span	4.5	Ft
Span #2, Max sag at 320' span	6.8	Ft
Span #3, Max sag at 350' span	8.2	Ft
Buckarm / tap spacing	2.5	Ft
Buckarm to incoming neutral drop	3.5	Ft
Neutral drop on taps, incoming to out	0.5	Ft
Phase to neutral distance	7.0	Ft
Neutral to lowest comm cable	3.8	Ft
Minimum clearance to bottom wire	17.5	Ft

Minimum Clearance value above is based on:
Private roads and other lands to neutrals and insulated communications conductors

Extra clearances (in feet) for tangent poles

		250' span		320' span		350' span	
Pole Height	Neutral Height at Pole (feet)	No Telco	With Telco	No Telco	With Telco	No Telco	With Telco
40	25.5	3.5	-0.3	1.3	-2.6	-0.2	-4.0
45	30.0	8.0	4.2	5.8	2.0	4.3	0.5
50	34.5	12.5	8.7	10.3	6.5	8.8	5.0
55	39.0	17.0	13.2	14.8	11.0	13.3	9.5

Extra clearances (in feet) for buckarm construction and side taps with lower than tangent neutral

		250' span		320' span		350' span	
Pole Height	Neutral Height at Pole (feet)	No Telco	With Telco	No Telco	With Telco	No Telco	With Telco
40	26.0	4.0	0.2	1.8	-2.1	0.3	-3.5
45	30.5	8.5	4.7	6.3	2.5	4.8	1.0
50	35.0	13.0	9.2	10.8	7.0	9.3	5.5
55	39.5	17.5	13.7	15.3	11.5	13.8	10.0

Extra clearances for span guys (in feet)

	Guy pole height ->	25 Ft		30 Ft		35 Ft	
Main line pole height	Neutral Height at Pole (feet)	No Telco	With Telco	No Telco	With Telco	No Telco	With Telco
40	22.0	2.0	0.7	4.5	0.7	4.5	0.7
45	26.5	2.0	2.0	6.5	5.2	9.0	5.2
50	31.0	2.0	2.0	6.5	6.5	11.0	9.7
55	35.5	2.0	2.0	6.5	6.5	11.0	11.0

Calculation of Maximum Line Angles

The following formula and the data tabulated below were used to calculate the maximum line angles on pin and spool insulator assemblies:

$$Sin(\theta/2) = \frac{P-(Fw\times Sw\times Ww)}{2\times Ft\times T} \qquad \theta = 2\times Arc\sin\left[\frac{P-(Fw\times Sw\times Ww)}{2\times Ft\times T}\right]$$

Where:

θ = Maximum Line Angle (calculated): [Degrees]
P = Designated Maximum Transverse Load (allowed on pin or insulator): [lbs]
Fw = Wind Overload Factor for Transverse Loads
Ft = Wire Tension Overload Factor for Transverse Loads
Sw = Wind Span (equals ½ sum of adjacent spans): [ft]
Ww = Wind Load on Conductor: [lbs/ft] *(See Table Below)*
T = Design Tension of Conductor: [lbs] *(See Table Below)*

From NESC Table 253-1 for Grade C Construction:

Fw = 1.75 for non-crossing spans (Footnote 4 to Table 253-1)
= 2.20 for crossing spans
Ft = 1.30

CONDUCTOR SIZE & TYPE	Strength	Maximum Tension	Design Tension *(T)(lbs)*
4 ACSR (7/1)	2360	60%	1416
2 ACSR (6/1)	2850	60%	1710
2 ACSR (7/1)	3640	60%	2184
1/0 ACSR (6/1)	4380	60%	2628
123.3 AAC (7)	4460	60%	2676
2/0 ACSR (6/1)	5310	50%	2655
3/0 ACSR (6/1)	6620	50%	3310
4/0 ACSR (6/1)	8350	40%	3340
246.9 AAC (7)	8560	40%	3424
336.4 ACSR (18/1)	8680	40%	3472
336.4 ACSR (26/7)	14100	35%	4935

	WIND LOAD *(Ww) (lbs/ft)* by NESC Loading District		
	LIGHT	MEDIUM	HEAVY
4 ACSR (7/1)	0.1928	0.2523	0.4190
2 ACSR (6/1)	0.2370	0.2720	0.4387
2 ACSR (7/1)	0.2438	0.2750	0.4417
1/0 ACSR (6/1)	0.2985	0.2993	0.4660
123.3 AAC (7)	0.2985	0.2993	0.4660
2/0 ACSR (6/1)	0.3353	0.3157	0.4823
3/0 ACSR (6/1)	0.3765	0.3340	0.5007
4/0 ACSR (6/1)	0.4223	0.3543	0.5210
246.9 AAC (7)	0.4223	0.3543	0.5210
336.4 ACSR (18/1)	0.5130	0.3947	0.5613
336.4 ACSR (26/7)	0.5408	0.4070	0.5737