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PERUSAHAAN UMUM LISTRIK NEGARA  
MINISTRY OF PUBLIC WORKS AND POWER  
JAKARTA, INDONESIA  
OWNER

97p.

**MEDAN POWER REHABILITATION PROJECT**

**INVITATION FOR BIDS**

**FURNISH AND ERECT FACILITIES  
FOR THE  
REHABILITATION AND EXPANSION OF THE DISTRIBUTION SYSTEM  
629-2**

**VOLUME I - BID AND CONTRACT FORMS**

**AID LOAN NO. 497-H-022**

**CHICAGO,  
ILLINOIS  
U. S. A.**

**HARZA ENGINEERING COMPANY**

**AUGUST 1973**

**MEDAN  
SUMATRA  
INDONESIA**

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PART I - BID FORM

SECTION 1.1 - INSTRUCTIONS TO BIDDERS

1.1-01 TIME AND PLACE FOR RECEIPT OF BIDS

Sealed Proposals for the construction, including the supply of necessary labor, materials and equipment, and placing in service of facilities for the Medan Electric Power Distribution System Rehabilitation and Expansion Project, located in North Sumatra, for the Ministry of Public Works and Power, represented by Perusahaan Umum Listrik Negara hereafter called "PLN", will be received by PLN on or before 11 A.M. o'clock, West Indonesian Standard Time, 15 October, 1973, at PLN's office in Jakarta, Indonesia at which time and place the Proposals will be publicly opened and read. Any proposal received at the office of PLN subsequent to the time specified will be promptly returned to the Bidder unopened. Bidders will be held responsible for assuring that their bids are actually received on time and at the place and office designated, and a late bid will not be considered even though it became late because of factors beyond the Bidder's Control, such as delays in mail handing, telegraphic transmission, or customs clearance. A late bid may be considered only when such bid is received at the place designated prior to award and when the sole cause for it becoming a late bid was mishandling on the part of the Owner, his employees, or his agents.

The Bidder may without prejudice to himself withdraw, modify, or correct a proposal after it has been deposited with the Owner, provided the request for such withdrawal modifications, or correction is filed with the Owner in writing or by cable before the time set for receiving bids. The original bid as modified by such written or cable communication will be considered as the proposal submitted by the Bidder. No Bidder shall withdraw his proposal after the hour set for receiving the bids until and unless award of the Contract is delayed for a period of more than 120 calendar days from the date set for opening of proposals.

1.1-02 ISSUING OF BID DOCUMENTS

Two complete sets of the Contract Documents will be furnished to each prequalified Bidder without charge. All documents remain the property of the Owner and shall be returned at the time of bid opening, except the Bidders may retain one copy.

Bidders desiring additional sets of the Contract Documents may obtain them upon payment of \$80.00 U.S. or Rps. 33200 per set. Individual volumes may be obtained upon payment of \$20.00 U.S. or Rps.8300 per volume, with checks payable to Perusahaan Umum Listrik Negara.

Manufacturers and Suppliers interested in submitting quotations to pre-qualified Bidders may obtain copies of the Contract Documents from Harza Engineering Company at the prices listed above.

The Contract Documents are available for examination or sale at the following locations:

PERUSAHAAN UMUM LISTRIK NEGARA  
Attention: Ir. Bagoes Moediyantoro,  
Director for Construction  
Jl. Sunan Ngampel No. 1  
Kebayoran Baru, Jakarta, Indonesia

HARZA ENGINEERING COMPANY  
150 South Wacker Drive  
Chicago, Illinois 60606

A list of prequalified Bidders to whom copies of these Contract Documents have been issued will be furnished by the Owner or the Engineer upon request.

#### 1.1-03 FORM OF BID AND MANNER OF SUBMISSION

Bids will be considered on Part I, Bid Form, but no bid will be considered for only a portion of the Bid Form. The Bid Form has an entry for each item on which payment will be made, and no other allowance of any kind will be made unless specifically provided for in the Contract Documents. In case of discrepancy between the "unit price" and the corresponding "total amount" entered for any item in the Bid Form, the "unit price" will govern. The monetary unit used shall be Indonesian Rupiahs for local costs and United States Dollars (US\$) for costs of goods and services from US and other eligible sources. Local costs shall not be reimbursed or paid to the Bidder with AID US currency but shall be met in Indonesian currency by the Owner. Each unit price and lump sum entered in the Bid Form shall be so divided between Indonesian currency and U.S. currency. The Bidder shall substantiate the split between Indonesian Rupiahs and United States dollars if requested by the Owner. To insure acceptance, bids shall be submitted in the firm name under which the Bidder was prequalified. If a Bidder wishes to submit his bid under a firm name differing from that of the prequalification, the Owner shall be so notified by the prequalified Bidder 45 calendar days in advance of the date of the opening of the



bids so that such a procedure may be either approved or disapproved in writing. Bidders may bid as members of a joint venture provided each member is a pre-qualified Bidder. Each contractor in a joint venture shall be responsible for the entire Contract unless the Owner permits otherwise.

The Bid and supporting documents shall be enclosed in double sealed envelopes. Both inner and outer envelopes shall be marked in English as follows:

BID FOR MEDAN POWER REHABILITATION PROJECT  
BID DOCUMENTS 629-2  
FURNISH AND ERECT FACILITIES FOR THE  
REHABILITATION AND EXPANSION OF  
THE DISTRIBUTION SYSTEM

PERUSAHAAN UMUM LISTRIK NEGARA  
ATTENTION: Ir. Bagoes Moediyantoro  
Director for Construction  
Jl. Sunan Ngampel No. 1  
Kebayoran Baru, Jakarta, Indonesia

One copy of the complete Bid Documents, including all addenda, shall be properly executed and submitted and will be considered the original. In addition six (6) extra conformed copies of Part I, Bid Form Section 1.2 through 1.11, shall be properly executed and submitted. In case of discrepancy between copies, the original will govern. Two unpriced copies of Bid Form and supporting documents shall be submitted to Harza Engineering Company, Chicago, Illinois.

#### 1.1-04 ACCEPTANCE OR REJECTION AND EVALUATION OF BIDS

Award will be made to that qualified BIDDER whose Proposal is responsive to this Invitation For Bid (IFB) and is both reasonable and lowest in price (U.S. Dollars and Indonesian Rupiahs).

A responsive Proposal is one which accepts all of the terms and conditions of the IFB without material modification. A material modification is one which in any way affects the price, quality, quantity, delivery, scope or completion date of construction or other services to be supplied or performed; or which limits in any way any responsibilities, duties or liabilities of the Owner or AID as any of the foregoing have been defined or specified in this IFB.

PLN reserves the right to waive minor irregularities or minor errors in any Proposal, which do not constitute a material modification, if it appears to PLN that such irregularities or errors were made inadvertently. Any such irregularities or errors so waived must be corrected in the Proposal prior to the acceptance thereof by PLN.

PLN reserves the right to reject any or all Proposals.

### 1.1-05 PROPOSAL GUARANTEE

To insure that a Contract will be executed and the performance of it properly secured if the bid is accepted, each bid shall be accompanied by a proposal guarantee in the amount of 10% of the total amount bid (U.S. currency plus other currencies), consisting of a certified check, cashier's check, irrevocable letter of credit, or a bid bond executed by the Bidder and U.S. sureties or U.S. insurance companies satisfactory to the Owner and shall be payable to the Owner in U.S. Dollars or other freely convertible currency. Bid bonds shall be executed on the approved form included with these Contract Documents and shall be accompanied by the authority or power of attorney of the surety's agent who signs the bond. The bid bond shall have a validity of not less than 120 calendar days from the date set for the opening of proposals.

No bid will be considered unless accompanied by the proposal guarantee. If the Successful Bidder fails to enter into a Contract in accordance with his bid and furnish the performance bond and payment bond in accordance with the provisions of these Contract Documents within 30 calendar days from the date on which he is notified that he is the Successful Bidder, the difference between his bid and the bid of the next lowest qualified bidder, not to exceed the amount of the bid bond, will be retained by the Owner as compensation for failure to execute the Contract. The proposal guarantee of the Bidders will be returned without interest as soon as the Successful Bidder signs the Contract and furnishes the performance bond and payment bond, but no later than 120 calendar days after the date set for opening of proposals. Bids will be accepted or rejected within 90 calendar days from the date set for opening of proposals.

### 1.1-06 . BIDDER'S UNDERSTANDING

The Bidder should visit the site and by careful examination satisfy himself as to the nature and location of the Work; the conformation of the ground; the character, quality, and quantity of the materials, both the surface and subsurface, to be encountered; the character of equipment and facilities needed preliminary to and during the prosecution of the Work; the general and local conditions, including climatological conditions; the equipment to be furnished and installed; and all other matters which can in any way affect the Work under the Contract. No verbal agreement or conversation with any officer, agent, or employee of the Owner or of the Engineer, either before or after the execution of the Contract, will affect or modify any of the terms or obligation herein contained.

Failure to visit the site of the project and to take steps necessary to ascertain the nature of the work and the general and local conditions which may affect the work or its cost will not relieve bidders from responsibility for properly estimating the difficulty or cost of performing the work.

#### 1.1-07 PRE-BID CONFERENCE

A pre-bid conference will be held at the Owner's office in Medan. After the site visit referred to in paragraph 1 of this Article 1.1-06 and a careful review of all the Contract Documents, each bidder shall submit to the Owner in writing any and all questions, comments, and requests for clarification. These comments must be delivered to the Owner by 6 September, 1973. The pre-bid conference will be held on 13 September, 1973 at which time the questions, comments and requests for clarification will be answered. Accepted changes to the Contract Documents, if any, and answers to questions and comments will be the subject of Addenda to be issued prior to the date set for opening of proposals. Receipt of these Addenda must be acknowledged by the Bidder as outlined in Article 1.1-10. Any comments, questions, or clarifications made by the Bidder when submitting his proposal may result in the Bidder's proposal being rejected as non-responsive.

#### 1.1-08 ASSISTANCE IN VIEWING THE SITE OF THE WORK

Bidders will be given assistance in viewing the site on application to the Owner. Bidders shall arrange for transportation to the site at their expense. Any and all expenses involved in such visits shall be to the account of the Bidder.

#### 1.1-09 INTENT OF CONTRACT DOCUMENTS

The Bidder shall submit his bid with the understanding that the Contract Documents cover all the work within the scope of the Contract and that, unless expressly excluded, any and all labor and materials not indicated therein but which may be necessary to complete any part of the work in a proper, substantial, and workmanlike manner, shall be considered as included and shall be furnished by the Contractor. It is understood that construction equipment and plant supplied by the Contractor will at all times be his property, unless otherwise specified.

1.1-10 ADDENDA

Addenda to the Contract Documents may be issued prior to the date of opening bids to clarify the Contract Documents or to reflect modifications in the design or Contract terms. Each addendum issued will be distributed by registered mail with return receipt to each person or organization to whom the Contract Documents have been issued. The recipient shall acknowledge receipt of each addendum also by signing and returning the receipt for distribution with the addendum in addition to signing the Post Office form for registered mail. All addenda issued become a part of the Contract Documents.

1.1-11 QUANTITIES

The quantities shown in Part I, Bid Form, are estimates for comparing bids. Payment will be made for quantities of Work actually performed, equipment delivered or material delivered.

1.1-12 ALTERATION OF THE QUANTITY OF WORK

The Bidder understands and agrees that the quantities called for in this proposal are approximate and that the total number of units upon which payment shall be made shall be as set forth in the final inventory. If the Owner changes the quantity of any unit or units specified in this proposal by more than 25%, and the materials cost to the Bidder is increased thereby to an extent which would not be adequately compensated by application of the unit price in this proposal to the revised quantity of such unit or units, such change, to the extent of the quantities of such unit in excess of such 25%, shall be regarded as a change within the meaning of 4.25, changes.

The Contract quantities will be considered firm when so certified by the Engineer but not later than six months after establishment of the Letter of Credit. The Contractor will be obligated to supply and the Owner to purchase all materials required for the certified number of billing units. The Owner is not obligated to pay the labor portion of billing units not installed, transferred or removed.

1.1-13 ADDITIONAL MATERIAL

The Contractor may at his option ship additional quantities of material in excess of the quantities specified in the Billing Units to take advantage of standard packaging and also to allow for damage in shipment, pilferage, breakage at the site and similar causes of loss. However allowance for the cost of these additional materials must be included in the unit prices and any such materials not used shall be turned over to the Owner without charge.

**1.1-14 SOURCE OF FUNDS**

U.S. Dollar payment for goods and services from the U.S. and other eligible source countries for the construction required by these Contract Documents will be made by the Owner from proceeds of a loan from the U.S. Agency for International Development to the Owner. Payment for all other costs will be made from funds of the Owner. The Bidder's attention is called to 5-22, Source and Origin.

**1.1-15 COMPARISON OF BIDS**

For the purpose of comparing bids, the portion of the prices quoted in Indonesian Rupiahs will be converted to U.S. Dollars at the rate of 415 Rupiahs per U.S. Dollar.

**1.1-16 BIDDER'S SPECIFICATION**

The Bidder shall submit a bid in strict compliance with the Contract Documents. The Bidder may also submit additional and alternate specifications not in conflict with the technical specifications of these Contract Documents. Any stipulation of the Bidder in conflict with these Contract Documents may be cause for rejection of the Bid.

**1.1-17 INELIGIBLE FIRMS**

No firm included on the list maintained by AID of suspended, debarred or ineligible bidders will be eligible to bid individually or in a joint venture or to participate as a subcontractor or otherwise.

**1.1-18 AID APPROVAL OF FORMAL CONTRACT**

The contract between the Owner and the Bidder, based upon these Contract Documents, and any proposed changes, additions, or insertions not in these Contract Documents, must be approved by AID before execution of the Contract.

PART I - BID FORM

SECTION 1.2 - PROPOSAL

Perusahaan Umum Listrik Negara Pusat  
Ministry of Public Works and Power  
Dj1. Trunodjojo Blok M-I 1/135  
Djakarta, Indonesia

Attention: Ir. Bagoes Moedijantoro  
Director of Construction

In accordance with Contract Documents 629-2 dated August, 1973  
and addenda thereto number \_\_\_\_\_ the undersigned, as  
(Insert proper numbers)

a Bidder, hereby proposes to furnish all plant, labor, equipment, and materials; and will do all things necessary to furnish and erect facilities for the Rehabilitation and Expansion of the Distribution System for the Medan Distribution Project for the unit prices and lump sums set forth in Part I, Bid Form, and agrees that if written notice of award of the Contract is received, within 120 calendar days after the date of opening of bids, he will execute the Contract and will furnish the performance bond and payment bond as required by the Contract Documents at the time the Contract is executed. Certified check, cashier's check, irrevocable letter of credit, bid bond (strike out inapplicable words) as required by the Contract Documents is attached. The undersigned further agrees that, if this proposal is accepted, and if he should fail to execute the Contract within 30 calendar days from the date on which he is notified that he is the acceptable Bidder to whom the Contract is awarded, the certified check, cashier's check, irrevocable letter of credit, bid bond (strike out inapplicable words) accompanying this proposal and the moneys payable thereon shall be paid into the funds of the Owner as agreed liquidated damages for such failures; otherwise the certified check, cashier's check, irrevocable letter of credit, bid bond (strike out inapplicable words) shall be returned to the Bidder.

\_\_\_\_\_  
Full Name of Bidder

\_\_\_\_\_  
Business Address

By \_\_\_\_\_  
Signature

\_\_\_\_\_  
Witness to Signature

\_\_\_\_\_  
Title

PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 1 of 1

TYPE A - SINGLE PHASE POLE TOP ASSEMBLY UNITS

A pole top assembly unit consists of the hardware, and their appurtenances, insulators, etc., except tie wire, required to support the primary conductors. It does not include the pole.

See Article 1.3.03 regarding materials to be supplied by Owner.

I-3.01-1

Unit No.	No. of Units	Unit Prices				Extended Prices		Reference Drawing No.		
		Labor		Material		Labor & Materials				
(1)	(2)	Dollars (3)	Rupiahs (4)	Dollars (5)	Rupiahs (6)	Dollars (7)	Rupiahs (8)	(9)	1,000 Rupiahs (10)	
						(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)	
A1	3,000									A1
A2	100									A2
A3	200									A3
A4	100									A4
A5	50									A5
A6	50									A6
A7	40									A7
A8	10									A <sup>2</sup>
<b>Total</b>										

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 1 of 2

TYPE C - THREE PHASE POLE TOP ASSEMBLY UNITS

A pole top assembly unit consists of the hardware, crossarms, (to be supplied by Owner) and their appurtenances, insulators, etc., except tie wire, required to support the primary conductors. It does not include the pole. Crossarm pins include 2x2x1/8 inch washer, nut, and locknut.

See Article 1.3.03 regarding materials to be supplied by Owner.

I-3.01-2

Unit No.	No. of Units	Unit Prices						Extended Prices		Reference Drawing No.	
		Labor		Material		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
C1	3,000										C1
C2	75										C2
C3	25										C3
C4	50										C4
C5	25										C5
C6	60										C6
C7	50										C7
C8	20										C8

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 2 of 2

TYPE C - THREE PHASE POLE TOP ASSEMBLY UNITS (Continued)

Unit No.	No. of Units	Unit Prices						Extended Prices		Reference Drawing No.	
		Labor		Material		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
C9-1	10										C9
C9-2	20										C9
C9-3	60										C9
C10	20										C10
C11-1	10										C11
C11-2	10										C11
C11-3	100										C11
C12	10										C12
C13	4										C13
<b>Total</b>											

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 1 of 2

TYPE D - CONDUCTOR ASSEMBLY UNITS

A conductor assembly unit consists of 1 kilometer of conductor or cable for primaries, secondaries or services, and includes tie wires, sleeves for splicing, connectors, and line guards and tools specified in Art. 7.15-03. The service shall be connected to the secondary or transformer and 75 cm of conductor or cable shall be left for connecting to the consumer's service entrance. In computing the compensation to the Contractor for conductor assembly units, only the horizontal distance between conductor supports or pole stakes shall be used. All tangent transformer poles require double support line guards.

Unit No.	No. of Units	Unit Prices						Extended Prices					
		Labor		Material		Labor & Materials		Labor & Materials	1,000 Rupiahs				
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars	Rupiahs	Dollars					
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(3)	(10)	(2)x(3)		
D1-1	300												336.4 AA Pri
D2-1	-												(Not Used)
D2-2	120												3/0 AA Sec.
D3-1	75												1/0 AA Pri
D3-2	400												1/0 AA Sec.
D4-1	225												2 AA Pri
D4-2	670												2 AA Sec.
D5	300												4 AA Sec.

I-3.01-4

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 2 of 2

TYPE D - CONDUCTOR ASSEMBLY UNITS (Continued)

Note: Items D9, D10, D14 and D15 are supply only.

Unit No.	No. of Units	Unit Prices				Extended Prices				Conductor size and Type	
		Labor		Material		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
D6	10										2 Duplex
D7	10										1/0 Triplex
D8	10										2 Triplex
D9	5	N.A.	N.A.								4 Triplex
D10	400	N.A.	N.A.								6 Duplex
D11	5										3/0 Quadruplex
D12	5										1/0 Quadruplex
D13	5										2 Quadruplex
D14	5	N.A.	N.A.								4 Quadruplex
D15	5	N.A.	N.A.								6 Quadruplex
D16	13										Communication Cable
<b>TOTAL</b>											

I-3.01-5

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 3 of 3

TYPE D - CONDUCTOR ASSEMBLY UNITS (Continued)

For determining the prices of the conductor assembly units listed above, the Bidder should use the following types and quantities of connectors. No separate payment will be made for connectors.

<u>Description (Ref. Section 7.15)</u>	<u>Quantity</u>	<u>Manufacturer and Catalog No., or equal</u>
a. Compression type, open sided, al. to al. or cu.	25,000	Thomas & Betts Cat. No. UB214
b. Compression type, open sided, al. to al. or cu.	57,000	Thomas & Betts Cat. No. OB-102
c. Sleeve type, insulated, al. to al. or cu.	40,000	Burndy Cat. No. ES-4W8W
d. Sleeve type, insulated, al. to al. or cu.	800	Burndy Cat. No. ES-4W6W
e. Sleeve type, insulated, al. to al. or cu.	800	Burndy Cat. No. ES-4W4W
f. Parallel groove clamp, al. to al.	55,000	AB Chance Cat. No. SPG105P
g. Parallel groove clamp, al. to al.	14,500	AB Chance Cat. No. SPG120P
h. Split Bolt, al. to al. or cu.	1,000	Anderson Electric No. CPS-2/0
i. Sleeve type, al. to al. or cu.	14,000	Burndy Cat. No. YSK2W6W Gd wire
j. Hot line clamp, al. to al. or cu.	1,500	A. B. Chance No. S1535AGP
k. Hot line clamp, al. to al.	500	A. B. Chance No. S1545AA
l. Mid-span tap, al. to al. or cu.	300	Burndy Cat. No. S4P27A
m. Mid-span tap, al. to al. or cu.	100	Burndy Cat. No. S4N27A
n. Triplex cable separator	100	Joslyn L 3181
o. Quadruplex cable separator	100	Joslyn L 3184
p. Parallel groove clamp, al. to al.	300	A. B. Chance SPG 130P
q. Parallel groove clamp, al. to al.	300	A. B. Chance SPG 135-2P

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TYPE E - GUY ASSEMBLY UNITS

A guy assembly unit consists of the hardware and wire. An overhead guy consists of an overhead guy, a pole, and a down guy, each of which is listed separately. Guy guards are designated separately. An adequate supply of pulling hooks for automatic deadends shall be included.

Unit No.	No. of Units	Unit Prices				Extended Prices				Reference Drawings No.	
		Labor		Material		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
E1-1	3,000										E1
E1-2	450										E1
E2-1	750										E2
E2-2	100										E2
E3-1	50										E3
E3-2	100										E3
E4	40										E4
E5-1	10										E5
E5-2	50										E5
E6	50										E6
E7	4,000										E7
<b>TOTAL</b>											

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TYPE F - ANCHOR ASSEMBLY UNITS

An anchor assembly unit consists of the anchor with rod complete, ready for attaching the guy wire. Log anchors to be supplied by Owner.

Unit No.	No. of Units	Unit Prices						Extended Prices				
		Labor		Material		Labor & Materials		Labor & Materials				
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)			
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)			
F1-1	3,000											
F1-2	1,390											
<b>TOTAL</b>												

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TYPE G - TRANSFORMER ASSEMBLY UNITS

A transformer assembly unit consists of the transformer, its protective equipment, and its hardware and leads with their connectors and supporting insulators and pins. This unit does not include the pole top, secondary, service, or grounding assemblies.

See Article 1.3.03 regarding materials to be supplied by Owner.

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Unit No.	No. of Units	Unit Prices						Extended Prices		Reference Drawing No.	Capacity KVA	
		Labor		Material		Labor & Materials		Labor & Materials				
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)			
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)			
G1-1,G2-1	100										G1, G2	10
G1-2,2-2	700										G1, G2	25
G1-3,2-3	600										G1, G2	50
G1-4,2-4	6										G1, G2	75
G1-5,2-5	3										G1, G2	100
G4-1	30										G4	3x10
G4-2	100										G4	3x25
G4-3	50										G4	3x50
G4-4	10										G4	3x75
G4-5	10										G4	3x100
<b>TOTAL</b>												

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TYPE J - PRIMARY AND SECONDARY ASSEMBLY UNITS

A primary or secondary assembly unit consists of the hardware, insulators, etc., to support the conductors or cable. It does not include the conductor or cable, or any hardware, insulators, etc., required to support service conductors or cable. Spools may be supplied by Owner, see 1.3-03-B.

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Unit No.	No. of Units	Unit Prices						Extended Prices		
		Labor		Material		Labor & Materials		Labor & Materials		
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars	Rupiahs	Dollars	1,000 Rupiahs	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	
						(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)	
J1-1	50,000									
J1-2	2,500									
J1-3	11,000									
J1-4	7,000									
J1-5	500									
J2-1	900									
J2-2	150									
J2-3	-	-	-	-	(Not Used)	-	-	-	-	-



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TYPE J - PRIMARY AND SECONDARY ASSEMBLY UNITS (Continued)

A primary or secondary assembly unit consists of the hardware, insulators, etc., to support the conductors or cable. It does not include the conductor or cable, or any hardware, insulators, etc., required to support service conductors or cable. Spools may be supplied by Owner, see 1.3-03-B.

Unit No.	No. of Units	Unit Prices				Extended Prices				
		Labor		Material		Labor & Materials		Labor & Materials		
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)	
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)	
J2-4	500									
J3-1	100									
J3-2	30									
J3-3	0-	-	-	-	(Not Used)	-	-	-	-	-
J3-4	60									
J4-1	2,000									
J4-2	10,000									
J4-3	800									

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TYPE J - PRIMARY AND SECONDARY ASSEMBLY UNIT (Continued)

A primary or secondary assembly unit consists of the hardware, insulators, etc., to support the conductors or cable. It does not include the conductor or cable, or any hardware, insulators, etc., required to support service conductors or cable. Spools may be supplied by Owner, see 1.3-03-B.

Unit No.	No. of Units	Unit Prices				Extended Prices				
		Labor		Material		Labor & Materials		Labor & Materials		
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)	
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)	
J4-4	100									
J5-1	20									
J5-2	100									
J5-3	20									
J5-4	40									
J5-5	10									
<b>TOTAL</b>										

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TYPE K - SERVICE ASSEMBLY UNITS (Supply Only)

A service assembly unit consists of the hardware, insulators, etc., required to support the service conductors or cable. It does not include the service conductor or cable, or any hardware, insulators, etc., required to support secondary conductors or cable.

Billing Unit No.	Reference Drawing No.	Quantity of Units	Unit Price		Extended Prices	
			United States Dollars (4)	Indonesian Rupiahs (5)	United States Dollars (6)	Indonesian Rupiahs (7)
(1)	(2)	(3)				
K1-2	K1	5,000				
K1-3	K1	25,000				
K1-4	K1	10,000				
K1-5	K1	2,000				
K1-6	K1	400				
K2-1	K2	40,000				
K2-2	K2	800				
K2-3	K2	200				
K2-4	K2	100				
K3	K3	100				
<b>TOTAL</b>						

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TYPE M - MISCELLANEOUS ASSEMBLY UNITS

A miscellaneous assembly unit consists of an additional unit needed in the Project for new line construction but not otherwise listed in the Proposal. This type includes grounding assemblies, fuse cutouts, reclosers, switches, regulators and other assembly units as shown on the respective drawings. See Article 1.3.03 regarding materials to be supplied by Owner.

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Unit No.	No. of Units	Unit Prices				Extended Prices				Reference Drawing Number	
		Labor		Material		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
M1	1,500										M-1
M4	20										M-4
M7	30										M-7
M8	20										M-8
M14-1	500										M-14
M14-2	500										M-14
M15	40										M-15
M16	1										M-16

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TYPE M - MISCELLANEOUS ASSEMBLY UNITS (Continued)

A miscellaneous assembly unit consists of an additional unit needed in the Project for new line construction but not otherwise listed in the Proposal. This type includes grounding assemblies, fuse cutouts, reclosers, switches regulators and other assembly units as shown on the respective drawings. See Article 3.03 regarding materials to be supplied by Owner.

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Unit No.	No. of Units	Unit Prices				Extended Prices				Reference Drawing Number			
		Labor		Material		Labor & Materials		Labor & Materials					
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars	Rupiahs	Dollars	1,000 Rupiahs				
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)	(9)	(10)		
M17	10												M-17
M18	2												M-18
M19	12,000												M-19
M20	4												M-20
M21	10												M-21
M23-1	350												M-23
M23-2	50												M-27
<b>TOTAL</b>													

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TYPE N - SUPPLY ONLY MATERIAL UNITS

Billing Unit No.	Reference Section	Description	Unit	Quantity	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>	<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>(9)</u>
N1	7.7	Fuse link, 3 Amp.	Ea.	225				
N2	7.7	Fuse link, 6 Amp.	Ea.	120				
N3	7.7	Fuse link, 10 Amp.	Ea.	10				
N4	7.7	Fuse link, 15 Amp.	Ea.	40				
N5	7.7	Fuse link, 20 Amp.	Ea.	30				
N6	7.7	Fuse link, 25 Amp.	Ea.	30				
N7	7.7	Fuse link, 30 Amp.	Ea.	30				
N8	7.3	Series coil, 70 Amp. Ea. for hydraulic re- closer, McGraw Edison Type 4E, or equal	Ea.	3				
N9	7.3	Series coil, 100 Amp. Ea. for hydraulic recloser, McGraw Edison type 4E, or equal.	Ea.	3				

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TYPE N - SUPPLY ONLY MATERIAL UNITS (Continued)

Billing Unit No.	Reference Section	Description	Unit	Quantity	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
N10	7.3	Series coil, 140 Amp. Ea. for hydraulic recloser, McGraw Edison Type 4E, or equal.		3				
N11	7.3	Series coil, 200 Amp. for Hydraulic recloser, McGraw Edison type 4E, or equal.	Ea.	3				
N12	7.5	Lightning arrester, 18 kV.	Ea.	30				
N13	7.4	Fuse cutout, 25 kV, non-load-break type, 100 amp.	Ea.	30				
N14	7.4	Fuse cutout, 25 kV load break type, 100 ampere.	Ea.	12				
N15	7.6	Combination arrester-Ea. cutout.		30				
N16	7.16, 7.17	Indoor stress relief Ea. cone for 1/OAWG, 25 kV cable, Elastimold Style 155C, or equal.		90				

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TYPE N - SUPPLY ONLY MATERIAL UNITS (Continued)

Billing Unit No.	Reference Section	Description	Unit	Quantity	Unit Price		Extended Price	
					United States Dollars	Indonesian Rupiahs	United States Dollars	Indonesian Rupiahs
<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>	<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>(9)</u>
N17	7.16, 7.17	Outdoor single conductor cable stress relief ter- minal kit for 750 MCM, 25 kV cable, Joslyn Cat. No. 83-00C117V190, for use with Cat. No. J9283-3 terminator.	Ea.	3	_____	_____	_____	_____
N18	7.16, 7.17	Outdoor single conductor cable stress relief terminal kit for 1/0 AWG, 25 kV cable, Joslyn Cat. No. 83- 01C97K160, for use with Cat. No. J9283-2 terminator.	Ea.	12	_____	_____	_____	_____
N19	7.16, 7.17	Straight splice kit for 750 MCM, 25 kV cable, Elastimold type k650S, or equal.	Ea.	10	_____	_____	_____	_____

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TYPE N - SUPPLY ONLY MATERIAL UNITS (Continued)

Billing Unit No.	Reference Section	Description	Unit	Quantity	Unit Price		Extended Price	
					United States Dollars	Indonesian Rupiahs	United States Dollars	Indonesian Rupiahs
<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>	<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>(9)</u>
N20	7.16, 7.17	Straight splice kit for 1/0 AWG, 25 kV cable, Elastimold Style 25S, or equal.	Ea.	10				
N21	7.17, 7.18	Vinyl plastic electrical tape, 1000 volts per mil minimum, 3/4 inch by 44 ft. roll, Minnesota Mining and Manufacturing Co. Tape No. 33, or equal.	Roll	100				
N22	7.8	Single-pole hook- operated vertically mounted disconnect.	Ea.	90				

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TYPE N - SUPPLY ONLY MATERIAL UNITS (Continued)

Billing Unit No.	Reference Section	Description	Unit	Quantity	Unit Price		Extended Price	
					United States Dollars	Indonesian Rupiahs	United States Dollars	Indonesian Rupiahs
<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>	<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>(9)</u>
N23	7.22	Photoelectric Control for street lights	Ea.	100				
N24	7.22	Photoelectric Control Adapter	Ea.	20				
N25	7.22	Street Light Control Relay with Adapter for Photo Control (60 ampere)	Ea.	20				
N26	7.22	Street Light Control Relay with Adapter for Photo Control (30 ampere)	Ea.	50				
<b>TOTAL</b>								

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TYPE P - POLE UNITS

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A pole unit consists of one wood pole in place. The pole unit shall include a galvanized steel pole dating nail dated for the year 1974. The pole will be furnished by the Owner. It does not include the pole top assembly unit or other parts attached to the pole. The first digit(s), following the prefix "P" in the pole Billing Unit No. indicate the length of the pole; the last digit shows the classification per ANSI. (Example: P10-5 means a pole 10 meters long, class 5).

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Billing Unit No. (1)	Pole Size and Class (2)	Quantity of Units (3)	Unit Price		Extended Price	
			United States Dollars (4)	Indonesian Rupiahs (5)	United States Dollars (6)	Indonesian Rupiahs (7)
P1	P9-5, P10-5	6,000				
P2	P11-5, P12-5, P12-4	7,500				
P3	P13-4, P14-4, P15-4	1,000				
<b>TOTAL</b>						

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TYPE Q - TREE TRIMMING AND REMOVAL UNITS

The three (3) tree trimming and removal units include trimming trees and felling trees with diameters of 6 inches (15 centimeters) in diameter per 10 meters in length of line route, felling trees with diameters between 6 inches (15 centimeters) and 18 inches (45 centimeters) and felling trees with diameters of 18 inches (45 centimeters) or larger. Measurement of diameter for payment shall be at 1 m above the ground line.

Billing Unit No. (1)	Reference Section No. (2)	Quantity of Units (3)	Unit Price		Extended Price	
			United States Dollars (4)	Indonesian Rupiahs (5)	United States Dollars (6)	Indonesian Rupiahs (7)
Q1	6.3	4,000				
Q2	6.3	4,000				
Q3	6.3	4,000				
TOTAL						

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TYPE UC1 - UNDERGROUND CABLE ASSEMBLY UNITS

Underground distribution construction units include one meter of cable, the laying and pulling of cables, and splicing of cables and other work as required to install the respective cable components of the underground facilities, as applicable on the Drawings and Staking Sheets. It does not include the cable terminations, cable trenching, backfilling, placement of cable bedding, installing conduit or pipe and removing and restoring paved surfaces. Prices include tools as specified in Article 7.17-03. Items UC1-3 through UC1-6 are supply only.

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Unit No.	No. of Units	Unit Prices				Extended Prices				Cable Size and Voltage	
		Labor		Material		Labor & Materials		Labor & Materials			
(1)	(2)	Dollars (3)	Rupiahs (4)	Dollars (5)	Rupiahs (6)	Dollars (7)	Rupiahs (8)	Dollars (9)	Rupiahs (10)	(10)	
						(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)	(2)x(8)	
UC1-1	10,000										750 MCM, 25 kV
UC1-2	5,000										1/0 AWG, 25 kV
UC1-3	3,000	N.A.	N.A.								3/0 AWG, 600 V
UC1-4	1,000	N.A.	N.A.								1/0 AWG, 600 V
UC1-5	3,000	N.A.	N.A.								2 AWG, 600 V
UC1-6	1,000	N.A.	N.A.								4 AWG, 600 V
<b>TOTAL</b>											

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TYPE UC2 - TRENCHING ASSEMBLY UNITS

A trenching assembly unit consists of one (1) lineal meter of trenching in soil, measured parallel to the surface of the ground, to a depth of 500 mm for secondary or 750 mm for primary and a width of 400 mm, including the excavation, backfilling, compacting and covering with bricks or planks. This unit includes all materials and labor required in the repair and/or replacement of streets, roads, drives, fences, lawns, shrubbery, watermains, pipes, pipelines and contents, underground power and telephone facilities, buried sewerage and drainage facilities, and any other units. This unit does not include underground cable facilities installed in the trench or cable bedding assembly units, when required.

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Unit No.	No. of Units	Unit Prices				Extended Prices				Drawing Reference Number	
		Labor		Material		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
UC2-1	5,000										UC-2
UC2-2	2,000										UC-2
<b>TOTAL</b>											

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TYPE UC3 - CABLE BEDDING ASSEMBLY UNITS

A cable bedding assembly unit consists of one (1) lineal meter of five-centimeter bed of clean sand or soil placed in the trench under the cable and a ten-centimeter layer of clean sand or soil backfill over the cable to the width of the trench.

NOTE: The exact location and number of units shall be determined by the Owner after the trenches are open in those areas where rock or other conditions make special bedding necessary.

Unit No.	No. of Units	Unit Prices						Extended Prices		Drawing Reference Number	
		Labor		Materials		Labor & Materials		Labor & Materials			
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars	Rupiahs	Dollars	1,000 Rupiahs		
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
UC3	5,000										UC-3
<b>TOTAL</b>											

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TYPE UC4 - UNDERGROUND PIPE CROSSING ASSEMBLY UNITS

An underground pipe crossing assembly unit consists of one (1) meter of 200 mm concrete pipe, installed in place. This unit includes any excavation, backfilling and tamping necessary for the installation of the pipe. The pipe will be installed at the depth specified by the Owner. Underground cable installed in the pipe is not included in this unit. This unit is required where streets to be crossed cannot be trenched for laying the cable in the normal manner, and it is necessary to pull the cable through the crossing.

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Unit No.	No. of Units	Unit Prices				Extended Prices		Drawing Reference Number			
		Labor		Material		Labor & Materials					
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars	1,000 Rupiahs				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
						(3)+(5)	(4)+(6)	(2)x(7)	(2)x(8)		
UC4-1	250										UC-4
UC4-2	100										UC-4
TOTAL											

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.01 - SCHEDULE OF PRICES

Sheet 1 of 1

TYPE UC5 - PAVEMENT ASSEMBLY UNITS

A pavement assembly unit consists of the labor and material necessary to remove and restore one (1) lineal meter of concrete pavement, measured along the route of the cable. All work shall be performed in accordance with the requirements of local authorities. Any trenching which may be necessary is included in this unit.

Unit No.	No. of Units	Unit Prices				Extended Prices				
		Labor		Material		Labor & Materials		Labor & Materials		
		Dollars	Rupiahs	Dollars	Rupiahs	Dollars (7)	Rupiahs (8)	Dollars (9)	1,000 Rupiahs (10)	
(1)	(2)	(3)	(4)	(5)	(6)	(3)+(5)	(4)+(6)	(2) x (7)	(2) x (8)	
UC5	50									
<b>TOTAL</b>										
<b>TOTAL ALL UC UNITS</b>										

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PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.02 LIST OF MAJOR ITEMS OF CONSTRUCTION EQUIPMENT

List the major items of construction equipment which the Bidder proposes to use on the work. This equipment does not include tools, construction equipment, test equipment and hot line tools and equipment to be furnished by the Bidder for the Owner's use.

<u>Equipment</u>	<u>Age</u>	<u>Condition</u>	<u>Location</u>	<u>Ownership</u>
------------------	------------	------------------	-----------------	------------------

PART I - BID FORM

SECTION 1.3 - NEW CONSTRUCTION

1.3.03 MATERIALS SUPPLIED BY OWNER

A. The Owner will supply at his warehouse or pole yard, locally fabricated timber products such as poles, crossarms and anchor logs.

The estimated time of availability is as follows:

5,000	3-1/2" x 4-1/2" x 8' crossarms	March 1, 1974
4,500	anchor logs	March 1, 1974
1,000	poles per month from November 1, 1973	
	(Total 14,500 poles) to February 1, 1975	

Miscellaneous treated timber or special fittings for local steel poles will be supplied on 90 days notice.

B. At his option, the Owner may supply secondary, services or neutral spool insulators.

Should Owner furnish these spool insulators, the unit price reduction per spool will be: \$ \_\_\_\_\_ Rps \_\_\_\_\_

Units requiring

spool Insulators: A 1, 2, 3, 6, 7, 8  
C 1, 2, 3, 4, 5, 6, 8, 9, 12, 13  
J1-1, J4-2, J4-3, M 4, 8, 16, 18, 21

C. The Contractor and the Engineer shall inspect the materials to be supplied by the Owner in the Owner's storage facilities. Materials which are undamaged shall be accepted by the Contractor in writing. Any materials damaged by the Contractor shall not be installed and shall remain the property of the Contractor. The Owner shall be reimbursed for each such item of damaged material, which, in the opinion of the Engineer is not suitable for installation and the cost shall be the cost of the material at the point of delivery to the Contractor.

PART I - BID FORM

SECTION 1.4 - REMOVAL AND TRANSFER

1.4.01 - SCHEDULE OF PRICES

Sheet 1 of 1

TYPE R - REMOVAL UNITS

A removal unit consists of the removal of all materials and appurtenances shown to be removed on the respective removal drawings.

Billing Unit No. (1)	Reference Drawing No. (2)	Quantity of Units (3)	Unit Price		Extended Price	
			United States Dollars (4)	Indonesian Rupiah (5)	United States Dollars (6)	Indonesian Rupiah (7)
R1	R1-1, R1-2 R1-3	100	_____	_____	_____	_____
R2	R2-1, R2-2, R2-3, R2-4	80	_____	_____	_____	_____
R3	R3-1, R3-2	10	_____	_____	_____	_____
R5	R5	10	_____	_____	_____	_____
R6	R6	10	_____	_____	_____	_____
R7	R7	10	_____	_____	_____	_____
R8	R8	5	_____	_____	_____	_____
<b>TOTAL</b>			_____	_____	_____	_____

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PART I - BID FORM

SECTION 1.4 - REMOVAL AND TRANSFER

1.4.01 - SCHEDULE OF PRICES

Sheet 1 of 1

TYPE T - TRANSFER UNITS

A transfer unit consists of the transfer of all materials and appurtenances from one location to another as shown on the respective transfer drawings.

Billing Unit No. (1)	Description and Reference Drawing No. (2)	Quantity of Units (3)	Unit Price		Extended Price	
			United States Dollars (4)	Indonesian Rupiahs (5)	United States Dollars (6)	Indonesian Rupiahs (7)
T1	Transfer one street light assembly, Drawing R9-1 or R9-2, from existing location to another location.	50	_____	_____	_____	_____
T2	Transfer one secondary phase or neutral wire or street light wire from an existing position shown on Drawing R2 or R3 to a new insulated clevis.	50	_____	_____	_____	_____
<b>TOTAL</b>			_____	_____	_____	_____

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PART I - BID FORM

SECTION 1.5 - TOOLS AND CONSTRUCTION EQUIPMENT

1.5.01 - SCHEDULE OF PRICES

Sheet 1 of 4

TYPE S - TOOLS

Billing Unit No. (1)	Ref erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
S1	7.20-03	Side cutting plier, 7 inch	Ea.	10				
S2	7.20-03	Thread holding plier	Ea.	10				
S3	7.20-03	Side cutting plier, 9 inch	Ea.	20				
S4	7.20-03	Oblique cutting plier	Ea.	10				
S5	7.20-03	Adjustable wrench, 8 inch	Ea.	10				
S6	7.20-03	Adjustable wrench, 12 inch	Ea.	20				
S7	7.20-03	Adjustable wrench, 15 inch	Ea.	5				
S8	7.20-03	Linemen's wrench	Ea.	20				
S9	7.20-03	Hack saw	Ea.	10				
S10	7.20-03	Hack saw blades	Box of 100	2				
S11	7.20-03	Electrician's hammer	Ea.	10				
S12	7.20-03	Ball pein hammer	Ea.	10				

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PART I - BID FORM

SECTION 1.5 - TOOLS AND CONSTRUCTION EQUIPMENT

1.5.01 - SCHEDULE OF PRICES

Sheet 2 of 4

TYPE S - TOOLS (Continued)

Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
S13	7.20-03	Hand drilling hammer	Ea.	10	_____	_____	_____	_____
S14	7.20-03	Linemen's hammer	Ea.	20	_____	_____	_____	_____
S15	7.20-03	Folding wood rule	Ea.	20	_____	_____	_____	_____
S16	7.20-03	Linemen's Knife	Ea.	20	_____	_____	_____	_____
S17	7.20-03	Bit brace	Ea.	10	_____	_____	_____	_____
S18	7.20-03	Pole bit, 11/16 inch	Ea.	20	_____	_____	_____	_____
S19	7.20-03	Pole bit, 9/16 inch	Ea.	20	_____	_____	_____	_____
S20	7.20-03	Chicago grip, 4 - 1/0 AWG	Ea.	20	_____	_____	_____	_____
S21	7.20-03	Chicago grip, 1/0 - 3/0 AWG	Ea.	10	_____	_____	_____	_____
S22	7.20-03	Chicago grip, 336 MCM	Ea.	10	_____	_____	_____	_____
S23	7.20-03	Adjustable climbers	Pr.	25	_____	_____	_____	_____
S24	7.20-03	Replaceable gaffs	Pr.	25	_____	_____	_____	_____

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SECTION 1.5 - TOOLS AND CONSTRUCTION EQUIPMENT

1.5.01 - SCHEDULE OF PRICES

Sheet 3 of 4

TYPE S - TOOLS (Continued)

Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
S25	7.20-03	Gaff gauge	Ea.	5				
S26	7.20-03	Body belt	Ea.	25				
S27	7.20-03	Safety Strap	Ea.	25				
S28	7.20-03	Canvas bucket	Ea.	25				
S29	7.20-03	Manila rope, 3/8 inch, 75 ft. long	Ea.	20				
S30	7.20-03	Safety lanyard	Ea.	6				
S31	7.20-03	Aerial basket boom strap	Ea.	6				
S32	7.20-03	Pole tong	Ea.	5				
S33	7.20-03	Pole pike, 2 inch x 10 ft	Ea.	10				
S34	7.20-03	Pole pike, 2 inch x 16 ft	Ea.	10				
S35	7.20-03	Coffing hoist, 1500 lb	Ea.	10				
S36	7.20-03	Coffing hoist, 6000 lb	Ea.	5				
<b>TOTAL</b>								

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PART I - BID FORM

SECTION 1.5 - TOOLS AND CONSTRUCTION EQUIPMENT

1.5.01 - SCHEDULE OF PRICES

Sheet 1 of 1

TYPE U - CONSTRUCTION EQUIPMENT

Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
U1	7.20-03	Pole dinkey, 1 ton	Ea.	2				
U2	7.20-03	Pole trailer, 3 ton	Ea.	2				
U3	7.20-03	Cable reel transport trailer	Ea.	3				
U4	7.20-03	Ladder truck	Ea.	5				
U5	7.20-03	Two bucket aerial device, 36 ft.	Ea.	2				
U6	7.20-03	Two bucket aerial device, 50 ft.	Ea.	1				
U7	7.20-03	Line truck	Ea.	4				
U8	7.20-03	Self propelled hydraulic crane	Ea.	1				
U9	7.20-03	Fork lift truck	Ea.	1				
U10	7.20-03	A-Frame and chain falls	Ea.	1				
<b>TOTAL</b>								

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PART I - BID FORM

SECTION 1.5 - TOOLS AND CONSTRUCTION EQUIPMENT

1.5.02 - LIST OF TOOLS

List hereunder the maintenance tools to be furnished with Billing Unit No. U8 - Self Propelled Hydraulic Crane. The cost of these tools shall be included in the lump sum figure bid for furnishing the crane. (Reference: Part VII, Sub-Section 7.20-04, Page VII-20-22).

PART I - BID FORM

SECTION 1.6 - TEST EQUIPMENT

1.6.01 - SCHEDULE OF PRICES

Sheet 1 of 1

Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
W1	7.21	Voltmeter, indicating, 0-150/300/600 volt	Ea.	4				
W2	7.21	Voltmeter, recording, 90-140 and 180-280 volt	Ea.	4				
W3	7.21	Volt-ammeter, clamp-on type	Ea.	3				
W4	7.21	Thermal ammeter for indoor and pad-mounted transformers	Ea.	3				
W5	7.21	Max-i-meter, hot line type	Ea.	6				
W6	7.21	Thermal recording ammeter, for pole mounting	Ea.	3				
W7	7.21	Earth gradient fault locator	Ea.	1				
W8	7.21	Oil circuit recloser test set	Ea.	1				
<b>TOTAL</b>								

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SECTION 1.7 - TRAINING OF PERSONNEL

1.7.01 - SCHEDULE OF PRICES

Sheet 1 of 10

Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X1	8.2-02	Hot line training of 17 personnel (3 foremen, 8 linemen and 6 groundmen) in primary hot line work	Lump Sum	1				
<u>HOT LINE EQUIPMENT FOR PRIMARY WORK</u>								
X2-1	8.2-03	Gloss restorer, 1 pint	Ea.	2				
X2-2	8.2-03	Epoxiglass bond kit	Ea.	2				
X2-3	8.2-03	Hot stick wiping cloth	Ea.	24				
X2-4	8.2-03	Hot stick tester	Ea.	2				
X2-5	8.2-03	Crossarm tool hanger	Ea.	2				
X2-6	8.2-03	Tool rack	Ea.	4				
X2-7	8.2-03	Lever lift tool set	Ea.	2				
X2-8	8.2-03	Wire tong, 2"x8'-0"	Ea.	4				

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SECTION 1.7 - TRAINING OF PERSONNEL

1.7.01 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X2-9	8.2-03	Wire tong, 2-1/2"x16'-0"	Ea.	2				
X2-10	8.2-03	Wire tong saddle with 2-1/2" clamp	Ea.	4				
X2-11	8.2-03	Wire tong saddle with 2" clamp	Ea.	4				
X2-12	8.2-03	Saddle extension	Ea.	6				
X2-13	8.2-03	Crossarm saddle	Ea.	4				
X2-14	8.2-03	Snatch block	Ea.	4				
X2-15	8.2-03	Hand line hook	Ea.	4				
X2-16	8.2-03	Rope snubbing bracket	Ea.	2				
X2-17	8.2-03	Saddle with clevis	Ea.	2				
X2-18	8.2-03	Wire tong pole clevis	Ea.	2				
X2-19	8.2-03	Dual auxiliary arm	Ea.	2				
X2-20	8.2-03	Transformer gin	Ea.	2				

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SECTION 1.7 - TRAINING OF PERSONNEL

1.7.01 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X2-21	8.2-03	Strain link stick	Ea.	6				
X2-22	8.2-03	Spiral link stick	Ea.	6				
X2-23	8.2-03	Roller link stick	Ea.	6				
X2-24	8.2-03	Double sheave rope blocks	Ea.	6				
X2-25	8.2-03	Triple sheave rope blocks	Ea.	6				
X2-26	8.2-03	1/2" rope, polypropylene	600 ft	2				
X2-27	8.2-03	1/4" rope, polypropylene	200 ft	2				
X2-28	8.2-03	Hook-on ammeter tongs	Ea.	2				
X2-29	8.2-03	Wire grip, No. 3 - 4/0 AWG	Ea.	4				
X2-30	8.2-03	Wire grip, No. 1/0 AWG - 400 MCM	Ea.	4				
X2-31	8.2-03	Wire grip, 1/2" - 1/2" steel	Ea.	4				
X2-32	8.2-03	Phase tester	Ea.	2				

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1.7.01 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X2-33		Not used						
X2-34	8.2-03	Pivot platform	Ea.	4				
X2-35	8.2-03	Tripod railing	Ea.	4				
X2-36	8.2-03	Rotary blade and prong tie stick	Ea.	2				
X2-37	8.2-03	Wire cutter	Ea.	2				
X2-38	8.2-03	Grip-all clamp stick, 6-1/2 ft.	Ea.	2				
X2-39	8.2-03	Grip-all clamp stick, 8-1/2 ft.	Ea.	2				
X2-40	8.2-03	Wire holding stick, 6-1/2 ft.	Ea.	2				
X2-41	8.2-03	Wire holding stick, 8-1/2 ft.	Ea.	2				
X2-42	8.2-03	Flexible insulated wrench	Ea.	2				

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SECTION 1.7 - TRAINING OF PERSONNEL

1.7.C1 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X2-43	8.2-03	All angle cog wrench	Ea.	2				
X2-44	8.2-03	Cleaning brush, circular type	Ea.	4				
X2-45	8.2-03	Cleaning brush, V type	Ea.	4				
X2-46	8.2-03	Universal pole	Ea.	2				
X2-47	8.2-03	Pin holder	Ea.	4				
X2-48	8.2-03	Ratchet wrench	Ea.	4				
X2-49	8.2-03	Cotter key remover	Ea.	4				
X2-50	8.2-03	Screw driver	Ea.	4				
X2-51	8.2-03	Chuck blank	Ea.	4				
X2-52	8.2-03	Mirror	Ea.	4				
X2-53	8.2-03	Shepherd hooks	Ea.	2				
X2-54	8.2-03	Adjustable insulator fork	Ea.	4				
X2-55	8.2-03	Cotter key tool	Ea.	4				

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Billing Unit No. (1)	Reference Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X2-56	8.2-03	Universal adapter	Ea.	4				
X2-57	8.2-03	Disconnect switch adapter	Ea.	4				
X2-58	8.2-03	Folding rule adapter, less rule	Ea.	4				
X2-59	8.2-03	Conductor cover	Ea.	12				
X2-60	8.2-03	Insulator cover set	Ea.	6				
X2-61	8.2-03	Crossarm cover	Ea.	6				
X2-62	8.2-03	Deadend cover	Ea.	12				
X2-63	8.2-03	Pole cover, 6 ft.	Ea.	4				
X2-64	8.2-03	Pole cover, 4 ft.	Ea.	4				
X2-65	8.2-03	Pole cover, 2 ft.	Ea.	4				
X2-66	8.2-03	Pole cover, 1 ft.	Ea.	4				
X2-67	8.2-03	Rubber gloves, 20 kV	Pr.	10				
X2-68	8.2-03	Leather cuff protectors	Pr.	10				

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SECTION 1.7 - TRAINING OF PERSONNEL

1.7.01 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price		
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)	
X2-69	8.2-03	Glove bag	Ea.	10					
X2-70	8.2-03	Rubber blanket	Ea.	8					
X2-71	8.2-03	Slotted rubber blanket	Ea.	8					
X2-72	8.2-03	Line hose	Ea.	12					
X2-73	8.2-03	Glove inflator	Ea.	2					
X2-74	8.2-03	Blanket pin	Ea.	20					
X2-75	8.2-03	Hot line tool trailer	Ea.	2					
TOTAL VALUE OF ITEMS X2-1 THROUGH X2-75									

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1.7.01 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Reference Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X3	8.2-04	Hotline training of 35 personnel (3 foremen, 18 linemen and 14 groundmen) in secondary hotline work.	Lump Sum	1				
		<u>HOT LINE EQUIPMENT FOR SECONDARY WORK</u>						
X4-1	8.2-05	Zip on blanket	Ea.	25				
X4-2	8.2-05	Slotted blanket	Ea.	20				
X4-3	8.2-05	Blanket pins	Ea.	100				
X4-4	8.2-05	Line hose	Ea.	100				
X4-5	8.2-05	Secondary rack	Ea.	5				
X4-6	8.2-05	Rubber gloves	Pr.	15				
X4-7	8.2-05	Protector gloves	Pr.	15				
X4-8	8.2-05	Wire grip, No. 6-2 AWG Cu.	Ea.	10				

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1.7.01 - SCHEDULE OF PRICES

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Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X4-9	8.2-05	Wire grip, No. 6-2 AWG Al.	Ea.	10				
X4-10	8.2-05	Wire grip, No. 2-4/0 Cu.	Ea.	10				
X4-11	8.2-05	Wire grip, No. 3-4/0 Al.	Ea.	10				
X4-12	8.2-05	Wire grip, 1/4" - 1/2" steel	Ea.	10				
X4-13	8.2-05	Canvas tool bucket	Ea.	5				
X4-14	8.2-05	Haven grip	Ea.	10				
X4-15	8.2-05	One ton nylon hoist	Ea.	10				
X4-16	8.2-05	One ton chain hoist	Ea.	5				
X4-17	8.2-05	Snatch block	Ea.	10				
X4-18	8.2-05	Double sheave rope blocks	Ea.	10				
X4-19	8.2-05	1/2" polypropylene rope	600 ft.	5				
X4-20	8.2-05	Utility platform	Ea.	10				

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Contract Documents 629-2  
Volume I

PART I - BID FORM

SECTION 1.7 - TRAINING OF PERSONNEL

1.7.01 - SCHEDULE OF PRICES

Sheet 10 of 10

Billing Unit No. (1)	Ref- erence Section (2)	Description (3)	Unit (4)	Quantity (5)	Unit Price		Extended Price	
					United States Dollars (6)	Indonesian Rupiahs (7)	United States Dollars (8)	Indonesian Rupiahs (9)
X4-21	8.2-05	Hand line hook	Ea.	10				
X4-22	8.2-05	Glove bag	Ea.	15				
X4-23	8.2-05	Line hose bag	Ea.	5				
TOTAL VALUE OF ITEMS X4-1 THROUGH X4-23								

I-7.01-10

Contract Documents 629-2  
Volume I

PART I - BID FORM

Section 1.7 - Training of Personnel

1.7-01 - SCHEDULE OF PRICES

<u>Billing Unit</u>	<u>Reference</u>	<u>Unit</u>	<u>United States Dollars</u>	<u>Indonesian Rupiahs</u>
X-5	8.3 Safety and First Aid	Lump Sum		

PART I - BID FORM

SECTION 1.8 - WAREHOUSE

1.8.01 - SCHEDULE OF PRICES

<u>Billing Unit (1)</u>	<u>Ref- erence (2)</u>	<u>Unit</u>	<u>United States Dollars (3)</u>	<u>Indonesian Rupiahs (4)</u>
Warehouse	Part IX	Lump Sum	_____	_____

PART I - BID FORM

Sheet 1 of 3

SECTION 1.9 - SUMMARY OF SCHEDULE OF PRICES

1. SECTION 1.3 - NEW CONSTRUCTION

<u>Type</u>	<u>Description</u>	<u>Totals from Schedule of Prices</u>			
		<u>United States Dollars</u>	<u>Local Costs</u> <u>Indonesian Rupiahs X 10<sup>3</sup></u>	<u>Equivalent Dollars</u>	<u>Total Equivalent Dollars</u>
A	Single Phase Pole Top Assembly Units	_____	_____	_____	_____
B	Three Phase Pole Top Assembly Units	_____	_____	_____	_____
D	Conductor Assembly Units	_____	_____	_____	_____
E	Guy Assembly Units	_____	_____	_____	_____
F	Anchor Assembly Units	_____	_____	_____	_____
G	Transformer Assembly Units	_____	_____	_____	_____
J	Primary and Secondary Assembly Units	_____	_____	_____	_____
K	Service Assembly Units	_____	_____	_____	_____
M	Miscellaneous Assembly Units	_____	_____	_____	_____
N	Supply Only Material Units	_____	_____	_____	_____
P	Pole Units	_____	_____	_____	_____
Q	Tree Trimming and Removal Units	_____	_____	_____	_____
UC	Underground Cable Assembly Units	_____	_____	_____	_____
TOTAL SECTION 1.3		_____	_____	_____	_____



PART I - BID FORM

Sheet 2 of 3

SECTION 1.9 - SUMMARY OF SCHEDULES OF PRICES (Continued)

		<u>Totals from Schedules of Prices</u>			
		<u>United States Dollars</u>	<u>Local Costs</u>		<u>Total Equivalent Dollars</u>
			<u>Indonesian Rupiahs X 10<sup>3</sup></u>	<u>Equivalent Dollars</u>	
<u>2.</u>	SECTION 1.4 REMOVAL AND TRANSFER				
R.	Removal Units	_____	_____	_____	_____
T.	Transfer Units	_____	_____	_____	_____
	TOTALS SECTION 1.4	_____	_____	_____	_____
<u>3.</u>	SECTION 1.5 - TOOLS AND CONSTRUCTION EQUIPMENT				
S.	Tools	_____	_____	_____	_____
U.	Construction Equipment	_____	_____	_____	_____
	TOTALS SECTION 1.5	_____	_____	_____	_____
<u>4.</u>	SECTION 1.6 - TEST EQUIPMENT				
<u>5.</u>	SECTION 1.7 - TRAINING OF PERSONNEL				
<u>Type</u>	<u>Description</u>				
X1	Hot Line Training for Primary Lines	_____	_____	_____	_____
X2	Equipment for Primary Hot Line Work	_____	_____	_____	_____
X3	Hot Line Training for Secondary Lines	_____	_____	_____	_____
X4	Equipment for Secondary Hot Line Work	_____	_____	_____	_____
X5	Safety and First Aid	_____	_____	_____	_____
	TOTALS SECTION 1.7	_____	_____	_____	_____
<u>6.</u>	SECTION 1.8 - WAREHOUSE				

PART I - BID FORM

Sheet 2 of 3

SECTION 1.9 - SUMMARY OF SCHEDULES OF PRICES (Continued)

<u>Section Number</u>	<u>Title</u>	<u>Totals from Schedules of Prices</u>			
		<u>United States Dollars</u>	<u>Local Costs</u>		<u>Total Equivalent Dollars</u>
			<u>Indonesian Rupiahs X 10<sup>3</sup></u>	<u>Equivalent Dollars</u>	
1.3	New Construction	_____	_____	_____	
1.4	Removal and Transfer	_____	_____	_____	
1.5	Tools and Construction Equipment	_____	_____	_____	
1.6	Test Equipment	_____	_____	_____	
1.7	Training of Personnel	_____	_____	_____	
1.8	Warehouse	_____	_____	_____	
	Totals	_____	_____	_____	

PART I - BID FORM

SECTION 1.10 - PROPOSAL GUARANTEE

Fill in bid bond on next page or append a certified check, cashier's check, or an irrevocable letter of credit.

BID BOND FORM

Date Bond Executed (Must  
not be later than bid  
opening date)

PRINCIPAL (Legal name and business address Type of Organization ("X" one)  
(bidder)

Individual  Partnership  
 Joint Venture  Corporation  
State of Incorporation:

SURETY(IES) (Name and Business Address)

Penal Sum of Bond				Bid Identification	
Percent	Amount Not to Exceed			Bid Date	Invitation No.
of Bid	Million(s)	Thousand(s)	Hundred(s)	Cents	

For: Furnish and Erect Facilities  
for the Rehabilitation and  
Expansion of the Distribution  
System

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the Perusahaan Listrik Negara, Ministry of Public Works and Power (hereinafter called the Owner) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally: Provided, That where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted the bid identified above.

NOW, THEREFORE, if the Principal, upon acceptance by the Owner of his bid identified above, within the period specified therein for acceptance one-hundred twenty (120) calendar days, shall execute such further contractual documents, if any, and give such bond(s) as may be required by the terms of the bid as accepted within thirty (30) calendar days after receipt of the forms by him, or in the event of failure so to execute such further contractual documents and give such bonds, if the Principal shall pay the Owner for any cost of procuring the work which exceeds the amount of his bid, then the above obligation shall be void and of no effect.

BID BOND FORM (Continued)

Each Surety executing this instrument hereby agrees that its obligation shall not be impaired by any extension(s) of the time for acceptance of the bid that the Principal may grant to the Owner, notice of which extension(s) to the Surety(ies) being hereby waived; provided that such waiver of notice shall apply only with respect to extensions aggregating not more than sixty (60) calendar days in addition to the period originally allowed for acceptance of the bid.

IN WITNESS WHEREOF, the Principal Surety(ies) have executed this bid bond and have affixed their seals on the date set forth above.

PRINCIPAL			
	1.	2.	
Signature(s)		(Seal)	Corporate Seal
Name & Title(s) (Typed)		2.	
INDIVIDUAL SURETIES			
	1.	2.	
Signature(s)		(Seal)	(Seal)
Name(s) (Typed)	1.	2.	
CORPORATE SURETY(IES)			
	Name & Address	State of Inc:	Liability Limit:
Surety A	1.	2.	
	Signature(s)		Corporate Seal
Surety B	Name(s) & Title (s) (Typed)	1.	2.
	Signature(s)		Corporate Seal
Surety C	Name & Address	State of Inc:	Liability Limit:
	1.	2.	
Surety D	Signature(s)		Corporate Seal
	Name(s) & Title(s) (Typed)	1.	2.
Surety E	Name & Address	State of Inc:	Liability Limit:
	1.	2.	
Surety F	Signature(s)		Corporate Seal
	Name(s) & Title(s) (Typed)	1.	2.

BID BOND FORM (Continued)

CORPORATE SURETY(IES) (Continued)			
Surety E	Name & Address	State of Inc:	Liability Limit:
	1.	2.	
	Signature(s)		Corporate Seal
	Name(s) & 1.	2.	
Surety F	Title(s) (Typed)		
	Name & Address	State of Inc:	Liability Limit:
	1.	2.	
	Signature(s)		Corporate Seal
Surety G	Name(s) & 1.	2.	
	Title(s) (Typed)		
	Name & Address	State of Inc:	Liability Limit:
	1.	2.	
	Signature(s)		Corporate Seal
	Name(s) & 1.	2.	
	Title(s) (Typed)		

INSTRUCTIONS

1. There shall be no deviation from this form without approval by the Owner.

2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.

3. The minimum penal sum of the bond shall be ten percent (10%) of the total bid price.

4. (a) Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Owner may require.

BID BOND FORM (Continued)

INSTRUCTIONS (Continued)

5. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal."

6. The name of each person signing this bid bond should be typed in the space provided.

PART I - BID FORM

SECTION 1.11 - SPARE PARTS

1.11.01 GENERAL

List hereunder the spare parts recommended by the manufacturers for all equipment being supplied under this contract.

The purchase of any or all of the recommended spare parts will be at the option of the Owner.

The option will be exercised before January 1, 1975.

The cost of spare parts is for budget purposes only and will not be considered in bid evaluation.



1.11.02 MANUFACTURER'S RECOMMENDED SPARE PARTS FOR DISTRIBUTION EQUIPMENT

List hereunder the spare parts which are recommended by the manufacturer for purchase.

The purchase of any or all of the recommended spare parts will be at the option of the Owner. The option will be exercised before January 1, 1975.

<u>Description</u>	<u>Quantity</u>	<u>Unit Price</u> <u>United States</u> <u>Dollars</u> <u>(U.S. Costs)</u>	<u>Amount</u> <u>United States</u> <u>Dollars</u> <u>(U.S. Costs)</u>
Distribution Transformers			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**Line Voltage Regulators**


**Oil Circuit Reclosers**


**Fuse Cutouts**


**Lightning Arresters**


**Switches**


Miscellaneous


1.11.03 MANUFACTURER'S RECOMMENDED SPARE PARTS FOR TOOLS AND  
CONSTRUCTION EQUIPMENT

List hereunder the spare parts which are recommended by the manufacturer for purchase.

The purchase of any or all of the recommended spare parts will be at the option of the Owner. The option will be exercised before January 1, 1975.

<u>Description</u>	<u>Quantity</u>	<u>Unit Price</u> United States Dollars (U.S. Costs)	<u>Amount</u> United States Dollars (U.S. Costs)
Pole dinkey, 1 ton			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
Pole trailer, 3 ton			
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Cable reel transport trailer


Ladder truck


Two bucket aerial device, 36 ft.


Two bucket aerial device, 50 ft.


Line truck


Self propelled hydraulic crane


Fork lift truck


1.11.04 MANUFACTURER'S RECOMMENDED SPARE PARTS FOR TEST EQUIPMENT

List hereunder the spare parts which are recommended by the manufacturer for purchase.

The purchase of any or all of the recommended spare parts will be at the option of the Owner. The option will be exercised before January 1, 1975.

<u>Description</u>	<u>Quantity</u>	<u>Unit Price</u> <u>United States</u> <u>Dollars</u> <u>(U.S. Costs)</u>	<u>Amount</u> <u>United States</u> <u>Dollars</u> <u>(U.S. Costs)</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

PART I - BID FORM

SECTION 1.12 SUBMISSIONS BY CONTRACTOR

1.12.01 MANUFACTURER'S INFORMATION

1.12.01-01 GENERAL

Within sixty days after signing the Contract the Contractor shall submit manufacturer's information for the various parts of the Contract as listed in this section. The manufacturers shall have designed, manufactured, and had in satisfactory commercial operation materials and equipment comparable with those required for a period of not less than 2 years prior to submission.

1.12.01-02 MANUFACTURER'S INFORMATION FOR DISTRIBUTION EQUIPMENT

For each major material and equipment item including; distribution transformers, line voltage regulators, oil circuit reclosers, open-type fuse cutouts, lightning arresters, combination arrester-cutouts, fuse links, switches, bare aluminum conductor, guy wire, 600 volt service cable, insulators (all types), underground cable-25KV, underground cable 600 volt and underground cable accessories; the Contractor shall append the following information for each manufacturer that will furnish the respective items:

- A. Name and address of manufacturer.
- B. Length of time organization has been in business as a manufacturer of equipment similar to that being furnished.
- C. Work similar in character to that required, which organization has completed:

<u>Year Commissioned</u>	<u>Type and Description of Material or Equipment Furnished and Name and Address of Owner</u>	<u>Approximate Contract Amount</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____



1.12.01-03 MANUFACTURER'S INFORMATION FOR TOOLS AND CONSTRUCTION EQUIPMENT

For each tool and construction equipment manufacturer, the Contractor shall append the following information:

- A. Name and address of manufacturer
- B. Length of time organization has been in business as a manufacturer of equipment similar to that being furnished.
- C. Work similar in character to that required for construction equipment which organization has completed:

<u>Year Commissioned</u>	<u>Type and Description of Construction Equipment Furnished and Name and Address of Owner</u>	<u>Approximate Contract Amount</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

1.12.01-04 MANUFACTURER'S INFORMATION ON TEST EQUIPMENT

For each test equipment manufacturer, the Contractor shall append the following information:

- A. Name and address of manufacturer.
- B. Length of time organization has been in business as a manufacturer of equipment similar to that being furnished.
- C. Work similar in character to that required, which organization has completed:

<u>Year Commissioned</u>	<u>Type and Description of Major Test Equipment Furnished and Name and Address of Owner</u>	<u>Approximate Contract Amount</u>
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____

1.12.01-5 MANUFACTURER'S INFORMATION ON HOT LINE TOOLS

The Contractor shall furnish the following information concerning the manufacturers of hot line line tools and equipment.

- A. Name and address of manufacturer.
- B. Length of time organization has been in business as a manufacturer of equipment similar to that being furnished.
- C. Typical work similar in character to that required, which organization has completed:

Year	Type and Description of Material or Equipment Furnished and Name and Address of Owner	Approximate Contract Amount
1. _____	_____ _____	_____
2. _____	_____ _____	_____
3. _____	_____ _____	_____

1.12.0-06 - MANUFACTURER'S INFORMATION ON WAREHOUSE

The Contractor shall append the following information:

- A. Name and address of manufacturer.
- B. Length of time organization has been in business as a manufacturer of warehouses.
- C. History of buildings furnished similar in character to that required for this work:

<u>Year Furnished</u>	<u>Description of Building</u>	<u>Approximate Contract Amount</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

1.12.01-07 PERFORMANCE DATA ON TRANSFORMERS per 7.1-06

Total I<sup>2</sup>R Winding Losses Plus Core Losses at 85°C:

Percentage of Full Load

No load	25%	50%	75%	100%	125%
_____	_____	_____	_____	_____	_____

Percent voltage regulation at full load at

Unity power factor \_\_\_\_\_

0.80 power factor \_\_\_\_\_

1.12.01-08 TRAINING INSTRUCTOR'S INFORMATION

The training instructor(s) shall have had not less than two years experience in training line construction personnel and not less than eight years experience as a lineman working on primary distribution lines with not less than three years experience in hot line work on lines of 15 kV or higher.

The underground training instructor should have not less than two years experience in the installation of XLP insulated cables, including splicing and terminating such cables of 15 kV or higher voltage class.

The Contractor shall provide the following information concerning the training instructor(s):

- A. Name and address of the company for whom the instructor(s) is employed.
- B. Length of time employed with the company.
- C. Major type of business of company.
- D. Length of time company has been involved with training line construction personnel.
- E. Name and address of instructor(s) with personnel resume since first employment in overhead line construction and/or underground construction.
- F. Training work performed by each instructor:

<u>Dates Training Performed</u>	<u>Duration of Training Program</u>	<u>Number of Personnel Trained</u>	<u>Name and Address of Client for which Training was Performed</u>
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____

PART I - BID FORM

SECTION 1.12 - SUBMISSIONS BY CONTRACTOR

1.12-02 PROGRESS SCHEDULES

1.12.02-01 GENERAL

In addition to the construction schedule as called for in Part V, within sixty days after Contract signature the Contractor shall submit progress schedules for various parts of the Contract as listed in this section.

1.12.02-02 PROGRESS SCHEDULE FOR TOOLS AND CONSTRUCTION EQUIPMENT

Append a progress schedule for delivery of tools and construction equipment under this section.

1.12.02-03 PROGRESS SCHEDULE FOR TEST EQUIPMENT

Append a progress schedule for delivery of test equipment under this section.

1.12.02-04 PROGRESS SCHEDULE FOR WAREHOUSE

Append a progress schedule for delivery and erection of the warehouse.

1.12.02-05 TRAINING SCHEDULE

Append a training schedule for training PLN line construction personnel in accordance with the provisions of Part VIII - Technical Provisions for Training.

The training schedules should consider the following:

1. All overhead line construction personnel and equipment operators will receive basic training during the first year of construction.
2. Those selected for secondary hot line training will start that training immediately following completion of the one year basic training program.

3. Those selected for 20kV hot line training will start that training immediately following the secondary hot line training program.

Therefore three training schedules are required for overhead line crews:

1. Basic course in line construction per 8.1-02
2. Secondary hot line work per 8.2-04
3. Primary hot line work per 8.2-02

In addition, one training schedule will be required for underground crews per 8.1-02

PART II - CONTRACT FORM

This agreement made and entered into on the \_\_\_\_\_ day of \_\_\_\_\_, 19\_\_ by and between \_\_\_\_\_, hereinafter called the Contractor, and the Perusahaan Umum Listrik Negara, Ministry of Public Works and Power, Jl. Sunan Hgampel No.1, Kebayoran Baru, Jakarta, Indonesia, hereinafter called the Owner.

WITNESSETH:

That the Contractor, for the consideration hereinafter fully set out, and the Owner, for the consideration of work performed, agree that:

1. SCOPE OF THE WORK:

The Contractor shall furnish all materials, plant, equipment, machinery, tools, supplies, labor, spare parts, training and transportation and to perform all the work in the manner and form provided by and under the terms and conditions contained in the Contract Documents made part hereof, entitled:

CONTRACT DOCUMENTS 629-2

FURNISH AND ERECT FACILITIES FOR THE  
REHABILITATION AND EXPANSION OF THE DISTRIBUTION SYSTEM

prepared by Harza Engineering Company, acting as, and in these Contract Documents entitled, the Engineer, and as set forth in the Bid Form and shall do everything required by the Contract Documents listed herein.

2. COMMENCEMENT AND COMPLETION:

The Contractor shall commence and complete the work as specified in 5-05 , Commencement, Prosecution, and Completion.



3. CONTRACT SUM

"The amount of this Contract is \_\_\_\_\_  
U.S. Dollars (US\$ \_\_\_\_\_) and \_\_\_\_\_  
Indonesian Rupiahs (R \_\_\_\_\_).

The Owner will pay the Contractor for the performance of the Contract, subject to the additions and deductions provided therein, in accordance with the unit prices and lump sum prices set forth in Part I, Bid Form, of this Contract. Such unit prices and lump sum prices shall be firm and not subject to escalation and shall be full compensation for and shall cover all cost for labor, materials, supplies, tools, equipment, machinery, transportation, storage, construction plant, tests, overhead (including taxes), profit, and other expenses including but not limited to all elements of logistic support incidental to compliance with the provisions of these Contract Documents.

4. PROGRESS PAYMENTS:

The Owner will make progress payments as specified in 4-32, Payments to Contractor.

5. FINAL PAYMENT:

The Owner will make final payment as specified in 4-34, Final Inspection, Acceptance, and Payment.

6. THE CONTRACT DOCUMENTS:

The Contract Documents are as defined in 4-02, Definitions.

7. PERFORMANCE AND PAYMENT BONDS:

The Contractor shall furnish Performance and Payment Bonds as specified in 5-04, Performance and Payment Bonds.

8. JURISDICTION:

In all matters relating to this Contract, the contracting parties will be governed by the existing laws of Indonesia and under the jurisdiction of the courts of justice of Indonesia.

IN WITNESS WHEREOF, the parties hereto have executed this Contract under their several seals the day and year first above written; the name and corporate seal of each corporate party hereto being hereto affixed and these presents duly executed in eight counterparts by the duly authorized officers of each party hereto, each of which counterparts shall, without proof or accounting for the other counterparts, be deemed an original Contract.

-----  
Witness as to Contractor:

\_\_\_\_\_

\_\_\_\_\_  
Individual Contractor

\_\_\_\_\_  
Partnership Contractor

\_\_\_\_\_

By

\_\_\_\_\_  
Member of the Partnership

\_\_\_\_\_  
Corporate Contractor

\_\_\_\_\_

By

\_\_\_\_\_  
(Affix  
Corporate  
Seal)

\_\_\_\_\_  
Title

Attested by the Engineer  
Harza Engineering Company

-----

\_\_\_\_\_  
Owner

PART III - PERFORMANCE BOND AND PAYMENT BOND FORMS

SECTION 3.1 - PERFORMANCE BOND FORM

PERFORMANCE	BOND	DATE BOND EXECUTED (Must be same or later than date of contract)
PRINCIPAL (Legal name and business address, contractor)		TYPE OF ORGANIZATION ("X" one)
		<input type="checkbox"/> Individual <input type="checkbox"/> Partnership <input type="checkbox"/> Joint Venture <input type="checkbox"/> Corporation
		State of Incorporation:
SURETY(IES) (Name(s) and business address(es))		Penal Sum of Bond
		Million(s)    Thousand(s)    Hundred(s)    Cent(s)
		Contract Date                      Contract No.

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the Perusahaan Umum Listrik Negara, Ministry of Public Works and Power (hereinafter called the Owner), in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally; Provided, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above;

NOW, THEREFORE, if the Principal shall:

(a) Perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Owner, with or without notice to the Surety(ies), and during the life of any guaranty required under the contract, and shall also perform and fulfill all the undertakings, covenants, terms, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety(ies) being hereby waived; and

(b) Pay to the Owner the full amount of the taxes imposed by the Owner which are collected, deducted, or withheld from wages paid by the Principal in carrying out the construction contract with respect to which this bond is furnished; then the above obligation shall be void and of no effect.

PERFORMANCE BOND (Continued)

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this performance bond and have affixed their seals on the date set forth above.

PRINCIPAL			
	1.	2.	
Signature(s)			
		(Seal)	(Seal) Corporate Seal
Name(s) & Title(s) (Typed)	1.	2.	
INDIVIDUAL SURETY(IES)'			
	1.	2.	
Signature(s)		(Seal)	(Seal)
Name(s) (Typed)	1.	2.	
CORPORATE SURETY(IES)			
Surety A	Name & Address	State of Inc: Liability Limit:	
	Signature(s)	1.	2. Corporate Seal
Surety B	Name(s) & Title(s) (Typed)	1.	2.
	Name & Address	State of Inc: Liability Limit:	
Surety C	Signature(s)	1.	2. Corporate Seal
	Name(s) & Title(s) (Typed)	1.	2.
Surety D	Name & Address	State of Inc: Liability Limit:	
	Signature(s)	1.	2. Corporate Seal
Surety E	Name(s) & Title(s) (Typed)	1.	2.
	Name & Address	State of Inc: Liability Limit:	
Surety F	Signature(s)	1.	2. Corporate Seal
	Name(s) & Title(s) (Typed)	1.	2.

PERFORMANCE BOND (Continued)

CORPORATE SURETY(IES) (Continued)			
Surety P	Name & Address	State of Inc:	Liability Limit:
	1. Signature(s)	2.	Corporate Seal
	Name(s) & 1. Title(s) (Typed)	2.	
Surety G	Name & Address	State of Inc:	Liability Limit:
	1. Signature(s)	2.	Corporate Seal
	Name(s) & 1. Title(s) (Typed)	2.	
	Bond Premium	Rate Per Thousand \$	Total \$

INSTRUCTIONS

1. There shall be no deviation from this form without approval by the Owner.
2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of this form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.
3. (a) Corporation executing the bond as sureties must be authorized to act as sureties.

Where more than a single corporate surety is involved, their names and addresses (city and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)", and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.

(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety for each individual surety, shall accompany the bond. Such sureties may be required to furnish additional substantiating information concerning their assets and financial capability as the Owner may require.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal."
5. The name of each person signing this performance bond should be typed in the space provided.

PART III - PERFORMANCE BOND AND PAYMENT BOND FORMS

SECTION 3.2 - PAYMENT BOND FORM

<b>PAYMENT BOND</b>	<b>Date Bond Executed: (Must be same or later than date of contract)</b>
<b>PRINCIPAL (Legal name and business address)</b>	<b>Type of Organization ("X" one)</b> ___ Individual ___ Partnership ___ Joint Venture ___ Corporation
	<b>State of Incorporation:</b>
<b>SURETY(IES) (Name(s) and business address(es))</b>	<b>Penal Sum of Bond</b> Million(s) Thousand(s) Hundred(s) Cents
	<b>Contract Date:</b> _____ <b>Contract No.</b> _____

KNOW ALL MEN BY THESE PRESENTS, That we, the Principal and Surety(ies) hereto, are firmly bound to the Perusahaan Umum Listrik Negara, Ministry of Public Works and Power (hereinafter called the Owner) in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally; Provided, That, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no liability is indicated, the limit of liability shall be the full amount of the penal sum.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into the contract identified above:

NOW, THEREFORE, if the Principal shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety(ies) being hereby waived, then the above obligation shall be void and of no effect.

IN WITNESS WHEREOF, the Principal and Surety(ies) have executed this payment bond and have affixed their seals on the date set forth above.

<b>PRINCIPAL</b>			
	1.	2.	
<b>Signature(s)</b>		<b>(Seal)</b>	<b>(Seal) Corporate Seal</b>
<b>Name(s) &amp; Title(s) (Typed)</b>	1.	2.	



PAYMENT BOND (Continued)

INDIVIDUAL SURETY(IES)			
	1.	2.	
Signature(s)		(Seal)	(Seal)
Name(s) (Typed)	1.	2.	
CORPORATE SURETY(IES)			
	Name & Address		State of Inc: Liability Limit:
Surety A	1.	2.	Corporate Seal
	Signature(s)		
Surety B	1.	2.	Corporate Seal
	Name(s) & Title(s) (Typed)		
	Name & Address		State of Inc: Liability Limit:
Surety C	1.	2.	Corporate Seal
	Signature(s)		
Surety D	1.	2.	Corporate Seal
	Name(s) & Title(s) (Typed)		
	Name & Address		State of Inc: Liability Limit:
Surety E	1.	2.	Corporate Seal
	Signature(s)		
Surety F	1.	2.	Corporate Seal
	Name(s) & Title(s) (Typed)		
	Name & Address		State of Inc: Liability Limit:
Surety G	1.	2.	Corporate Seal
	Signature(s)		
Surety H	1.	2.	Corporate Seal
	Name(s) & Title(s) (Typed)		

PAYMENT BOND (Continued)

CORPORATE SURETY(IES) (Continued)		
Name & Address	1.	State of Inc: Liability Limit:
	1.	2.
Name(s) & Title(s) (Typed)	1.	2.

Corporate Seal

INSTRUCTIONS

1. There shall be no deviation from this form without approval by the Owner.
2. The full legal name and business address of the Principal shall be inserted in the space designated "Principal" on the face of the form. The bond shall be signed by an authorized person. Where such person is signing in a representative capacity (e.g., an attorney-in-fact), but is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved, evidence of his authority must be furnished.
3. (a) Corporations executing the bond as sureties must be authorized to act as sureties. Where more than a single corporate surety is involved, their names and addresses (City and State) shall be inserted in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)," and in the space designated "SURETY(IES)" on the face of this form only the letter identification of the Sureties shall be inserted.  
  
(b) Where individual sureties execute the bond, they shall be two or more responsible persons. A completed Affidavit of Individual Surety for each individual surety, shall accompany the bond. Such sureties may require to furnish additional substantiating information concerning their assets and financial capability as the Owner may require.
4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Seal."
5. The name of each person signing this payment bond should be typed in the space provided.

PART III -- PERFORMANCE BOND AND PAYMENT BOND FORMS

SECTION 3.3 -- CRITERIA FOR APPROVAL OF BONDS AND GUARANTIES

A. The U.S. Treasury Department requires surety companies and insurance companies that wish to qualify as acceptable sureties on Federal bonds to meet certain minimum requirements. The surety or insurance company:

1. Has capital, fully paid up in cash, of not less than \$250,000; is solvent; and is otherwise qualified to do the business for which approval is requested.
2. Has and maintains on deposit with the proper financial officer of the State in which incorporated, for the protection of all its policy holders, legal investments having a current market value of not less than \$100,000.
3. Is licensed in any State in which it is to do a fidelity and surety business.
4. Must not engage in any type of business not authorized by its charter or the laws of the State in which it is incorporated.
5. Must have its cash capital and other funds safely invested in accordance with the laws of the State in which it is incorporated.
6. Shall not write any risk on any bond, the amount of which is greater than 10 percent of the paid-up capital and surplus of the company; this amount is known as the underwriting limitation.

B. The U.S. Controller of the Currency has set a lending limit whereby a national banking institution's obligation to any person, co-partnership, association, or corporation shall at no time exceed 10 percent of the capital stock of such banking institution actually paid in and unimpaired, and 10 percent of its unimpaired surplus fund.

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PD-AAD-771



PERUSAHAAN UMUM LISTRIK NEGARA  
MINISTRY OF PUBLIC WORKS AND POWER  
JAKARTA, INDONESIA  
OWNER

54p.

MEDAN POWER REHABILITATION PROJECT

INVITATION FOR BIDS

FURNISH AND ERECT FACILITIES  
FOR THE  
REHABILITATION AND EXPANSION OF THE DISTRIBUTION SYSTEM  
629-2

VOLUME II - GENERAL AND SPECIAL CONDITIONS

AID LOAN NO. 497-H-022

CHICAGO,  
ILLINOIS  
U. S. A.

HARZA ENGINEERING COMPANY

AUGUST 1973

MEDAN  
SUMATRA  
INDONESIA

SUMMARY OF VOLUMES

VOLUME I - BID AND CONTRACT FORMS

- PART I BID FORM
- PART II CONTRACT FORM
- PART III PERFORMANCE BOND AND PAYMENT BOND FORMS

VOLUME II - GENERAL AND SPECIAL CONDITIONS

- PART IV GENERAL CONDITIONS
- PART V SPECIAL CONDITIONS

VOLUME III - TECHNICAL SPECIFICATIONS

- PART VI TECHNICAL SPECIFICATIONS FOR ERECTION OF DISTRIBUTION FACILITIES
- PART VII TECHNICAL SPECIFICATIONS FOR DISTRIBUTION OF MATERIAL AND EQUIPMENT
- PART VIII TECHNICAL SPECIFICATIONS FOR TRAINING
- PART IX TECHNICAL SPECIFICATIONS FOR FURNISH AND ERECTION OF WAREHOUSE

VOLUME IV - CONSTRUCTION STANDARDS, DRAWINGS AND WORK ORDERS

- PART X CONSTRUCTION UNITS AND STANDARDS
- PART XI DRAWINGS, MAPS, PLANS AND SAMPLE WORK ORDERS

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PART IV - GENERAL CONDITIONS

4-01 FORM OF CONTRACT

The form of the Contract will be the unit price type in which the units of measurement for the various items will be "quantities" for certain items and "lump sum" for others. All payments to the Contractor will be based on the items in the bid form, except for payments made under the provisions of 4-25, Changes. The Successful Bidder agrees to execute Part II, Contract Form, and Part III, Performance Bond and Payment Bond Forms.

4-02 DEFINITIONS

Whenever these words occur in the Contract Documents they shall have the following meanings:

"AID": U.S. Agency for International Development.

"BID DRAWINGS": Drawings included in these Contract Documents for bidding purposes.

"BIDDER": Any party or parties submitting a proposal for the work covered by these Contract Documents.

"COMMERCIAL OPERATION": A distribution system is considered ready for commercial operation when the installation has been completed and tested sufficiently to be capable of delivering power continuously.

"CONTRACT": The agreement between the Contractor and the Owner, respectively, for the execution of, and payment for, the Permanent Works as defined in these Contract Documents.

"CONTRACTOR": The Successful Bidder who is awarded the Contract to perform the work covered by these Contract Documents.

"CONTRACT DOCUMENTS":  
Part I, Bid Form; Part II, Contract Form; Part III, Performance Bond, and Payment Bond Forms; Part IV, General Conditions; Part V, Special Conditions; Part VI, Technical Specifications for Erection of Distribution Facilities; Part VII, Technical Specifications for Distribution Material and Equipment; Part VIII, Technical Specifications for Training; Part IX, Technical Specifications for Furnish and Erection of Warehouse; Part X, Construction Units and Standards; Part XI, Drawings,



Maps, Plans, and Sample Work Orders; and Addenda, if any, to any or all of these Contract Documents, plus the bid and accompanying data submitted by the Successful Bidder and approved for inclusion in the Contract plus Supplementary Drawings, Contractor's Drawings, and Drawings as defined herein. These Contract Documents are complementary, and the work called for by one is as binding upon the parties as if called for by all. In the event of conflict between the Contract Documents, the interpretation of the Engineer shall govern. In the event of conflict between drawings and specifications, specifications will govern.

"CONTRACTOR'S DRAWINGS": Drawings provided by the Contractor to delineate the work to be done and/or the equipment to be furnished under these Contract Documents.

"DESIGN": To determine and draw the principal features of the specified item, piece of equipment, or article so it will perform the functions and meet the conditions stipulated.

"DETAIL": To prepare Drawings of all parts of the designed item, piece of equipment, or article in accordance with the design, so it can be fabricated and/or erected exactly, without doubt regarding and portion.

"DRAWINGS": Bid Drawings, Supplementary Drawings, and Contractor's Drawings.

"ERECT," "INSTALL," "PLACE," "APPLY," "LAY": Work done and all expenses, including labor, materials, tests, plant, and overhead, incurred in receiving a specified item, article, or piece of apparatus or equipment at a geographical location designated in these Contract Documents, in transporting it to and storing it at the site of the Work, and there erecting, installing, placing, applying, or laying it as shown on the Drawings or as directed.

"ENGINEER": Harza Engineering Company, its officers and properly authorized representatives or such other person, as may be designated by the Owner.

"FURNISH": Work done and all expenses, including labor, materials, tests, plant, and overhead, incurred in providing and delivering to a geographical location designated in these Contract Documents, a specified item, article, or piece of apparatus or equipment.

"FURNISH AND ERECT," "FURNISH AND INSTALL," "FURNISH AND PLACE," "FURNISH AND APPLY," "FURNISH AND LAY": Work done and all expenses, including labor, materials, tests, plant, and overhead, incurred in providing, delivering, transporting, storing, and erecting, installing, placing, applying, or laying a specified item, article, or piece of apparatus or equipment as shown on the Drawings or as directed.

"OWNER": Perusahaan Umum Listrik Negara, Ministry of Public Works and Power, an Indonesian Government owned electric utility.

"PERMANENT WORKS": Structures, materials, equipment, and land improvements incorporated in the complete project covered by this Contract.

"PROJECT": Medan Power Distribution Project consisting of construction and rehabilitation of electric distribution in the Cities and environs of Medan, Belawan, and Bindjai in North Sumatra.

"SITE": The lands and other places on, under, in or through which the work is to be executed or carried out and any other lands or places provided by the Owner for the purposes of the Contract together with such other places as may be specifically designated in the Contract Documents as forming part of the Site.

"SUBCONTRACTOR": Individual, partnership, or corporation having a direct contract with the Contractor for furnishing labor or services.

"TERMS OF APPROVAL, REVIEW, JUDGMENT, OR DIRECTION": When the terms "approved," "subject to approval," "satisfactory," "equal to," "to equal," "proper," "as directed," "where directed," "when directed," "determined by," etc., are used, the approval, review, judgment or direction implied is understood to be a function of the Owner as represented by the Engineer.

"SUCCESSFUL BIDDER": The Bidder selected for award of the Contract.

"SUPPLEMENTARY DRAWINGS": Drawings of structures and equipment furnished to the Contractor after award of the Contract to furnish additional details for construction.

"STAKING SHEET": A form providing a tabulation of construction units span lengths and staked locations for a specific Work Order.

"WORK": Labor, materials, equipment, and services necessary to complete the Contract.

"WORK ORDER": An order for work to be performed, consisting of a brief description of the work, a staking sheet and a drawing showing the types, quantities and approximate location of construction units.

4-03 SUSPENSION OF WORK

The Owner may at any time suspend the work or any part thereof temporarily by giving 3 calendar days' notice to the Contractor in writing and stating the reasons. The Owner will reimburse the Contractor for all expenses incurred as a result of such suspension unless such suspension is (a) otherwise provided for in the Contract Documents or (b) necessary for the proper execution of the work or by reason of weather conditions affecting the safety or quality of the work, or by some default on the part of the Contractor. The Contractor will not be entitled to recover any such extra cost, unless he gives notice in writing of his intention to claim to the Engineer within 28 days of the Owner's order. If the progress of the entire Permanent Works is suspended on the written order of the Owner for more than 90 calendar days, the Contractor may serve a written notice to the Engineer requesting permission within 28 calendar days from the receipt thereof to proceed with the Permanent Works, and if such permission is not granted within that time, the Contractor by a further written notice so served may (but is not bound to) elect to treat the suspension as termination in accordance with 4-38, Termination of Contract for Convenience of the Owner.

4-04 OWNER'S RIGHT TO TERMINATE THE CONTRACT BECAUSE OF DEFAULT BY THE CONTRACTOR

If the Contractor should be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed, or if, in the Owner's opinion, he falls behind his construction schedule and is not prosecuting the work with such diligence as will insure the meeting of the completion dates, or if he should fail to make prompt payments to Subcontractors or for material or labor or disregard laws, ordinances, or instruction of the Owner or the Engineer, or otherwise be guilty of a violation of any provision of the Contract Documents, the Owner may consider the Contractor in default and serve written notice upon the Contractor of his intention to terminate the Contract. Such notice will contain the reasons for the intention to terminate the Contract, and unless within 10 calendar days after the receipt of such notice by the Contractor such violation or delay shall cease or satisfactory arrangement for correction be made, the Contract, upon expiration of said 10 calendar days, shall terminate. In the event of any such termination, the Owner will immediately serve notice thereof upon the surety and the Contractor, and the surety will

have the right to take over and perform the Contract. No plant, equipment, material, or appliances shall be removed from the premises after receipt of written notice of intention to terminate the Contract.

If the surety does not indicate its intention to perform within 20 calendar days and commence performance thereof within 30 additional calendar days from the date of mailing notice of termination, the Owner will take over the Contract and prosecute same to completion of the Contract by whatever manner it may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Contract is finished.

If the extra cost incurred in completing the work, including managerial and administrative expenses and all other extra costs and damages, exceeds the Contractor's entitlement for monies retained and acceptable work completed but not paid for at the time of termination, then such excess shall be paid to the Owner by the Contractor or his surety. In computing such expenses and damages, any deduction applicable to 5-05, Commencement, Prosecution and Completion, will be included. If such extra costs are less than the Contractor's entitlement as described above then the difference will be paid to the Contractor by the Owner. The Owner may take possession of and utilize in completing the Contract such materials, appliances, and plant as may be on the Site and necessary for the completion of the Contract. When the Contract has been terminated by the Owner, said termination will not affect or terminate any of the rights of the Owner against the Contractor or his surety then existing or which may thereafter accrue because of the Contractor's default. Any retention or payment of moneys by the Owner due the Contractor under the terms of the Contract will not release the Contractor or his surety from liability for his default.

#### 4-05 CONTRACTOR'S RIGHT TO SUSPEND WORK

In the event that the Owner fails to pay any Rupiah amount due at the end of 120 calendar days after the due date in accordance with 4-32, Progress Payments, or if the work should be stopped under an order of any court or other public authority or by excepted risks as defined in 4-22, Protection of Work and Property, for a period of 90 calendar days through no fault of the Contractor, the Contractor may consider the work suspended in accordance with 4-03, Suspension of Work.

#### 4-06 SEPARATE CONTRACTS

The Owner reserves the right to let other contracts in connection with the Project, and the Contractor shall cooperate and afford other

contractors every opportunity for access to the Work, for the introduction and storage of materials, and for the execution of their work without delay.

#### 4-07 ASSIGNMENT OF CONTRACT BY CONTRACTOR

The Contractor shall not assign his obligation under this Contract without the written approval of the Owner and AID and shall not assign the right to receive payments without the written approval of the Owner.

#### 4-08 SUBCONTRACTORS

The Contractor will be permitted to subcontract up to a maximum of 30% of the total contract amount to the following types of firms: (a) U.S. firms, (b) other eligible source country firms or (c) Indonesian firms.

The Contractor shall notify the Owner in writing of the Names of each Subcontractor proposed for the work, together with the extent and character of the work to be done by each Subcontractor. The Contractor before entering into a subcontract shall deliver to the Owner an affidavit setting forth the name and address of the Subcontractor and a summary description of the work subcontracted including specific bid items if appropriate. The Owner reserves the right to approve or disapprove Subcontractors. If at any time for sufficient reason the Owner determines that any Subcontractor is incompetent or undesirable, it will notify the Contractor accordingly, and immediate steps shall be taken for cancellation of such subcontract. Subletting by Subcontractors will be subject to the same regulations. There will be no contractual relation between the Subcontractor and the Owner, and the Contractor shall be fully responsible for all the work under these Contract Documents.

#### 4-09 CORRESPONDENCE

Any notice to the Contractor from the Owner relative to any part of this Contract shall be considered delivered and service thereof completed when said notice is posted, by registered mail, to the Contractor at his last address or delivered to the Contractor or his authorized representative at the Site.

All mailed letters, Drawings, notices, instructions, etc., pertinent to the progress of the work shall be forwarded by air unless delivery by surface transportation can be accomplished within 3 days. Receipt of

such mail will be promptly acknowledged when requested. If acknowledgement is not received in reasonable time, duplicated copies shall be forwarded in like manner.

On all correspondence the name and official position of the signer shall be typewritten or printed immediately below the handwritten signature.

All correspondence shall be written in the English language.

All correspondence relating to these Contract Documents shall be directed to the Owner with one copy to the Engineer.

#### 4-10 INDEMNITY

The Contractor shall protect, defend, indemnify, and save the Owner, the Engineer, and its consultants and each of their officers, agents or employees, harmless from and against all losses and all claims, demands, suits, actions, recoveries, and judgments of every nature and description brought or recovered against them by reason of any act or omission of the Contractor, his agents, or Subcontractors in the execution of the Work.

#### 4-11 LIENS

Final payment will not be made until the Contractor delivers to the Owner release in full of all actual or potential liens arising from this Contract, including releases from all Subcontractor's or receipts for payment in full in lieu thereof, and, in either Case, an affidavit of the Contractor stating that the releases and receipts include all the labor, materials, apparatus, or equipment in connection with which a lien could be filed. If any liens remain unsatisfied after all payments under this Contract are made, the Contractor shall refund to the Owner all moneys (including all costs and reasonable attorney's fees) that the Owner pays in disposing of such liens.

#### 4-12 CLAIMS

If the Contractor claims that any instructions by Drawings or other media issued after the date of the Contract involve extra cost under this Contract, he shall give the Engineer written notice thereof within 30 calendar days after the receipt of such instructions, and in any event before proceeding to execute the work, except in emergency endangering life or property.

#### 4-13 ROYALTIES AND PATENTS

The Contractor shall pay all royalties and license fees in connection with his operations under this Contract. He shall hold and save the Owner, its officers, agents, servants, and employees harmless from liability of any nature or kind, including costs and expenses, for or on account of any copyrighted or uncopied composition, secret process, patented or unpatented invention, article, method or appliance manufactured or used in performance of this Contract, unless otherwise specifically stipulated.

#### 4-14 DISCREPANCIES

If the Contractor finds any discrepancy between various parts of the Contract Documents or any errors or omissions in Drawings or in the layouts and instructions, it shall be his responsibility to immediately inform the Engineer in writing. Any work done after such discovery until authorized, shall be done at the Contractor's risk.

#### 4-15 RIGHTS-OF-WAY

The land and rights-of-way shown on the Drawings and the access thereto from the existing public highway system will be furnished by the Owner for the work covered by these Contract Documents. The Contractor will be permitted to use such lands for construction purpose, but any additional land desired by the Contractor for construction purposes shall be arranged by the Contractor.

#### 4-16 SUPERVISION

During the progress of the work, the Contractor shall keep on the work a competent superintendent, whose authority shall be designated in writing and who shall represent the Contractor. Directions given to him shall be as binding as if given to the Contractor. Important directions will be confirmed to the Contractor in writing. The superintendent shall be assisted by competent individuals whose total training and experience shall cover all phases of the work to be performed.

#### 4-17 INSPECTION

Authorized representatives of the Owner and the Engineer shall have access to all places where work is being done or where materials or equipment are being manufactured, stored, or prepared for use under these Contract Documents, and they shall have full facilities for unrestricted inspection during working hours of such materials, equipment, and work, including full access to purchasing and engineering information. The Engineer shall be furnished with such information as may be required regarding materials used and the process of manufacture for the various items of equipment and shall be informed of the production schedules so that inspections may be performed adequately.

Inspections by the Engineer of equipment or materials during their manufacture will be performed for the Owner solely in an effort to detect discrepancies and defects as early as possible, when they can be most readily corrected, and the work thereby expedited. No acceptance of equipment or materials shall be construed to result from such shop inspections by the Engineer. Any inspections or tests or waivers thereof shall not relieve the Contractor of responsibility for meeting all requirements of these Contract Documents.

#### 4-18 EMPLOYEES

A. Not less than 80% of all persons who perform services under the Contract at the Site, whether employed directly by the Contractor or by a Subcontractor, shall, at any time, be citizens of the United States, or other eligible source countries (U.S. AID Geographic Code 941), excluding from this computation, however: (i) citizens of Indonesia as determined under the law thereof and (ii) individuals who have been physically present in Indonesia substantially uninterrupted for a period, immediately preceding the date of any determination hereunder, of not less than 3 consecutive years. The Contractor agrees that his bid shall constitute a continuing undertaking to the Owner, in consideration of the Contract:

1. To furnish the Owner, upon the Owner's request, any and all information pertaining to the above Contract term; and,

2. To pay to the Owner if United States citizens and other eligible source country citizens, shall at any time comprise less than 80% of all persons employed on the Project (as determined above) an amount equal to 15% of the total cost of all labor employed for work at the Site for the period during which such deficiency occurred.



B. The Contractor shall use his best efforts to select and employ, for the assignment in Indonesia, personnel who are technically competent to perform their assigned duties, who are reliable, who will comply with local laws and respect local customs, and who will so conduct themselves as to avoid reflecting discredit upon Indonesia or the United States of America. The Contractor shall take all reasonable measures to assure that the general conduct of his personnel is not offensive to local customs, traditions, or standards of behavior.

C. Should written request for removal of any of Contractor's employees be made to the Contractor by the Owner for reasons which in the Owner's opinion constitute good cause, the Contractor shall terminate the employment of and repatriate such employee to his place of residence.

D. It is the intent of the Contract that Indonesian nationals be employed to the fullest practicable extent permitted by the availability of qualified personnel. It is recognized by the parties hereto that, except as specifically provided below, the final determination of practicability and economic feasibility in the foregoing regard shall rest with the Contractor.

E. All unskilled laborers required by the Contractor and his Subcontractors in the performance of work under the Contract in Indonesia shall be Indonesian nationals, unless in individual cases employees of other nationality are approved in writing by the Owner.

F. Wage rates, benefits, and conditions of employment for Indonesian nationals employed by the Contractor for work required under the Contract shall be in accordance with accepted local practice and standards, if any, of Indonesia.

G. The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him.

H. The Contractor shall comply with all Indonesian immigration regulations in force at any time during the life of the Contract, including, but not limited to, visa requirements and residence permits. All formalities connected therewith shall be the Contractor's responsibility. The Owner will provide such declaration as may be required by the authorities. No person employed by the Contractor for work under this Contract shall depart for Indonesia until approved by the Owner, or begin work in Indonesia until entry visas and work permits have been obtained. Resumes of all key (supervisory) personnel shall be submitted to the Owner for approval at least sixty (60) calendar days prior to departure for Indonesia.

I. The Contractor's employees may import at their own expense for their personal use a reasonable quantity of household goods and personal effects. These goods and effects will be exempt from import duties and taxes provided that those items not consumed are re-exported. The Owner will be sole judge as to what constitutes a "Reasonable Quantity".

J. The Contractor's employees may import at their own expense for their personal use, one automobile per family, which will be exempt from import duties and taxes provided that the automobile will be re-exported.

#### 4-19 SAMPLES AND DESCRIPTIVE DATA

The Contractor shall obtain and handle samples and descriptive data on materials or equipment proposed for use by the Contractor as required by these Contract Documents, and the entire cost of such work shall be included in the prices for the various items in the Schedules of Prices.

#### 4-20 ACCIDENT AND FIRE PREVENTION

Precaution shall be exercised at all times for the protection and safety of all persons (including employees) and property.

The Contractor shall comply with all applicable statutory requirements and such directions as the Owner may consider necessary or desirable for accident and fire protection. The general conduct of the work shall be accomplished in accordance with the safe practices on construction work recommended in the AGC "Manual of Accident Prevention in Construction" and ANSI A10.2, "Safety Code for Building Construction" to the extent that such practices are not in contravention of applicable laws, ordinances, and regulations. The location and security of all storage areas for explosives will be subject to approval. Inventory control of explosives satisfactory to the Owner shall be instituted by the Contractor. The storage areas shall be suitably guarded at all times.

Fire protection facilities shall be of the gas or other chemical type and/or pressure water type as approved.

#### 4-21 SANITATION

Provisions for the sanitary necessities of all persons employed on the work, beginning with the first person employed, shall be constructed and maintained in a neat and sanitary condition by the Contractor in such number, manner, and places as may be necessary to comply with the sanitary requirements of the applicable statutory provisions or as directed.

#### 4-22 PROTECTION OF WORK AND PROPERTY

The Contractor shall be responsible for all the work under this Contract until completion and final acceptance thereof, except that the Contractor shall not be responsible for the damages or losses caused by force majeure as

described in Article 4-26 of this contract. He shall continuously protect all work and property from loss or damage including any materials or equipment furnished by the Owner. The Contractor shall not use any permanent equipment or materials for construction purposes without the express written consent of the Owner.

As the material and equipment are received in accordance with 5-18, Materials Furnished by the Owner, the Contractor shall check all shipments for damage and shortage and, if practicable, in the presence of the appropriate manufacturer's representative. If material or equipment is received before it is required for installation, it shall be properly stored and protected, in accordance with the manufacturer's recommendations, against weather damage, corrosion, and loss.

#### 4-23 CORRECTION OF WORK

During the life of the Contract and for a period of 365 calendar days subsequent to final acceptance in accordance with 4-34, Final Inspection, Acceptance, and Payment, the Contractor shall promptly repair and/or remove and replace without cost to the owner any part of the work failing to conform to the requirements of the Contract Documents and shall pay all expenses of making such repair and for removal and replacement. If, after notice, the Contractor refuses or persistently neglects to make correction so as to meet the requirements of these Contract Documents, the Owner may proceed at its own expense to make such corrections as may be required and to deduct from the payment due the Contractor an amount equal to the actual expense incurred. The Owner, however, may elect to accept an equitable reduction in price or a refund instead of correction of the condemned work.

Re-examination of questioned work may be ordered by the Engineer and if so ordered the work must be exposed by the Contractor. If such work is found to be in accordance with the Contract Documents by the Engineer, an equitable adjustment will be made in the Contract for the cost of re-examination and replacement. If such work is found not to be in accordance with the Contract Documents by the Engineer, such costs shall be at the expense of the Contractor.

#### 4-24 CLEANING UP

During construction, the Contractor shall at all times keep the working and storage areas used by him free from accumulations of waste materials or rubbish. Before final inspection of the work, the Contractor shall remove or dispose of in a satisfactory manner all excess materials, temporary structures, waste, and debris and have the entire premises in a condition

of cleanliness satisfactory to the Engineer. No direct payment will be made for this requirement and the entire cost of cleaning up shall be included in the prices for the various items in the Schedules of Prices.

#### 4-25 CHANGES

A. The Engineer may make changes within the scope of the Contract, may add to or deduct from the quantities shown in the Schedules of Prices, or may order extra work authorized by the Owner. All such work shall be executed under the conditions of these Contract Documents.

B. Payment for changes or extra work, where in the opinion of the Engineer bid prices do not apply, will be made on the basis of one or more of the following ways:

1. By agreement on unit prices.
2. By agreement on a lump sum.
3. By direct cost plus 20%, plus equipment rental.

C. If neither 1 nor 2 of the above method is agreed upon, the Contractor, upon receipt of an order, shall proceed with the work. Case 3 will then apply, and the Contractor shall keep and present daily to the Engineer, in such form as he may direct, an accurate account of the direct costs and an account of all the charges for the rental of construction equipment used accompanying both accounts with vouchers. The Engineer will certify to the amounts of direct cost and of construction equipment rental used in the work.

D. The direct cost includes labor, taxes and insurance on labor, fringe benefits, the Contractor's expense of housing and feeding laborers and immediate supervisors (foremen), the invoice cost and transportation cost of materials and supplies used in the work, and cost of subcontract work. The direct cost does not include overhead, administrative, or engineering expense, rental of small or hand tools which are not machine powered, or any other costs not specifically included in direct cost above, all of which will be considered included for payment in the 20% of direct costs.

E. The charges for construction equipment rental shall be made in accordance with a rate schedule that shall be agreed upon between the engineer and the Contractor before the extra work is started. Such a rate schedule shall be based on similar rate schedules for comparable construction equipment on large construction projects that are currently in force in Indonesia. Rates for equipment rental shall include overhead, administrative expenses, fuel, lubrications, repairs, profit, and other expenses related to the use of this equipment.

F. Until the final correct amount of the cost of the changes in the work is determined, monthly payments will be made based on the Engineer's estimate.

#### 4-26 FORCE MAJEURE

The term, Force Majeure, as used in this agreement shall mean any cause beyond the control of the Contractor, and which the Contractor could not foresee and/or reasonably provide against and which prevents the Contractor from wholly or partly performing any duties under the contract. Force Majeure shall include, but is not limited to, any of the following:

- (1) War, Revolution, Insurrection or Hostilities  
(Whether declared or not),
- (2) Riot, Civil Commotion or Civil Uprising  
(Other than among the Contractor's employees),
- (3) Earthquake, Flood, Tempest, Hurricane,  
Lighting or other natural diaster,
- (4) Any fire or major proportions, or explosion,
- (5) Epidemic,
- (6) Strike, Lockout or other Industrial Disturbance.

If there occurs an event constituting Force Majeure, the Contractor shall give written notice of the occurrence to the Owner within 15 days of the occurrence or as soon thereafter as is practicable, including a statement describing the effect of such occurrence upon the performance of this Agreement. In the event of a Force Majeure, the Contractor unless otherwise directed by the Owner in writing shall continue to undertake and perform the duties set forth in this Agreement as far as is reasonably practicable. If prevented from so performing by such cause, the performance may be suspended during the continuance of such inability but for no longer period and such inability shall be removed if practicable with all reasonable dispatch. In the event of a Force Majeure resulting in a suspension of work this agreement shall be extended by a period equal to that for which the Contractor was prevented from performing.

The Contractor shall be entitled to reasonable costs incurred as a consequence of a Force Majeure. If such event lasts for more than 45 days after notice has been given to the Owner in writing, either party may terminate this agreement and the Contractor shall thereupon be entitled to any sums which would be payable pursuant to the termination provision of this agreement.

4-27 CHANGED CONDITIONS

If the Contractor encounters subsurface or latent physical conditions (other than weather conditions or conditions due to weather conditions) or artificial obstructions, which conditions or obstructions could not have been reasonably foreseen by an experienced contractor, the Contractor shall immediately notify the Engineer or such conditions before they are disturbed. The Engineer will promptly investigate the conditions and submit his recommendations to the Owner. If the Owner determines that such conditions do exist and cause an increase or decrease in the cost of, or the time required for, performance of this Contract, an equitable adjustment will be made and the Contract modified in writing accordingly.

4-28 POSSESSION PRIOR TO COMPLETION

The Owner will have the right to take possession of or use any completed or partially completed part of the Permanent Works prior to final completion. Such possession or use shall not be deemed an acceptance of any of the Permanent Works not completed in accordance with the Contract Documents. If such prior possession or use delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment of the Contract price and the time of completion will be made, and the Contract will be modified in writing accordingly.

4-29 EQUIPMENT GUARANTEES

The Contractor shall guarantee all Permanent Works furnished by him under these Contract Documents against all defects in design, workmanship, and materials during the life of the Contract and for a period of 365 calendar days subsequent to the date of final inspection and acceptance in accordance with 4-34, Final Inspection, Acceptance, and Payment. The guarantee period on repaired or replaced defective parts shall extend for a period of 365 calendar days after the repair or replacement.

4-30 RIGHT TO OPERATE UNSATISFACTORY EQUIPMENT

The Owner shall have the right to operate all Permanent Works as soon and as long as it is in operating condition, whether or not such equipment has been accepted as complete and satisfactory, except that this shall not be construed to permit operation of any equipment which may be damaged by such operation before any required alterations or repairs have been made. All repairs, alterations, or replacements required of the Contractor shall be made by the Contractor at such times as directed and in such a manner as will cause the minimum interruption in the use of the equipment by the Owner.

4-31 ROUTES OF LINES

Routes of all lines and locations of poles and equipment will be established by the Engineer. The Engineer will stake the locations of all poles, anchors and trenches and issue Work Orders as provided for in Part VI, Technical Specifications for Erection of Distribution Facilities.

No direct payment will be made to the Contractor for locating structures and establishing grades, and the entire cost shall be included in the prices for the various items in the Schedules of Prices.

4-32 PAYMENTS TO CONTRACTOR

A. SOURCE OF PAYMENT

Progress payments for goods shipped to the Project and for completed construction units will be made from a US\$ Letter of Credit and from Indonesian Government funds established for this Project, in the currencies in the Schedule of Prices.

Payments in U.S. dollars will be made against an irrevocable Letter of Credit established in mutually agreed upon United States Banks which are correspondents of Bank Indonesia upon presentation of documents which will include certification by the Engineer as to completion of specified shipments, and certification by the Engineer and approval by the Owner as to completion of units of work. Rupiah payments will be made through the State Treasury Office (Kantor Bendahara Negara) in Medan upon presentation of documents as for dollar payments.

B. PAYMENT FOR MATERIALS AND RUPIAH ADVANCE PAYMENTS

1. PAYMENT FOR ELIGIBLE MATERIALS AND EQUIPMENT SHIPPED

Payment of ninety percent (90%) of the invoiced amount for the quantities of eligible equipment and materials required for the Billing Units in the Schedule of Prices, including additional material in accordance with Paragraph 1.1-13, as well as eligible freight and insurance costs, will be payable from the US\$ Letter of Credit on presentation of the following shipping documents, certified by the Engineer:

a. Commercial Invoice, to include itemized:

Quantities  
Material or equipment description  
Manufacturer's name  
Manufacturer's catalog number  
Unit Price  
Item price  
Shipping weight and dimensions

b. On-Board Bill of Lading or Air Waybill, freight prepaid,

c. Marine Insurance Certificate.

Disposition of original and copies of the shipping documents required for payment and for customs clearance by the Contractor shall be in accordance with the requirements of the Paying Bank and the Indonesian Customs.

Certification by the Engineer of shipping documents will not relieve the Contractor of obligation in respect to overshipment, undershipment or any failure to comply with this Contract.

Title for eligible materials and equipment shall pass to the Owner FOB vessel at port of export; however all materials or equipment shall be protected by the Contractor, and any materials damaged or missing shall be promptly replaced by the Contractor, without cost to the Owner.

## 2. RUPIAH ADVANCE PAYMENT

After the Contract has been executed and Notice to Proceed has been given, the Contractor may, upon written request, be granted by the Owner an Advance Payment amounting to ten percent (10%) of the Contract total Rupiah amount as shown in the Bid Price Schedule, to purchase equipment or materials necessary for the progress of the works. Repayment of the Advance Payment, in Rupiah, shall be guaranteed by the Contractor on a prescribed form issued by an Owner approved Government bank. The said Advance Payment will be paid through the Medan State Treasury Office (Kantor Bencahara Negara) within one month of the written request and when the said guarantee is accepted by the Owner.

Should the Owner ascertain that any portion of the amount granted as Advance Payment has not been utilized in the work under this Contract, the Owner will recover the entire amount of each Payment from the amount of the relevant bank guarantee.

The Advance Payment paid to the Contractor shall be repaid by the Contractor in monthly installments deducted from the monthly payments, exclusive of the first three (3) payments, and each amounting to twenty percent (20%) of the Rupiah value of the works performed in the corresponding month. Any part of the Advance Payment outstanding at the time of payment of the final monthly payment shall be deducted from the final payment or from the relevant bank guarantee.

The bank guarantee for Advance Payment may be reduced in accordance with the monthly repayment installments but it shall at any moment be valid and in effect for an amount not less than the total amount of outstanding Advance Payment.

## C. PAYMENT OF CONTRACTOR'S MONTHLY INVOICES

During the first ten days of each calendar month the Contractor shall submit to the Engineer in triplicate and in approved form separate US\$ and Rupiah invoices of the amounts due the Contractor for the work performed during the previous calendar month. The content and format of the invoice shall be in accordance with the requirements of the Owner and AID. The invoice shall include the quantities of work completed for each unit price and lump sum item that was a part of completed Work Orders during the month as certified by the Engineer and approved for payment by the Owner.

Progress payment will not be made for completion of construction units that are a part of a Work Order that has not been completed and certified



by the Engineer, unless prior authorization in writing has been given by the Engineer for the work orders estimated as requiring in excess of 60 days for completion. The Contractor shall deduct from the amount of the US\$ invoice submitted for payment, 75% of the demonstrated CIF Port of Belawan cost of equipment and materials that were applied in the work invoiced and for which shipment payments had previously been made. The Engineer will verify each invoice in the field and, if found correct, will certify and submit it to the Owner within 10 calendar days after receipt of the invoice. If found incorrect, the invoice will be returned to the Contractor for correction within this same 10 day period.

Within 30 calendar days after receiving the Contractor's monthly payment invoices certified by the Engineer, the Owner will approve and make payment of the amount so certified, deducting 10%. Such retained percentage will be paid to the Contractor within 60 calendar days after final inspection and acceptance in accordance with 4-34, Final Inspection, Acceptance and Payment.

Payment for training of PLN personnel will be made only after all training has been completed, certified by the Engineer and approved by the Owner.

D. PAYMENTS TO LOCAL SUPPLIERS AND SUBCONTRACTORS

The Contractor shall pay each local supplier and each local subcontractor, if any within five (5) days after receipt of any payment from the Owner, the amounts owed corresponding to materials furnished for, or construction performed on the Project.

4-33 FINAL INSPECTION, ACCEPTANCE, AND PAYMENT

Within 30 calendar days after the completion of the Permanent Works a thorough inspection thereof will be completed. When the Permanent Works comply with the Contract Documents they shall be accepted; final payment of US Dollars and Rupiahs shall be made within 60 calendar days after this acceptance. Payment for materials purchased by the Contractor and not included in the Permanent Work will be made for net quantities of individual items not exceeding the estimated quantities of materials as determined from the Billing Units in the Schedule of Prices less the quantity installed in the Permanent Works. Payment will be made on the basis of the Contractor's bid price for the material portion of each Billing Unit less the calculated amount of the payment made at the time of shipment, adjusted for the net quantities indicated above.

4-34 ENGINEER'S STATUS

The Engineer on behalf of the Owner, will grant required approvals and take necessary action with respect to the following:

- A. Witnessing shop tests of equipment prior to shipment;
- B. Approvals of the quantity and quality of equipment and materials delivered to the site;
- C. Inspection and acceptance or rejection of work in progress or in place and requiring replacement of defective work, equipment, or materials;
- D. Issuing change orders as the Owner may stipulate.
- E. Approval of work and certification of progress in connection with payments invoiced by the Contractor;
- F. Interpretations of drawings and specifications.
- G. Final inspection and acceptance of the Permanent Works.

4-35 DISPUTES

The Engineer will, within 45 calendar days after their presentation to him, make decisions in writing on claims of the Contractor on matters relating to the quality, execution, and progress of the Work. In the event that the Engineer requires additional data from the Contractor to make his decision, he shall notify the Contractor in writing of the data required and the approximate additional time necessary for the Engineer's decision following receipt of data from the Contractor. In cases where Contract time of financial or legal consideration are involved, upon written application by the Contractor, the Engineer will submit the claims with his recommendations to the Owner for consideration and decision. If the Contractor does not agree with such decision, the matter may be referred to arbitration in accordance with 4-36, Arbitration.

4- 36 ARBITRATION

Any dispute or difference that may arise between the Owner and the Contractor in regard to the interpretation or execution of this Contract which cannot be settled or adjusted by mutual agreement, or the settlement of which is not otherwise provided for in the Contract, shall be submitted to arbitration. Arbitration shall be in accordance with the International Chamber of Commerce "Rules of Conciliation and Arbitration" by one or more arbitrators appointed in accordance with the Rules unless the parties agree upon some other procedure. The arbitration proceedings shall be conducted in Indonesia. During the period of arbitration, the performance of the Contract shall be carried on without interruption and in accordance with the terms of the Contract, except as to the work for which the Owner may specifically authorize delay pending arbitration.

4- 37 TERMINATION OF CONTRACT FOR CONVENIENCE OF THE OWNER

The Owner may terminate the Contract for convenience at any time provided the Contractor is given a notice in writing which will include the date on which the work shall be stopped. Payment for the work accomplished will be made as follows:

- A. Payment at Contract prices for items of work completed.
- B. A lesser prorated amount based on Contract prices for partially completed items of the work. This amount will be determined by mutual agreement between the Owner and the Contractor and if agreement is not reached the matter may be referred to arbitration in accordance with 4-35, Disputes, and 4-36, Arbitration.
- C. The out-of-pocket cost of materials acquired for the work by the Contractor but not used in the work. The materials will become the property of the Owner.
- D. The cost of demobilization which shall include dismantling equipment, shipment of equipment to point of origin, and cost of termination and transportation of personnel to their home station. The amount will be determined by mutual agreement between the Owner and the Contractor and if agreement is not reached the matter may be referred to arbitration in accordance with 4-35, Disputes, and 4-36, Arbitration.
- E. Demonstrated unrecovered mobilization costs up to the following amounts:

<u>Remaining Work to be Completed (Percent of Total Amount of Contract at Time of Award)</u>	<u>Amount to be Paid to Contractor (Percent of Cost of Remaining Work)</u>
81 - 100	5
61 - 80	4
41 - 60	3
21 - 40	2
0 - 20	1

The cost of the remaining work will be determined by the Engineer based on the prices in the Schedules of Prices.

#### 4- 38 NON-DISCRIMINATION IN EMPLOYMENT

During the performance of this Contract, the Contractor shall conform to the following requirements with respect to workers recruited in the United States and U.S. citizens wherever recruited:

A. The Contractor shall not discriminate against any employee or applicant for employment because of race, creed, color, or national origin or sex. The Contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment, without regard to their race, creed, color, national origin, or sex.

B. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, national origin, or sex.

C. The Contractor shall send to each labor union or representative of workers with which he has collective bargaining agreement or other contract or understanding a notice, to be provided by the Owner, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

D. The Contractor shall comply with all provisions of Executive Order No. 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

E. The Contractor shall furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and shall permit access to his books, records, and accounts by the Owner, and the

Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

F. In the event of the Contractor's non-compliance with the non-discrimination clause of this Contract or with any of the said rules, regulations, or orders, this Contract may be cancelled, terminated, or suspended in whole or in part, and the Contractor may be declared ineligible for further contracts financed by AID in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

G. The Contractor shall include the provisions of paragraph A through G in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as the Owner may direct as a means of enforcing such provisions, including sanctions for non-compliance. Provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Owner, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.

#### 4-39 GRATUITIES

A. The Owner may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this Contract, if it is found after notice and hearing by the Owner or his duly authorized representative that gratuities (in the form of gifts, entertainment, or otherwise) were offered or given by the Contractor or agent or representative of the Contractor to any officer or employee of AID, the Engineer, or the Owner with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending or the making of any determinations with respect to the performing of this Contract, provided that the existence of the facts upon which the Owner or his duly authorized representative makes such findings shall be in issue and may be reviewed in any competent court.

B. In the event this Contract is terminated as provided in paragraph A herein, the Owner shall be entitled to pursue the same remedies against the Contractor as it might pursue in the event of a breach of the Contract by the Contractor.

C. The rights and remedies of the Owner provided in this clause are not exclusive and are in addition to any other rights and remedies provided by law or under this Contract.

4-40 TRAINING

The Contractor shall train PLN personnel in the operations and maintenance of reclosers, regulators and switches and other equipment furnished under these Contract Documents, in addition to specific training to be supplied under PART V - SPECIAL CONDITIONS, and PART VIII TECHNICAL SPECIFICATIONS FOR TRAINING.

PART V - SPECIAL CONDITIONS

5-01 THE REQUIREMENTS

It is required that the Facilities for the Rehabilitation and Expansion of the Distribution System for the Medan Power Distribution Project be constructed and completed in accordance with these Contract Documents.

5-02 SCOPE OF THE CONTRACT

A. The new rehabilitated 50 Hz, primarily overhead distribution systems will supplant 7 kV and 12 kV, 3-phase underground primary systems and 127/220 volt, 3-phase, 4-wire overhead secondary systems and will be 50 Hz, 11.5/20 kV, multi-grounded primary with 220/380 volt secondary with a common neutral. The Project will consist of the following main features (quantities are approximate):

1. 150 kilometers of 3-phase, 4-wire, 11.5/20 kV overhead lines.
2. 150 kilometers of 1-phase, 2-wire, 11.5/20 kV overhead lines.
3. 10 kilometers of 3-phase, 11.5/20 kV underground cable.
4. 500 kilometers of 1-phase, 220 volt and 3-phase 220/380 volt overhead secondary lines.
5. 70 MVA of single phase distribution transformers.
6. Miscellaneous distribution line construction and rehabilitation.
7. 13 Kilometers, 12-pair communications cable.
8. Training line construction maintenance and operations personnel of the Owner.

B. The Contractor will be required to furnish all materials for the Project except poles, crossarms, log anchors and some miscellaneous materials which will be supplied by the Owner.

C. The Project does not include the construction or rehabilitation of generation or substation facilities. This work will be done by others. In addition, the installation and rehabilitation of services to existing consumers and service entrance sections will not be a part of the Project

as this work will be done by the Owner using materials furnished by the Contractor. Street lighting circuits are included, but fixtures are not part of the Project.

D. The types of work for the accomplishment of this Contract include, but are not necessarily limited to, the following:

1. Miscellaneous work.
2. Furnishing, storage and handling of materials and equipment.
3. Construction and installation of distribution lines.
4. Rehabilitation and removal of distribution lines.
5. Furnishing tools and equipment.
6. Training of line construction maintenance and operations personnel of the Owner.
7. Construction of Warehouse.

E. The above general outline of the principal features does not in any way limit the responsibility of the Contractor to perform all work and furnish all labor, equipment, and materials required by the Contract Documents. The work to be performed shall be carried on at such places and such order of precedence as will meet the requirements of the Contract Documents.

#### 5-03 LAWS AND REGULATIONS

The Contractor shall familiarize himself with and be governed by all Laws of Indonesia and all regulations, ordinances, or orders made thereunder and the lawful requirements of any public authority in any way affecting or applicable to the Contractor or his operations.

#### 5-04 PERFORMANCE AND PAYMENT BOND

To assure compliance with the terms of the Contract, the Contractor shall furnish a performance bond in the amount of 30% of the Contract amount and a payment bond in the amount of 30% of the Contract amount, with U.S. sureties or insurance companies who are acceptable to the Owner and meet the requirements of Section 3.3, Criteria for the Approval of Bonds and Guarantees. These bonds shall remain in full force and effect until the Contractor has performed fully hereunder, including the 365 day period provided for in 4-23, Correction of Work, and 4-29, Equipment



Guarantees. The proceeds of these bonds shall be payable to the Owner in U.S. dollars or other freely convertible currency. The form of performance bond and payment bond required is shown in Part III, Performance Bond and Payment Bond Forms. No separate payment will be made to the Contractor for furnishing the performance and payment bonds.

5-05 COMMENCEMENT, PROSECUTION, AND COMPLETION

A. The Contractor is to commence work under this Contract within 30 calendar days after the date of notice to proceed, which will be issued after Contract signature and after letter of credit acceptable to the Contractor is opened, and shall prosecute the work with faithfulness and energy to completion. The Contractor shall complete the various parts of the Permanent Works within 760 calendar days after the date of notice to proceed.

B. Time is of the essence, and damage will result to the Owner if the Contractor fails to complete the various parts of the Permanent Works by the dates specified above, or any extension thereof granted by the Owner. Since the exact amount of such damage would be difficult to ascertain, it is agreed that the Contractor shall pay to the Owner, \$500 as liquidated damages and not as penalty, for each calendar day the completion of the various parts of the Permanent Works is delayed beyond the completion date.

C. The total amount of liquidated damages assessed will not exceed 100,000 U.S. dollars.

5-06 INSURANCE

A. Before commencement of the Work, the Contractor shall procure and thereafter maintain in force, at its sole expense, until the Work has been completed and accepted in its entirety by the Owner, insurance covering the above liabilities specified in paragraph 4-22, Protection of Work and Property, under policies in form, in amounts and with insurance carriers acceptable to the Owner. Such insurance shall include Builders Risk "All Risk" Completed Value Insurance, in accordance with paragraph B, hereafter. In addition to the foregoing, the Contractor shall also obtain the following insurance in not less than the following amounts:

<u>Insurance</u>	<u>Amount</u>
(i) Workmen's Compensation	Payments comparable to those provided under the Long-shoremen's and Harbor Workers act (33 U.S.C. 901 et seq.)
(1) U.S. citizens, bona fide residents of the U.S. and personnel hired in the U.S.	
(2) All others	Payments meeting at least the minimum legal requirements which are applicable by reason of the point of hiring and site of work
(ii) Employer's Liability	\$100,000
(iii) Public Bodily Injury Liability	
Per Person	100,000
Per Accident	500,000
(iv) Public Property Damage Liability	
Per Accident	100,000
(v) Automobile Bodily Injury	
Per Person	100,000
Per Accident	500,000
(vi) Automobile Property Damage Liability	
Per Accident	100,000

The coverage referred to in (iii) and (iv) above shall include contractual liability insurance against the liability assumed in 4-10, Indemnity. All such policies shall name as additional named insureds as their interests may appear the Owner, the Engineer and its consultants, and each of their officers, employees and agents, and all other persons with an insurable interest who may be designated by the Owner as an additional named insured, and said policies or certificates thereof shall be delivered to the Owner. Each policy or certificate will include an endorsement or statement waiving right of cancellation or reduction in coverage without 10 day's notice in writing to be delivered by registered mail to the Owner. In the event that any class of employees engaged in work under this Contract are employed by subcontractors, then the Contractor shall provide and require each subcontractor at the Site to provide adequate protection for such employees.

B. Without limiting the obligations and responsibility of the Contractor under 4-22, Protection of Work and Property, the Contractor shall provide Builder's Risk "All Risk" Insurance for the properties indicated hereinafter against all loss or damage from whatever cause arising (other than excepted risks in 4-22, Protection of Work and Property)

for which he is responsible under the terms of the Contract and in such manner that the Owner and Contractor are covered by this insurance from damages or losses, from the commencement to the completion of the Work, and are also covered for any loss or damage occasioned by the Contractor in the course of any operation carried out by him for the purpose of complying with his obligations under 4-23, Correction of Work. The Properties that shall be insured are: (a) The Work being performed under this Contract to the full value thereof plus any additional expense incidental to the restoration or repair of such loss or damage, including the cost of demolishing and removing any part of the Work and removing debris of whatever nature and (b) For the full value of the materials, permanent equipment, including Owner-furnished equipment, and construction plant and equipment brought on to the Site.

C. No direct payment will be made to the Contractor for taking out and maintaining the insurance required under paragraphs A and B. above and the entire cost thereof shall be included in the prices bid for the various items in the Schedule of Prices.

#### 5-07 PROGRESS REPORTS

A monthly progress report shall be prepared by the Contractor at the close of each calendar month in a form approved by the Engineer and submitted by the Contractor to the Engineer and the Owner not later than the tenth of the following month together with the invoices required under 4-32, Progress Payments. The report shall show the amount of the work completed, materials received to date, materials in storage, and the cumulative results of all operations completed or in progress and shall be summarized in terms of a percentage of completion.

#### 5-08 CONSTRUCTION SCHEDULE

To provide for adequate control of work under these Contract Documents, the Contractor shall, within 3 months after signing the Contract, prepare and submit for review a complete detailed construction schedule to amplify the schedule submitted with his bid. Every 6 months thereafter, during the life of the Contract, the Contractor shall submit for review with the progress reports required under 5-07, Progress Reports, either a revised construction schedule which shall replace that previously submitted or certify that the previously submitted schedule is still in effect. The Contractor may submit for review a construction schedule prepared by the Critical Path Method (CPM), which shall be prepared in accordance with a standard method of CPM preparation by personnel experienced in construction scheduling under the system used.

The Contractor shall promptly report to the Engineer the occurrence of any event or condition that might delay or prevent completion of the Project in accordance with an approved schedule and to indicate steps being taken to meet the situation.

5-09 ACCESS, COMMUNICATIONS, AND UTILITIES

A. Access (Existing).

1. Air. Commercial air facilities for passenger and freight transportation to Medan are available through Garuda Airlines.

2. Ports. The port of access is Belawan.

3. Railroad. A railroad runs from Belawan to Medan.

4. Highway. The route of the main access road to the Project is shown on the Drawings. There is an all weather road from Belawan to Medan and from Medan to Bindjai.

5. Railroad and Highway Loadings. The Contractor shall satisfy himself as to the capacity and size of loads that can be transported on the railroads and highway.

B. Access (By Contractor). The Contractor shall satisfy himself of the existing access facilities.

C. Communications. The Contractor shall make arrangements for communications for his own use.

5-10 TAXES AND DUTIES

A. The Contractor and the Contractors non-Indonesian field personnel shall be exempt from payment of Indonesian Income taxes on payments received hereunder and of custom duties, Harbor Dues and other charges for import of personal effects.

B. In order to obtain exemption from all duties and taxes connected with imports the Contractor shall submit to the Owner a complete list of goods to be imported into the country under franchise. Upon receipt of such lists the Owner will take the necessary steps with the proper authorities to obtain the customs exemptions for the goods covered by the lists.

C. The Owner will arrange with the Custom's Authorities to authorize the free importation of the goods mentioned above upon presentation by the Contractor of the shipping documents.

D. Any instruments, tools, machinery and trucks required for the performance of the Contractor's services in Indonesia and imported by the Contractor on the condition of their reexportation, may be exempted from any custom duties, charge, etc. Goods imported under this franchise shall not be used for purposes other than those expressly stated in the Contract. The Contractor shall not sell, cash, nor relinquish possession in any manner within the boundaries of Indonesia any of the goods imported under franchise, even though this Contract shall have been rescinded, resolved, lapsed, or terminated, without previously paying all taxes exempted herein. In the event the Contractor does not withdraw but elects to dispose of its equipment, including vehicles, in Indonesia, upon which customs, duties and taxes have been relieved, the Contractor shall bear the cost of all such duties and taxes as may be imposed in conformity with the laws and regulations of Indonesia.

E. Aid loan funds are not available for the payment of any tax, duty, fee, retention, contribution or like charges of any kind paid, or payable by the Contractor or Contractor's personnel.

F. A reasonable portion of the final payment may be withheld until the Contractor submits valid proof that the equipment and any excess materials have been disposed of in accordance with the requirements stipulated herein.

G. The Contractor affirms that the Contract price or prices cited herein, including the prices in subcontracts hereunder, do not include any charge, tax, duty, levy, or expense from which the Contractor is relieved under the foregoing provisions of this section.

#### 5-11 PHYSICAL DATA

The following data relating to the Project are not intended as a representation or warranty, but are furnished for information for bidding purposes only. It is expressly understood that the Owner or the Engineer will not be responsible for any interpretations or conclusions drawn therefrom. The Contractor should also visit and examine the Site in accordance with 1.1-06, Bidder's Understanding.

A. Climatological Data. Climatological data are summarized as follows:

Air Temperature: The average ambient air temperature is 26°C (79°F) for all months of the year.

The maximum recorded air temperature is 35°C (95°F).

The minimum recorded air temperature is 19°C (66°F).

Rainfall: The average annual rainfall for the past six years (1966 through 1971) is 1700 millimeters.

Approximately eighty-one percent (81%) of the annual rainfall occurs between the months of August and December, inclusive. Some rain can be expected every month. Rain generally falls between the late afternoon and early morning hours.

**Humidity:** The average humidity over the past six years (1966 through 1971) is eighty-seven percent (87%).

**B. Soil Conditions.** The soil is generally firm loam or sandy. Approximately ten percent (10%) of the area in which poles will be set has an extremely high water table.

#### 5-12 STANDARDS

**A. General.** The standards under which the Work shall be performed or tested are specified throughout the Contract Documents. Where such standards are specified, it shall be understood that the latest revision or edition at the time of submission of bids shall apply. In referring to standards the following abbreviations have been used:

<u>Name</u>	<u>Abbreviation</u>
American Society for Testing and Materials 1961 Race Street Philadelphia, Pennsylvania 19103, USA	ASTM
Associated General Contractors of America, Inc. 1957 E Street, NW Washington, D. C. 20406, USA	AGC
Insulated Power Cable Engineers' Association 283 Valley Road Montclair, New Jersey, USA	IPCEA
Institute of Electrical and Electronic Engineers 345 East 47th Street New York, New York 10017, USA	IEEE
International Chamber of Commerce 38, Cours Albert 1er Paris VIII, France	ICC
National Board of Fire Underwriters 85 John Street New York, New York 10017, USA	NBFU

<u>Name</u>	<u>Abbreviation</u>
National Bureau of Standards c/o Superintendent of Documents U.S. Government Printing Office Washington, D. C. 20425, USA	NBS
National Electric Code Board of Underwriters 85 John Street New York, New York 10017, USA	NEC
National Electrical Manufacturer's Association 155 East 45th Street New York, New York 10017, USA	NEMA
National Electric Safety Code c/o National Bureau of Standards Superintendent of Documents U.S. Government Printing Office Washington, D.C. 20425, USA	NESC
Rural Electrification Administration U.S. Department of Agriculture Washington, D. C. 20425, USA	REA
Society of Automotive Engineers 485 Lexington Avenue New York, New York 10017, USA	SAE
Underwriter's Laboratories, Inc. 207 East Ohio Street Chicago, Illinois 60611, USA	UL
American National Standards Institute, Inc. 1430 Broadway New York, New York 10018, USA	ANSI (USA) (ASA)

B. Or Equal. For convenience in designation in the Contract Documents, certain equipment, articles, materials, or processes are designated by trade name or catalog name and number. Such designation shall be deemed to be followed by the words "or equal" whether such words are shown or not, and the Contractor may offer any material or process which shall be equal to that so indicated or specified. The burden of proof as to comparative quality and suitability of alternatives shall be upon the Contractor.

C. Instruments. Instruments shall be calibrated in the metric system of units.

D. Nameplates, Signs and Notices. Nameplates on equipment, signs and notices shall be in the English language. In some cases, the Owner may require the nameplates, signs, and notices in Indonesian. The Owner will furnish the translation.

#### 5-13 MATERIALS AND WORKMANSHIP

Unless otherwise specified, all materials incorporated in the Permanent Works shall be new, and both workmanship and materials shall be of first class quality and, where shown, of the classification and grades designated. Materials not specifically designated, shall be subject to approval, shall be suitable for the purpose, and shall as far as practicable comply with the latest specifications of the ASTM.

#### 5-14 PERMANENT WORKS MECHANICAL AND ELECTRICAL EQUIPMENT

##### A. Standard Products.

1. All equipment shall be new and shall be essentially standard products of manufacturers regularly engaged in the production of the type of equipment specified herein. Like items shall be the product of a single manufacturer.

The sizes, ratings and capacities, and dimensions of the various equipment items listed herein are based on currently available standard products of United States manufacturers. The metric designations shown were obtained by direct conversion; reasonable deviations will be allowed to permit supply of standard equipment. In no case shall the capacity furnished be less than that specified, unless approved by the Engineer.

B. Tropicalization. All electrical insulation, fiber panels, or spacers, wood, and other materials inside equipment which could be damaged by fungus or other parasitic growths shall be coated with Humi-Seal 1B12, or equal, (a product of the Columbia Technical Corp., 24-30 Brooklyn Queens Expwy., W., Woodside, New York 11377, USA).

#### 5-15 DRAWING SCHEDULE

The Contractor shall, within 3 months after signing the Contract, prepare and submit with the Construction Schedule required by 5-08, Construction Schedule, a schedule of Drawings he proposes to submit in accordance with the requirements of 5-17, Contractor's Drawings, Manufacturers' Data and Instructions, together with the dates on which he



proposes to submit such Drawings. Every 6 months thereafter, during the life of the Contract, together with each revision or certification of the Construction Schedule as required by 5-08, Construction Schedule, the Contractor shall either revise this schedule of Drawings and resubmit it or certify that the previously furnished schedule is still in effect.

5-16 OWNER-FURNISHED DRAWINGS

A. General. The Drawings listed in Part XI, Drawings, Maps, Plans and Sample Work Order show the permanent works to be constructed under these Contract Documents as definitely and in as much detail as is possible at the present time. Additional detail for construction purposes will be furnished to the Contractor in the form of Supplementary Drawings or by revision to the Drawings. The Contractor shall advise the Engineer of any errors or omissions discovered on the Drawings or in the Contract Documents.

B. Bid Drawings.

1. The Bid Drawings are included in Volume IV, Construction Standards, Drawings and Work Orders.

C. Supplementary Drawings.

1. The Supplementary Drawings will be furnished to the Contractor as the construction work progresses in accordance with the provisions of Section 6.5, Work Order Procedures.

2. The information provided on Supplementary Drawings will also include the following:

a. Details as submitted by suppliers of owner-furnished equipment.

D. Contract Documents to be Furnished to Contractor. Ten copies of Volumes I through IV of the Contract Documents will be furnished to the Contractor without charge upon request and any additional copies, which the Contractor may request, will be furnished at the cost of reproduction. These Owner-Furnished Drawings and Contract Documents are to be used only in connection with the work specified herein and with the exception of the signed Contract set are to be returned upon request at the completion of the Contract.

5-17 CONTRACTOR'S DRAWINGS, MANUFACTURERS' DATA, AND INSTRUCTIONS

A. General. The Contractor shall submit to the Engineer, Drawings,

design data, operating instructions, and catalog pages as outlined herein and in the technical specifications. The sequence of submission shall be such that information is available for review of each Drawing when it is received. Contractor's official verification that the information shown thereon has been checked by the Contractor and is correct for use in the Project except for Drawings of a preliminary nature furnished for information which shall be clearly identified as such. Before submitting any Drawings for review, the Contractor shall obtain approval of the list of Drawings he proposes to submit. All Drawings shall be submitted in accordance with the Drawing Schedule of 5-15, Drawing Schedule.

B. Review.

1. Three prints with dark lines on a white background shall be furnished to the Engineer of each Drawing submitted. One copy will be returned to the Contractor marked "Reviewed", "Reviewed with Corrections Indicated," or "Examined and Returned for Corrections." Prints marked "Reviewed" and "Reviewed with Corrections Indicated" authorize the Contractor to proceed with construction of fabrication of equipment covered by such Drawings with corrections, if any, indicated thereon. Review will not relieve the Contractor of responsibility for conformity to the Contract Documents and correct detail and fit of parts when installed. Upon receipt of prints which have been "Reviewed," the Contractor shall furnish without delay one cloth or film reproducible copy of approved quality and type and one additional print of each Drawing with dark lines on a white background. If minor revisions are made after a Drawing has been reviewed, the Contractor shall furnish one reproducible copy and one additional print subsequent to each revision. No major revision affecting the design shall be made after a Drawing has been "Reviewed" without resubmitting the Drawings.

2. When prints of Drawings have been marked "Reviewed with Corrections Indicated" or "Examined and Returned for Corrections" the Contractor shall make the necessary corrections and submit 3 copies. Every revision shall be shown by number, date, and subject in a revision block. In addition, each revised Drawing shall have its latest revision clearly delineated.

3. All applicable requirements of the above paragraphs with reference to the Drawings shall apply equally to design data, catalog pages, illustrations, printed specifications, or any other data submitted for review.

4. The Contractor shall make any changes in the designs which are necessary to make the equipment conform to the provisions and intent of these Contract Documents, without additional cost to the Owner.

5. The Contractor shall leave a blank area of 100 mm x 70 mm on all Drawings adjacent to the Drawing title block for the Engineer's review stamps.

6. Should an error be found in a Contractor's Drawing during the erection of structures or installation of equipment, the correction, including any field changes found necessary, shall be noted on the Drawings, and it shall be resubmitted for review and record as outlined above.

C. Record Copies. Prior to completion of the work under the Contract, the Contractor shall furnish to the Owner:

1. One complete set of permanent reproducible cloth or film copies of approved quality and type of all Contractor's Drawings of structures and equipment as finally built.

2. Ten copies of operating instructions for the various items of equipment.

3. Ten copies of applicable parts catalogs.

D. Metric System. All units of measurements used shall be in the metric system except as otherwise specified.

#### 5-18 MATERIALS FURNISHED BY THE OWNER

Materials furnished by the Owner which the Contractor shall install will be delivered unloaded at the Contractor's warehouse and/or the Owner's pole yard. If delivery of any of the materials is sufficiently late to prevent the completion of the work by the Contract completion dates, the Contract time will be extended as provided in 4-26, Delays and Extension of Time. The Contractor shall check the quantity and condition of the equipment and materials when delivered to him, acknowledge receipt in writing to the Engineer, and include a report of any damages and shortages. He shall be responsible for any loss or damage to the materials from then on until the completion of the Contract.

#### 5-19 CAMPS

A. The Contractor shall provide all the facilities for all his personnel. The location, design, construction, and operation of any camp will be subject to approval. Adequate sanitary facilities subject to approval shall be provided and maintained in a clean and sanitary manner. Expensive or permanent types of construction will not be required, but all buildings erected in the camp shall be substantial in construction and reasonably attractive in appearance. After the completion of the Permanent Works and before final payment is made, the Contractor shall remove all of his own buildings and other construction

facilities, shall backfill with earth all basements and other excavated areas, and shall leave the camp sites in a clean and sightly condition. No direct payment will be made to the Contractor for constructing and removing the camps, and the entire cost thereof shall be included in the prices bid for the various items in the Schedules of Prices. Construction facilities shall at all times remain the property of the Contractor, unless the Owner elects to purchase certain facilities from the Contractor.

B. The Contractor shall be responsible for the conduct of his personnel.

#### 5-20 MEDICAL CARE

The Contractor shall provide and maintain adequate medical facilities for treatment of sickness and of accidents and provide a doctor and nurse, medicine, and drugs necessary therefor. The facilities shall be at least equal to those required by applicable laws, regulations, and ordinances. No direct payment will be made for providing medical care, and the entire cost thereof shall be included in the prices bid for the various items in the Schedules of Prices.

#### 5-21 UNITS OF MEASUREMENT

A. Measurements used to determine payments will be expressed in the metric system.

B. Where used in these Contract Documents, the following units of measurement will be abbreviated as shown and have the equivalent indicated.

<u>Unit of Measurement</u>	<u>Abbreviation</u>	<u>Equivalents</u>
Hectare	ha	2.471 acres 10,000 m <sup>2</sup>
Millimeter	mm	0.1 cm
Centimeter	cm	0.0328 feet
Meter	m	3.281 feet
Square meter	m <sup>2</sup>	10.764 square feet; 1.196 square yards

<u>Unit of Measurement</u>	<u>Abbreviation</u>	<u>Equivalents</u>
Cubic Meter	m <sup>3</sup>	35.315 cubic feet; 1.308 cubic yards
Kilogram	kg	2.205 pounds
Kilometer	km	3,281 feet
Liter	l	0.264 gallon (US)
Metric ton	-	1,000 kg
Kilograms per square centimeter	kg/cm <sup>2</sup>	14.223 pounds per square inch (psi)
Liters per minute	l/min	0.264 gallons per minute (gpm)
Cubic meters per second	m <sup>3</sup> /sec	35.315 cubic feet per second (cfs)
Metric horsepower	-	0.9862 horsepower

5-22 SOURCE AND ORIGIN

A. General. Where practicable, equipment and material shall be of Indonesia source and origin. Local materials such as, but not limited to, cement, reinforcing steel, and wood products meeting the requirements of these Contract Documents will be acceptable. Equipment and material imported for the Project shall be of United States or AID Geographic Code 941 countries source and origin. Payment for these items will be made from funds in accordance with 1.1-14, Source of Funds.

B. Source and Origin.

1. Source and Origin of Services. Construction services provided under this Contract shall have their source and origin in the United States or other eligible countries under AID Geographic Code 941.

a. The "source of origin" of construction services:

(1) Furnished under a personal service contract with an individual, means the country of citizenship or permanent residence (substantially uninterrupted physical presence for 3 consecutive years) of such individual; or

(2) If furnished by a firm, means the nationality of the firm as defined below.

b. U.S. Firm. An entity is a "U.S. firm" if it meets all of the conditions listed in subparagraphs (1), (2), and (3) below:

(1) It is incorporated or legally organized in the United States.

(2) It has its principal place of business in the United States, in an other eligible source country, or in the country of the borrower.

(3) It is more than 50% beneficially owned by a U.S. firm or firms or by U.S. citizens.

c. Other Eligible Source Country Firm. An entity is an "other eligible source country firm" if it meets the conditions listed in subparagraphs (1), (2), and (3) below:

(1) It is incorporated or legally organized in an other eligible source country.

(2) It has its principal place of business in an other eligible source country, in the United States, or in the country of the borrower.

(3) It is more than 50% beneficially owned by a firm or firms of the United States, of an other eligible source country, or of the country of the borrower, or by citizens of such countries, or any combination thereof; Provided, that for the purpose of determining currency of payment, any firm which is more than 50% beneficially owned by a firm or firms of the country of the borrower, or citizens of that country or any combination thereof, shall be deemed to be a "local firm."

d. Local Firm. An entity is a "local firm" if it meets both the conditions listed in subparagraphs (1) and (2) below and in addition either (3) or (4) below:

(1) It is incorporated or legally organized in the country of the borrower.

(2) It has its principal place of business in the country of the borrower.

(3) It is more than 50% beneficially owned by a firm or firms of the borrower country or of the United States, or by citizens of either country, or any combination thereof.

(4) It is determined by A.I.D. to be an integral part of the local economy of the country of the borrower. This determination is applicable only for the purpose of supplying goods and services in the country of the borrower.

e. Citizenship Eligibility. To determine citizenship eligibility for source and origin purposes, the following definitions apply:

(1) A "permanent resident" is a person who is not a citizen, yet has been physically residing substantially uninterrupted for more than 3 years in an eligible source country. Such "permanent residents" may be utilized on an A.I.D.-financed project only within the country of their permanent residence.

(2) A "third country national" is an individual who is not a citizen of the United States, or a national of the borrowing country, or a citizen of an other eligible source country.

f. Beneficial Ownership, Citizenship.

(1) "Beneficial ownership" of a firm is presumptively established by the bona fide certification of a duly authorized officer of the firm as to the citizenship of the firm's owners.

(2) In the case of corporations, the corporate secretary shall certify as to beneficial ownership. He may presume citizenship on the basis of a stockholder's record address provided, however, he certifies, regarding any stockholder whose holdings are material to the corporation's qualifications, that he knows of no facts which might rebut that presumption.

2. Source and Origin for Procurement of Materials and Equipment. Materials and equipment imported for use on this Project shall be from the United States or other eligible countries under AID Geographic Code 941.

a. Rules. A.I.D. source and origin rules apply to procurement of equipment and materials by fixed-price contractors as follows:

(1) With respect to equipment and materials to be incorporated in the Project or otherwise transferred to the borrower, including spare parts for the same, e.g., "included commodities."

(2) With respect to equipment and materials to be used on the Project but which will not be incorporated in the Project or otherwise transferred to the borrower, e.g., "Contractor-owned commodities"--in the manner and to the extent specified in Section 4.3.c.

(3) In no event may any equipment or materials, whether under (1) or (2) above, be utilized in the Project unless the source and origin thereof is a country or countries included in A.I.D. Geographic Code 935 (i.e., is not of Communist Bloc source or origin).

b. Included Commodities. Included commodities, imported for the Project, are subject to the following rules governing source or origin:

(1) With respect to equipment and materials the "origin" thereof is the country in which such equipment or material was mined, grown, or produced through manufacturing, processing, or assembly; and the "source" thereof is the country or territory from which such commodity is shipped to the borrower country, except that when equipment or materials are shipped to the borrower country from a free port or bonded warehouse in the form in which received therein, "source" means the country or territory from which such equipment or material was shipped to such free port or bonded warehouse, and except that if the equipment or material is located in the borrower country at the time of its purchase for the Project, "source" means the borrower country. A produced commodity shall be deemed of country origin, if, as a result of manufacturing, processing, or assembly in such country, a commercially recognized new commodity is produced that is substantially different in basic characteristics or in purpose or utility from any of its imported components.

(a) Procurement of motor vehicles is restricted to U.S. manufacture as required by Section 636(1), Foreign Assistance Act. However, vehicles manufactured in the United States may be procured in any authorized source country to which they have been shipped, either assembled or knocked down for assembly only, in such country.

(b) No produced commodity shall be eligible for A.I.D. financing if such commodity contains any component from a Communist Bloc Country (i.e., a country not specified in A.I.D. Geographic Code 935).

(2) No produced commodity shall be eligible for A.I.D. financing:

(a) If such commodity contains any component or components which were imported from ineligible sources; and

1. Such components were acquired by the producer in the form in which they were imported; and

2. The total cost of such components (delivered at the point of production) amounts to more than 50 percent, of such other percentage as A.I.D. may specify in the Loan Agreement, Letters of Implementation, or other related documents, of the lowest



price (excluding the cost of ocean transportation and marine insurance) at which the supplier makes the commodity available for export sale, whether or not financed by A.I.D.

3. In the application of 2. above, the following interpretation shall apply:

a. For loans not tied to U.S. source and origin, components from the other eligible source countries, and from the borrower country, may be used without limitation in applying this percentage rule.

(b) If such commodity has been transported to the borrower country:

1. By a transportation medium owned, operated, or under control of any Communist Bloc country (i.e., a country not specified in A.I.D. Geographic Code 935).

2. On a vessel which A.I.D., by written notice to the borrower, has designated as ineligible.

3. Under any ocean or air charter which has not received prior approval by A.I.D.

c. Contractor-Owned Equipment.

(1) Prior-Owned Equipment and Materials. Equipment and materials owned or leased by the Contractor prior to the opening of bids for the Contract shall not be subject to A.I.D. source and origin requirements, other than the Communist Bloc source and origin rule specified in Section 5.22 B 2 a (3).

(2) Equipment and Materials Acquired for the Project. Subsequent to the opening of bids for the Contract and unless otherwise specified in the IFB, equipment and materials purchased or leased by the Contractor for construction or incorporation in the Project shall be subject to A.I.D.'s source and origin requirements for the Project. However, Contractor procurement of spare parts reasonably required for maintenance, during the construction of the Project, of prior-owned or - leased construction equipment of non-U.S. source and origin, pursuant to Section 5.22 B 2 c (1), shall not be subject to A.I.D.'s source and origin requirements for the Project, other than the Communist Bloc source and origin rule specified in Section 5.22 B 2 a (3).

(3) Ocean Shipping and Other Non-local Transportation. Materials and equipment imported under this Project shall be shipped in accordance with the following rules and regulations:

(a) Commodities may not be shipped on any vessel which A.I.D., by written notice to Perusahaan Listrik Negara, has designated as ineligible. The Contractor shall determine the eligibility of vessels before shipping. The Contractor will not be reimbursed for any commodity shipped in noncompliance with this provision.

(b) The borrower shall insure that at least 50 percent of the gross tonnage of all equipment and materials which may be transported to the borrower country on ocean vessels for use on or incorporation in the Project (whether procured or supplied by the borrower or the Contractor), shall be transported on privately owned U.S.-flag commercial vessels, computed separately for dry bulk carrier, dry cargo liners, and tankers, to the extent such vessels are available at fair and reasonable rates for U.S.-flag commercial vessels. The equipment and materials to which the foregoing requirements applies do not include (a) equipment and materials which were owned or leased by the Contractor prior to the opening of bids for the Contract, or (b) any other equipment and materials the procurement of which was not, directly or indirectly, financed by A.I.D. This requirement applies whether or not A.I.D. finances such transportation.

(c) Equipment and materials to which the foregoing requirements applies, which are not transported on U.S.-flag commercial vessels in accordance with 5.22 B 3 b, above, shall be transported on carriers under the flag of other eligible source countries, unless A.I.D. determines in advance of the shipment that no such carrier is available and approves shipment on a carrier under the flag of a country included in A.I.D. Geographic Code 935.

(d) If the Contractor's total shipments under the Contract fail for any reason to meet the U.S.-flag shipping obligation established in its Contract pursuant to Section 5.22 B 3 b above, and it is determined that the Contractor's total shipping costs were less than if that obligation had been met, an appropriate adjustment shall be made in the Contract price.

4. Source and Origin of Marine Insurance. Marine Insurance on commodities shipped under this Contract shall have their source in the United States or other eligible source countries under AID Geographic Code 941.

5. AID Geographic Codes.

a. AID GEOGRAPHIC CODE 941 - SELECTED FREE WORLD

The United States (001 and 002), and any other independent country in the Free World (A) excluding the cooperating country itself and the following:

<u>Europe</u>		<u>Other</u>	
Andorra	Malta	Algeria	Kuwait
Austria	Monaco	Australia	Libya
Belgium	Netherlands	Canada	New Zealand
Denmark	Norway	Cyprus	Qatar
Finland	Portugal	Greece	Somali Republic
France	San Marino	Hong Kong	S. Africa, Rep. of
Germany, Fed. Rep.	Spain	Iraq	Southern Rhodesia
Berlin, West	Sweden	Israel	Sudan
Iceland	Switzerland	Japan	Syria
Ireland	United Kingdom		United Arab Rep. (Egypt)
Italy	Vatican City		U.A. Emirates
Liechtenstein	Yugoslavia		Yemen
Luxembourg			

(A) "Free World" excludes any area or country listed in Code 935.

b. AID GEOGRAPHIC CODE 935 - SPECIAL FREE WORLD

Any area or country in the Free World, including the cooperating country itself.

Countries excluded from the free World are as follows:

Cuba

China (Mainland) and Other Communist-Controlled Areas, incl.:

Manchuria  
Inner Mongolia  
Tsinghai Province  
Sikang Province  
Sinkiang  
Tibet  
The former Kwantung Leased Territory  
The present Port Arthur Naval Base area  
Liaoning Province

**EASTERN EUROPE**

Albania  
Bulgaria  
Czechoslovakia  
East Germany (Soviet Zone of Germany and Soviet Sector of  
Berlin)  
Estonia  
Hungary  
Latvia  
Lithuania  
Romania

**KOREA, NORTH**

**OUTER MONGOLIA**

**POLAND**

**UNION OF SOVIET SOCIALIST REPUBLICS (USSR)**

**VIET-NAM (NORTH)**

**5-23 AID MARKING REQUIREMENTS**

All equipment and materials shall carry the official AID (clasped hands) emblem. Emblems shall be affixed by metal plate, decalcomania, stencil, label, tag, or other means, depending upon the type of commodity or shipping container and the nature of the surface to be marked. The emblem placed on the commodities shall be as durable as the trademark, company name, or brand name affixed by the producer; the emblem on each shipping container shall be affixed in a manner which assures that the emblem will remain legible until the container reaches the consignee. Upon each shipping container the last set of digits of the identification number of the pertinent loan agreement or other document shall be marked in characters at least equal in height to the shipper's marks. Lists of firms that supply satisfactory emblems may be obtained from the Engineer. The official AID (clasped hands) emblem shall be prominently displayed on all ships during loading and unloading when their cargoes consist entirely of AID-financed goods. Ship charterers shall insert in charter party agreements instructions relating to the display of AID emblems.

**5-24 BOOKS AND RECORDS**

The Contractor and his Subcontractors shall maintain adequate books and records concerning transactions under or in connection with

the Contract and shall make them available for inspection and audit by the Owner and AID (or their authorized agents or representatives) during the Contract term and for a period of 3 years after final payment under the Contract, to insure compliance with the requirements of the Contract between the Owner and Contractor. They will be subject to audit for compliance with source and origin and comparable requirements.

5-25 AID APPROVALS

A. The parties hereto understand that A.I.D. has reserved certain approval rights including, but not limited to, the right to approve the terms, of this Contract, the Contractor, and any or all plans, reports, specifications, subcontracts, bid documents, Drawings, or other documents related to this Contract and the Project of which it is part. The parties hereto further understand and agree that A.I.D., in reserving any or all of the foregoing approval rights, has acted solely as a lender to assure the proper use of United States Government funds, and that any decision by A.I.D. to exercise or refrain from exercising these approval rights shall be made as a lender in the course of financing this Project and shall not be construed as making A.I.D. a party to the Contract. The parties hereto understand and agree that A.I.D. may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project of which this Contract is part, with the parties jointly or separately, without thereby incurring any responsibility or liability to the parties jointly or to any of them.

B. Any approval or failure to disapprove by AID of any plan, report, specification, contract, bid document, Drawing or other documents shall not bar the BORROWER or AID from asserting any right, or relieve the CONTRACTOR of any liability which the CONTRACTOR might otherwise have to the BORROWER or AID, because of such plan, specification, contract, bid document, Drawing, or other document or any performance or failure of performance thereunder, or under any AID, CONTRACTOR's or Supplier's certificate.

5-26 DIVERSION AND VESTING RIGHTS OF AID

To the extent and as set out in the AID Loan Agreement financing the Project or related documents, in an event of default, breach of agreement or extra-ordinary situation shall occur or if disbursement by AID shall be unlawful, AID may direct that title to the commodities financed by it to be transferred to AID. The CONTRACTOR shall abide by AID instructions with respect to delivery or diversion of such transferred commodities.

5-27 PACKING AND SHIPPING

A. Export Packing.

1. The Contractor shall adhere and require his suppliers of procurement items to adhere to standard packing requirements recognized by the Export Trade Carriers and such packing shall be so constructed as to avoid loss or damage from the elements, pilferage and the hazards of handling and storage. Such packing shall be sufficiently strong so that it will not break, leak or fall apart thereby exposing the contents. Interior blocking, bracing and cushioning shall be provided where necessary to absorb shocks, prevent rattling and relieve destructive forces. Packages containing fragile material shall be so marked in bold stout letters and be tropicalized.

2. Machined parts must be thoroughly greased and amply protected against rust-forming and other corrosive elements.

3. In accordance with good packing practices, materials shall be packed in the smallest possible containers since steamship freight is usually based on cubic measurements.

4. The use of open type crating and/or similar packing shall be restricted to materials not susceptible to pilferage or to damage by the elements or salt water. This method of packing shall not be used without obtaining the prior approval of the Engineer.

B. Export Marking. The Contractor shall adhere to and require his suppliers to adhere to the following provisions for export marking:

1. All external marking must be legibly and durably painted or stenciled on two sides and both ends of containers in letters at least one and one-half inches high. Under no circumstances shall chalk or crayon be used.

2. Packages in each shipment must be numbered consecutively. No two packages delivered shall carry the same package number.

3. Net, tare and gross weights in kilograms, as well as the correct outside measurements in terms of length, width and height in the Metric System must be shown on each package.

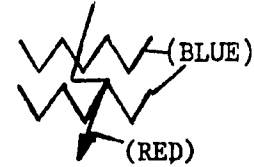
4. Marks indicating where to "SLING" shall be emphasized on containers with an arrow.

5. In the event that prior approval has been obtained from the Engineer to forward pieces without packing as specified in any Export Packing Paragraph, the pieces must be otherwise safely protected or bundled, using ample metal binding; and metal tags bearing the required marks must be firmly wired to each bundle in at least two visible places.

6. Unless otherwise specified by the Owner, only the following identifying marks shall be used on shipping containers in addition to AID marking:

SHIPPING MARKS

(YELLOW) 1) CASE MARKING (YELLOW)

<p><u>PROJECT AID</u> <u>BARANG PEMERINTAH</u></p> <p>TO: PERUSAHAAN UMUM LISTRIK NEGARA</p> <p><u>BELAWAN - MEDAN</u> <u>INDONESIA</u></p> <p>AID LOAN NO.: _____</p> <p>AID COMMODITY CODE NO.: _____</p> <p>CONTRACT NO.: _____</p> <p>GROSS WT: _____ KG NET WT: _____ KG</p> <p>DIMENSIONS: _____ M</p>	 <p>SHIPPER: _____</p> <p>P. O. NO. _____</p> <p>CASE NO. _____ OF _____</p> <p>L/C NO. _____</p> <p>REF. NO. _____</p>
--	--


(YELLOW) (YELLOW)

MARKING AS ABOVE: OPPOSITE STANDING SIDES

CORNER MARK: THREE SIDES OF EACH UPPER CORNER  
AND TWO SIDES OF EACH LOWER CORNER

THUNDERBOLT AND ZIG ZAG MARKS FIVE SIDES

2) SHIPPING TAGS

<p>(SAME AS FOR CASE MARKING WITHOUT CORNER MARKS)</p>	
--	---

(YELLOW)





3. To: Contract 629-C 1 copy  
Harza Engineering Company  
150 So. Wacker Drive  
Chicago, Illinois 60606, U.S.A.

E. Transshipment. Belawan has regular shipping service by several eligible shipping firms. Unless prompt and reliable transshipment service can be arranged at Singapore or other ports outside of Indonesia, preference should be given to shipping by lines having direct service from port of embarkation to the Port of Belawan.

F. Export Licenses. Any license or other documentation required by the country of origin to export material, equipment or services to Indonesia shall be obtained by the Contractor.

5-28 AMENDMENTS TO CONTRACT

A. This Contract may be amended or modified at any time during which it is in force, by mutual agreement between the Owner and the Contractor, subject to the approval of AID. Any change or modification not so approved shall not be financed by AID.

B. For amendments involving changes in quantities of Construction Units, the Contractor shall, on request from the Engineer submit a new cost estimate on the basis of his Contract Bid Prices, adjusted for demonstrated cost changes.

C. For amendments involving Construction Units not included in the original Contract Documents, the prices shall be negotiated on the basis of specifications supplied by the Engineer.



4970201 (6)  
PD-AAD-771

PERUSAHAAN UMUM LISTRIK NEGARA  
MINISTRY OF PUBLIC WORKS AND POWER  
JAKARTA, INDONESIA  
OWNER

195p.

## MEDAN POWER REHABILITATION PROJECT

INVITATION FOR BIDS

FURNISH AND ERECT FACILITIES  
FOR THE  
REHABILITATION AND EXPANSION OF THE DISTRIBUTION SYSTEM  
629-2

VOLUME III - TECHNICAL SPECIFICATIONS

AID LOAN NO. 497-H-022

CHICAGO,  
ILLINOIS  
U. S. A.

HARZA ENGINEERING COMPANY

AUGUST 1973

MEDAN  
SUMATRA  
INDONESIA



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**PART VI - TECHNICAL SPECIFICATIONS FOR ERECTION  
OF DISTRIBUTION FACILITIES**

**SECTION 6.1 - MISCELLANEOUS WORK**

**6.1-01 SCOPE**

In accordance with the specifications contained in this Section or as directed, the Contractor shall:

- A. Mobilize and move-in.
- B. Furnish and erect a permanent warehouse, temporary warehouses, storage facilities and office space as specified herein.
- C. Demobilize and move-out.

**6.1-02 MOBILIZATION AND MOVE-IN**

Mobilization and move-in shall consist of the following:

- A. Moving construction equipment, material, and personnel to the Site.
- B. Setting up the Contractor's stores.
- C. Establishing camps and minor construction facilities as required.

**6.1-03 WAREHOUSE FACILITIES**

A. General. The Contractor shall erect and maintain, including janitor service, the buildings for use by the Contractor as specified herein. The storage facilities shall be completed by the time stated in Section 5-05, Commencement, Prosecution, and Completion. All temporary warehouses and storage facilities furnished and erected by the Contractor shall be the responsibility of the Contractor.

B. Temporary Field Offices and Storage Areas. The Contractor shall furnish and construct for the exclusive use of the Contractor or Sub-contractors any temporary building or storage facilities that may expedite the completion of the work. The Owner may assist the Contractor in locating vacant land or unused storage facilities that may be rented

or leased for his temporary use; however, the responsibility for obtaining adequate space shall be solely that of the Contractor. The Contractor shall be responsible for maintaining the facilities and shall remove all temporary buildings and storage facilities erected by the Contractor after Project completion.

C. Permanent Warehouse. The Contractor shall furnish and erect a permanent warehouse in accordance with the provisions of Part IX, Technical Specifications for Furnish and Erection of Warehouse. The Contractor shall erect the warehouse during mobilization, in the early stages of the Work, so that the warehouse will be completed and ready to store the first items purchased by the Contractor as they arrive at the Site. The permanent warehouse will be for the Contractor's use during the entire term of the Contract; however, the Contractor shall turn over space in the warehouse to the Owner section by section as required for transfer of materials to the Owner. The Contractor shall install his own bins, shelves and storage areas in the permanent warehouse at his own expense.

#### 6.1-04 DEMOBILIZATION AND MOVE-OUT

Demobilization and move-out shall consist of the following:

A. Moving construction equipment not to be retained by the Owner, material in excess of quantities permitted in USAID guidelines and personnel from the Site.

B. Removing temporary storage and camp facilities.

#### 6.1-05 MEASUREMENT FOR PAYMENT

There will be no separate payment to the Contractor for mobilization and move-in; building and/or removing temporary warehouse and storage facilities and demobilization and move-out except as provided for in Part IV, for the permanent warehouse as described above, and the entire cost for this work, except for the permanent warehouse, shall be included in the prices for the various items in the Schedules of Prices. Payment for the furnish and erection of the permanent warehouse will be made in accordance with Part I - Bid Form, Section 1.8 - Warehouse.

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**PART VI - TECHNICAL SPECIFICATIONS FOR**  
**ERECTION OF DISTRIBUTION FACILITIES**

**SECTION 6.2 - STORAGE AND HANDLING OF  
MATERIALS AND EQUIPMENT**

**6.2-01 SCOPE**

All material to be used in construction of the Project shall be stored so as to be protected from deteriorating effects of the elements. In general, all metallic pieces of hardware and connectors must be protected from rain by being stored under a roof; poles, crossarms, crossarm braces, transformers and bare and insulated wire and cable reels may be stored in the open; and special equipment and materials may be stored under roof or in the open but covered with a tarpaulin. Handling and storage of specific equipment and material items are covered in more detail in subsequent sections.

Storage of any equipment or material items directly on the ground, even for short periods of time, will not be permitted. Equipment or materials stored in the open shall be stacked on boards or timbers and shall be at least 30 centimeters above the surface of the earth at all times. Storage of equipment and materials in areas subject to flooding or accumulation of water will not be permitted.

The storage yards shall be kept free of vegetation to prevent rotting of wooden materials and corrosion of metallic parts.

**6.2-02 STORAGE OF MATERIALS AND EQUIPMENT**

A. Poles, Crossarms, Crossarm Braces, Pole Keys, Anchor Logs, and Wire Moulding. Poles, crossarms, crossarm braces, pole keys, and ground wire moulding shall be stored on suitable supports, each group being stacked separately. They shall be laid and stacked as flat and evenly as possible in order to prevent sagging or undue stress of any of the components. These items may be stored in the open, uncovered.

B. Bare and Insulated Conductor, Guy Wire, Ground Wire, and Tie Wire Reels. Bare and insulated conductor, guy wire, ground wire and tie wire reels may be stored in the open but shall be stored with the lagging in place and on wooden planks or timbers at least 30 centimeters above the ground. The reels shall not be laid on their sides and may not be stacked on top of each other. An acceptable alternate to the above is that if adequate drainage is provided, wire and cable reels may be stored on a clean concrete surface. All reels shall be treated for protection against decay and insect damage.

C. Transformers, Reclosers, Voltage Regulators, Lightning Arrestors, Cutouts, Insulators, and Construction Equipment. Equipment items and insulators that are manufactured for outdoor service and/or installation may be stored in the open if suitably crated, uncovered on wooden planks or timbers at least 30 centimeters above the ground or, if adequate drainage is provided, may be stored on a clean concrete surface. Equipment items may not be stacked on top of each other unless suitably crated for stacking.

D. Anchor Rods and Anchors, Ground Rods, and Structural Steel. Anchor rods and anchors, ground rods, and structural steel may be stored in the open, uncovered on wooden planks or timbers at least 30 centimeters above the ground.

E. Air Break Switches. Air break switches may be stored in the open, on wooden planks or timbers at least 30 centimeters above the ground provided they are protected from rain and moisture by being covered with a tarpaulin or other waterproof cover.

F. Connectors, Pole and Pole Line Hardware, Conductor and Cable Splicing Equipment, Indoor Switchgear and Equipment and Test Equipment. Connectors; pole and pole line hardware such as bolts, nuts, washers, clamps, armor rod, grips, brackets, etc.; conductor and cable splicing equipment shall be stored under roof and suitably protected from effects of the weather. Indoor switchgear and switchgear accessories; energy meters; and test equipment shall be stored in a clean, dry, well protected area.

#### 6.2-03 HANDLING OF MATERIALS AND EQUIPMENT

All equipment and materials of the Project must be handled with care in order to minimize damage. Damaged equipment and material must not be used. In the event of damage to equipment or materials, the damage shall be repaired to the satisfaction of the Engineer.

The handling of specific equipments and materials shall be in accordance with manufacturer's instructions and the methods or instructions described in the appropriate construction and installation specifications below.

6.2-04 MEASUREMENT FOR PAYMENT

There will be no separate payment for storage and handling of materials and equipment nor for repair and/or replacement of parts and materials, and the entire cost for this work shall be included in the prices for the various items in the Schedules of Prices.

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**PART VI - TECHNICAL SPECIFICATIONS FOR**  
**ERECTION OF DISTRIBUTION FACILITIES**

**SECTION 6.3 - CONSTRUCTION AND INSTALLATION OF  
DISTRIBUTION LINES**

**6.3-01 SCOPE**

The construction and installation of distribution lines consists of placing, stringing, installing and/or mounting of all poles, conductors, cables, equipment and accessories as shown on the Drawings, Work Orders and Staking Sheets, or as otherwise directed by the Engineer necessary for the rehabilitation and expansion of the distribution systems of the Cities of Medan, Belawan and Bindjai, Sumatra, Indonesia.

**6.3-02 GENERAL**

All construction and installation Work shall be done in a thorough and workmanlike manner in accordance with the Contract Documents and shall be subject to acceptance by the Engineer. Deviations from the Contract Documents shall not be permitted except upon written permission of the Engineer.

The "Basic Design Requirements for Overhead Electric Power Lines and Substations" issued by Perusahaan Umum Listrik Negara, Medan, Sumatra, Indonesia shall be used for establishing the mechanical strength of lines and electrical clearances of conductors and cables. Copies of this document may be obtained from Harza Engineering Company in Chicago or Medan.

The Contractor shall execute the Project by completing a number of Work Orders as covered in Section 6.5, Work Order Procedures.

The location of all poles, guy stubs and anchors will be staked by the Engineer in advance of construction prior to issuance of individual Work Orders to the Contractor. Changes in locations of any construction units as indicated by stake positions and Staking Sheets shall be made only upon obtaining written permission of the Engineer. If the Contractor finds that stakes have been removed or suspects that locations have been changed he shall immediately notify the Engineer for confirmation of stake positions or re-staking as applicable.

When it is necessary to keep trenches, pole holes, anchor holes or other excavations open over night the holes shall be properly covered or barricaded with visible warning signs displayed to warn and protect passers-by.

If blasting is necessary for any type of excavation, every precaution must be taken in the handling of explosives and in protecting the surface against flying pieces of rock and dirt.

When it is necessary to string wires or ropes across highways, streets or pedestrian crossings or place materials or equipment at locations that may endanger lives or property, the contractor shall take necessary steps to reduce hazards to a minimum.

### 6.3-03 ERECTING AND SETTING POLES

A. Distributing Poles. In distributing poles to their respective locations, the largest and straightest poles shall be used for deadend, corner and angle poles. Poles must be handled carefully and damaged poles shall not be used.

B. Pole Setting

1. The pole hole shall be of sufficient diameter to permit the pole to settle freely to the bottom of the hole without trimming the butt and still have sufficient space between the pole and the sides of the hole to permit proper tamping of the backfill at every point around the pole, and throughout the entire depth of the hole.

2. The setting depth, in meters, for poles of various length shall be as follows:

<u>Length of Pole (m)</u>	<u>Setting in Soil (m)</u>	<u>Setting In Solid Rock (m)</u>
9.0	1.6	1.1
10.0	1.7	1.1
11.0	1.8	1.2
12.0	1.8	1.3
13.0	1.9	1.3
14.0	2.0	1.4
15.0	2.1	1.4

3. "Setting in Soil" Specification shall apply:

a. Where poles are to be set in soil

b. Where there is a layer of soil more than 0.6 meters in depth over solid rock.

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

4. "Setting in Solid Rock" Specifications shall apply where solid rock is encountered at the ground line and where the hole is substantially vertical, approximately uniform in diameter, and large enough to permit the use of tamping bars in full depth of the hole.

5. Where there is a layer of soil 0.6 meters or less in depth over solid rock, the depth of the hole shall be the depth of the soil plus the depth specified under "Setting in Solid Rock," provided however, that such depth does not exceed the depth specified under "Setting in Soil."

6. On sloping ground the depth of the hole shall be measured from the low side of the hole. Where a pole is to be set on the side of a steep grade where soil erosion appears to be a consideration, the hole shall be 0.3 meters deeper than specified under "Setting in Soil."

7. When an earth boring machine is employed for holes, the bottom of the hole shall be thoroughly tamped to compact any loose earth that may be present.

8. All holes shall be backfilled with soil or small rock and all pole holes in rock shall be inspected and approved in writing by the Engineer before being backfilled. Organic material shall not be used for backfill. When organic material is encountered it shall be replaced with backfill material approved by the Engineer.

9. Backfill shall be thoroughly tamped the full depth of the pole hole. Earth shall be banked around the pole to a minimum height of 15 centimeters above ground level. Excess earth shall be disposed of in a manner approved by the Engineer.

C. Facing Poles. The face of a pole is defined as the side of the pole which is gained to receive crossarms. The following rules shall apply for facing poles on primary distribution construction:

1. In straight sections of the line, the face shall be in line with the distribution line and adjacent poles shall face in opposite directions.

2. At terminals and deadends, the face of the last two poles shall be on the side facing the terminal or deadend.

3. On unusually long spans, the poles shall be set so that the crossarm comes on the side of the pole away from the long span,

4. Where pole top pins are used, they shall be on the opposite side of the pole from the gain.

5. At corners, the face(s) of the pole shall be away from the inside corner.

D. Pole Alignment and Raking

1. The Contractor is responsible for setting poles in alignment according to the staking sheets. If the Contractor should find stakes out of alignment, the Engineer will, upon request of the Contractor, realign stakes according to the Staking Sheets.

2. Poles shall be set plumb except at corners where they shall be set and raked against the load so that the pole top will be in line after the load is applied. The rake in pole shall not exceed 15 centimeters for each three (3) meters of pole length after the conductors are installed at the required stringing tension. Deadend poles shall be set so as to be plumb and in line after the load at stringing conditions is applied.

E. Drilling Holes and Cutting Gains

1. Poles shall be pre-drilled and gained in accordance with the Drawings. Roofs shall be pre-cut as shown on the Drawings. Pre-bored holes and pre-cut roofs and gains will not require field treating for any type of wood pole.

2. All other holes and gains required shall be made in the field by the Contractor. All borings and cuts made in treated poles shall be treated or painted in the field with an approved preservative.

F. Installing Pole Date Nails and Identification Tags. The Contractor shall furnish and install a date nail, a pole height nail, a PLN identification tag and a pole numbering tag for each pole construction unit in accordance with the Drawings.

G. Installing Pole Keys. Top and/or bottom pole keys shall be installed at locations shown on the Staking Sheets in accordance with the Drawings or as otherwise approved by the Engineer.

6.3-04 MOUNTING CROSSARMS, PINS, INSULATOR BRACKETS AND INSULATORS

Crossarms shall be mounted on the gained side of the pole and faced in accordance with the provisions of Section 6.3-03, C. above. Pole through-bolts, crossarm double-arming-bolts and all other pole, equipment and hardware mounting bolts shall be long enough to fully engage the nut and locknut but shall not extend more than two (2) inches beyond the nut after the nut is tightened. The ends of bolts may not be cut off to meet this requirement except as directed by the Engineer. The cut ends shall be painted with an approved rust-prohibitive paint.

A locknut shall be installed with each nut or eyenut associated with all bolts or threaded hardware such as insulator pins and double-arming-bolts.

Care shall be taken in handling and installing all insulators. In assembling suspension insulator units and insulators on secondary clevises, care shall be taken to insure that all cotter bolts and pins are in place. Pin-type insulators shall be tight on the pins. On tangent construction the top groove must be in line with the conductor after tying in.

All crossarms will be pre-drilled in accordance with the Construction Drawings. If special mounting holes, insulator pin or equipment mounting holes are required, the Contractor shall bore them in the field. These field drilled holes shall be treated by painting with an approved preservative.

#### 6.3-05 INSTALLING OVERHEAD LINE CONDUCTORS AND CABLES

Phase conductors for distribution lines shall be installed and connected so that phases are arranged on the structure or crossarm in the order A, B and C from north to south, west to east or top to bottom as applicable. The neutral conductor shall be located as shown on the Drawings.

Conductors may be strung by either conventional or tension stringing methods.

Care shall be exercised to avoid kinking, twisting, or abrading the conductor in any manner. Conductors shall not be tramped on, run over by vehicles, or dragged over sharp rocks. The wire on each reel shall be inspected for cuts, kinks, or other damages. Damaged portions or imperfect splices in the conductor shall be cut out and the wire respliced.

Conductors shall be pulled over suitable rollers or stringing blocks properly mounted on the pole or crossarm, to prevent binding while stringing.

Installation of conductors and accessories shall be done in accordance with manufacturer's recommendations.

With pin-type insulators the conductors shall be tied in the top groove of the insulator on tangent poles and on the side of the insulator away from the strain at angles. Pin-type insulators shall be tight on the pins and on tangent construction the top groove must be in line with the conductor after tying in.

There shall not be more than one splice per conductor in any span, and no splice shall be located within 3 meters (10 feet) of the conductor support. Before splicing, the conductor ends shall be coated with an approved oxide inhibitor and thoroughly cleaned with a wire brush.

Utmost care shall be exercised in installing parallel groove clamps and split bolt connectors. The contact surface of the clamp and the wire shall be clean and bright. An approved oxide inhibitor shall be used as recommended by the manufacturer. A steel brush shall be the principal cleaning medium. Bolts shall be brought down hard, but the threads must not be overstressed. These same precautions for cleaning shall apply to the conductor before splicing.

Conductors shall be sagged in accordance with sag and tension charts or tables furnished by the Contractor. The sag of all conductors after stringing shall be in accordance with tables provided by Para. 7.9-07. A maximum increase of 7.5 centimeters (3 inches) of the specified sag in any span will be acceptable; provided, however, that required clearances are maintained. Under no circumstances will a decrease in the specified sag be allowed. Sagging shall be by sighting between targets unless otherwise approved by the Engineer.

The air temperature at the time and place of stringing shall be determined by a certified etched-glass thermometer (or approved equal). The temperature at which the conductor is sagged in and the spans in which sags are measured shall be recorded and the information given to the Engineer.

Conductors may be strung by controlled-tension method using neoprene lined (or approved equal) double bull-wheel type tension stringing equipment. The equipment shall have groove sizes that will in no way damage the conductor. It shall be of a type capable of maintaining preset tensions and pulling speed. Sufficient continuous tension shall be maintained to keep conductors clear of ground or obstructions that could damage conductor or that could be damaged by conductor. Sheaves shall be designed and used so that the pulling line does not damage the sheaves or deposit foreign matter in the liner which may damage the conductor or cause foreign matter to be deposited on the conductor. Complete manufacturer's data on tension equipment shall be furnished to the Engineer for approval prior to beginning of work.

The maximum pulling tension shall not exceed 110% of the final unloaded conductor tension at 60°F for the ruling span being used. The cable pullers, tensioners and pulling machines shall be located preferably as near the midspan as possible, but in no case shall the slope of the conductor between the machine and the stringing block at the first structure be steeper than three horizontal to one vertical. The length of conductor sagged in one operation shall be limited to the length that can be sagged satisfactorily as approved by the Engineer.

The time lapse between stringing and sagging conductors shall not be greater than 72 hours unless otherwise permitted or directed by the Engineer.

### 6.3-06 INSTALLING GUYS AND ANCHORS

Guys shall be installed in locations shown on the Staking Sheets and Drawings. Points of attachment to poles shall be as shown on the Drawings. Guys and anchors shall be installed before conductors are strung.

Holes for anchors shall be dug in locations staked by the Engineer. All anchors and rods shall be in line with the load and shall be so installed that the eye of the rod is above grade. Under no circumstances shall the eye of the rod be covered. Not more than 15 centimeters (6 inches) of the rod shall remain out of the ground after the load is applied. In cultivated fields or other locations, as deemed necessary, the projection of the anchor rod above the ground may be increased to a maximum of 30 centimeters (12 inches) to prevent burial of the rod eye.

When an expansion type anchor is used, the anchor must be fully expanded and must be expanded into undisturbed earth before backfilling the anchor hole.

When a cone anchor is used, the hole shall be backfilled to a depth of 60 centimeters (two feet) over the anchor with coarse crushed rock. This shall be thoroughly tamped during backfilling.

When log anchors are used the size and type of log shall be as shown on the Staking Sheets and Drawings. Excavations for log anchors should be made so that the log will bear against undisturbed earth when load is applied.

Backfill must be thoroughly tamped the full depth of all anchor holes.

Rock anchors shall be placed in accordance with the detailed instructions of the Engineer. Where rock is encountered below the surface of the ground, instructions from the Engineer shall be obtained before placing an anchor at that point.

Guy guards shall be installed only at special locations indicated on the Staking Sheets.

The setting of each anchor as regards depth and position shall be inspected by the Engineer and his approval given before the anchor hole is backfilled.

### 6.3-07 INSTALLING GROUNDS

Galvanized steel ground plates with an 8 ft. (2.44m), No. 6 AWG solid soft drawn copper pigtail attached shall be installed on the butt (nailed to the bottom) of all wood poles. The Contractor shall connect the copper pigtail to a No. 4 AWG aluminum pole ground lead by a compression connector as indicated on the Drawings. The upper end of the No. 4 AWG aluminum shall be connected to the neutral conductor.

Ground rods shall be installed by the Contractor only at special locations as indicated on the Staking Sheets or as otherwise designated by the Engineer. The Contractor will not be required to perform ground resistance (megger) measurements at any location. All ground resistance measurements will be made by the Engineer or Owner.

Ground rods, when installed, shall be driven full length in undisturbed earth at least 0.6 meter from the surface of the pole. The top shall be at least 30 centimeters (12 inches) below the surface of the earth. The ground wire shall be attached to the rod with a clamp and secured to the pole with staples or by other means if so noted on the Drawings. On wood poles, staples on the ground wire shall be spaced 60 centimeters (two feet) apart except for a distance of 2.4 meters (8 feet) above the ground and 2.4 meters (8 feet) from the top of the pole where they shall be 15 centimeters (6 inches) apart.

All equipment shall have at least two connections from the frame, case or tank to the multi-grounded neutral conductor as indicated in the Drawings.

All equipment and lightning arrester grounds shall be connected to a driven ground. All grounds used on the pole shall be interconnected and attached to a common ground wire.

#### 6.3-08 INSTALLING EQUIPMENT AND PROTECTIVE DEVICES

Transformers, reclosers, regulators, and other equipment and protective devices shall be handled carefully to avoid damage to insulators, protective finish or operating parts. Equipment and protective devices shall be located in accordance with the Staking Sheets and shall be positioned in accordance with the Drawings. Equipment shall be installed in accordance with the manufacturer's instructions. Only qualified and experienced personnel shall be allowed to make equipment installations and conductor and cable connections.

Care shall be taken to insure that the correct size and rating of equipment and rating of protective device including fuses are installed in their proper locations as indicated on the Staking Sheets and Construction Standards or as otherwise directed by the Engineer.

#### 6.3-09 INSTALLING UNDERGROUND CABLE AND ACCESSORIES

Cable shall be handled carefully at all times to avoid damage, and shall not be dragged across the ground, fences, or other sharp projections. Care shall be exercised to avoid excessive bending of the cable. The ends of the cable shall be sealed at all times against moisture with suitable end caps. Where it is necessary to cut the cable, the ends shall be terminated or sealed immediately after the cutting operation.



All trenching depths specified are minimum as measured from the final grade to the top surface of the cable. The routing shall be as shown on the Staking Sheets and Drawings unless conditions encountered are such that changes are necessary to accomplish the Work. In such event, the Engineer shall be notified promptly. If rock or other difficult digging is involved, the Contractor shall determine the nature and extent of the difficulty and the Engineer will decide whether rerouting, rock trenching, or other changes are necessary. Loose soil or crumbly rock will not be considered as "difficult digging." The trench widths specified are minimum and should be increased as necessary to obtain the required depth in loose soils.

Where trenches are intended for more than one cable, particular care must be taken to provide for extra depth and width to allow for soil falling into the trench during the laying of the first cables.

Care shall be exercised to minimize the likelihood of water-flow since this may cause trench damage and reduction in trench depth. When this occurs, the trench must be cleared to the specified depth before installing the cable.

All trenches shall follow straight lines between staked points as far as possible. Secondary and service trenches shall extend in a straight line from takeoff points wherever possible. The trenches shall be dug so that the bottom has a smooth grade. Large rocks, stones and gravel in excess of one inch shall be removed from the bottom of the trench. Where this cannot be done, a 5 centimeter (two inch) layer of sand or clean soil shall be placed in the bottom of the trench.

Construction shall be arranged so that trenches will be left open for the shortest practicable time to avoid creating a hazard to the public and to minimize the likelihood of trench collapse due to other construction activity, rain, accumulation of water in the trench, etc.

The cable shall be placed in the trench as soon after the trenching operation as feasible. Wherever possible, cable shall be payed out from the reel mounted on a moving vehicle or trailer. The reel shall be supported so that it can turn easily without undue strain on the cable. The cable shall be carefully placed in the trench by hand. All cable placement shall be done under constant supervision to be certain that no damage to the cable occurs.

The cable shall be inspected carefully by the Contractor as it is removed from the reel in laying operations to be certain that it is free from visible defects. The Engineer shall decide upon corrective action when defects are discovered.

Where more than one cable is to be placed in a trench, the spacings required by the specifications shall be observed. Care must be taken that any soil falling into the trench during the laying of the first cables does not reduce the clearances of the last cable below that specified. Should this occur, the excess soil must be removed carefully by hand or with equipment that will not damage the installed cables.

Due to the necessity of making on-the-spot corrections and changes on Staking Sheets, it may not be possible for the Engineer to issue revised Staking Sheets to the Contractor in all cases. When changes are made, dated, and initialed by the Engineer on the original of the Contractor's Staking Sheets, it shall be the Contractor's responsibility to transfer these changes to copies of Staking Sheets being used by the Contractor for construction purposes.

The minimum bending radius of primary cable is 12 times the overall diameter of the cable. The minimum bending radius of secondary and service cable is 6 times the overall diameter of the cable. In all cases, the minimum radius specified is measured to the surface of the cable on the inside of the bend.

As the cables are laid they shall be identified and tagged at locations designated by and with identification tags provided by the Owner, under direction of the Engineer. The tags shall be securely attached to the cable.

Before any cable splices or terminations are installed, the Contractor and Engineer shall jointly inspect all cable placement. If corrections are required, a second inspection shall be made after completion of the changes.

All cable splicing and terminating shall be performed in the presence of the Engineer.

Cable splices and terminations shall be made in accordance with the manufacturer's instructions. Cable terminations shall be made at locations indicated on the Staking Sheets and related Drawings. Not more than one cable splice shall be permitted for each 300 meters (approximately 1000 ft) of cable installed unless authorized by the Engineer. No bends shall be permitted within 30 centimeters (one foot) of the ends of the splice. The cable or circuit numbers and the exact locations of all splices and terminations shall be noted as "as built" conditions on the Staking Sheets.

Before any backfilling operations are begun, the Contractor and Engineer shall jointly inspect all trenches, cable placement, splices and other construction not accessible after backfilling and an inventory of construction and billing units shall be taken. If corrections are required, a second inspection shall be made after completion of changes. Cable acceptance tests shall then be performed in accordance with the requirements of Section 6.6-01 of these Specifications.

In backfilling, the backfill soil shall be free of debris, organic material, pieces of scrap cable, and rocks larger than 7.5 centimeters (3 inches) in any dimension. The first 15 centimeters of backfill shall be free from any rocks, gravel or other material that might damage the cable jacket. Backfilling shall be completed in such a manner that voids will be minimized. Excess soil shall be piled on top and shall be well tamped. All rock and debris shall be removed from the site and any damage to the premises repaired immediately to the satisfaction of the Engineer.

Concrete roadways or surfaces shall be restored to their original condition by the Contractor.

#### 6.3-10 MOUNTING AND CONNECTING STREET LIGHTS

The installations of new street light fixtures and complete new lighting systems are not within the scope of the Contract. However, the Contractor may be required to set new street light poles, install new or transfer existing street light circuits to new and existing poles and transfer existing street light fixtures, lamps and accessories as indicated on the Staking Sheets and Drawings.

Mast arms, fixtures and control accessories shall be positioned as shown on the Drawings. Care should be taken to insure that the reflectors are clean and fixtures are mounted for maximum light efficiency.

#### 6.3-11 INSTALLING SECONDARIES AND SERVICES

Secondary conductors will normally be bare all aluminum conductors installed at 20 centimeter (8 inch) vertical spacing on insulated clevises as shown on the Drawings. However, secondary conductors may be insulated or multi-conductor service cable may be used in special cases as noted on Staking Sheets and Drawings.

Services will normally be multi-conductor service cable attached to the service pole on insulated clevises supporting the neutral wire and/or messenger. In general, services will be installed by others; however, the Contractor shall furnish the service drop conductors as listed in the Bid Form. Also, in special cases the Contractor may be required to install services as shown on the Staking Sheets or as otherwise directed by the Engineer.

Secondaries and service drops shall be so installed as not to obstruct climbing space. There shall not be more than one splice per conductor in any span, and splices shall be located at least 3 meters (ten feet) from the conductor support. Where the same covered conductors are to be used for the secondary and service drop, they may be installed in one continuous run.

Conductors shall be sagged in accordance with sag tables furnished by the Engineer.

#### 6.3-12 ACCESS TO LINE ROUTES

The Owner will obtain the permission necessary to construct distribution facilities at all locations shown on the Drawings. The Contractor shall provide and maintain all access to the line routes.

#### 6.3-13 TREE TRIMMING AND REMOVAL

Trees to be trimmed or removed will be indicated on the Staking Sheets and Drawings or as otherwise designated by the Engineer.

All trees and brush shall be cut or trimmed so that a minimum of two (2) meters clearance is obtained between trees or brush and any distribution wire. In special cases less clearance may be permitted with approval of the Engineer.

In order for the Owner to maintain desirable public relations and at the same time permit the required amount of tree trimming, it is essential that the Contractor provide men properly trained in the art of tree trimming and care. The Contractor shall furnish personnel that have sufficient knowledge of the types of trees, their lives and growth habits, in Medan, Indonesia and environs to secure adequate line clearance by trimming without serious injury to their life and beauty. Appearance shall be of utmost importance and all work shall be kept as inconspicuous as possible. The symmetry of the trees shall be maintained after cutting, if at all possible.

A cut made near to the trunk or a main branch of a tree should be a flush cut with care being taken to avoid splitting the bark and cambium layer on the bottom side of the cut. To facilitate healing of wounds, square cuts should be avoided and all cuts should be either flush or pointed (slanted).

All cuts larger than 5 centimeters (2 inches) in diameter should be covered with a good wound dressing such as an asphaltic paint, but properly made smaller cuts will not generally require protection. Pointed cuts shall be deemed necessary for a finished operation.

Trees in conflict with the line will be removed, whenever possible after the Owner has secured permission for their removal and the Contractor is so advised on the Work Order or by letter. Before felling trees the Contractor shall insure that the felling will not endanger lives or damage existing lines or other property. Any damage caused to life or property resulting from improper protection or removal of hazards shall be

to the account of the Contractor. In some cases when wires or other hazards exist, the tops of trees may have to be removed before the trees can be felled.

The Contractor shall remove and dispose of all broken, hanging or other unsightly limbs. He shall clean up all felled trees, tree branches, brush and debris before his departure from the work area.

All tree trimming and removal shall be approved for payment by the Engineer.

#### 6.3-14 WORKING ON OR NEAR ENERGIZED LINES

The Contractor shall not be required to work on energized lines, either of primary voltage or secondary voltage except in the capacity of training the Owner's personnel in accordance with the provisions of Part VIII of these Specifications.

During construction of new or rehabilitation of existing lines the Contractor shall work closely with the Engineer to coordinate the proper timing of switching circuits for outages. The Contractor shall not operate any circuit breakers, switches or other types of sectionalizing devices either on existing primary or on existing secondary distribution systems. All such switching operations will be performed by the Owner. When the Contractor anticipates that circuits near his Work must be de-energized, he shall notify the Engineer by letter at least seven days in advance of the required outage. He shall describe the area and lines that he wants de-energized with an estimate of the length of time he needs the outage for each line involved. The Engineer will coordinate all required switching activities.

Primary circuits (7 kV and higher) shall not be approached nor grounding attempted until the Contractor has obtained clearance from an authorized representative of the Owner that the line to be worked on or near has been de-energized from all sources. All conductors shall be considered energized until they are adequately grounded by the Contractor.

#### 6.3-15 MEASUREMENT FOR PAYMENT

Pole erection and mounting crossarms, pins, insulator brackets and insulators will be measured on a unit basis per Section 1.3.01, Schedule of Prices.

Measurement for payment for stringing conductor will be in accordance with Section 1.3-01, Schedule of Prices and the length will be computed only on horizontal distances.

Guys, anchors, grounds, equipment and protective devices, underground cable and accessories, street lights and secondaries and services will be measured on a unit basis per Section 1.3-01, Schedule of Prices. The length of underground cable and secondary and service conductors will be computed only on horizontal distances as indicated on the Staking Sheets and Drawings. No separate payment will be made for providing and maintaining access to the Work.

There will be three basic construction units for tree trimming and removal in accordance with Section 1.3-01, Schedule of Prices. One unit is for trimming trees and is a unit per 10 meters in length, independent of the width of trimming. This unit will include the felling of all trees having a diameter of 15 centimeters (6 inches) or smaller. The second unit is for felling trees larger than 15 centimeters (6 inches) in diameter, but smaller than 45 centimeters (18 inches) in diameter, the unit basis being per tree. The third unit is for felling trees with a diameter of 45 centimeters (18 inches) or larger, the unit basis being per tree. The diameter of all trees shall be measured at a height of one meter above the ground line.

In determining the length of trimming required for a given line, the length of actual clearing shall be measured in a straight line parallel to the line between poles and across the foliage cleared (not trunk) projected to the ground line. Lengths along the line route in which no trees are to be removed or trimmed or underbrush cleared shall be omitted from the total measurement.

Before any tree trimming or removal is begun, the Contractor and Engineer shall jointly inspect the proposed route of the staked line and take an inventory of the billing units.

No separate payment will be made for grounding de-energized lines.

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**PART VI - TECHNICAL SPECIFICATIONS FOR**  
**ERECTION OF DISTRIBUTION FACILITIES**

**SECTION 6.4 - REHABILITATION AND REMOVAL  
OF DISTRIBUTION LINES**

**6.4-01 SCOPE**

The rehabilitation and removal of distribution lines consist of revamping, transfer and removal of poles, conductors, cables, equipment and accessories as shown on Drawings, Work Orders and Staking Sheets or as otherwise designated by the Engineer necessary for the rehabilitation and expansion of the distribution systems of the Cities of Medan, Belawan and Bindjai, Sumatra, Indonesia.

**6.4-02 GENERAL**

All construction and rehabilitation work shall be done in a thorough and workmanlike manner in accordance with the Plans, Specifications, Drawings, Standards and Work Orders and shall be subject to the acceptance of the Engineer.

Because of the desire of the Owner to strive for a high degree of service continuity for each consumer during the conversion of the 7 kV and 12 kV primary and 127/220 volt secondary system to 11.5/20 kV primary, 220 volt single-phase and 220/380 volt three-phase secondary, it will be necessary to have both the existing system and proposed system in operation simultaneously. For this reason and because of the tight construction schedule, the rehabilitation of the distribution system has been arranged so that the Contractor will erect the primary and secondary circuits and the Owner will install the bulk of the services and remove unused existing facilities after the Contractor has completed his Work.

**6.4-03 WORKING ON PRIMARY LINES**

Approximately 95% of the existing primary system is underground. The Contractor will not be required to rehabilitate or remove underground primary lines except to a limited degree necessary to continue service to a few consumers who will continue to be served by 7 kV or 12 kV transformers. The bulk of the 7 kV or 12 kV underground cables will remain intact and may or may not be removed by the Owner after the Contractor's Work has been completed.



The Contractor shall convert existing overhead 7 kV feeders to 11.5/20 kV only as provided for on the Staking Sheets or as otherwise designated by the Engineer. All revamp Work shall be done in a neat and workmanlike manner to conform to the Standards for new construction established by the Engineer.

#### 6.4-04 WORKING ON SECONDARY LINES

Most of the existing secondary systems is overhead on steel poles. In many cases the steel poles will remain and will carry the new as well as existing secondaries. The Contractor may be required to install new secondaries and leave the existing secondary tied in to service the load without the new secondary being energized except for acceptance testing.

In other cases the Contractor may be required to install and test new secondary lines, remove existing secondaries, energize the new secondaries temporarily at the existing voltage of 127/220 and tie existing or new services to these secondaries.

In most cases the Owner will make the actual conversion of consumers from 127/220 volts to 220/380 volts.

#### 6.4-05 REMOVING, TRANSFERRING AND INSTALLING SERVICES

The installation of and removal of services will be done only to a limited extent by the Contractor, the bulk of this Work being performed by the Owner. However, the Contractor will be required to install new services, tie new and existing services to new, revamped or existing secondaries and build completely new secondary-service lines as designated on the Staking Sheets or as otherwise directed by the Engineer.

#### 6.4-06 WORKING ON OR NEAR ENERGIZED LINES

The Contractor shall not work on or near energized lines and shall take all precautions to protect against personal injury from contact with live lines in accordance with the provision of Section 6.3-14, Part VI of these Specifications.

**6.4-07 MEASUREMENT FOR PAYMENT**

Removal and rehabilitation of the existing primary and secondary distribution system shall be measured on a unit basis per Section 1.4-01, Schedules and Prices. Payment shall be limited to the extent as designated on the Staking Sheets or as otherwise designated by the Engineer.

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PART VI - TECHNICAL SPECIFICATIONS FOR  
ERECTION OF DISTRIBUTION FACILITIES

SECTION 6.5 - WORK ORDER PROCEDURES

6.5-01 GENERAL

The Contractor shall erect the distribution system by completing a number of Work Orders which will be issued to him in a sequence determined by the Engineer. Each Work Order will consist of a brief description of the Work to be performed, a Staking Sheet and a drawing or set of maps showing the approximate location of poles, anchors, transformers, switches, and other construction units. The Engineer will field stake the locations of all poles, guy stubs and anchors in accordance with the Staking Sheets prior to the issuance of Work Orders to the Contractor for Construction.

The Contractor will be furnished an original and 4 copies of each Work Order. The original will be identical to the copies except that it will be stamped in red as follows:

ORIGINAL W. O. NO. \_\_\_\_\_

APPROVED FOR CONSTRUCTION

DATE \_\_\_\_\_ APP. \_\_\_\_\_

and will be dated and signed by the Engineer.

A sample Work Order with a brief description of Work to be performed, a Staking Sheet and drawing with an explanation of symbols and nomenclature used are provided in Volume IV of these Contract Documents. Changes in types, quantities or locations of construction units as indicated by stake positions and the Staking Sheets shall be made only upon receipt of written permission from the Engineer. These authorized changes shall be initialled by the Engineer on the original copy of the Work Order. The Contractor shall be responsible for making any changes on the Work Order copies.

The completion of the construction (and/or retirement) of a Work Order must be certified by the Engineer before the Contractor submits the completed Work Order and his invoice for billing. The Engineer will inspect the Work completed by the Contractor and if completed to his satisfaction will give his approval in writing on the Contractor's original copy of the Work Order. If the Work is not completed to the satisfaction of the Engineer, the Contractor shall correct all deficiencies noted by the Engineer and re-submit the Work for certification.

After receiving the Engineer's certification of a Work Order, the Contractor shall submit the original copy of the Work Order with his billing invoice to the Engineer for certification of payment. The billing invoice will be forwarded to the Owner for payment in accordance with 4-32, Progress Payments. The original copy of the Work Order will be retained by the Engineer for posting to as-built, property record maps.

#### 6.5-02 MATERIAL CONTROL

A. The Contractor shall control the flow of materials in and out of warehouses by the use of stock card records or other suitable means. The Contractor shall assume full responsibility for the orderly and timely flow of materials to insure that sufficient quantities of all materials furnished by the Contractor are on hand at all times in order not to delay the construction.

B. At the completion of the Contract the Contractor shall furnish the Engineer with a list of materials which includes the following information for each item purchased for the Project:

1. Quantities of materials purchased by the Contractor for his installation on the Project.

2. Quantities of materials installed on the Project by the Contractor.

3. Quantities of materials purchased for the Project but not installed by the Contractor (this will include items such as service cable, construction and test equipment and other items purchased by the Contractor but to be used by or installed by others).

4. Quantities of all excess materials including items not intended to be used by or installed by the Contractor.

C. The above information must be documented by invoices furnished by the vendor and the Contractor which may be readily verified by the Engineer.

D. The Contractor will be paid for excess materials in accordance with the provisions of 4-34, Final Inspection, Acceptance, and Payment.

#### 6.5-03 CONSTRUCTION AND RETIREMENT UNITS

Work Orders will be completed by the Contractor by the installation and/or removal of construction units and retirement units, respectively. The amount of Work involved and the quantities of materials needed for each unit are shown on the respective Drawings. Payments for completion of construction and/or retirements units shall be made to the Contractor

in accordance with the requirements of 4-32, Progress Payments, at prices listed by the Contractor in the Bid Form.

The Contractor shall be responsible for returning to the Owner all materials that are removed from the field and to be retired. If materials being removed are different from those listed on the respective Work Orders the Contractor shall note the changes on the original copy of the Work Order and have the changes approved by the Engineer prior to turning the materials over to the Owner.

#### 6.5-04 STAKING SHEETS

A Staking Sheet will be included as a part of each Work Order to show pole numbers, construction units, span lengths and locations of all lines. A sample Staking Sheet with an explanation of its intended use, symbols and nomenclature is included in Volume IV of these Contract Documents.

#### 6.5-05 AS-BUILT DRAWINGS

The Contractor will not be required to prepare any As-Built Drawings other than revising Work Orders as approved by the Engineer and outlined in 6.5-01 above. All revisions to the original copy of the Work Order drawings should be made clearly and legibly in order for the Engineer to use them as a basis for preparing permanent record, As-Built Drawings.

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**PART VI - TECHNICAL SPECIFICATIONS FOR**  
**ERECTION OF DISTRIBUTION FACILITIES**

**SECTION 6.6 - ACCEPTANCE TESTING, ENERGIZING  
AND TURNING OVER TO THE OWNER**

**6.6-01 ACCEPTANCE TESTING**

After installation of conductors, conductor accessories, cables, cable accessories and equipment and prior to final acceptance by the Engineer, tests performed by the Contractor and witnessed by the Owner and Engineer shall be made as described below. If any piece of equipment or material shall fail to meet the prescribed tests, the Contractor shall correct any deficiencies and the tests shall be repeated until all equipment and materials pass the tests.

A. Distribution Transformers. No load voltage measurements shall be made at the secondary terminal of all distribution transformers to insure that the transformers have been connected properly and in the case of three-phase banks to insure that the phase rotation is correct. The magnitude of all voltage measurements and the location, time and date shall be recorded.

B. Regulators.

1. The "initial operation" instructions provided by the manufacturer shall be followed for each regulator. The Contractor shall adjust regulator settings to initial values recommended by the manufacturer, energize each regulator from the source side with the regulator by-pass switch open and with the control circuit fuses in place but with the control circuit switch in the off position. Caution should be taken when energizing or de-energizing a regulator to insure that the tap changer is always in the neutral position.

2. The voltage level controls shall be energized by setting the auto-raise-lower switch to the auto position with the voltage level setting on 230 volts. The source (high voltage input to regulator) shall be regulated (by the Owner) to 11.5 kV line to neutral (20 kV line to line). The voltage at the voltage test terminals shall be measured and recorded. This voltage should be 230 volts with the tap position indicator on zero.

3. The voltage level knob shall be adjusted to test one step of regulation in the raise direction and one step in the lower direction. If the regulator operates satisfactorily the voltage control should be adjusted to operate through the entire range of raise and lower taps for which the regulator was designed.



4. At the discretion of the Engineer simulated load tests in the control circuit may be performed for checking the operation of the band width, time delay and line drop compensator circuit components.

5. The final voltage level, band width, time delay, line drop compensator and range of regulation settings for each regulator shall be adjusted to values designated by the Engineer.

C. Reclosers. Recloser settings, plug-in components and accessories shall be adjusted and/or installed as recommended by the Engineer. Each recloser shall be energized from the source side with the external manual operating handle in the closed position and with the manual control switch in the control panel, if applicable, in the reset position. The recloser shall then be energized and tested for tripping, once by using the external manual operating handle and once by using the manual tripping switch in the control panel, if applicable.

D. Switches and Cut-outs. All switches and cutouts shall be operated with lines and components de-energized to test the switch parts for alignment and smoothness of operation. If switches drag and do not open and close freely, corrections shall be made by the Contractor until all components operate freely. Load-break switching devices shall be tested energized after having been operated satisfactorily de-energized.

E. Primary Underground Cables, 25 kV. Immediately after installation of primary underground cables, splices and terminations, a direct-current high voltage test shall be made on each entire length of installed cable in accordance with Section 6.14.6 of IPCEA Publication No. S-66-524.

F. Secondary Underground Cable, 600V. Immediately after installation of secondary underground cables, splices and terminations, a direct-current high voltage test shall be made on each entire length of installed cable in accordance with Section 6.14.6 of IPCEA Publication No. S-66-524. The d-c test voltage shall be applied for 5 minutes in accordance with the following table:

<u>Conductor Size, AWG or MCM</u>	<u>Test Voltage, kV</u>
8-2	13.2
1- 4/0	16.8
225-500	24.0

#### 6.6-02 ENERGIZING PRIMARY AND SECONDARY LINES

Primary and secondary lines shall be energized or de-energized only by the Owner. Until the time the actual change-over or conversion of consumers' voltage takes place primary and secondary lines will be energized

only for test purposes. When working near new, existing or rehabilitated lines the Contractor should take safety precautions for working on or near energized lines as covered in Sections 6.3-14 and 6.4-06 of these Specifications.

6.6-03 TURNING OVER TO OWNER

The Contractor shall turn over completed distribution line facilities to the Owner immediately after the distribution facilities have been approved by the Engineer for billing. Final acceptance by the Owner will be made after the distribution facilities have passed the applicable acceptance tests in 6.6-01, above, to the satisfaction of the Engineer. Final inspection, acceptance and payment will be made in accordance with 4-34, Final Inspection, Acceptance and Payment.

6.6-04 MEASUREMENT FOR PAYMENT

There shall be no separate payment for any acceptance testing performed by the Contractor, and the entire cost for this work shall be included in the prices for the various items in the Schedules of Prices.

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
MATERIAL AND EQUIPMENT

SECTION 7.1 - SINGLE-PHASE DISTRIBUTION TRANSFORMERS

7.1-01 SCOPE

This section specifies the minimum requirements for the manufacture and supply of single-phase overhead distribution transformers. The transformers will be installed as single-phase 11550-231/462-volt units or in banks of three to form three-phase 11550/20000-volt grounded-wye 231/400-volt grounded-wye banks.

7.1-02 STANDARDS

The transformers shall conform to ANSI C57-12.00, "General Requirements for Distribution, Power and Regulating Transformers and Shunt Reactors," ANSI C57.12.20, "American Standard Requirements, Terminology, and Test Code for Distribution, Power and Regulating Transformers, and Reactors Other Than Current-Limiting Reactors", except for voltage and frequency as noted below.

7.1-03 RATINGS AND ELECTRICAL CHARACTERISTICS

A. Voltage Ratings:

Primary - 20,000 Grd.Y/11,550 volts.

Secondary - 231/462 volts, two windings which can be connected externally for series or parallel operation.

B. Basic Impulse Insulation Level (BIL):

High Voltage Winding - 125 kV

Low Voltage Windings - 30 kV

**C. KVA Rating:**

The continuous kVA ratings shall conform to ANSI C57.12.00 and ANSI C57.12.20 and shall be 10, 25, 50, 75 or 100 kVA as specified in the bid form.

**D. Temperature Rise:**

The temperature rise shall be 65°C in a maximum ambient air temperature of 40°C and in an average 24 hour maximum ambient air temperature of 30°C.

**E. Impedance:**

The maximum allowable impedance for each size and type of transformer, expressed in per cent of the transformer base kVA, shall be as follows:

<u>Size (kVA)</u>	<u>Maximum Allowable Impedance (%)</u>
10 through 50	2.5
75 through 100	3.0

The impedance of all transformers of the same size and type shall be the same within the tolerance limits allowed in ANSI C57.12.00. Impedances lower than the maximum limits established above will be preferred.

**F. Bushings and Terminals:**

Primary, secondary and neutral bushings and terminals shall conform to the requirements of ANSI C57.12.00 and ANSI C57.12.20 except all transformers, regardless of rating, shall have only one primary bushing.

**G. Frequency:**

The transformers shall be designed for 50 Hz operation.

**H. Taps:**

All transformers shall be furnished with taps in the high voltage winding rated 12127.5, 11838.75, 11261.25 and 10972.5 volts (2-2 1/2% above and 2-2 1/2% below nominal).

## 7.1-04 CONSTRUCTION CHARACTERISTICS

### A. Bushings and Terminals:

1. All transformer sizes ranging from 5 through 100 kVA shall have only one primary bushing. All transformers shall have four secondary bushings with two connecting bars for series parallel operation. The internal connections to the four low voltage bushings and four ends of the two secondary windings shall be arranged for subtractive polarity as shown in Figure S-19 of ANSI Standard C57.12.20-1964.

2. Bushings and terminals shall be constructed and positioned in accordance with the requirements of Section 5.1 and Figure S-4 of Table S-2 of ANSI C57.12.20-1964.

3. All external terminals shall be fabricated of or plated with a material to accommodate either copper or aluminum conductors to minimize corrosion or "cold flow" of the conductors or terminals. The terminal sizes and types shall be in accordance with ANSI C57.12.20.

### B. Tank, Tank Cover and Handhole:

The tank, tank cover and handhole construction shall conform to the requirements of ANSI C57.12.20. The outer surface of the tank cover shall be plastic coated to prevent flashovers caused by accidental wildlife contact between the high voltage bushing terminal(s) and tank cover. The plastic coating shall have a minimum thickness of 0.508 mm (20 mils), a minimum dielectric strength of 39400 volts per millimeter (1000 volts/mil) and shall be resistant to the effect of the elements.

### C. Insulating Liquid:

The transformers shall be filled and insulated with standard transformer mineral oil meeting the requirements of ASTM D1040. The mineral oil shall not be used or reprocessed oil, but must be new, clean oil. The transformers shall be shipped with the mineral oil inside the respective tanks.

## 7.1-05 LOSSES

The maximum allowable loss at rated KVA load, rated secondary voltage and 0.8 power factor shall be as follows:

KVA Rating	% Loss
10	2.5
25	2.0
50	1.6
75	1.5
100	1.4

7.1-06 OTHER INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

The Contractor shall furnish the following information:

A. The manufacturer's nominal rated core losses and total losses, in watts, for each size and type of transformer, as follows:

	Total ( $I^2R$ Winding Losses Plus Core Losses) at 85°C at:				
	25%	50%	75%	125%	
No Load	Full	Full	Full	Full	Full
<u>(Core) Losses</u>	<u>Load</u>	<u>Load</u>	<u>Load</u>	<u>Load</u>	<u>Load</u>

B. The manufacturer's specified voltage regulation, in per cent, for each transformer listed in the Bid Forms at rated voltage, current and frequency at a:

power factor of unity

power factor of 80.0 per cent

7.1-07 TESTS AND TEST REPORTS

Tests shall be made in accordance with ANSI C57.12.20 and ANSI C57.12.00.

Three (3) certified copies of the results of all tests, including curves, oscillograms for impulse tests, graphs, etc. shall be furnished. The cost of all tests and test reports shall be for the account of the Contractor and already included in his bid price.

All prototype and production tests performed will be witnessed by the Engineer unless waived in writing. No transformers shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.2 - LINE VOLTAGE REGULATOR

7.2-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of single-phase, step-type line voltage regulators. The voltage regulators will be installed line-to-ground on an 11.5/20.0 kV, 50 Hz, grounded-wye distribution system, either individually for regulating single-phase, 2-wire, multi-grounded circuits or in banks of three for regulating 3-phase, 4-wire, multi-grounded-wye circuits.

7.2-02 STANDARDS

The regulators shall conform to ANSI Standard C57.15, "Requirements, Terminology, and Test Code for Step-Voltage and Induction-Voltage Regulators" and NEMA Publication No. TR-1, "Transformers, Regulators and Reactors" except the frequency shall be 50 Hz and the regulator voltage rating shall be 20,000 Grd. Y/11,550 volts.

7.2-03 RATINGS AND ELECTRICAL CHARACTERISTICS

The ratings and electrical characteristics of each regulator shall be as follows:

- Rated voltage, kV	20 Grd. Y/11.55
- Insulation Class, kV	25
- BIL, kV (Min.)	150
- Rated continuous current, amps	200
- Rated Frequency, Hz	50
- Range	10% raise to 10% lower
- Steps	32 - 5/8%

Potential transformer taps shall be suitable for control of primary line voltage from plus 10% to minus 10% of the primary nominal system line to ground voltage of 11.5 kV. The voltage sensing device of the regulator, test terminals and external power supply terminals shall be calibrated for the nominal secondary line to ground voltage of 220 volts. The voltage level control adjustment shall be adjustable from 192 to 248 volts, with scale markings in two-volt increments.

The bandwidth dial shall be calibrated for  $\pm 2.0$ ,  $\pm 3.0$ ,  $\pm 4.0$ ,  $\pm 5.0$  and  $\pm 6.0$  volts.

The time delay dial shall provide for continuous adjustment of the time delay from 10 through 60 seconds between the energizing of the voltage-sensing device and functioning of the load tap changing equipment.

The line drop compensator adjustments shall be calibrated to provide resistance and reactance settings from 0 to 44 volts.

The control cabinet, which shall be mounted directly on the regulator tank wall, shall contain solid state electronic controls of Class I, Accuracy (Section 4.2.3.2 of ANSI C57.12). A rubber or thermoplastic insulated multi-conductor cable, complete with necessary fittings shall be furnished for connecting the control cabinet to the voltage regulator.

The control cabinet shall contain the following accessories in addition to those specified above:

- 1) Control circuit breaker or readily replaceable fuses.
- 2) Terminals for connecting a 220 volt two wire external source.
- 3) Output test terminals.
- 4) Internal-External source switch.
- 5) Auto-Off-Test-Raise-Lower control switch or switches.
- 6) Test rheostat to permit variation of the applied voltage to the sensing circuit with no change in the regulator output voltage.
- 7) Operation counter with at least five digits.
- 8) Neutral light indicator to indicate when regulator is in neutral position (Note: The light should be operable only with the control switch in the test position).

- 9) Raise-Lower indicator lights to indicate when the edge of the band has been reached (Note: The lights should be operable only with the control switch in the test position).
- 10) Increased current capacity for reduced range of voltage regulation in accordance with ANSI C57.15.
- 11) A position indicator with limit switch adjustments to limit the range of regulation in 1-1/4 percent steps.
- 12) A reset button on the control panel for automatically resetting the drag hands on the position indicator.
- 13) Two 230 volt a.c. heater elements to reduce humidity in the control cabinet.

#### 7.2-04 CONSTRUCTION CHARACTERISTICS

Support lugs, lifting lugs and mounting hangers shall be fabricated in accordance with ANSI Standards. Support lugs shall be designed for single regulator or cluster mounting of three regulators on a pole.

The regulators shall be filled and insulated with standard transformer mineral oil meeting the requirements of ASTM D1040. The oil shall not be used or reprocessed oil but must be new, clean oil. The regulators shall be shipped completely assembled and filled with oil.

#### 7.2-05 TESTS AND TEST REPORTS

Tests shall be made in accordance with the requirements of ANSI C57.15. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No regulators shall be shipped until they have been released for shipment by the Engineer.

#### 7.2-06 RECOMMENDED MAINTENANCE PROGRAM

The Contractor shall furnish a detailed recommended maintenance program for each type of regulator furnished.

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SECTION 7.3 - OIL CIRCUIT RECLOSERS

7.3-01 SCOPE

This section specifies the minimum requirements for the manufacture and supply of single or three-phase automatic circuit reclosers. The 3-phase reclosers will be installed on 4-wire 11.5/20 kV grounded-wye, 50 hertz lines and the single-phase reclosers will be installed on 2-wire grounded-neutral 11.5 kV, 50 hertz lines.

7.3-02 STANDARDS

The recloser shall conform to ANSI C37.60, "Requirements for Automatic Circuit Reclosers for Alternating Current Systems" and NEMA Pub. No. SG13, "Automatic Circuit Reclosers, Automatic Line Sectionalizers and Oil-filled Capacitor Switches for Alternating-Current Systems" except the rated frequency shall be 50 Hz.

7.3-03 RATINGS AND ELECTRICAL CHARACTERISTICS

The ratings and electrical characteristics of the automatic circuit reclosers shall conform to the following which are taken from Lines 9 and 10 of Tables 2 and 3 of ANSI C37.60-1968 with the exception of frequency which will be 50 Hz:

Line No. Ref.	McGraw Edison Company, or equal type designation and (Type Control)	Maximum Recloser Current Rating, Amperes		Ratings for Reclosers Using Reduced Coil or Minimum Trip Settings, Amperes		
		Cont.	Sym.	Coil Size	Min. Trip	Sym. Int.Cap
		50Hz	Int.Cap.			
9	E (Hydraulic)	280	4000	50	100	3000
10	RVE (Electronic)	400	6000	-	100	3000

The nominal system voltage shall be 11.5 kV line to neutral and 20 kV line to line. The basic impulse level shall be 150 kV.

Each recloser shall be set at the factory or supplied with plug-in components, as applicable, to provide the number and types of fast and delayed operations to lock-out as designated below:

Single Phase Hydraulically Controlled Recloser

Coil Size (Amps)	Min. Trip (Amps)	No. and Type of Phase Trip Curve		Reclosing Time (Sec.)
		Fast	Delayed	
50	100	2-A	2-B	1.5

Three Phase Electronically Controlled Recloser

Min. Phase Trip (Amps)	No. and Type of Phase Trip Curve		Min. Grd. Trip (Amps)	No. and Type of Grd. Trip Curve		Reclosing Intervals (Sec.)			Reset Time (Sec.)
	Fast	Delayed		Fast	Delayed	1st	2nd	3rd	
100	2-A	2-B	25	2-#1	2-#2	1/2	2	5	90

All single-phase reclosers shall be hydraulically controlled employing a series trip coil.

All three-phase reclosers shall be electronically controlled by employing solid state devices energized from a 24 volt d-c nickel-cadmium battery supplied with each unit.

The hydraulic control settings for the single phase reclosers shall be capable of being changed in the field by making mechanical adjustments on the recloser upon removing it from the tank.

The control settings for the three phase, electronic control, reclosers shall be capable of being changed by a combination of making control knobs and switch adjustments and the interchanging of plug-in solid-state components in the control cabinet of the unit.

### 7.3-04 CONSTRUCTION CHARACTERISTICS

The recloser tanks shall be fabricated of heavy gauge steel and finished with an inhibited epoxy prime coat covered by a finish coat of thermosetting acrylic paint.

The insulation medium and interrupter medium shall be oil. Vacuum interrupter type reclosers will not be acceptable.

Standard NEMA mounting brackets shall be furnished for pole mounting the reclosers.

The electrical connection terminals shall be suitable for terminating aluminum conductors equivalent to the copper sizes shown in Table 5 of ANSI C37.60-1968 in either the vertical or horizontal position.

The three-phase electronically controlled units shall include the basic recloser, a weatherproof control cabinet with all control components and a 6 ft. control cable connecting the recloser with the control cabinet. The control cabinet shall be mounted on the recloser tank or pole as recommended by the manufacturer. The cabinet shall be capable of being locked by means of a padlock inserted into a hole in the door handle.

Nameplate data shall conform to the requirements of Section 7.4 of ANSI Standard C37.60-1968 except that for hydraulic reclosers the operating sequence shall also be included.

### 7.3-05 ACCESSORIES

A. Accessories for hydraulic reclosers shall include at least the following:

1. A lifting strap for hoisting the recloser or removing the operating mechanism out of the tank.
2. A hood for housing the operating handle and non-reclosing lever and for protecting the operations counter.
3. A manual operating handle for providing a means for manual closing and opening with lockout of the recloser.
4. A non-reclosing lever for setting the recloser to lockout after one operation.

5. An operations counter with at least 5 digits.
6. A contact position indicator for indicating when the recloser has operated to lockout.

B. Accessories for electronic reclosers shall include at least the following:

1. Lifting eyes or straps for hoisting the recloser or for lifting the mechanism out of tank.
2. Oil dip stick for checking oil level.
3. A hood for housing the manual operating handle.
4. A manual operating handle for providing a means for manual closing and opening with lockout of the recloser, with a contact position indicator.

C. The following accessories are to be included in the control cabinet:

1. An operations counter with at least five digits.
2. Manual control switch to close and open lock out control.
3. Control fuse to protect closing coil.
4. Battery test terminals for testing battery voltage, charging rate and quiescent battery-drain current.
5. Lamp-test/lockout-indicating switch and indicator lamp for indicating recloser lockout and for testing lamps.
6. A manual trip test button for testing operation of the recloser.
7. Non-reclosing/normal-reclosing switch for setting control for one-shot to lockout without changing settings of other selector switches.
8. Ground-trip-block/normal-ground-operation switch for bypassing ground-trip circuit.
9. Selector switch for selecting the number of fast ground-trip operations.
10. Selector switch for selecting the number of fast phase-trip operations.
11. Selector switch for selecting the number of total operations to lockout.



12. Plug-in trip resistors, timing plugs, reclosing interval plugs and reset delay plug to provide the operating features as described in Section 7.3-03, above.
13. Two 230 volt a-c heater elements with resistors to reduce humidity in control cabinet.

#### 7.3-06 TESTS AND TEST REPORTS

Tests shall be made in accordance with ANSI C37.60.

Three (3) certified copies of the results of all tests shall be furnished. All production tests performed will be witnessed by the Engineer unless waived in writing. No reclosers shall be shipped until they have been released for shipment by the Engineer.

#### 7.3-07 RECOMMENDED MAINTENANCE PROGRAM

The Contractor shall furnish a detailed recommended maintenance program for each type of recloser furnished.

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SECTION 7.4 - OPEN-TYPE FUSE CUTOUTS

7.4-01 SCOPE

This section specifies the minimum requirements for the manufacture and supply of expulsion and dropout open-type cutouts with fiber tubes and with a single fusible element of the renewable type for distribution transformer protection and sectionalizing, and distribution line protection and sectionalizing. Both the load-break and non-load-break types are covered by this Specification.

These Specifications cover all open-type cutouts, whether employed independently or as part of a combination arrester-cutout.

7.4-02 STANDARDS

The cutouts shall conform to ANSI C37.42 and NEMA Publication No. SG-2 except the frequency shall be 50 Hz.

7.4-03 RATINGS AND ELECTRICAL CHARACTERISTICS

- A. System Nominal Voltage: 11.5/20 kV grounded-wye
- B. Cutout Rated Voltage: 25 kV
- C. Rated Maximum Voltage: 27 kV
- D. Basic Impulse Insulation Level (BIL): 125 kV
- E. Normal Operating Frequency: 50 Hertz
- F. Rated Continuous Current: 100 amps with fuse-holder and 200 amps with blade disconnect.

G. Maximum Interrupting Rating of Cutouts:

$\frac{X}{R}$ Ratio	Symmetrical Amperes	Asymmetrical Amperes	Nomenclature
10	4000	6000	EHD (Extra Heavy Duty)

H. Rated Short-Time Current with Fuse Holder Replaced with a Blade Disconnect:

Momentary Amperes	1/4 Second Amperes	4 Second Amperes	Nomenclature
6000	4000	1500	EHD

I. Load-break Capabilities:

If the load-break feature is specified, the cutout shall be capable of being operated to break full load current up to the continuous current rating of the cutout without the assistance of any special tools and without destroying any part of the cutout or its associated fuse link.

J. Temperature-Rise Limitations:

The combination units shall be capable of withstanding temperature rise limits specified in ANSI C37.42.

7.4-04 CONSTRUCTION CHARACTERISTICS

A. Mounting Brackets:

The cutouts shall be suitable for pole or crossarm mounting and shall be capable of being mounted using standard EEI-NEMA mounting brackets as described in NEMA Publication No. 100.

B. Operation:

The cutouts shall be capable of being operated with a standard switch stick in accordance with ANSI C37.42.

C. Terminal Connections.

The terminal connections for the cutouts shall be such as to accommodate either copper or aluminum conductor sizes as covered in Section 42.5.6 and Table 4 of ANSI C37.42-1969.

7.4-05 FUSE LINKS

Fuse links for the open-type cutouts shall be ordered separately and shall conform to the requirements of Section 7-7, Part VII of these Specifications.

7.4-06 TESTS AND TEST REPORTS

Design tests and conformance tests shall be conducted in accordance with ANSI C37.42. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No cutouts shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.5 - LIGHTNING ARRESTERS

7.5-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of Distribution-Class lightning arresters employed independently or as part of a combination arrester - cutout; for protecting distribution substation and distribution line equipment, cables conductors and accessories.

7.5-02 STANDARDS

The arresters shall conform to ANSI C62.1 and C62.2 and NEMA Pub. No. LA 1 except the frequency shall be 50 Hz.

7.5-03 RATINGS AND ELECTRICAL CHARACTERISTICS

A. Voltage Ratings:

18 kV for application on a 11.5/20 kV  
effectively grounded wye system, 125 kV Bil.

B. Power Frequency: 50 Hz

C. Performance and Tests:

The test requirements and procedures and performance characteristics shall conform to the requirements of ANSI C62.1.

7.5-04 CONSTRUCTION CHARACTERISTICS

A. Mounting Brackets.

The Distribution class lightning arresters shall be suitable for

pole or crossarm mounting and shall be capable of being mounted using standard EEI-NEMA mounting brackets as described in NEMA Publication No. 100.

B. Terminal Connections.

Terminal connections shall be of the solderless clamp type without external line lead or external gap in accordance with ANSI C 62.1.

7.5-05 SPECIAL FEATURES

The arrester shall be provided with an arrester disconnecter as defined in NEMA Publication No. LA 1. In the event of an arrester failure, one terminal of the arrester shall be dislocated from the arrester body to remove the arrester from the circuit and provide an easily visible means of finding and acknowledging a faulted arrester. If arresters are used independently and not as part of an arrester-cutout combination, the arrester disconnecter shall be in the ground lead terminal. If an arrester is used as part of an arrester-cutout combination, the disconnecter may be on either end of the arrester providing that if the disconnecter is on the line end, no hazard will be created by an exposed live terminal after the line end terminal is automatically disconnected because of a faulted arrester.

7.5-06 TESTS AND TEST REPORTS

Design tests and conformance tests shall be conducted in accordance with ANSI C 62.1. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No arresters shall be shipped until they have been released for shipment by the Engineer.



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SECTION 7.6 - COMBINATION ARRESTER-CUTOUTS

7.6-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of combination arrester-cutouts for distribution transformer, equipment and cable protection. Both the load-break and non-load-break types of cutouts are covered by this Specification. Open-link cutouts will not be accepted.

7.6-02 STANDARDS

The combination arrester cutouts shall conform to ANSI C37.42, C62.1 and C62.2 and NEMA Publication Nos. SG.2 and LA.1 except the frequency shall be 50 Hz.

7.6-03 RATINGS AND ELECTRICAL CHARACTERISTICS

The ratings and electrical characteristics of the lightning arrester and fuse cutout components of the combination arrester-cutout shall be in accordance with the provisions of Sections 7.5-03 and 7.4-03, Part VII of these Specifications, respectively.

7.6-04 CONSTRUCTION CHARACTERISTICS

The construction characteristics of the lightning arrester and fuse cutout components of the combination arrester-cutout shall conform to the provisions of Sections 7.5-04 and 7.4-04, Part VII of these Specifications, respectively.

7.6-05 SPECIAL FEATURES

The "special features" specified in Section 7.5-05, Part VII of these Specifications shall also apply to the combination arrester-cutout.

7.6-06 FUSE LINKS

Fuse links for the combination arrester-cutouts shall conform to the requirements of Section 7.7, Part VII of these Specifications.

7.6-07 TESTS AND TEST REPORTS

Design tests and conformance tests shall be conducted in accordance with Sections 7.4-06 and 7.5-06 of these Specifications as they apply to fuse cutouts and lightning arresters, respectively. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No combination arrester-cutouts shall be shipped until they have been released for shipment by the Engineer.

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
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SECTION 7.7 - FUSE LINKS FOR OPEN-TYPE CUTOUTS

7.7-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of fuse links for use with the open type distribution cutouts described in Sections 7.4, 7.5 and 7.6.

7.7-02 STANDARDS

The fuse links shall conform to ANSI C37.43 and NEMA Pub. No. SG-2.

7.7-03 RATINGS AND ELECTRICAL CHARACTERISTICS

A. Rated Nominal Voltage: 25 kV

B. Rated Maximum Voltage: 27 kV

C. Rated Continuous Currents:

1, 2, 3, 6, 8, 10, 12, 15, 20, 25, 30, 40, 50, 65, 80  
or 100 amperes as specified in the Bid Form.

D. Power Frequency: 50 Hz

E. Time-Current Characteristics:

The melting time-current characteristics shall conform to the minimum and maximum values to melt the fuse link at points indicated and within the accuracy limits specified as Type T (slow) in Section 43-3 and Table 3 of ANSI C37.43-1969.

7.7-04 CONSTRUCTION CHARACTERISTICS

A. Basic Construction:

The fuse links shall be of the button head type for use in fuse holders of drop-out type cutouts.

B. Interchangeability Requirements:

The fuse links shall meet the requirements of ANSI C37.43.

7.7-05 OTHER INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

The Contractor shall furnish three (3) copies each of the coordination charts or curves referenced in ANSI C37.43 for each type of fuse that he proposes to furnish. These charts or curves shall include the total clearing and melting time-current characteristic curves for each type fuse furnished.

7.7-06 TESTS AND TEST REPORTS

Design tests shall be conducted in accordance with ANSI C37.43. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No fuse links shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.8 - SECTIONALIZING AND BYPASS SWITCHES

7.8-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of outdoor blade disconnect, regulator bypass and gang-operated disconnect switches to be installed on a 11.5/20 kV four-wire grounded-wye distribution system.

7.8-02 STANDARDS

The sectionalizing and by-pass switches shall conform to ANSI C37.30, "American National Standard Definitions and Requirements for High-Voltage Air Switches, Insulators, and Bus Supports" and C37.32, "Schedules of Preferred Ratings, Manufacturing Specifications, and Application Guide for High Voltage Air Switches, Bus Supports, and Switch Accessories".

7.8-03 RATINGS AND ELECTRICAL CHARACTERISTICS

- A. Rated Frequency: 50 Hz
- B. Rated Nominal Voltage: 20 kV
- C. Impulse Withstand, Min: 125 kV
- D. Rated Continuous Current, Load-Break Current (if applicable) and Short-Time Current are as follows:



Switch Type	* Mounting	Manuf. Reference	Current in Amperes			Load- Break
			Rated Cont.	Rated Momentary	Rated (time)	
Single-Pole Disconnect	Under-hung on Crossarm	A.B. Chance Cat. No. M2A-2720, or equal	400	20000	(8000) (min.) (3-sec.)	-
Gang Operated Load-Break	Horizontal on Crossarms	A.B. Chance Cat. No. D60150LE, or equal	600	(12800) (min.)	(8000) (min.) (3-sec.)	600
Gang Operated Non-Load- Break with Arcing Norms	Horizontal on Crossarms	KPF Elect.Co. Type A202 for 23 kV, or equal	400	20000	12,500 (4-sec.)	-
Regulator By-Pass Single Pole	Vertical on Crossarms	S & C Type XL Cat. No. 33413, or equal	600	30000	18,500 (4-sec.)	-

\* The switches shall be mounted and connected as shown in the Construction Standard Drawings. Electrical clearances shall conform to those applicable in "Basic Design Requirements for Overhead Electric Power Lines and Substations."

#### 7.8-04 CONSTRUCTION AND OPERATING CHARACTERISTICS

The switches shall be of the gang-operated or hook-stick operated type as described in Section 7.8-03 above and as shown in the Construction Standard Drawings. The single-pole disconnect switches and regulator by-pass switches shall be capable of being operated with a standard switch stick as illustrated in Fig. 2 of ANSI C37.32-1965.

#### 7.8-05 TESTS AND TEST REPORTS

All tests for the air switches shall be conducted in accordance with the requirements of ANSI C37.34. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No switches shall be shipped until they have been released for shipment by the Engineer.

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
MATERIAL AND EQUIPMENT

SECTION 7.9 - ALUMINUM CONDUCTOR, EC-H19 GRADE (HARD DRAWN)

7.9-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of class AA concentric-lay-stranded, bare, hard-drawn aluminum conductor for use in primary and secondary overhead power distribution systems.

7.9-02 STANDARDS

The aluminum conductors shall conform to the following standards:

ASTM B-230 -- Aluminum Wire, EC-419, for Electrical Purposes

ASTM B-231 -- Aluminum Conductors, Concentric Lay

ASTM H35.1 -- American National Standard for Alloy and Temper Designation Systems for Wrought Aluminum

ASTM B-233 -- Aluminum Rolled Rods for Electrical Purposes

7.9-03 ALUMINUM CONDUCTOR PROPERTIES

The aluminum conductor shall be Class AA stranded hard-drawn aluminum conforming to the requirements of ASTM Designation B-230 and B-231 and having the following characteristics:

<u>A.</u> Conductor size (MCM or AWG):	336.4	3/0	1/0	2	4
<u>B.</u> Conductor Code Name:	Tulip	Phlox	Poppy	Iris	Rose
<u>C.</u> Ultimate Strength (lbs):	5940	3005	1970	1335	875
(Kg) :	2700	1360	896	606	397
<u>D.</u> Outside Diameter (in.):	0.666	0.646	0.368	0.292	0.232
(cm) :	1.69	1.18	0.935	0.742	0.590

<b>E. Stranding, Number</b>	:	19	7	7	7	7
Diameter (in.):	:	.1331	.1548	.1228	.0974	.0772
Diameter (mm.):	:	.338	.393	.311	.247	.196
<b>F. Reel Designation</b>		NR 48.28 [NR 36.22 Sizes #3/0 to #4]				
<b>G. Standard Reel Length (ft.):</b>		6015	4445	7065	11235	17855
(m)	:	1830	1355	2150	3430	5440
<b>H. Net wt. per reel (Approx.)</b>						
(lbs.):	:	1900 (700 lbs. sizes #3/0 to #4)				
(Kg)	:	864 (318 Kgs. sizes #3/0 to #4)				

7.9-04 REELS

The complete conductor shall be furnished on non-returnable wooden reels in accordance with NEMA WC-21, "Nonreturnable Reels for Wires and Cables". Each reel shall be equipped with lagging, bound on the reels with galvanized steel bands. The protective lagging shall not be less than Class 3, Heavy-duty Physical Protector as covered in NEMA Pub. No. 25. The reels shall be sufficiently sturdy in construction to withstand normal service incident to ocean shipping, hauling and field installation of conductor using tension stringing equipment.

Each end of the aluminum wire shall be properly and securely fastened to the reel. The standard length of each piece of conductor to be shipped on each reel shall be as designated in Section 7.9-03, above, provided that a maximum of ten per cent of the total amount of the conductor to be furnished may be shipped in random lengths, each such length to be not less than 610 meters (2000 ft.). No random length shall be wound on the same reel with a standard length, and all reels on which random lengths are furnished shall be of the same dimensions as reels for the standard conductor lengths.

7.9-05 MARKINGS

The cable and cable reels shall be clearly marked and identified in accordance with ASTM B-231 and in accordance with AID Regulations. In addition to marks required for shipping purposes, each reel shall be marked to show serial number, type and size of conductor, conductor code name, length of conductor, arrow showing the direction of payout, and gross and net weights.

7.9-06 TESTS AND TEST REPORTS

All tests called for in ASTM Designations B-230, 231 and 233 shall be performed and the conduct of such tests shall be as specified in the applicable ASTM Standards.

In addition to the above tests, ultimate strength tests for three (3) specimens of each size of the completed conductors shall be made in accordance with the provisions of Section 9.2 of ASTM Designation B-231.

Stress-strain curves for three (3) specimens of each size of the completed conductors shall be determined.

Three (3) certified copies of the results of all tests, including curves, graphs, etc., shall be furnished. The cost of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No conductor shall be shipped until it has been released for shipment by the Engineer.

7.9-07 OTHER INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

The Contractor shall furnish three (3) copies of each of the following documents for each size and type of conductor listed in Section 7.9-03 of these Specifications within ninety (90) days after notice of award of contract:

- A. Initial and final sag and tension curves with no ice (a bare aluminum wire constant of .05 lbs/ft<sup>2</sup> (.2445 Kg/m<sup>2</sup>) will be added for calculation of forces from winds as for NESC Light Loading District) for spans of 30 m to 150 m for the following limiting conditions:
  - 1. Maximum tension with a 9 lb/ft<sup>2</sup> (44.01 Kg/m<sup>2</sup>) wind at 60°F (15.5°C) not to exceed 40% of ultimate strength.
  - 2. Initial tension with no wind at 60°F (15.5°C) not to exceed 25% of the ultimate strength.
  - 3. Final tension with no wind at 60°F (15.5°C) not to exceed 20% of ultimate strength.
- B. Initial (stringing) and final sag tables for each size and type of conductor listed in Section 7.9-03 with limiting conditions as shown above. The increments of span length and temperature shall be three meters and 5°C, respectively with the span length varying from 30 m to 150 m and the temperature from 5°C to 50°C. The sags shall be given in and rounded to the nearest centimeter.

The sag tables shall be provided for the following spans:

<u>Conductor</u>	<u>Ruling Span (m)</u>	<u>Span Lengths (m)</u>	<u>Ruling Span (m)</u>	<u>Span Lengths (m)</u>
336.4MCM, AAC	60	30 - 75	90	75 - 150
3/0 AWG, AAC	60	30 - 75	90	75 - 150
1/0 AWG, AAC	60	30 - 75	90	75 - 150
2 AWG, AAC	60	30 - 75	90	75 - 150
4 AWG, AAC	60	30 - 75	90	75 - 150

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
MATERIAL AND EQUIPMENT

SECTION 7.10 - ANNEALED ALUMINUM TIE WIRE  
AND FLAT ARMOR TAPE

7.10-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of annealed (soft-drawn or EC-O Grade), solid aluminum tie wire and flat aluminum armor tape for use in overhead distribution systems.

7.10-02 STANDARDS

The tie wire and flat armor tape shall conform to the following standards:

ASTM B-233--Aluminum Rolled Rods for Electrical Purposes

ANSI H-35.1--American National Standards for Alloy and Temper Designation Systems for Wrought Aluminum

7.10-03 MATERIAL PROPERTIES

The material required herein shall be aluminum tie wire and flat armor tape fabricated of annealed aluminum, conforming to the requirements of EC-O Grade Aluminum, ASTM Designation B-233 with the following characteristics:

<u>A. Round Aluminum Tie Wire</u> <u>For Use With:</u> <u>Conductor Size</u> <u>(AWG or MCM)</u>	<u>Tie Wire Size</u> <u>(AWG)</u>
336.4 AA	4
3/0 AA	4
1/0 AA	6
2 AA	6
4 AA	6



**B. Flat Aluminum Armor Tape  
For Use With:  
Conductor Size  
(AWG or MCN)**

	Tape Dimensions (inch/mm)	
	<u>Width</u>	<u>Thickness</u>
1/0 AA	0.30/7.92	0.05/1.32
2 AA	0.25/6.60	0.03/0.792
4 AA	0.25/6.60	0.03/0.792

7.10-04 PACKING AND SHIPPING

The round aluminum tie wire shall be furnished in standard coils of 50 pounds (22.7 Kg) and the flat aluminum armor tape shall be furnished in standard coils of 10 pounds (4.55 Kg) in accordance with the following tables:

Size (AWG)	Round Aluminum Tie Wire Approximate Weight		Approximate Length in Standard Coil of 50 lb. (22.7 Kg)	
	<u>16./1000 ft.</u>	<u>kg/Km</u>	<u>ft</u>	<u>m</u>
6	24.2	36.1	2062	630
4	38.4	57.3	1300	396

Tape Dimensions		Flat Aluminum Armor Tape Approximate Weight		Approximate Length in Standard Coil of 10 lb. (4.55 Kg)			
<u>Width</u>	<u>Thickness</u>	<u>16./1000 ft</u>	<u>Kg/Km</u>	<u>ft</u>	<u>m</u>		
<u>inch</u>	<u>mm</u>	<u>inch</u>	<u>mm</u>				
0.30	7.92	0.05	1.32	8.8	13.1	1136	346
0.25	6.60	0.03	0.792	17.6	26.2	568	173

Each coil shall be securely wrapped in water-resistant paper to prevent moisture from entering the package in the event it becomes soaked with rain.

7.10-05 MARKINGS

The net weight, length, size, width, thickness and diameter, as applicable, of each wire shall be marked on a tag attached to the end of the conductor inside of the package. The same information, together with the manufacturer's serial number (if any) and all shipping marks and other information, including markings required by AID, shall appear on the outside of the package.

7.10-06 TESTS AND TEST REPORTS

All applicable tests called for in ASTM Designation B-233, shall be performed and the conduct of such tests shall be as specified in the referenced standard.

Three (3) certified copies of the results of all tests, including curves, graphs, etc., shall be furnished. The cost of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No tie wire and flat armor tape shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.11 - GUY WIRE

7.11-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of zinc-coated (galvanized) guy wire strand to be used for overhead (span) guys and down guys for supporting poles at angles and dead-ends or other locations specified by the Engineer.

7.11-02 STANDARDS

The guy wire shall conform to ASTM A475, "Zinc-Coated Steel Wire Strand."

7.11-03 WIRE STRAND

The guy wire strand shall be 7-strand, High-Strength Grade Zinc-coated steel cable in accordance with Table I of ASTM-A475 and shall be of the following sizes and have the following characteristics:

<u>Nominal Diameter of the Strand (in.)</u>	<u>Nominal Diameter of Coated Wires in Strand (in.)</u>	<u>Approximate Weight of Strand Per 1000 ft. (lb.)</u>	<u>Minimum Breaking Strength (lb.)</u>
1/4	0.080	121	4750
3/8	0.120	273	10800

The component wires shall be preformed to the helical form that they will assume in the finished product prior to laying them about the strand core.

The weight of zinc-coating, in ounces per square foot of uncoated wire surface, shall not be less than that specified for Class A galvanizing in Table IV of ASTM A475.

#### 7.11-04 REELS

The reels for the steel wire strand shall be of such design, construction, and strength as to guarantee satisfactory delivery of the strand at its destination without displacement, chafing, or other damage incurring during shipment or field handling. Each end of the steel wire strand shall be properly and securely fastened to the reel. All reels shall be of the non-returnable type in accordance with NEMA WC-21 entitled "Nonreturnable Reels for Wires and Cables." The protective lagging shall not be less than Class 3, Heavy-duty Physical Protector as covered in NEMA Pub. No. WC25-1969.

#### 7.11-05 MARKINGS

Each reel shall be clearly marked in accordance with Section 15 of ASTM B-231 and in accordance with AID Regulations.

#### 7.11-06 TESTS AND TEST REPORTS

Tests for the wire strand and zinc-coating shall be made in accordance with the provisions of ASTM Standards A475 and A90, respectively.

Three (3) certified copies of the results of all tests shall be furnished. The cost of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No guy wire shall be shipped until it has been released for shipment by the Engineer.

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SECTION 7.12 - 600 VOLT SERVICE CABLE

7.12-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of duplex and quadruplex, 600 volt insulated all aluminum conductor with a bare aluminum neutral for use as neutral-supported secondary and service drop cables.

7.12-02 STANDARDS

The 600 volt service cable shall conform to IPCEA S-66-524/NEMA WC 7, "Cross-linked-thermosetting-polyethylene-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

7.12-03 CONDUCTOR CHARACTERISTICS

Insulated conductors shall be "EC" Grade, 3/4 hard-drawn (EC-H16 or H26), Class B concentric stranded aluminum in accordance with ASTM B262 and Section 7.3.2.1.2 of IPCEA S-66-524/NEMA WC 7. Conductor sizes and types shall be as listed in Part I, Bid Form.

Neutral conductors shall be bare, "EC" Grade, hard-drawn (EC-H19 or 5005-H19), concentric stranded aluminum in accordance with Drawing D1 of Volume IV. The size of the neutral conductor shall be the same as the phase conductors.

7.12-04 INSULATION CHARACTERISTICS

The insulation shall be black cross-linked-thermosetting polyethylene suitable for outdoor service cable in accordance with Part 3 and Section 7.3 of the referenced standard. The insulation shall be suitable for conductor temperatures of 90°C for continuous normal operation, 130°C for emergency overload conditions and 250°C for short-circuit conditions.

#### 7.12-05 CONSTRUCTION CHARACTERISTICS

The insulated conductor(s) shall be twisted around the bare neutral conductor without fillers with a lay of 25 to 60 times the overall diameter of the insulated conductor(s).

#### 7.12-06 REELS

The cable reels shall be of such design, construction and strength as to guarantee satisfactory delivery of the cable at its destination without displacement, chafing or other damage incurring during shipment or field handling. The reels shall be capable of withstanding all stresses due to braking and stringing operations. All reels shall be wooden of the non-returnable type and shall conform to IPCEA A-9-428/NEMA WC6, "Drum Diameters of Reels for Wires and Cables;" NEMA WC21, "Non-returnable Reels for Wires and Cables," and NEMA WC 25, "Protective Coverings for Wire and Cable Reels."

#### 7.12-07 MARKINGS

The cable and reels shall be clearly marked and identified in accordance with Section 15 of ASTM B-231 and in accordance with AID Regulations.

#### 7.12-08 TESTS AND TEST REPORTS

Tests shall be conducted in accordance with Part 6 and Section 7.3.5 of IPCEA S-66-524/NEMA WC 7.

Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No cable shall be shipped until they have been released for shipment by the Engineer.



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SECTION 7.13 - POLE LINE HARDWARE AND ACCESSORIES

7.13-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of pole line hardware which include: anchor rods, bolts, braces, brackets, cable riser shields and supports, clamps, clevises, ground rods and plates, guy attachments, moulding, nuts, pins, pipe, screws, anchor shackles, staples and washers.

7.13-02 STANDARDS

The hardware and accessories shall conform to the following standards as applicable for each item:

EEI TD-2	Specification for Strand Eye Anchor Rods
EEI TD-4	Specification for Eye Bolts
EEI TD-11	Specification for Guy Hooks and Guy Strain Plates
EEI TD-95	Specification for Ground Wire Moulding
EEI TDJ-1 NEMA PH-101	Standards for Steel Bolts and Nuts
EEI TDJ-3 NEMA PH-3	Standards for Lag Screws
EEI TDJ-5 NEMA PH-5	Standards for Eye nuts and Eyelets
EEI TDJ-10 NEMA PH-10	Standards for Washers used in Overhead Line Construction

<u>Standard Number</u>	<u>Title</u>
EEI TDJ-17 NEMA PH-17	Standards for Bolt type Insulator Pins
EEI TDJ-22 NEMA PH-22	Standards for Pole Top Insulator Pins
EEI TDJ-30 NEMA PH-30	Standards for Galvanized Ferrous Ground Rods
REA D-8	Specifications for Service Deadend Clevises
REA D-18	Specifications for 60 Inch Wood Cross Arm Braces
ANSI B27.1	Lock Washers
ANSI B27.2	Plain Washers
ANSI C80.1	Rigid Steel Conduit, Zinc Coated
ASTM A153	Specification for Zinc-Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A239	Method of Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron and Steel Articles.

7.13-03 ANCHOR RODS

Anchor rods shall conform with EEI TD-2.

7.13-04 BOLTS

The following bolts are included in these specifications:

- A. Double arming bolts per EEI TDJ-1
- B. Carriage bolts per EEI TDJ-1
- C. Eyebolts per EEI TD-4
- D. Machine bolts per EEI TDJ-1

7.13-05 BRACES

The braces included in these specifications are listed below:

- A. Brace, Wood, 28", Joslyn Catalog Number J5526 or equal.
- B. Brace, Sidearm Vertical, 4'-0", Joslyn Catalog Number J1537 or equal.
- C. Brace, Side Arm Diagonal, 7'-0", Joslyn Catalog Number J1521 or equal.
- D. Brace, 60" Span, 18" Drop (for 10'-0" cross-arm) per REA D-18.

7.13-05 BRACKETS AND CABLE SUPPORTS

The brackets included in these specifications are listed below:

- A. Extension bracket, Joslyn Catalog Number J22658 or equal.
- B. Transformer Cluster Bracket:
  - 1. Band type, Joslyn Catalog Number J6780 with adapter plate J6786, or equal.
  - 2. Through bolt type, Joslyn Catalog Number J6866, or equal.
- C. Pole band for attaching two secondary racks or clevises to metal poles:

<u>Nominal Pole Dia. (Inches)</u>	<u>A. B. Chance Catalog No., or equal</u>
3	6373
4	6374
5	6375

- D. Insulated wire holder similar to McGraw Edison Catalog No. DKIMI, or equal.
- E. One-bolt cable support clamp, to support multi-plex secondary cables having a messenger size up to 7/16 inch diameter, Joslyn Catalog No. J1093, or equal.
- F. Two-bolt cable support, Chance No. 7911 or equal.

7.13-07 CABLE RISER SHIELD AND CABLE SUPPORTS

A. Cable riser shields shall be provided as follows:

3" conduit McGraw-Edison Catalog Number DU6P1, or equal.

4" conduit McGraw-Edison Catalog Number DU1P1, or equal.

5" conduit McGraw-Edison Catalog Number DU1P2, or equal.

Lag screws shall be provided per paragraph 7.13-15 as required.

B. Cable supports shall be provided as listed below:

<u>Cable Size (Inches)</u>	<u>Kellums Catalog Number or equal</u>
1.00 to 1.25	022-01-017
1.75 to 2.00	022-01-020

7.13-08 CLAMPS

The following clamps are included in these specifications:

A. Anchor rod bonding clamps:

1. Single eye, Joslyn Catalog Number J3230, or equal.

2. Twin eye, Joslyn Catalog Number J3231, or equal.

B. Ground rod clamps, Reliable Catalog Number 3458, or equal.

7.13-09 CLEVISES

The following clevises shall be provided:

A. Secondary spool insulator clevises per REA specification No. D-8.

B. Thimble clevis, side opening:

1. Standard per Fanner Catalog Number 201, or equal (No. 2 AAC through No. 3/0 AAC)

2. Large per Fanner Catalog Number 209, or equal (336.4 MCM AAC).

7.13-10 GROUND RODS AND PLATES

Ground rods shall be provided per EEI TDJ-30. Ground plates shall be Joslyn Catalog Number J055W, or equal.

7.13-11 GUY ACCESSORIES

The following guy accessories shall be provided:

- A. Guy attachments for 5/8 inch bolt:
  - 1. Formed Strap, Joslyn Catalog Number J6502, or equal.
  - 2. Angle Bolt Eye, Joslyn Catalog Number J6500, or equal.
  - 3. Malleable Iron Guy Hook, Joslyn Catalog Number J6555 or J6556, or equal.
- B. Guy hook per EEI TD-11
- C. Guy guards, Fanner Catalog Number 96PSG-2, or equal.
- D. Guy fitting, guy clamp for sidewalk guy, A. B. Chance Catalog Number 0502, or equal.
- E. Guy fitting, pole plate for sidewalk guy, A. B. Chance Catalog Number 0501 or equal.

7.13-12 MOULDING

Ground wire moulding shall be provided per EEI TD-95.

7.13-13 NUTS

The following type nuts shall be provided:

- A. Locknuts shall be of type M.F., or equal, as follows:

<u>Bolt Size</u>	<u>McGraw-Edison Catalog Number, or equal</u>
3/8 inch	DF3N1
1/2 inch	DF3N2
5/8 inch	DF3N4
3/4 inch	DF3N6
7/8 inch	DF3N8

- B. Eyenuts shall be provided per EEI TDJ-6.
- C. Thimble eyenuts shall be provided per EEI TDJ-6.

7.13-14 PINS

Pole top pins shall be provided per EEI TDJ-22 and crossarm pins shall be provided per EEI TDJ-17.

7.13-15 PIPE

Steel pipe used for sidewalk guy shall be galvanized steel pipe conduit per ANSI C80.1.

7.13-16 SCREWS

The following type screws shall be provided:

- A. Lag screws per EEI TDJ-3.
- B. Elliptical Eye screws, Joslyn Catalog Number J8930, or equal.
- C. Drive Hook, Joslyn Catalog Number J3316P, or equal.

7.13-17 SHACKLES, ANCHOR

Anchor shackles shall be Joslyn Catalog Number J2742, or equal.

7.13-18 STAPLES AND NAILS

Ground Wire Staples shall be Joslyn Catalog Number J6652, or equal. Moulding Staples shall be Joslyn J142, or equal. Pole data nails shall be similar to Joslyn Catalog 101-67 galvanized steel with a 1/4" shank, 1/2" head and 2-1/2" length dated for the year 1974.

7.13-19 WASHERS

The following type washers shall be provided:

- A. Square flat washers per EEI TDJ-10.
- B. Round flat washers per ANSI B27.2.
- C. Lock washers per ANSI B27.1.

7.13-20 GALVANIZING

All ferrous materials shall be galvanized in accordance with ASTM-A153. Each item shall withstand 6 one-minute dips (except cotter pins which shall withstand 4 one-minute dips) in the copper sulfate solution per ASTM-A239.

7.13-21 TESTS AND TEST REPORTS

Tests shall be conducted as called for in the respective Basic Standards listed in Section 7.13-02, above. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his Bid Price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No hardware or accessories shall be shipped until they have been released for shipment by the Engineer.



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SECTION 7.14 - INSULATORS

7.14-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of suspension, pin type and spool type insulators.

7.14-02 STANDARDS

The insulators shall conform to the following standards:

ANSI C 29.2	Wet-Process Porcelain Insulators (Suspension type)
ANSI C 29.3	Wet-Process Porcelain Insulators (Spool type)
ANSI C 29.6	Wet-Process Porcelain Insulators (High-Voltage pin type)

7.14-03 SUSPENSION INSULATORS

Suspension insulators shall conform with all requirements of ANSI C 29.2, "Wet-Porcelain Insulators (Suspension Type)," Class 52-4.

7.14-04 PIN TYPE INSULATORS

Pin type insulators shall conform with all requirements of ANSI C 29.6, "Wet-Porcelain Insulators (High-Voltage Pin Type)," Class 56-1.

7.14-05 SPOOL TYPE INSULATORS

Spool type insulators shall conform with all requirements of ANSI 29.3, "Wet-Process Porcelain Insulators (Spool Type)," Class 53-2.

7.14-06 TESTS AND TEST REPORTS

Tests for suspension type, pin type and spool type insulators shall be conducted as specified in Section 8 and 9 of ANSI C 29.2, C 29.6 and C 29.3, respectively. Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No insulators shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.15 - CONDUCTOR ACCESSORIES

7.15-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of all connectors, joints, clamps and line guards to be used for the new installation of Number 4 AWG AAC, 2 AWG AAC, 1/0 AWG AAC, 3/0 AWG AAC, 336.4 MCM AAC conductors; #4 AWG ground wire and 1/4 inch and 3/8 inch High-strength guy strand and for connection to existing copper secondary overhead power distribution systems.

7.15-02 STANDARDS

The conductor accessories shall conform to the following standards:

NEMA-SG1-1962	Electric Power Connectors
NEMA-SG14.10-1962	Overhead Distribution Connectors for Aluminum Conductors
NEMA-SG8.1-1959	Pressure Connectors for Copper Conductors, compression type
NEMA-SG8.2-1959	Pressure Connectors for Copper Conductors, screw type

7.15-03 GENERAL

A. Aluminum to aluminum and aluminum to copper connectors shall have an aluminum or aluminum alloy body with aluminum alloy or steel bolts, nuts and washers. Copper to copper connectors shall be made entirely of copper or copper alloy.

B. Bolts, where required, shall be fitted with nuts that are snug but may be turned with the fingers the entire length of bolt.

C. All ferrous materials shall be galvanized in accordance with ASTM-A153, "Specification for Zinc-Coating (Hot-Dip) on Iron and Steel Hardware." Each item shall withstand 6 one-minute dips in the copper sulfate solution per ASTM A239, "Method of Test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron and Steel Articles."

D. Each accessory shall be marked with the manufacturer's identification mark and number and the conductor size (AWG or MCM) and type for which it shall be used.

E. The Contractor shall furnish seven (7) sets of compression tools, dies and accessories for each type of compression connector and joint he furnishes. This list shall include cable cutter dies, special die inserts, pressure test gauges, compression tool carrying cases, oxide inhibiting compound, and other accessories as required. The price of these compression tools and other hand tools necessary for installing the connectors, joints and clamps the Contractor furnishes shall be included in his bid price in the Bid Form, Part I, Volume I of these Contract Documents.

#### 7.15-04 CONNECTORS

Connectors may be compression type, parallel groove type or split bolt type connectors as indicated in the Bid Form and on the Drawings. All compression connectors and parallel groove connectors shall be prefilled with an approved oxide inhibiting compound and wrapped in individual containers such as plastic bags or sealed with a plastic coating or caps. Acceptable connectors are listed as follows:

A. Compression type connectors:

1. Sleeve type, minimum tension, for aluminum to aluminum or copper:

<u>Conductor Range</u>	<u>Burndy Catalog No., or Equal</u>
No. 4 AWG str. - 6 AWG sol.	YSK 2W6W
No. 2 AWG AA Str.	YS 2CA
No. 1/0 AWG AA str.	YS 25A
No. 3/0 AWG AA str.	YS 27A

**2. Sleeve type, minimum tension, insulated for service entrance connections, for aluminum to aluminum or copper:**

<u>Conductor Size, AWG</u>		<u>Burndy Catalog No. or Equal</u>
<u>Service Drop</u>	<u>Service Entrance</u>	
6 str.	8 Solid - 10 str.	ES-4W8W
6 str.	6 Solid - 8 str.	ES-4W6W
6 str.	4 Solid - 6 str.	ES-4W4W

**3. Open sided sleeve type for aluminum to aluminum or copper:**

<u>Conductor Range</u>		<u>Thomas &amp; Betts Catalog No., or Equal</u>
<u>Main</u>	<u>Tap</u>	
(No. 5 AWG Solid - No. 2 AWG str.)	(No. 14 AWG Solid - No. 8 AWG str.)	UB214
(No. 6 AWG Solid No. 1/0 AWG str.)	(No. 6 AWG Solid - No. 1 AWG str.)	OB102

**B. Parallel groove type connectors for aluminum to aluminum:**

<u>Conductor Range, AWG or MCM</u>		<u>A. B. Chance Catalog No., or Equal</u>
<u>Main</u>	<u>Tap</u>	
1/0 str. - 6 Solid	1/0 str. - 6 Solid	SPG105P
4 str. - 2 str.	1/0 str. - 6 Solid	SPG120P
397.5 MCM-1/0 Str.	2/0 Str - 6 Solid	SPG130P
397.5 MCM-3/0 Str.	397.5 MCM-3/0 Str.	SPG135.2P

**C. Split bolt type connectors for aluminum to aluminum or copper:**

<u>Conductor Range, AWG</u>		<u>Anderson Electric Catalog No., or Equal</u>
<u>Main</u>	<u>Tap</u>	
2 Solid - 2/0 Str.	6 Solid - 2/0 Str.	CPS-2/0

D. Mid-span tap connectors for tapping services from quadruplex secondary aluminum conductor, aluminum to aluminum or copper.

<u>Conductor Range, AWG</u>		<u>Burndy Catalog No., or Equal</u>
<u>Main</u>	<u>Tap</u>	
2 Str. - 3/0 str.	6 str. - 2 str.	S4P27A
2 Str. - 3/0 str.	6 Solid - 4 str.	S4N27A

E. Connectors shall be subject to all tests listed in paragraph 7.15-08, below.

7.15-05 SPLICES

All splices shall be of the preformed type as listed below:

<u>Wire Size and Types</u>	<u>Preformed Type Splice Catalog Number</u>
No. 4 AWG AAC	Preformed LS-0112, or equal
No. 2 AWG AAC	Preformed LS-0118, or equal
No. 1/0 AWG AAC	Preformed LS-0124, or equal
No. 3/0 AWG AAC	Preformed LS-013 , or equal
336.4 MCM AAC	Preformed LS-0138, or equal

Splices shall be subject to all tests listed in paragraph 7.15-08, below. Splices shall be classified as Class 1, full tension.

7.15-06 CLAMPS

The clamps included in these specifications are listed below:

A. Hot line clamps (to be applied over line guard when used with aluminum conductors) shall conform to the following:

<u>Conductor Range, Dia. in Inches</u>		<u>A. B. Chance Catalog No., or Equal</u>
<u>Main</u>	<u>Tap</u>	
0.806 - 0.250	0.806 - 0.204	S1535AGP (for al. or cu.)
1.490 - 0.939	0.703 - 0.198	S1545AA (for al. only)



**B. Automatic dead end clamp (pulling hooks similar to Reliable No. R9055 shall be furnished as required):**

<u>Wire Size and Type</u>	<u>Catalog Number</u>
1/4 inch HS Guy Strand, short bail	Reliable R5100, or equal
1/4 inch HS Guy Strand, long bail	Reliable R5100-L, or equal
3/8 inch HS Guy Strand, short bail	Reliable R5102, or equal
3/8 inch HS Guy Strand, long bail	Reliable R5102-L, or equal

**C. Straight line dead end clamp:**

<u>Wire Size and Type</u>	<u>Catalog Number</u>
No. 2 AWG thru No. 3/0 AWG AAC	Ohio Brass 91550, or equal
336.4 MCM AAC	Ohio Brass 91570, or equal

**D. Universal Strain clamp:**

<u>Wire Size and Type</u>	<u>Catalog Number</u>
No. 2 AWG thru No. 3/0 AWG AAC	Ohio Brass 88500, or equal

**E. Strain clamp:**

<u>Wire Size and Type</u>	<u>Catalog Number</u>
No. 2 AWG thru No. 3/0 AWG AAC	Ohio Brass 86537, or equal
336.4 MCM AAC	Ohio Brass 86541, or equal

**F. Preformed dead end:**

<u>Wire Size and Type</u>	<u>Catalog Number</u>
No. 4 AWG AAC	Preformed DG-4541, or equal
No. 2 AWG AAC	Preformed DG-4542, or equal
No. 1/0 AWG AAC	Preformed DG-4544, or equal
No. 3/0 AWG AAC	Preformed DG-4546, or equal
336.4 MCM AAC	Preformed DG-4549, or equal
1/4 inch HS Guy Strand	Preformed GDE-2104-7W, or equal
3/8 inch HS Guy Strand	Preformed GDI-1106-7W, or equal

G. Clamps shall be subject to all tests listed in paragraph 7.15-08, below. Hot line clamps shall be classified as Class 3, minimum tension; all other clamps shall be classified as Class 1, full tension.

H. Service Wedge Clamps:

<u>Wire Size and Type</u>	<u>Catalog Number</u>
No. 6 AWG AAC	Joslyn R 7081, or equal
No. 2 to No. 4 AWG AAC	Joslyn R 7091, or equal
No. 1/0 AWG AAC	Joslyn R 7083, or equal
No. 3/0 AWG AAC	Joslyn R 7094, or equal

7.15-07 LINE GUARDS

Preformed line guards shall be provided at each primary support position.

<u>Wire Size and Type</u>	<u>Catalog Number</u>
No. 2 AWG AAC	Preformed MG-0130, or equal
No. 1/0 AWG AAC	Preformed MG-0134, or equal
No. 3/0 AWG AAC	Preformed MG-0139, or equal
336.4 MCM AAC	Preformed MG-0147, or equal

Line guards shall be subject to test 7.13.04.1, B, C, D and E and 7.13.04.2.

7.15-08 TESTS AND TEST REPORTS

A. Required tests are defined below:

1. Mechanical tests per NEMA SG 14.10 and SG 1.
2. Heat cycle tests per NEMA SG 14.10-1962.
3. Temperature rise tests per NEMA SG 1-1062.
4. Resistance tests per NEMA SG 1-1962.
5. Radio influence test per NEMA SG 1-1962.

Samples for the above tests shall be picked at random. Three samples per lot will be required for each test. No sample will be used for more than one test. Copper to copper accessories shall be tested per NEMA SG 8.1-1959 or SG 8.2-1959.

B. Three (3) certified copies of the results of all of the above tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

C. All accessories will be visually inspected to assure that external characteristics, including dimension verification, comply with the specifications. If a total of any lot exceeds a 3% rejection, the whole lot will be rejected.

D. All production tests performed will be witnessed by the Engineer unless waived in writing. No conductor accessories shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.16 - UNDERGROUND CABLE, 25 kV

7.16-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of 25 kV two-conductor concentric-neutral power cables consisting of one cross-linked-thermosetting-polyethylene-insulated aluminum central conductor and one coated copper concentric conductor applied helically overall. These cables shall be suitable for use on an 11.5/20 kV grounded-wye, 50 Hz, power distribution system. The cables and insulation shall be suitable for use in wet or dry locations, directly buried in the earth or installed in conduit or cable trenches and suitable for exposure to sunlight at continuous conductor operating temperatures of 90°C, 130°C for emergency overload conditions and 250°C for short-circuit conditions.

7.16-02 STANDARDS

The 25 kV cable shall conform to IPCEA Publication No. S-66-524/NEMA Publication No. WC 7 "Cross-linked-thermosetting-polyethylene-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

7.16-03 CONDUCTOR PROPERTIES

The central conductor shall be "EC" Grade 3/4 hard-drawn aluminum, Class B stranded in sizes ranging from No. 1/0 AWG through 750 MCM as specified in the Construction Standards and Bid Form.

7.16-04 CONDUCTOR SHIELDING

The conductor shielding shall be an extruded conducting material in accordance with Part 2.4 of IPCEA Pub. No. S-66-524. Conductor shielding of tapes, conducting compounds or conducting cements that are not extruded will not be accepted.

#### 7.16-05 INSULATION

The shielded central conductor shall be insulated with cross-linked-thermosetting-polyethylene (XLP) having an average thickness of not less than 260 mils (6.60mm) for circuits having a maximum normal operating phase to phase voltage of 22 KV, 50 Hz.

#### 7.16-06 INSULATION SHIELDING AND PROTECTIVE COVERING

A layer of semiconducting nonmetallic material meeting the requirements of Part 7.2.4 of IPCEA Pub. No. S-66-524 shall be extruded over the insulation to serve as both a shield and a protective covering. The shielding shall be free stripping to facilitate the removal of all conducting material when splices or terminations are being made. The average thickness of this layer shall be not less than the values given in Table 7.1-2 of the referenced standard.

#### 7.16-07 CONCENTRIC CONDUCTOR

The overall concentric conductor shall be annealed coated copper having a current carrying capacity of either 100% of or 1/3 of the capacity of the central conductor as specified in the Bid Form. The number and size of the individual concentric wires shall conform to the requirements of Part 7.1.5 or Part 7.2.5 of IPCEA Pub. No. S-66-524 as applicable.

The coating over the bare wires shall be either lead or lead alloy in accordance with ASTM Specification BI 89 or with tin in accordance with ASTM Specification B 33.

#### 7.16-08 REELS AND PACKING

Cables shall be furnished on non-returnable type wooden reels that meet the requirements of NEMA Publication No. WE 21. Standard packages shall consist of a minimum of 1000 ft. of cable per reel or lengths of runs that may be designated by the Engineer prior to the Contractor ordering the cable. The maximum approximate reel capacity shall not exceed 8000 lbs. and the maximum reel size shall not be greater than NEMA Reel Code No. 7236 designation.

The lagging on the reels shall be bound with galvanized steel bands. The reels shall be sufficiently sturdy in construction to withstand service incident to ocean shipping, hauling and field handling. The protective lagging shall not be less than Class 4, Extra-heavy-duty Physical Protector as covered in NEMA Pub. No. WC 25.

Watertight seals shall be applied to all cable ends to prevent the entrance of moisture during transit or out-of-door storage.

#### 7.16-09 MARKINGS

The cable shall have suitable markings underneath the concentric conductor strands on the outer surface of the insulation shielding and protective covering at regular intervals to indicate the name of the manufacturer, conductor size, type designation and voltage rating.

The cable reels shall be clearly marked and identified in accordance with AID Regulations. In addition to AID markings and marks required for shipping purposes, each reel shall be marked to show serial number, type and size of conductor, type and size of concentric neutral, type of insulation, voltage rating of cable, length of conductor, arrow showing end of the conductor, and gross and net weights.

#### 7.16-10 TESTS AND TEST REPORTS

Physical and aging tests, electrical tests and all other tests required in Section 6 of IPCEA Specification S-66-524 shall be made by the cable manufacturer. The manufacturer shall perform the above referenced electrical tests on each completed length of cable. The AC test voltage shall be 38 kV, the DC test voltage shall be 100 kV and the minimum corona extinction level shall be 19 kV in accordance with the above referenced IPCEA Specification.

Three (3) certified copies of the results of all manufacturer's tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No 25 kV cable shall be shipped until they have been released for shipment by the Engineer.

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SECTION 7.17 - UNDERGROUND CABLE ACCESSORIES

7.17-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of underground cable accessories to be used for splicing and terminating 25 kV and 600 volt cross-linked-polyethylene-insulated Class B stranded aluminum conductors.

7.17-02 STANDARDS

All cable accessories supplied shall be suitable for use on cross-linked-polyethylene-insulated conductors. The splicing and terminating materials shall be compatible with conductor, conductor shielding, insulation and insulation shielding materials with which they will come in contact in accordance with IPCEA Publication No. S-66-524, as applicable.

7.17-03 ELECTRICAL AND CONSTRUCTION CHARACTERISTICS

All insulating, splicing and terminating materials shall be suitable for and specifically designed for the respective cable types and ratings with which they will be used. All materials shall be suitable for use in wet or dry locations and suitable for exposure to sunlight at continuous operating temperatures of 90°C, 130°C emergency overload conditions and 250°C for short-circuit conditions. All straight splices shall be suitable for direct burial in the earth.

All connectors for straight splices and primary (25kV) cable terminations shall be of the compression type. Splicing sleeves and terminals shall be pre-filled with an approved oxide inhibitor.

Disconnectable splices and terminations such as those manufactured by the Elastimold Division of Amerace-ESNA Corporation will be acceptable provided the manufacturer can substantiate that identical products of the manufacturer have had three or more years of satisfactory in service experience.

7.17-04 PACKING

Splice kits and termination kits for primary cable (25 kV) shall be packaged individually with all components necessary for making the splice or termination in separate kits. A set of detailed manufacturer's instructions shall be included in each kit.

Splicing materials and connectors for low voltage cable (600 V) may be packaged by combining like materials or in kits as required.

7.17-05 TESTS AND TEST REPORTS

Three (3) certified copies of the results of all design tests, conformance tests and production tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No cable accessories shall be shipped until they have been released for shipment by the Engineer.

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**PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION**  
**MATERIAL AND EQUIPMENT**

**SECTION 7.18 - UNDERGROUND CABLE, 600 VOLT**

**7.18-01 SCOPE**

This Section specifies the minimum requirements for the manufacture and supply of 600 volt cross-linked-polyethylene-insulated aluminum conductor power cable. These cables shall be suitable for use on a 220/380 volt grounded-wye, 50 Hz, power distribution system. The cables and insulation shall be suitable for use in wet or dry locations, directly buried in the earth or installed in conduit or cable trenches and suitable for exposure to sunlight at continuous conductor operating temperatures of 90°C, 130°C for emergency overload conditions, and 250°C for short-circuit conditions.

**7.18-02 STANDARDS**

The 600 volt cable shall conform to IPCEA Publication No. S-66-524/  
NEMA Publication No. WC 7, "Cross-linked-thermosetting-polyethylene-insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

**7.18-03 CONDUCTOR PROPERTIES**

The conductor shall be "EC" Grade 3/4 hard-drawn aluminum, Class B stranded in sizes ranging from No. 2 AWG through 750 MCM as specified in the Construction Standards and Bid Form.

**7.18-04 INSULATION AND PROTECTIVE COVERING**

The conductor shall be insulated with cross-linked-thermosetting-polyethylene (XLP) having an average thickness of not less than the following values which are taken from Column A, Table 3-1 of IPCEA Publication No. S-66-524 for conductors rated 0-600 volts, phase to phase:

Conductor Size AWG or MCM	Minimum Average Insulation Thickness	
	mils	mm
2	62	1.57
1 - 4/0	78	1.98
225 - 500	94	2.39
525 - 750	109	2.77

The insulation material shall serve as both the conductor insulation and a protective covering or outer jacket.

7.18-05 REELS AND PACKING

Cables shall be furnished on non-returnable type wooden reels that meet the requirements of NEMA Publication No. WE 21. Standard packages shall consist of a minimum of 1000 ft. of cable per reel or length of runs that may be determined by the Engineer prior to the Contractor ordering the cable. The maximum approximate reel capacity shall not exceed 8000 lbs. and the maximum reel size shall not be greater than NEMA Reel Code No. 7236 designation.

The lagging on the reels shall be bound with galvanized steel bands. The reels shall be sufficiently sturdy in construction to withstand service incident to ocean shipping, hauling and field handling. The protective lagging shall not be less than Class 4, Extra-heavy-duty Physical Protector as covered in NEMA Pub. No. WC 25-1969.

Watertight seals shall be applied to all cable ends to prevent the entrance of moisture during transit or out-of-door storage.

7.18-06 MARKINGS

The cable shall have suitable markings on the outer surface of the insulation at regular intervals to indicate the name of the manufacturer, conductor size, type designation and voltage rating.

The cable reels shall be clearly marked and identified in accordance with AID Regulations. In addition to AID markings and marks required for shipping purposes, each reel shall be marked to show serial number, type and size of conductor, type of insulation, voltage rating of cable, length of conductor, arrow showing the direction of payout, and gross and net weights.

7.18-07 TESTS AND TEST REPORTS

Physical and aging tests, electrical tests and all other tests required by Section 6 of IPCEA Specification S-66-524 shall be made by the cable manufacturer. The manufacturer shall perform the above referenced electrical tests on each completed length of cable. The AC and DC test voltages shall be as follows as taken from Table 3-1 of IPCEA Publication No. S-66-524:

Conductor Size AWG or MCM	Test Voltage (kV)	
	AC	DC
2	5.5	16.5
1 - 4/0	7.0	21.0
225 - 500	8.0	24.0
525 - 750	10.0	30.0

Three (3) certified copies of the results of all manufacturer's tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No 600 volt cable shall be shipped until they have been released for shipment by the Engineer.

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
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SECTION 7.19 - INSTRUMENT TRANSFORMERS

7.19-01 SCOPE

This section specifies the minimum requirements for the manufacture and supply of outdoor type, instrument transformers for primary metering on a 11.5/20 kV effectively grounded wye connected overhead line. Both current and potential transformers are included.

7.19-02 STANDARDS

The instrument transformers shall conform to ANSI C57.13, "Requirements for Instrument Transformers" except the frequency shall be 50 Hz.

7.19-03 POTENTIAL TRANSFORMER SPECIFICATIONS

The potential transformers shall be single phase, outdoor type, oil insulated units suitable for phase-to-ground operation on a 11.5/20 kV effectively grounded wye system. They shall be of the single bushing type, complete with solderless clamp-type terminals for phase and ground connections. Clamps for the phase connections shall be suitable for connection of number 2 AWG stranded all aluminum conductor and the clamp for the ground connection shall be suitable for connection of number 4 AWG stranded aluminum conductor.

Each potential transformer shall be furnished with mounting brackets designed for mounting on a EEL-NEMA standard 3-1/2" x 4-1/2" wood cross-arm. All bolts or hardware required to attach the mounting bracket to the crossarm and transformer shall be included. Mounting brackets and hardware shall be hot-dip galvanized.

The potential transformers shall be 25 kV Insulation Class and 150 kV BIL and shall have a winding ratio of 120/200:1 and a thermal capacity of not less than 400 volt-amperes. They shall be capable of withstanding a secondary short circuit for a minimum of one second and shall have an ANSI standard accuracy classification of 0.3 with a standard burden designation of W.



All secondary leads of the potential transformers shall be brought out and terminated on terminal blocks in a weatherproof junction box on the side of the transformer case. The junction box shall have a gasketed removable cover and provisions for weatherproof connection of external circuits.

#### 7.19-04 CURRENT TRANSFORMER SPECIFICATIONS

The current transformers shall be outdoor, bar type, oil filled units. They shall be suitable for operation on a 11.5/20 kV effectively grounded wye system. They shall have a single primary and single secondary winding rated 200:5 amperes and have a BIL of 150 kV. They shall be designed to have an ANSI standard metering accuracy classification of 0.3 with a standard burden of B-0.1.

Solderless, clamp-type connectors shall be provided on the phase and ground terminals. Clamps for the phase connection shall be suitable for 1/0 AWG stranded all aluminum conductor and the clamp for the ground connection suitable for connection of number 4 AWG stranded aluminum conductor.

Each current transformer shall be furnished with mounting brackets designed for mounting on a EEL-NEMA standard 3-1/2" x 4-1/2" wood cross-arm. All bolts on hardware required to attach the mounting bracket to the crossarm and transformer shall be included. Mounting brackets and hardware shall be hot-dip galvanized.

All secondary leads shall be brought out to grounding type terminals in a weatherproof junction box on the side of the transformer case. The junction box shall have a gasketed removable cover and provisions for weatherproof connection of external circuits.

#### 7.19-05 TESTS AND TEST REPORTS

Each potential and current transformers shall be tested in accordance with ANSI C-57.13. Typical ratio correction factor and phase-angle curves for 50 cycle service shall be furnished for both current and potential transformers.

Three (3) certified copies of the curves and of the results of all other tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No instrument transformers shall be shipped until they have been released for shipment by the Engineer.

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
MATERIAL AND EQUIPMENT

SECTION 7.20 - TOOLS AND CONSTRUCTION EQUIPMENT

7.20-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of tools and construction equipment. The specified tools and construction equipment shall be furnished by the Contractor who shall turn over the equipment to the Owner for the Owner's exclusive use except that they may be used by the Contractor to train the Owner's personnel during the training program covered in Part VIII, "Technical Specifications for Training." The tools and construction equipment will be used by the Owner's personnel to install services and complete the rehabilitation of the distribution system that is beyond the scope of the Contractor's Work, perform routine operation and maintenance procedures and install new line extensions and services to new consumers after the Contractor's Work is completed.

This list of tools and construction equipment does not include hot line tools and equipment which are covered in Part VIII, Section 8.2 of these Specifications.

7.20-02 STANDARDS

All materials used in the manufacture of the tools and equipment furnished under these Contract Documents shall be new and of first-class commercial quality, free from defects and imperfections, and of approved classification and grade. Materials shall, as far as practicable, conform to the latest specifications issued by the American Society for Testing and Materials (ASTM), or other approved standard covering the classes or kinds of materials to be used.

All aerial construction devices shall conform to ANSI A92.2.

7.20-03 TOOL AND EQUIPMENT SPECIFICATIONS

The Contractor shall be required to furnish tools and equipment listed below in the quantities listed in Section 1.5, Part I - Bid Form. The tools and equipment shall be manufactured using high grade raw materials and modern manufacturing techniques to insure the supply of top quality, safe tools and equipment.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
1.	Side cutting plier, 7 inch, with blue plastic insulation on handle grips.	Mathias Klein and Sons, Inc., Catalog No. D201-7, or equal.
2.	Thread holding plier, with 5/8 inch threaded opening, with blue plastic insulation on handle grips.	Mathias Klein and Sons, Inc., Catalog No. D213-9NE-TH, or equal.
3.	Side cutting plier, 9 inch, with yellow high dielectric plastic insulation on handle grips.	Mathias Klein and Sons, Inc., Catalog No. HD-201-9NE, or equal.
4.	Oblique cutting plier, 8 inch, with red plastic insulation on handle grips.	Mathias Klein and Sons, Inc., Catalog No. D228-8, or equal.
5.	Adjustable wrench, 8 inch, with plain handle.	Mathias Klein and Sons, Inc., Catalog No. 500-8, or equal.
6.	Adjustable wrench, 12 inch, with plain handle.	Mathias Klein and Sons, Inc., Catalog No. 500-12, or equal.
7.	Adjustable wrench, 15 inch, with plain handle.	Mathias Klein and Sons, Inc., Catalog No. 500-15, or equal.
8.	Linemen's wrench, for 5/8 inch hardware.	Mathias Klein and Sons, Inc., Catalog No. 3146, or equal.
9.	Hack saw, for 12 inch blades, with thumb screw adjustment for tightening blade.	Mathias Klein and Sons, Inc., Catalog No. 701-12-TH, or equal.
10.	Hack saw blades, high speed steel, colored yellow.	Mathias Klein and Sons, Inc., Catalog No. 1232HS, or equal.
11.	Electrician's hammer, with fiber glass handle with blue neoprene bonded handle covering, with 18 ounce head, 14 inch overall length.	Mathias Klein and Sons, Inc., Catalog No. 807-18, or equal.
12.	Ball pein hammer, wooden handle, with 12 ounce head, 12-3/4 inch overall length.	Mathias Klein and Sons, Inc., Catalog No. 803-12, or equal.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
13.	Hand drilling hammer, with hickory handle, with 48 ounce head, 10-1/4 inch length overall.	Mathias Klein and Sons, Inc., Catalog No. 823-48, or equal.
14.	Lineman's hammer, with fiber glass handle with neoprene cushioned grip, with 36 ounce head, 14-1/2 inch length overall	Mathias Klein and Sons, Inc., Catalog No. 809-36, or equal.
15.	Folding wood rule, 2 meter length with markings graduated in centimeters and millimeters on one side and inches and 16ths of an inch on the other side.	Stanley Tools, Catalog No. 714ME, or equal.
16.	Lineman's knife, single 3 inch blade which automatically locks open.	Mathias Klein and Sons, Inc., Catalog No. 1550-4, or equal.
17.	Bit brace with ball bearing head and spring loaded alligator jaws, with 10 inch sweep.	Mathias Klein and Sons, Inc., Catalog No. 64004, or equal.
18.	Standard pole bit for drilling wood poles and crossarms made of very hard wood, 11/16 inch diameter by 18 inches long with 12 inch twist.	Pruzan Company, Catalog No. 415T-11/16 inch, or equal.
19.	Standard pole bit for drilling wood poles and crossarms made of very hard wood, 9/16 inch diameter by 18 inches long with 12 inch twist.	Pruzan Company, Catalog No. 415T-9/16 inch, or equal.
20.	"Chicago" grip for all aluminum conductor sizes of No. 4 AWG through 1/0 AWG, with smooth jaw grips.	Mathias Klein and Sons, Inc., Catalog No. 1656-20, or equal.
21.	"Chicago" grip for all aluminum conductor sizes of No. 1/0 AWG through No. 3/0 AWG, with smooth jaw grips.	Mathias Klein and Sons, Inc., Catalog No. 1656-30, or equal.
22.	"Chicago" grip for 336.4 MCM all aluminum conductor with smooth jaw grips.	Mathias Klein and Sons, Inc., Catalog No. 1656-40, or equal.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
23.	Replaceable gaff adjustable climbers; adjustable from 15 inches to 19 inches in 1/2 inch increments measured from instep to top of slide; with split ring at ankle, straps and pads, for climbing wood power poles.	Mathias Klein and Sons, Inc., Catalog No. C1959-AR, or equal.
24.	Replaceable gaffs with lock screw and wrench for use with the adjustable climbers, Item No. 23 above.	Mathias Klein and Sons, Inc., Catalog No. 59, or equal.
25.	Gaff gauge for determining if gaffs are properly sharpened, with box and instructions.	Mathias Klein and Sons, Inc., Catalog No. KG-1, or equal.
26.	Lineman's leather body belt, for waist size of 32 inches, with 2 D rings, tape holder, knife snap and two pocket tabs.	Mathias Klein and Sons, Inc., Catalog No. 5262, or equal.
27.	Safety strap, nylon, 1-3/4 inches wide by 5 ft. - 8 inches long with adjustable length buckle and lockable snaps.	Mathias Klein and Sons, Inc., Catalog No. KL-5295, or equal.
28.	Canvas bucket made of No. 1 canvas with reinforced leather bottom, with manila rope handle and swivel snap.	Mathias Klein and Sons, Inc., Catalog No. 5104-S, or equal.
29.	Manila rope hand line, 3/8 inch, 75 ft. long, with swivel snap.	Mathias Klein and Sons, Inc., Catalog No. 1804-60, or equal.
30.	Safety Lanyard, 1/2" manila rope, 5 ft. long, with snap on each end.	Mathias Klein and Sons, Inc., Catalog No. 5489-M-1/2", or equal.
31.	Aerial basket boom strap, nylon, with adjustable buckle and two D rings, 1-3/4 inches wide by 54 inches long.	Mathias Klein and Sons, Inc., Catalog No. 5217-2D, or equal.
32.	Pole tong, with 3 ft. hickory handle and 7 to 18 inches diameter range.	A. B. Chance Company Catalog No. C-200-T, or equal.
33.	Pole pike, 2 inch diameter by 10 ft. long epoxyglass pole with retractable safety point.	A. B. Chance Company Catalog No. 210PH, or equal.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
34.	Pole pike, 2 inch diameter by 16 ft. long epoxyglass pole with retractable safety point.	A. B. Chance Company Catalog No. 216PH, or equal.
35.	Coffing hoist, ratchet and pawl type, aluminum alloy construction with steel chain and swivel hook, 3000 lb. capacity.	Graybar Electric Co. Catalog No. RA-15-2W, or equal.
36.	Coffing hoist, ratchet and pawl type, aluminum alloy construction with steel chain and swivel hook, 6000 lb. capacity.	Graybar Electric Co. Catalog No. RA-30-2W, or equal.

7.20-04 CONSTRUCTION EQUIPMENT SPECIFICATIONS

The Contractor shall furnish the following items of construction equipment in the quantities listed in Section 1.5, Part I - Bid Form:

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
1.	Pole trailer, 2000 lb. capacity, with two 7.75 x 15 tires mounted on a 3000 lb. capacity axle, with towing eye for pulling empty trailer, with provisions on the ends of the two bolsters for anchoring 1/4 inch straight link binding chains, with recessed section in center of both bolsters for centering pole used with drawbar as a tongue for towing the loaded trailer, approximate overall length of 8'-0", with the following accessories:	McCabe-Powers Body Company, Model AD-10 Pole Dinkey, or equal.
	a) A lever operated pawl-and ratchet assembly, having steel load-gripping spurs for binding pole(s) to trailer, equipped with cable drum and 18'-0" of 5/16" steel cable.	
	b) Drawbar assembly including towing eye, two lengths of binding chain, and two screw-type chain binders which pull anchoring studs into towing end of the pole used as a tongue for pulling loaded trailer.	

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
2.	<p>Pole trailer, 6000 lb. capacity, with two 7.50 x 20-8 ply tires mounted on a 7000 lb. capacity axle, with a towing eye attached to A-frame assembly for pulling empty trailer, a steel saddle on each bolster for centering the pole used with drawbar as a tongue for towing the loaded trailer, with two adjustable stanchions on each bolster for anchoring in desired position by cam-type locking handles, with two loops on each side of the trailer frame for attaching load binders with the following accessories:</p> <p>a) A lever operated pawl-and-ratchet assembly, having steel load-gripping spurs for binding pole(s) to trailer, equipped with cable drum and 18'-0" of 5/16" steel cable.</p> <p>b) Drawbar assembly including towing eye, two lengths of binding chain, and two screw-type chain binders which pull anchoring studs into towing end of the pole used as a tongue for pulling loaded trailer.</p>	<p>McCabe-Powers Body Company, Catalog No. Model A-30, or equal.</p>
3.	<p>Cable reel transport trailer for hauling and paying out 25 kV insulated power cable with maximum reel size of NEMA Reel Code No. 7236 designation and maximum reel capacity of 8000 lbs.; with two disc wheels and 9:00 x 20-10 ply tires for vehicular transport and a hydraulically operated retractable roller bearing landing wheel for balancing and positioning the trailer; with two reel spindle bars capable of being positioned in one of five support brackets on individually-operated lifting cylinders to raise, lower, or level reel; with two hand-operated hydraulic pumps with self-sustained reservoirs and built-in check valves for elevating the reel to pay-out or traveling height; with jumper cable connection socket for the 15 x 3 electric brakes and recessed tail lights; with safety chains and latch hook on the drawbar; with heavy gauge fenders and the following accessories:</p>	<p>McCabe-Powers Body Company, Series CM-8, or equal.</p>



<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	a) Torsion bars to reduce bouncing of the trailer frame.	
	b) Safety bar with spring loaded locking pins equipped with towing eye for tandem hook-up of trailers.	
	c) Reel brake.	
4.	Revolving aerial ladder truck mounted on truck chassis with service truck body as follows:	McCabe-Powers Body Company, Series HLEP Mounted on a One Ton Truck Chassis, with a Series 44-E-104D Body, or equal.
	a) The revolving aerial ladder shall be capable of being elevated at an angle of 75 degrees with the horizontal to a vertical height of 28'-6" between the inside floor of the truck chassis and the bottom of the one-man curved surface work platform mounted on the end of the ladder; with 12 volt heavy duty battery-powered hydraulic elevation, extension and rotation controls; capable of being raised and lowered to any point from horizontal to an elevation of 75 degrees with 360° rotation. The upper section of the two 17 ft. long sections shall be completely retractable, sliding inside the lower section. The ladder construction shall be steel or high strength aluminum alloy with side rails coated with an insulating compound resistant to peeling, chipping, fungus and weather damage. The platform at the top of the ladder shall be constructed of fiberglass and the top section shall be insulated to protect the workman against accidental contact with 380 volt lines.	
	b) The minimum truck chassis size shall be one ton, equipped with a 40 Amp low cut in high output generator and heavy duty battery.	

The vehicle shall be powered by a gasoline engine with rated output of not less than 165 HP. The engine shall be equipped with

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	<p>a complete 12 volt electrical system including a direct electric starting system.</p> <p>The transmission shall be of the constant mesh type and shall provide a minimum of three speeds in forward and one in reverse.</p> <p>The truck chassis shall be furnished with single front and dual rear wheels for two wheel drive.</p> <p>The steering shall be hydraulic with right hand drive.</p> <p>The speedometer and odometer shall be in metric units. Ammeter, oil pressure, water temperature and fuel gauges shall be furnished and be readily visible from the driver's seat. The cab shall be furnished with dual, electric two-speed (minimum) windshield wipers, door locks with safety latches, and safety glass windows, outside rear-view mirrors both left and right sides, sun visor on driver's side and inside dome light.</p> <p>The chassis, bumper and wheels shall be painted black, and all other parts yellow.</p> <p>The fuel tank shall have a minimum capacity of 19.5 gallons.</p> <p>A front tow hook and rear tow loop shall be installed on the respective bumpers.</p> <p>c) The truck body shall contain modular, all-welded construction and storage bins on each side of the truck. The individual compartment doors shall be capable of being locked by a single master key.</p>	

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
5.	<p>Hydraulically powered, insulated, overcenter aerial device with two one-man buckets on upper section of two-arm boom with maximum height of approximately 36 ft. from ground to bucket floor, to be used for heavy duty dead and hot line construction and maintenance work with all required components for a complete working unit. The chassis cab shall be of the conventional type. The hydraulic aerial device shall be mounted on a truck chassis having a minimum cab-to-axle dimension of 102 inches; a wheel base of 174 in.; a minimum capacity of 5,000 pounds at the front axle and 15,000 pounds at the rear axle; a minimum rear spring capacity at pad of 8100 pounds; a minimum front spring capacity at pad of 2500 pounds with a 8.00 x 22.5, 8 ply tubeless tires and a frame section modulus of approximately 14 cubic inches. The hydraulic aerial device shall have an electrically insulated upper boom of fiberglass construction with all hydraulic lines, control rods, etc., of non-conductive material.</p>	<p>Pitman Manufacturing Co., Division of A. B. Chance Co., Catalog No. HS-36 MO-12 with Truck Chassis and Body, or equal.</p>

The hydraulic aerial device shall be furnished with two "one man" fiberglass buckets capable of maintaining a perpendicular position to the chassis through all operating positions. A minimum working height of 41 feet and a maximum radius of 26 feet 11 inches from the center line of rotation to bucket support shaft shall be provided. Total bucket capacity in all positions shall be a minimum of 600 pounds. The minimum total upper boom capacity in the restricted position shall be 2000 lbs.

The lower arm shall rotate through a minimum vertical angle of 90 degrees from a horizontal rest position. The upper arm shall rotate through a minimum vertical angle of 240 degrees. The unit shall have a continuous rotation turret assembly.

The stored position of the hydraulic aerial device when ready for road travel shall not

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
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exceed 8 feet in width, 11 feet 4 inches in height and 19 feet 2 inches in length.

The basic unit shall include a separate out-rigger assembly with controls, full pressure controls at the bucket position and lower controls at the turret, and a bucket leveling system.

The vehicle shall be powered by a gasoline engine with rated output of not less than 285 HP. The engine shall be equipped with a complete 12 volt electrical system including a direct electric starting system.

The transmission shall be of the constant mesh type and shall provide a minimum of four speeds in forward and one in reverse.

The truck chassis shall be furnished with single front and dual rear wheels for two wheel drive.

The steering shall be hydraulic with right hand drive.

The speedometer and odometer shall be in metric units. Ammeter, oil pressure, water temperature and fuel gauges shall be furnished and be readily visible from the driver's seat. The cab shall be furnished with dual, electric two-speed (minimum) windshield wipers, door locks with safety latches, and safety glass windows, outside rear-view mirrors both left and right sides, sun visor on driver's side and inside dome light.

The chassis, bumper and wheels shall be painted black, and all other parts yellow.

The fuel tank shall have a minimum capacity of 19.5 gallons.

A front tow hook and rear tow loop shall be installed on the respective bumpers.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
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The truck body shall contain modular, all-welded construction and storage bins on each side of the truck. The individual compartment doors shall be capable of being locked by a single master key.

The following accessories shall be furnished with each aerial device:

Two fiberglass buckets 24" wide by 24" long and 38" deep with 3" toe space.

Two vinyl-coated material full bucket type covers.

Emergency power system with d-c electric motor and wiring to truck d-c battery supply permitting emergency operation of the unit in event of failure of truck's engine or main hydraulic pump.

One hydraulic tool adapter kit at the boom including flow divider, selector valve and hoses with quick disconnect fittings.

One hydraulic tool adaptor kit at the main frame with the same equipment as above item.

One insulated remote start and stop system for starting and stopping the truck's engine from the operator's buckets, for 12 volt system.

One control console located on the main frame for operation of outriggers, boom system elevation and boom rotation.

Thirty gallon hydraulic oil reservoir with breather cap and dip stick to assure efficient operation of hydraulic tools.

One truck grounding assembly complete with the following:

50 feet of No. 2 AWG stranded copper grounding cable with 600 volt yellow cover and ferrules attached to each end.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	One cable reel for 100 feet No. 2 AWG 600 volt insulated cable.	
	Two snap-on ground clamps.	
	One ground screw rod with a "T" handle and a copper and bronze rod, 0.590" diameter with 14" screw and a total length of 6 feet.	
	One basic lifting attachment package including quadrant, mast support, 7 foot fiberglass mast and a steel end cap and the necessary hardware for installation.	
	One 10 foot long 2-1/2" diameter epoxyglass crossarm for use with the basic lifting attachment.	
	Three wire holders for attaching to epoxyglass crossarm above.	
	One crossarm attaching kit to attach crossarm to basic lifting attachment for handling balanced load.	
	One crossarm attaching kit to attach crossarm to basic lifting attachment for handling unbalanced load.	
	One sheave and support bracket for mounting over the end of the fiberglass mast in the basic lifting attachment.	
	One nylon block assembly consisting of two nylon blocks with loose swivel hooks and becketts and 50 feet of 3/8" polypropylene rope.	
	These aerial devices to be capable to handle the hydraulic saws and pruner included with Item No. 6.	

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
6.	Hydraulically powered insulated, overcenter aerial device with two one-man buckets on upper section of two-arm boom with maximum height of approximately 49 ft. 6 inches from ground to bucket floor, to be used for heavy duty dead and hot line construction and maintenance work with all required components for a complete working unit. The chassis cab shall be of the conventional type.	Pitman Manufacturing Co., Division of A. B. Chance Co., Catalog No. HS-50HA-12 with Truck Chassis and Body, or equal.

The hydraulic aerial device shall be mounted on a truck chassis having a minimum cab-to-axle dimension of 102 inches, a wheel base of 174 inches, a minimum capacity of 7000 pounds at the front axle and 17,000 pounds at the rear axle with heavy duty front and rear springs. The hydraulic aerial device shall have an electrically insulated upper boom of fiberglass construction with all hydraulic lines, control rods, etc., of non-conductive material.

The hydraulic aerial device shall be furnished with two "one man" fiberglass buckets capable of maintaining a perpendicular position to the chassis through all operating positions. A minimum working height of 51 feet and a maximum radius of 39 feet 2 inches from the center line of rotation to bucket support shaft shall be provided. Total bucket capacity in all positions shall be a minimum of 600 pounds. The minimum total upper boom capacity in the restricted position shall be 2000 lbs.

The lower arm shall rotate through a minimum vertical angle of 90 degrees from a horizontal rest position. The upper arm shall rotate through a minimum vertical angle of 210 degrees. The unit shall have a continuous rotating turret assembly.

The stored position of the hydraulic aerial lift when ready for road travel shall not exceed 8 feet in width, 11 feet 4 inches in height and 24 feet 6 inches in length.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
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The basic unit shall include a separate out-rigger assembly with controls at the bucket position and lower controls at the turret and a bucket leveling system.

The vehicle shall be powered by a gasoline engine with rated output of not less than 391 HP. The engine shall be equipped with a complete 12 volt electrical system including a direct electric starting system.

The transmission shall be of the constant mesh type and shall provide a minimum of four speeds in forward and one in reverse.

The truck chassis shall be furnished with single front and dual rear wheels for two wheel drive.

The steering shall be hydraulic with right hand drive.

The speedometer and odometer shall be in metric units. Ammeter, oil pressure, water temperature and fuel gauges shall be furnished and be readily visible from the driver's seat. The cab shall be furnished with dual, electric two-speed (minimum) windshield wipers, door locks with safety latches, and safety glass window, outside rear-view mirrors both left and right sides, sun visor on driver's side and inside dome light.

The chassis, bumper and wheels shall be painted black, and all other parts yellow.

The fuel tank shall have a minimum capacity of 19.5 gallons.

A front tow hook and rear tow loop shall be installed on the respective bumpers.

The truck body shall contain modular, all-welded construction and storage bins on each side of the truck. The individual compartment doors shall be capable of being locked by a single master key.



<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
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The following accessories shall be furnished with each aerial device:

Two fiberglass buckets 24" wide by 24" long and 38" deep with 3" toe space.

Two vinyl-coated material full bucket type covers.

Emergency power system with d-c electric motor and wiring to truck d-c battery supply permitting emergency operation of the unit in event of failure of truck's engine or main hydraulic pumps.

One hydraulic tool adapter kit at the boom including flow divider, selector valve and hoses with quick disconnect fittings.

One hydraulic tool adapter kit at the main frame with the same equipment as above item.

One insulated remote start and stop system for starting and stopping the truck's engine from the operator's buckets, for 12-volt system.

One control console located on the main frame for operation of outriggers, boom system elevation and boom rotation.

Thirty gallon hydraulic oil reservoir with breather cap and dip stick to assure efficient operation of hydraulic tools.

One truck grounding assembly complete with the following:

50 feet of No. 2 AWG stranded copper grounding cable with 600 volt yellow cover and ferrules attached to each end.

One cable reel for 100 feet No. 2 AWG 600 volt insulated cable.

Two snap-on ground clamps.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	One ground screw rod with a "T" handle and a copper and bronze rod 0.590" diameter with 14" screw and a total length of 6 feet.	
	One basic lifting attachment package including quadrant, mast support, 7 foot fiberglass mast and a steel end cap and the necessary hardware for installation.	
	One 10 foot long 2-1/2" diameter epoxyglass crossarm for use with the basic lifting attachment.	
	Three wire holders for attaching to epoxy-glass crossarm above.	
	One crossarm attaching kit to attach cross-arm to basic lifting attachment for handling balanced load.	
	One crossarm attaching kit to attach cross-arm to basic lifting attachment for handling unbalanced load.	
	One sheave and support bracket for mounting over the end of the fiberglass mast in the basic lifting attachment.	
	One nylon block assembly consisting of two nylon blocks with loose swivel hooks and becketts and 50 feet of 3/8" polypropylene rope.	
	One insulated hydraulic chain saw with a 9" cutting capacity.	
	One insulated hydraulic circular saw with a 3-3/4" cutting capacity.	
	One hydraulic impact wrench/drill with 5/8" bolt and 1-1/16" drill capacities.	
	One insulated hydraulic pruner having a 2" cutting capacity.	

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	One non-conductive hydraulic hose 5 feet long with quick disconnect fittings at each end.	
	One non-conductive hydraulic hose adapter assembly 14" long.	
	One hydraulic hose assembly kit with 500 feet of hose and male quick disconnect fittings at each end.	
7.	Line construction and maintenance body truck with 1-1/2 ton chassis and 12 ft. body. The truck body shall be of electrically-welded, all-steel construction installed on a conventional chassis. The roof of the truck body shall be of the telescopic type, sliding forward when desired.  The vehicle shall be powered by a gasoline engine with rated output of not less than 165 HP. The engine shall be equipped with a complete 12 volt electrical system including a direct electric starting system.  The transmission shall be of the constant mesh type and shall provide a minimum of three speeds in forward and one in reverse.  The truck chassis shall be furnished with single front and dual rear wheels for two wheel drive.  The steering shall be hydraulic with right hand drive.  The speedometer and odometer shall be in metric units. Ammeter, oil pressure, water temperature and fuel gauges shall be furnished and be readily visible from the driver's seat. The cab shall be furnished with dual, electric two-speed (minimum) windshield wipers, door locks with safety latches, and safety glass windows, outside rear-view mirrors both left and right sides, sun visor on driver's side and inside dome light.	McCabe Powers Body Company, Series 1900 or equal.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	<p>The chassis, bumper and wheels shall be painted black, and all other parts yellow.</p>	
	<p>The fuel tank shall have a minimum capacity of 19.5 gallons.</p>	
	<p>A front tow hook and rear tow loop shall be installed on the respective bumpers.</p>	
	<p>One vertical and five horizontal compartments shall be provided on each side of the body.</p>	
	<p>Shelves and bins with adjustable dividers and doors with cylinder locks shall be provided.</p>	
	<p>The body superstructure shall have troughs and racks for storing tamps, shovels, pipe, tools and material.</p>	
	<p>The truck shall be equipped with a winch in the rear of the truck having a minimum capacity of 10,000 pounds with 150 feet of 10,000 pound capacity wire rope.</p>	
	<p>A telescopic derrick capable of handling poles up to 55 ft. in length and capable of being dismantled and stored in the rear of the truck shall be provided.</p>	
	<p>The line truck shall include the following accessories:</p>	
	<ul style="list-style-type: none"><li>a) "Caboscope"</li><li>b) Dome light in body</li><li>c) Heavy duty generator</li><li>d) Power take-off and drive assembly</li><li>e) Extended winch shaft</li><li>f) Detachable winch head</li><li>g) Collapsible power reel</li><li>h) Remote controls for winch</li><li>i) Winch line holder</li><li>j) Winch line safety hook</li><li>k) Spring-type derrick hold downs</li><li>l) Combination rear bumper and platform extension with derrick side leg brackets.</li><li>m) Adjustable body jacks</li></ul>	

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	n) Spindle and sheave wheel assembly	
	o) Universal swivel sheave	
	p) Snatch block eye bolt	
	q) Safety tread steel floor	
	r) Heavy duty pintle hook	
	s) Manually operated wire reel	
	t) Exterior ladder rack with eccentric hold-down	
	u) Tow hooks	
	v) Insulated and ventilated rubber goods compartment	
	w) Insulated hot stick compartment	
	x) Directional signals	
	y) Stainless steel water cask with mounting brackets	
	z) Medical kit holder	
	aa) Automatic brake controls	
	ab) Undercoating	
	ac) Splash aprons	

8. Self-propelled hydraulic crane equipped with an 18 ft. boom. The crane chassis shall be of the 4 x 4 type and shall incorporate features and pertinent mechanisms of the best quality and design as used in the construction of the latest models of this type of equipment.

The Galion Iron Works and Mfg. Company, Model 90, or equal.

The chassis shall be furnished with 4 wheels and shall be designed for all wheel steering.

The steering mechanism for the rear wheels shall be of the hydraulic type and the steering mechanism for the front wheels shall be of the mechanical type provided with a booster power steering unit. Both the front and rear steering mechanisms shall be designed for a minimum inside turn angle of approximately 24°. The maximum turning radius shall be 18 ft.

The truck body shall contain modular, all-welded construction and storage bins on each side of truck. The individual compartment doors shall be capable of being locked by a single master key.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
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Hydraulically actuated, internal expanding brakes shall be furnished on both front wheels and shall be foot pedal operated from the operator's station. Either hydraulic operated internal expanding brakes on both rear wheels or a hydraulic actuated internal expanding brake mounted on the propeller shaft shall be furnished and shall be operated by the same foot pedal that operates the front wheel brakes. A mechanical parking brake shall also be furnished.

Both the front and rear axles shall be driving axles having antifriction bearings throughout.

The chassis shall be equipped with 4 outriggers located at the extreme outer corners of the chassis. The outriggers shall be hydraulically actuated and shall be operated from the operator's station.

The chassis shall be equipped with 12.00 x 24 (minimum size acceptable) - 8 ply tubeless tires. The tread design shall be suitable for off the road use. Wheels shall be of the integral disc and rim type.

The chassis shall be equipped with a conventional enclosed-type cab with a one man control station. All crane and travel operators shall be controlled from this station. The instrument panel shall contain all necessary instruments including, but not limited to, a speedometer, ammeter, oil pressure gauges, water temperature gauge, fuel gauge, and the ignition and light switches, starter button, and pilot light. The operator's seat shall be fully adjustable.

The crane shall be powered by a diesel engine with a rated output of not less than 90 HP. The engine shall be equipped with a complete 12-volt electrical system including a direct electric starting system.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
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The transmission shall be of the constant mesh type and shall provide a minimum of 3 speeds in both forward and reverse. The transfer case shall be of the constant mesh, single speed type.

The boom swing mechanism shall be hydraulic motor driven. The swing mechanism shall be capable of 360° continuous rotation at a swing speed of approximately 3 rpm.

The boom shall be of the extending-retracting type actuated by hydraulic cylinders. The extending speed shall be approximately 50 fpm and the retracting speed shall be approximately 70 fpm. In the retracted position the maximum horizontal reach of the boom shall not exceed 16.5 ft. In the extended position the minimum horizontal reach of the boom shall be at least 18 feet.

The reach shall be measured from the boom center of rotation to the centerline of boom point sheave. The boom shall be designed for a minimum elevation of 40° from horizontal. The boom shall raise from the horizontal position to the full elevated position in approximately 16 seconds.

The hoist drum shall be hydraulic motor driven. The system shall be designed to prevent lowering of the load unless the hoist controller is placed in the "lower" position.

Table of Lifting Requirements

<u>Capacity (pounds)</u>	<u>Radius* (feet)</u>	<u>Boom Tip Elevation Above* Ground Level (feet)</u>
16,800	6	16.5
14,400	8	18.0
12,000	10	20.0
9,800	12	21.5
8,000	14	21.5
6,900	16	18.5
6,000	18	14.0
5,700	19	9.0

\*Radius and elevation shall be measured to centerline of boom point sheave.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
	<p>The crane shall be capable of lifting any load in the Table of Lifting Requirements and turning through a full 360° arc. All lifts will be made with the outriggers set. Sufficient line shall be provided to permit the hook to reach the ground when the boom tip is at the highest elevation above ground level.</p> <p>The crane shall be fully equipped including all necessary sheaves, fairleads, cables, hooks, erection and assembly, operating and maintenance instructions, and repair parts books, in English.</p> <p>The crane shall be provided with a suitable grease gun, hydraulic jack of adequate capacity, and a complete set of wrenches and tools for all ordinary maintenance work on the crane. Such tools shall be listed in Section 1.5, Part I, Bid Form, and their cost shall be included in the lump sum figure bid for furnishing the crane.</p> <p>The spare parts which are recommended for purchase with the crane and their lump sum cost shall be listed in Section 1.11, Part I, Bid Form. Purchase of any or all of the spare parts shall be at the option of the PLN. The bidder shall also list in the Bid Form the name and address of the closest supplier of spare parts to Medan, Sumatra, Indonesia.</p>	
9.	Fork lift truck, four wheel, with pneumatic tires, 4000 kg (8800 lbs) lifting capacity, with simplex mast and adjustable fork to be used for handling pallets, cable reels and other materials.	Yale Catalog No. VGP-80 NB, or equal.
10.	A-frame and chain falls, 10 ton capacity, to be mounted in warehouse for loading and off-loading equipment and materials.	



#### 7.20-05 INSPECTION, TESTS AND TEST REPORTS

The Contractor shall grant duly accredited representatives of the Owner and Engineer free access to his shops during working hours for inspection of manufacture and of materials used, shall furnish them with such information as may be required, and shall afford full facilities for inspection.

Acceptance of the work or waiving of the inspection shall in no way relieve the Contractor of the responsibility for furnishing equipment in accordance with the requirements of these Contract Documents.

All materials, supplies, parts and assemblies thereof, entering into the work to be done under these Contract Documents, shall be tested, unless otherwise directed, according to the best commercial method for the particular type and class of work. Where the Contractor desires to use stock material not manufactured specifically for the work covered by these Contract Documents, he shall submit satisfactory evidence that such material conforms to the requirements of these Contract Documents, in which case tests on these materials may be waived.

Manufacturer's design and operation tests on completed equipment shall be performed in accordance with recognized industry standards. Load and operational tests, at rated capacity of the equipment shall be performed on all vehicular equipment, trailers, aerial construction devices and digger-derricks prior to shipping the equipment.

Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No tools or equipment shall be shipped until they have been released for shipment by the Engineer.

#### 7.20-06 FIELD TESTS

Upon delivery to the Site, each piece of construction equipment will be examined and may be tested by the Engineer and Owner to determine its compliance with the requirements of these specifications. Operating and load tests at any values up to and including rated capacities may be performed as applicable to the item being tested.

7.20-07 INSTRUCTIONS AND TRAINING

The Contractor shall provide instructions for and training of PLN's personnel in the proper use of the tools and equipment as specified in Section 8.1 of these Contract Documents. Vehicle and equipment operators shall be trained as specified in Sub-paragraphs J, K and L of Section 8.1, Sub-section 8.1-02.

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PART VII - TECHNICAL SPECIFICATIONS FOR  
DISTRIBUTION MATERIAL AND EQUIPMENT

SECTION 7.21 - TEST EQUIPMENT

7.21-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of test equipment. The test equipment shall be furnished by the Contractor who shall turn over the equipment to the Owner for the Owner's exclusive use.

7.21-02 STANDARDS

The test equipment shall conform to the following standards as applicable:

ANSI C39.1  
(NEMA 11 1-1964)

Requirements for Electrical  
Indicating Instruments

ANSI C39.4

Specifications for Automatic Null-  
Balancing Electrical Measuring  
Instruments

ANSI C39.5

Safety Requirements for Electrical  
Measuring and Controlling Instru-  
mentation

IEC 34-1

Rotating Electrical Machines

7.21-03 INSTRUMENT SPECIFICATIONS

The Contractor shall furnish the following test instruments in the quantities listed in Part I - Bid Form, Section 1.3:

Item No.	Description	Manufacturer Reference and Catalog Number
1.	Voltmeter, a-c, indicating, 50Hz, $\pm 3/4\%$ accuracy, portable, 0-150/300/600 volt scales with 60/75 scale divisions, complete with carrying case and 36 inch test leads.	Westinghouse Electric Corp. Type PA-141, Style No. 606B692A18 with Style No. 5496D12601 Case and 292B480603 Test Leads, or equal.
2.	Voltmeter, a-c, recording, 50Hz, $\pm 2\%$ accuracy, double range, 90-140/180-280 volt, portable, weather proof, circular chart, hand-wound clock drive for 8 days, 1 day and 7 day chart speeds, V-pen inking, with the following accessories:	Westinghouse Electric Corp. Type 45, Style No. 410C131A50, or equal.
	a) Two 1/4 oz. bottles of red ink, extreme temperature $+32^{\circ}\text{F}$ to $+120^{\circ}\text{F}$ .	Style No. 763A041G04, or equal.
	b) 25 circular charts, 1 day, 90-140 volt scale.	Style No. 542D768H02, or equal.
	c) 25 circular charts, 7 day, 90-140 volt scale.	Style No. 542D771H03, or equal.
	d) 100 circular charts, 1 day, 180-280 volt scale.	Style No. 542D768H04 or equal.
	e) 100 circular charts, 7 day, 180-280 volt scale.	Style No. 542D771H04, or equal.
3.	Volt/ammeter, a-c, clamp-on type, 50 Hz, 0-300/600 volt and 0-10/40/100/300 amp scales, $\pm 3\%$ accuracy, with the following accessories:	Amprobe Instrument Division of SOS Consolidated, Inc. Model No. TM-43A with RS-5A meter, or equal.
	a) Test leads with insulated alligator clips.	Extendo Lead Pack VLK-311R, or equal.
	b) Split core CT, 10:1 ratio.	Model A-50-1 Dera-Tran, or equal.
	c) Phase sequence adaptor.	PSA-1, or equal.

Item No.	Description	Manufacturer Reference and Catalog Number
	d) "Energizer" CT with 1:1, 1:5, and 1:10 ratios for greater sensitivity in reading, with screwed in European round prongs, 2 extra British type round prongs and British fuse plug adaptor.	Model A-45CL or equal.
	e) Carrying case for housing the clamp-on type volt/ammeter and all accessories.	U Case, or equal.
4.	Thermal type ammeter with dual ratio split-core CT, 50 Hz, with instantaneous and 15 minute maximum demand ammeter, + 2% accuracy at full scale of 6 amps, CT ratios of 25/1 and 50/1, insulated for 600 volts, complete with waterproof leads and connectors and carrying case.	H.D. Electric Co. HD TEL-I-MAX CT Model A, Cat. No. CT-25, or equal.
5.	Combination thermal and instantaneous ammeter, 50 Hz, with built-in split-core CT with four ranges of 40/5, 100/5, 200/5 and 500/5, suitable for hot line work, + 2% accuracy, with 15 minute thermal time interval, complete with carrying case.	H.D. Electric Co. Hot Line Min Max-I-Meter, Cat. No. MIM 125HL CC, or equal.
6.	Combination split-core CT and thermal recording ammeter calibrated as a unit, 50 Hz, with four ratio 40/5, 100/5, 200/5 and 500/5 CT with 1 1/4" core opening, a 15 day hand wound clock for driving circular ammeter chart, with 15 minute thermal time interval and 6 ampere full scale ammeter, + 2% accuracy, for operation in ambient of + 60°F to + 120°F, weatherproof for outdoor use, with a 10 ft. lead, with chart speed gear for 2 day charts, inside zero, complete with one 1 oz. bottle of red ink, ten 2-day charts, pen cleaning set and the following accessories:	H.D. Electric Co. Cat. No. CCAOH-125, or equal.
	a) One chart speed gear and attachment for 8-day chart.	H. D. Electric Co. Cat. No. S6210, or equal.
	b) Pack of 100 circular charts, 2-day, 0-6 amperes full scale with inside zero.	H. D. Electric Co. Cat. No. S6206, or equal.
	c) Pack of 100 circular charts, 8-day, 0-6 amperes full scale with inside zero.	H. D. Electric Co. Cat. No. S6207, or equal.
	d) Two 1 ounce bottles of red ink.	H. D. Electric Co. Cat. No. S6256, or equal.

<u>Item No.</u>	<u>Description</u>	<u>Manufacturer Reference and Catalog Number</u>
e).	Spare fine line nib.	H.D. Electric Co. Cat. No. S6211, or equal.
f).	Extra split-core CT with four ratios of 250/5, 500/5, 1000/5 and 1500/5, 50 Hz, $\pm$ 2% accuracy, to be calibrated at the factory for use with recording ammeter, complete with carrying case.	H.D. Electric Co. Cat. No. MT 350CC, or equal.
7.	Earth gradient cable fault locator, 220 volt 50/60 Hz, single-phase input to transmitter with a 10 ft., 3 wire cord and two 10 ft. output leads, 25-0-25 microampere detector instrument with two 8 ft. and one 40 ft. leads, complete with carrying case.	James G. Biddle Co. Cat. No. 651000, except with 220 volt input to transmitter, or equal.
8.	Electronic controlled automatic oil circuit recloser portable test set for determining tripping characteristics of 3-phase electronically controlled recloser of the McGraw Edison Company Types WVE and RVE, or equal.	Multi-Amp Corp. Model ERT/ACTS, or equal.

The Contractor shall furnish, with each instrument, three (3) sets of instruction manuals explaining in detail the operation of the instrument furnished.

#### 7.21-04 TESTS AND TEST REPORTS

Three (3) certified copies of the results of all tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

All production tests performed will be witnessed by the Engineer unless waived in writing. No test equipment shall be shipped until it has been released for shipment by the Engineer.

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PART VII - TECHNICAL SPECIFICATIONS FOR DISTRIBUTION  
MATERIAL AND EQUIPMENT

SECTION 7.22 - STREET LIGHT CONTROLS

7.22-01 SCOPE

This Section specifies the minimum requirements for the manufacture and supply of street lighting controls which will be installed by the Owner. This equipment shall include photoelectric lighting controls, adapters and control relays for control of existing street lighting circuits.

7.22-02 STANDARDS

The Photoelectric Control Relays shall conform to EEI-NEMA Publication No. SH 16-1962, "Physical and Electrical Interchangeability of Light Sensitive Control Devices Used in Control of Roadway Lighting."

7.22-03 PHOTOELECTRIC LIGHTING CONTROL

The photoelectric lighting control shall be a cadmium sulfide cell, for 220-volt, 50 Hz operation, rated 1800 volt-amperes, normally closed contacts, with return on range of  $1.1 \pm 0.6$  foot candles and turn off range 6.0 foot candles maximum. The control shall be equipped with surge suppression, lightning arrester and twistlock plug conforming to EEI-NEMA Standards. The control shall be Fisher-Pierce Catalog No. 6672, or equal.

7.22-04 PHOTOELECTRIC CONTROL ADAPTER

The Photoelectric control adapter shall be equipped with a locking type receptacle for mounting the photoelectric lighting control and equipped with a galvanized bracket for pole mounting. It shall be equal to Fisher-Pierce S 476-71 and suitable for use from 200 to 240 volts 50 Hz.

**7.22-05 STREET LIGHT CONTROL RELAY WITH ADAPTER FOR PHOTO CONTROL**

The street light control relays shall be magnetic relays with 220-volt, 50 Hz coils and equipped with a locking type receptacle for the photo control and a galvanized steel bracket for pole mounting. They shall be self protected against lightning and completely protected against moisture. Switches shall be capable of carrying their rated current continuously at 230 volts, 50 Hz. They shall have electrically independent normally-open contacts and be equal to General Electric Type CR 160 L32425 AA (30 ampere) and CR 160 LA2 125 AA (60 ampere). An integrally-mounted receptacle for the photo control is preferred, but separate adapters will be accepted.

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PART VII - TECHNICAL SPECIFICATIONS FOR  
MATERIALS AND EQUIPMENT

SECTION 7.23 - COMMUNICATIONS CABLE AND FITTINGS

7.23-01 SCOPE

This section covers the manufacture and supply of communications cable and fittings for installation between the Owner's operating headquarters and the power plants at Glugur and Titi Kuning.

7.23-02 STANDARD FOR COMMUNICATION CABLE

The cable shall be of the Figure-8 type, a combination of integral messenger and telephone cable, equal to Anaconda Cable Products Type CUP-8.

7.23-03 CABLE ASSEMBLY

The telephone conductors shall consist of twelve twisted pairs of solid, annealed 19 AWG copper, polyethylene insulated and color coded. The messenger shall be 1/4-inch, 7-wire galvanized steel. The core shall be covered with a non-hygroscopic tape to maintain mechanical protection and added dielectric strength. A single Figure-A shaped extrusion of black, virgin, high-molecular-weight polyethylene shall be applied simultaneously over the paralleled core and messenger to provide high environmental protection.

7.23-04 ELECTRICAL CHARACTERISTICS

The electrical characteristics shall be as follows:

Average mutual capacitance:  $0.083 \pm 0.007$  microfarads/mile

Capacitive unbalance: picofarads/1000 feet, pair-to-pair: 30  
pair-to-shield: 125

Crosstalk coupling loss (Far-End) R.M.S. db/1000 ft. at 150 KHz: 73

Attenuation, db/mile at 1000 cps - 68°F: 1.25

DC conductor resistance, ohms/mile - 68°F: nominal 42.5  
maximum 46.0

High voltage test: Insulation capable of withstanding for 3 seconds  
a dc voltage of: 4500 conductor to conductor  
10000 conductor to shield.

#### 7.23-05 SPLICING AND DEADENING

The cable shall be installed as specified in Article 6.3-05, "Installing Overhead Line Conductors and Cables." At deadend corners only the messenger will be deadened, using either preformed or automatic deadends, and the cable will be continuous. At splice points the messenger will be spliced with preformed or automatic splices, and the cable pairs will be spliced with compression sleeves and the splice made up in accordance with instructions of the cable supplier. At the six terminal points the Contractor will cut and seal the cable, leaving at least one meter of cable for the Owner to make his terminations. All splicing materials will be included in the unit price of the cable, and two tools for splicing the conductors will be supplied and turned over to the Owner on completion of the work.

#### 7.23-06 MOUNTING HARDWARE

On all tangent structures and angles up to 30° the cable shall be supported by means of a special cable hanger for integrated messenger cable equal to Joslyn J2235. On angles of 30° to 60° it shall be supported by an angle suspension clamp equal to Joslyn J7901-A.

#### 7.23-07 TESTS AND TEST REPORTS

Three (3) certified copies of the results of all manufacturer's tests shall be furnished. The costs of all tests shall be for the account of the Contractor and already included in his bid price.

After installation, the Contractor shall test each pair for continuity.

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PART VII - TECHNICAL SPECIFICATIONS FOR TRAINING

SECTION 8.1 - OVERHEAD AND UNDERGROUND LINE CONSTRUCTION METHODS

8.1-01 SCOPE

This Section covers on-the-job training, to include classroom instruction if required, of Perusahaan Umum Listrik Negara (PLN) line construction personnel in overhead and underground distribution line construction methods. The Contractor shall train approximately 7 non-working foremen, 24 linemen, 24 groundmen and 13 vehicle and equipment operators to be proficient in their respective areas of distribution work. The above PLN personnel shall work with and assist the Contractor's field personnel in the erection of distribution lines for the periods of time specified below. All personnel shall have been trained by the Contractor in the specified areas of distribution line construction within the first twelve months after the Contractor sets (erects) the first distribution pole for the Project. The schedule for training PLN's personnel will be prepared by the Owner after collaborating with the Contractor after the latter has arrived at and moved-in at the Site.

The scope of this part of the Work includes working only on new and existing lines that are de-energized and specifically excludes hot line training which is covered in Section 8.2, below.

The personnel to be trained by the Contractor under this Section will be selected by the Owner. The Owner will attempt to select personnel who have had some type of experience in the fields in which they will be expected to work, however, the Contractor should conduct his training on the assumption that PLN personnel have had no previous training in the respective areas in which they will be trained.

PLN will equip its personnel to be trained with all hand tools, linemen's tools and construction equipment required for training. These tools and construction equipment will be furnished by the Contractor for turning over to PLN in the early stages of the Project in accordance with Section 7.19 of these Contract Documents. The Contractor shall furnish hot line tools and equipment necessary for hot line work and training as specified in Section 8.2, below.

8.1-02 CONSTRUCTION METHODS

All PLN line construction personnel to be trained under this Section, including foremen, linemen, groundmen and equipment operators shall be trained in the following areas until proficient, except that the specified length of training time in each area shall not be less than that specified:

- A. Erecting and setting primary and secondary distribution poles, 2 weeks.
- B. Installing anchors, anchor rods and guys, 2 weeks.
- C. Stringing, sagging and tying in primary and secondary lines, 2 weeks.
- D. Installing overhead distribution transformers, 1 week.
- E. Installing grounds, lightning arresters and cutouts, 1 week.
- F. Digging and preparing primary and secondary underground cable trenches, laying cable and backfilling trenches, 1 week.
- G. Terminating and splicing primary underground cable, including installing pole risers, 1 week.
- H. Terminating and splicing secondary underground cable, 1 week.
- I. Installing indoor, padmounted transformers and primary protective devices, 1 week.

Vehicle and equipment operators shall be trained as follows:

- J. One line truck driver shall be trained for each of the four line trucks purchased. The trainees shall be trained for a minimum of two weeks to operate the truck and all equipment associated with the truck.
- K. One service truck driver shall be trained to drive and operate each of the five ladder trucks purchased.
- L. One operator shall be trained to operate each of the three two-bucket aerial devices.
- M. One operator shall be trained to operate the self propelled hydraulic crane.



The operators of devices that require coordination with work of other personnel such as bucket trucks that have a remote control panel for linemen to operate shall be trained to operate the equipment with the other personnel that will work with the device.

#### 8.1-03 MEASUREMENT FOR PAYMENT

There will be no payment made to the Contractor for work performed under this Section. It is understood that the Contractor's personnel will take time to train the PLN personnel; however, the Contractor will receive the benefit of the work performed by the PLN trainees without having to pay them. Hourly wage payments to the trainees will be made by the Owner.

#### 8.1-04 TRAINING SCHEDULE

The Owner proposes to train the overhead line construction crews in four groups, each to receive three months of training. To implement this program and receive maximum production from each group the Contractor shall schedule the earliest possible delivery of tools and equipment in Section 7.19. The Owner's existing underground cable crews should be trained and utilized throughout the project as required for new underground installations.

#### 8.1-05 USE OF OWNER'S PERSONNEL AND EQUIPMENT

When a crew is assigned by the Owner to the Contractor for training in accordance with the training schedule, the crew and associated tools and equipment supplied under Section 7.19 shall be used exclusively and continuously for basic training and for on-the-job training in construction of installations or removals within the scope of the Contractor's work. The Owner shall designate a supervisor to accompany the crew and be responsible to the Contractor's designated supervisor for the discipline of the Owner's personnel and for the production of the crew. The Owner shall be responsible for the maintenance and repairs of the equipment, and the Contractor shall provide fuel and lubrication during on-the-job training.

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PART VIII - TECHNICAL SPECIFICATIONS FOR TRAINING

SECTION 8.2 - HOT LINE WORK

8.2-01 SCOPE

This Section covers the training and equipping of Perusahaan Umum Listrik Negara (PLN) distribution line construction personnel in the art of hot line work using standard hot stick tools and equipment. Seventeen (17) PLN line construction personnel shall be trained for hot line work on 11.5/20 kV grounded-wye primary lines. Thirty-five (35) PLN line construction personnel, including the 17 personnel to be trained for hot line primary work, shall be trained for hot line work on 220/380 volt grounded-wye and 220/440 volt, three wire, single phase secondary lines. The personnel to be trained by the Contractor under this Section will be selected by the Owner and shall have been previously trained in Section 8.1, "Overhead and Underground Line Construction Methods."

A dummy line with spans not less than 60 feet (18.3 meters) will be available to the Contractor for hot line training. The dummy line will be constructed by the Contractor on a unit cost basis as layed out and staked by the Engineer. The materials will be purchased and payment will be made for the dummy line the same as for any other line and no special payment will be made for the erection of the dummy line under this Section.

8.2-02 HOT LINE PRIMARY TRAINING

The Owner, after consultation with the Engineer and Contractor, will select three foremen, eight linemen and six groundmen believed to be the best suited for performing primary hot line work on 11.5/20 kV grounded-wye distribution lines. These personnel will be selected on the basis of their performance during training under Section 8.1, "Overhead and Underground Line Construction Methods" and their performance in the execution of previous duties with PLN. The Contractor shall train these seventeen men to be proficient in their respective fields so that after training, there will be two primary hot line crews, each consisting of a foreman, three linemen and two groundmen that will work as two separate teams and an extra foreman, two extra linemen and two extra groundmen to fill-in in either team in the event a regular member of a team is absent. If it is

found that any of the above personnel are not suitable for primary hot line work, the Owner will select replacement personnel as required.

The seventeen PLN line construction personnel shall be trained by the Contractor or qualified Subcontractor until they become proficient in the art of hot line primary work in the nine areas described below. The personnel shall be trained to perform the work below by climbing and working on wood poles without the aid of bucket or platform trucks or booms. They shall also be trained to perform the work below with the aid of one two-bucket, hot line truck similar to the Pitman MO and HA Hotstick Aerial Devices manufactured by the Pitman Manufacturing Co., Division of A. B. Chance Co. The personnel shall be trained by the Contractor to operate the aerial device as required to perform the various hot line works.

In addition to being trained in the art of primary hot line work the 17 primary hot line personnel shall be trained to perform secondary hot line work as covered in Section 8.2-04 below.

The primary hot line personnel shall be trained using hot stick tools and accessories until proficient in the following areas:

- A. Change pin-type insulators on a single-phase line. This includes both the lift method and side method of replacing the pin-type insulator and pole-top-pin on single-phase tangent primary poles with and without secondary underbuild.
- B. Change crossarms and insulators on a three-phase line. This provides for replacing the crossarm and pin-type insulators and insulator mounting pins on three-phase primary poles with or without secondary underbuild.
- C. Change poles. This provides for replacing a pole in single-phase and three-phase lines with and without secondary underbuild.
- D. Change double crossarms. This provides for replacing crossarms, insulators and insulator accessories on guyed angle poles and guyed dead-end poles.
- E. Change transformers. This provides for replacing a single-phase distribution transformer on single-phase and three-phase lines and replacing a cluster mounted three-phase transformer bank on three-phase lines.
- F. Connect tap lines and connectors. This provides for installing single-phase tap lines and connecting them to single-phase and one-phase of three-phase lines and installing three-phase tap lines and connecting them to three-phase lines.

G. Installing full-tension splices, repair sleeves, connectors, line guards, hot line clamps and insulator ties.

The Engineer will determine when and if each of the PLN personnel is sufficiently proficient in each of the above areas. This Work will be considered complete when the Engineer certifies and the Owner approves in writing that all personnel have attained a satisfactory degree of proficiency in all areas listed above.

8.2-03 HOT LINE EQUIPMENT FOR PRIMARY WORK

The Contractor shall fully equip two primary hot line crews with the hot line tools and equipment necessary to perform hot line work on 11.5/20 kV grounded-wye primary lines. The following equipment to be used for training and later for hot line work by PLN, is the requirement for one crew:

<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>A. B. Chance Catalog No. or Equal</u>
1	1	Gloss restorer, 1 pint	T400-0803
2	1	Epoxiglass bond kit	H1917
3	12	Hot stick wiping cloth	M1904
4	1	Hot stick tester, 220 Volt	LT11A
5	1	Crossarm tool hanger	M1860
6	2	Tool rack	M4660
7	1	Lever lift tool set	C400-0393
8	2	Wire tong, 2" x 8'-0"	H4646-8
9	1	Wire tong, 2-1/2" x 16'-0" spliced	H4647-16
10	2	Wire tong saddle with 2-1/2" clamp	M4740-5W
11	2	Wire tong saddle with 2" clamp	M4740-4W
12	3	Saddle extension	C400-0073
13	2	Crossarm saddle	M4744

<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>A. B. Chance Catalog No. or Equal</u>
14	2	Snatch block	2230-2
15	2	Hand line hook	M1849
16	1	Rope snubbing bracket	M1846W
17	1	Saddle with clevis	M4740-15W
18	1	Wire tong pole clevis 2-1/2"	M1728-5
19	1	Dual auxiliary arm	C400-0054
20	1	Transformer gin	C400-0315
21	3	Strain link stick 1-1/4" x 4'0"	H4715-2
22	3	Spiral link stick	H4722
23	3	Roller link stick	H4714-4
24	3	Double sheave rope blocks	2424P
25	3	Triple sheave rope blocks	2426P
26	600 ft.	1/2" polypropylene rope	M1895-3
27	200 ft.	1/4" polypropylene rope	M1895-1
28	1	Hook-on ammeter tongs	H1968-6
29	2	Wire grip, No. 3 - 4/0 Al.	H307-3942HL
30	2	Wire grip, No. 1/0-400 MCM Al.	H307-3952HL
31	2	Wire grip, 1/4" - 1/2" steel	H307-3943HL
32	1	Phase tester for 11.5/20 kV grded wye system	H1876, H1876-4
33		Not used	
34	2	Pivot platform	H4954-4W
35	2	Tripod railing	H4964
36	1	Rotary blade and prong tie stick	H1855-25

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<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>A. B. Chance Catalog No. or Equal</u>
37	1	Medium duty wire cutter	H1875-6
38	1	Grip-All clamp stick 1-1/4" x 6'-0" 1/2"	H403-0292
39	1	Grip-All clamp stick 1-1/4" x 8'-5-1/2"	C403-0293
40	1	Wire holding stick 1-1/4" x 6'-5"	H1960-6
41	1	Wire holding stick 1-1/4" x 8'-5"	H1960-8
42	1	Flexible insulated wrench	H1981-5
43	1	All angle cog wrench, 6'-0"	C403-0184
44	2	Cleaning brush, circular type	M4455-92
45	2	Cleaning brush, "V" type	M4455-63
46	1	Universal pole	H1760-4
47	2	Pin holder	M4455-2
48	2	Ratchet wrench	M4455-6
49	2	Cotter key remover	M4455-12
50	2	Screw driver	M4455-28
51	2	Chuck blank	M4455-37
52	2	Mirror	M4455-38
53	1	Shepherd hook	M4455-39
54	2	Adjustable insulator fork	M4455-67
55	2	Cotter key tool	M4455-82
56	2	Universal adapter	M4455-84
57	2	Disconnect switch adapter	M4455-9

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<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>A. B. Chance Catalog No. or Equal</u>
58	2	Folding rule adapter, less rule	M4455-16
59	6	Conductor cover	M4931
60	3	Insulator cover set	C406-0046
61	3	Crossarm cover	M4933
62	6	Deadend cover for 20 kV	M4948
63	2	Pole cover 6'-0"	M4937-6
64	2	Pole cover 4'-0"	M4937-4
65	2	Pole cover 2'-0"	M4937-2
66	2	Pole cover 1'-0"	M4937-1
67	5 pr.	Rubber gloves, class 3, 20,000 volt, 14" length, two color, black on yellow, size 9	WR20-142B
68	5 pr.	Leather cuff protectors, 12-1/2" length, size 9	WRLCP-125
69	5	15" glove carrying bag	GCB1-15
70	4	36" x 36" rubber blanket	900E
71	4	36" x 36" slotted rubber blanket	1300
72	6	Line hose	OR125-45
73	1	Glove inflator, small head, bench model, with hand pump	RG1-BP
74	10	Blanket pin	HS-20
75	1	Hot line tool trailer with heater and universal fitting board	C405-0010
76	1	Test set for testing dielectric strength and for punctures in rubber goods and hot line tools	



8.2-04 HOT LINE SECONDARY TRAINING

The Owner, after consultation with the Engineer and Contractor, will select twelve linemen, and six groundmen for the Contractor to train for hot line work on secondary (220/380 volt grounded-wye) distribution lines using rubber gloves and blankets. In addition to training these 18 personnel, the Contractor shall also train the 17 personnel selected for hot line primary work covered in 8.2-02, above in the art of secondary hot line work.

These personnel will be selected on the basis of their performance during training under Section 8.1, Overhead and Underground Construction Methods and their performance in the execution of previous duties with PLN. The 18 personnel selected to perform only secondary hot line work shall be trained so that there will be five crews consisting of two linemen and one groundman plus two extra linemen and an extra groundman to fill-in in any secondary crew in the event a regular member of a crew is absent. One of the two linemen in each of the five crews shall be trained to be a working foreman. If it is found that any of the above personnel are not suitable for hot line work, the Owner will select replacement personnel as required.

The 35 PLN hot line construction personnel shall be trained by the Contractor or qualified Subcontractor to perform hot line work and maintenance on 220 volt, two wire, 220/440 volt, three wire, single-phase and 220/380 volt, four wire, secondary lines and services, using rubber gloves and accessories.

8.2-05 HOT LINE EQUIPMENT FOR SECONDARY WORK

The Contractor shall fully equip five secondary crews with the hot line tools and equipment necessary to perform hot line work on low voltage (less than 600 volts) lines. The following equipment, to be used for training and later for hot line work by PLN, is the requirement for one crew:

<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>A. B. Chance Catalog No. or Equal</u>
1	5	12" x 36" x 1/16" zip on blanket, maroon	123-LV
2	4	36" x 36" x 1/8" slotted blanket, black	1100
3	20	Blanket pins	20

<u>Item</u>	<u>Quantity</u>	<u>Description</u>	<u>A. B. Chance Catalog No. or Equal</u>
4	20	1" I.D. x 4-1/2'-0" line hose	R100-45
5	1	Secondary rack, 3 hooks	H4800-7
6	3 pr.	Low voltage rubber gloves, 11" length, size 9	WR5-11
7	3 pr.	Protector gloves, 10" length, size 9	GCHP-10
8	2	Wire grip, No. 6 - 2 Cu.	T383
9	2	Wire grip, No. 6 - 2 Al.	T383-2
10	2	Wire grip, No. 2 - 4/0 Cu.	H307-3942HL
11	2	Wire grip, No. 3 - 4/0 Al.	H307-3942HL
12	2	Wire grip for insulated conductors and steel guy strand, 1/4" - 1/2" dia.	H307-3943HL
13	1	Canvas tool bucket	19
14	2	Haven grip, 1/8" - 1/2" steel wire	369
15	2	One ton nylon hoist	C309-0029
16	1	One ton chain hoist	3011S
17	2	Snatch block	2230-2
18	2	Double sheave rope blocks	2424P
19	600 ft.	1/2" polypropylene rope	M1895-3
20	2	Utility platform	C402-0428
21	2	Hand line hook	M1349
22	3	Glove bag	2411
23	1	Line hose bag	211

**8.2-06 MEASUREMENT FOR PAYMENT**

Payment for work performed under this Section will be made on a unit basis in accordance with PART I - BID FORM, Section 1.7, Training of Personnel by the Contractor. There will be one unit of payment for training the 17 primary hot line personnel, one unit of payment for training the 35 secondary hot line personnel and individual units of payment for the primary and secondary hot line tools and equipment to be furnished by the Contractor.

The units for payment for training will be based on the following maximum times:

X3 - Six weeks for 35 men

X1 - Six weeks for 17 men

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PART VIII - TECHNICAL SPECIFICATIONS  
FOR TRAINING

SECTION 8.3 - SAFETY AND FIRST AID

8.3-01 SCOPE

The Contractor shall conduct classes in safety and first aid, teaching approximately 68 PLN line construction personnel by using on-the-job training and classroom instruction methods.

8.3-02 ON-THE-JOB SAFETY TRAINING

The Contractor shall train PLN line construction personnel to observe recognized safety practices and methods in the construction, operation, and maintenance of the PLN, Medan power distribution system. The Contractor shall, while training PLN personnel in overhead and underground construction methods, hot line work and inspection and test procedures; provide on-the-job safety training. This work shall include at least the following:

- A. Care and proper use of climbing equipment and materials, hand tools, construction equipment, rubber protective equipment, hot line tools and clothing.
- B. Knowledge and understanding of the type and scope of work that is to be performed before starting the work.
- C. The use of caution when working on or near energized lines and the proper use and meaning of caution signs.
- D. The proper meaning of working space and climbing space and the importance of keeping the climbing space clear at all times.
- E. The importance and proper methods of installing grounding devices on de-energized high voltage lines before attempting to work on them and removing grounding devices before re-energizing the lines.

Final determination of when the PLN personnel have received adequate on-the-job safety training will be certified by the Engineer and approved by the Owner. This part of the work will be considered complete when the Engineer certifies and the Owner approves in writing that the Contractor has satisfactorily trained the PLN personnel in all areas listed above.

### 8.3-03 CLASSROOM SAFETY AND FIRST AID INSTRUCTIONS

The Contractor shall teach PLN personnel safety rules and regulations and first aid procedures by using classroom instruction methods, demonstrations and teachers' aids as required. The PLN personnel shall be taught and demonstrate that they can properly perform the following first aid procedures:

A. Pole-top resuscitation using the Oesterreich method, the double-rock method, the bear-hug method and the arm-grasp method. These methods shall be taught only to the linemen that have been properly trained as covered in Section 8.1, above.

B. Mouth-to-mouth (insufflation) resuscitation.

C. Prone resuscitation using the back-pressure-arm-lift method, the back-pressure-hip-roll method or the Shafer-prone-pressure method.

D. Symptoms and treatment for shock.

E. Bleeding and its control including the six principal pressure points where finger or hand pressure against a bone may stop the bleeding of a severed artery.

Final determination of when the PLN personnel have received adequate instructions in safety and first aid will be made by the Engineer. This part of the Work shall be considered complete when the Engineer certifies in writing that the Contractor has satisfactorily trained the PLN personnel in all areas listed above.

### 8.3-04 MEASUREMENT FOR PAYMENT

Payment for Work completed under this Section will be made on a lump sum basis, i.e., one payment will be made for safety and first-aid training of the specified number of PLN personnel.

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PART IX - TECHNICAL SPECIFICATIONS FOR FURNISH  
AND ERECTION OF WAREHOUSE

SECTION 9.1 - SITE PREPARATION

9.1-01 SCOPE

This Section specifies the work to be carried out by the Contractor and by the Owner in preparation of the warehouse site, located in accordance with Drawing 629/2-W1 in Vol. IV of these Contract Documents.

9.1-02 REMOVAL OF EXISTING BUILDING AND ACCESS

The Owner shall remove any building that will not be turned over to the Contractor for his use within the area assigned for the Contractor's construction base camp and for the permanent warehouse, and will permit access of the Contractor to the property assigned.

9.1-03 COMPACTED FILL

The Owner shall design and provide a compacted earth fill to bring the entire area assigned to grade.

9.1-04 STORM DRAINAGE

The Owner shall design and provide surface and subsurface drainage necessary to prevent the accumulation of storm waters, including roof runoff, on the assigned property.

9.1-05 SEPTIC TANK AND DRAIN FIELD

The Contractor shall design, supply and install a septic tank, sewer piping and drain field in accordance with existing codes and practices for the city of Medan adequate for the washrooms and sanitary installations to be provided in the warehouse building.



9.1-06 FENCING

The Owner shall fence the area assigned to the Contractor and provide a suitable access gate.

9.1-07 PAVING

The Owner may pave the area assigned, with the exception of that area to be occupied by the warehouse building, with due regard for the Contractor's vehicle traffic requirements and material storage needs.

9.1-08 SUBMITTAL AND APPROVAL OF DRAWINGS

The Contractor shall obtain such permits and arrange for such inspections of the work as required by local regulations, and shall submit, for the approval of the Engineer, construction drawings, in accordance with local engineering practices.

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PART IX - TECHNICAL SPECIFICATIONS FOR FURNISH  
AND ERECTION OF WAREHOUSE

SECTION 9.2 - BUILDING

9.2-01 SCOPE

This Section specifies the Work to be carried out by the Contractor in the supply and erection of the warehouse building in accordance with Drawing 629/2-W2 (XI - 4) in Vol. IV of the Contract Documents.

9.2-02 GENERAL DESCRIPTION AND DIMENSIONS

The warehouse building shall be prefabricated from steel and designed in accordance with the "Steel Construction Manual" of the American Institute of Steel Construction or equivalent and the "Specification for the Design of Cold-Formed Steel Structural Members" of the American Iron and Steel Institute or equivalent. The building shall be composed of 14 equal bays each having a 70' width and 20' nominal height. The overall length shall be approximately 285'. The building shall be Type BCS-3F as manufactured by Armco Steel Corp., Middletown, Ohio, USA or equal. The building shall be designed to withstand its own dead load plus live load and wind load as follows:

Live Load, pounds per square foot, 20

Wind Load, pounds per square foot, 25

Loading on storage loft above office area, live load, pounds per square foot, 200

Method of load application shall be in accordance with "Recommended Design Practices Manual," of the Metal Building Manufacturers Association, MBMA, or equivalent.

9.2-03 STRUCTURE

The building structural frame shall consist of welded plate rafter beams and exterior columns, with a maximum of one interior pipe column for each pair of rafter beams. Canopy beams shall be provided at each main building column and as required to extend the roof by 10' on the front and 5' on the back sides. All welding shall be performed by operators qualified as described in the "Standard Qualification Procedures"

of the American Welding Society, or equivalent. All structural parts shall have grease, scale and rust removed and receive two coats of anti-corrosion primer paint. All parts must be marked and referenced to complete erection instructions supplied with the building. Framing for storage loft, and office ceiling support shall be incorporated into one system. It shall be fabricated of standard structural sections for beams and columns. The deck shall be constructed of steel floor panels with a light weight concrete fill as the wearing surface. A steel stairway with handrails shall be furnished on the exterior of the office wall inside the warehouse for access to the loft.

#### 9.2-04 ROOF

The roof shall be constructed of preformed, interlocking panels, formed, cut to length and drilled or punched in the factory from aluminum coated 24-gage steel sheets. Roof panels shall be of standing-seam interlocking design. The standing seams shall have a factory-applied, non-hardening sealant and the seams shall be continuously locked or crimped together by mechanical means during erection. The roof construction shall carry an Underwriter's Laboratories Construction (Uplift) rating of not less than class 30. Deflection of roof panels or of purlins shall not exceed  $L/180$  of its span under loading conditions specified in 9.2-02, plus the weight of a power roof ventilator at mid span. Roof panels shall be fastened to the purlins with stainless steel or aluminum weather-sealed type self drilling screws. The roof shall have a slope of  $1/2"$  in  $12"$  and shall extend  $10'$  over the front of the building and  $5'$  over the sides and back of the building. The front edge of the roof shall be provided with a gutter of adequate section preformed from the same type of material used for the roof panels and shall be sloped to down-spouts located at each main building column. The roof surface shall be unpainted.  $1-1/2"$  of aluminum foil faced flexible Fiber Glass blanket insulation, approved by Underwriters' Laboratories shall be installed between the purlins and the roof panels over those parts of the roof covering the 5 bays of Section No. 1, as indicated in Drawing 629C/2-W2 (XI - 4).

#### 9.2-05 WALLS

The walls shall be composed of interlocking sheet steel panels with suitable base zee, girt, eave purlin, wall cap, and eave flashing. The panels shall extend without joints from the base zee to the eave on the front, back, and side walls of Section No. 1 of Drawing 629C/2-W2. On all other walls, the panels shall extend to a height of  $16'$  above the base zee.

The remaining opening between the top of the panels and eaves shall be covered with 3/4" mesh 12 gage galvanized steel woven wire or galvanized expanded steel of equivalent section. The panels shall be of aluminum coated 24 gage sheet steel preformed, cut to length, punched or drilled and color coated with siliconized acrylic enamel or flouropolymer coating in the factory. Color samples of coatings available shall be submitted to the Engineer for selection by the Owner. Panels are to be coated in not more than two different colors selected.

#### 9.2-06 DOORS

A 16' x 16' steel 2-leaf hanging door shall be provided for each of the four warehouse sections. Each leaf shall be constructed of light steel frame, with panels of the same type as used on the walls described in paragraph 9.2-05. Each hanging door shall be supported by low friction roller hangers running on a support rail with suitable end stops and guided by a slotted guide rail set in the floor. Hasps shall be provided for padlocking either leaf to the door frame inside of the building, or leaf to leaf outside of the building with a 4" padlock to be provided by the Contractor. Duplicate keys shall be provided for each of the four padlocks, which will have non-interchangeable keys. Two 3' x 7' steel doors each having a single light of wire reinforced clear glass shall be provided for the office, with each door having a tumbler-type lock, two keys, non-interchangeable. All doors shall be suitably constructed and finished for direct exposure to the weather and for continuous rust free long life in high humidity environment; suitable framed openings shall be provided.

#### 9.2-07 WINDOWS

Three pairs of 3'-8" x 5'-5" and 1/8" aluminum projected sash windows shall be provided for the office space. Glazing shall be outside with 1/4" wire reinforced clear glass. All windows shall be furnished with all operating hardware installed, framing and fasteners required to replace structurally the wall panels or framing displaced.

#### 9.2-08 PARTITIONS

Three main partitions shall be provided, composed of 10 gage galvanized steel wire 2" mesh or galvanized expanded steel equivalent in weight supported on a steel frame. These partitions shall be located as shown on Draqing 629C/2-W2 and shall extend from wall to wall and from floor to ceiling. A hinged access door 5' wide by 10' high shall be provided in each partition, and of the same construction as the main partitions. Each

access door shall be provided with hasps and a padlock. Each of the three padlocks shall have duplicate keys, but the keys shall not be interchangeable between padlocks. All frames and hardware shall be rust-proof or painted with suitable anti-corrosive primer and painted.

#### 9.2-09 OFFICE

The office shall be located as shown in Drainwg 629C/2W2. All walls shall be 10' in height aluminum coated steel preformed panels, with 1" fiberglass insulation and perforated sound absorbing board or equivalent prefinished interior surface. The ceiling shall be fully insulated, and constructed of preformed 24 gage aluminum coated steel panels. The ceiling shall be hung from the loft framing.

#### 9.2-10 WASHROOMS AND TOILETS

Separate washrooms shall be provided for men and for women, arranged as shown in Drawing No. 629C/2-W2. The Contractor will install facilities of good quality in accordance with local codes and practices prevailing in the city of Medan. The Contractor will install louvered ventilators from the washrooms through the ceiling and into the loft area, and louvered doors giving access to the washrooms and toilet compartments.

#### 9.2-11 FOUNDATIONS AND FLOOR

The Contractor shall design and construct adequate foundations required to withstand the column reactions and support the uniform dead and wind load transmitted by the roof and walls. Foundation shall be of reinforced concrete and designed in accordance with acceptable soil loadings for soil conditions existing at the site. The Contractor shall make his own soil investigations. The Contractor shall design and pour a reinforced concrete floor capable of withstanding a distributed loading of  $1000\text{mg}/\text{m}^2$  and live concentrated loading of  $10000\text{ kg}/\text{m}^2$  28 days after pouring. The floor shall cover all bays and extend 12' in front of the building and 8' to the rear and sides of the building. The grade level to be used by the Contractor for column footings and floor level shall be established by the Engineer.

#### 9.2-12 WATER SUPPLY

The Contractor shall arrange for piping in water for the warehouse sanitary installations and for his other needs.

9.2-13 SUBMITTAL AND APPROVAL OF DRAWINGS

The Contractor shall submit Drawings of the building and foundations in sufficient detail to indicate compliance with specifications for approval of the Engineer. The Contractor shall furnish 3 reproducible copies of all as-built drawings to the Engineer for transmittal to the Owner.

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PART IX - TECHNICAL SPECIFICATIONS FOR FURNISH  
AND ERECTION OF WAREHOUSE

SECTION 9.3 - INSTALLED EQUIPMENT AND SERVICES

9.3-01 SCOPE

This Section specifies the work to be carried out by the Contractor in supply and installation of installed equipment and services for the operation of the warehouse, in accordance with Drawing 629/2-W2 in Vol. IV of these Contract Documents.

9.3-02 VENTILATORS

Two vertical discharge exhauster ventilators having 13300 cfm capacity each and equipped with 1 hp, 220-V, 50-Hz motors and starters shall be furnished and installed by the Contractor in the roof over Section No. 1, as indicated in Drawing 629/2-W2. These ventilators shall be supplied with protective windbonds, ball bearing motors, ventilator curb and automatic dampers. Lubrication shall be of the sealed type, requiring maintenance not oftener than once per year.

9.3-03 AIR CONDITIONERS

The Contractor shall furnish and install three automatic air conditioning units, one below each of the office windows. Each unit shall have 16000 BTU capacity or greater when operating on single-phase, 220-V, 50-Hz supply.

9.3-04 FURNITURE

The Contractor shall purchase for his own account all furnitures, filing cases, card files and other portable items required for his use. On completion of the Work, the Owner may at his option, purchase these items from the Contractor.

9.3-05 SHELVES, RACKS AND BINS

The Contractor shall purchase and install for his own account all shelves, racks and bins that he may require for handling material and equipment in the warehouse. On completion of the Work, the Owner may, at his option, purchase these items from the Contractor.

9.3-06 ELECTRIC LIGHTING AND POWER

The Owner shall make available to the Contractor such quantities of electric power as required by the Contractor for construction and operation of the warehouse and other buildings to be used by the Contractor in the area indicated in Drawing 629C/W-1, within 30 days following the Contractor's requisition placed with the Engineer. The Contractor shall pay for electric power used in accordance with the industrial rate prevailing for such services. The Contractor shall be exempt, however, from any connection charge or any construction costs up to the meter installed by the Owner. The Contractor shall design and install all internal and external lighting circuits, fittings and fixtures in accordance with his needs, in accordance with codes and regulations acceptable to the Owner. Three sets of reproducible as-built drawings shall be supplied to the Engineer for transmittal to the Owner.

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PART IX - TECHNICAL SPECIFICATIONS FOR FURNISH  
AND ERECTION OF WAREHOUSE

SECTION 9.4 - MEASUREMENT FOR PAYMENT

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PART IX - TECHNICAL SPECIFICATIONS FOR FURNISH  
AND ERECTION OF WAREHOUSE

SECTION 9.4 - MEASUREMENT FOR PAYMENT

9.4-01 GENERAL

The payment for Work performed under Sections 9.1, 9.2 and 9.3 will be made on a lump sum basis.



4970201 (7)  
PD-AAD-771

107p

PERUSAHAAN UMUM LISTRIK NEGARA  
MINISTRY OF PUBLIC WORKS AND POWER  
JAKARTA, INDONESIA  
OWNER

MEDAN POWER REHABILITATION PROJECT

INVITATION FOR BIDS

FURNISH AND ERECT FACILITIES  
FOR THE  
REHABILITATION AND EXPANSION OF THE DISTRIBUTION SYSTEM  
629-2

VOLUME IV  
CONSTRUCTION STANDARDS, DRAWINGS AND WORK ORDERS

AID LOAN NO . 497-H-022

CHICAGO,  
ILLINOIS  
U. S. A.

HARZA ENGINEERING COMPANY

AUGUST 1973

MEDAN  
SUMATRA  
INDONESIA

SUMMARY OF VOLUMES

VOLUME I - BID AND CONTRACT FORMS

- PART I BID FORM
- PART II CONTRACT FORM
- PART III PERFORMANCE BOND AND PAYMENT BOND FORMS

VOLUME II - GENERAL AND SPECIAL CONDITIONS

- PART IV GENERAL CONDITIONS
- PART V SPECIAL CONDITIONS

VOLUME III - TECHNICAL SPECIFICATIONS

- PART VI TECHNICAL SPECIFICATIONS FOR ERECTION OF DISTRIBUTION FACILITIES
- PART VII TECHNICAL SPECIFICATIONS FOR DISTRIBUTION OF MATERIAL AND EQUIPMENT
- PART VIII TECHNICAL SPECIFICATIONS FOR TRAINING
- PART IX TECHNICAL SPECIFICATIONS FOR FURNISH AND ERECTION OF WAREHOUSE

VOLUME IV - CONSTRUCTION STANDARDS, DRAWINGS AND WORK ORDERS

- PART X CONSTRUCTION UNITS AND STANDARDS
- PART XI DRAWINGS, MAPS, PLANS AND SAMPLE WORK ORDERS

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- SECTION C - THREE PHASE POLE TOP ASSEMBLIES
- SECTION D - CONDUCTOR ASSEMBLY UNITS
- SECTION E - GUY ASSEMBLY UNITS
- SECTION F - ANCHOR ASSEMBLY UNITS
- SECTION G - TRANSFORMER ASSEMBLY UNITS
- SECTION J - PRIMARY AND SECONDARY ASSEMBLY UNITS
- SECTION K - SERVICE ASSEMBLY UNITS
- SECTION M - MISCELLANEOUS ASSEMBLY UNITS
- SECTION R - REMOVAL AND TRANSFER ASSEMBLIES
- SECTION U - UNDERGROUND ASSEMBLY UNITS

PART XI DRAWINGS, MAPS, PLANS AND SAMPLE WORK ORDERS

- XI-1 Proposed 11.5/20 KV Distribution System Scale 1 : 50,000 cm
- XI-2 Proposed 11.5/20 KV Distribution System One - Line Diagram
- XI-3 Warehouse Site Plan
- XI-4 Warehouse General Arrangement and Sections
- XI-5 Sample Secondary Work Order Construction Drawing
- XI-6 Sample Secondary Work Order Staking Sheet
- XI-7 Sample Secondary Estimate Work Order
- XI-8 Sample Primary Work Order Construction Drawing
- XI-9 Sample Primary Work Order Staking Sheet
- XI-10 Sample Primary Estimate Work Order

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VOLUME IV - CONSTRUCTION STANDARDS, DRAWINGS  
AND WORK ORDERS

PART X - DISTRIBUTION CONSTRUCTION UNITS

SECTION A - SINGLE PHASE POLE TOP ASSEMBLIES

<u>No.</u>	<u>Description</u>
A1	1-phase pole top 0° - 30° angle
A2	1-phase pole top 30° - 60° angle
A3	1-phase pole top deadend
A4	1-phase tap from 3-phase line
A5	1-phase tap from 1-phase line
A6	1-phase double deadend
A7	1-phase tap fuse
A8	1-phase tap from steel pole

SECTION C - THREE PHASE POLE TOP ASSEMBLIES

<u>No.</u>	<u>Description</u>
C1	3-phase pole top 0° - 15°
C2	3-phase double arm 15° - 30°
C3	3-phase vertical 30° - 60°
C4	3-phase deadend, double arm
C5	3-phase double deadend on arms
C6	3-phase 60° - 90° vertical angle
C7	3-phase tap from 3-phase line
C8	3-phase 90° on crossarms
C9	Sidarm construction
C10	Fuse installation, 3-phase tap
C11	Single arm for second circuit
C12	3-phase tap from steel pole
C13	3-way vertical corner

SECTION D - CONDUCTOR ASSEMBLY UNITS

D1	Overhead conductors and services
----	----------------------------------



SECTION E - GUY ASSEMBLY UNITS

E1	Down guy
E2	Head guy
E3	Double down guy
E4	Sidewalk guy
E5	Double head guy
E6	Push brace
E7	Guy guard

SECTION F - ANCHOR ASSEMBLY UNITS

F1	Log anchor assemblies
F2	Depth of setting for anchors

SECTION G - TRANSFORMER ASSEMBLY UNITS

GI	Single phase transformer on 1-phase tangent
G2	Single phase transformer on 3-phase tangent
G4-1	Three-phase bank on 3-phase deadend or tangent

SECTION J - PRIMARY AND SECONDARY ASSEMBLY UNITS

J1-1	Insulated secondary clevis
J1-2	Secondary deadend :-4AA
J1-3	- 2 AA
J1-4	- 1/0 AA
J1-5	- 3/0 AA
J2-1	Preformed primary deadend :- 2 AWG AA
J2-2	- 1/0 AWG AA
J2-3	- 3/0 AWG AA
J2-4	:- 336.4 MCM AA
J3-1	20Kv angle assembly : - 2 AWG ; AA
J3-2	- 1/0 AWG AA
J3-3	- 3/0 AWG AA
J3-4	- 336.4 MCM AA
J4-1	Steel pole band
J4-2	Secondary clevis on steel pole band
J4-3	Secondary rack on steel pole band
J4-4	Cable hanger on steel pole band
J5	Secondary cable support

SECTION K - SERVICE ASSEMBLY UNITS

K1-1 to K1-6	Various service assemblies
K2	Service wedge clamp
K3	Underground service, 220/380 volt
K4	Secondary conductor configuration
K5	Typical 220/380 volt overhead service to a vault
K6	Typical 220/380 volt underground service to a vault
K7	Typical 20Kv underground service to a vault

SECTION M - MISCELLANEOUS ASSEMBLY UNITS

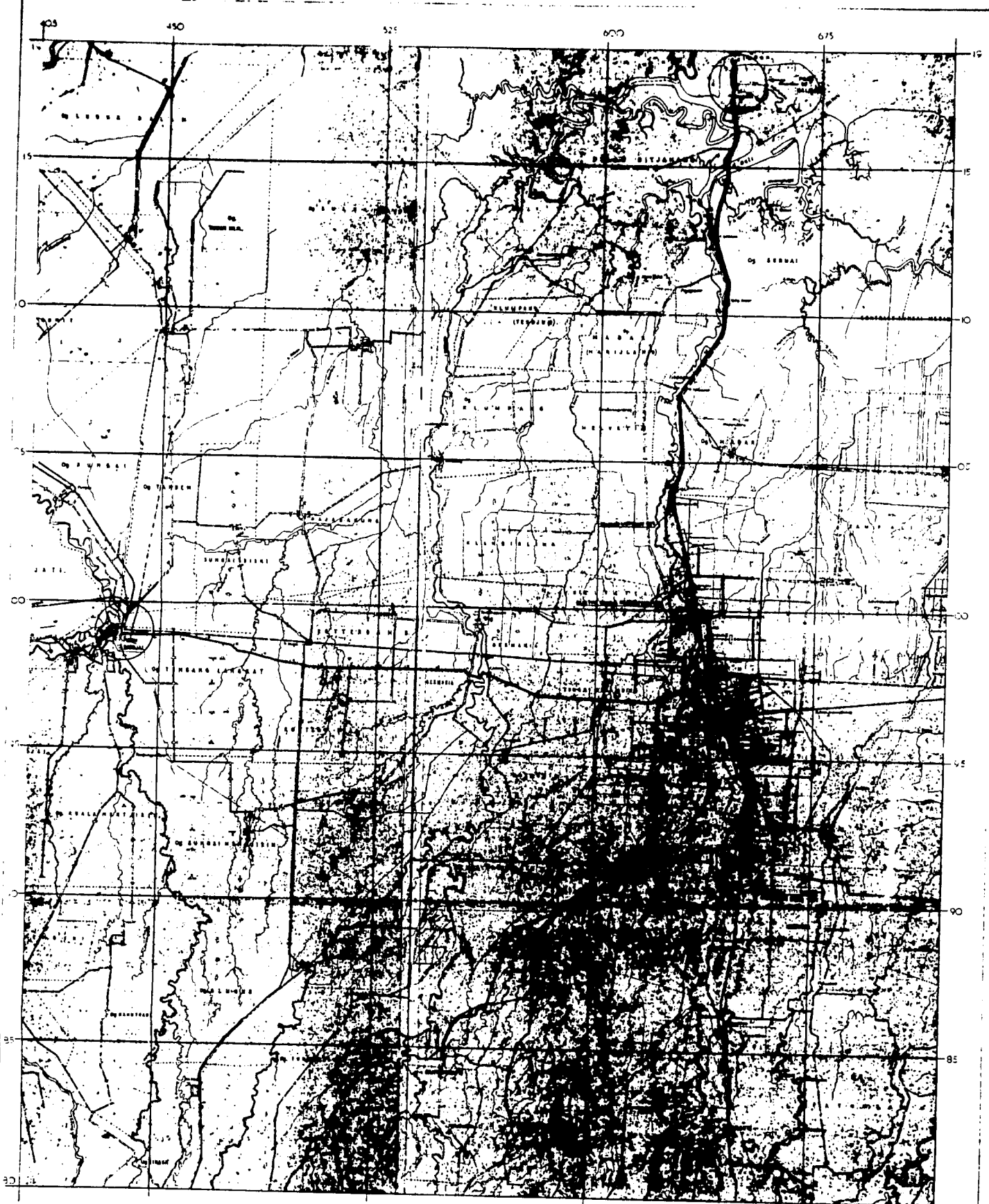
M1	Grounding assembly ground rod type
M2	Framing guide, 20Kv poles
M3	Framing guide, secondary poles
M4	20Kv hook operated disconnect
M5	Crossarm drilling guide
M6	Angle construction guide
M7	20Kv underground riser
M8	20Kv sectionalizing switch, group operated
M9	Primary tap assembly guide
M10	Guying, pole attachment details
M11	Anchor and guy bonding;
M12	Hot line tying guide, single insulator
M13	Hot line tying guide, double insulator
M14	Pole key
M15	Bog shoe
M16	20Kv Metering Set
M17	One sectionalizing oil circuit recloser
M18	3-phase 11.5/20Kv voltage regulator assembly
M19	Pole protection assembly, plate type
M20	Three sectionalizing oil circuit reclosers
M21	750 MCM underground cable termination
M22	Construction drawing symbols
M23	Self-supported communication cable.

SECTION R - REMOVAL AND TRANSFER ASSEMBLIES

R1	Existing steel poles
R2	Existing 127/220 volt crossarms
R3	Existing 127/220 volt racks
R5	Existing 127/220 volt 4-way deadend
R6	Existing guy and anchor
R7	Existing overhead guy
R8	Existing push brace
R9	Existing street lights

**SECTION U - UNDERGROUND ASSEMBLY UNITS**

UC2	Underground cable trench
UC3	Underground cable bedding assembly
UC4	Underground cable pipe crossing



- LEGEND:**
- 115/20KV, 3 $\phi$  CIRCUITS, PROPOSED OVERHEAD.
  - 115/20KV, 3 $\phi$  CIRCUITS, PROPOSED UNDERGROUND
  - 115/20KV, 3 $\phi$  CIRCUIT EXISTING OVER HEAD

REV	DATE	NATURE OF REVISION	BY	CHKD	APPRD

**PERUSAHAAN LISTRIK NEGARA**  
**EXPLOITASI I NORTH SUMATRA**  
 MEDAN ELECTRIC POWER SYSTEM  
 RECONSTRUCTION AND EXPANSION  
 MEDAN BRANCH

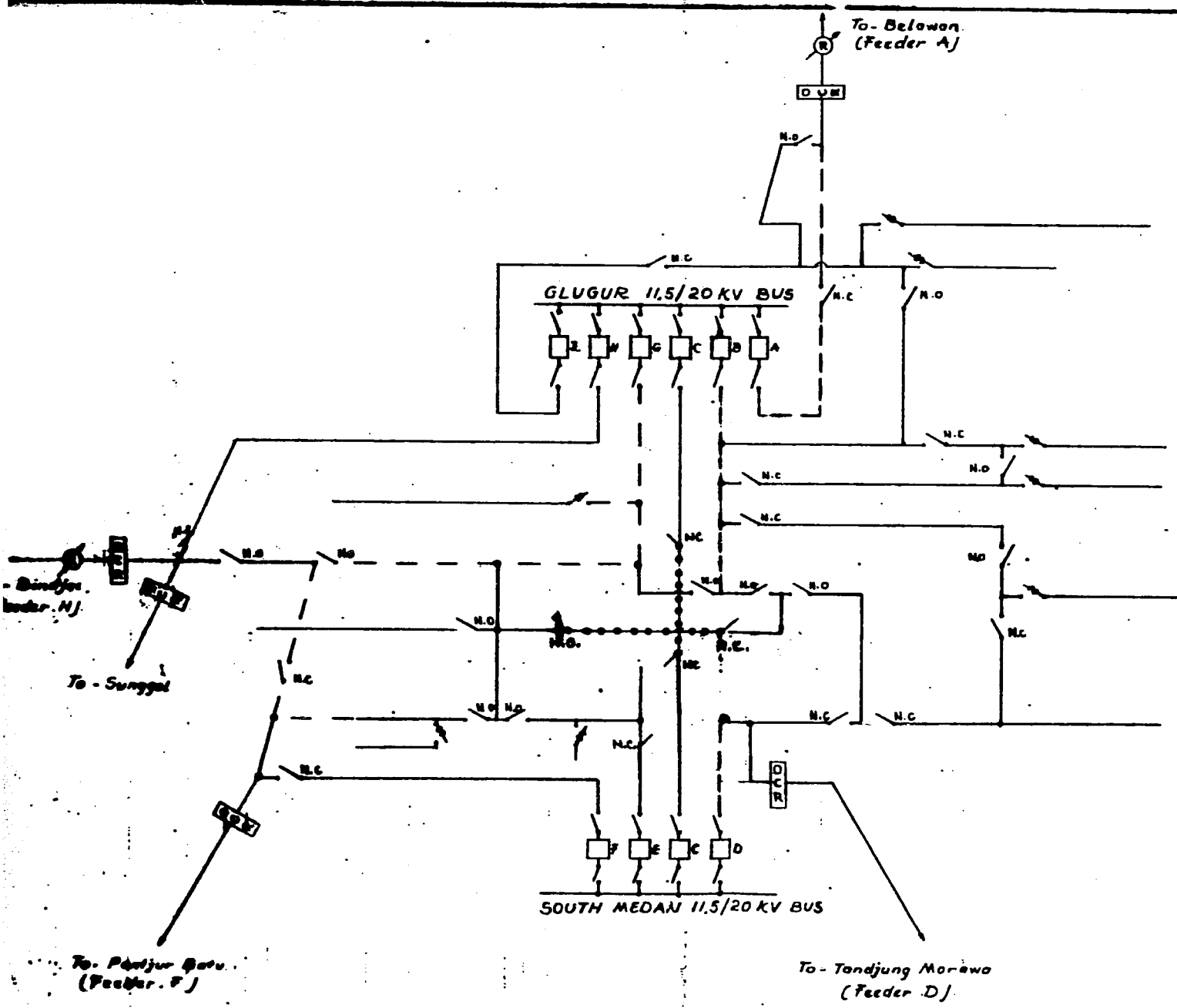
**PROPOSED 115/20KV**  
**PRIMARY DISTRIBUTION SYSTEM**

CONSULTING ENGINEER  
**HARZA ENGINEERING COMPANY**  
 APPROVED: \_\_\_\_\_  
 DATE: \_\_\_\_\_

U.S. AND LOCAL  
 407 - H - 000

1-20-000  
 11-1

DESIGNED BY	DATE	DESIGN CHECKED BY	DATE
	28-10-72		28-10-72



**LEGEND.**

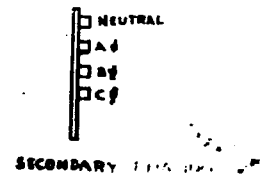
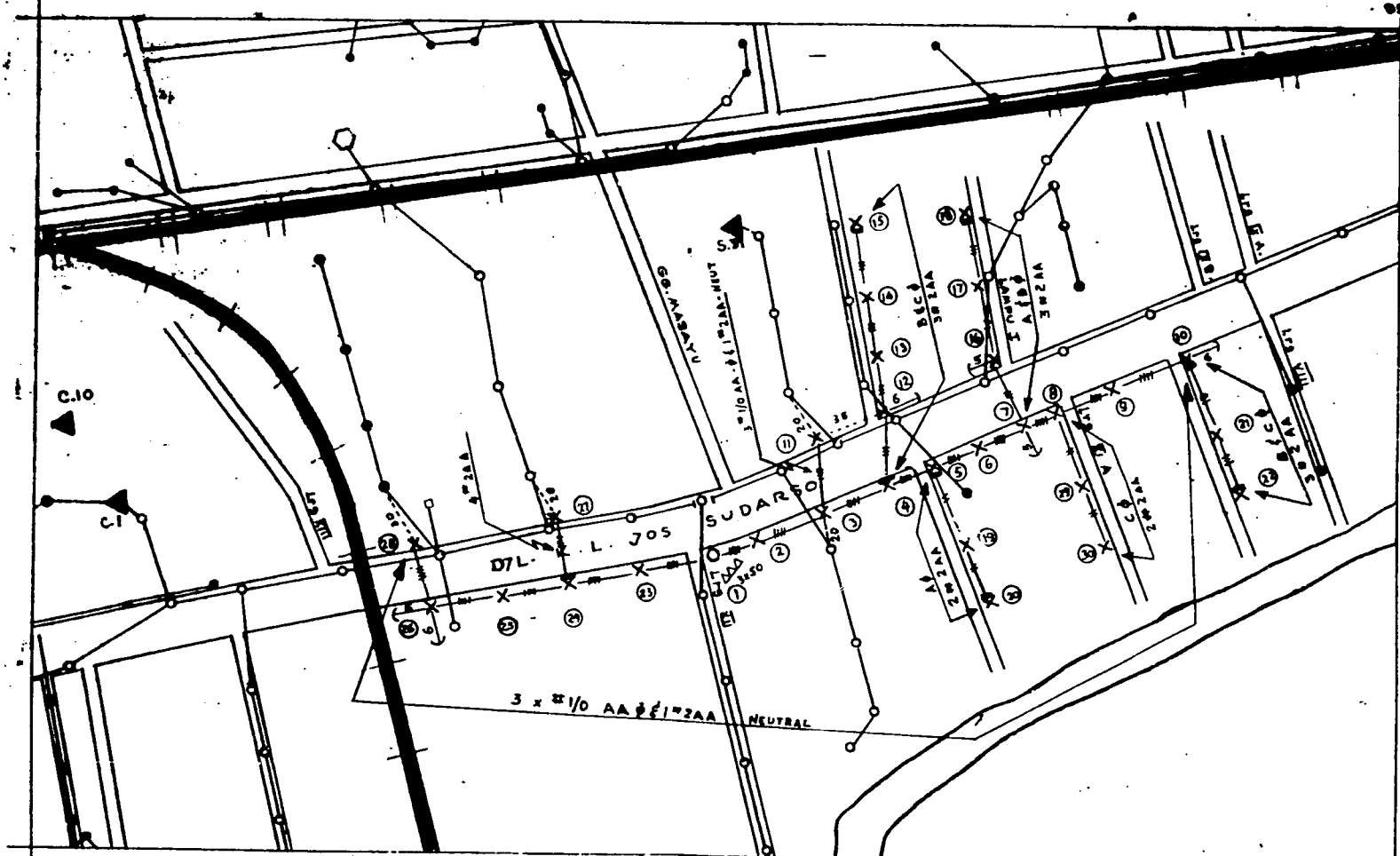
- Existing 11.5/20 KV primary overhead line operating at 7 KV
- Proposed new 11.5/20 KV primary overhead line.
- Proposed new 11.5/20 KV primary underground line.
- N.O. Sectionizing switch normally open.
- N.C. Sectionizing switch normally closed.
- Fused disconnect switch.
- O.C.R. Automatic recloser.
- A.V.R. Automatic voltage regulator.

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
11.5/20 KV PRIMARY SYSTEM SINGLE LINE DIAGRAM	
MARA ENGINEERING CO.,	
APPROVED	DATE 17-9-73





Reference  
Spec App  
64.5-85



**CAUTION:**  
 UNDERGROUND HIGH VOLTAGE  
 CABLES ON BOTH SIDES  
 OF D7L K L JOS SUBARSO

FOR BIDDING ONLY  
 NOT FOR CONSTRUCTION

X1-5

PERUSAHAAN LISTRIK NEGARA  
 EKSPLOITASI I SUMATERA UTARA

CONSTRUCTION DRAWING  
 WORK ORDER NO. 101

HARZA ENGINEERING CO, CHICAGO  
 APPROVED

DATE 25/1/55 NO 5-1

X1-5





PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA  
**CONSTRUCTION WORK ORDER**  
 U.S. AID LOAN 497 - H - 022 CONTRACT NUMBER 629 - 2  
 HARZA ENGINEERING COMPANY, CHICAGO - ENGINEER

CONSTRUCTION WORK ORDER NUMBER 101  
 KEY MAP REFERENCE 67.5 - 95  
 BASE MAP REFERENCE 67.5 - 99

DESCRIPTION : INSTALL APPROXIMATELY 1.0 KM OF 220/130 VOLT SECONDARY INCLUDING 29 POLES AND ONE 3-PHASE 150KVA TRANSFORMER BANK.

ESTIMATED COST : U.S. \$ \_\_\_\_\_ RUPIAH \$ \_\_\_\_\_

CONSTRUCTION DRAWING, 1 Sheets : Prepared by K.M.  
 STAKING SHEET, 1 Sheets : Prepared by K.M.  
 FIELD STAKING : Prepared by \_\_\_\_\_ Date \_\_\_\_\_  
 CONSTRUCTION WORK ORDER : Checked by \_\_\_\_\_ Date \_\_\_\_\_  
 HARZA ENGINEERING COMPANY, MEDAN : Approval \_\_\_\_\_ Date \_\_\_\_\_  
 PERUSAHAAN LISTRIK NEGARA, MEDAN : Approval \_\_\_\_\_ Date \_\_\_\_\_  
 WORK ORDER ISSUED TO CONTRACTOR : Date \_\_\_\_\_  
 CONSTRUCTION COMPLETED, Date \_\_\_\_\_ Inspected by \_\_\_\_\_  
 WORK ORDER CERTIFIED COMPLETE : Approval \_\_\_\_\_ HARZA Eng Co, Date \_\_\_\_\_  
 WORK ORDER CERTIFIED FOR PAYMENT : Approval \_\_\_\_\_ HARZA Eng Co, Date \_\_\_\_\_

**SUMMARY**

CONSTRUC TION UNIT	QUAN TITY	CONTRACT COST (U.S. Dollar)	CONTRACT COST (Rupiah x 10 <sup>3</sup> )	P.L.N COST (Rupiah x 10 <sup>3</sup> )	TOTAL COST (Rupiah x 10 <sup>3</sup> )	CONSTRUC TION UNIT	QUAN TITY	CONTRACT COST (U.S. Dollar)	CONTRACT COST (Rupiah x 10 <sup>3</sup> )	P.L.N COST (Rupiah x 10 <sup>3</sup> )	TOTAL COST (Rupiah x 10 <sup>3</sup> )
P9-5	11										
P10-5	15										
P11-5	3										
E1-1	6										
E2-1	5										
E7	6										
F1-1	6										
G4-3	1										
D3-2	1256										
D4-2	1743										
J1-1	130										
J1-3	44										
J1-4	14										
Q1	6										
Q2	1										
M15	7										
M19	29										

SUMMARY : PREPARED BY \_\_\_\_\_ CHECKED BY \_\_\_\_\_







PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA  
**CONSTRUCTION WORK ORDER**  
 U.S. AID LOAN 497 - H - 022 CONTRACT NUMBER 629-2  
 HARZA ENGINEERING COMPANY, CHICAGO - ENGINEER

CONSTRUCTION WORK ORDER NUMBER 008  
 KEY MAP REFERENCE 67.5 - 95  
 BASE MAP REFERENCE 67.5 - 99

DESCRIPTION : FEEDER "B", 20KV PRIMARY FEEDER FROM GUGUR GENERATING STATION TO THE EAST AND NORTHEAST PART OF THE CITY, THIS WORK ORDER INCLUDES 2.56 KILOMETERS OF 336.4 MCM, OVERHEAD, 3-PHASE CIRCUIT.

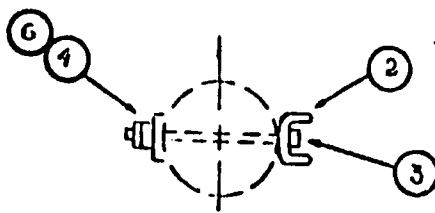
ESTIMATED COST : U.S. \$ \_\_\_\_\_ RUPIAHS \_\_\_\_\_  
 CONSTRUCTION DRAWING, 1 Sheets : Prepared by P.N.  
 STAKING SHEET, 2 Sheets : Prepared by P.N.  
 FIELD STAKING \_\_\_\_\_ Prepared by \_\_\_\_\_ Date \_\_\_\_\_  
 CONSTRUCTION WORK ORDER \_\_\_\_\_ Checked by \_\_\_\_\_  
 HARZA ENGINEERING COMPANY, MEDAN : Approval \_\_\_\_\_ Date \_\_\_\_\_  
 PERUSAHAAN LISTRIK NEGARA, MEDAN : Approval \_\_\_\_\_ Date \_\_\_\_\_  
 WORK ORDER ISSUED TO CONTRACTOR : Date \_\_\_\_\_  
 CONSTRUCTION COMPLETED, Date \_\_\_\_\_ Inspected by \_\_\_\_\_  
 WORK ORDER CERTIFIED COMPLETE : Approval \_\_\_\_\_ HARZA Eng. Co, Date \_\_\_\_\_  
 WORK ORDER CERTIFIED FOR PAYMENT : Approval \_\_\_\_\_ HARZA Eng. Co, Date \_\_\_\_\_

**SUMMARY**

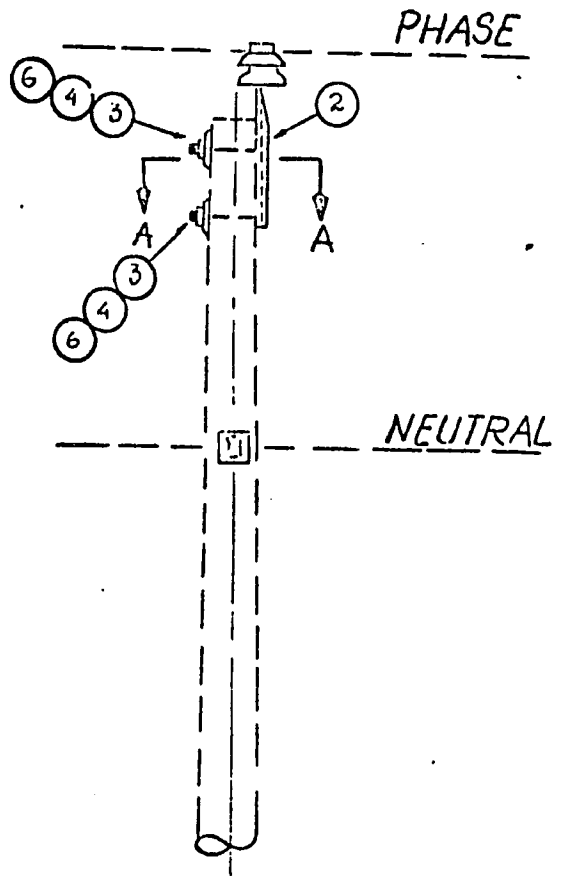
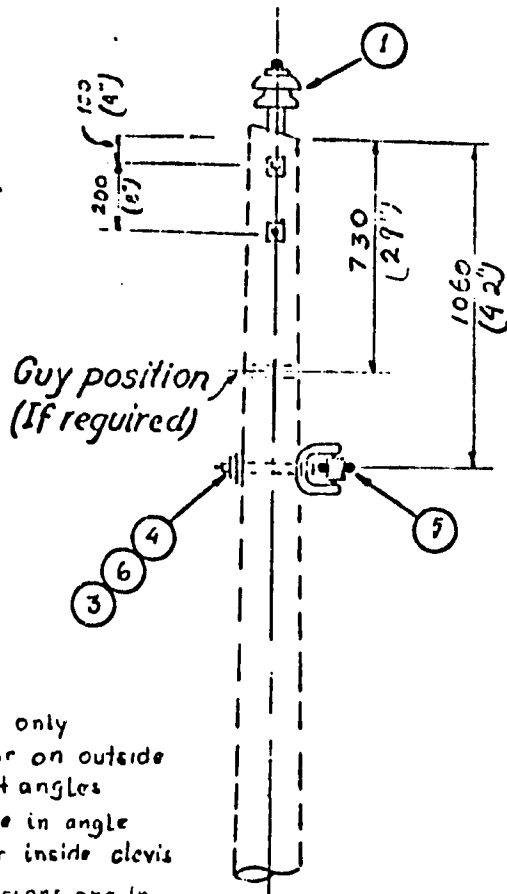
CONSTRUC- TION UNIT	QUAN- TITY	CONTRACT COST (U.S. Dollar)	CONTRACT COST (Rupiah x 10 <sup>3</sup> )	P.L.N COST (Rupiah x 10 <sup>3</sup> )	TOTAL COST (Rupiah x 10 <sup>3</sup> )	CONSTRUC- TION UNIT	QUAN- TITY	CONTRACT COST (U.S. Dollar)	CONTRACT COST (Rupiah x 10 <sup>3</sup> )	P.L.N COST (Rupiah x 10 <sup>3</sup> )	TOTAL COST (Rupiah x 10 <sup>3</sup> )
P9-5	56										
P12-5	56										
P13-4	8										
C1	57										
C2	2										
C4	1										
C6	3										
C7	3										
E1-1	5										
E1-2	5										
E2-1	5										
E2-2	4										
E3-2	8										
E7	6										
F1-1	5										
F1-2	12										
D1-1	768										
D2-2	256										
D3-1	248										
D4-2	276										
J1-3	1										
J1-5	12										
J2-2	3										
J2-4	33										
M1-	4										
M4	1										
M19	60										
Q1	19										
Q2	18										
Q3	7										

SUMMARY PREPARED BY \_\_\_\_\_ CHECKED BY \_\_\_\_\_

01-IX



SECTION A-A



Notes:

1. For #2AA only
2. Conductor on outside except at angles  
When line in angle conductor inside clevis
3. All dimensions are in millimeters and inches

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	1 Pin type insulator	5	1 Sec. clevis, w/insulator
2	1 Pole top pin 20"	6	3 Locknut
3	3 Hex. bolt 5/8" x reqd length.		
4	3 Sq. washer, 2 1/4"		

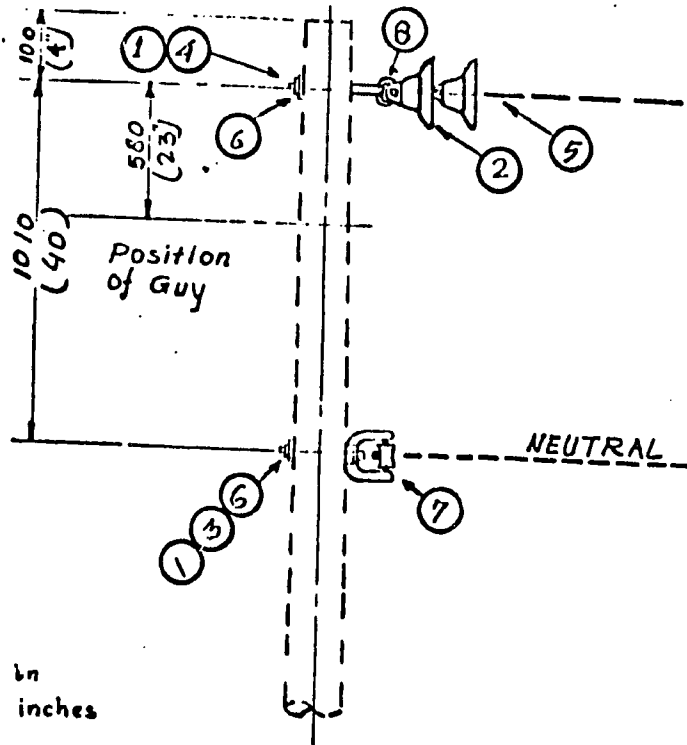
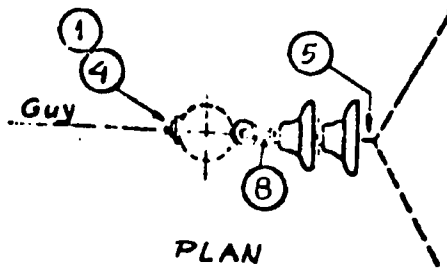
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20 KV PRIMARY, 1-PHASE  
TANGENT, 0°-30°, SINGLE  
PRIMARY SUPPORT

HARZA ENGINEERING CO., CHICAGO  
APPROVED..... MEDAN

DATE: 4-5-72 DWG. NO. A1





All dimensions in millimeters and inches

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	2 Washer, square 2 1/4"	5	Angle assembly, primary as req'd
2	2 Insulator, suspension, 10"	6	2 Locknut
3	1 Bolt, mach 5/8" x req'd. length	7	1 Secondary, clevis, insulated
4	1 Bolt, eye 5/8"	8	1 Shackle, anchor

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20 KV. PRIMARY,  
1-PHASE 30° TO 60° ANGLE

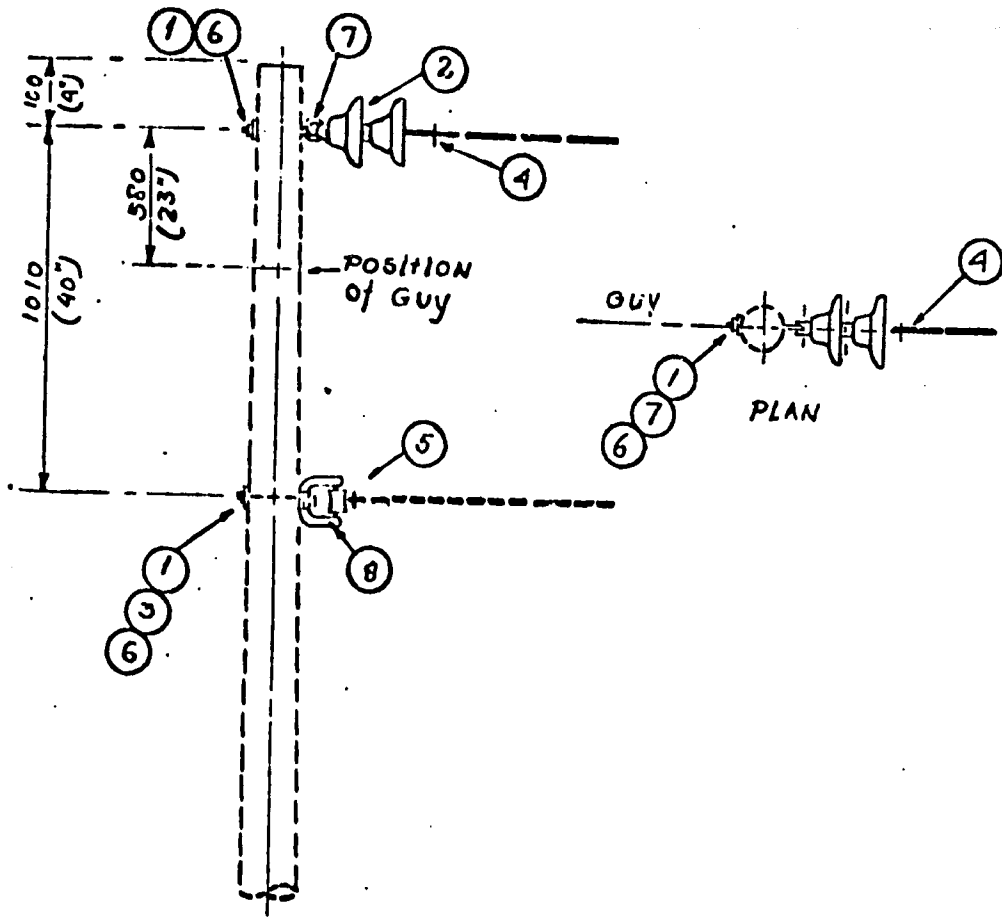
MARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 12-6-72

DWG. NO. A3





Notes:  
All dimensions in millimeters  
and inches.

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	2 Washer, square 2 1/4"	5	Deadend assembly, neutral as req'd
2	2 Insulator, suspension, 10"	6	2 Locknuts
3	1 Bolt, mach 5/8" x req'd length	7	1 Bolt eye 5/8" x length as req'd
4	Deadend assembly, primary as req'd	8	1 Clevis with insulator

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

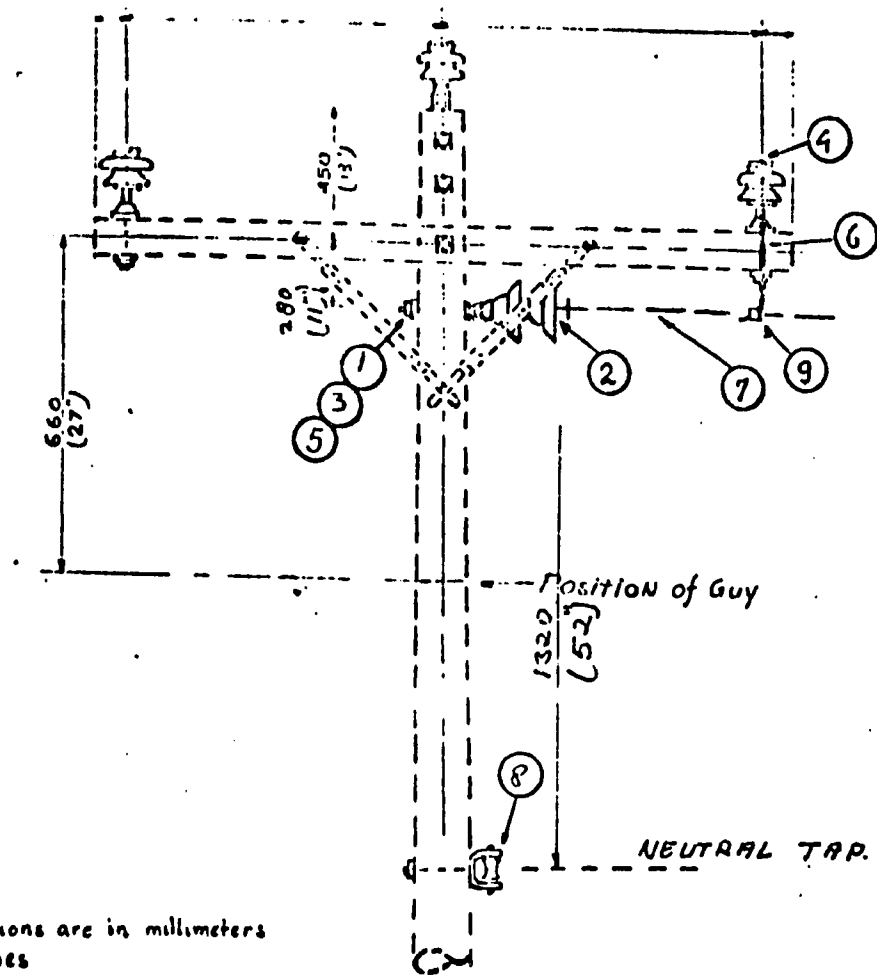
115/20KV PRIMARY  
1-PHASE, DEADEND (SINGLE)

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 12-6-72

DRWG. A 3



**Notes:**

1 All dimensions are in millimeters and inches

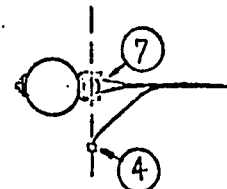
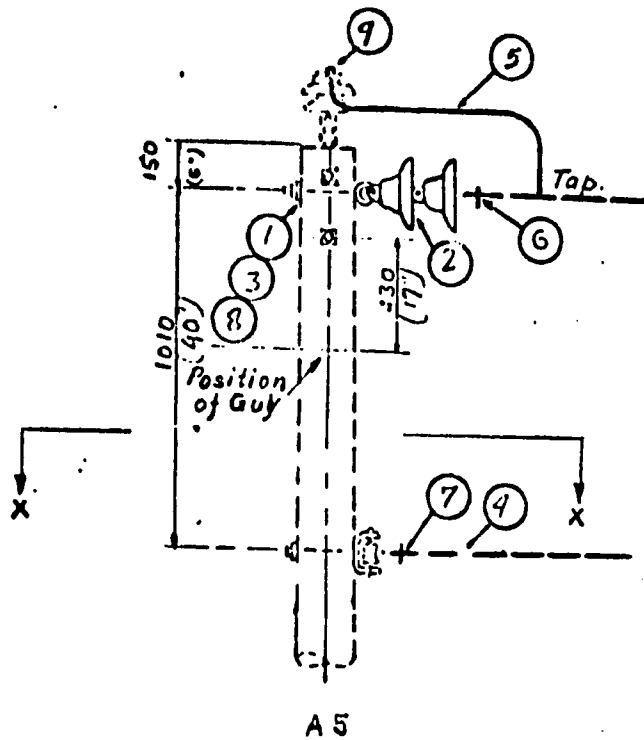
		ASSEMBLY UNIT	
		A 4	
ITEM	MATERIAL	NO	REQ'D
1	Washer square, 2 1/8"	1	
2	Insulator, suspension, 10"	2	
3	Bolt, eye 5/8" x req'd. length	1	
4	Connectors hot line clamp		
5	Locknut	1	
6	Jumpers, as required		
7	Deadend assembly, primary as req'd		
8	Deadend assembly, neutral as req'd		
9	Connector, parallel groove, as required		

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20KV 1-PHASE  
TAP FROM 3-PHASE TANGENT

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE: 21-6-72 DWG. NO. A4



Section X-X

Notes:

1. Assembly may be used with the following drawings: A1, A2, A3
2. All dimensions in millimeters and inches.

ITEM NO.	MATERIAL	ITEM NO.	MATERIAL
1	1 Washer, square, 2 1/4"	6	Drandend assembly, primary as req'd
2	2 Insulator, suspension, 10"	7	Drandend assembly, neutral as req'd
3	1 Bolt eye 5/8" x req'd. length	8	Locknuts
4	Connectors, as required	9	Hot line clamp as required
5	Jumpers, as required		

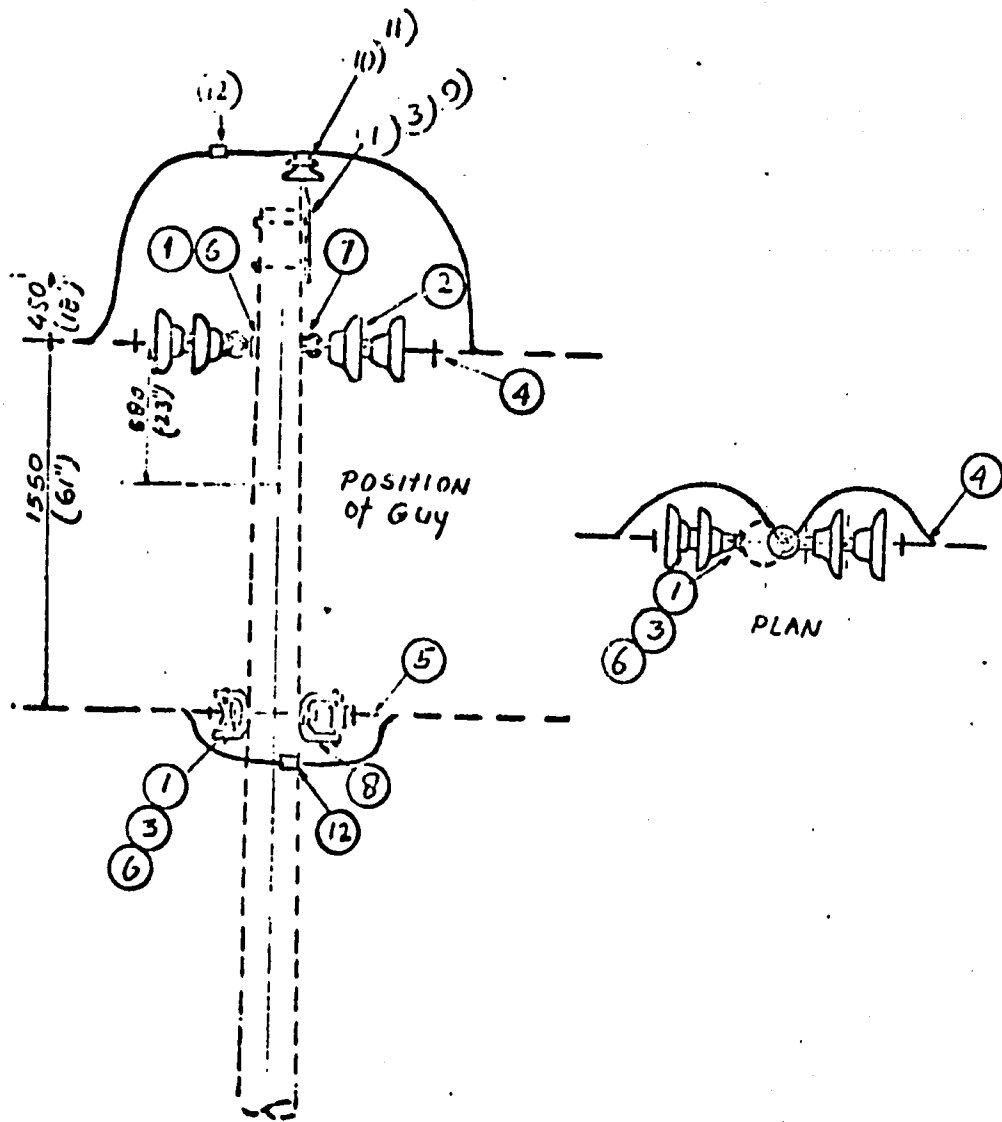
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20 KV PRIMARY  
SINGLE PHASE TAP.

HARZA ENGINEERING CO. CHICAGO

APPROVED.....

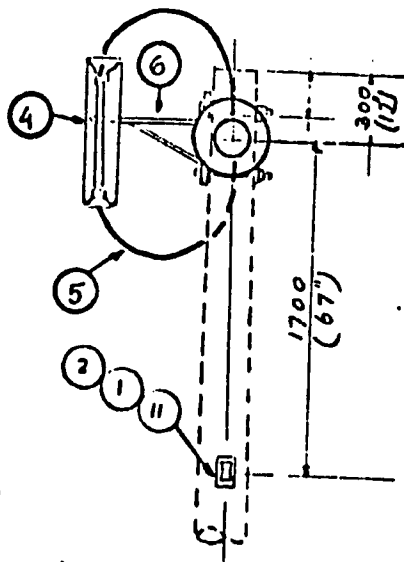
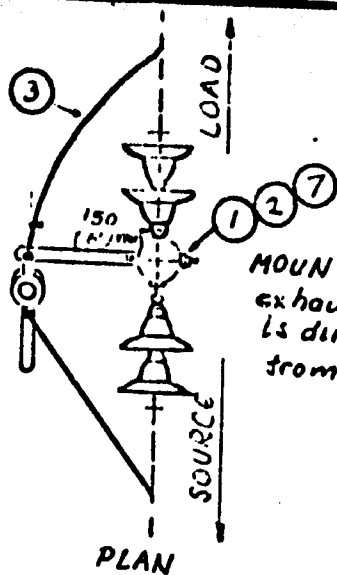
DATE 12-6-72 DWG. NO. A5



Notes:

1. All dimensions are in millimeters and inches
2. Dimensioned for use with 12 meter pole

ITEM NO	MATERIAL	ITEM NO	MATERIAL	
1	4 Washer square 2 1/4"	5	Deadend assembly neutral as reqd	
2	4 Insulator, suspension, 10"	6	1 Nut, eye 5/8"	
3	3 Bolt, mach 5/8" x reqd length	7	1 B.H. eye 5/8" x reqd length	
4	Deadend assembly, primary as reqd	8	2 Clevis, with insulator	
9	2 Locknuts	PERUSAHAAN LISTRIK NEGARA E X P L O I T A S I S U M A T E R A U T A R A  11.5/20KV PRIMARY 1-PHASE, DOUBLE DEADEND  HARZA ENGINEERING CO, CHICAGO APPROVED..... DATE 12-6-72 DWG. NO. 46		
10	1 Pole top pin 20"			
11	1 Pin type insulator			
12	Connectors as required			
REV NO	DATE	REVISION	BY	APPD
1	7-1-72	Added pole top pin		



**Notes.**

1. All dimensions in millimeters and inches.

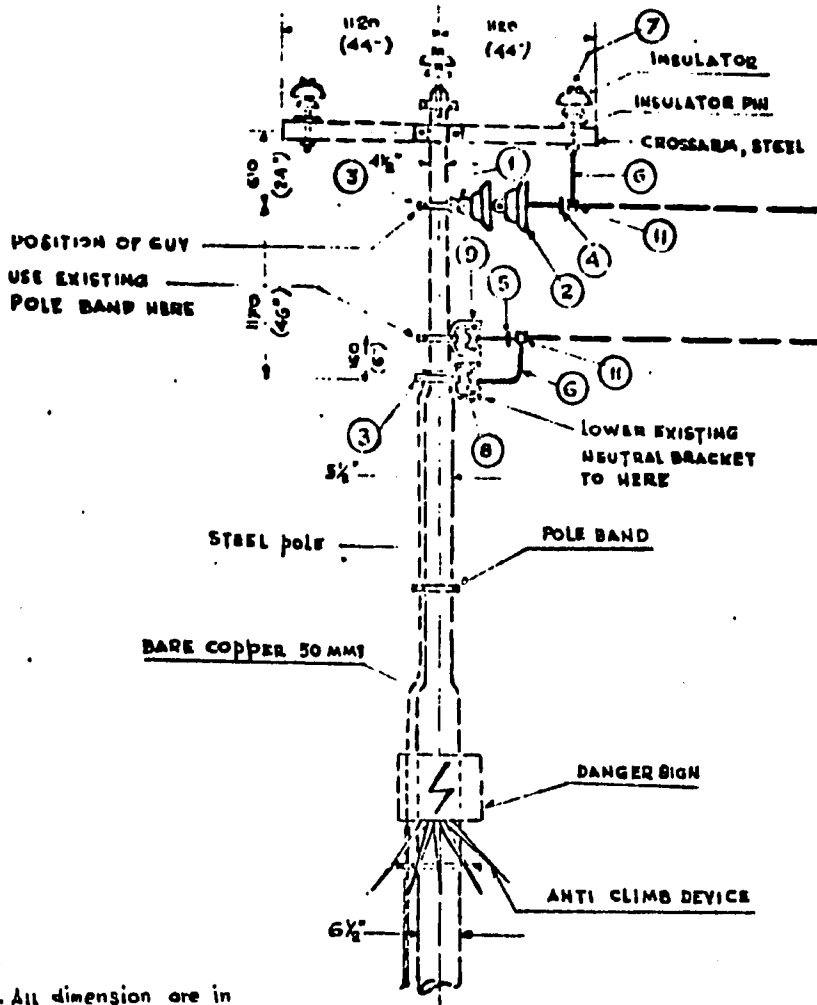
2 Dimensioned for 12 meter pole

ITEM	MATERIAL	NO. REQUIRED
1	Bolt, machine, 5/8" x required length	3
2	Washer, square, 2 1/4"	4
3	Pigtail from deadend	1
4	Cutout, fuse, single shot	2
5	Leads or jumpers as required	1
6	Bracket, extension	2
7	Locknuts 5/8"	2
8	Eyebolt, 5/8"	1
9	Eye nut 3/8"	1
10	Insulator, suspension	4
11	Secondary clevis w/insulator	2

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA  
 11.5/20KV, 1-PHASE ONE  
 SECTIONALIZING FUSE CUTOUT

REV NO	DATE	REVISION	BY	APPR
1	7-4-75	Added insulators to C/A		

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....  
 DATE 12-6-72 DWS:NC A 7



**NOTE :**

1. All dimension are in millimeters and inches
2. Clamp, item 7, shall be installed so aluminum jumpers connection is level with copper conductor

ITEM	No	MATERIAL	ITEM	No.	MATERIAL
1	1	Eye nut, 3/8"	7		Hot line clamp, as req'd
2	2	Insulator suspension 10"	8		parallel clamp, as req'd
3	2	poleband, 4 1/2" for steel pole	9	1	Clevis and insulator
4		Dead end assembly, primary	10		
5		Dead end assembly, neutral	11		Connectors as required
6	2	Al Jumpers, size as required			

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

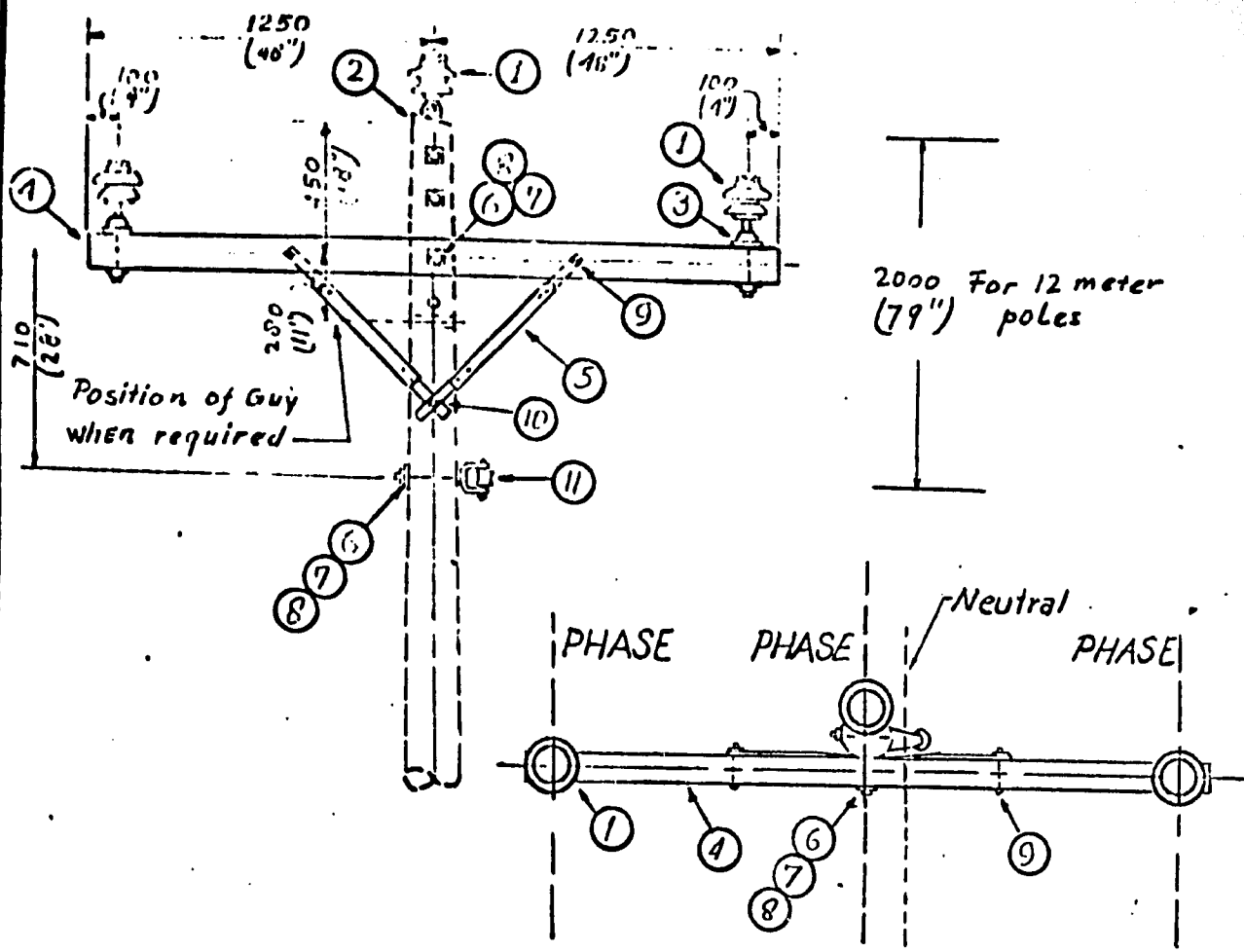
11.5/20 KV PRIMARY  
SINGLE PHASE TAP FROM  
EXISTING THREE PHASE COPPER LINE

**HARZA ENGINEERING CO., CHICAGO**

APPROVED.....

DATE 23 - 9 - 1973 DWG. NO. A - 8





2000 For 12 meter (79'') poles

PLAN

- NOTES:
1. All dimensions are in millimeters and inches
  2. Supplied by OWNER

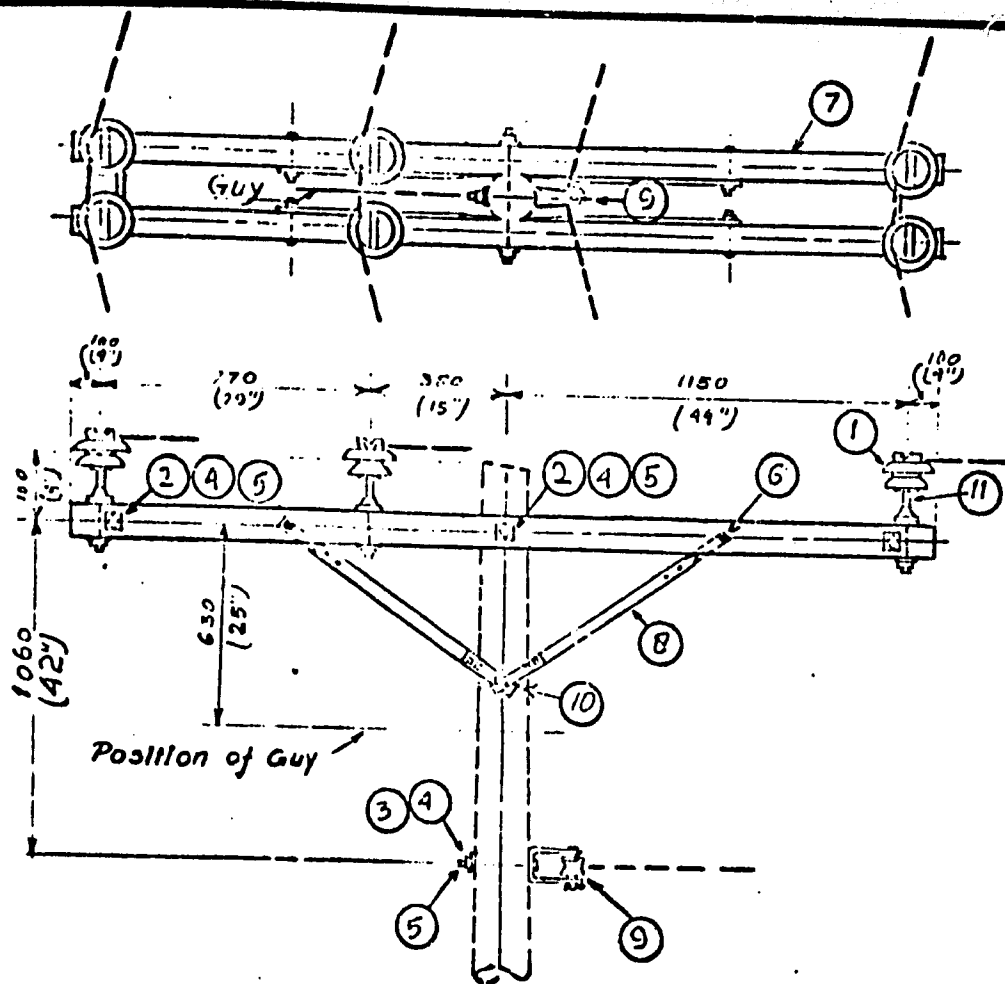
ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	3 Insulator, pin type	7	5 Wa. washer, 2 1/4"
2	1 Pole top pin, 20"	8	4 Locknut
3	2 Pin crossarm, steel, 5/8" x 1 1/2"	9	2 Bolt, Carriage, 3/8" x 4 1/2"
4	1 Crossarm, 3 1/2 x 4 1/2 x 8' 2/	10	1 Screw, Lag 1/2 x 4"
5	2 Brace, wood 2 1/2"	11	1 Sec. clevis W/insulator
6	4 Mach. bolt 5/8" x req. length		

REV NO	DATE	REVISION	BY	APPR
1	2-11-72	Added note re supply of crossarms	llc	llc

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
115/20KV PRIMARY, 3 PHASE TANGENT, 0° - 15° SINGLE CROSSARM CONSTRUCTION	
HARZA ENGINEERING CO., CHICAGO	
APPROVED..... <i>[Signature]</i>	
DATE 4-5-73	Drawn C1



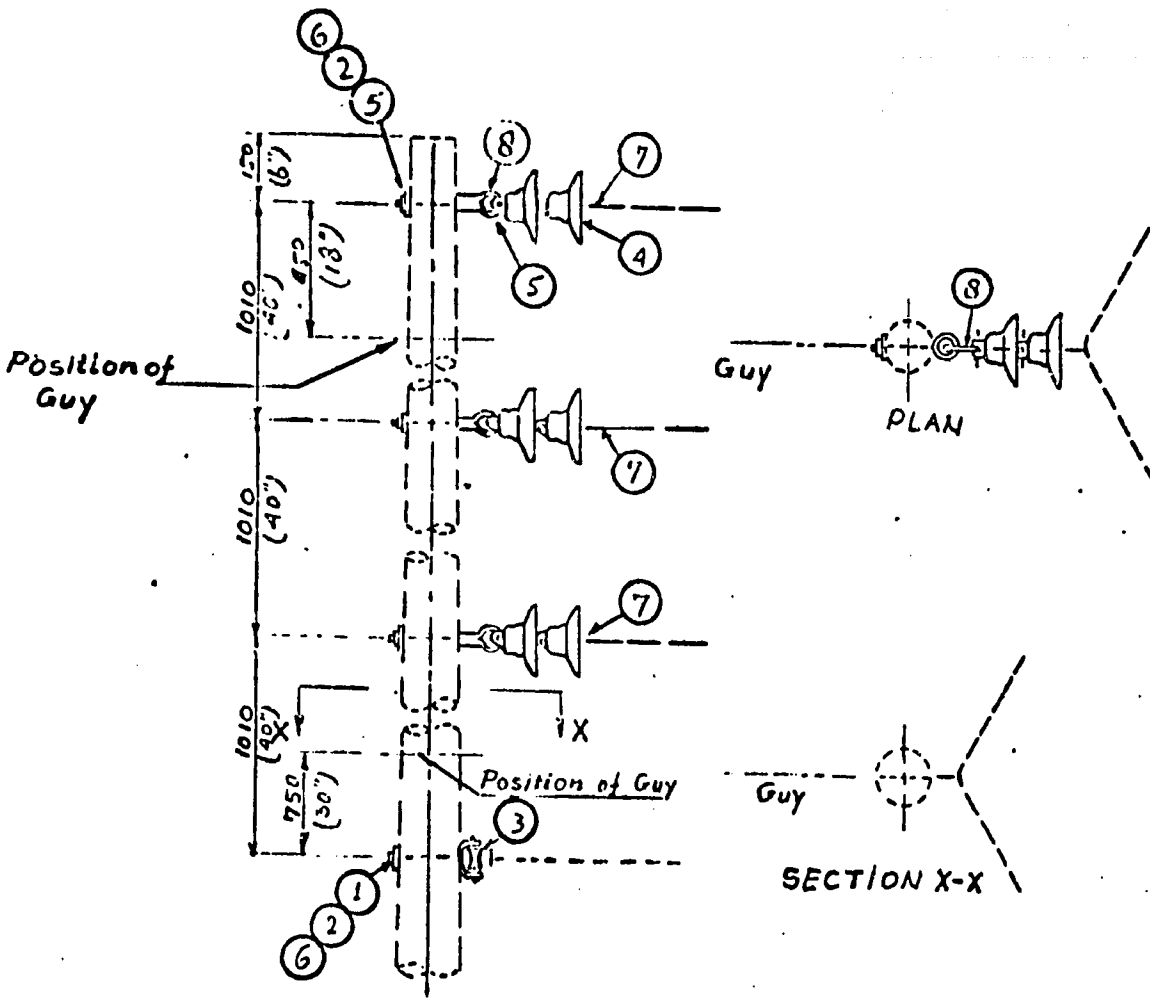
**Notes:**

- 1. All dimensions are in millimeters and inches.
- 2. Supplied by OWNER

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1 6	Insulator, Pin Type	7 2	Crossarm 3'1/2 x 4'1/2 x 8' 2/
2 3	Bolt, double-arming 5/8" x req. length	8 4	Brace, wood 28"
3 1	Bolt, machine 5/8" x req. length	9 1	Sec. clevis with insulator.
4 11	Square washer 2'1/4"	10 1	Bolt, machine 1/2"
5 7	Locknut	11 6	Pin, crossarm 5/8" x 14"
6 4	Bolt, carriage 3/8" x 1/2"		

REV NO	DATE	REVISION	BY	APPR	
1	11-12-72	Added note re supply of crossarms			PERUSAHAAN LISTRIK NEGARA EXPLOITASI SUMATERA UTARA 11.5/20KV 3PHASE CROSSARM CONSTR. DOUBLE PRIMARY SUPPORT MAX. TRANSVERSE LOADING 750 LBS/PIN 15° TO 30° MAX. ANGLE HARZA ENGINEERING CO., CHICAGO APPROVED..... DATE: 1-5-1972 DWG NO. C-2





Noted:

1. All dimensions are in millimeters and inches.

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	1 Bolt, machine $\frac{7}{8}$ " x req'd length	5	3 Bolt, eye $\frac{5}{8}$ " x req'd length
2	4 Washer, square $2\frac{1}{4}$ "	6	4 Locknut
3	1 Clevis, insulated	7	Angle assembly, primary as req'd
4	6 Insulator, suspension $5\frac{3}{4} \times 10$ "	8	3 Shackle, anchor

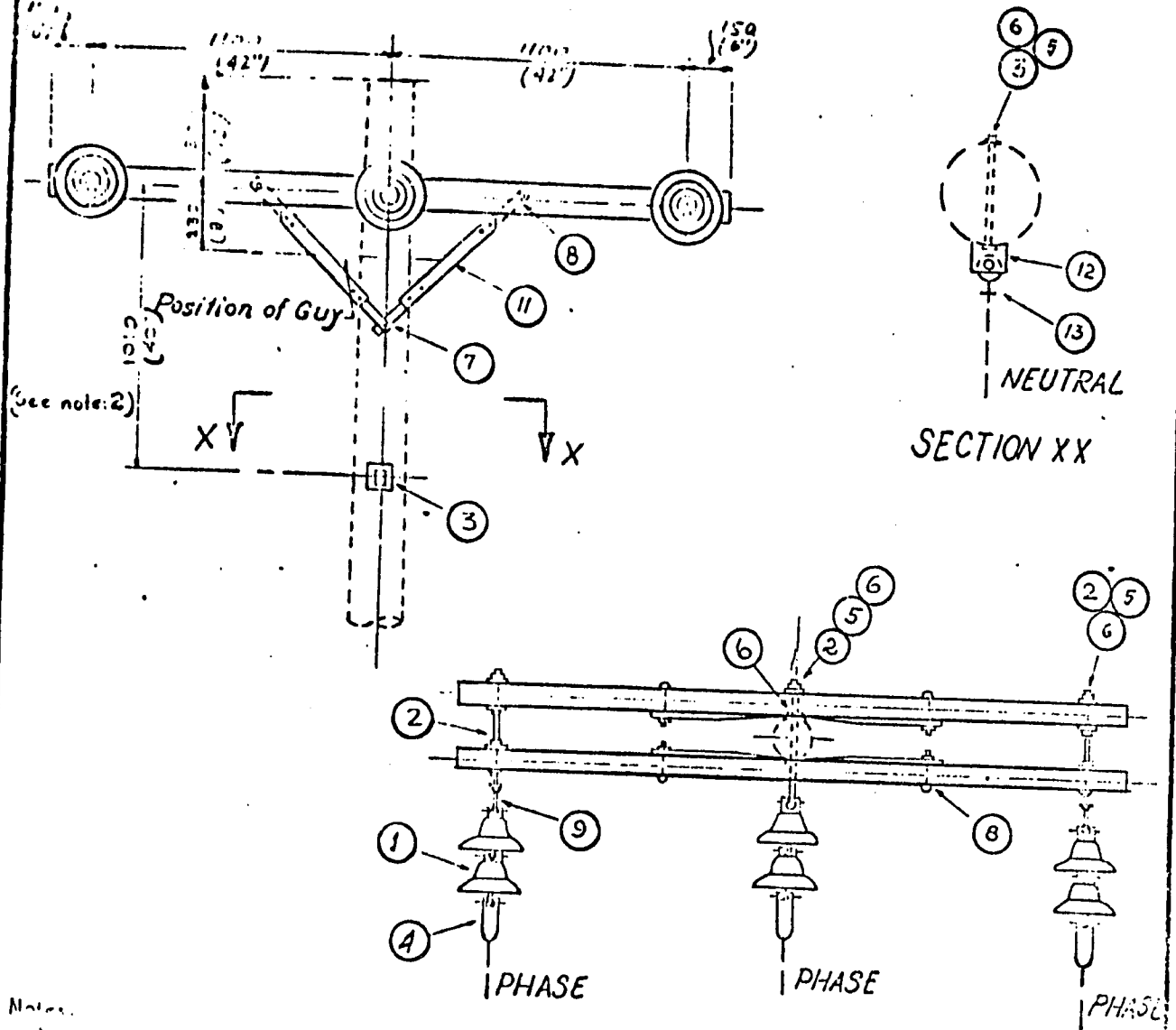
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20KV. PRIMARY, 3 PHASE  
VERTICAL CONSTRUCTION  
30° TO 60° ANGLE

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 4-5-72 DWG. NO. C3



- Notes:
- 1) All dimensions are in millimeters and inches
  - 2) Supplied by OWNER
  - 3) This dimension is 1700 for 12 meter or longer poles

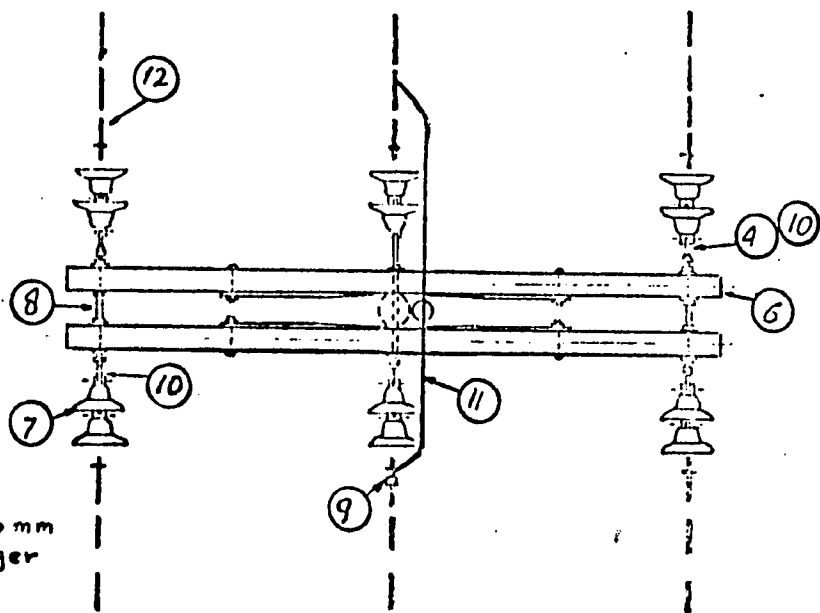
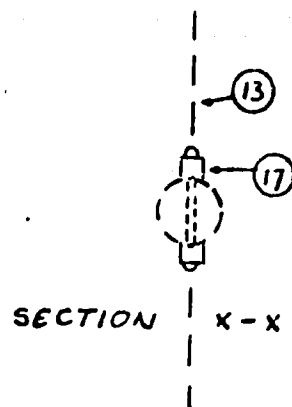
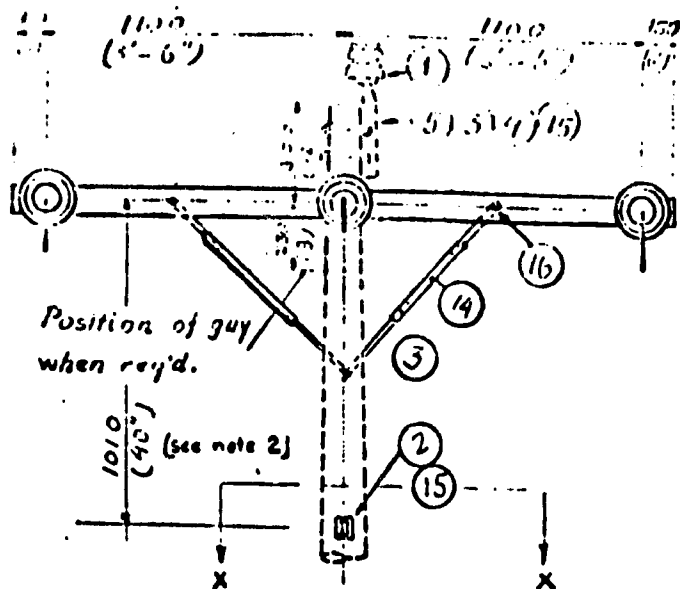
ITEM NO.	MATERIAL	ITEM NO.	MATERIAL
1	Insulator, susp. 5 1/4" x 10"	7	Bolt machine 1/2" x reqd length.
2	Bolt double armung, 5/8" x required length	8	Bolt carriage, 3/8 x 4 1/2"
3	Bolt mach. 5/8" x reqd length	9	Nut eye 5/8"
4	Primary deadend assembly as reqd	10	Crossarm, 3 1/2 x 4 1/2" x 8' 2/
5	11 Sp. washer, 2 1/4"	11	Brace, wood 2 1/2"
6	4 Locknut 3/8"	12	Sec. clevis, w/insulator
		13	Neutral deadend assembly as reqd

NO.	DATE	REVISION	By	APPR
1	10.12.72	Added note re supply of crossarms		

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

11.5/20 KV PRIMARY, 3-PHASE  
 SINGLE DEADEND, CROSSARM  
 CONSTRUCTION

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....  
 DATE 4-5-1972 DWG. NO. C4



**Noted:**

1. All dimensions are in millimeters unless otherwise noted
2. This dimension is 1700 mm for 12 meter or longer poles
3. Supplied by OWNER

ITEM NO.	MATERIAL	ITEM NO.	MATERIAL
1	1 Insulator, pin type	10	6 Nut, eye, 5/8"
2	3 Bolt, machine, 5/8" x req'd length	11	Jumpers or leads as required
3	1 Bolt, machine, 1/2" x req'd length	12	Deadend assembly, primary as req'd
4	12 Washer, square, 2 1/4"	13	Deadend assembly, neutral as req'd
5	1 Pin, pole top 20"	14	4 Brace, crossarm, wood, 28"
6	2 Crossarm, 3 1/2" x 4 1/2" x 8' 0" 3/	15	3 Locknuts
7	12 Insulator, suspension, 10"	16	4 Bolt carriage 7/8" x 4 1/2"
8	3 Bolt, double arming, 5/8" x req'd. length.	17	2 Clevis, secondary, insulated
9	Connectors, as req'd.		

REV NO	DATE	REVISION	BY	APPR
1	20-11-72	Added note re supply of crossarms	6	/

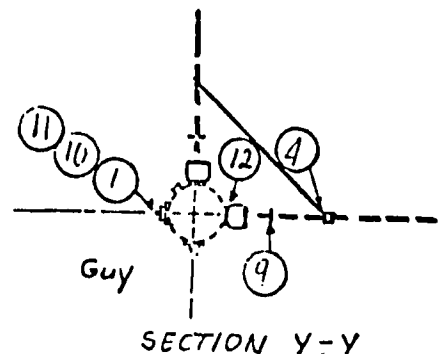
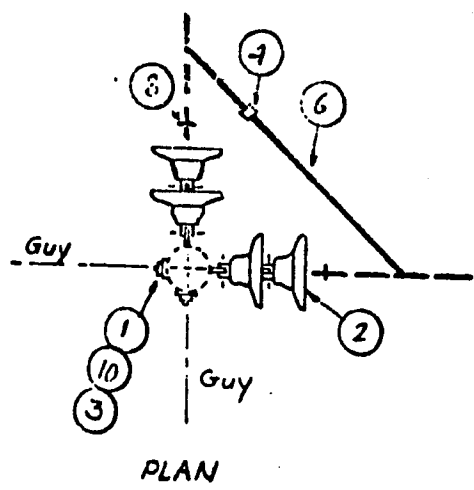
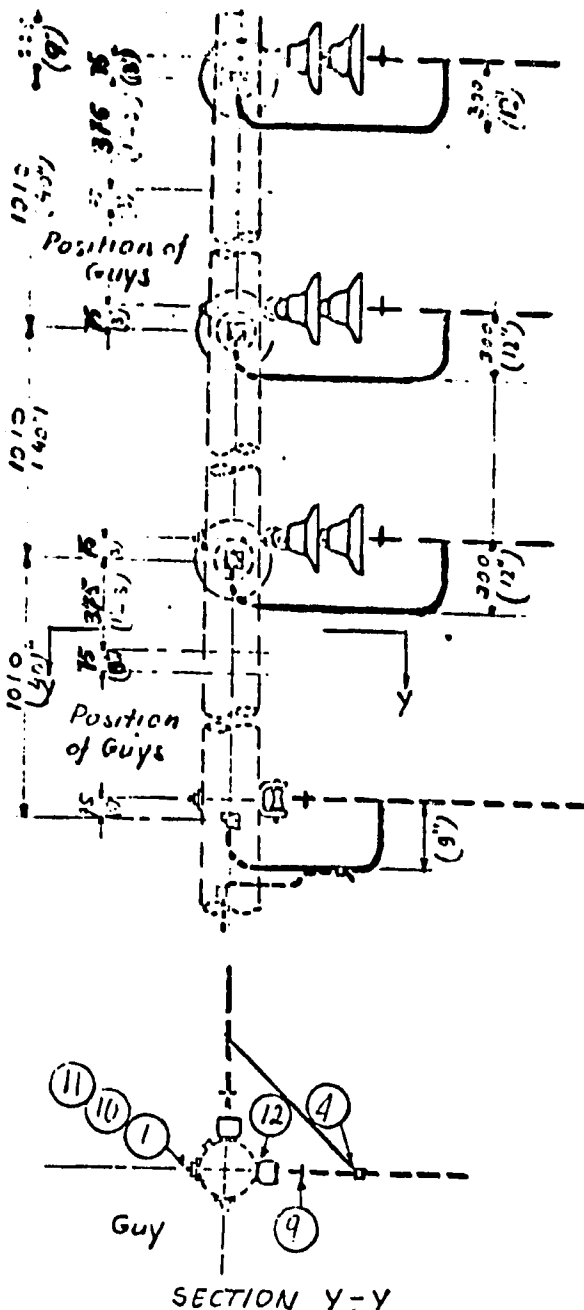
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA LINTAS

11,5/20KV PRIMARY 3-PHASE  
DOUBLE DEADEND CROSSARM  
CONSTRUCTION

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 12-6-72 DWG. NO. C5



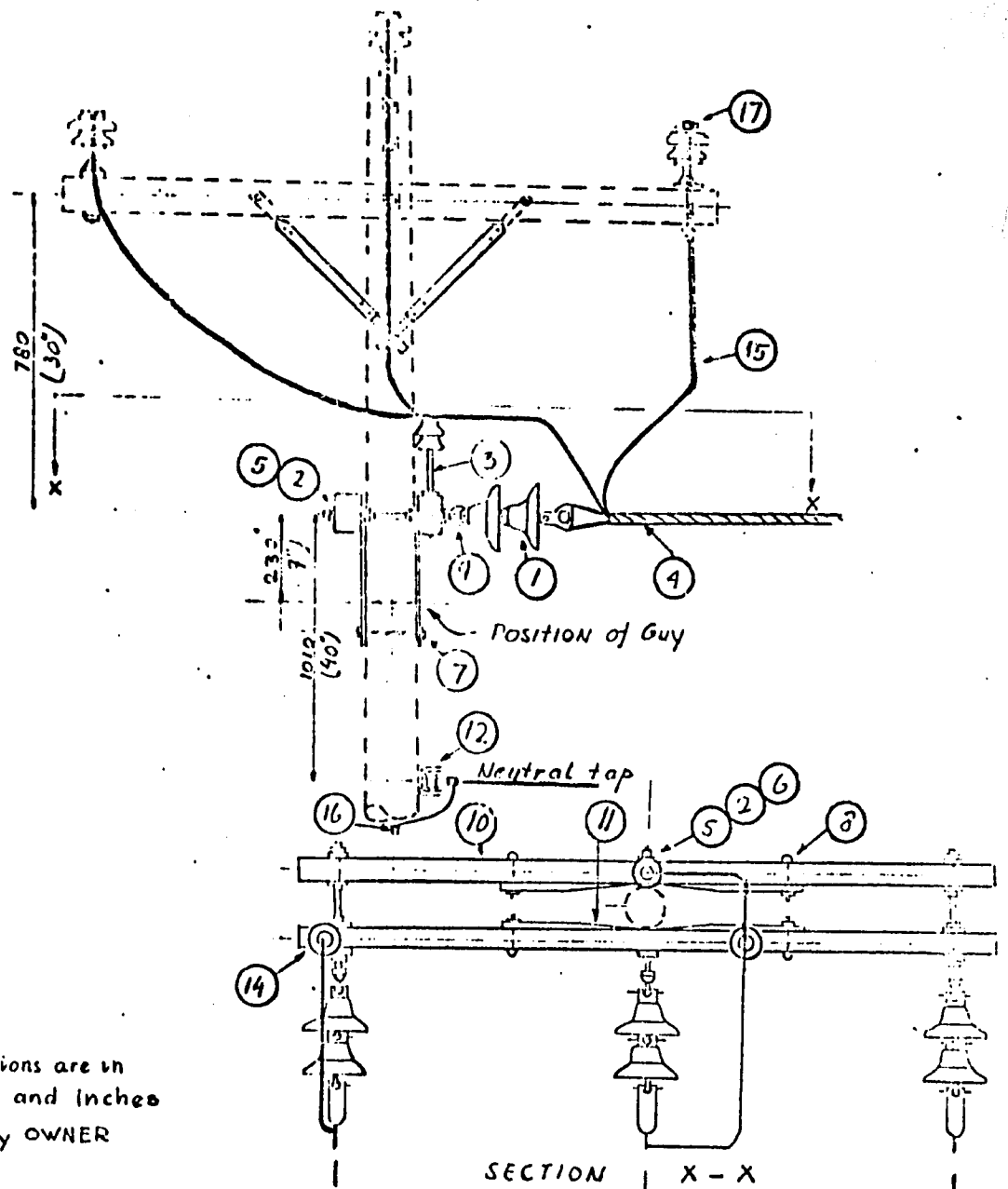
ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	8 Washer, square 2 1/4"	8	Deadend assembly, primary as req'd
2	12 Insulator, suspension, 10"	9	Deadend assembly, neutral as req'd
3	6 Bolt, eye, 5/8" x req'd length	10	8 Locknut
4	Connectors, as required	11	2 Bolt, machine 5/8" x req'd length
6	Jumpers, as required	12	2 Clevis, insulated

Noted:  
1. All dimensions are in millimeters and inches

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA  
11.5/20KV, 3 - PHASE  
VERTICAL CONSTRUCTION  
60° TO 30° ANGLE

HARZA ENGINEERING CO, CHICAGO  
APPROVED.....

DATE 21 - 8 - 72 JUBANG C 6



Notes:

1. All dimensions are in millimeters and inches
2. Supplied by OWNER

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	6 Insulator, susp. 5 3/4" x 10"	8	4 Bolt, carriage, 3/8" x 4 1/2"
2	3 Bolt, double arming, 5/8" x required length	9	3 Nut, eye 5/8"
3	2 Pin insulator 5/8" x 14"	10	2 Crossarm, 3 1/2" x 4 1/2" x 8" 2/
4	Primary dendend as req'd	11	4 Brace, wood 28"
5	10 Sq. washer, 2 1/4"	12	Neutral dendend assembly as req'd
6	3 Locknut		
7	1 Bolt machine 1/2" x req'd length.		

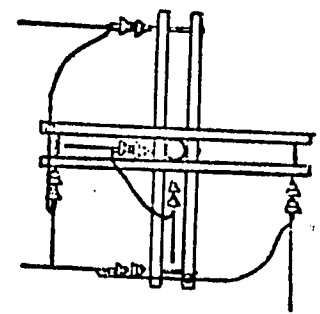
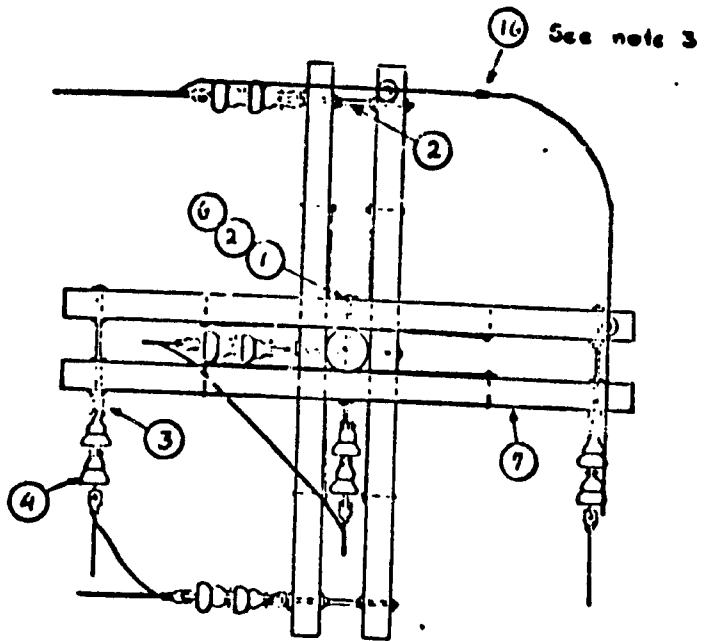
14	2	Insulator pin type		
15	3	Jumpers as required		
16		Connectors as required		
17		Hot line clamps, as req'd.		
REV NO	DATE	REVISION	By	APPR
1	3-22-72	Added note re supply of crossarms	h	

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

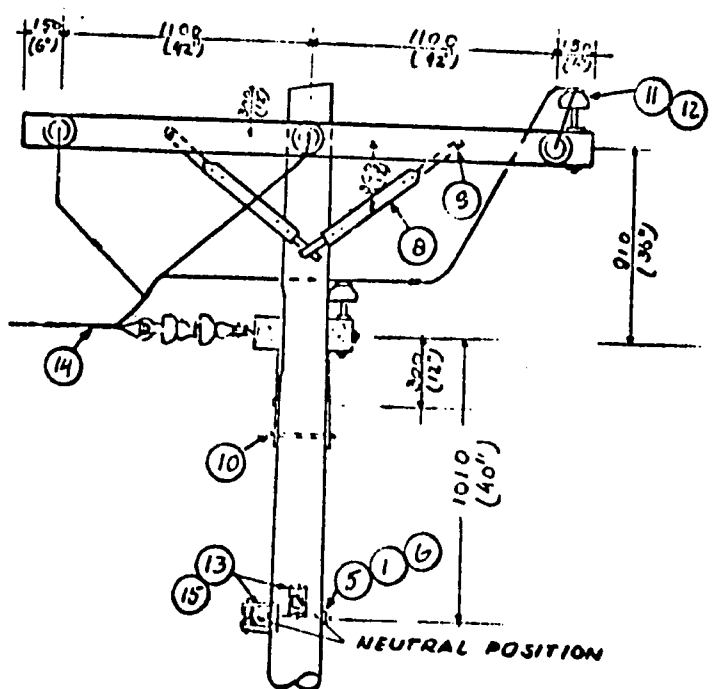
11.5/20KV 3-PHASE  
 TAP FROM 3-PHASE TANGENT.

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....

DATE 12-6-72 DWG. NO. C7



ALTERNATE ARRANGEMENT



- Notes.
1. All dimensions in millimeters and inches
  2. See sheet 2 of 2 for material list.
  3. If 1-bolt parallel groove clamps are used two are required for  $\frac{3}{0}$  or 336.4 MCM AA.

Sheet 1 of 2

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
11.5/20KV 3-PHASE PRIMARY 90° ANGLE CROSSARM CONSTRUCTION
HARZA ENGINEERING CO., CHICAGO
APPROVED.....
DATE 24-8-1972 DWG NO. C 3

ASSEMBLY UNIT

NO	MATERIAL	WHSE NO	QUANTITY REQUIRED
1	WASHER, SQUARE 2 1/4"		22
2	BOLT, DOUBLE ARMING 5/8"		6
3	NUT, OVAL EYE 5/8"		6
4	INSULATOR, SUSPENSION 10"		12
5	BOLT, MACHINE 5/8"		2
6	LOCKNUTS 5/8"		8
7	CROSSARM 3 1/2 x 4 1/2 x 8' 2/		4
8	BRACE, CROSSARM, WOOD 28"		8
9	BOLT, CARRIAGE 3/8" x 4 1/2"		8
10	BOLT, MACHINE 1/2" X REQD LENGTH		2
11	INSULATOR, PIN TYPE		2
12	PIN, INSULATOR 5/8 x 14"		2
13	CLEVIS SECONDARY, INSULATED		2
14	DEADEND ASSEMBLY, PRIMARY		2
15	DEADEND ASSEMBLY, NEUTRAL		as req'd
16	CONNECTORS		as req'd

NOTE

- 1) SEE SHEET 1 OF 2 FOR ASSEMBLY DRAWING
- 2) SUPPLIED BY OWNER

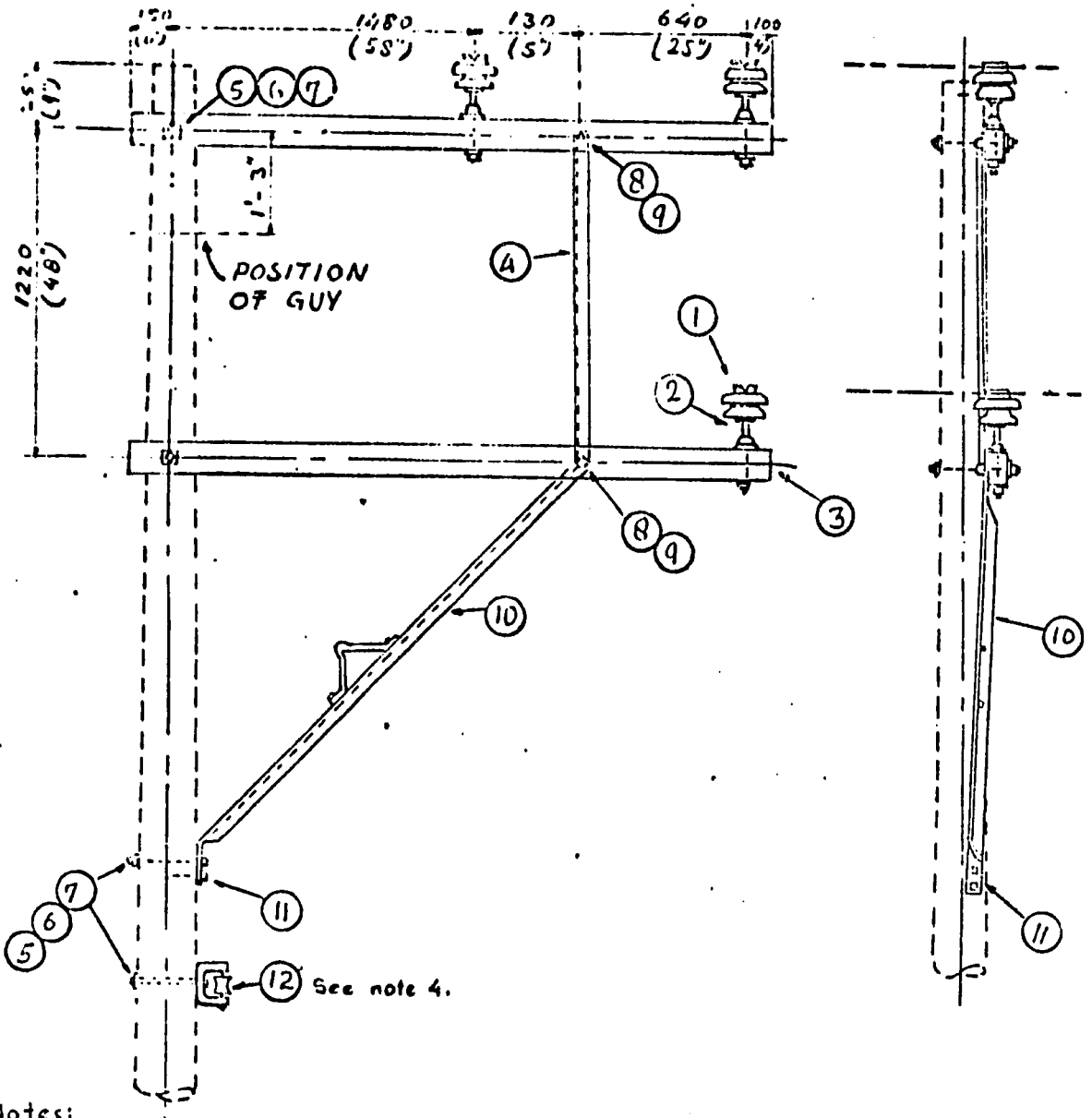
SHEET 2 OF 2

REV NO	DATE	REVISION	BY	APPR
1	30-12-72	Added note re supply of crossarms	le	

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11, 5/20 KV PRIMARY  
90° CORNER ON CROSSARM

HARZA ENGINEERING CO., CHICAGO  
APPROVED... *K. A. Le...* MERAN  
DATE 13, JUNE 1972 DWG. NO. C.8



Notes:

1. Where these assemblies are required, span shall be shortened, as at crossings.
2. Dimensions in millimeters and inches.
3. For material list see sheet 2.
4. The exact location of the neutral must be shown on the work order.

Sheet 1 of 2

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
11.5/20 KV. PRIMARY SIDEARM CONSTRUCTION	
HARZA ENGINEERING CO., CHICAGO	
APPROVED.....	
DATE 12-6-72	DWG. NO. C9



ASSEMBLY UNIT

	C9-1	C9-2	C9-3			
Sidearm Construction						
Single phase one arm	X					
Three phase one arm		X				
Three phase two arms			X			

NO	MATERIAL	WHSE NO	QUANTITY REQUIRED			
1	INSULATOR, PIN TYPE		1	3	3	
2	PIN, INSULATOR 5/8 x 14"		1	3	3	
3	CROSSARM, 3 1/2" x 4 1/2" 2/		1	1	2	
4	BRACE, SIDEARM, VERTICAL				1	
5	BOLT, MACHINE 5/8"		3	3	4	
6	WASHER, SQUARE 2 1/4", 11/16" HOLE		4	4	6	
7	LOCKNUT, 5/8"		3	3	4	
8	BOLT, MACHINE 1/2" x 4 1/2"		1	1	2	
9	WASHER SQUARE 2 1.4", 9/16" HOLE		1	1	2	
10	BRACE, 7" SIDEARM		1	1	1	
11	LAG SCREW 1/2" x 4"		1	1	1	
12	CLEVIS, SECONDARY, INSULATED		1	1	1	

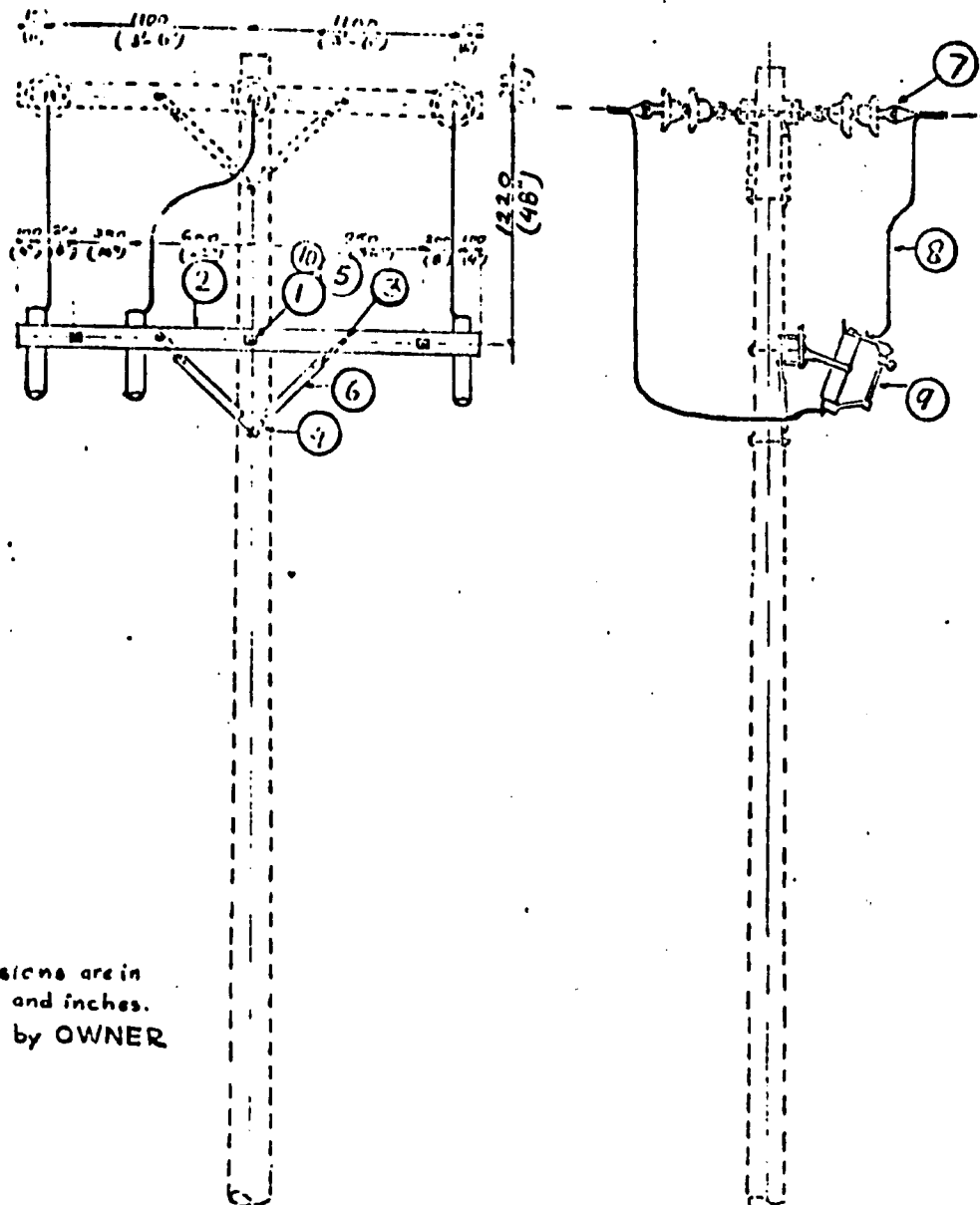
NOTE

- 1) SEE SHEET 1 OF 2 FOR ASSEMBLY DRAWING
- 2) Supplied by OWNER

SHEET 2 OF 2

REV	DATE	REVISION	BY	APP
1	30/12/77	Added note re supply of crossarms		

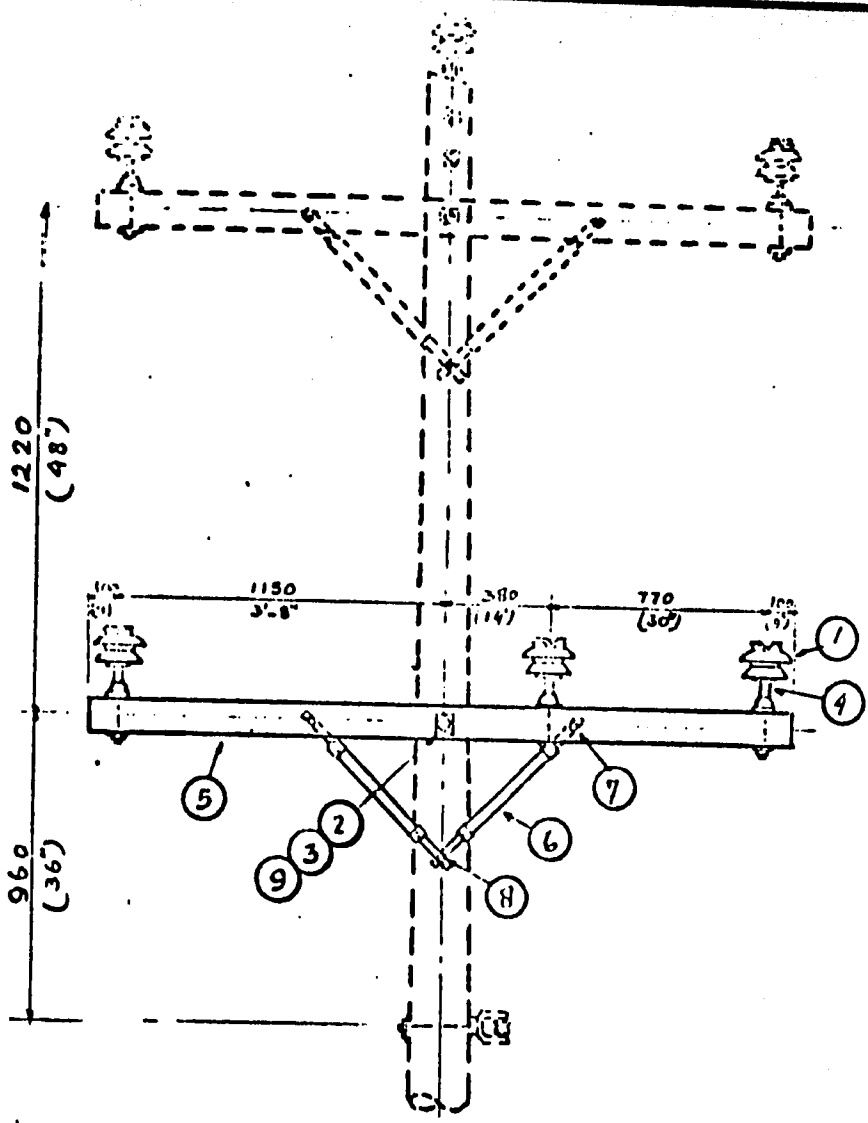
PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA  
 11. 5/20 KV INTERNAL  
 SIDE ARM CONSTRUCTION  
 HARZA ENGINEERING CO, CHICAGO  
 APPROVED: MERAN  
 DATE 13. JUNE 1972 DWG NO. C 9



Notes.

- 1 All dimensions are in millimeters and inches.
2. Supplied by OWNER

NO	MATERIAL	QUANTITY REQUIRED	
1	Bolt, machine 1/8" x req'd length	1	
2	Crossarm, 3 1/2" x 4 1/2" x 8" 2/	1	
3	Bolt, carriage 3/8" x 4 1/2"	2	
4	Screw, lag 1/2" x 4"	1	
5	Washer, square 2 1/4"	2	
6	brace, crossarm, wood 28"	2	
9	Load break 2/0 with bracket	3	
10	Locknut.	1	
REV NO	DATE	REVISION	By APPR
1	30-11-72	Added note re supply of crossarms	18 / [Signature]
			PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
			11.5/20 KV SECTIONALIZING CUTOUT
			HARZA ENGINEERING CO., CHICAGO
			APPROVED..... [Signature] .....
			DATE. 21-8-72 DWG NO. C 10



**Notes:**

- 1. All dimensions are in millimeters and inches
- 2. Supplied by OWNER

ITEM	MATERIAL	ASSEMBLY UNIT		
		C11-1 1.φ NO Reg	C11-2 2φ	C11-3 3.φ NO Reg
1	Insulator, pin type	1	2	3
2	Bolt, machine, 5/8" x req'd length	1	1	1
3	Washer, square, 2 1/4"	2	2	2
4	Pin, crossarm, steel, 2 1/8" x 14"	1	2	3
5	Crossarm 3 1/2" x 4 1/2" x 8' - 0" 2/	1	1	1
6	Brace, wood, 2x8"	2	2	2
7	Bolt, carriage, 3/4" x 4 1/2"	2	2	2
8	Screw, lag, 1/2" x 4"	1	1	1
9	Locknuts	1	1	1

REV NO	DATE	REVISION	By	APPR
1	10-11-72	Added note re supply of crossarms	4	AV

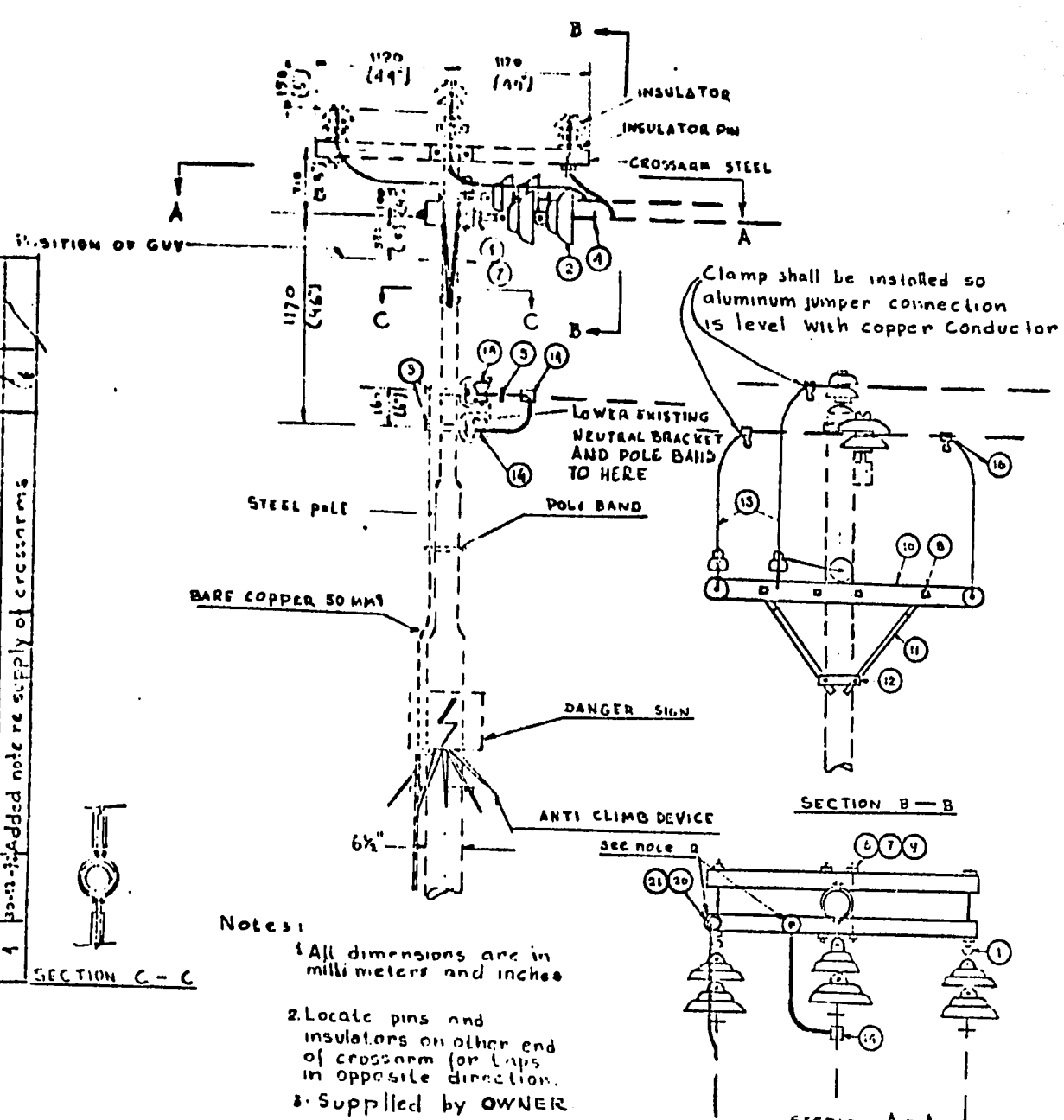
PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

11.5/20KV, 3-PHASE CROSSARM-  
 CONSTRUCTION - DOUBLE CIRCUIT  
 SINGLE PRIMARY SUPPORT AT  
 0° TO 5° ANGLE

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....

DATE 16-6-72 DWG. NO. C.11

REVISION	BY	DATE
1	APPZ	10-11-72
Added note re supply of crossarms		

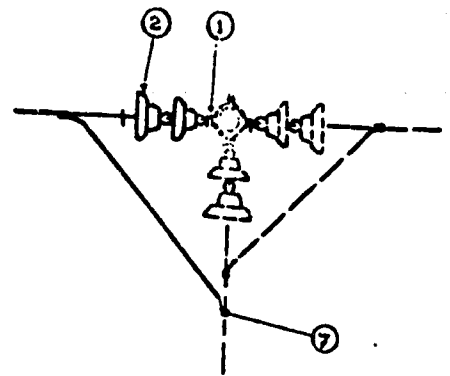
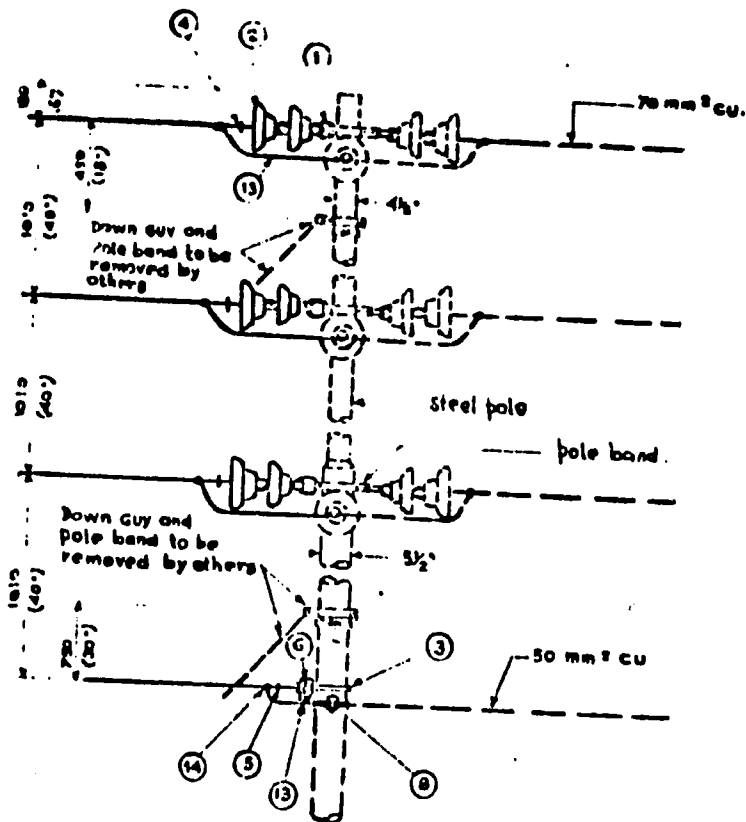


ITEM	No	MATERIAL	ITEM	No.	MATERIAL
1	5	Eye nut, 5/8"	16		Hot line clamp, as req'd
2	6	Insulator suspension 10"	17		
3	2	pole band 4 1/2" for steel pole	18	1	Clevis and insulator
4		Dead end assembly, primary	19		Not used
5		Dead end assembly, neutral	20	2	Insulator, pin type
6	12	lock nut 5/8"	21	2	Insulator, pin steel
7	4	Bolt, double pricing 5/8" x required length			
8	4	Bolt, carriage, 3/8" x 4 1/2" with 1" rd. washer			
9	16	Square washer, 2 1/4"			
10	3	Crossarm 3 1/2" x 4 1/2" x 8'-0", wood			
11	4	Splice, wood, 28"			
12					
13	4	Aluminum jumpers, size as required.			
14	4	Connections as required.			

PERUSAHAAN LISTRIK NEGARA  
EKSPLOITASI I SUMATERA UTARA

11.5/20KV PRIMARY  
THREE PHASE TAP FROM  
EXISTING THREE PHASE COPPER LINE

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....  
DATE 23 - 9 - 1972 DWG. NO. C - 12



**NOTE :**

- All dimensions are in millimeters and inches

ITEM	No.	MATERIAL
1.	3	Chain link, 1/2"
2.	6	Insulator suspension 10"
3.	1	pole band 5 1/2" for Steel pole
4.		Dead end assembly, primary
5.		Dead end assembly, neutral
6.	1	Clevis and insulator
7.		Hot line clamp, as req'd
8.	2	parallel clamp 80 mm² cu. to 3/0 AWG. AL.
9.		
10.		
11.		
12.		
13.	4	Aluminum jumpers, size as required.
14.	4	Connectors as required.
15.		

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

11.5/20 KV PRIMARY  
 THREE PHASE VERTICLE TAP FROM  
 EXISTING THREE PHASE COPPER LINE

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....  
 DATE 23-9-1972 DWG. NO. C-13

<u>ASSEMBLY</u>	<u>APPLICATION</u>	<u>CONDUCTOR SIZE</u>	<u>CODE NAME</u>
<u>UNIT</u>		<u>AND DESCRIPTION</u>	
D1-1	Primary	336.4 MCM AA, Bare	Tulip
D2-1	Primary	3/0 AWG AA, Bare	Phlox
D2-2	Secondary	3/0 AWG AA, Bare	Phlox
D3-1	Primary	1/0 AWG AA, Bare	Poppy
D3-2	Secondary	1/0 AWG AA, Bare	Poppy
D4-1	Primary	2 AWG AA, Bare	Iris
D4-2	Secondary	2 AWG AA, Bare	Iris
D5	Secondary	4 AWG AA, Bare	Rose
D6	Secondary	2 AWG AA, Duplex	Doberman/XLP
D7	Secondary	1/0 AWG AA, Triplex	Kibe - Neretina/XLP
D8	Secondary	2 AWG AA, Triplex	Kench - Conch/XLP
D9	Secondary	4 AWG AA, Triplex	Oyster/XLP
D10	Secondary	6 AWG AA, Duplex	Collie/XLP
D11	Secondary	3/0 AWG AA, Quadruplex	Kopeck - Suffolk/XLP
D12	Secondary	1/0 AWG AA, Quadruplex	Kibe - Costena/XLP
D13	Secondary	2 AWG AA, Quadruplex	Kench - Palomino/XLP
D14	Secondary	4 AWG AA, Quadruplex	Kaki - Hackney/XLP
D15	Secondary	6 AWG AA, Quadruplex	Kazoo - Morochuca/XLP
D16	Control Cable	Self-supported 12 pair, 19 AWG Cu	

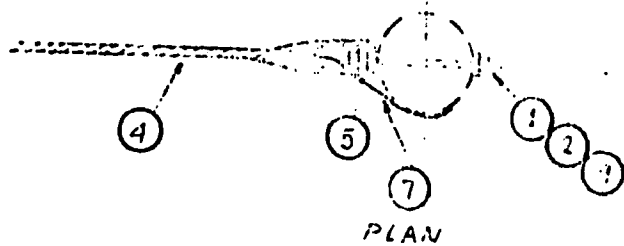
Items D 6 through D 15 may be used as service cables or secondary cables.

<u>U.S. Size</u>	<u>Metric Equivalent</u>
	mm <sup>2</sup>
336.4 MCM	170
3/0 AWG	85
1/0 AWG	54
2 AWG	35
4 AWG	20
6 AWG	13
19 AWG	0.65

1	17-2 '73	Added D16		
Rev. No.	Date	Revision	By	App.

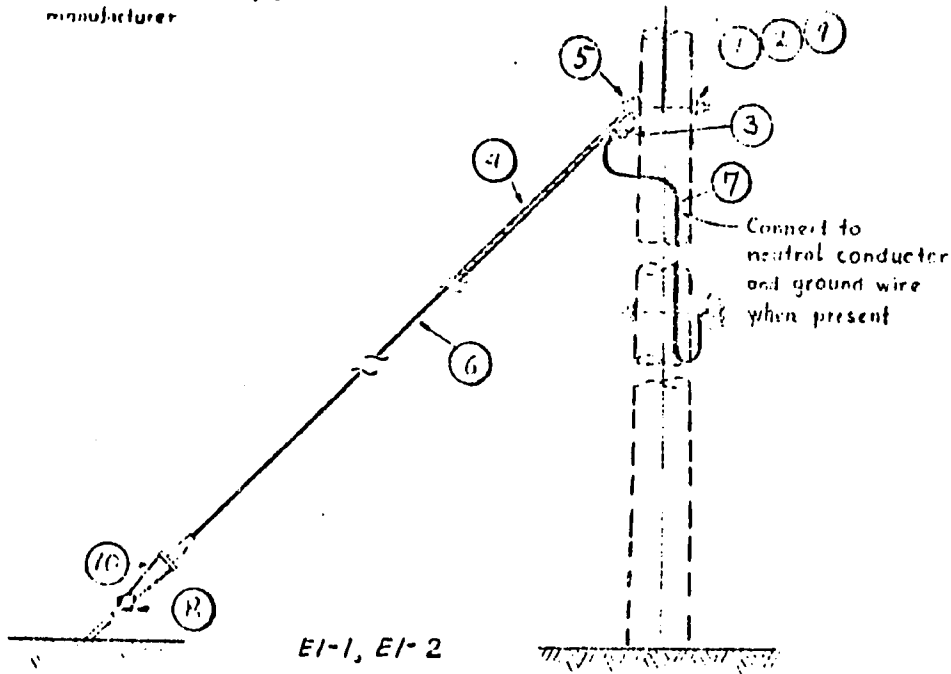
Superseded D1 dated 18 Oct. 1972

PERUSAHAAN UMUM LISTRIK NEGARA	
OVERHEAD CONDUCTORS AND SERVICES	
HARZA ENGINEERING CO., CHICAGO	
APPROVED.....	
DATE 23 Jan. '73	DWG. NO. D 1



Notes:

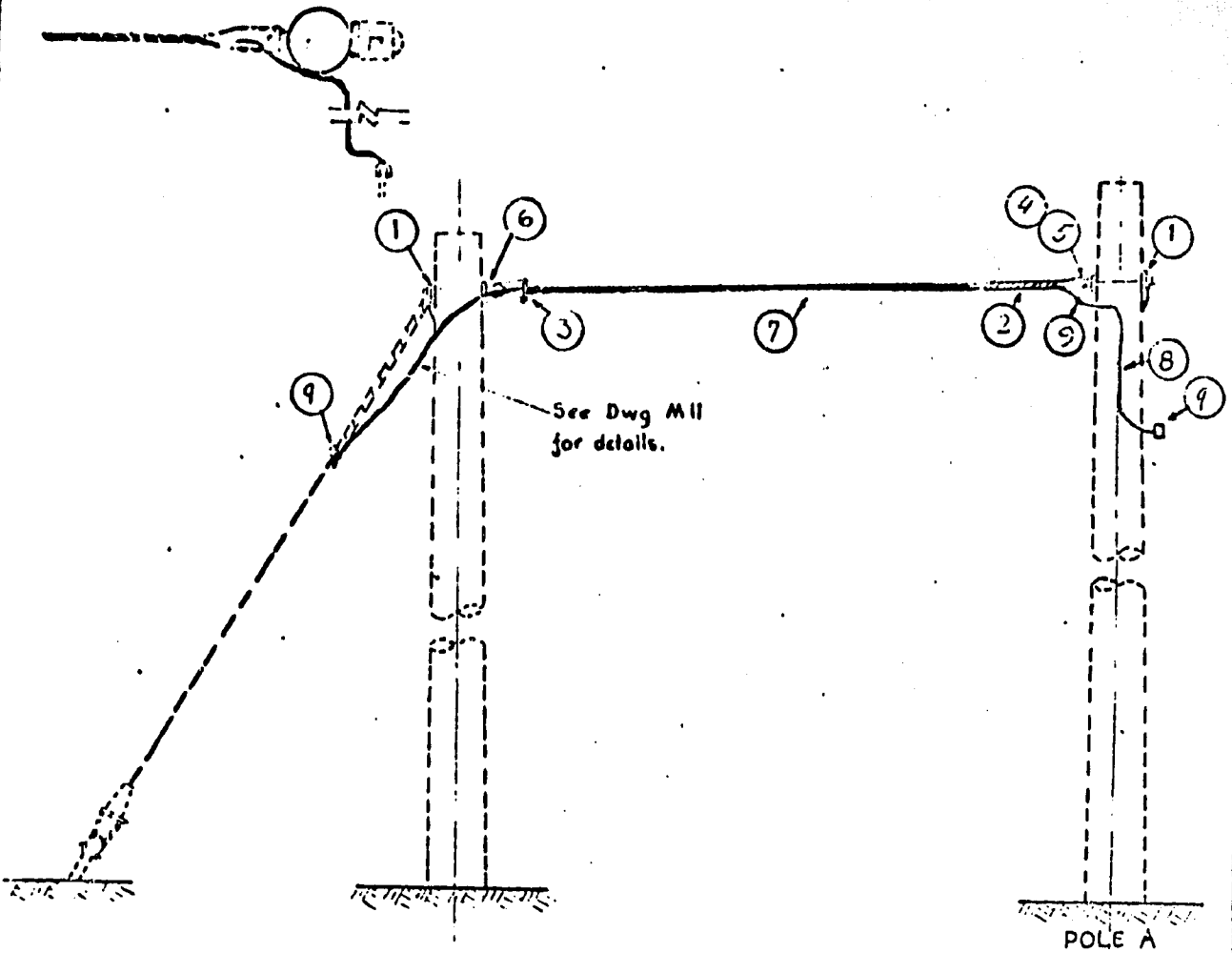
- 1. Forged type grips may be used only with suitable attachments (item 5) as recommended by grip manufacturer



ITEM	MATERIAL	ASSEMBLY UNIT	
		EI-1 1/4" Guy Wire	EI-2 3/8" Guy Wire
		Nº REQ'D	Nº REQ'D
1	Bolt, machine, 5/8" x required length	1	1
2	Washer, 1/4" square	1	1
3	Connectors	as req'd	as req'd
4	Deadend for guy strand preformed	1	1
5	Guy attachment	1	1
6	Guy wire H.S. 7 strand	req'd length	req'd length
7	Jumpers, #24 Al	1	1
8	Clamp and/or rod bonding	1	1
9	Locknut	1	1
10	Dead end for guy strand automatic	1	1

PERSONNEL NOT TO BE  
EXPOSED TO HAZARDOUS  
SINGLE DOWN GUY  
MARZA ENGINEERING CO., CHICAGO  
APPROVED.....  
DATE: 21-8-72 SIGNED: EI

PLAN of POLE A



ASSEMBLY UNIT				
E2-1	E2-2			
1/4"	3/8"			

NO	MATERIAL	WHSE NO	QUANTITY REQUIRED			
1	Washer, square 2 1/4" x 1/16" hole		1	1		
2	Deadend for guy strand preformed		1	1		
3	Deadend for guy strand automatic		1	1		
4	Guy attachment		1	1		
5	Nut, machine 3/8"		1	1		
6	Nut, thimble eye 3/8"		1	1		
7	Guy wire, HS 7-strand		required length		Average 20 meters	
8	Dumper, # 4 AA		1	1		
9	Connectors as required.					

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI 1 SUMATERA UTARA

SINGLE SPAN GUY

HARZA ENGINEERING CO., CHICAGO

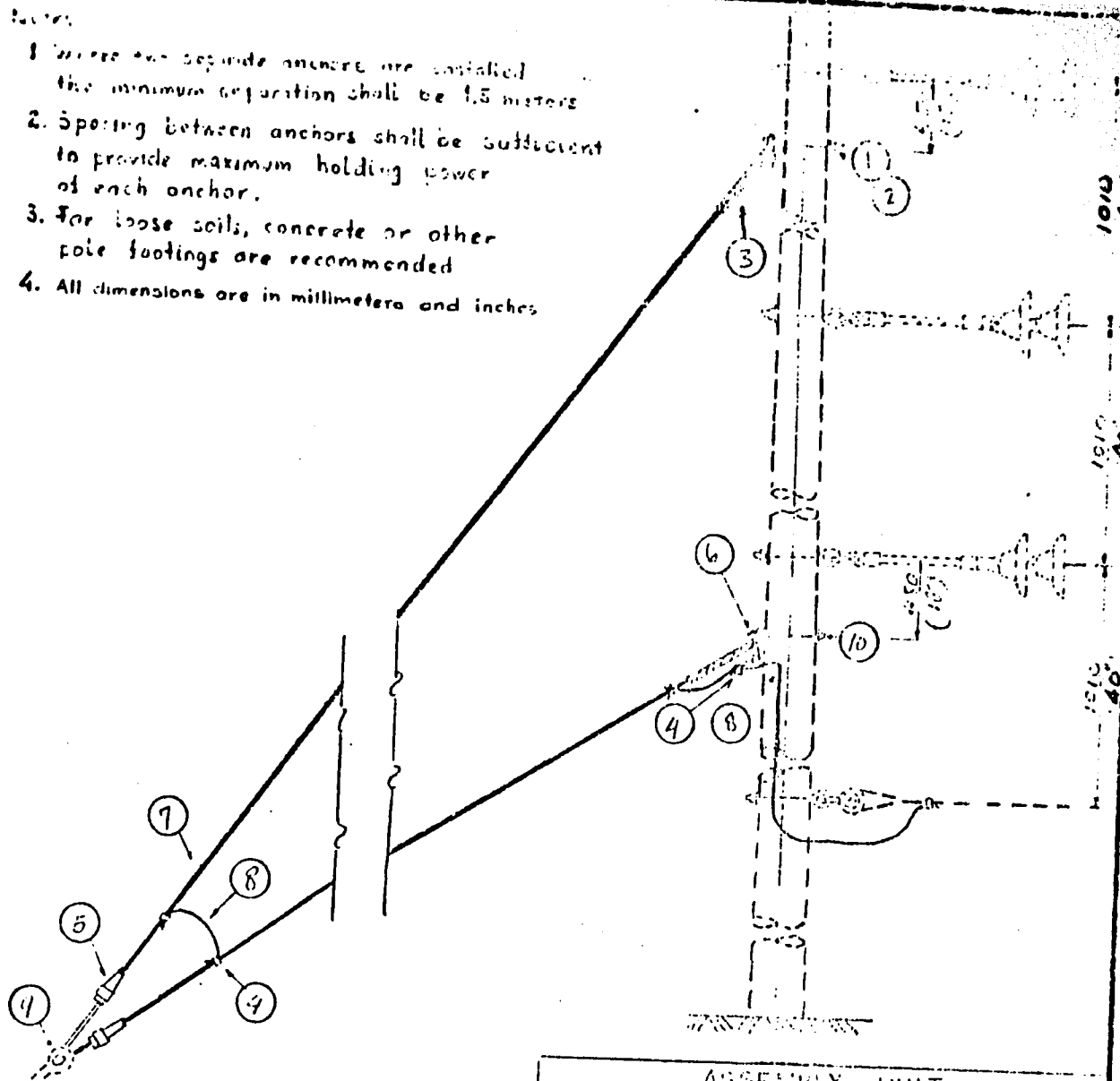
APPROVED.....

DATE 12-6-72 DWG. NO. E.2



Notes:

1. Where two separate anchors are installed the minimum separation shall be 1.5 meters
2. Spacing between anchors shall be sufficient to provide maximum holding power of each anchor.
3. For loose soils, concrete or other pole footings are recommended
4. All dimensions are in millimeters and inches



ITEM	MATERIAL	ASSEMBLY UNIT	
		E3-1. 1/4" GUY WIRE	E3-2. 3/8" GUY WIRE
		No. Required	No. Required
1	Bolt, machine, 5/8" x required length	2	2
2	Washer square 2 1/4"	2	2
3	Terminal for guy strand, preformed	2 (1 long, 1 short bolt)	2
4	Connectors, as required		
5	Deadend for guy strand, automatic	2	2
6	Guy attachment, Mall Iron	2	2
7	Guy wire, HS, 7 Strand (Average 28 meters)	required length	required length
8	Jumpers, No. 4 stranded Al. alloy or equiv.	as required	as required
9	Clamp, guy bonding for double eye rod	1	1
10	Locknut	2	2

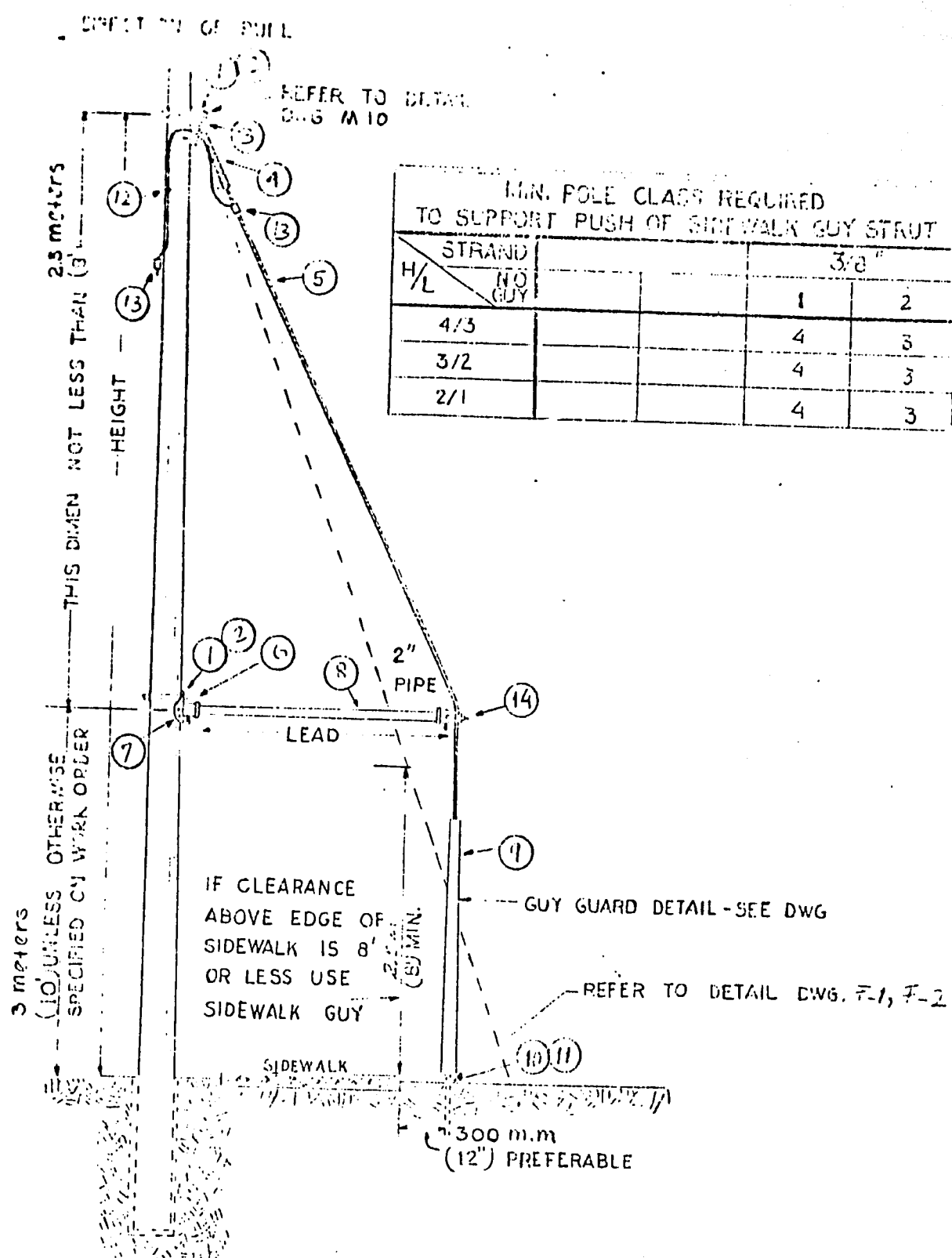
PERUSAHAAN LISTRIK, NEGARA  
 EKSPLOITASI I SUMATERA UTARA

115/20 KV TWO GUY  
 GUYS.

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 12-6-74 DRAWING E3



MIN. POLE CLASS REQUIRED TO SUPPORT PUSH OF SIDEWALK GUY STRUT

STRAND H/L	NO GUY	3/8"	
		1	2
4/3		4	3
3/2		4	3
2/1		4	3

Sheet 1 of 2  
See sheet 2 for material list

PERUSAHAAN LISTRIK BELAKANG  
EKSPLOITASI I SUMATERA UTARA

**SIDEWALK GUY**

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE 2-9-1968 DWGNO. EA

ASSEMBLY UNIT

Guy Strand size

E4-1	E4-2
1/4"	3/8"

NO	MATERIAL	WIRE NO	QUANTITY REQUIRED		
1	BOLT, MACHINE 5/8"		2		
2	WASHER, SQUARE 2 1/4"		2		
3	FITTING, GUY ATTACHMENT		1		
4	DEADEND, GUY, PREFORMED		1		
5	STRAND, GUY AS REQUIRED		3/8"	Average	13 meters
6	FITTINGS, SIDEWALK GUY CHANCE 0501		1		
7	SCREW LAG, 1/2 X 4		1		
8	PIPE, 2" AS REQUIRED		1		
9	GUARD GUY, PLASTIC, AS REQUIRED		1		
10	DEADEND, GUY, AUTOMATIC		1		
11	CLAMP, GUY BONDING		1		
12	JUMPER / / 4 AA		1		
13	CONNECTOR, AS REQUIRED		1		
14	FITTING, SIDEWALK GUY CHANCE 0502		1		

NOTE

1) SEE SHEET 1 OF 2  
FOR ASSEMBLY DRAWING

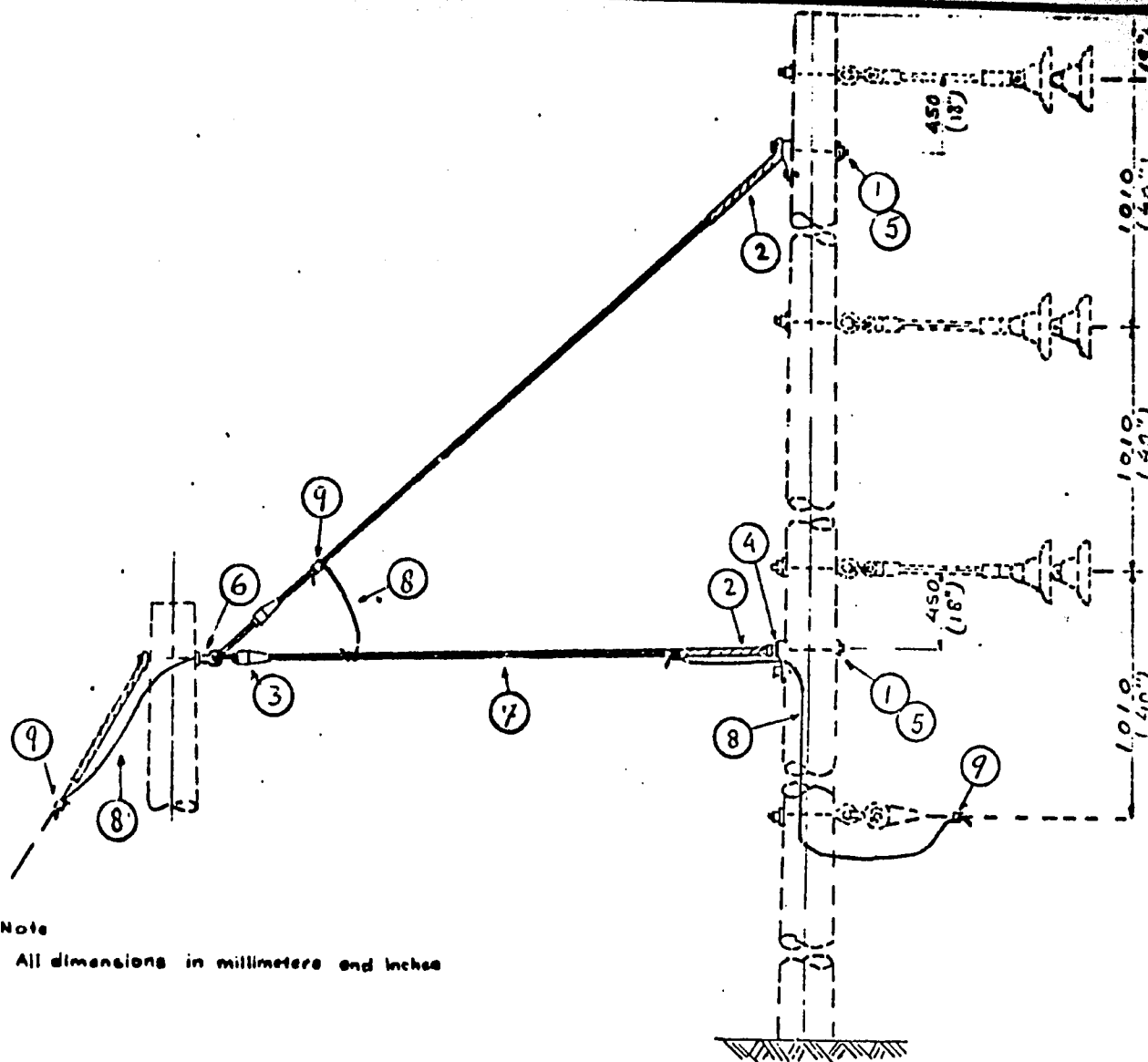
SHEET 2 OF 2

REV NO	DATE	REVISION	BY	APPR

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

SIDEWALK GUY

HARZA ENGINEERING CO, CHICAGO  
APPROVED... NEDAN  
DATE 13 JUNE 1972, DUNGS E 4



Note  
All dimensions in millimeters and inches

ITEM	MATERIAL	ASSEMBLY UNIT	
		E 5 - 1 1/4" GUY WIRE	E 5 - 2 3/8" GUY WIRE
1	Washer, square 2 1/4" x 1/16" hole	2	2
2	Deadend for guy strand preformed	2	2
3	Deadend for guy strand automatic	2 (1 long, 1 short bail)	2 (1 long, 1 short bail)
4	Guy attachment	2	2
5	Bolt, machine 5/8"	2	2
6	Nut, twineye 5/8"	1	1
7	Guy wire, HS. 7-strand Average 40 meters	required	length.
8	Jumper, # 4 AA or equal	2	2
9	Connectors as required.		

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20 KV DOUBLE SPAN GUY  
THROUGH BOLT TYPE

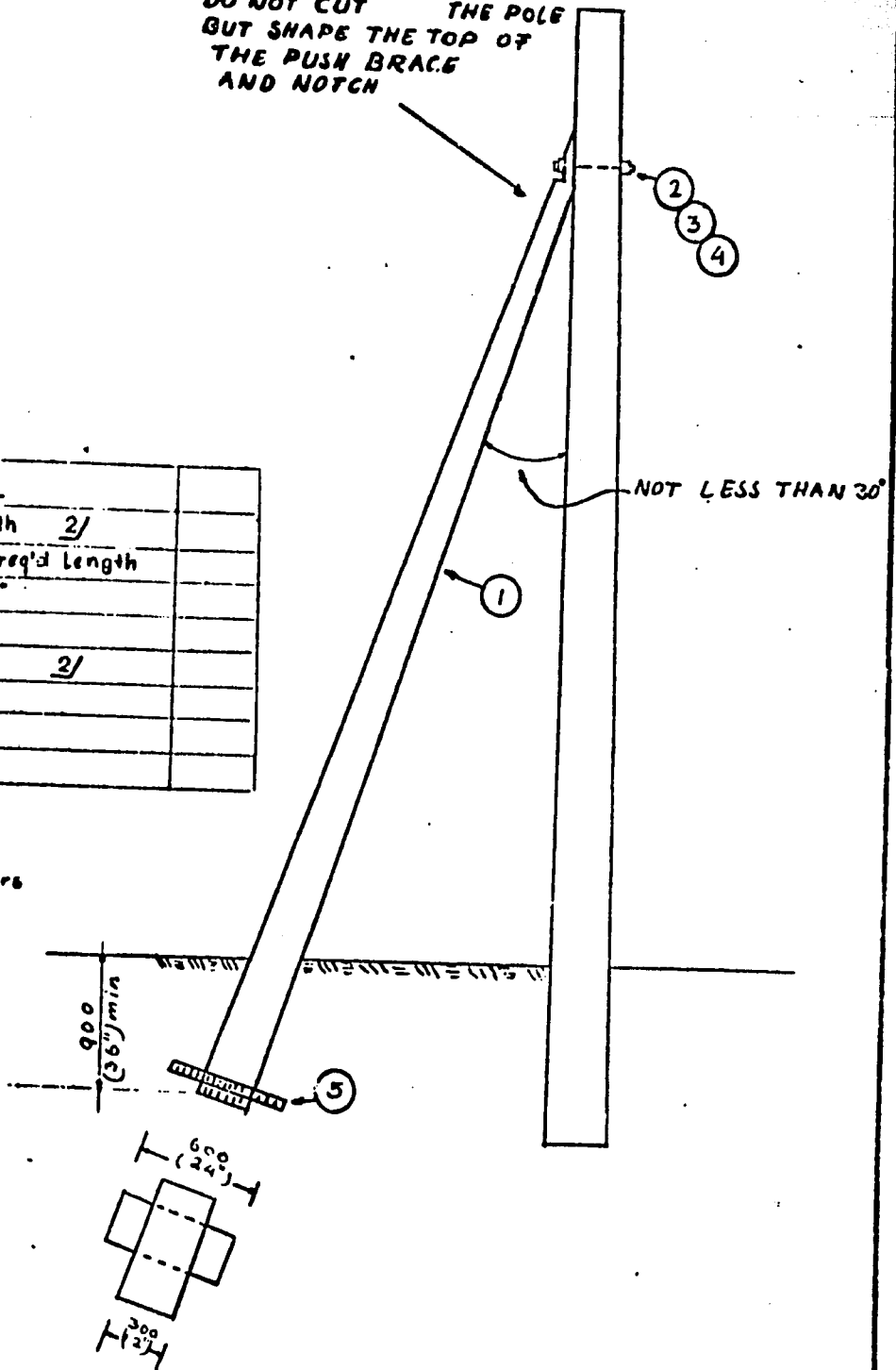
HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE, 16 Oct 1972

DWG. NO. E 5

DO NOT CUT THE POLE  
BUT SHAPE THE TOP OF  
THE PUSH BRACE  
AND NOTCH



ITEM NO	MATERIAL
1	1 Pole, required length 2/
2	1 Bolt, machine 5/8" x req'd length
3	2 Washer, square 2 1/4"
4	1 Locknut 5/8"
5	2 Plank, 2", treated 2/

Notes:  
1. All dimensions in millimeters and inches  
2. Supplied by OWNER

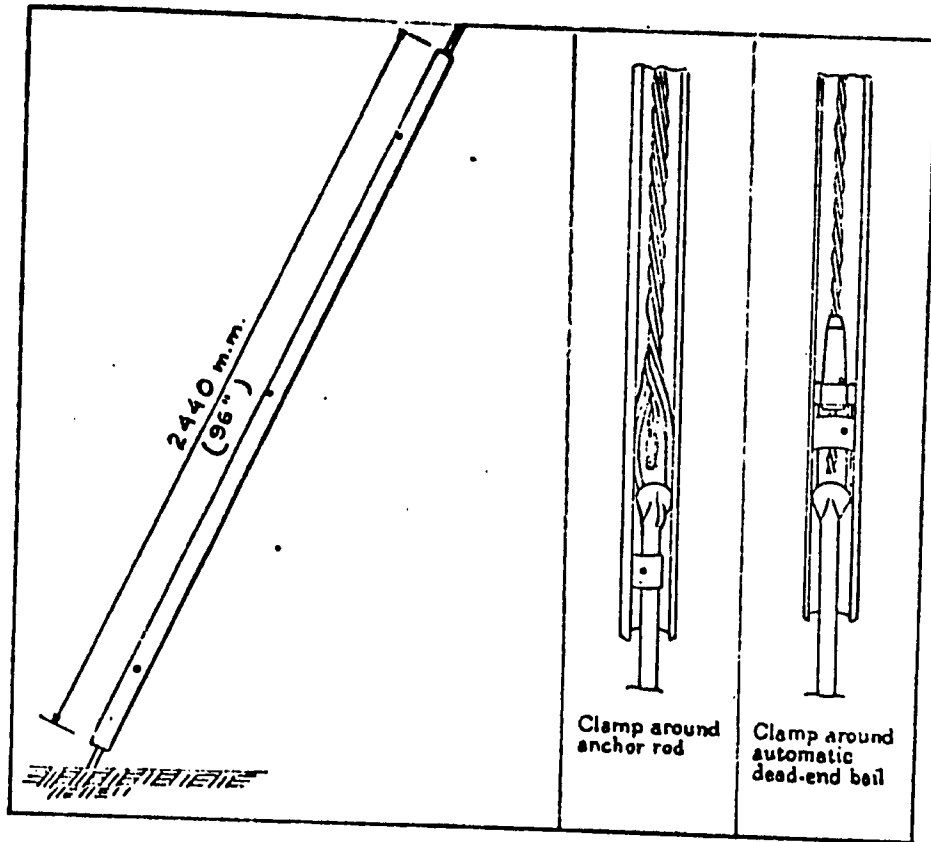
REV NO	DATE	REVISION	By	APPR
1	30-11-72	Added note 2		

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

PUSH BRACE

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

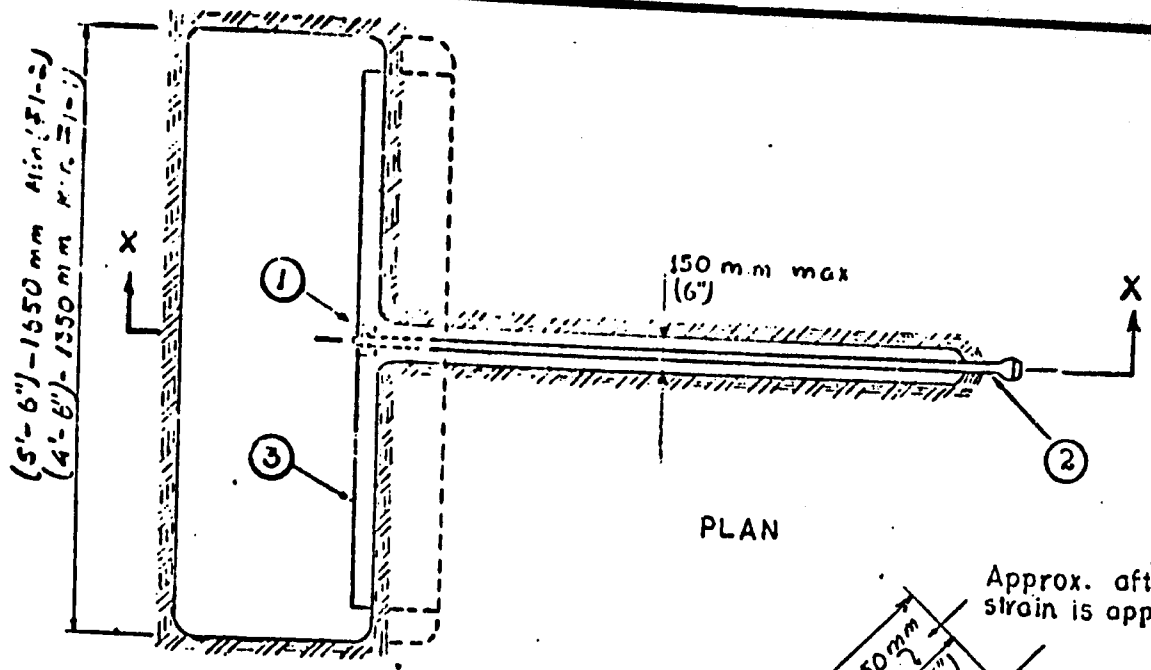
DATE 16-6-72      DWG. NO. E-6



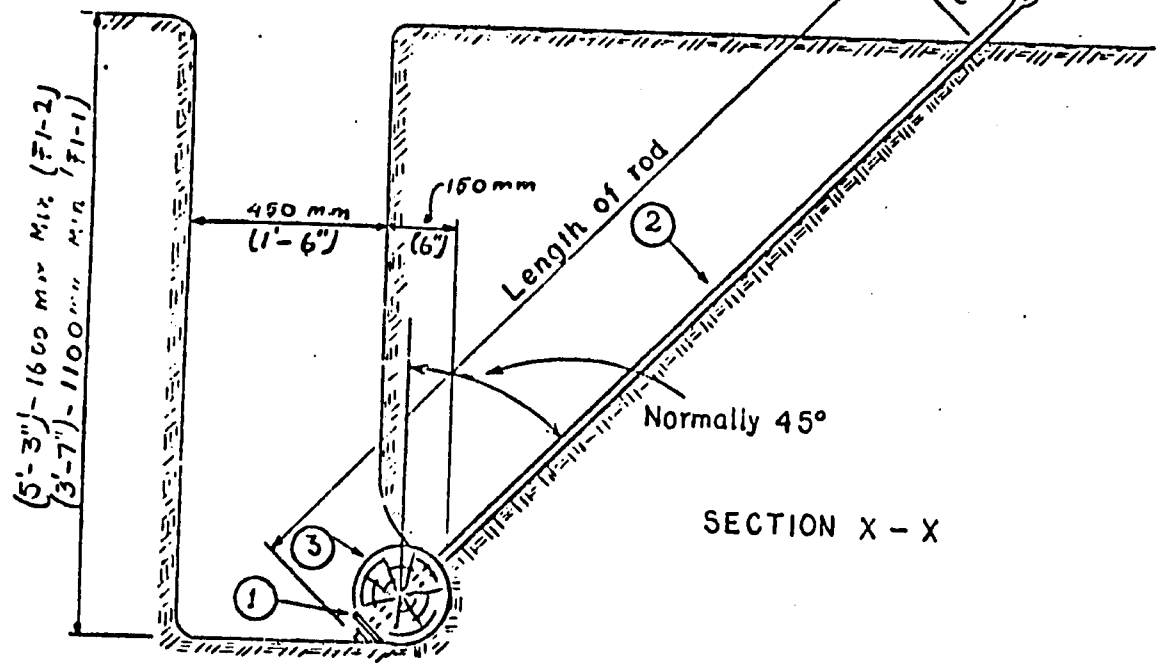
Plastic guy guard, high impact resistance,  
rigid vinyl type, yellow color  
Equal to Fanner 96 PSG - 2 Y.

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
GUY GUARD
HARZA ENGINEERING CO., CHICAGO APPROVED.....
DATE. 18 - 9 - 1972 DWG. NO. E.7





PLAN



SECTION X - X

		ASSEMBLY UNIT					
		F1-1			F1-2		
ITEM	MATERIAL	NO	TYPE		NO.	TYPE	
1	Washer, 13/16" hole	1	4" x 4" x 1/2"		1	4" x 4" x 1/2"	
2	Rod, anchor, thimble type eye	1	5/8" x 6'-0"		1	3/4" x 8'-0"	
3	Anchor, (treated log) 2/	1	8" dia x 4'-0"		1	20" dia x 5'-0"	
	Holding power in ordinary soil, (Kgs)		3600			5,400	

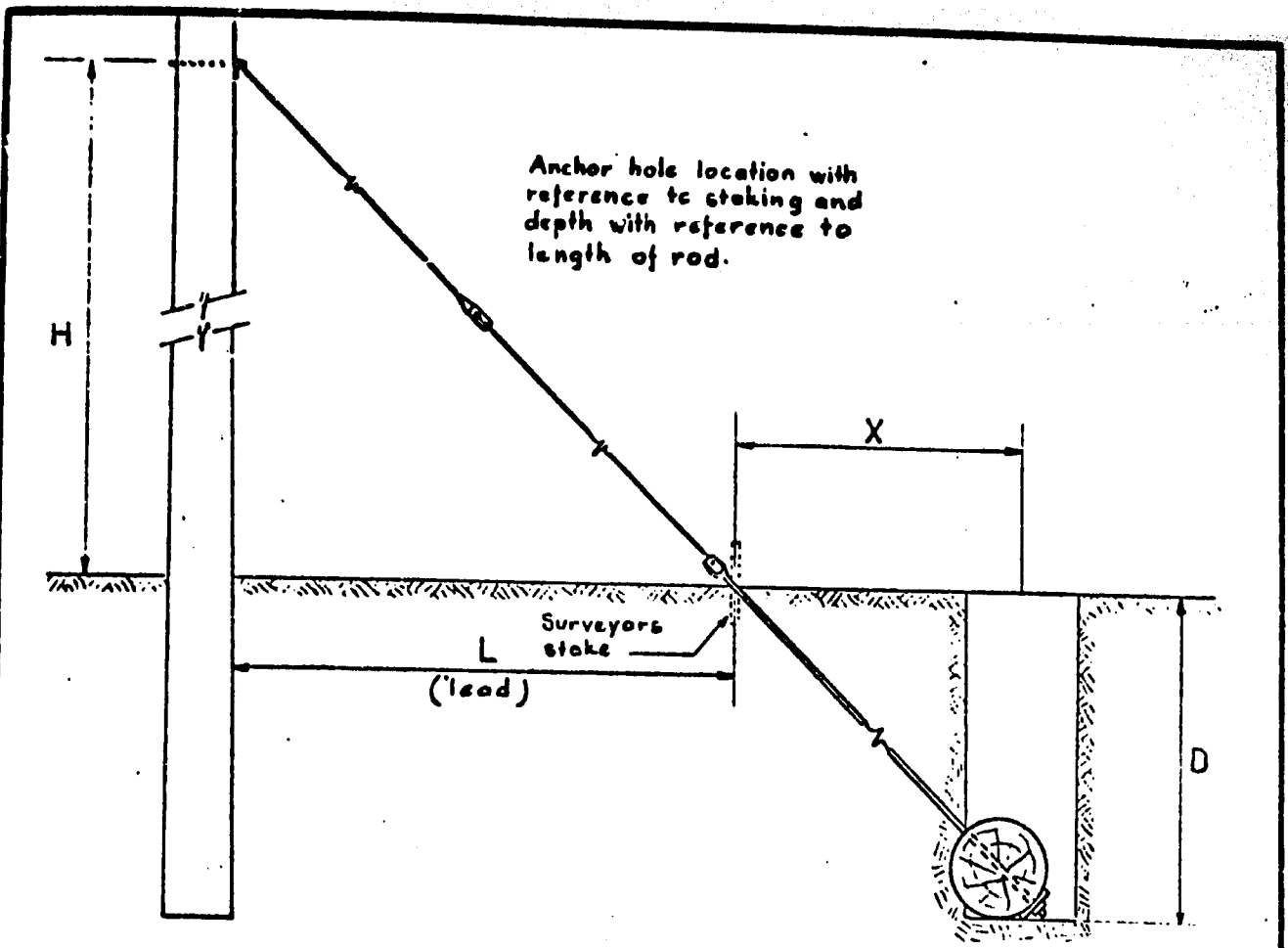
- Noted:
- All dimensions are in millimeters and inches.
  - Supplied by OWNER.

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

LOG ANCHOR ASSEMBLY

HARZA ENGINEERING CO., CHICAGO  
 APPROVED...  
 DATE 30-5-72 DWG. NO. F1

REV NO	DATE	REVISION	By	APPR
1	20-11-72	Added note re supply of logs	16	



ROD LGTH $\frac{L}{H}$ RATIO	6' Rod.				8' Rod			
	X	X	D	D	X	X	D	D
	Inches	mm	Inches	mm	Inches	mm	Inches	mm
1/4	16	406	66	1680	22	560	90	2290
1/3.5	18	460	65	1650	23	580	89	2260
1/3	20	510	65	1650	29	740	89	2260
1/2.5	25	635	65	1650	34	860	88	2235
1/2	30	760	62	1575	41	1040	85	2160
1/1.75	33	840	60	1525	44	1120	83	2110
1/1.5	36	910	58	1470	50	1270	80	2030
1/1.25	41	1040	56	1420	56	1420	77	1960
1/1	46	1170	52	1320	64	1625	72	1830
1.25/1	52	1320	48	1220	70	1780	65	1650
1.5/1	57	1400	43	1100	74	1880	59	1500

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATRA UTARA

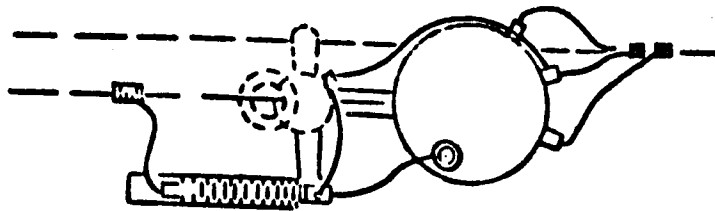
ANCHOR  
HOLE LOCATION

HARZA ENGINEERING CO., CHICAGO

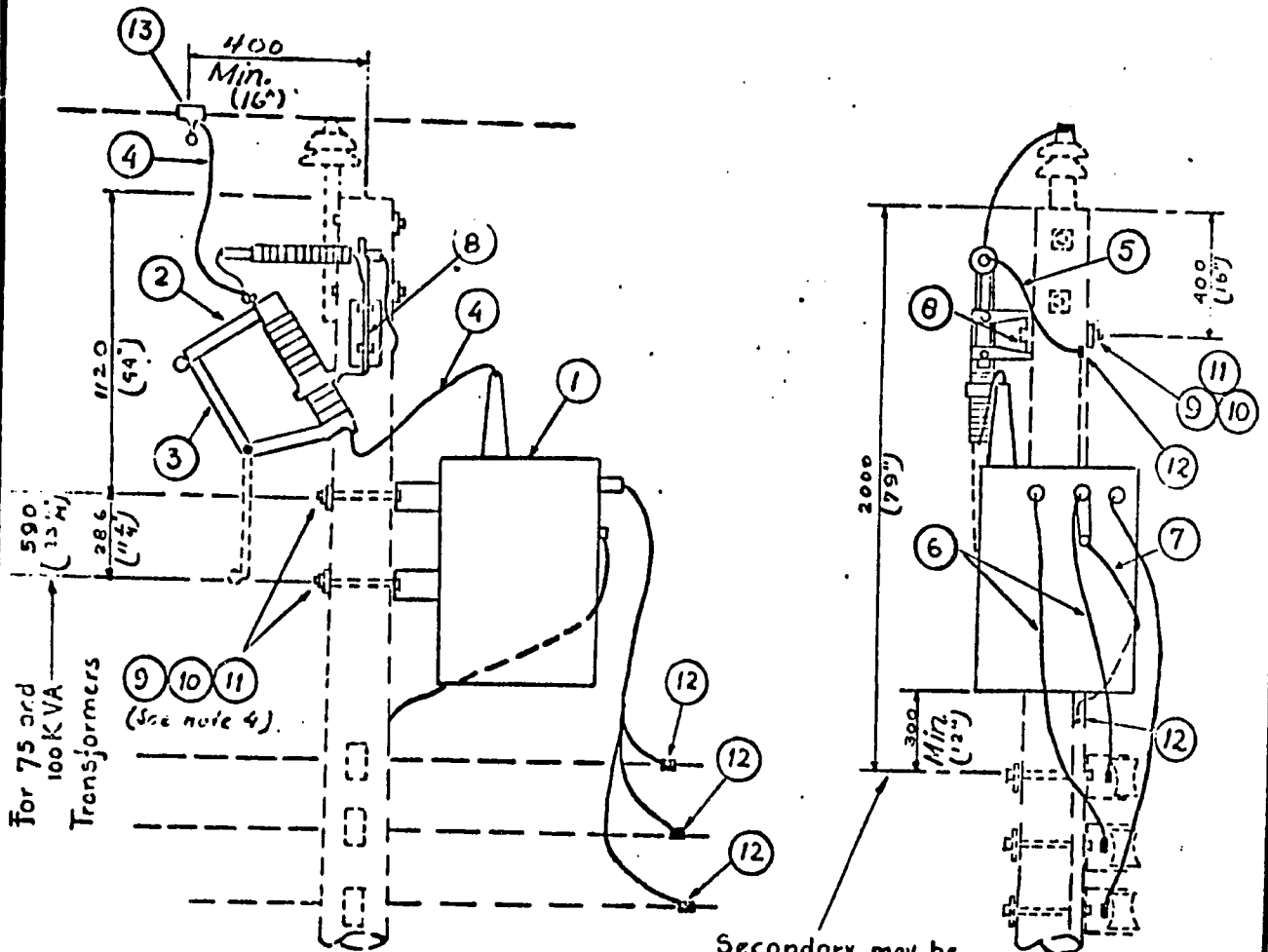
APPROVED.....

DATE 30-9-1972 DWG NO F.2.





PLAN



For 75 and  
100 KVA  
Transformers

NOTES:

- 1) ALL DIMENSIONS ARE IN MILLIMETERS AND INCHES.
- 2) SEE SHEET 2 OF 2 FOR MATERIAL LIST
- 3) IF THIS INSTALLATION MUST BE MADE ON A DEADEND POLE WITH A DOWN GUY, USE A CROSSARM FOR MOUNTING THE CUTOUT, AND MOUNT THE TRANSFORMER ON THE OPPOSITE SIDE OF THE POLE
- 4) FOR TRANSFORMER 75KVA AND LARGER USE 3/4" MOUNTING BOLTS.

Secondary may be lowered to maintain clearance

SHEET 1 OF 2

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
SINGLE PHASE TRANSFORMER 10 TO 100 KVA AT 1-PHASE TANGENT AND SMALL ANGLE (0°-30°)	
HARZA ENGINEERING CO., CHICAGO APPROVED.....MEDAN	
DATE: 27-4-1972	DWG. NO. G-1

	ASSEMBLY UNIT				
	G1-1	G1-2	G1-3	G1-4	G1-5
Transformer size (KVA)	10	25	50	75	100
Secondary Riser, Aluminium (2)	2	1/0	1/0	3/0	3/0
Neutral Riser, Aluminium (1)	2	2	2	1/0	1/0

NO	MATERIAL	WHSE NO	QUANTITY REQUIRED				
			G1-1	G1-2	G1-3	G1-4	G1-5
1	TRANSFORMER, MAX. 100 KVA		1	1	1	1	1
2	COMBINATION C/O - ARRESTER		1	1	1	1	1
3	POLE TIE, AS REQUIRED		1	1	1	1	1
4	PH. Jumper, No. 4 AA		2	2	2	2	2
5	GRD. LEAD, NO. 4 AA		1	1	1	1	1
6	SEC. RISER, 600 V INSULATION						as above
7	PH. Jumper GRD., NO. 4 AA		1	1	1	1	1
8	C/O MOUNTING BRACKET, POLE TYPE		1	1	1	1	1
9	MACHINE BOLT 5/8" x REQ'D LENGTH		3	3	3	1	1
	MACHINE BOLT 3/4" x REQ'D LENGTH					2	2
10	LOCKWASHER 2 1/4" WITH 11/16" HOLE		3	3	3	1	1
	WASHER 2 1/4" WITH 13/16" HOLE					2	2
11	LOCKWASHER, 5/8"		3	3	3	1	1
	LOCKWASHER, 3/4"					2	2
12	CONNECTION, AS REQ.						
13	HOT LINE CLAMP						
	WIRING SCHEDULE						
	10 and 25 KVA 3 AMP						
	50 KVA 6 AMP						
	75 KVA 10 AMP						
	100 KVA 15 AMP						

**NOTE**

- 1) SEE SHEET 1 OF 2 FOR ASSEMBLY DRAWING

SHEET 2 OF 2

REV NO	DATE	REVISION	BY	APPR	
1	10/2/72	Corrected Item No. 15 to No. 9	6	1/2	

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA II/72  
 SINGLE PHASE TRANSFORMER 10 TO  
 100 KVA AT 1-PHASE TOWER  
 AND SHIEL. WIRE (0° - 30°)  
 HARZA ENGINEERING CO., CHICAGO  
 APPROVED: [Signature]  
 DATE 13 OCT 1972 DWG. NO. 61



ASSEMBLY UNIT

	G2-1	G2-2	G2-3	G2-4	G2-5
Transformer size (KVA)	10	25	50	75	100
Secondary Riser, Aluminium (2)	2	1/0	1/0	3/0	3/0
Neutral Riser, Aluminium (1)	2	2	2	1/0	1/0

NO	MATERIAL	W/ISE NO	QUANTITY REQUIRED				
			G2-1	G2-2	G2-3	G2-4	G2-5
1	TRANSFORMER, MAX. 100 KVA		1	1	1	1	1
2	COMBINATION C/O - ARRESTER		1	1	1	1	1
3	FUSE LINK, AS REQUIRED		1	1	1	1	1
4	PRI, JUMPER, NO. 4 AA		2	2	2	2	2
5	GRD. LEAD, NO. 4 AA		1	1	1	1	1
6	SEC. RISER, 600 V INSULATION						
7	TRANSFORMER GRD. NO. 4 AA					as above	
8	C/O MOUNTING BRACKET, CROSSARM TYPE		1	1	1	1	1
9	MACHINE BOLT 5/8" X REQ'D LENGTH		3	3	3	1	1
	MACHINE BOLT 3/4" X REQ'd LENGTH					2	2
10	SQUARE WASHER 2 1/4" WITH 11/16" HOLE		3	3	3	1	1
	SQUARE WASHER 2 1/4" WITH 13/16" HOLE					2	2
11	LOCKNUT, 5/8"		3	3	3	1	1
	LOCKNUT, 3/4"					2	2
12	CONNECTOR, AS REQ.						
13	HOT LINE CLAMP		1	1	1	1	1

FUSING SCHEDULE

- 10 and 25 KVA 3 AMP
- 50 KVA 6 AMP
- 75 KVA 10 AMP
- 100 KVA 15 AMP

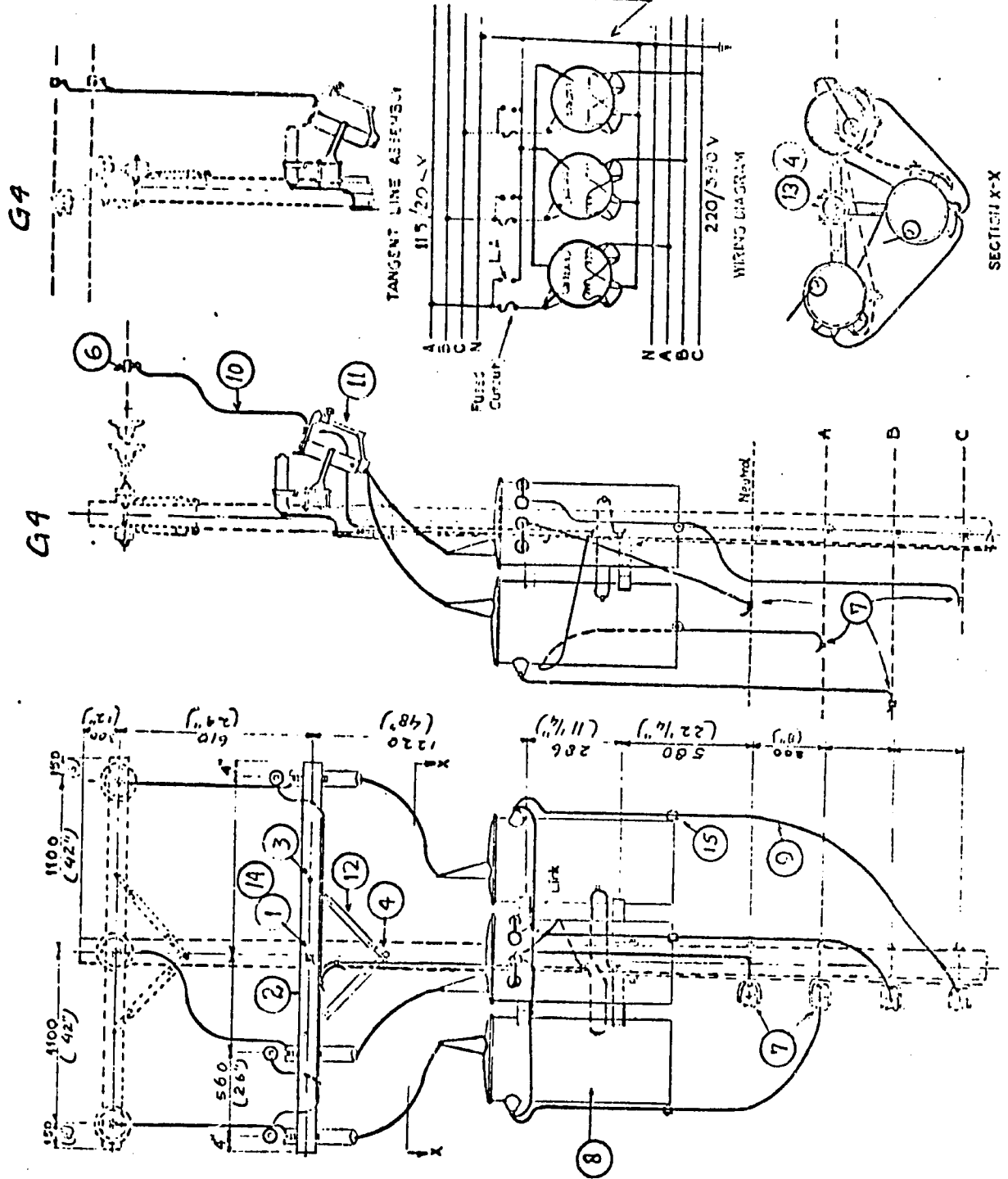
NOTE

- 1) SEE SHEET 1 OF 2 FOR ASSEMBLY DRAWING

SHEET 2 OF 2

REV	DATE	REVISION	BY	APPROVED	PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
					SINGLE PHASE TRANSFORMER 10 TO 100 KVA AT 3-PHASE TANGENT AND SMALL ANGLE (08°- 30°)
					HARZA ENGINEERING CO, CHICAGO
					APPROVED <i>Km/le</i> MEDAN
					DATE 13 JUNE 1972 G2

Primary and secondary neutrals must be interconnected



Notes:

1. For transformers 75 KVA & larger use two cluster brackets and dimension as shown.
- For transformers 50KVA and smaller use one cluster bracket with adpater plates.
2. Re-connect secondary as shown.
3. All dimensions are in millimeters and inches.

SHEET 1 OF 2

PERUSAHAAN LISTRIK NEGARA EKSPLOITASI I SUMATERA UTARA
11.5/20 KV THREE TRANSFORMERS CLUSTER MOUNTED WYE WYE FOR 220/380VOLT POWER LINES
HARZA ENGINEERING CO., CHICAGO APPROVED.....
DATE Apr 27, 1972 DWG. NO. G4

ASSEMBLY PART

	G4-1	G4-2	G4-3	G4-4	G4-5
Transformer Bank Line, 1VA	3x10	3x25	3x50	3x75	3x100
Secondary Riser, AL (2)	2	1/0	3/0	2x3/0	2x3/0
Neutral Riser, AL (1)	2	2	1/0	3/0	3/0

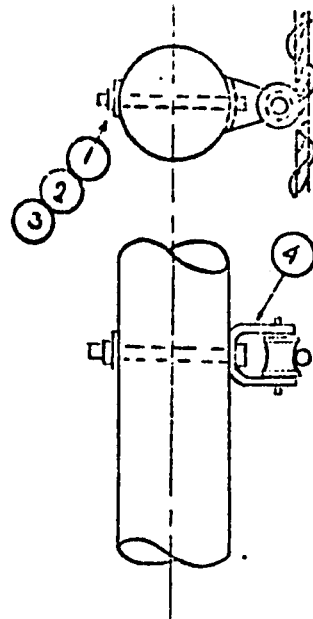
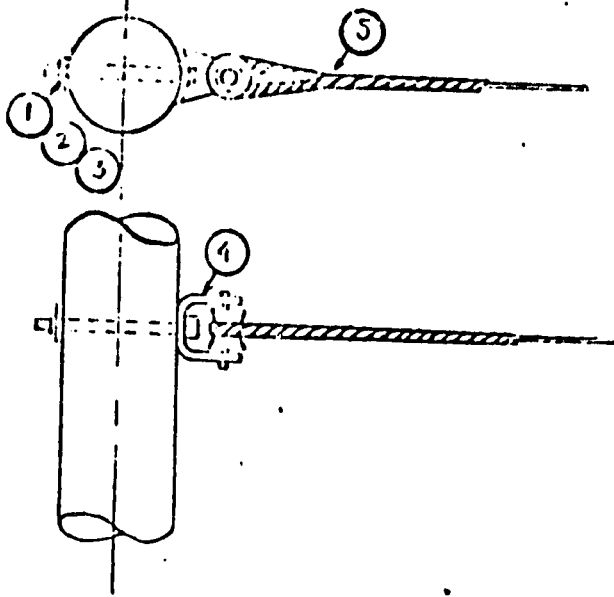
NO	MATERIAL	WHISE NO	QUANTITY REQUIRED				
	SCREWS, 2 1/2"		1	1	1	1	1
	SCREWS, 1 1/2" x 1/8" x 1/8"		1	1	1	1	1
	SCREWS, 3/8" x 1/8"		2	2	2	2	2
	SCREWS, 1/2" x 1/8"		4	4	4	4	4
	DRILL MACHINE, 5/8" x REQ'D LENGTH		1	1	1	1	1
	CONN. WIRE, P. CROCODENGS BUNDLE						
	TRANSFORMER, 100 VA TRN. 1/3"						
	JUMPER BARE, 500 V INSULATED		as above	as above	as above	as above	as above
	CUTOUT WITH BRACKET, COMBINATION		6	6	6	6	6
	BRACE, WOOD, 2"		3	3	3	3	3
	BRACKET, TRANSFORMATION CLUSTER		2	2	2	2	2
	LOCKNUTS		2	2	2	2	2
	TRANSFORMER TRAINER BRACKET		1	1	1	1	1
	FUSE LINKS		3	3	3	3	3
	SAME AS G1		3	3	3	3	3

NOTE

- i) SEE SHEET 1 OF 2 FOR ASSEMBLY DRAWING
- j) SUPPLIED BY OWNER

SHEET 2 OF 2

REV NO	DATE	REVISION	BY	APPR	
		Check load or supply of transformer			PERUSAHAAN LISTRIK NEGARA EKSPLOITASI SUMATERA UTARA 11.5/20 BT
		Revised transformer connection and added lag screws			THREE TRANSFORMERS CLUSTER MOUNTED WYE WYE FOR 220/380 VOLT POWER LOADS
					INDRA ENGINEERING CO., CIRCARD APPROVED... MEDAN DATE 27, Nov. 1980 DUC No. 6.4



	Construction Unit	J1-1	J1-2	J1-3	J1-4	J1-5
	AA Conductor size		4	2	1/0	3/0
1	Washer square 2 1/4"	1				
2	Bolt Machine 3/8" x req'd length	1				
3	Locknut	1				
4	Clevis, secondary, insulated	1				
5	Preformed deadend		1	1	1	1

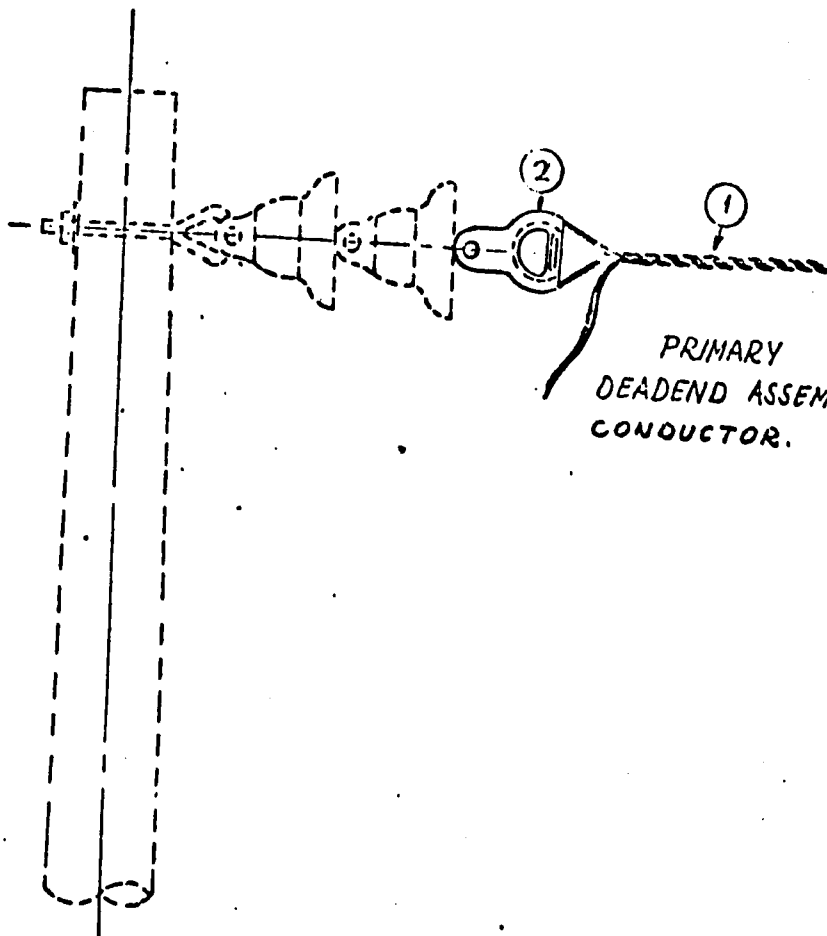
Assembly Unit	J1-1-clevis and bolt in place	
	J1-2 Complete deadend ass'y (in place)	4
	J1-3 " " " " " "	2
	J1-4 " " " " " "	1/0
	J1-5 " " " " " "	3/0

All primary neutral clevises included with primary Construction unit unless otherwise noted

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI 1 SUMATERA UTARA

Secondary supports  
and Deadends

REV NO	DATE	REVISION	BY	APPR	HARZA ENGINEERING CO., CHICAGO APPROVED.....
1	31-1	Added J1-6 and J1-7			DATE 4-5-72 DWG: J1



PRIMARY  
DEADEND ASSEMBLY, ALUMINIUM  
CONDUCTOR.

Assembly unit.		J2-1	J2-2	J2-3	J2-4		
All aluminium conductor size		2	1/0	3/0	336.4		
ITEM	MATERIAL	QUANTITY REQUIRED					
1	Grip deadend, preformed	1	1	1	1		
2	Standard thimble clevis	1	1	1			
2	Large thimble clevis				1		

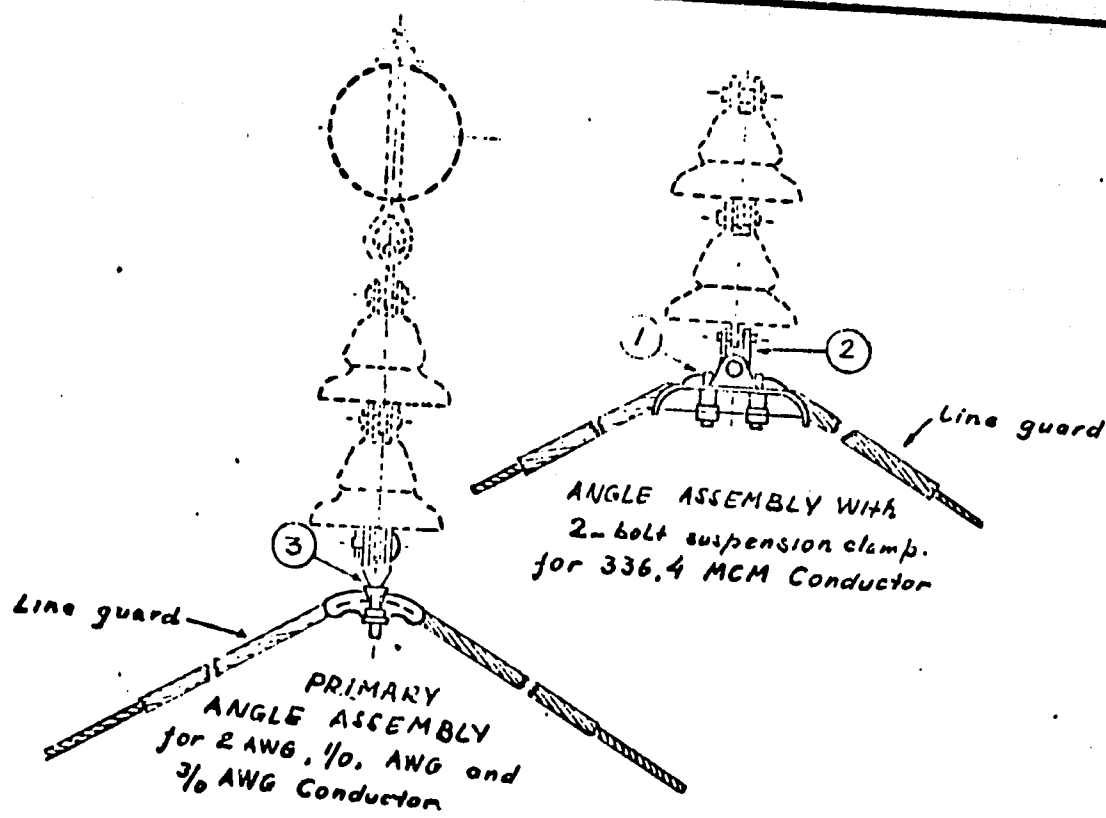
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

DEADEND ASSEMBLY GUIDE  
PREFORMED DEADEND METHOD  
ALUMINIUM CONDUCTORS

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....*[Signature]*.....

DATE 30-6-72 DWS NO. J.2





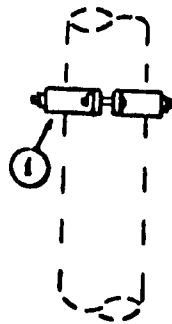
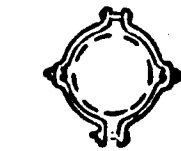
Assembly Unit		J3-1	J3-2	J3-3	J3-4		
Conductor size		2	1/0	3/0	336.4		
NO	MATERIAL	QUANTITY REQUIRED					
1	Clamp, suspension				1		
2	Shackle, anchor				1		
3	Clamp, angle	1	1	1			

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

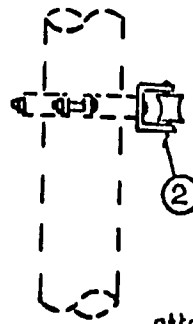
ANGLE ASSEMBLY GUIDE, VERTICAL  
CONSTRUCTION 30° TO 60° ANGLE

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

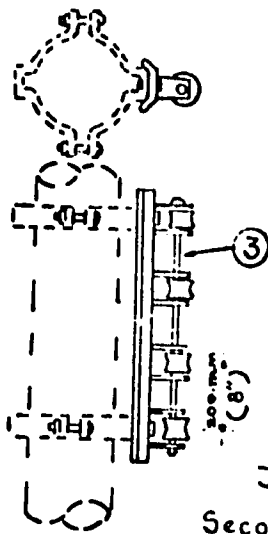
DATE 30-6-72 DWG. NO. J3



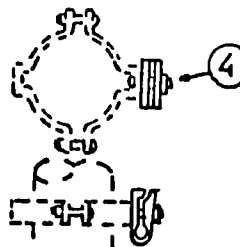
J4-1  
Pole band  
for tubular steel pole



J4-2  
Secondary clevis  
attached to pole band  
Also may be used with J1-1



J4-3  
Secondary rack  
for tubular steel pole



J4-4  
Cable Suspension  
Clamp attached  
to pole band

ITEM	MATERIAL	J4-1	J4-2	J4-3	J4-4
1	Pole band, A.B CHANCE No. 6373 3 1/2"		-	-	-
	6324 4 1/2"	1	-	-	-
	6375 5 1/2"		-	-	-
2	Secondary clevis, W/Insulator	-	1	-	-
3	Secondary rack, extended, 4-spool, W/Ins	-	-	1	
4	Cable suspension clamp, 1-bolt				1

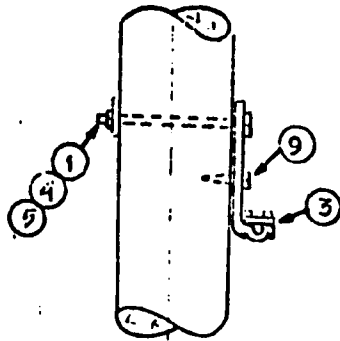
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

SECONDARY ATTACHMENT  
TO TUBULAR STEEL POLES

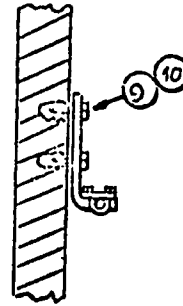
HARZA ENGINEERING CO., CHICAGO

APPROVED.....

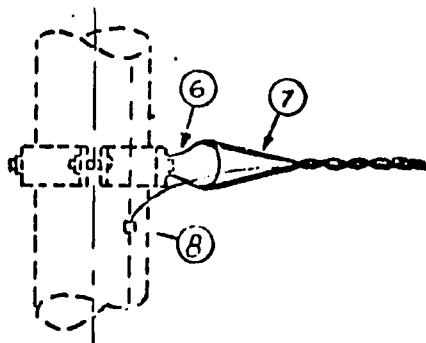
DATE 31-8-1972 DWG. NO. J-4



J5-1



J5-2



J5-3, 4, 5

5005 AL. neutral.  
 J5-3. #2  
 J5-4. #1/0  
 J5-5. #3/0

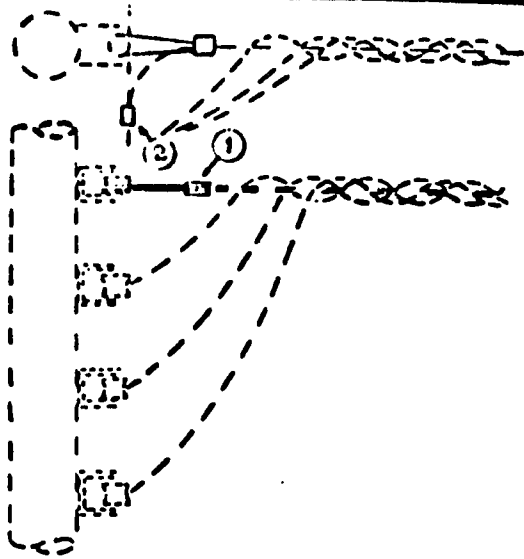
ITEM	MATERIAL	NO REQUIRED				
		J5-1	J5-2	J5-3	J5-4	J5-5
1	Square washer	1				
2						
3	Cable hanger	1	1			
4	Bolt, machine 5/8 req'd length	1				
5	Locknut	1				
6	Thumblock nut			1	1	1
7	Preformed deadend			1	1	1
8	Connector as required			1	1	1
9	Screw lag	1	2			
10	Lead anchor insert.		2			

PERUSAHAAN LISTRIK NEGARA  
 EKSPLOITASI I SUMATERA UTARA

SECONDARY CABLE SUPPORT

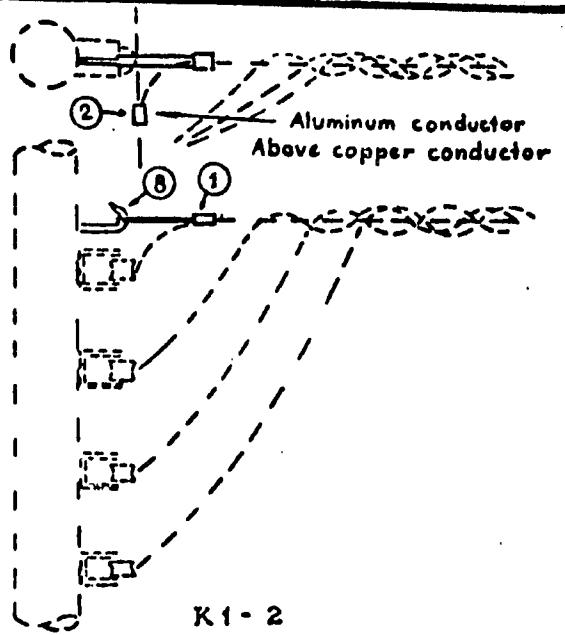
HARZA ENGINEERING CO, CHICAGO  
 APPROVED

DATE 7-4-75 DWG NO J.5



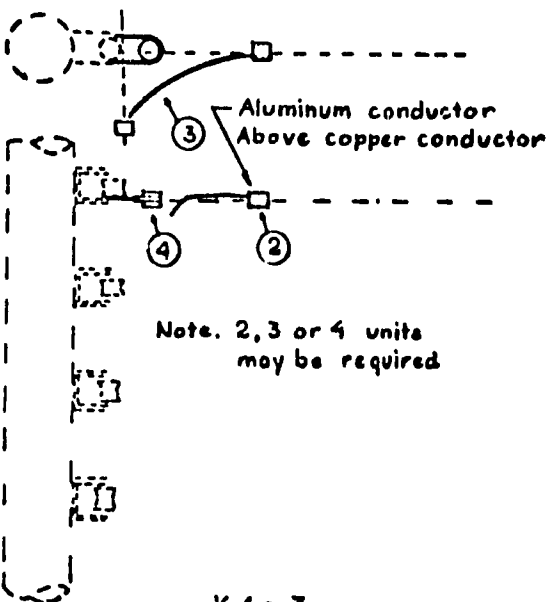
K1-1

Aluminum Duplex or Quadruplex Service from Aluminum Secondary.



K1-2

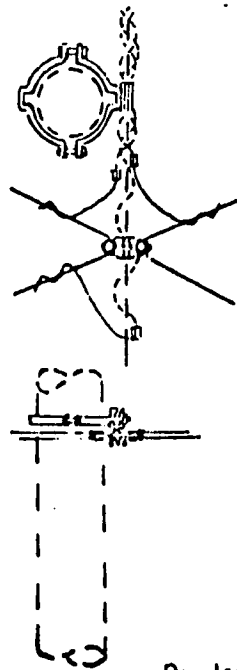
Aluminum Duplex or Quadruplex Service from Copper Secondary.



Note. 2, 3 or 4 units may be required

K1-3

1  $\phi$  or 3  $\phi$  Copper Service (open wire) from Aluminum Secondary.



K1-6

Duplex or quadruplex service from quadruplex secondary

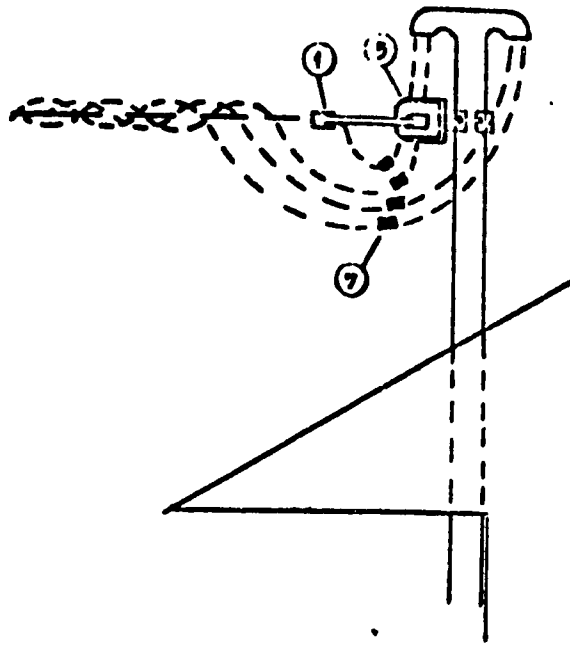
Sheet 1 of 2

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

SERVICE DROP CONNECTIONS  
AT POLE AND BUILDING

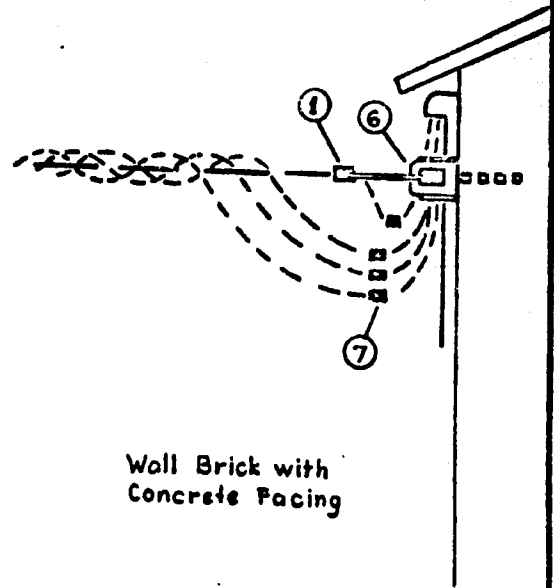
HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE 23 - 6 - 1972 DWG. NO. K.1



K1-4

Duplex or Quadruplex Service Attachment to Service mast.



Wall Brick with  
Concrete Facing

K1-5

Duplex or Quadruplex Service Attachment to Building Wall.

Sheet 2 of 2

ITEM	MATERIAL	NUMBER OF ITEMS					
		K1-1	K1-2	K1-3	K1-4	K1-5	K1-6
1	Deadend service drop, wedge grip type		As required for K. 2				-
2	Connector as required				-	-	Span tap
3	Jumper, aluminum, as required	-	-	1	-	-	-
4	Insulated wire holder, Mc Grow Edison DR. 1M1		-	1	-	-	-
5	Wire holder, pipe mounting, 1 1/2" to 3 1/2"		-	-	1	-	-
6	Wire holder, wall mounting		-	-	-	1	-
7	Connectors, Compression as required		-	-			-
8	Drive hook wire holder.		1	-	-	-	-

PERUSAHAAN LISTRIK NEGARA  
EXPLCITASI I SUMATERA UTARA

SERVICE DROP CONNECTION  
AT POLE AND BUILDING

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE: 23-8-1972 DWG. NO. K 1



- K 2 - 1 — \* 6 AA
- K 2 - 2 — \* 4 AA, \* 2 AA
- K 2 - 3 — \* 1/0 AA
- K 2 - 4 — \* 3/0 AA

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

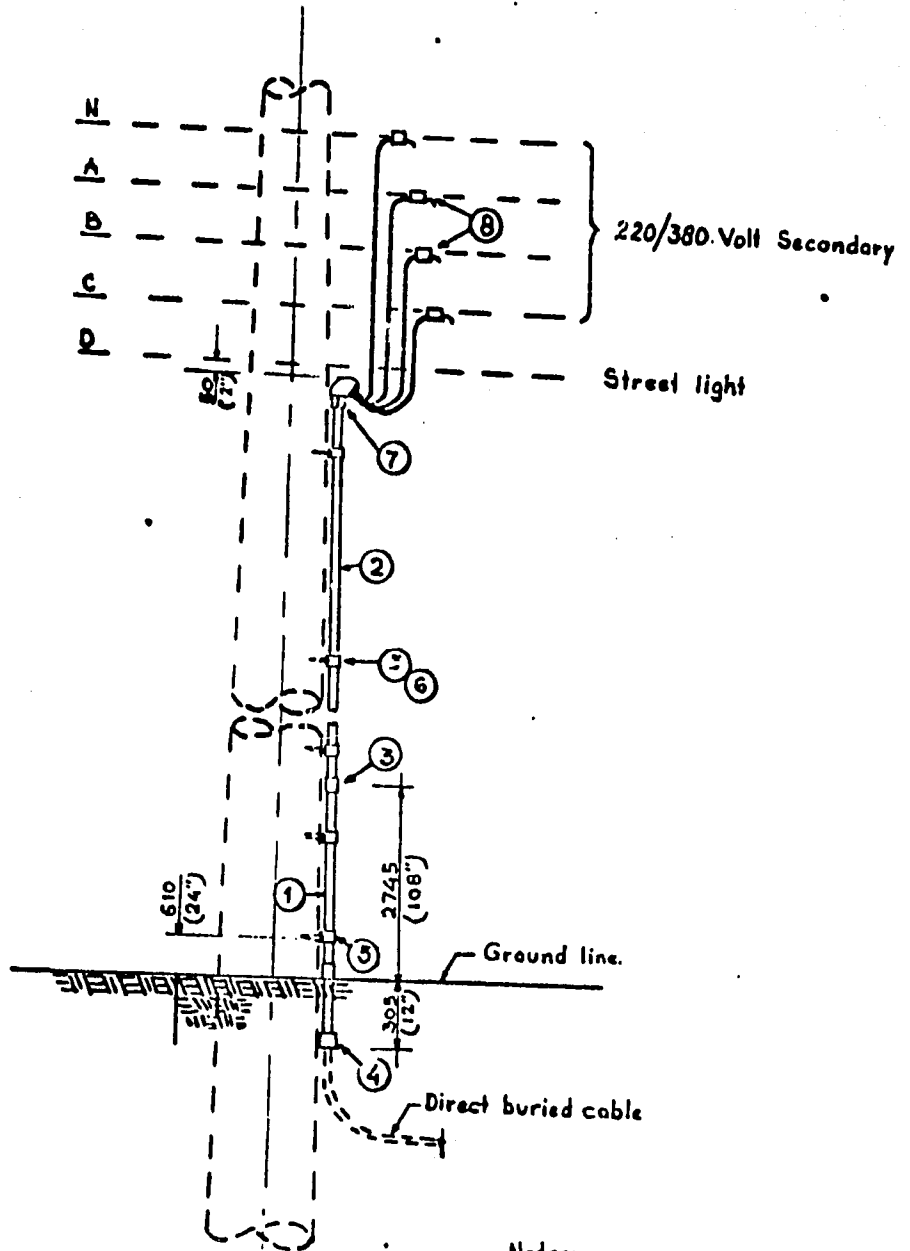
SERVICE WEDGE CLAMP

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 15-10-72

DWG. NO. K 2



Notes:

1. All dimensions are in millimeters and inches.
2. Strap conduit at 1220 mm (48") interval.

ITEM	No.	MATERIAL
1	1	Conduit, rigid galv. steel 2" dia 10' long:
2	1	Conduit, plastic, heavy wall, 2" dia x req'd, length
3	1	Conduit adapter - steel to plastic
4	1	Conduit bushing, galv. steel 2" dia.
5	7	Pipe strap; two hole for 2" dia conduit
6	14	Lag screw, 3/8" x 3"
7	1	Weather head, galv steel or PVC, for 2" pipe.
8	4	Connector as required

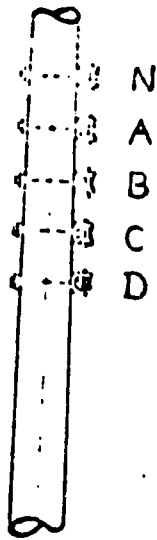
PERUSAHAAN LISTRIK NEGARA  
 EXPLICITASI I SUMATERA UTARA

220/380 VOLT THREE PHASE  
 UNDERGROUND CABLE  
 TERMINAL POLE

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 14 Oct 1972 DWG. NO. K 3



Voltage	N	A	B	C	D
220 V 1 $\phi$	Neutral	$\cancel{\phi}$			* Street Light
220/440 V 1 $\phi$	Neutral	$\emptyset$	$\emptyset$		** Street Light
220/380 V 3 $\phi$	Neutral	$\emptyset$	$\emptyset$	$\emptyset$	Street Light

1) Preferred position of clevis is to the street side of pole.

\*. If proper ground clearance cannot be obtained, position B or C may be used

\*\* If proper ground clearance cannot be obtained, position C may be used

Fig 1

### SECONDARY CONDUCTOR POSITION



1) Conductors to be located on outside of insulators except for angles

Fig - 2

### SECONDARY TANGENT

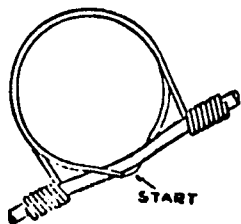
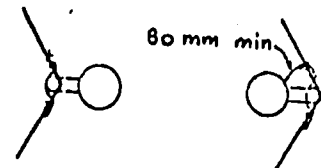


Fig - 4  
TYING DETAIL



Preferred

Alternate

Fig-3

### SECONDARY ANGLE

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

### SECONDARY CONDUCTOR CONFIGURATION

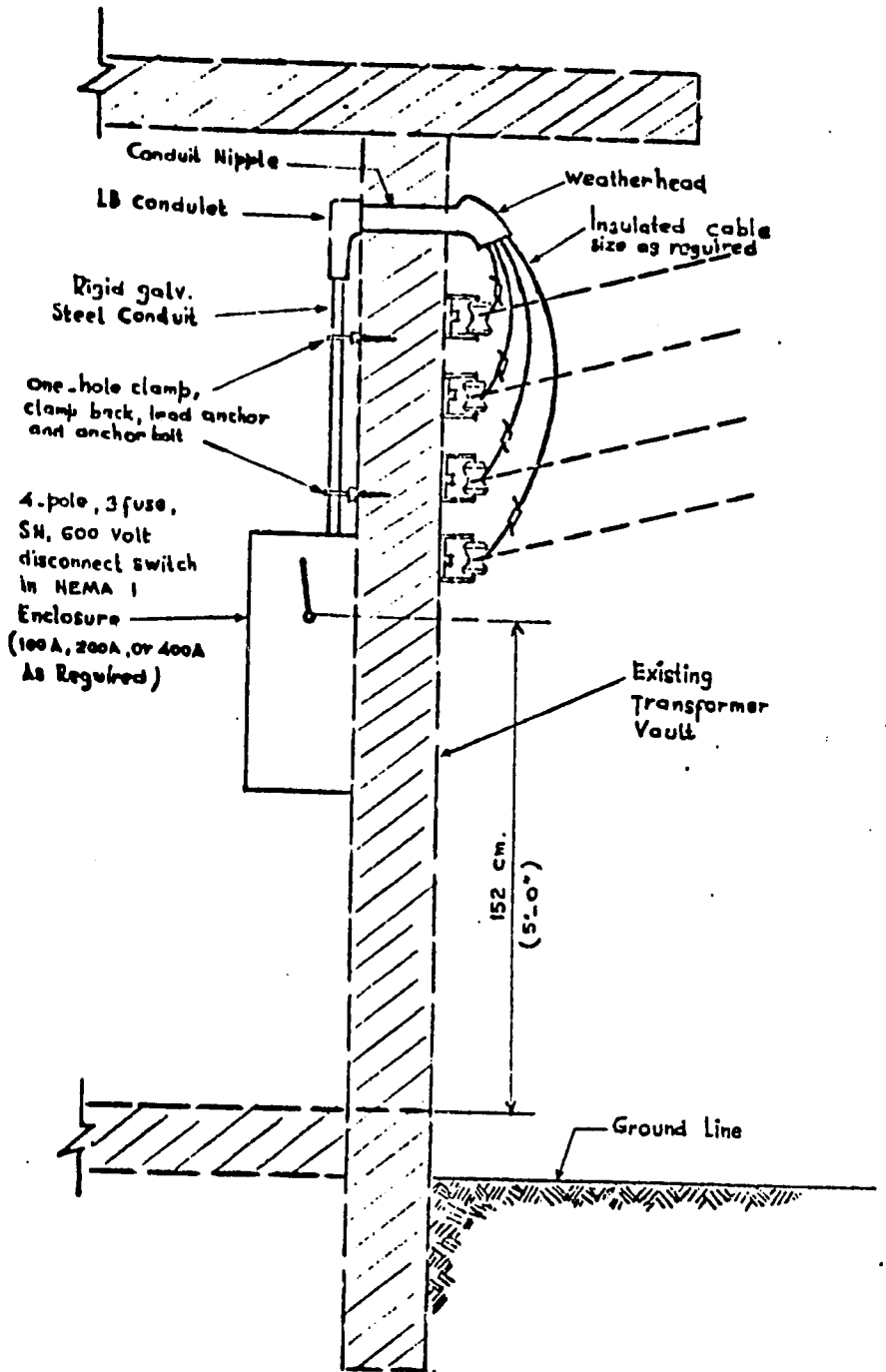
HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 31-8-72

DWG NO. K4





Note :

Walls, roof and floors  
are non-reinforced  
concrete

ASSEMBLY UNIT			PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
No:	SWITCH CAPACITY	600 - VOLT CABLE SIZE	220/380 VOLT, THREE-PHASE OVERHEAD SERVICE TO TRANSFORMER VAULT.
K 5 - 1	100 A	No. 2 AWG	<b>HARZA ENGINEERING CO., CHICAGO</b> APPROVED..... DATE 30-7-72 DWG. NO. K5
K 5 - 2	200 A	No. 3/0 AWG	
K 5 - 3	400 A	No. 250 MCM	

4-pole, 3-fuse, SN, 600 Volt disconnect switch in NEMA 1 enclosure. (100 A, 200 A, or 400 A as required)

One-hole clamp, clamp back lead anchor and anchor bolt

Rigid galv. steel conduit

Conduit bushing

Existing Transformer Vault

122 cm (3'-0")

Ground line

4- 600 Volt, 1/2 cables, size as required

Note:  
Walls, roof and floors are non-reinforced concrete.

ASSEMBLY UNIT			
NO.	SWITCH CAPACITY	600-VOLT CABLE SIZE	
KG-1	100 A	No. 2 AWG	
KG-2	200 A	No. 3/0 AWG	
KG-3	400 A	No. 250 MCM.	

PERUSAHAAN LISTRIK NEGARA  
EXPLOTASI I SUMATERA UTARA

220/380 VOLT THREE-PHASE  
UNDERGROUND SERVICE  
TO TRANSFORMER VAULT

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE 30-7-72 DWG NO. K.6

3- 20 KV, 100 Ampere,  
Single-pole hook-operated,  
disconnect switches with lead  
anchors and anchor bolts as  
required.

Existing Transformer Vault

3- Coils stress relief cones  
similar to Eiectamold style  
15-6C.

3- Spool cable clamp assembly,  
similar to  
Dalle Star Type 6TF 2  
2-lead anchors and anchor bolts.

Conduit bushing

1- Hole pipe clamp with clamp-  
back, lead anchor and anchor bolt.

Ground line

Galvanized steel conduit

Conduit bushing

Note:  
Walls, roof, and floors  
are non-reinforced  
concrete.

3-1/3 c. 20 KV Cable

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

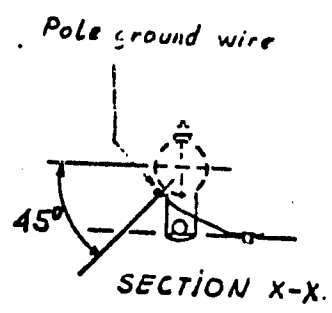
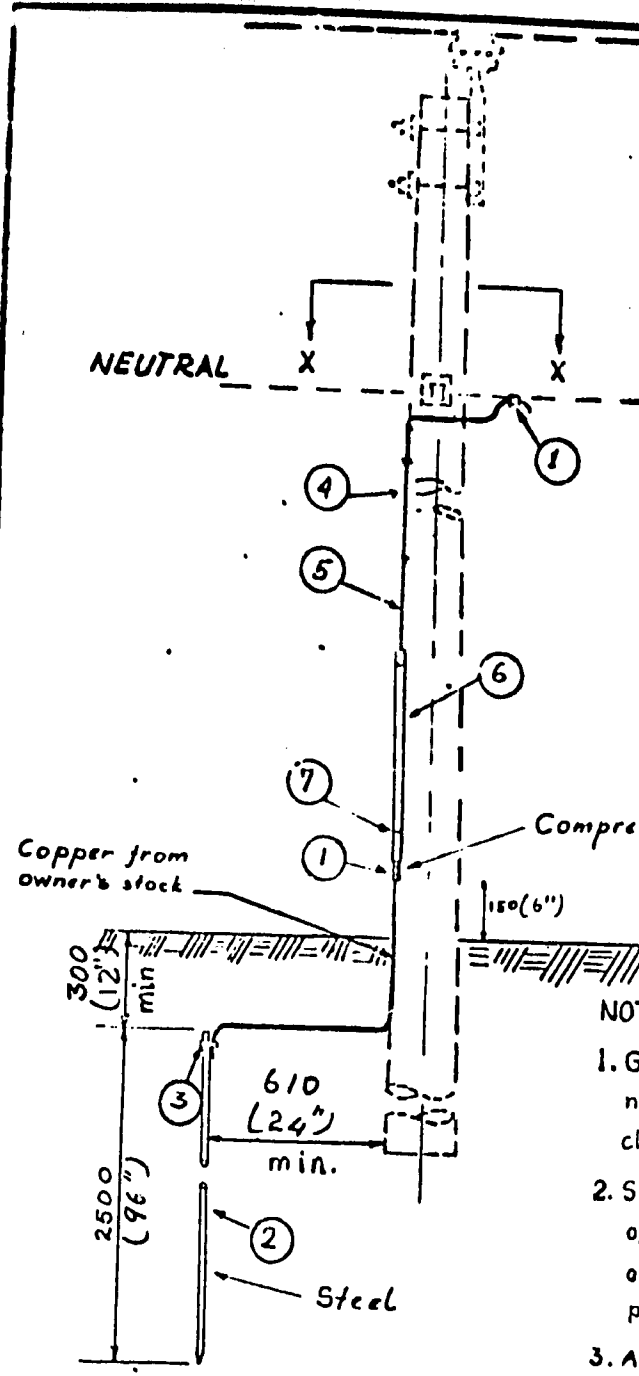
11,5/20 KV THREE-PHASE  
UNDERGROUND TERMINAL  
IN TRANSFORMER VAULT

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 30-7-73

DWG. NO. K. 7



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 600mm apart except for a distance of 2.5m above ground and 2.5m from top of pole where they shall be 150mm apart
3. All dimensions in millimeters and inches

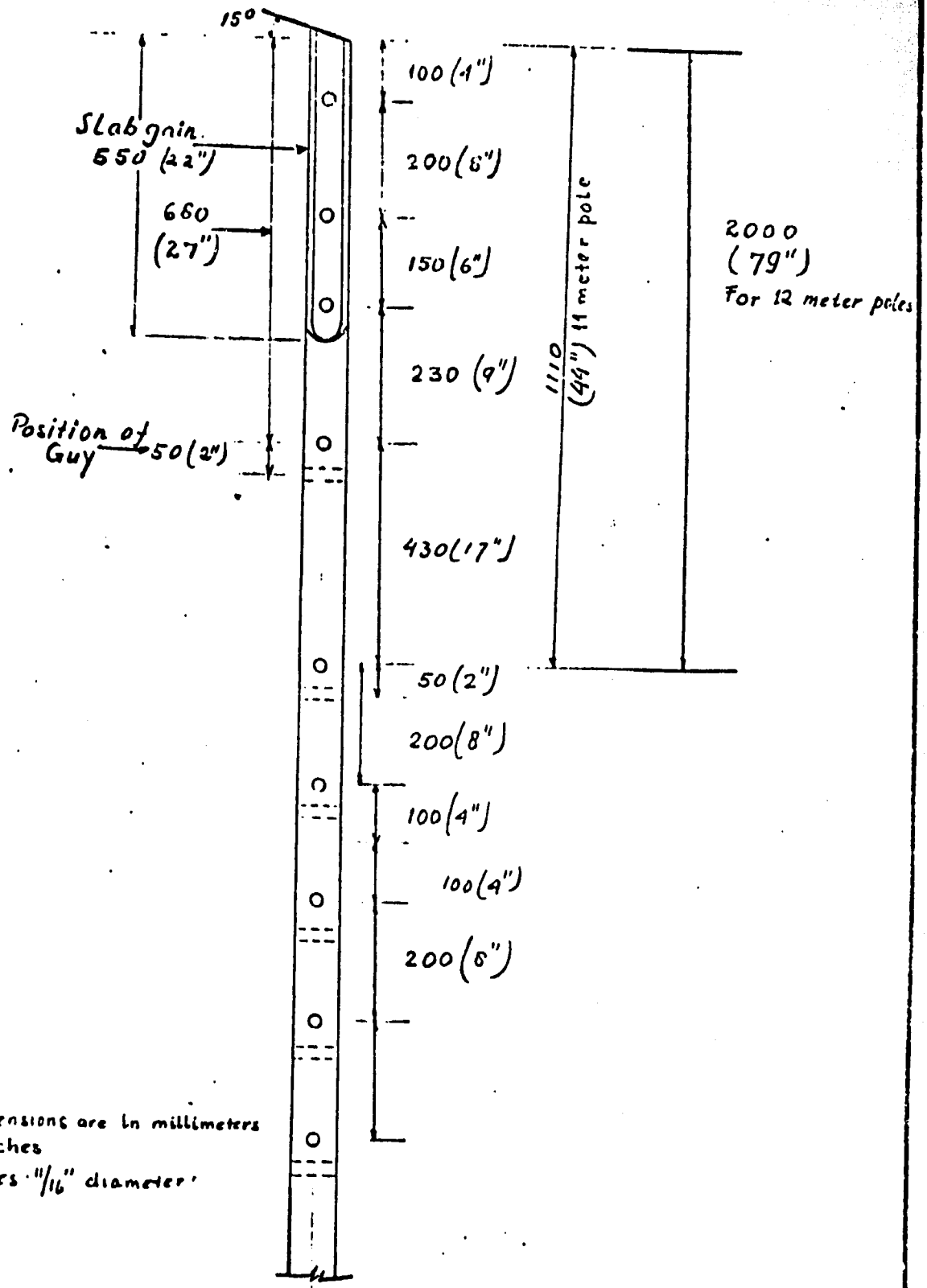
ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	Connectors, as required.	6	1 Moulding 2.5 meters x 15 mm, wood or plastic
2	1 Rod, ground, steel, 1/2" x 8' galvanized	7	3 Moulding staples
3	1 Clamp, ground rod		
4	Staples ground wire, as required		
5	Ground wire, No 4 AA as required		

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

GROUND ASSEMBLY -  
GROUND ROD TYPE.

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE 4-5-72 DWG. NO. M. 1



Notes:

1. All dimensions are in millimeters and inches
2. All holes  $\frac{1}{16}$ " diameter

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

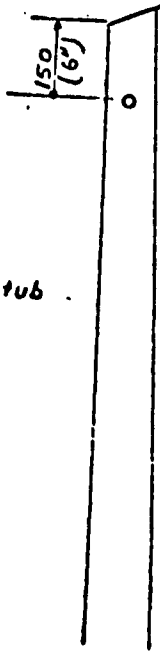
Pole Framing 11 and 12 meter  
poles.

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

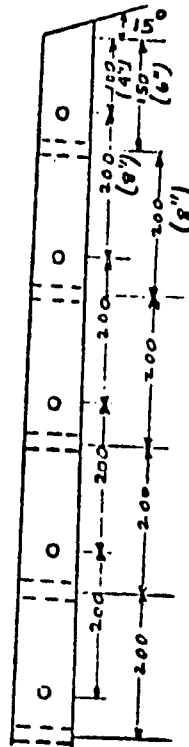
DATE 4-5-72 Dwg. No. M-2

Position  
of Guy



Guy Stub

M3-2



Framing for 9 and 10  
meter poles  
All holes 1/16"

Secondary  
pole

M3-1

Noted:

1. All dimensions are in millimeters  
and inches

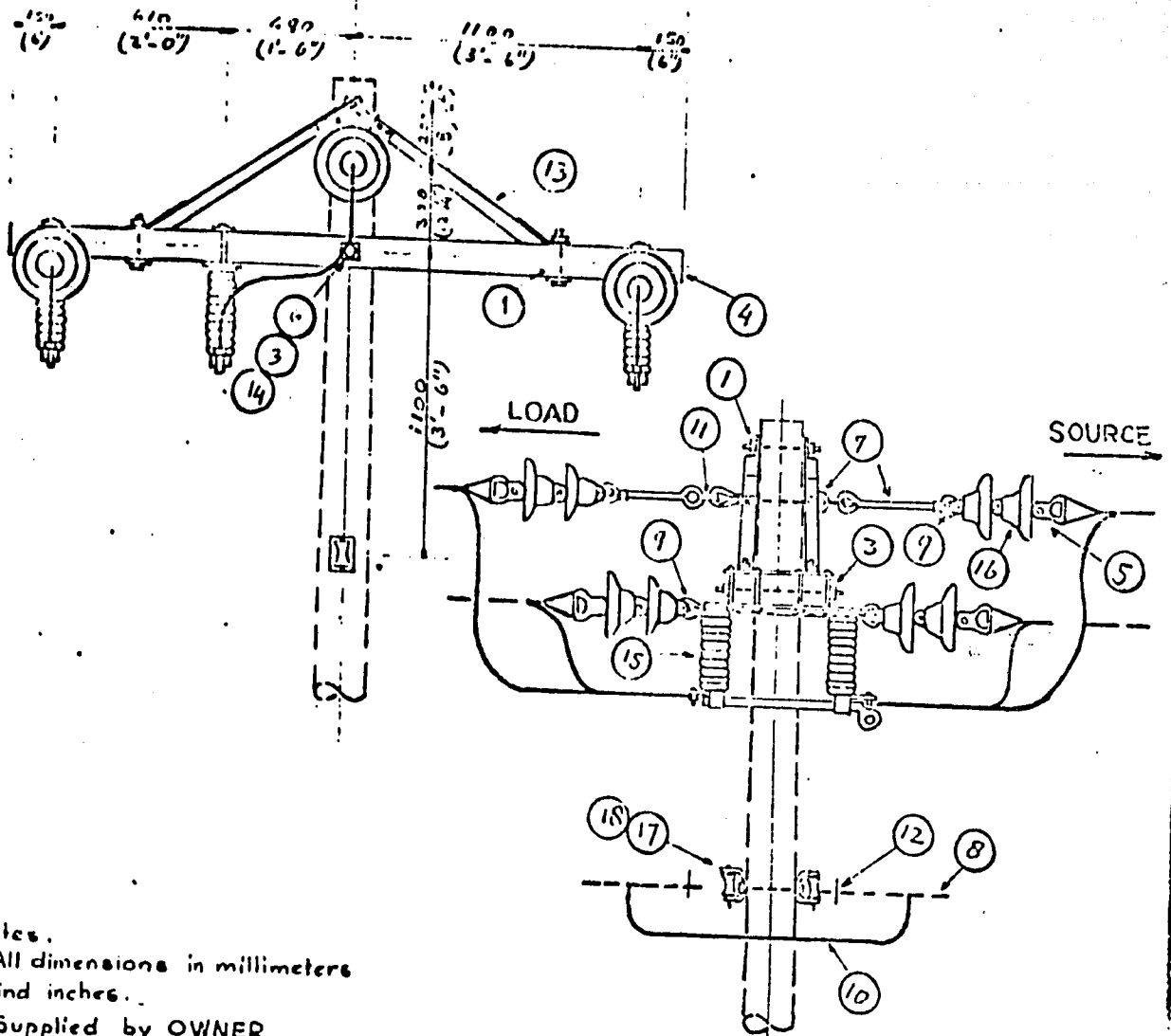
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI 1 SUMATERA UTARA

9 or 10 meter Pole Framing

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 4-5-72 DWG. NO. M3



- Notes.
1. All dimensions in millimeters and inches.
  2. Supplied by OWNER

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	5 Bolt, machine, 1/2" x req'd length	10	Jumpers, as required
2	5 Washer, round, 1 3/8" dia	11	2 Snackle, anchor
3	10 Washer, square, 2 1/4"	12	Dradend assembly, neutral, as req.
4	2 Crossarm, 3 1/2" x 4 1/2" x 8'-0" 2/	13	2 Brace, crossarm, wood 60" span
5	Deadend, assembl., primary	14	7 Locknuts
6	3 Bolt double arming, 5/8" x req'd lgth	15	3 Switch, disconnect, 25 KV, with mounting hardware
7	3 Bolt, eye, 5/8" x required length	16	12 Insulator, suspension, 10"
8	Connectors, as required	17	1 Bolt, machine 5/8" x req'd length
9	7 Nut, eye, 5/8"		
18	2 Insulated clevis		

REV NO	DATE	REVISION	By	APPR
1		Added note re suply of crossarms		

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

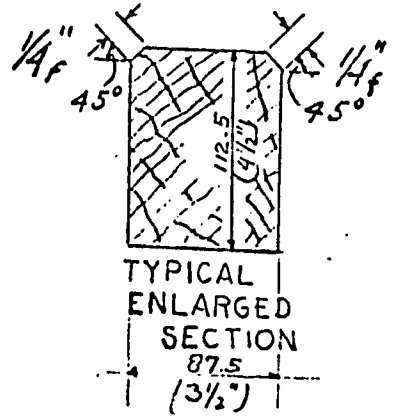
11.5/20KV  
 THREE SECTIONALIZING  
 DISCONNECT SWITCHES

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....

DATE 12-6-72 DWG. NO. M 4

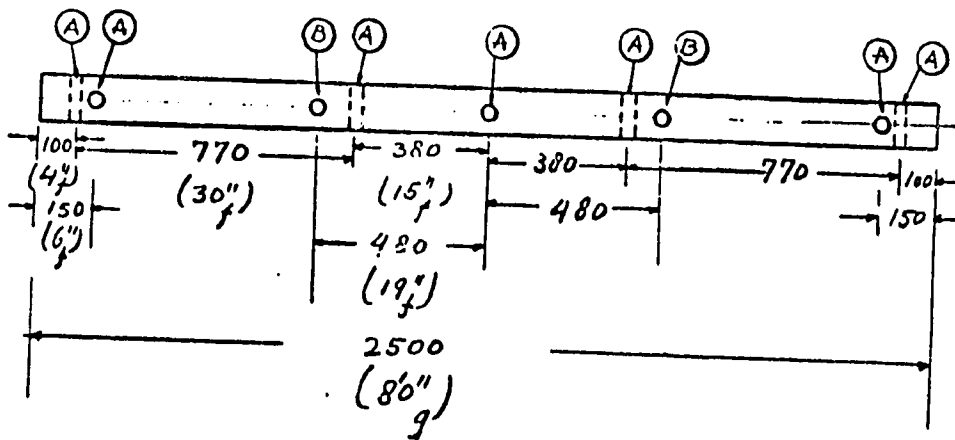
BOLT FOR VARIOUS  
SIZE HOLES

Nominal hole size	Bolt size
(A) 1/16"	5/8"
(B) 7/16"	3/8"



Dimension Tolerances

- f --- (3 mm ±)  
1/8" ±
- g --- (7 mm ±)  
1/4" ±



Notes

- 1. All dimensions are in millimeters unless otherwise noted

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

CROSSARM DRILLING GUIDE

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 12-6-72. DWG. NO. M5

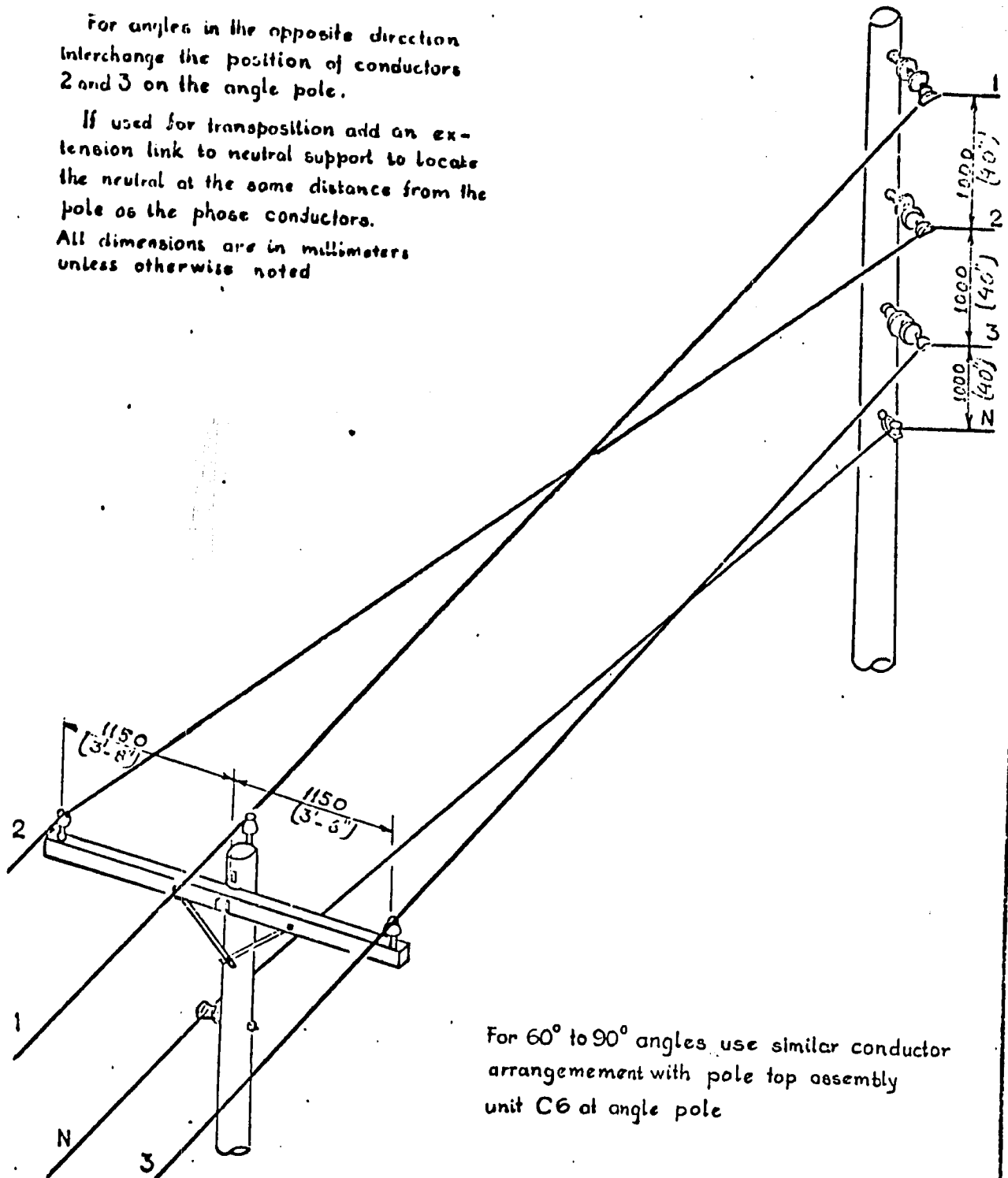


**Notes:**

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

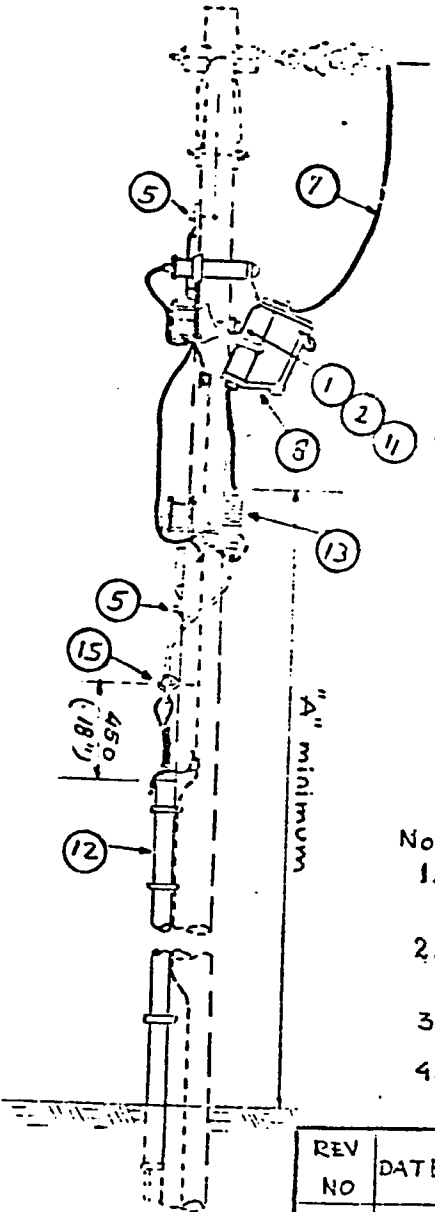
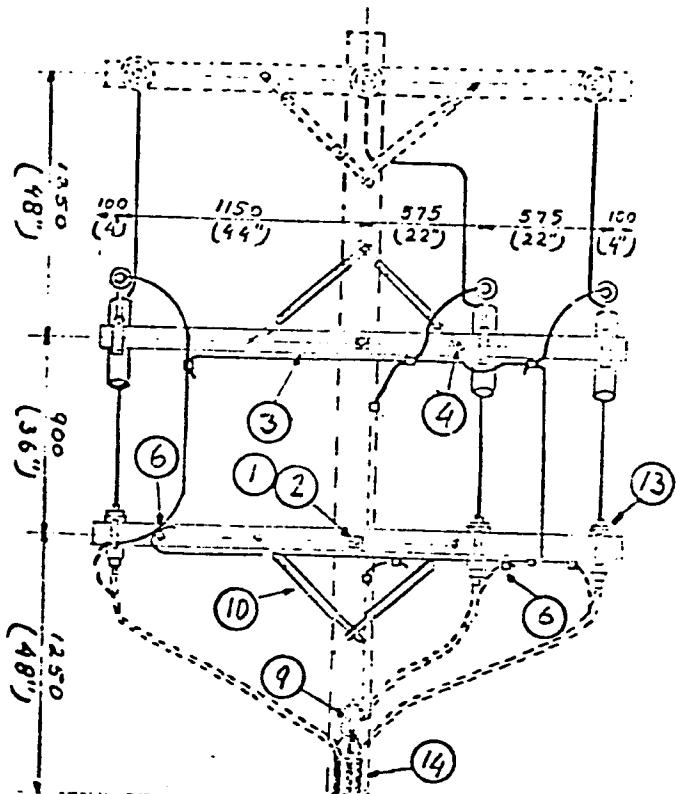
If used for transposition add an extension link to neutral support to locate the neutral at the same distance from the pole as the phase conductors.

All dimensions are in millimeters unless otherwise noted



For 60° to 90° angles use similar conductor arrangement with pole top assembly unit C6 at angle pole

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
ANGLE CONSTRUCTION GUIDE CROSSARM TO VERTICAL CONST-30° TO 60° ANGLE	
HARZA ENGINEERING CO., CHICAGO	
APPROVED.....	
DATE 4-5-72	DWG. NO. M6



ITEM NO.	DESCRIPTION
1	3
2	4
3	2
4	4
5	Screw, 1/2" x 1/4" x 1/8"
6	Connectors, as required
7	Numbers, as required
8	3
9	1
10	4
11	Locknuts
12	1
13	3
14	3
15	1

Assembly Unit		
No.	Shield Size	Cable Size
M7	3"	1/0 AWG

- Notes:
1. No bends permitted within 150mm of cable terminal base.
  2. Allow minimum cable slack of 600mm at bottom of riser.
  3. All dimensions in millimeters and inches
  4. Supplied by OWNER

All metal risers to be grounded

2500 min (96")

A" minimum  
Road Side 3' and  
Field Side 2.5'

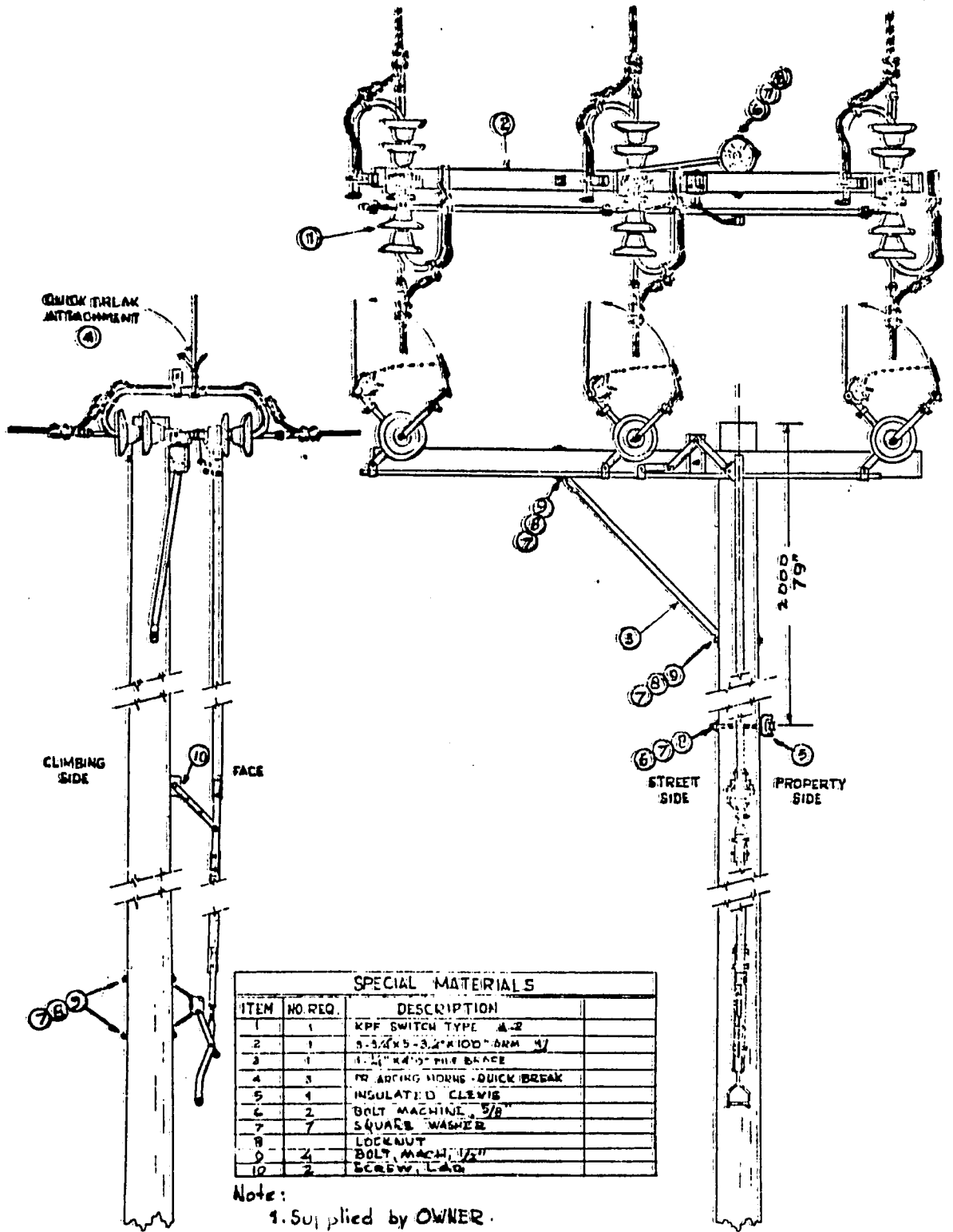
Slack

PERUSAHAAN LISTRIK NEGARA  
EKSPLOITASI I SUMATERA UTARA  
THREE-PHASE CABLE TERMINAL POLE (WITH DISTER) VALVE ARRESTERS

HARZA ENGINEERING CO., CHICAGO  
APPROVED: [Signature]

DATE 12-6-72 DWG. NO. M7

REV NO	DATE	REVISION	By	APPR
1	10-12-72	Added note re supply of crossarms	[Signature]	[Signature]



SPECIAL MATERIALS		
ITEM	NO. REQ.	DESCRIPTION
1	1	KPF SWITCH TYPE A-2
2	1	5-3/4" X 5-3/4" X 100" ARM W/
3	1	1-1/2" X 4-1/2" FILE BRACE
4	3	FR ARDING HORNS - QUICK BREAK
5	4	INSULATED CLEVIS
6	2	BOLT MACHINE, 5/8"
7	7	SQUARE WASHER
8		LOCKNUT
9	2	BOLT, MACH, 1/2"
10	2	SCREW, LAG

Note:  
1. Supplied by OWNER.

Mounting dimension to be supplied later

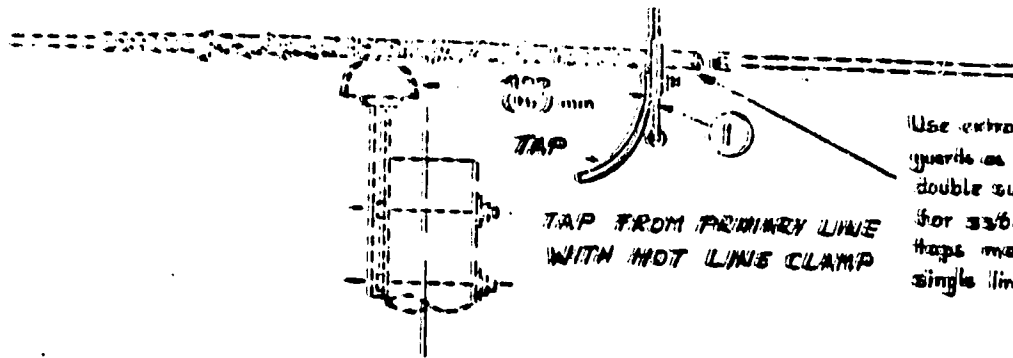
REV NO	DATE	REVISION	By	APPR
1	20-12-72	Added note re supply of crossarms		
2	10-7-73	Added items 5-10		

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

115/20KV PRIMARY  
THREE-POLE GROUP OPERATED  
AIR BREAK SWITCH.

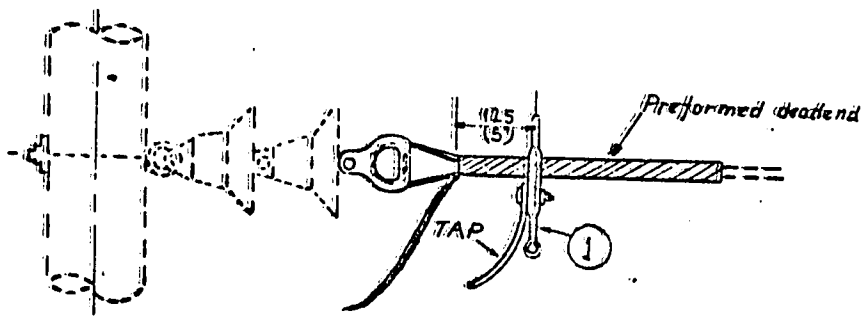
MARZA ENGINEERING CO, CINCINNATI  
APPROVED *[Signature]*

DATE 15-10-72 *[Signature]* M E



TAP FROM PRIMARY LINE WITH HOT LINE CLAMP

Use extra length line guards as specified for double supports, except for 336-A/M2/M, where taps may be made on single line guard.



TAP FROM PRIMARY DEADEND WITH HOT LINE CLAMP

For tap without hot line clamp make tap on extended pigtail

Notes:

1. On new construction, tap may be made directly over line guards provided conductor is thoroughly cleaned and inhibitor used before installing line guards.
2. When installing line guards on existing lines, conductor should be wire brushed thoroughly and inhibitor used before installing line guards.
3. All dimensions are in millimeters and inches

PERUSAHAAN LISTRIK NEGARA  
EKSPLOITASI I SUMATERA UTARA

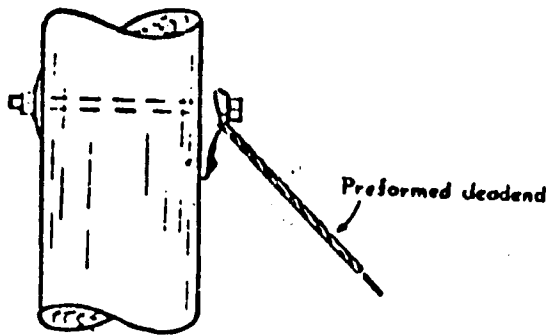
TAP ASSEMBLY GUIDE  
ALUMINIUM CONDUCTORS

WARZA ENGINEERING CO., CHICAGO

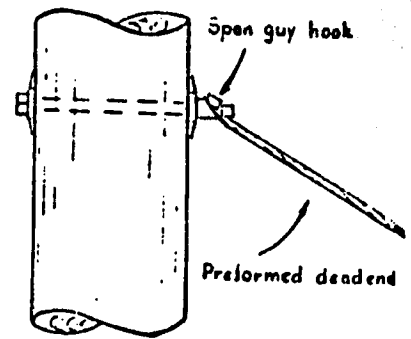
APPROVED *[Signature]*

DATE 12-6-72 DESGNO. M-9

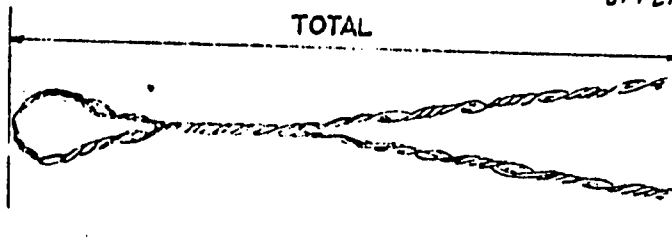




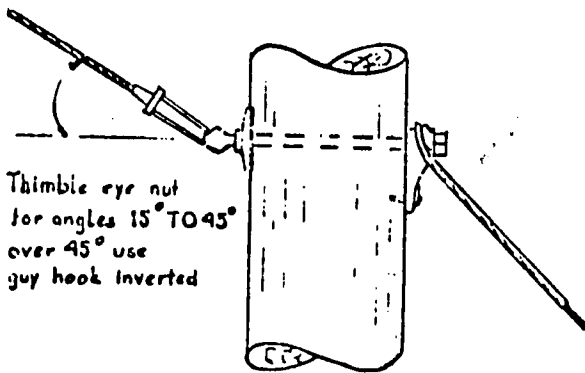
DOWN GUY



SPAN GUY  
UPPER END



BOLT SIZE	STRAND NOMINAL SIZE-7 STR.	PREFORMED DEAD ENDS TOTAL LENGTHS
5/8"	1/4"	25"
5/8"	3/8"	35"



Thimble eye nut  
for angles 15° TO 45°  
over 45° use  
guy hook inverted

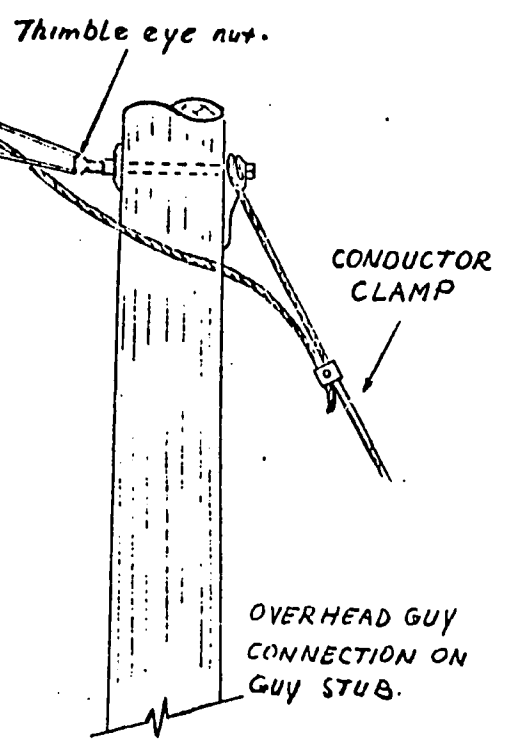
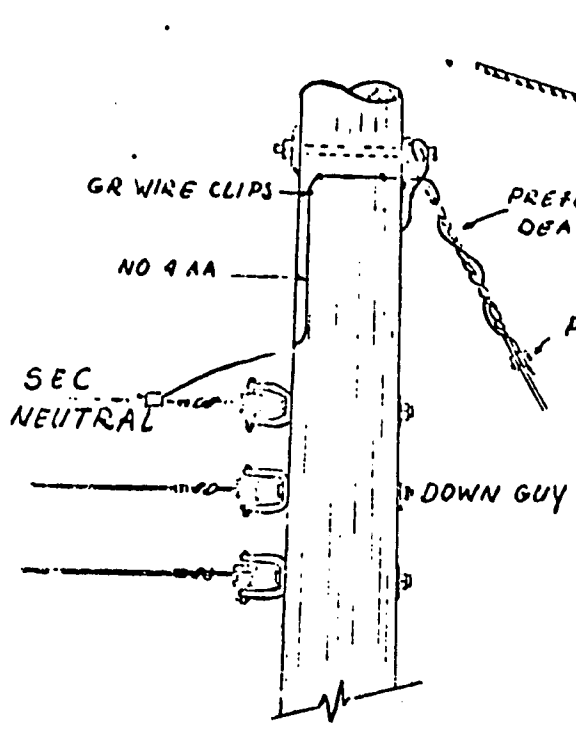
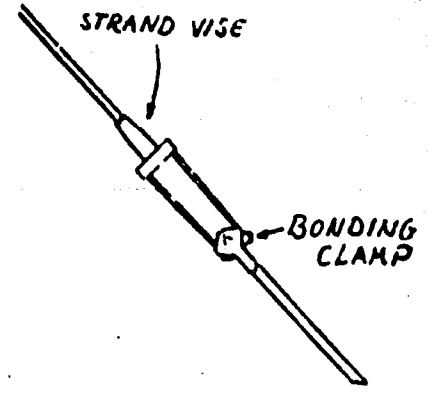
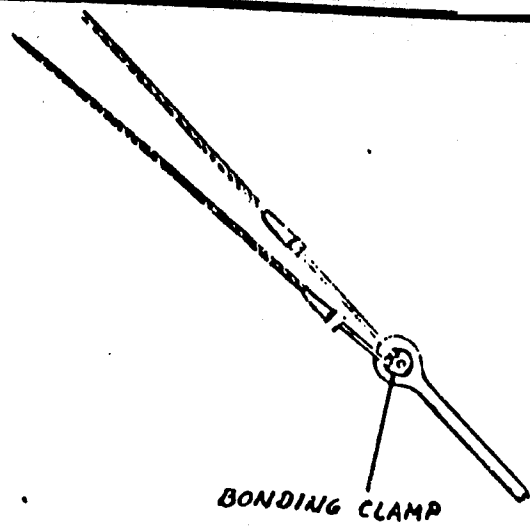
GUY STUBS

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

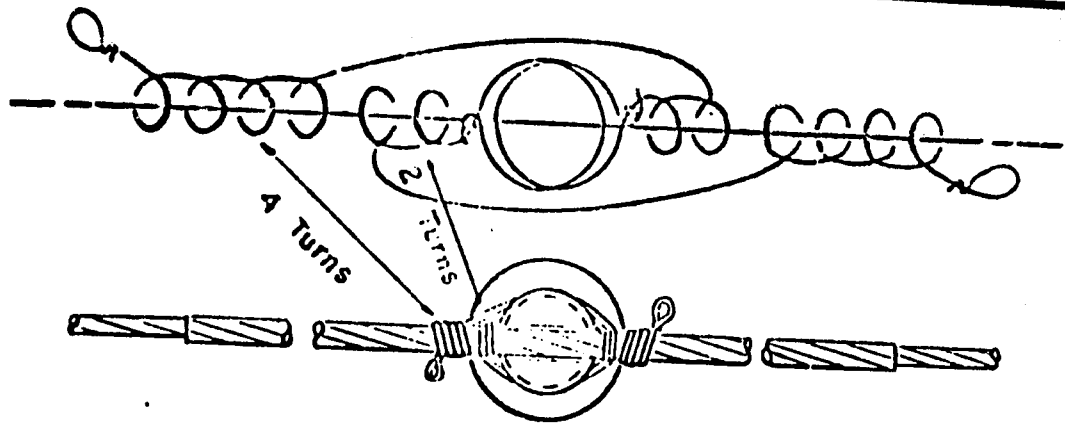
GUYING  
POLE ATTACHMENTS DETAILS

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

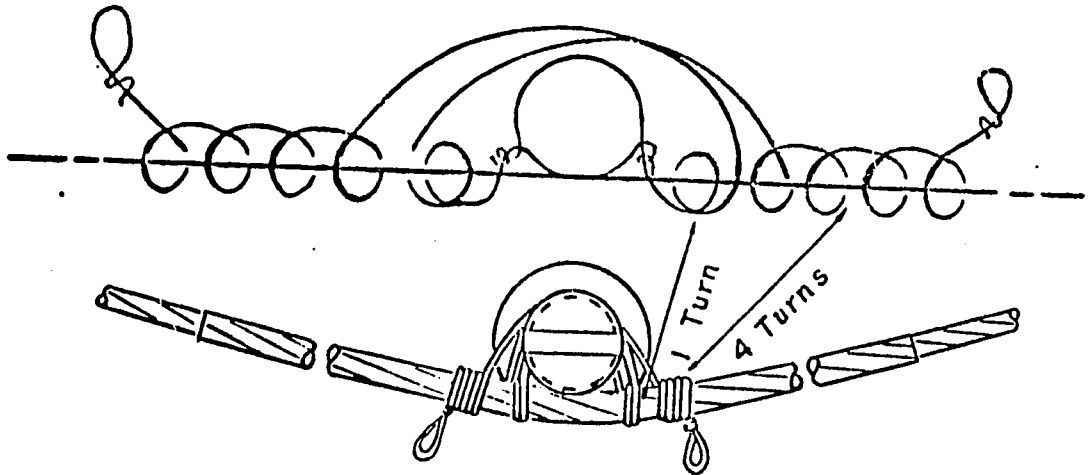
DATE 12-5-72 DWG. NO. M10



PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
ANCHOR & GUY BONDING	
HARZA ENGINEERING CO., CHICAGO	
APPROVED.....	
DATE 12-6-72	DWG. NO. M11



TOP GROOVE TIE



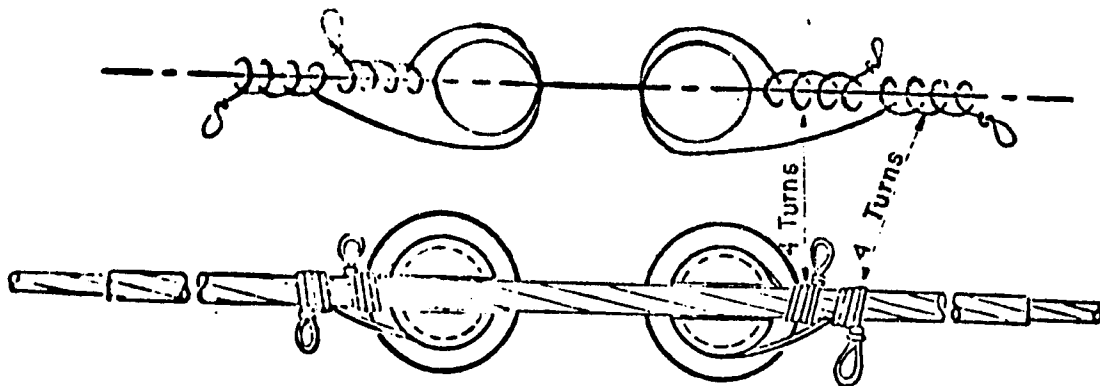
SIDE GROOVE TIE

Notes:

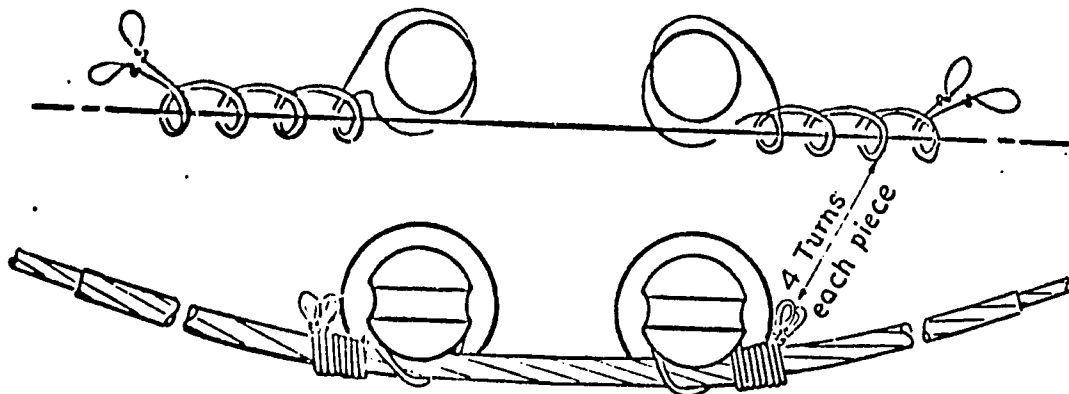
1. Tie wire assembly should be as tight as can be wrapped with hot line tools.
2. Tie wire lengths listed below can be used with insulators having a neck diameter up to and including 3 1/2 inches.
3. Turns may be made in either direction, as long as one-half the turns oppose the other half to prevent loosening of the tie.

A-A		DIAM. OVER LINE GUARDS	ALUMINUM TIE WIRE	
SIZE AWG	COND. DIAM		SIZE AWG	LENGTH (each piece)
# 2	.292	.534	6	3' 6"
1/0	.368	.610	6	3' 6"
3/0	.464	.706	4	3' 9"
336.4	.666	.958	4	4' 0"

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA  
 HOT LINE TYING GUIDE, SINGLE  
 INSULATOR ALUMINUM TIE WIRE  
 ALUMINUM CONDUCTOR WITH  
 PREFORMED LINE GUARDS  
 HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....  
 DATE 12-6-72 DWG. NO. 11.12



TOP GROOVE DOUBLE TIE



SIDE GROOVE DOUBLE TIE

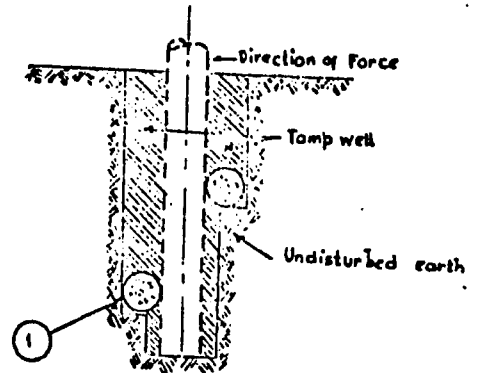
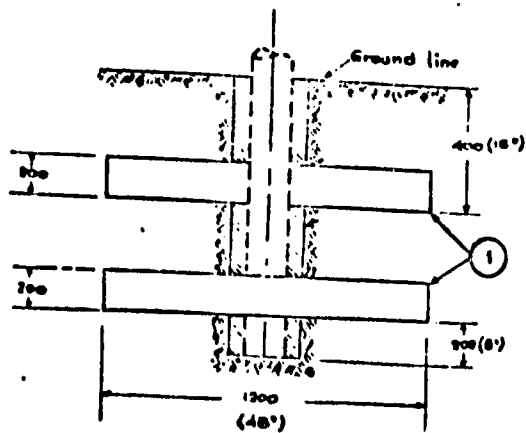
NOTES:

1. Tie wire assembly should be as tight as can be wrapped with hot line tools.
2. Tie wire lengths listed below can be used with insulators having a neck diameter up to and including 3 1/2 inches.
3. Turns may be made in either direction, as long as one-half the turns oppose the other half to prevent loosening of the tie

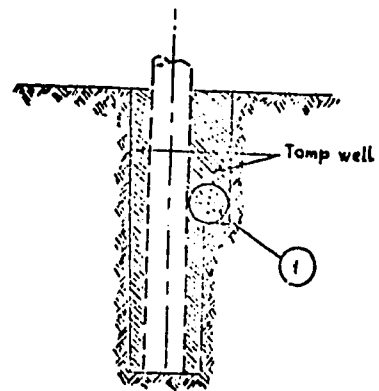
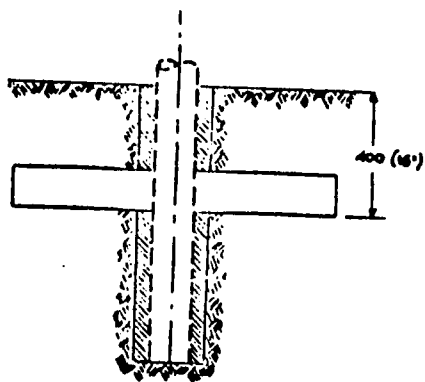
A - A		DIAM OVER LINE GUARDS	ALUMINUM TIE WIRE	
SIZE AWG	COND DIAM		SIZE AWG	LENGTH (each piece)
3/0	.464	.706	4	4'9"
336.4	.666	.958	4	5'6"

PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA  
 HOT LINE TYING GUIDE, DOUBLE  
 INSULATOR ALUMINIUM TIE WIRE  
 ALUMINIUM CONDUCTOR WITH  
 PREFORMED LINE GUARD  
 HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....  
 DATE 12 - 6 - 72 DWG. NO. M. 13





M 14-2



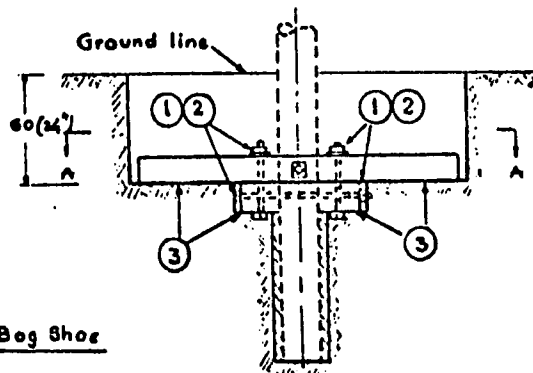
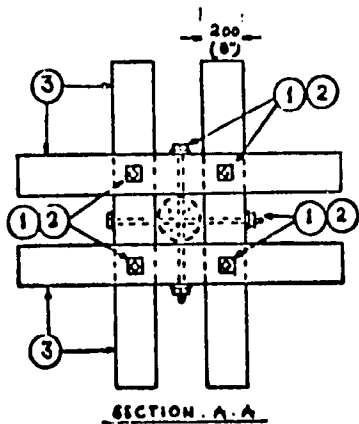
M 14-1

Note:

1. Logs supplied by OWNER

ITEM	NO.	MATERIAL
1		logs, treated, 200mm x 1200 mm.

REV NO	DATE	REVISION	By	APPR	PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
1	20.12.72	Added note re supply of material	<i>[Signature]</i>	<i>[Signature]</i>	<p>POLE KEY</p> <p>HARZA ENGINEERING CO. CHICAGO APPROVED <i>[Signature]</i></p>
					DATE 14-10-72
					DWG. NO. M. 14.

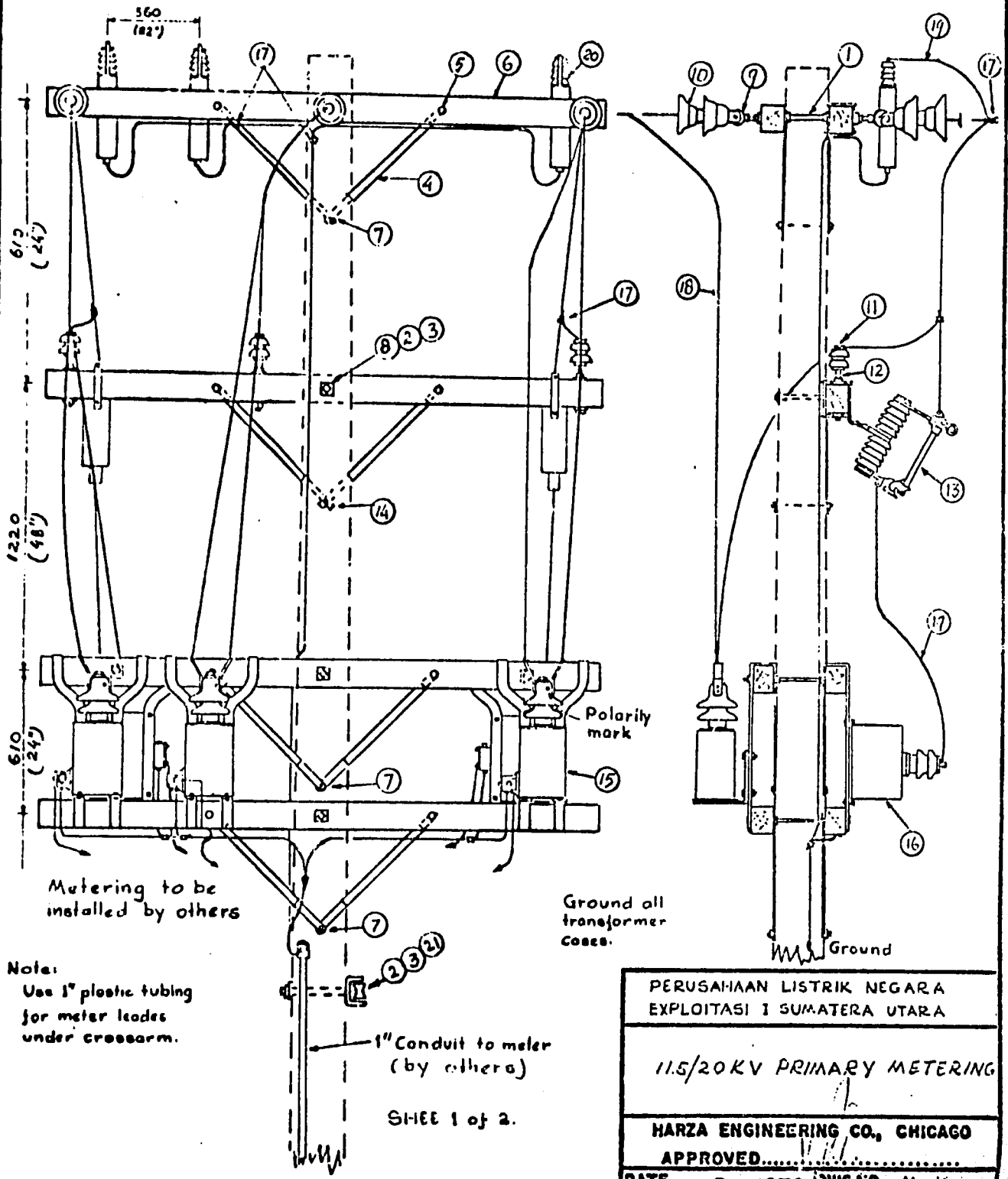
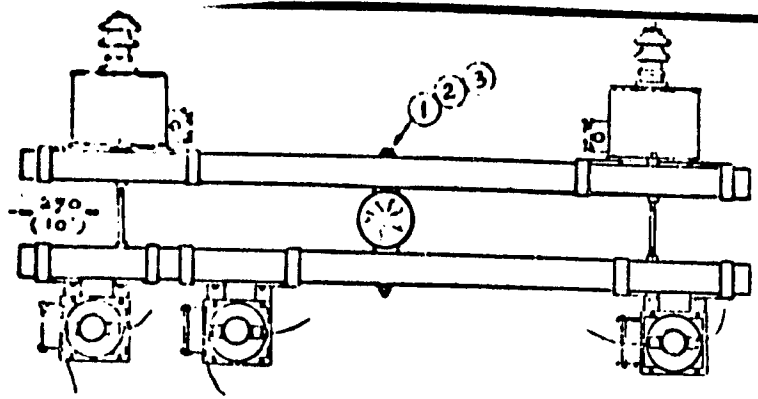


ITEM	No	MATERIAL
1	6	Bolt, machine 5/8" x req'd length
2	12	Washer, square 2 1/4"
3	4	Planks, treated 150 x 200 x 1500 mm 2/

Note:

1. All dimensions are in millimeters and inches
2. Supplied by OWNER

REV NO	DATE	REVISION	By	APPR	PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
1	30-12-72	Added note re supply of planks			
					HARZA ENGINEERING CO., CHICAGO APPROVED.....
					DATE 14 Oct 1972 DWG. NO. M.15



Metering to be installed by others

Ground all transformer cases.

Note:  
Use 1" plastic tubing for meter leads under crossarm.

1" Conduit to meter (by others)

SHEET 1 of 2.

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
11.5/20KV PRIMARY METERING
HARZA ENGINEERING CO., CHICAGO APPROVED.....
DATE. 30 Oct 1972 DWG. NO. M. 16

# Bill of Material

## ASSEMBLY UNIT

M16

NO	MATERIAL	WHSE NO	QUANTITY REQUIRED
1	Bolt, double arming 5/8"		9
2	Washer, square 2 1/4"		32
3	Locknuts 5/8"		12
4	Brace, crossarm, wood		14
5	Bolt, carriage 3/8" x 4 1/2"		14
6	Crossarm, 3 1/2" x 4 1/2" x 8'0"	2/	7
7	Bolt, machine 1/2" x req'd length		3
8	Bolt, machine 5/8" x req'd length		2
9	Nut, eye 5/8"		6
10	Insulator, suspension 10"		12
11	Insulator, pin type		3
12	Pin, crossarm 5/8" x 14"		3
13	Fuse cutout, 1 amp. fuse		2
14	Screw, lag 1/2" x 4"		1
15	Current transformers w/hangers		3
16	Potential transformers w/hangers		3
17	Connectors as required		
18	Jumper, 1/0 AA as req'd		
19	Jumper /-4 AA as req'd		
20	Lightning arresters		
21	Insulated clevis		3

**NOTE**

- 1) SEE SHEET 1 OF 2 FOR ASSEMBLY DRAWING
- 2) supplied by OWNER

SHEET 2 OF 2

REV NO	DATE	REVISION	BY	APPR
1		Added note 2		
2	10-4-73	Added item 21		

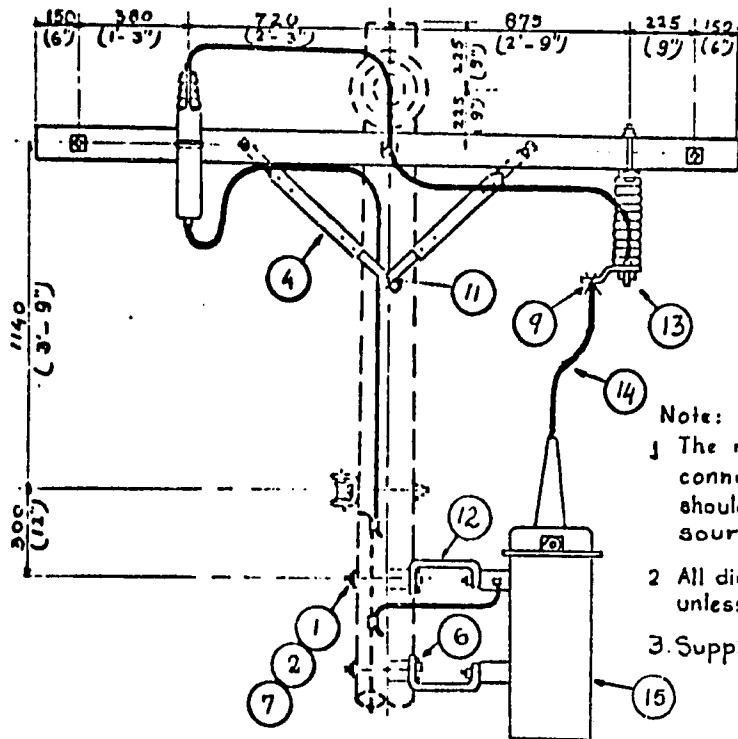
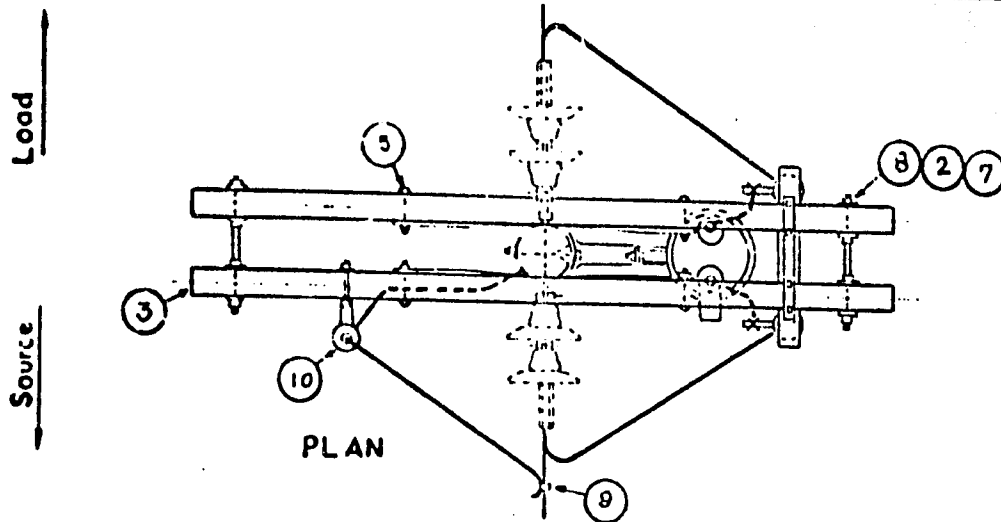
PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

11.5/20Kv Primary Metering

WARZA ENGINEERING CO., CHICAGO

APPROVED: *[Signature]* MEDAN

DATE 30-10-1972 DWG NO M 16

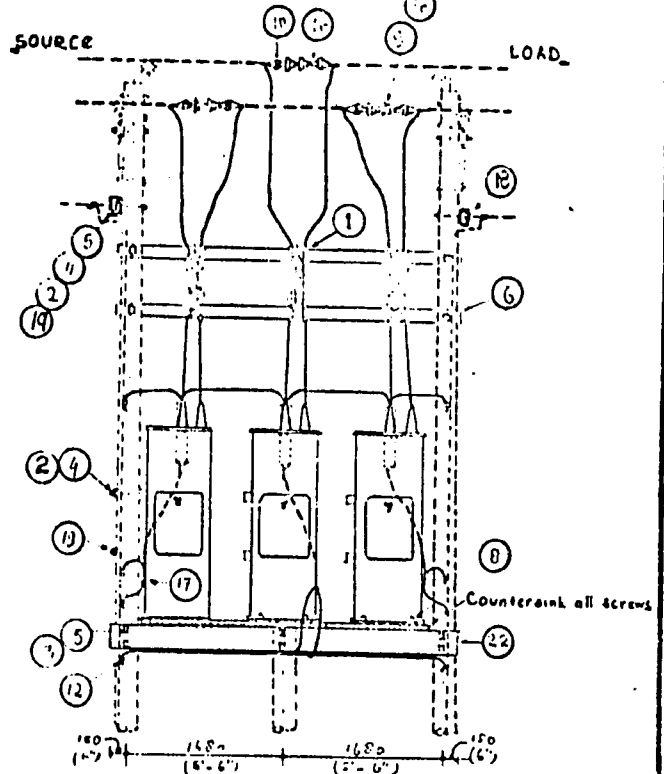
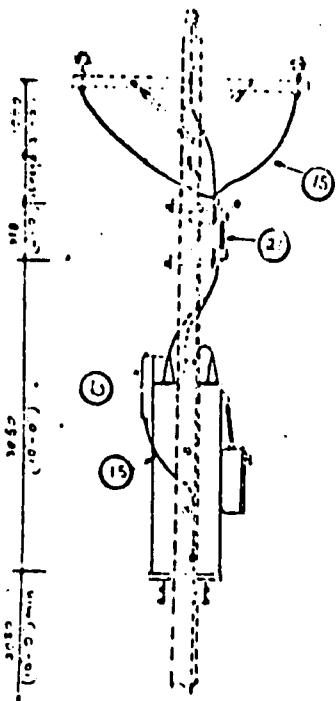
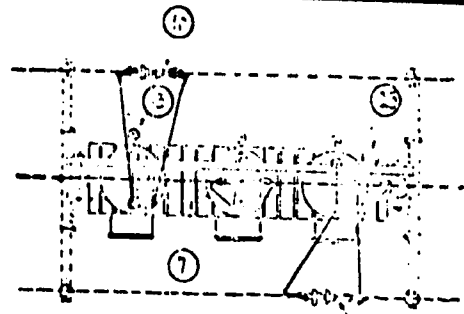
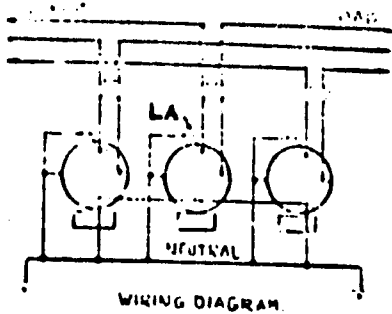


- Note:
- 1 The recloser terminal bushing connected directly to the coil should be connected to the source.
  - 2 All dimensions in millimeters unless otherwise noted.
  - 3 Supplied by OWNER

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	2 Bolt machine, 5/8" x req'd. length	9	Connectors, as required
2	12 Washer, square, 2 1/4"	10	1 Lightning arrester
3	2 Crossarm, 3 1/2" x 4 1/2" x 8'-0" $\frac{3}{4}$ "	11	1 Bolt, machine 1/2" x req'd length
4	4 Brace, wood, 28"	12	2 Bracket, extension for recloser
5	4 Bolt, carriage, 3/8" x 4 1/2"	13	1 Switch, recloser by-pass, 200 Amp
6	4 Screw, lag, 1/2" x 4"	14	Jumpers, stranded, as required
7	8 Locknuts	15	1 Recloser, oil circuit, 100 Amp
8	3 Bolt, double arming, 5/8" x req'd. length		

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA			
11.5/20KV ONE SECTIONALIZING OIL CIRCUIT RECLOSER WITH BY-PASS SWITCH			
HARZA ENGINEERING CO., CHICAGO			
APPROVED.....			
DATE, 24-8-1972		DWG. NO. M. 17	

REV NO	DATE	REVISION	By	APPR
1	30-12-72	Added note 3.		



Sheet 1 of 2 - See sheet 2 for notes

ITEM NO.	MATERIAL	ITEM NO.	MATERIAL
1	12 Bolt, machine, 1/2" x req'd length	14	3 By-pass arrester see note 4
2	8 Bolt, machine, 5/8" x req'd length	15	Leads or jumpers as required
3	6 Bolt, machine, 3/4" x req'd length	16	3 Chain link, 5/8" x 3/4"
4	12 Washer, round, 1 3/8" dia, 9/16" hole	17	3 Connector, solderless see note 4
5	14 Washer, square, 2 1/4"	18	2 Deadend assembly, neutral
6	2 Crossarm 3 3/4" x 4 3/4" x 12" G/	19	Locknuts
7	Screw, leg, 1/2" x 5", as required	20	3 Regulator, step type, 1 1/2", 200 Amp
8	8 Screw, leg, 5/8" x 6"	21	3 Regulator, by-pass switch
9	6 Insulator suspension G"	22	2 Structural timber, 4" x 12" x 12' x 0" G/
10	6 Deadend assembly, primary	23	Planks, 2" or 3" thick, length as req'd G/
11	2 Civi., insulated		
12	Connectors, as required		
13	3 Lightning arrester		

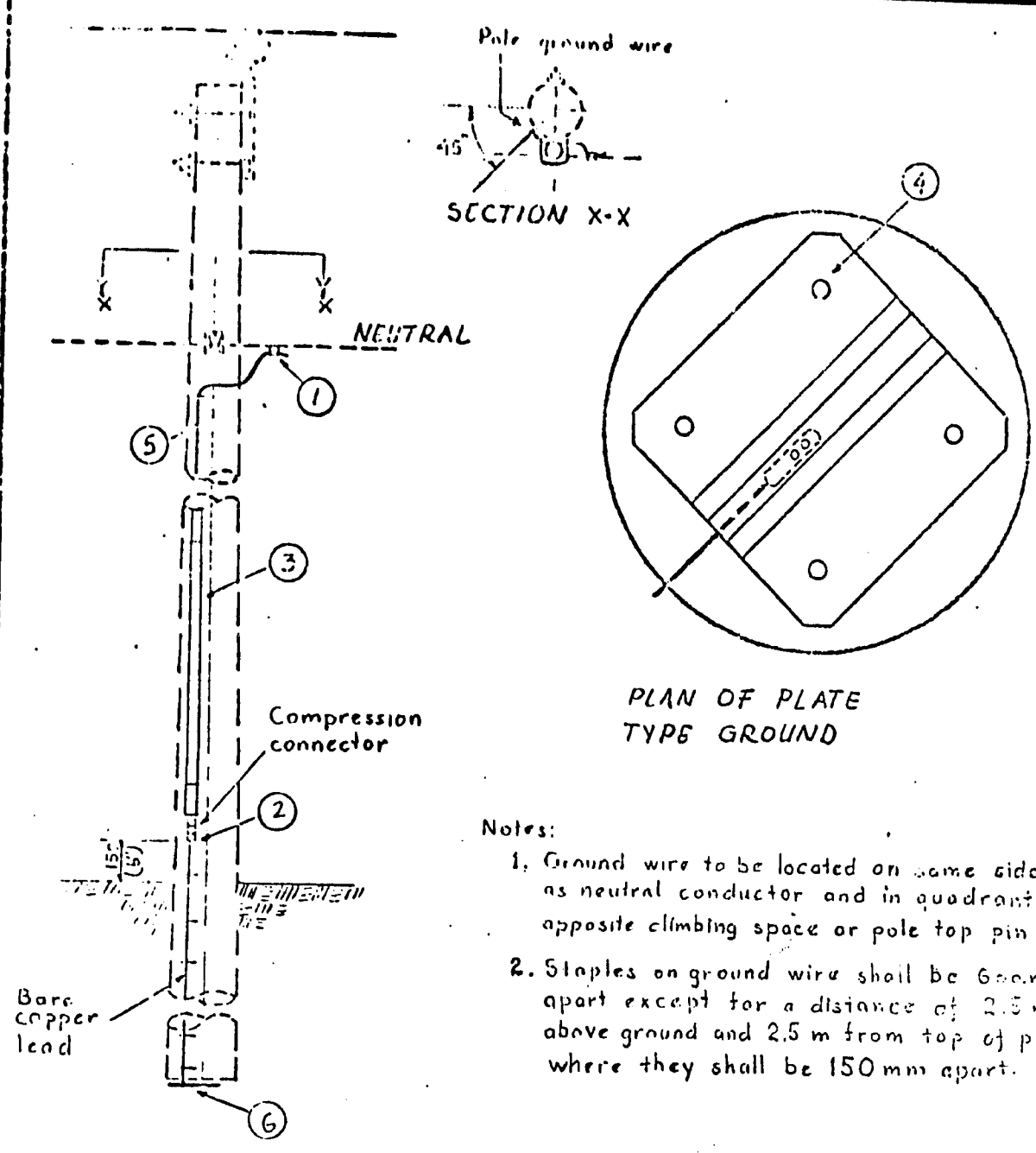
PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI 1 SUMATERA UTARA  
 11.5/20 KV, 3-PHASE STEP  
 VOLTAGE REGULATOR ASSEMBLY  
 Sheet: 1  
 HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....  
 DATE. 29-8-1972 DWG. NO. M.18

**Notes:**

1. All structural timber and planks to be treated
2. When mounting lugs for direct pole mounting are not provided, all regulators must be bolted to platform.
3. All dimensions in millimeters and inches.
4. To be supplied with regulator
5. Mounting details to be supplied by contractor
6. To be supplied by OWNER.

Sheet 2 of 2

REV NO	DATE	REVISION	BY	APPR	
1	20-12-72	Added note 6	6	AP	PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
					11.5/20KV 3 PHASE STEE VOLTAGE REGULATOR ASSEMBLY
					HARZA ENGINEERING CO, CHICAGO APPROVED.....
					DATE 31-10-72 DWGNO M.18



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 600mm apart except for a distance of 2.5 m above ground and 2.5 m from top of pole where they shall be 150 mm apart.

ITEM NO	MATERIAL	ITEM NO	MATERIAL
1	Connectors, as required	5	Ground wire, No. 4 aluminum, or equivalent, as required
2	Connectors, compression	6	1 Grounding plate, built type, galv. steel with bare copper lead
3	1 Moulding 2,5 meters x 15 mm		
4	4 Nails, galvanized, 1", roofing		

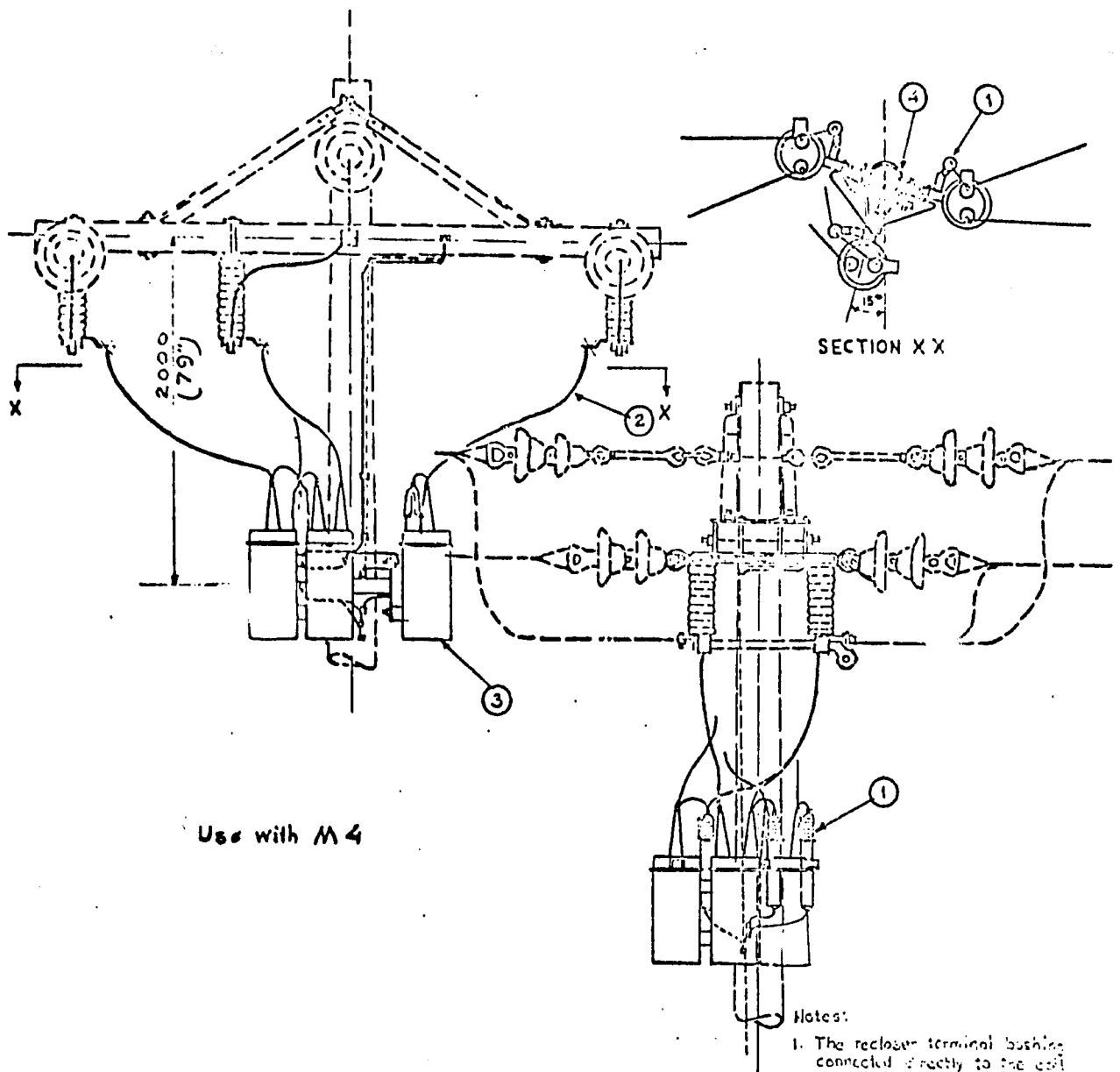
PERUSAHAAN LISTRIK NEGARA  
 EXPLOITASI I SUMATERA UTARA

POLE PROTECTION  
 ASSEMBLY - PLATE TYPE

HARZA ENGINEERING CO., CHICAGO  
 APPROVED.....

DATE 24-8-1972 DWG. NO. M 19





Use with M 4

Notes:

1. The recloser terminal bushing connected directly to the coil should be connected to the source.
2. Each recloser tank shall have two connections to ground.
3. Where suitable hanger is not furnished with the recloser a standard transformer hanger may be used as indicated.
4. All dimensions in millimeters and inches.

ITEM	NO	MATERIAL
1	3	Lightning arrester
2		Jumpers, stranded, as required
3	3	Recloser, oil circuit.
4	1	Bracket, cluster type, with adapter plate as req'd.

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA.

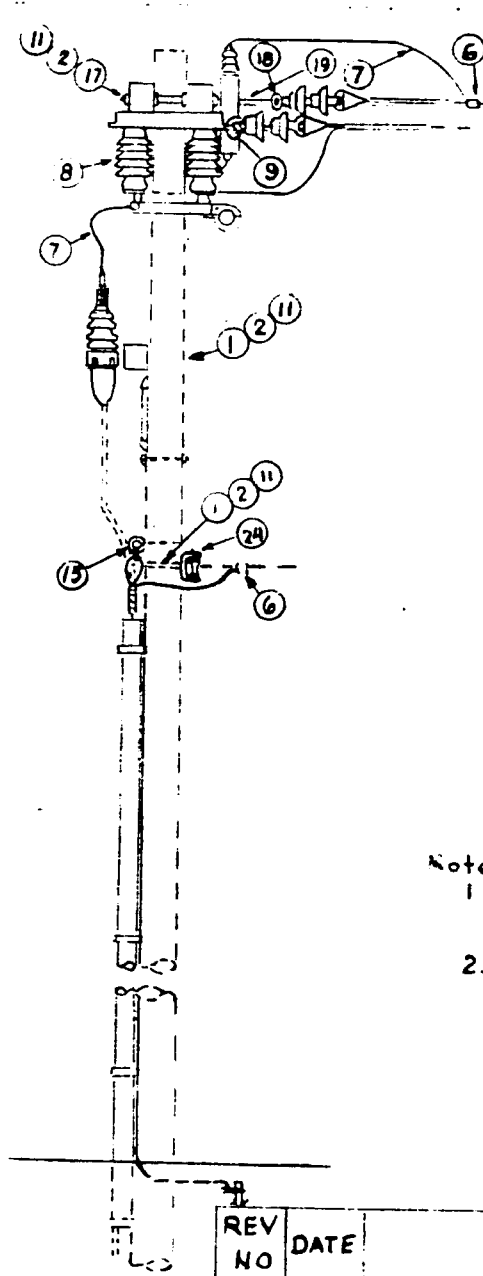
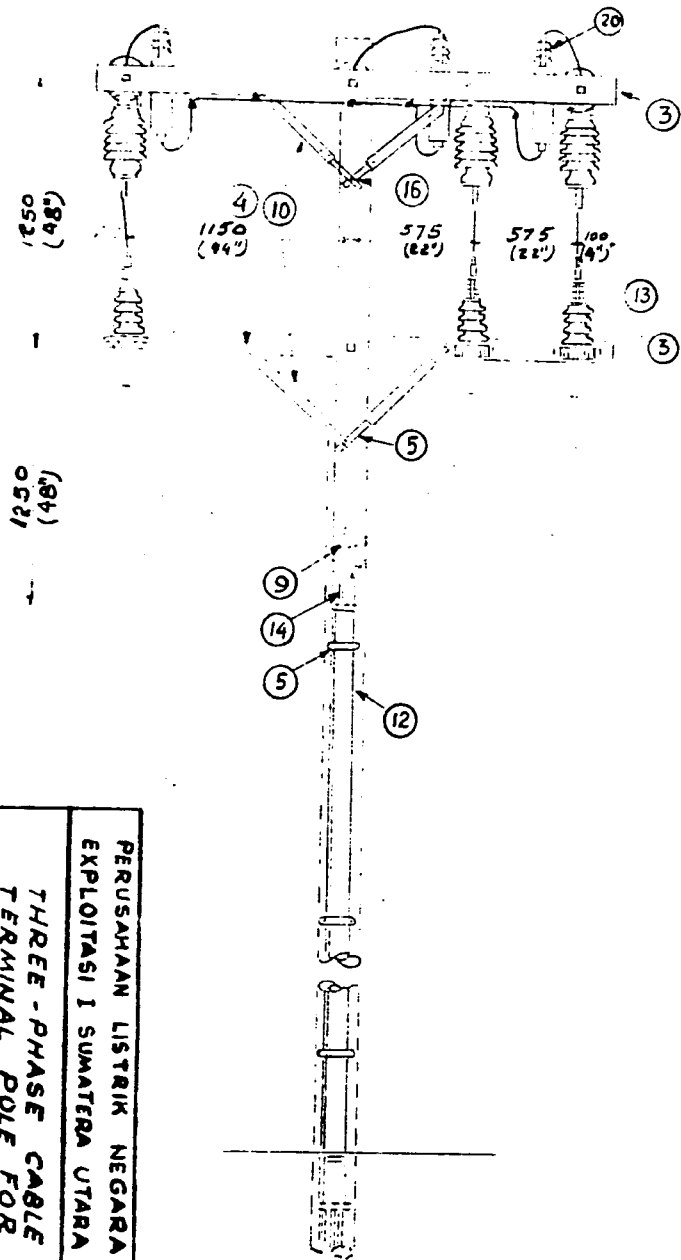
SECTIONALIZING OIL CIRCUIT RECLOSERS  
WITH BY-PASS SWITCHES

HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 24-8-1972 DWG. NO. M 20





ITEM	MATERIAL
1	2 Bolt, machine 5/8" x req'd length
2	4 Washer, square, 2 1/4"
3	3 Crossarm, 3 1/2" x 4 1/2" x 10"
4	4 Bolt, carriage, 3/8" x 4"
5	Screw, lag 1/2" x 4" o. d.
6	Connectors as req'd
7	Jumpers, as required
8	3 Hook operated disconnect
9	4 Shackle, anchor
10	4 Brace, wood, 28"
11	7 Locknuts
12	1 Cable riser shield 5"
13	3 Cable termination with crossarm
14	3 Cable support for 750 MCM
15	1 Eye screw, elliptical
16	1 Bolt machine 1/2" x req'd length
17	3 Bolt, double arming, 5/8"
18	2 Eye nut, 5/8"
19	1 Bolt eye 5/8" x 12"
20	3 lightning arrestors
21	6 Insulators suspension 5 3/4" x 10"
22	Pri deadends
23	Sec deadend
24	1 Sec clevis



Notes:  
 1. All dimensions in millimeters and inches  
 2. Supplied by OWNER.

PERUSAHAAN LISTRIK NEGARA  
 EKSPLOITASI I SUMATERA UTARA  
 THREE-PHASE CABLE  
 TERMINAL POLE FOR  
 750 MCM AA  
 HARZA ENGINEERING CO, CHICAGO  
 APPROVED  
 31-10-72 DWG No M 21




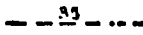











REV NO	DATE	REVISION	BY	APPR
1	30-12-72	Added notes; changed quantity of cross		

# CONSTRUCTION DRAWING SYMBOLS

## A - EXISTING SYSTEM.

	POLES
	OVERHEAD CIRCUIT TRANSFORMER IN VAULT

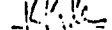
## B - TO BE INSTALLED

	POLES (Height & class indicated on staking sheet)
	SECONDARY CONDUCTORS (i.e. 3 - conductors, size as indicated on drawing)
	POLE KEY
	SPAN GUY (i.e. 33 meters, guy strand size indicated on staking sheet)
	DOWN GUY (i.e. 8 meters lead, guy strand size indicated on staking sheet)
	POLE NUMBER (References Construction Drawing to staking sheet)
	PRIMARY CONDUCTORS (Number and size indicated on drawing)
	TRANSFORMERS - SINGLE PHASE (Size indicated on drawing)
	TRANSFORMER - THREE PHASE BANK (Size indicated on drawing)
	SWITCH, HOOK OPERATED, SINGLE POLE DISCONNECT
	SWITCH, GROUP OPERATED, NON - LOAD BREAK
	SWITCH, GROUP OPERATED, LOAD BREAK
	SWITCH, FUSED DISCONNECT TYPE
	VOLTAGE REGULATOR (Size indicated on drawing)
	OIL CIRCUIT RECLOSER (Size indicated in drawing)

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

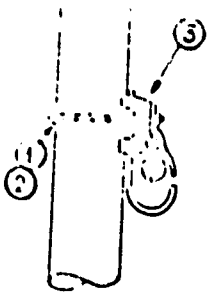
### CONSTRUCTION DRAWING SYMBOLS

WARZA ENGINEERING CO., CHICAGO.

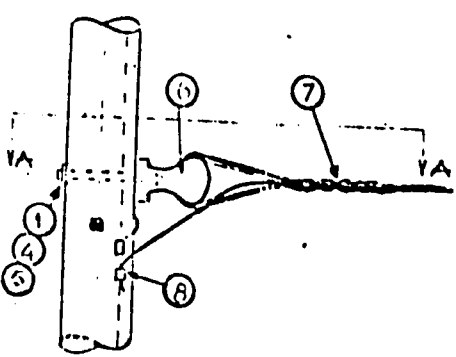
APPROVED 

DATE 30-10-72      DWG. NO. N-22

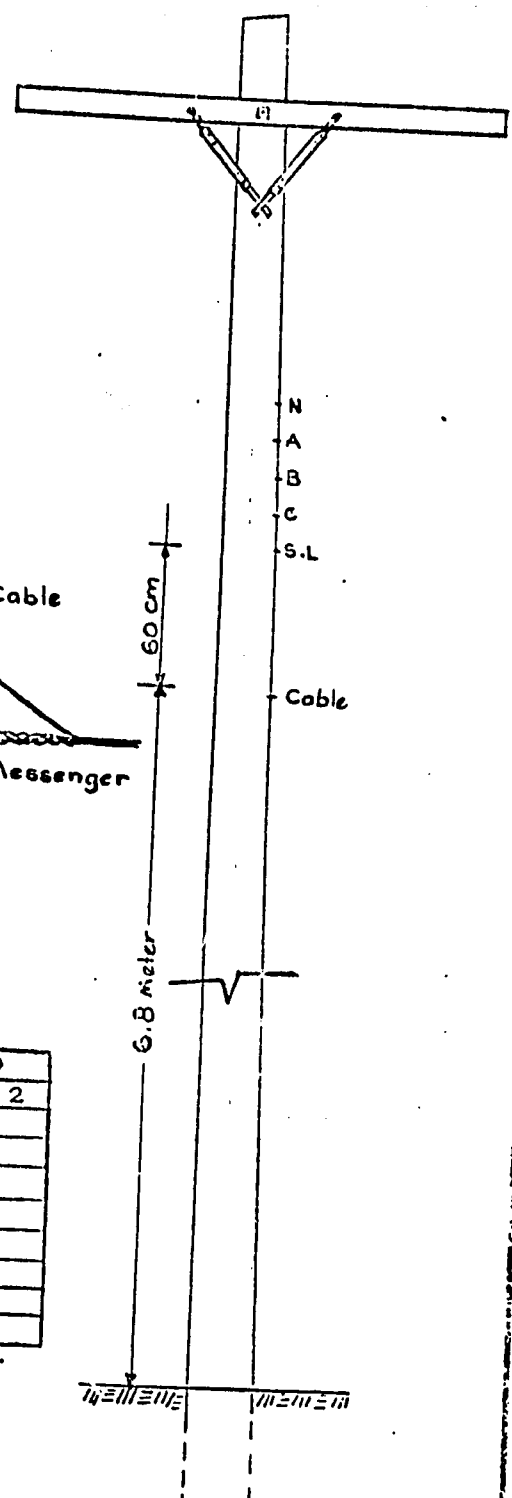
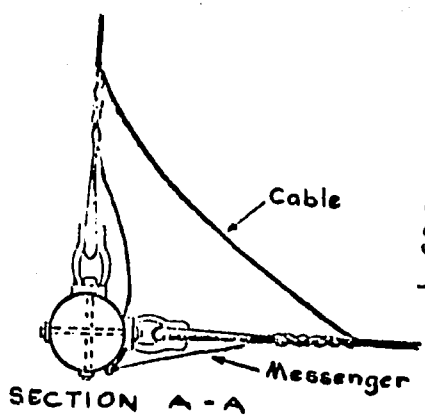
TYPICAL TANGENT POLE



M.23-1  
0°-30° ANGLE



M.23-2



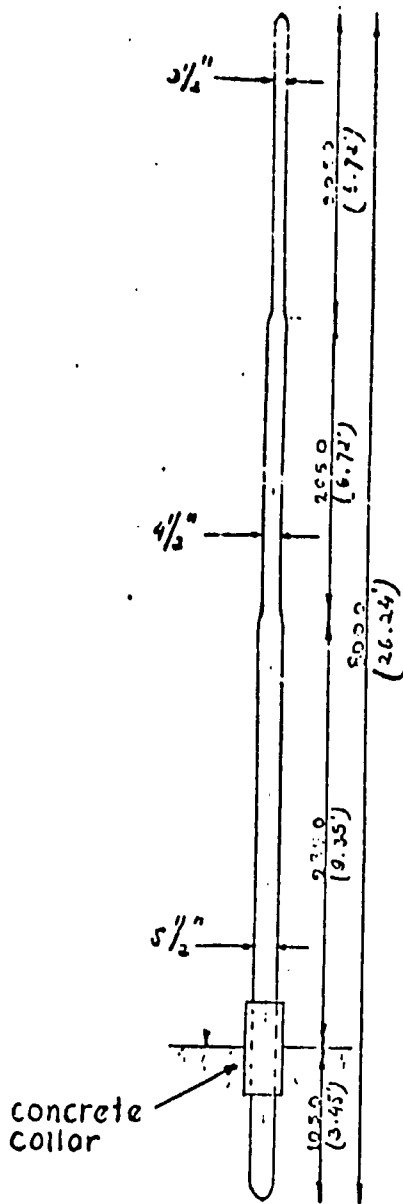
ITEM	MATERIAL	NO. REQUIRED	
		M 23-1	M 23-2
1	Square Washer	1	1
2	Hanger bolt assembly	1	
3	Cable hanger	1	
4	Bolt, machine 5/8" x req'd length		1
5	Locknut		1
6	Thimble nut		1
7	Preformed deadend		1
8	Connector as required		1

PERUBAHAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

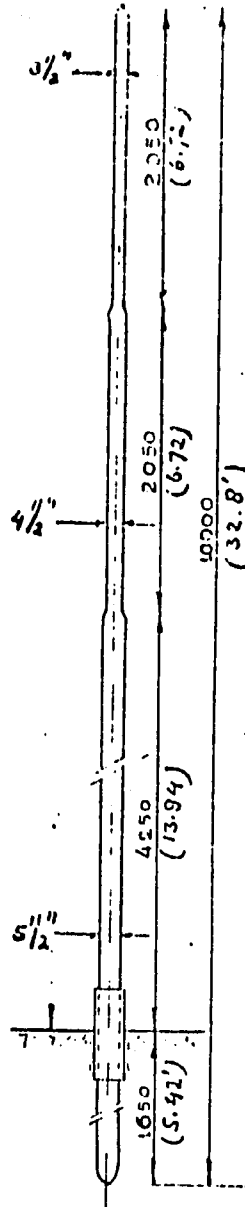
SELF SUPPORTED  
CONTROL CABLE

HARZA ENGINEERING CO, CHICAGO  
APPROVED *[Signature]*

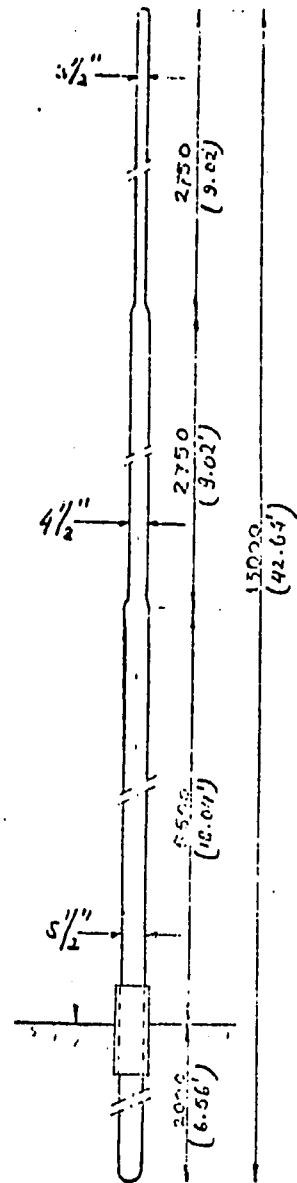
DATE 21-2-1975 DWG. NO. M 23



8. METER  
UNIT R1-1



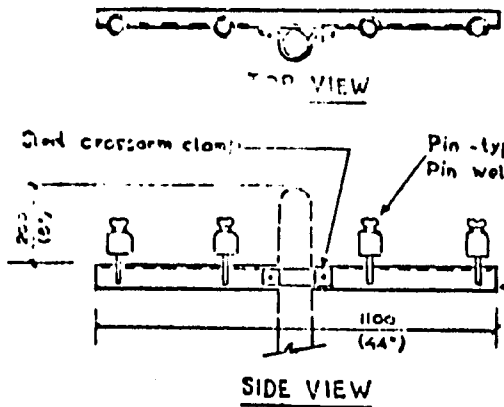
10. METER  
UNIT R1-2



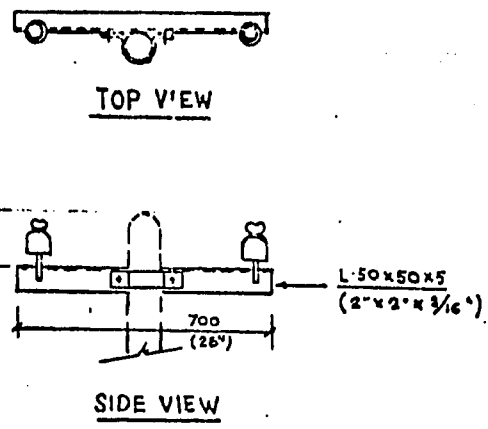
13. METER  
UNIT R1-3

Note: All dimensions are  
in millimeters unless  
otherwise noted.

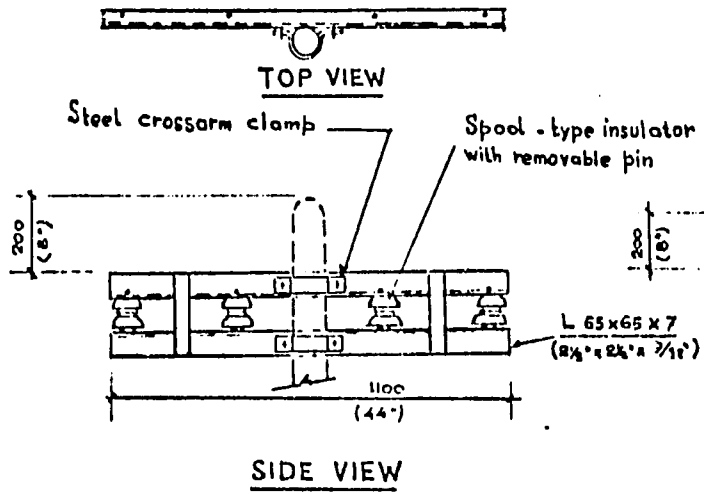
PERUSAHAAN LISTRIK NEGARA EKSPLOITASI I SUMATERA UTARA
REMOVAL UNIT'S EXISTING STEEL POLES
HARZA ENGINEERING CO., CHICAGO APPROVED.....
DATE 31-7-72 DWG. NO. R1



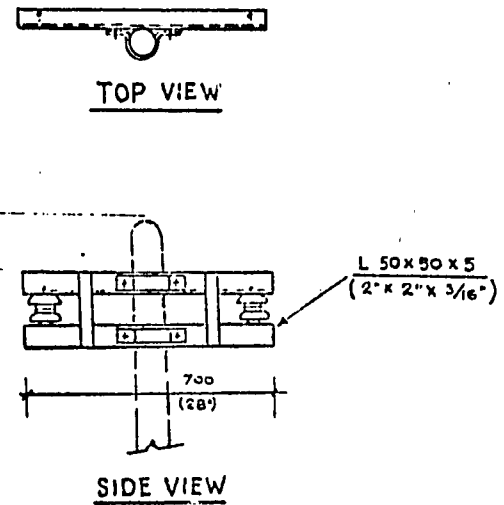
**4 - PIN CROSSARM  
UNIT R 2-1.**



**2 - PIN CROSSARM  
UNIT R 2-2**



**4 - SPOOL CROSSARM  
UNIT R 2-3.**



**2 - SPOOL CROSSARM  
UNIT R 2-4.**

**Notes:**

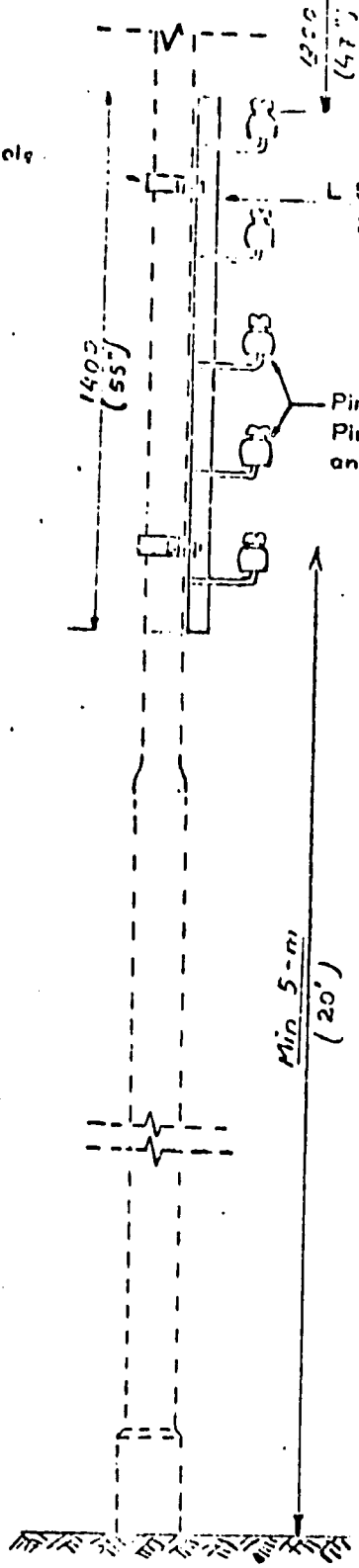
1. All dimensions are in millimeters and inches.
2. Removal of steel poles is included in Unit R 1.

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
REMOVAL UNIT EXISTING 127/220VOLT CROSSARMS	
HARZA ENGINEERING CO., CHICAGO APPROVED.....	
DATE 5/1/72	DWG. NO. R 2

Steel pole band

L 50 X 50 X 5  
2" X 2" X 3/16

Pin-type insulators  
Pin welded to angle iron.



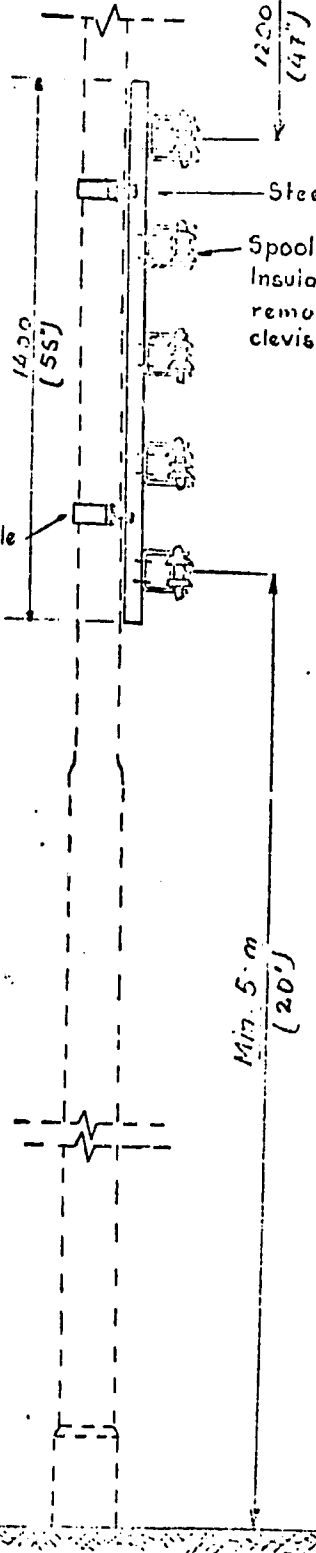
5-PIN RACK  
UNIT R3-1

Notes:

1. All dimensions are in millimeters and inches
2. Removal of steel poles is included in Unit R1.
3. Removal units include the removal of all 2, 3, 4 and 5 pin and spool type racks.

1200  
(47")

Steel channel  
Spool-type insulator and removable steel clevis.



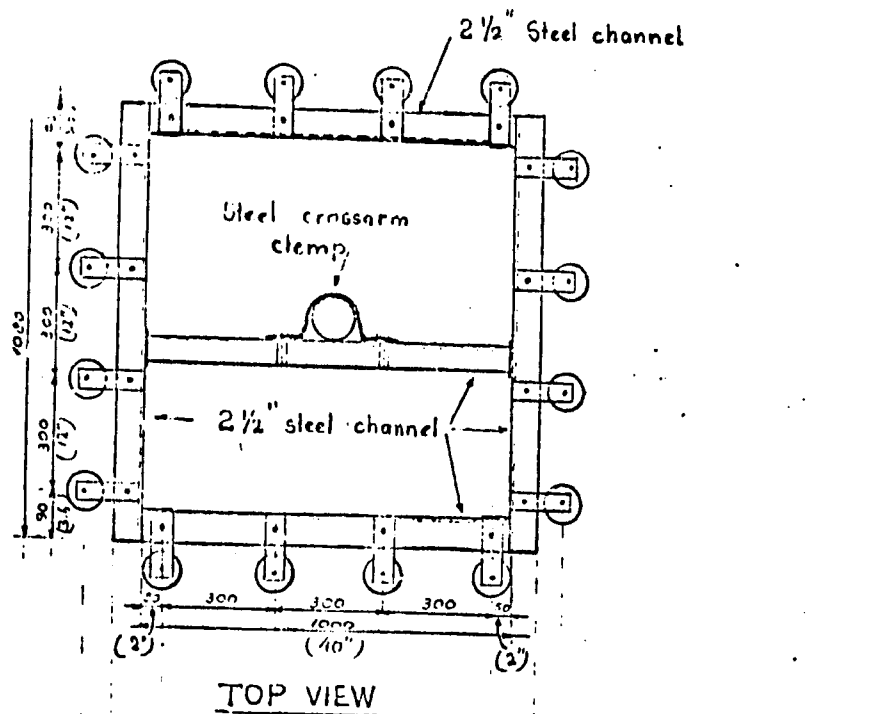
5-SPOOL RACK  
UNIT R3-2

PERUSAHAAN LISTRIK NEGARA  
EKSPLOITASI I SUMATERA UTARA

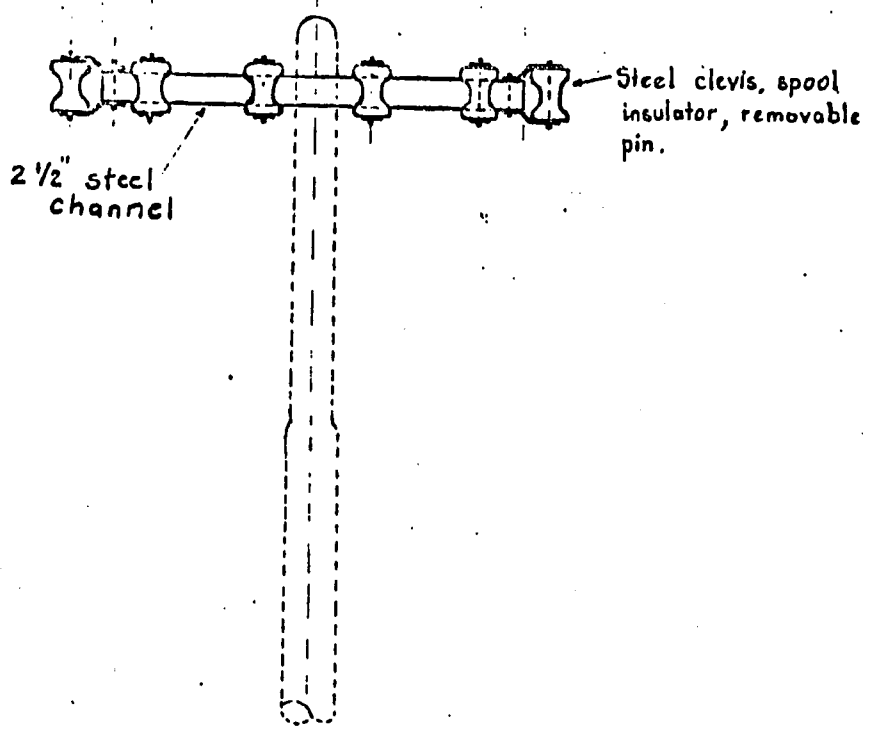
REMOVAL UNIT  
EXISTING 127/220VOLT RACKS

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE 31-7-72 DWG. NO. R3



TOP VIEW

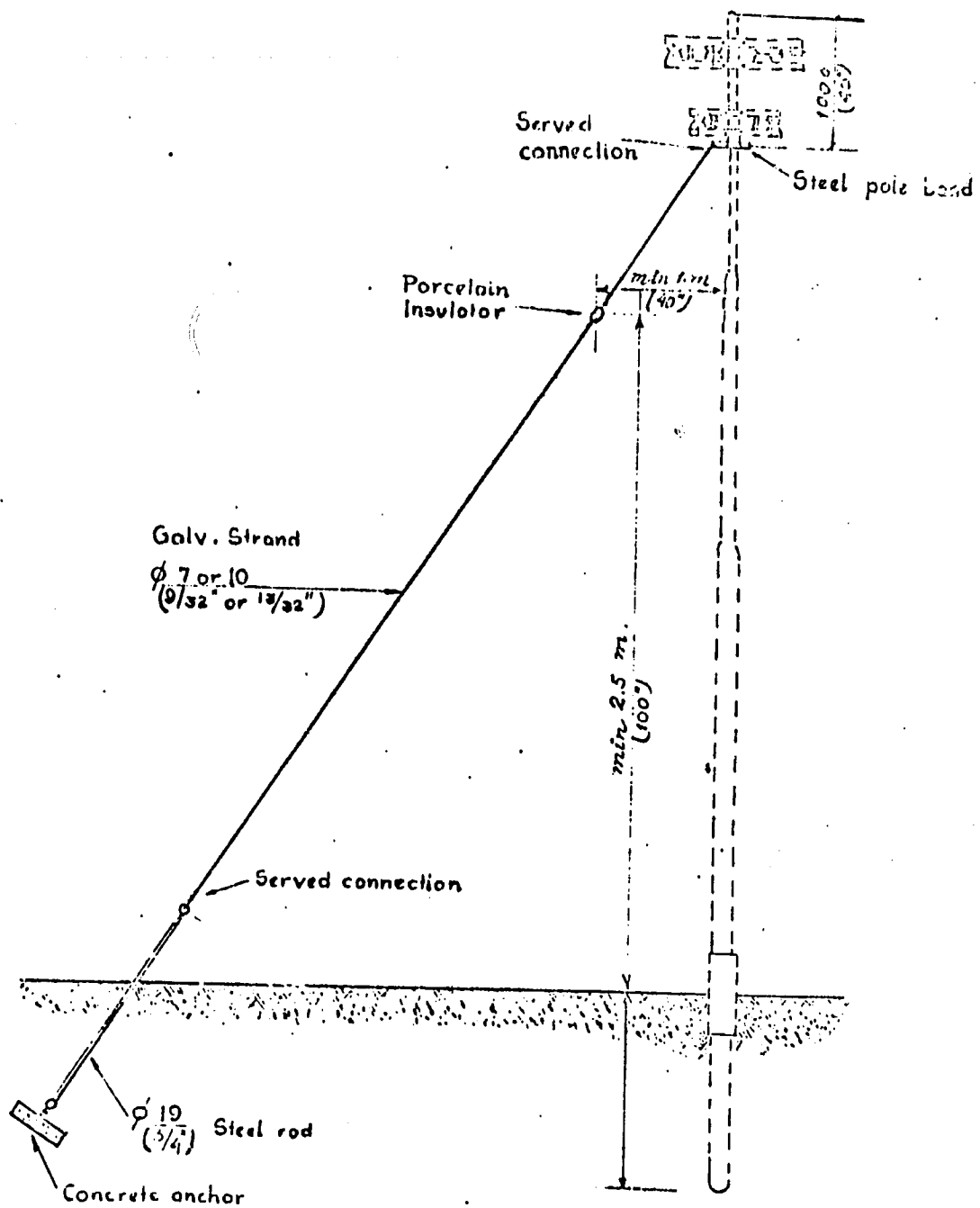


ELEVATION

- Notes:
1. All dimensions are in millimeters and inches.
  2. Removal of pole is included with Unit R 1

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA	
REMOVAL UNIT 127/220VOLT, 4-WAY DEAD-END	
HARZA ENGINEERING CO., CHICAGO	
APPROVED.....	
DATE 31-7-72	DWG. NO. R 5

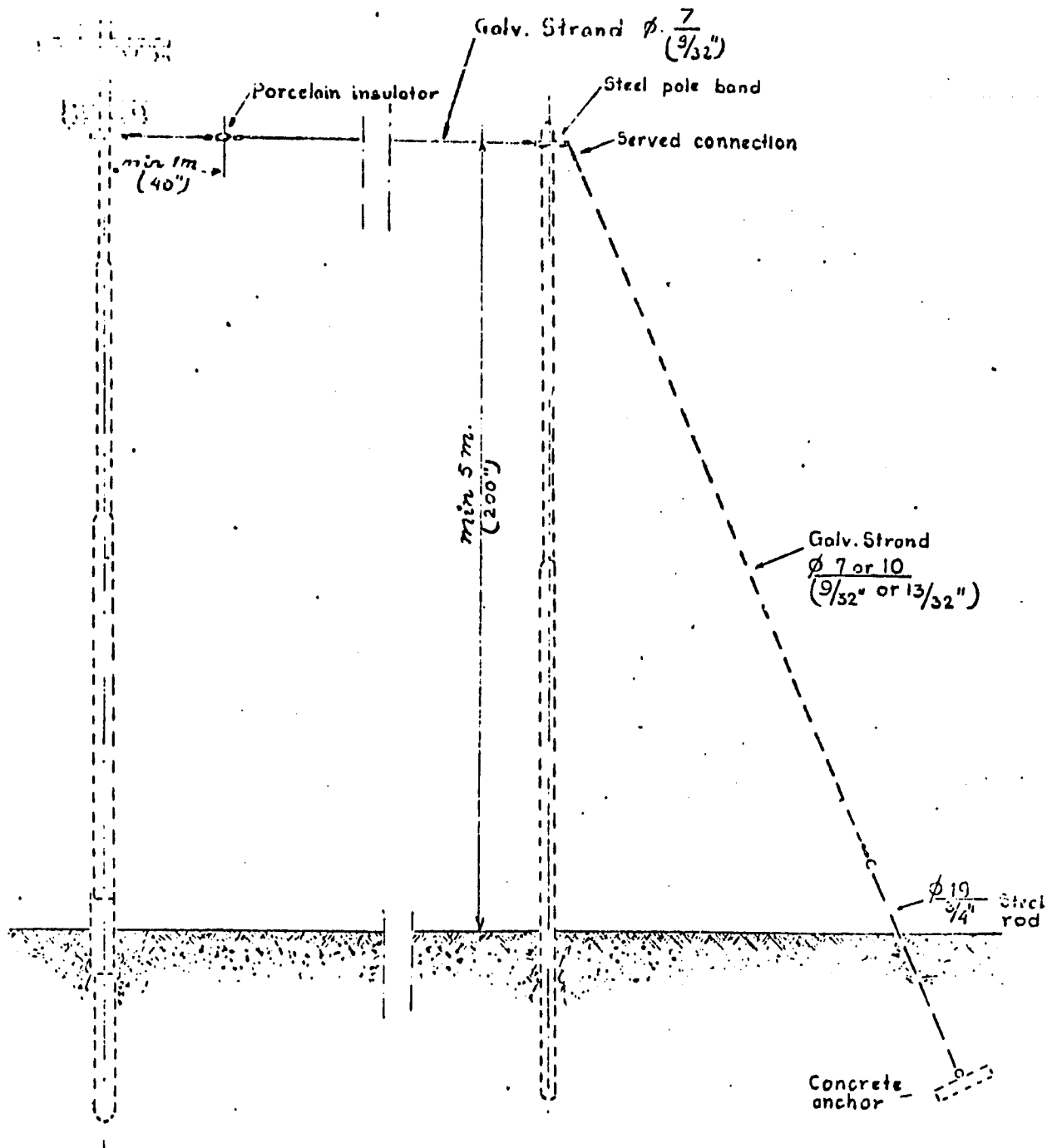




Notes:

1. All dimensions are in millimeters unless otherwise noted.
2. Removal of steel poles and crossarms are included with units R1 and R2.

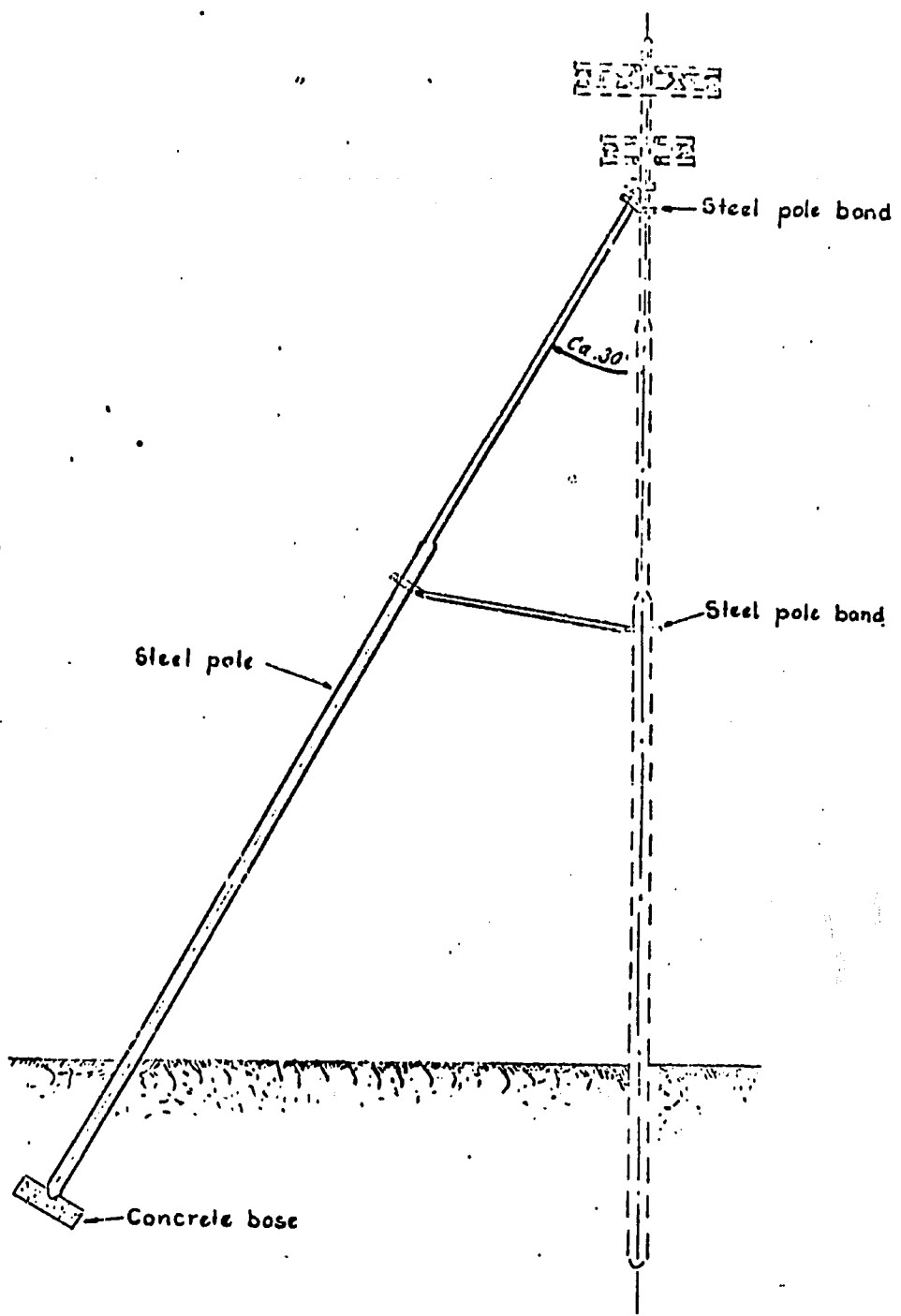
PERUSAHAAN LISTRIK NEGARA EKSPLOITASI I SUMATERA UTARA	
REMOVAL UNIT DOWN GUY	
MARZA ENGINEERING CO., CHICAGO	
APPRO	.....
DATE 31-7-77	DWG. NO. R.6



**Notes:**

1. All dimensions are in millimeters unless otherwise noted.
2. Removal of steel poles, crossarms and down guy are included with Units R1, R2 and R6

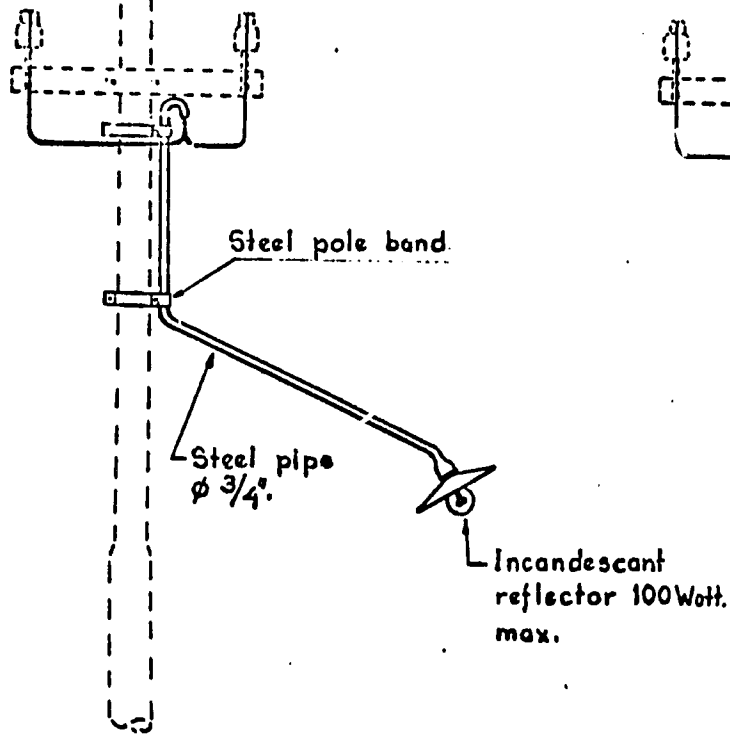
PERUSAHAAN LISTRIK NEGARA EPLGITASI I SUMATERA UTARA	
REMOVAL UNIT OVERHEAD GUY	
MARZA ENGINEERING CO., CHICAGO	
APPROVED.....	
DATE 31-7-72	DWG. NO. R 7



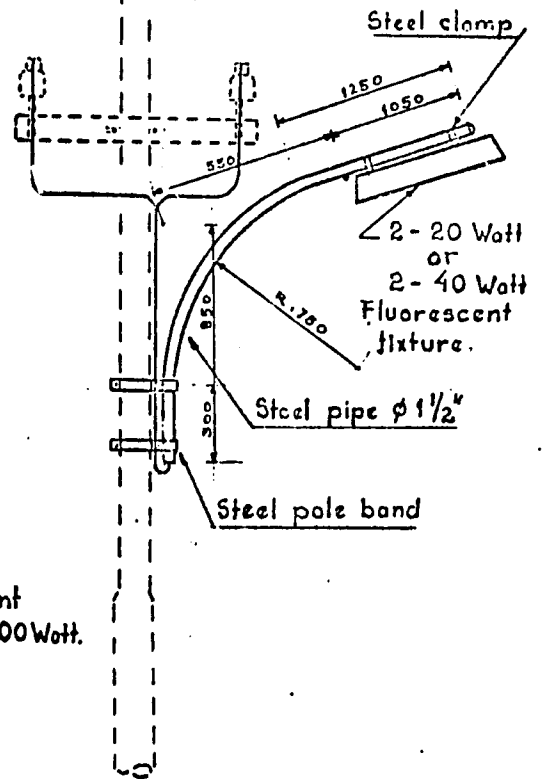
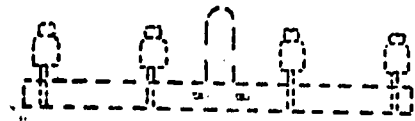
**Notes:**

1. All dimensions are in millimeters unless otherwise noted
2. Removal of line pole and crossarms are included with Units R1 and R2

PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
REMOVAL UNIT PUSH BRACE
HARZA ENGINEERING CO., CHICAGO APPROVED.....
DATE 31-7-72 PERUSAHAAN LISTRIK NEGARA



INCANDESCENT  
UNIT R 9-1.



FLUORESCENT  
UNIT R 9-2

Notes:

1. All dimensions are in millimeters unless otherwise noted.
2. Removal of steel poles and crossarms is included in units R1 and R2.

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

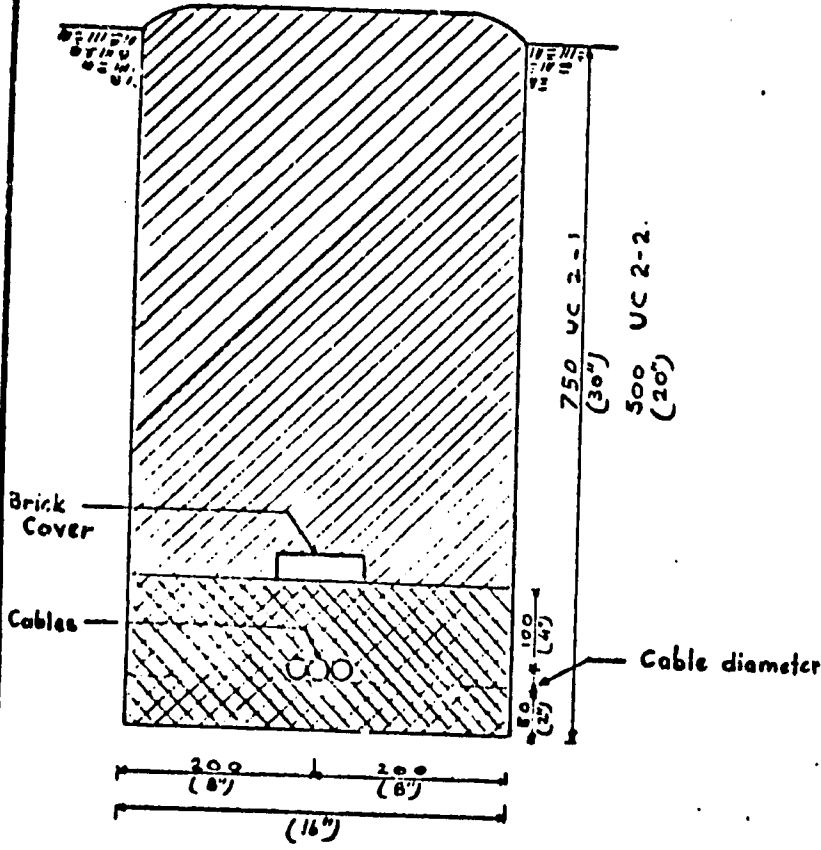
REMOVAL UNIT  
STREET LIGHTING



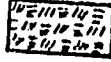
HARZA ENGINEERING CO., CHICAGO

APPROVED.....

DATE 31-7-72

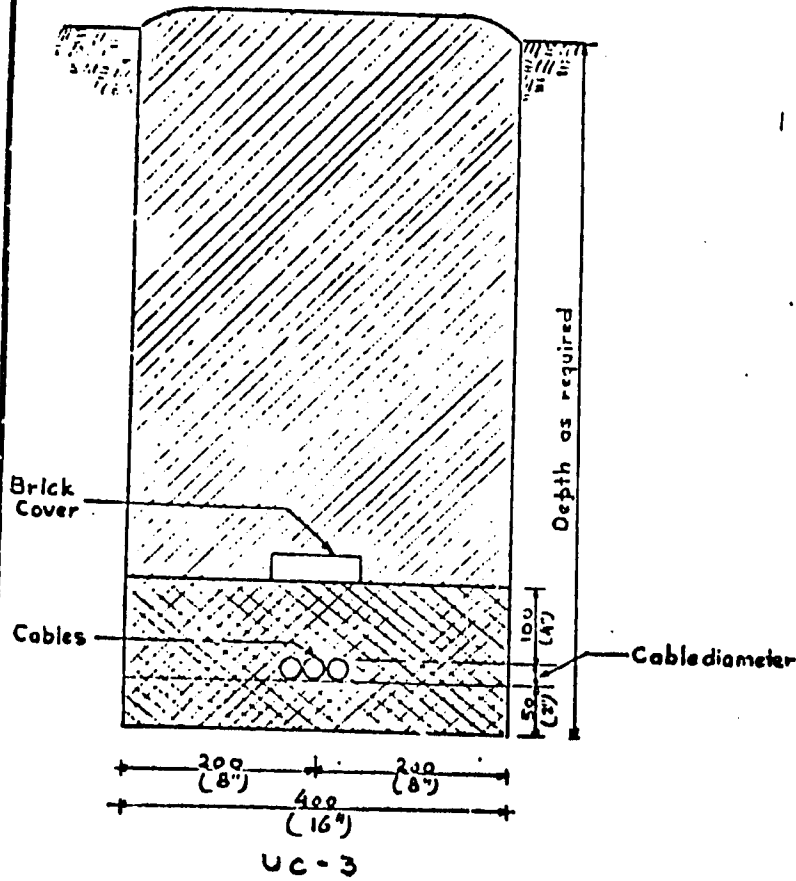
DWG. NO. R.9






-  Clean sand or screened soil
-  Clean soil compacted backfill
-  Undisturbed earth

Note  
 All dimensions are in millimeters  
 and inches

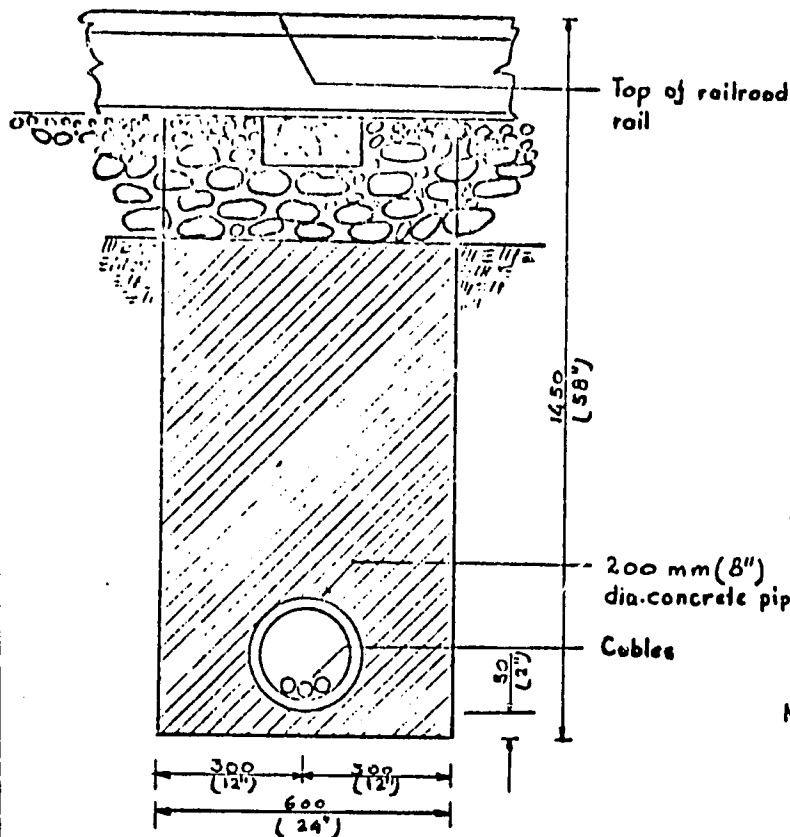
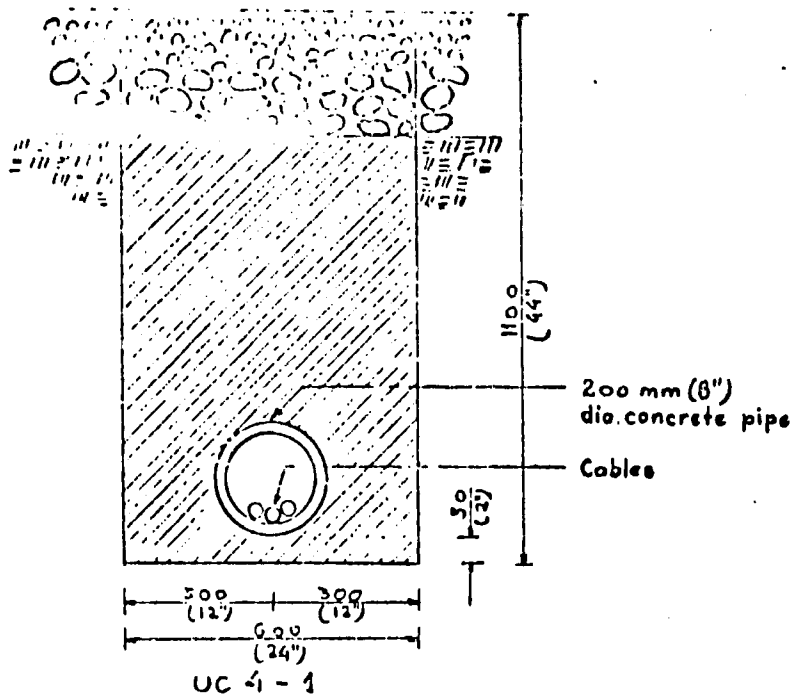
PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA
UNDERGROUND CABLE TRENCHES
HARZA ENGINEERING CO., CHICAGO
APPROVED.....
DATE 14 Oct 1972
DWG NO UC-2



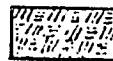
-  Clean sand or screened soil.
-  Clean soil compacted backfill.
-  Undisturbed earth.

**Note:**  
All dimensions are in millimeters and inches

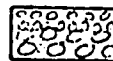
PERUSAHAAN LISTRIK NEGARA EXPLOITASI I SUMATERA UTARA.
UNDERGROUND CABLE BEDDING.
HARZA ENGINEERING CO., CHICAGO APPROVED <i>[Signature]</i>
DATE: 14 Oct 1972 <i>[Signature]</i> UC-3



Clean soil compacted  
backfill.



Undisturbed earth.



Rock.

Note:  
All dimensions are in millimeters  
and inches

PERUSAHAAN LISTRIK NEGARA  
EXPLOITASI I SUMATERA UTARA

UNDERGROUND CABLE PIPE  
CROSSING

HARZA ENGINEERING CO., CHICAGO  
APPROVED.....

DATE 14 Oct. 1972 DCS/AS UC 4