MINISTRY OF IRRIGATION AND POWER

CENTRAL WATER AND POWER COMMISSION
(POWER WING)

RURAL LINE STANDARDS

CONSTRUCTION MANUAL

DESIGNS-GENERAL

NEW DELHI

FOREWORD

In the programme of power development, Rural Electrification has assumed an important role and the various State Governments have fixed targets for supplying electricity to a certain number of villages every year. The need for economy in the capital outlay on rural schemes has made it necessary to examine carefully the ways and means of evolving designs which would result in utmost savings in cost. Accordingly, the Central Water and Power Commission initiated work on evolving standard designs for different phases of rural lines.

Due to wide variations in the design practices in vogue in some of the States, it has led to uneconomic use of material in some cases. It is, therefore, felt that if designs of rural distribution lines are brought on a uniform and standard basis and adopted by the various States for similar wind regions it would lead to greater economy and efficiency.

It is hoped that this Manual which has been finalized after consulting the various State Electricity Boards and Departments would prove useful for the design and construction engineers who are engaged on rural electrification schemes and that these will be followed to the maximum extent possible by the project engineers.

It is possible that based on actual experience the project authorities would be able to make some improvements on the methods suggested herein. The C. W. & P. C. would be thankful to receive from time to time such suggestions for incorporation in this Manual for the benefit of all concerned.

NEW DELHI;
Dated the 18*th November*, 1958.

M. HAYATH
Chairman (*C.W. & P.C.*)

INTRODUCTION

On the recommendations of the "Engineers' Seminar" held at Roorkee in 1954, a Directorate of Rural Electrification was formed in the Central Water & Power Commission, and the work of formulating standards for primary and secondary rural lines was entrusted to this Directorate. Design practices from some of the States where Rural Electrification had made some progress were studied along with designs adopted by other countries. It was observed that the States had varied designs for practically the same conditions.

The Indian Electricity Rules as revised in 1956 have provided an opportunity to revise the existing designs. Also the C.W. & P.C. have recommended in "Code of Practice as regards Wind Pressures and Temperature Variations for the Design of Overhead Power Lines" that for rural lines a reduced wind pressure of 10 lbs./sq. ft. may be adopted in a large section of the 15 lbs. wind region. As a result, we are now issuing this "Rural Line Standards—Construction Manual" for rural lines based on these revisions. It covers 11 KV and 400/230 Volt rural lines erected on wood poles only, having maximum spans up to 500 ft. and 300 ft. respectively.

Since treated wood poles of Indian origin form the most economical type of line supports, this Commission has pursued the question of obtaining treated wood poles from Indian forests with the Ministry of Food & Agriculture, Government of India; Inspector General of Forests; President, Forest Research Institute, Dehra Dun; and the State Forest Departments. It has now been definitely indicated that with effective co-ordination in the procurement, seasoning and preservative treatment and the afforestation programmes, treated wood poles can be supplied from Indian forests to meet the entire requirements of Rural Electrification programmes. Extensive efforts in this direction have already been started. Till such efforts materialize, other types of supports, such as, concrete, steel tubular and fabricated steel poles may have to be utilized. Design data for these types of supports, if need be, will be supplied separately.

In countries like Russia and Sweden, use of jointed wood poles is being extensively made in order to utilize shorter lengths of poles because of the difficulty in the transport of longer lengths over hilly and winding roads. In India also, this difficulty is being acutely felt by the Forest authorities and hence the use of jointed wood poles is strongly recommended wherever full length poles are not readily available.

Utmost economy in the provision of materials and equipment is vital in the case of electrification of the rural areas where the characteristics presumably are such, that the rigorous conditions of operation and maintenance are not required. Therefore, efforts have been made to utilize the indigenous and most economical materials, commensurate with the modern practice of line design employed in this as well as many advanced countries.

In the All India Power Engineers' Conference, 1957, held at Bangalore, a general view was expressed by the Power Engineers that in order to achieve further economy so greatly needed for rapid development of Rural Electrification, a further revision and relaxation to some of the rules and factors of safety as specified in the Indian Electricity Rules (1956) appeared to be called for. Accordingly, it was decided in the Conference that a Committee of Power Engineers be set up to examine this aspect and recommend revisions and relaxations which can safely be adopted for electrical installations in rural areas without much risk of safety and continuity of supply. The Committee has finalized its recommendations and these have been intimated to the State Governments for adoption. Preparation of a separate Manual based on these recommendations is in hand. This will be issued in due course.

This Manual is issued in following sections:—

(*i*) Designs—General	Covering the designs and particulars relating to all the Wind Pressure Regions.
(*ii*) Designs—10 lbs. Wind Region (*iii*) Designs—15 lbs. Wind Region (*iv*) Designs—20 lbs. Wind Region (*v*) Designs—30 lbs. Wind Region	Covering the special particulars relating to the respective regions.

The contents of this Manual were circulated to the Chief Electrical Engineers of various State Governments/State Electricity Boards. We have incorporated certain valuable suggestions made by them to improve the utility of this Manual. Any further suggestions in this regard may kindly be addressed to the "Director, Rural Electrification, C.W. & P.C., New Delhi."

NEW DELHI,
Dated the 15th November, 1958

S. S. KUMAR
Member (Utilization)

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RE/G/1·04	Power and Tele-communication lines crossing—Guard on Power line Supports.
RE/G/1·05	Power and Tele-communication lines crossing—Cantilever Guard, oblique crossing.
RE/G/1·06	Power and Tele-communication lines crossing—Cantilever Guard, Right angle crossing.
RE/G/1·07	Arrangement for crossing of rural lines over railway tracks.
RE/G/1·08	Protective guarding for 400/230 Volt lines with earthing details.
RE/G/1·09	Protective guarding for 11 KV lines across the road.
RE/G/1·10	Protective guarding for 400/230 Volt lines for all-Aluminium Conductors.
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SECTION 1

CLEARANCES, CROSSINGS AND SAFETY DEVICES

This section details the minimum clearances for 11 KV and 400/230 Volt rural lines to satisfy the provisions in the Indian Electricity Rules, 1956. It gives the regulations for crossing railway tracks or tele-communication circuits and the safety devices recommended for use on overhead rural lines.

The drawings included are based on (*i*) the Indian Electricity Rules (1956), (*ii*) the Code of Practice for the Protection of Tele-communication lines at crossings with Overhead Power lines other than Electric Traction Circuits (1955)—a Publication of the Central Standing Committee for Co-ordination of Power and Tele-communication Systems, and (*iii*) the Regulations governing the Placing of Electric Transmission lines across Railway Tracks (1955)—a Publication of the Railway Ministry.

Brief details of the drawings included in this Section are given below:—

RE/G/1·01: In the Indian Electricity Rules (1956), minimum clearances from ground to be maintained for the conductors of overhead power lines are specified under various conditions, such as: (*i*) lines erected elsewhere than along or across any street, and (*ii*) lines erected across or along any street. These have been summarized in a tabular form and illustrated in the Drawing.

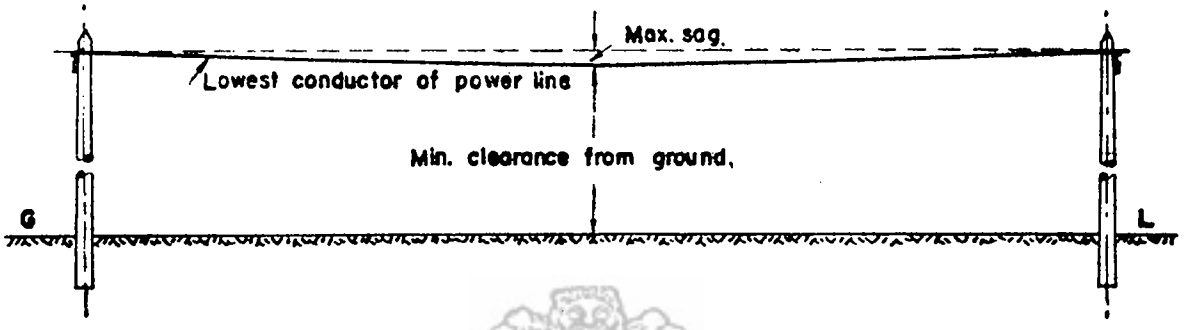
RE/G/1·02 & RE/G/1·03: The requisite horizontal and vertical clearances of 11 KV and 400/230 Volt overhead lines from adjacent buildings and at points where the lines may be crossing over any building are illustrated in these drawings.

RE/G/1·04, RE/G/1.05 & RE/G/1·06: For the safety of tele-communication lines at locations where the overhead power lines may be crossing over the same, the Central Standing Committee for Co-ordination of Power and Tele-communication systems has framed certain regulations and specified particular designs of guarding arrangements. These are illustrated in detail in these drawings.

RE/G/1·07: For power lines crossing over any railway track, the Railway Ministry have issued such regulations prescribing the type of line construction to be adopted and minimum clearances to be maintained on the line conductors over rails, railway structures and railway communication lines, if any, falling under the same. Since the design to be adopted at such crossing points is to be approved by the Railway authorities in each case, this drawing has been prepared illustrating the requisite clearances and showing a standard design of line construction. As the factors of safety to be adopted for various materials at railway crossing construction are different from those specified in Indian Electricity Rules (1956), an extract of these regulations is also attached so that the supports etc. at these crossings may be suitably designed and got approved by the Railway authorities.

RE/G/1·08, RE/G/1·09 & RE/G/1·10: Sub rule (1) of Rule No. 91 of the Indian Electricity Rules (1956) specifies that overhead power lines running along or across any street should be so protected that in the event of breakage of conductors they should be made harmless before falling on the ground and causing accidents. These drawings illustrate the type of guards recommended for such purposes for 400/230 Volt and 11 KV lines.

RE/G/1·11: Caution boards and anti-climbing devices are to be installed on 11 KV line supports as per Rule Nos. 35 (*b*) and 91 (3) of the Indian Electricity Rules (1956). The recommended details are illustrated in this drawing.



NO.	PARTICULARS.	MINIMUM CLEARANCE FROM GROUND OF LOWEST CONDUCTOR IN FEET	
		11 KV LINES	400/230 VOLT LINES.
1.	An overhead line, including service lines, erected across any street.	20	19
2.	An overhead line, including service lines, erected along any street.	19	18
3(a)	An overhead line, including service lines, erected elsewhere than along or across any street, if bare.	15	15
3(b).	An overhead line, including service lines, erected elsewhere than along or across any street, if insulated.	13	13

BASED ON I.E RULES (1956)
RULE NO. 77.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

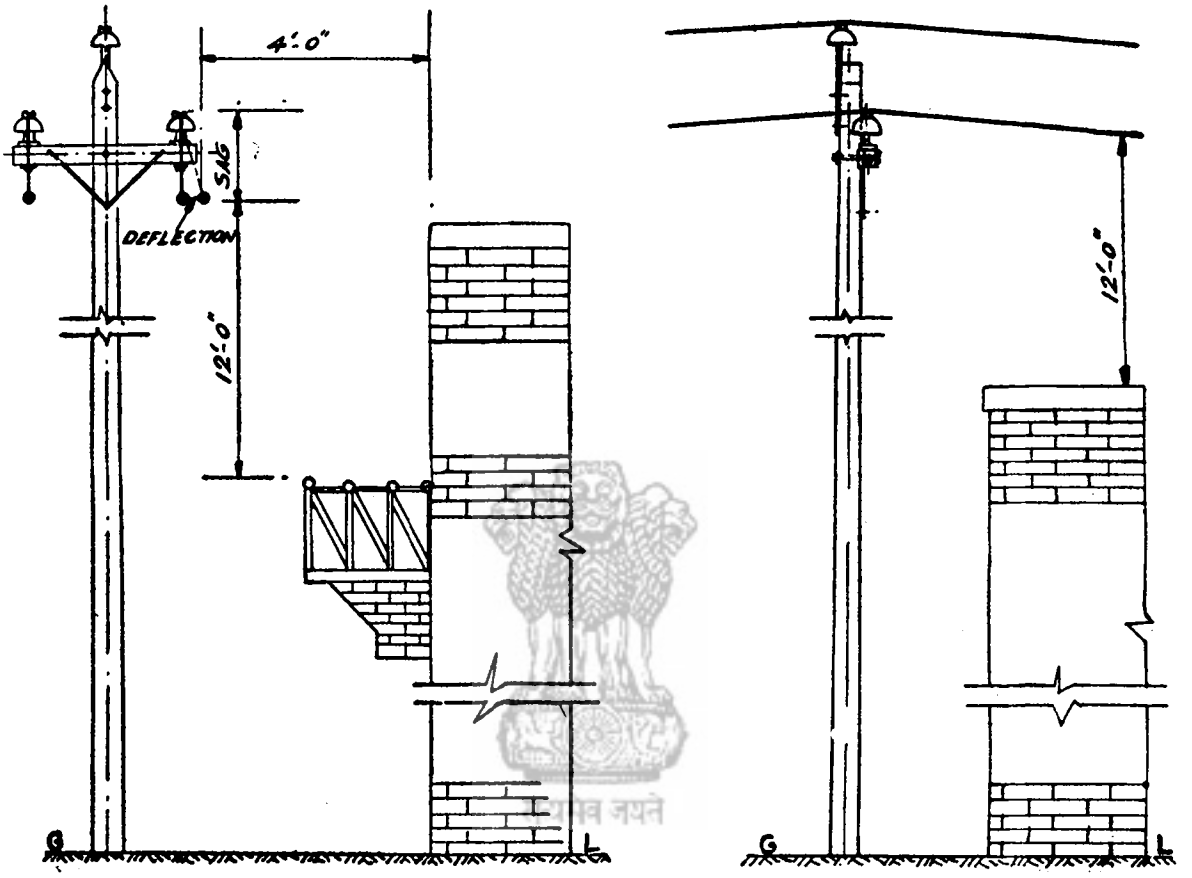
RURAL LINE STANDARDS

MINIMUM CLEARANCES ABOVE GROUND FOR 11 KV & 400/230 VOLT LINES.

DRAWN
TRACED
CHECKED
SCALE —

RECOMMENDED
APPROVED

NEW DELHI
8-5-1957



Note:-

1. Horizontal clearances are to be maintained from the conductors under maximum deflection due to wind.
2. Vertical clearances are to be maintained from the position of the conductor under the conditions of the maximum sag at the prescribed maximum temperature.
3. Sag and deflection curves have been included in the designs of the respective wind regions.

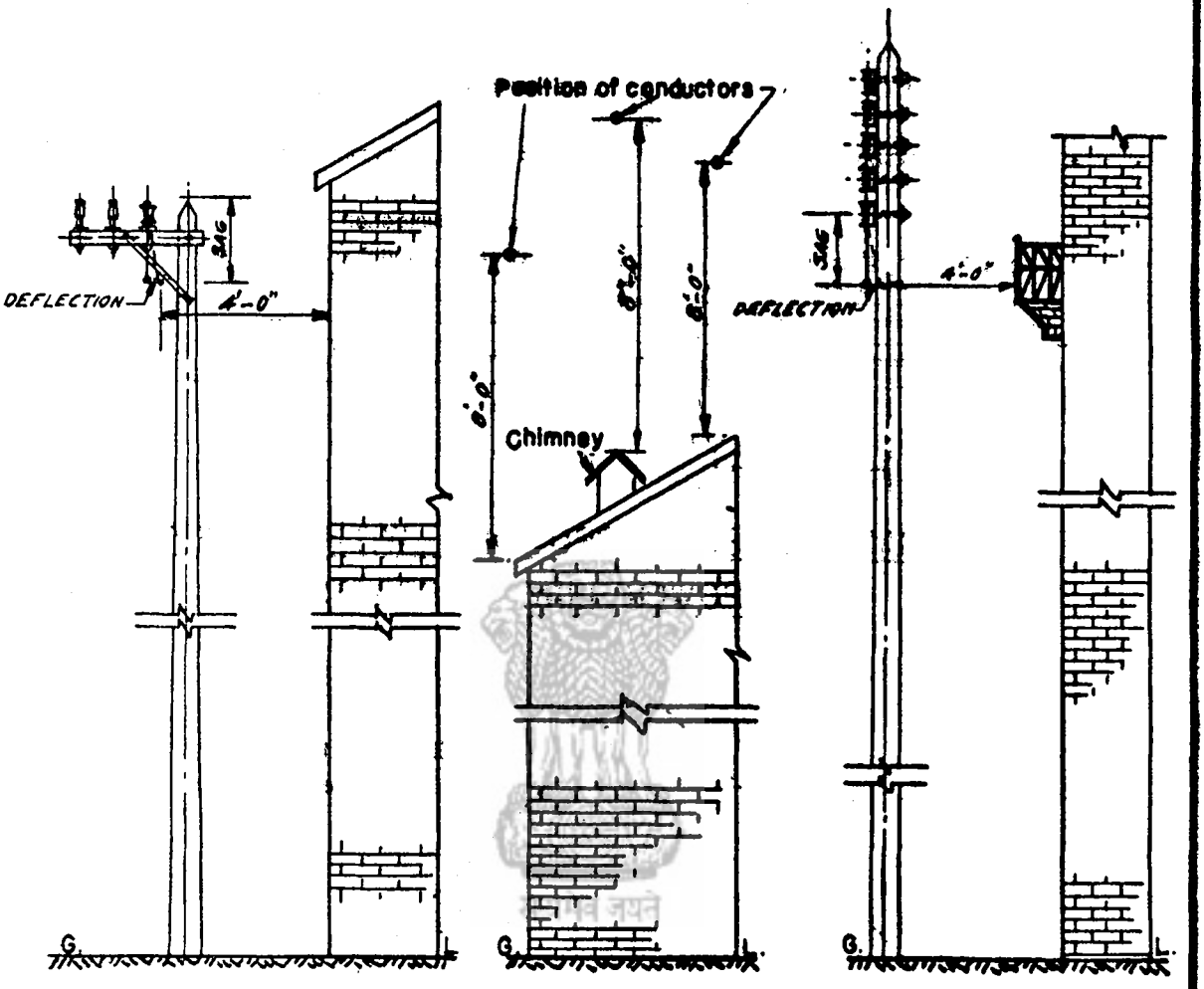
BASED ON I.E. RULES (1956)
RULE NO. 80.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

11 KV LINE CLEARANCES FROM BUILDINGS

DRAWN MB	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
SCALE —	NEW DELHI 10.8.58	RE/G/1.02



NOTE:-

1. Horizontal clearances are to be maintained from the conductors under maximum deflection due to wind.
2. Vertical clearances are to be maintained from the position of the conductor under the condions of the maximum sag at the prescribed maximum temperature.
3. Sag and deflection curves have been included in the designs of the respective wind regions.

BASED ON I.E. RULES (1956)
RULE NO. 79

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

400/230 VOLT LINE
CLEARANCES FROM
BUILDINGS

DRAWN	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
SCALE:-	NEW DELHI	RE/G/1.03

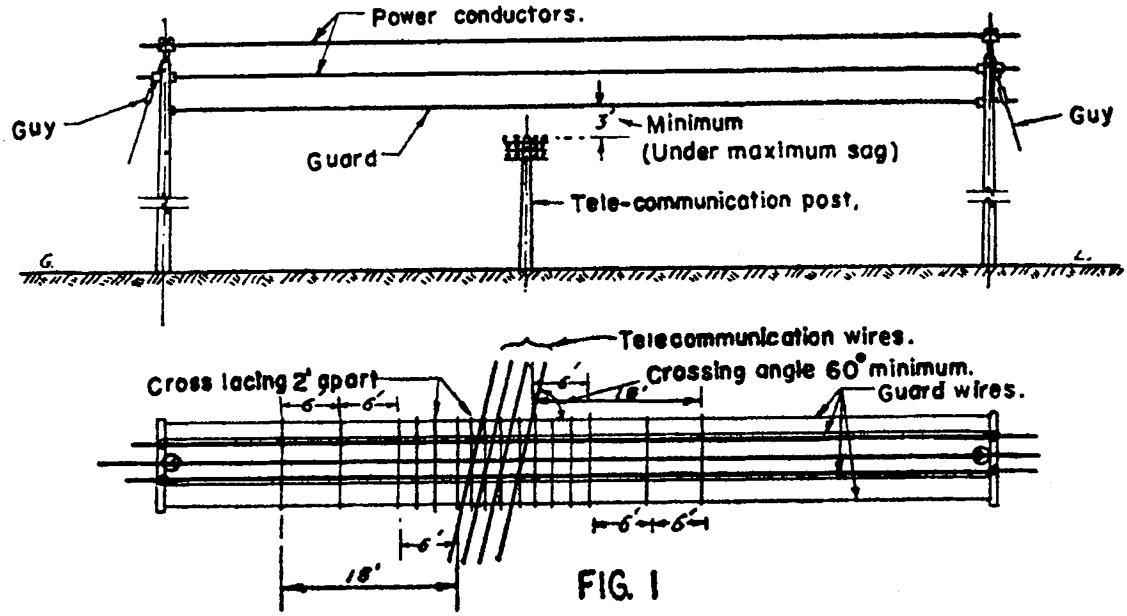


FIG. 1

TYPICAL CROSSING PROVIDED WITH A GUARD ON POWER LINE SUPPORTS.

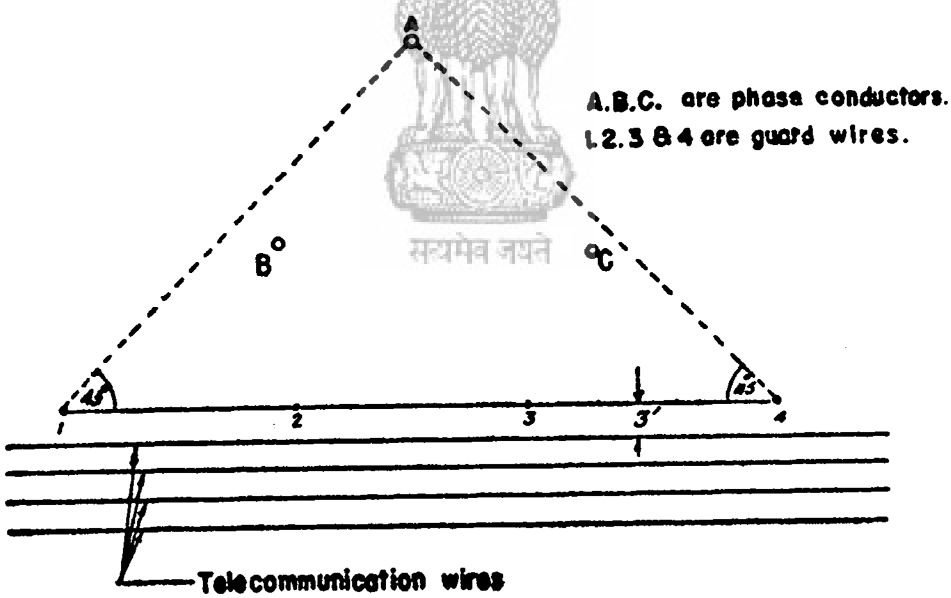


FIG. 2

SECTIONAL VIEW

GOVERNMENT OF INDIA.
CENTRAL WATER & POWER COMMISSION

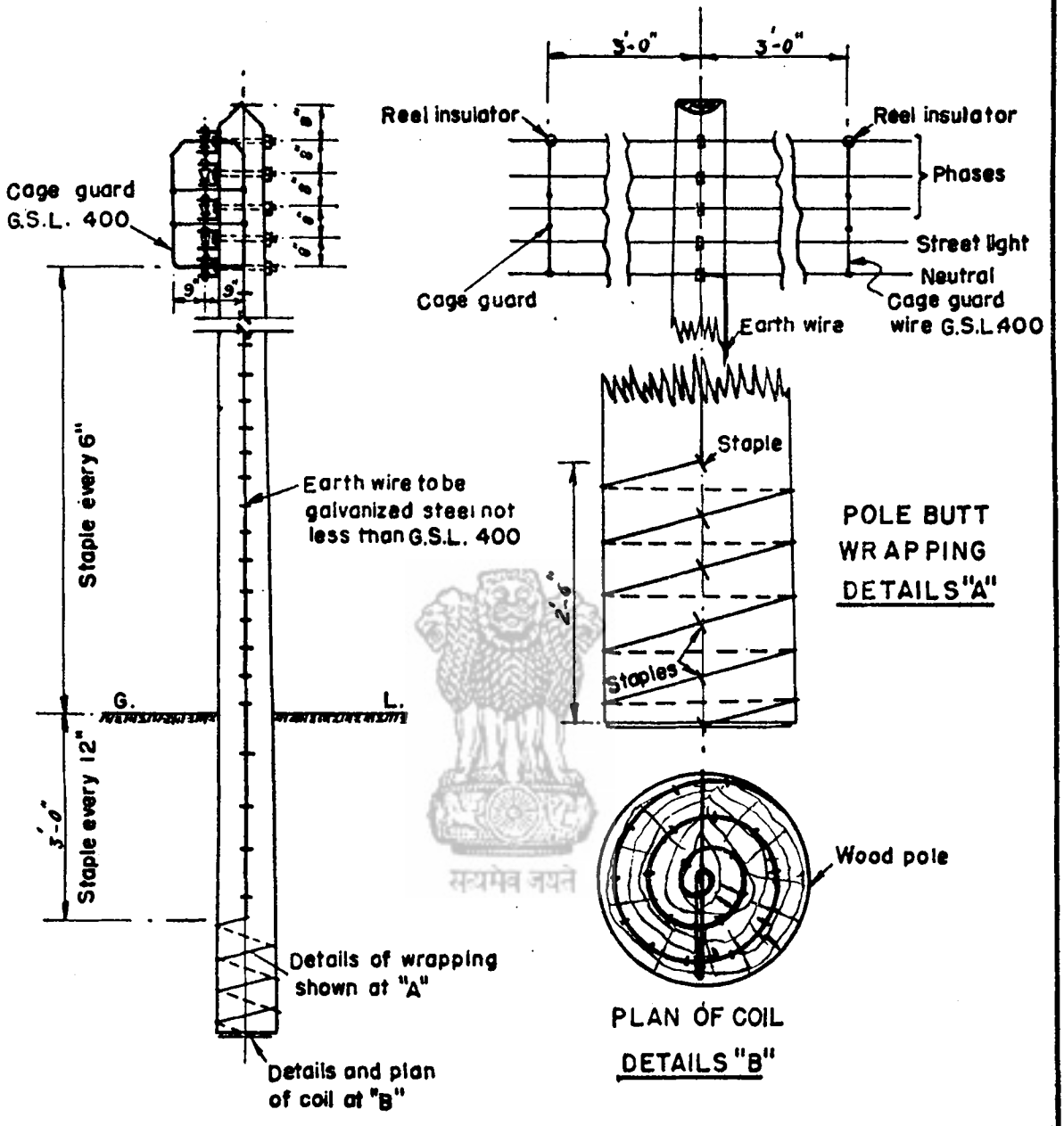
RURAL LINE STANDARDS

POWER AND TELE-COMM. LINES CROSSING — GUARD ON POWER LINE SUPPORTS.

DRAWN. —	RECOMMENDED.
TRACED.	
CHECKED.	APPROVED.
SCALE :- nil	NEW DELHI 23.2.57 — RE/G/ 1·04.

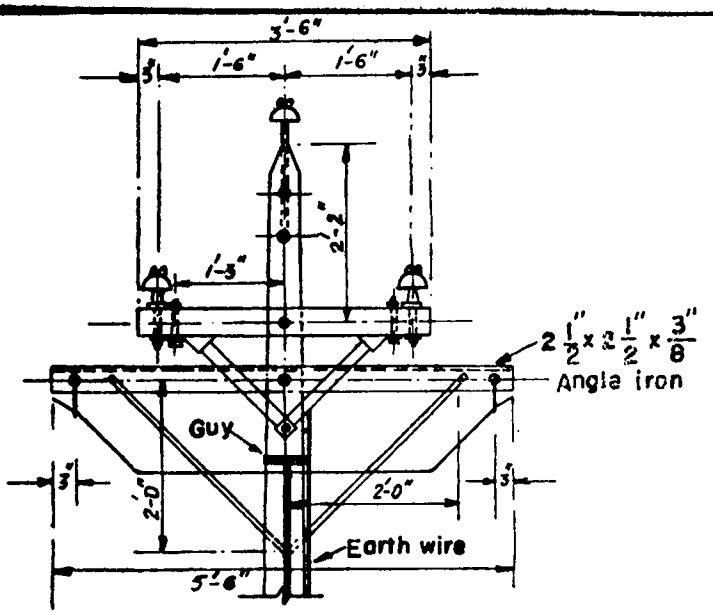
TRACED FROM

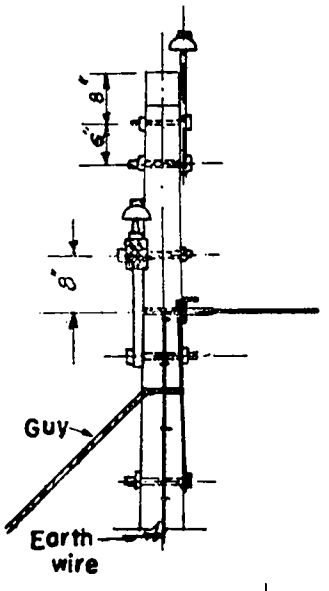
Code of Practice for the protection of tele-communica-tion lines at crossings with over head power lines other than Electric Traction Circuits.(Provisional).Fig.1A & 1B. Published by, Central Standing Committee for co-ordination of power & telecommunication systems.



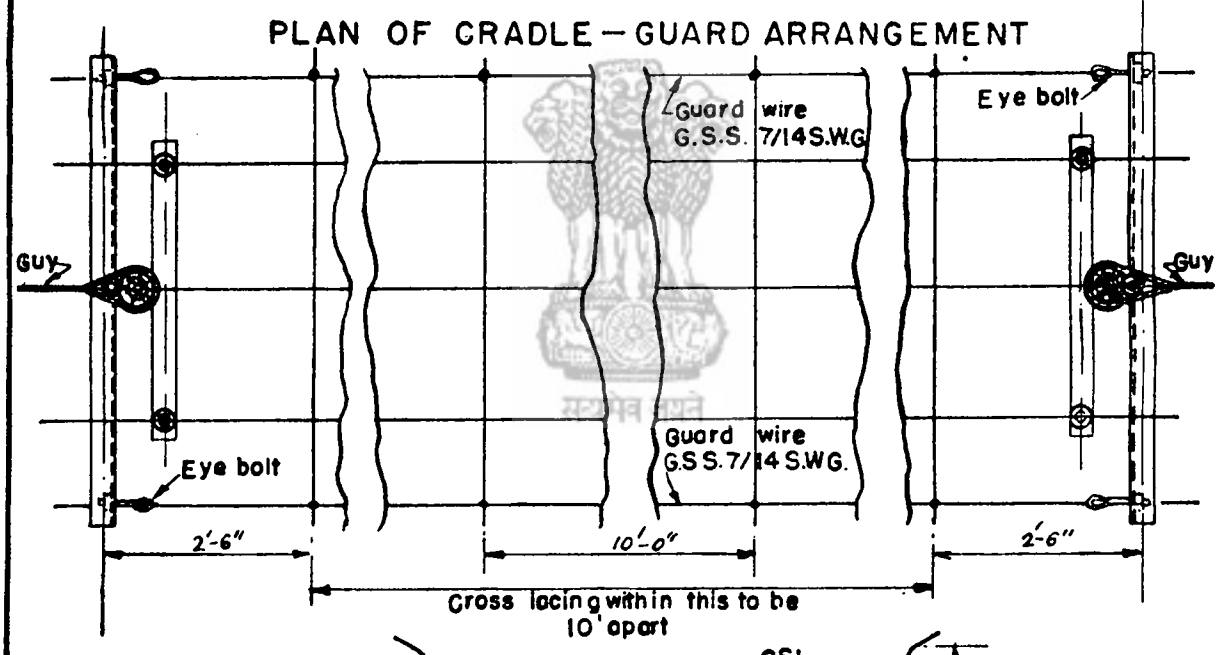
Based on I.E. Rules (1956)
Rule No. 91 (1)

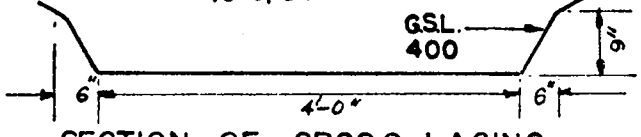
GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION	
RURAL LINE STANDARDS PROTECTIVE GUARDING FOR 400/230 V LINES WITH EARTHING DETAILS.	
DRAWN VB TRACED CHECKED	RECOMMENDED APPROVED
SCALE:—	NEW DELHI RE/G/1.08





PLAN OF CRADLE – GUARD ARRANGEMENT





SECTION OF CROSS LACING

Note:-

As per I.E. Rule - 67(5), Earthing resistance shall not exceed 25 ohms.

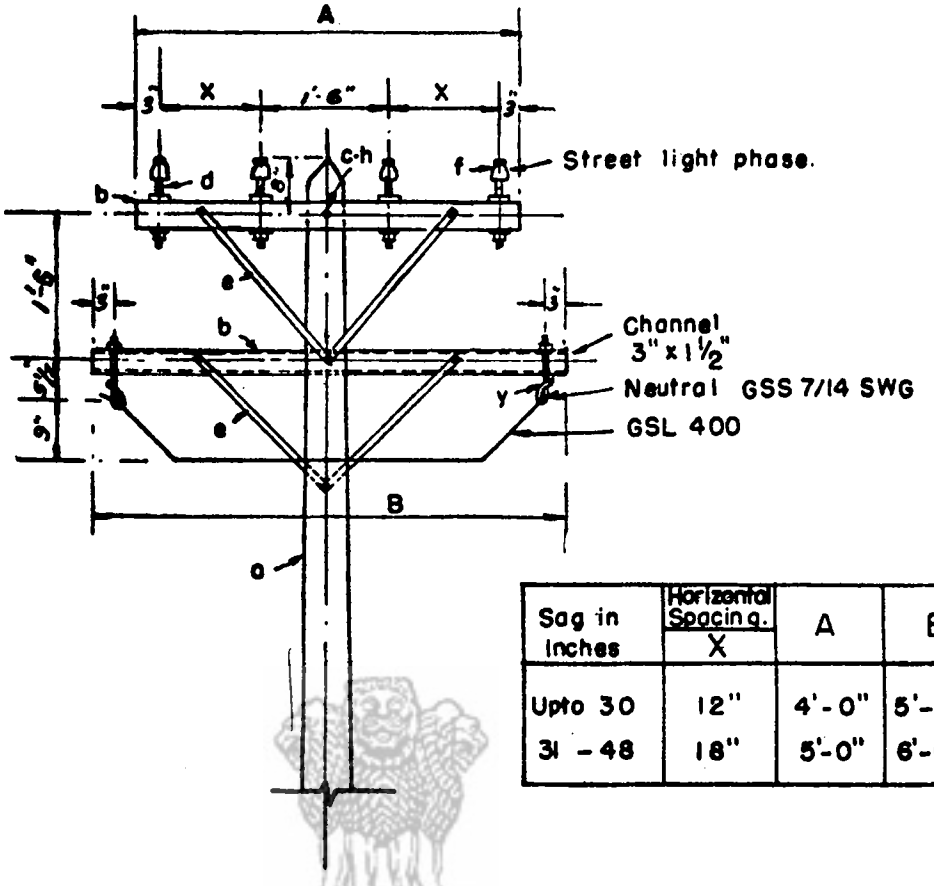
Based on I.E. Rules (1956) Rule no 91(1).

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

PROTECTIVE GUARDING
FOR 11 KV LINES
ACROSS THE ROAD

DRAWN VB TRACED CHECKED	RECOMMENDED APPROVED	
SCALE:—	NEW DELHI 18.5.58.	RE/G/1-09



Sag in Inches	Horizontal Spacing X	A	B
Upto 30	12"	4'-0"	5'-0"
31 - 48	18"	5'-0"	6'-0"

ITEM	No. REQD.	Material	ITEM	No. REQD.	Material
a	1	Pole, treated wood.	f	4	Insulators, pin type, 400/230 volt.
b	1	Crossarm wood 4"x3"x reqd. length.	h	7	Washers, m.s. 2"x2"x 3/16", 11/16" hole.
b	1	Crossarm steel, 3"x1½"x reqd. length.	Y	2	Cradle wire attachment.
d	4	Pins, crossarm type, 400/230volt.	c	8	Bolts, machine 5/8"x reqd. length.
e	4	Bracings, steel			

Notes:

1. Protective guarding for All-Aluminium conductors only.
2. For copper conductors refer drg. No. RE/G/3.10
3. Max. spans to be limited to:—

   10&15 lbs. wind region - 220ft.

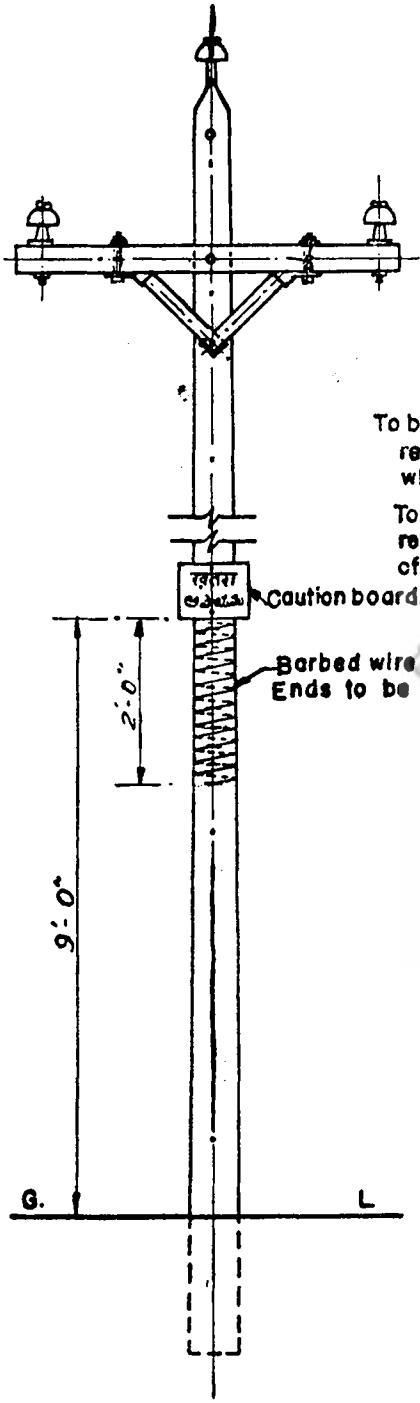
   20&30 lbs wind region - 180ft & 135ft respectively.

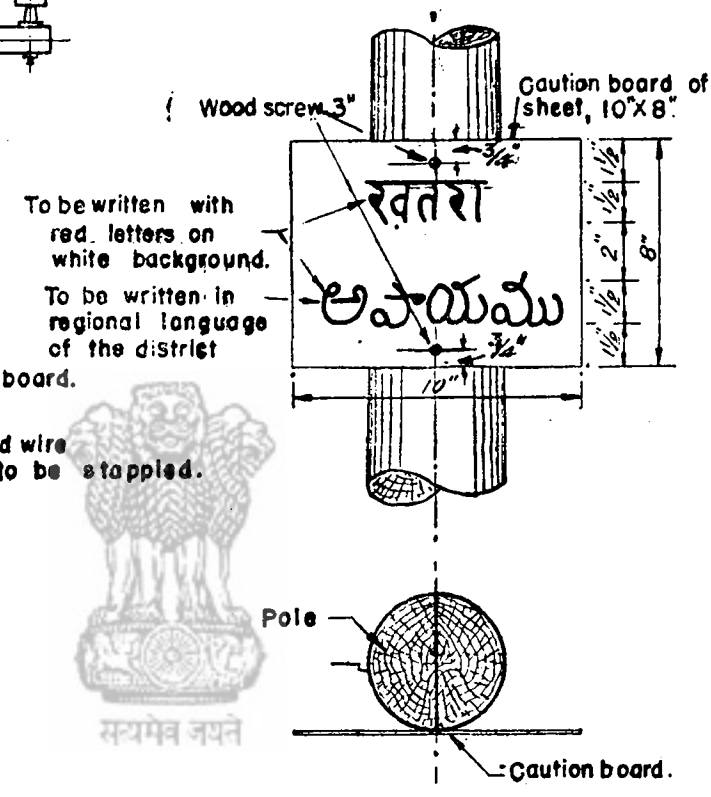
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

PROTECTIVE GUARDING FOR 400/230 VOLT LINES FOR ALL-ALUMINIUM CONDUCTORS.

DRAWN VG	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
Scale:—	NEW DELHI. 2-2-59	RE/G/1.10





DETAILS OF
CAUTION BOARD
SCALE 2"=1'

NOTE:-

i) The design and wording of the caution board to be approved by the State Electrical Inspector.

ii) Caution board to face road-side.

BASED ON I.E RULES (1956)
RULE NO 35(b) AND 91(3).

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

ANTI-CLIMBING DEVICE & CAUTION BOARD FOR IIKV LINES.

DRAWN NG TRACED CHECKED	RECOMMENDED APPROVED	
SCALE 1"=2'	NEW DELHI 12.3.1967	RE/G/1.11

EXTRACT FROM REGULATIONS GOVERNING THE PLACING OF ELECTRIC TRANSMISSION LINES ACROSS RAILWAY TRACKS

Note:—*These Regulations do not apply to Crossings where provision has to be made for electric traction.*

(i) *Approval of works by the Railway*—The approval of the Railway in writing shall be obtained:—

(*a*) Before any Crossing is commenced,

(*b*) before the Works are taken into use, and

(*c*) notice shall be given to the Railway at least 7 days before any Crossing is put into service for the first time.

(ii) *Certificate of Compliance with Regulations*—Before the Railways' written approval to take the crossing into use is granted, a Certificate certifying that the works have been constructed in full compliance with these regulations shall be obtained by the Railway from the party responsible for the construction of the Crossing.

(iii) *Maintenance*—No work involving the removal, alteration or maintenance of any crossing shall be undertaken without the previous notice being given to the Railway.

The crossing constructions shall be maintained so as to reduce the hazards to life and property, as far as practicable. It shall be inspected periodically to determine its fitness for service. Defects revealed by inspection shall be corrected as soon as possible.

The crossing spans and the two adjoining spans shall be kept free as far as practicable from overhanging or decayed trees which might fall into the line.

(iv) *Protection from moving road vehicles*—Supporting structures including guys adjacent to roadways shall be so located that the danger of being struck by moving road vehicles may be reduced as far as practicable.

(v) *Protection of Communication Lines*—The crossing shall in no way interfere with or endanger any Railway communication lines, and sanction given by the Railway to the placing of a Crossing shall not be construed as affecting in any way the Indian Post and Telegraph Department's requirements for the protection of any communication lines.

(vi) *Work to be executed by the Railway*—The disturbance of any Railway Road, or ground, or any attachment to any Railway structure, which may be necessary in the placing, or maintenance of the Crossing, shall be affected by, or under, the supervision of, the Railway, and any conduit, culvert, or similar work, passing under Railway premises, shall be constructed by the Railway in such a manner and of such materials as it may approve of.

(vii) *Type of Crossings over Railway Tracks*—(*a*) Where Electrical protective arrangements ensure the instantaneous isolation of the Crossing provided for in paragraph (XIX), the Crossing shall be supported at each end by a self-supporting steel structure and each line conductor shall be supported by means of multiple insulator units.

The insulators may be of the suspension, tension, or pin type, as required, but all insulator units and their attachment to the conductors shall be capable of supporting the crossing with the factors of safety provided for herein when any conductor affecting the Crossing is broken.

(*b*) In cases where the Electrical protective arrangements do not ensure the instantaneous isolation of the Crossing as provided for in paragraph (XIX), the conductors within the crossing span shall be protected by means of a guard cradle of such design as to efficiently earth any broken conductor and prevent the falling below the guard cradle. For typical crossing *see* drawing No. RE/G/1·07.

(*c*) *Angles at which overhead lines cross the Railway Track*—As far as possible the crossing must be effected at right angles to the Railway Track. In very special cases a deviation, to the extent of 30° may be allowed.

(viii) *Under Railway Tracks*—Cables crossing under Railway Tracks shall be carried through a suitable conduit or culvert in such a manner that the cable can be laid, withdrawn or maintained without interfering with or endangering Railway Tracks.

(ix) *Compliance with Standard Specification*—All materials used in the construction of the crossings shall comply with Indian Standard Specification and where these are not available the relevant British Standards shall be acceptable.

(x) *Supporting Structures*—The structures supporting the crossing shall be steel poles or fabricated steel towers or reinforced cement concrete poles of approved designs and the factors of safety of such poles and towers, their foundations and crossarms shall not be less than those specified below:—

(*a*) Steel Poles	2·5	Based on crippling load.
R. C. C. Poles	3·5	
(*b*) Steel towers	2·5	Under normal conditions.
	1·5	Under broken wire conditions.

(xi) *Conductors, Guards, Guys and Ground Wires*—The factor of safety of all conductors, ground wires and guard wires in the Crossing shall not be less than 2 calculated on the ultimate breaking strength under maximum loading conditions (maximum wind pressure and minimum temperature) and at the same time the factor of safety under average service conditions (90° F and still air) shall not be less than 4 subject to the minimum sizes specified below.

No copper conductor in the crossing span having breaking strength less than 1,237 lbs. equivalent to a minimum of 8 SWG shall be used.

All guard wires shall be of galvanized steel of not less than the following sizes:

No. 6 SWG for bearer wires.
No. 10 SWG for cross wires.

All guy wires shall be galvanized and shall not be less than 7/11 SWG.

All guy wires shall be connected to the anchors above ground level.

Splices shall, as far as possible, be avoided in the crossing span. If it is impracticable to avoid such splices they shall be of such type and so made as to have a strength substantially equal to that of the conductor in which they are placed. In case of doubt Railways can insist to have authentic test certificate to their satisfaction.

Taps shall be avoided in the crossing span, where practicable, but, if required shall be of a type which will not impair the strength of the conductor to which they are attached.

(xii) *Insulators Pin type*—Where the line is supported by pin type insulators in duplicate with a bridle wire, each insulator unit with its connection to the conductor shall have a factor of safety 2 under the worst loading conditions with the other unit broken.

(xiii) *Insulators—Suspension or Tension type*—Where the line is supported by multiple string of tension or suspension insulators by common yoke or straddle wire, each insulator unit shall consist of not less than two separate strings and each string shall be of such strength that with one string broken the remaining string or strings shall be capable of withstanding the maximum load with the factor of safety 2 under worst conditions.

(xiv) *Wind pressure*—The maximum wind pressure on the structure shall be determined from the map RE/G/10·01.

In the case of lattice poles or towers, it shall be taken as acting horizontally on 1·5 times the exposed area of one face.

In the case of tubular steel poles, it shall be taken as acting on 2/3 of the projected area of the pole.

In the case of conductors, it shall be taken as acting on 2/3 of the projected area and acting horizontally and at right angles to the crossing.

(xv) *Temperature*—The minimum and maximum temperatures for the conductors and the ground wires shall be determined from the map RE/G/10·02.

(xvi) *Provision for Ice loading*—Where provision has to be made for ice or snow loadings these shall be determined in the light of local conditions with the approval of the Authority Administering the Electricity Act.

(xvii) *Inaccessibility of Conductors*—Where the voltage exceeds 650, the supporting structures on Railway land shall be provided with approved anti-climbing devices. Warning notices shall be erected in approved situations in such languages as may be considered necessary.

(xviii) *Earthing*—All guard wires and the crossing supporting structures inclusive of all guy wires shall be efficiently earthed and separate earths shall be provided at each pole or tower.

(xix) (a) *Isolation of Transmission lines in the event of breakage*—Where the crossing is unguarded such protective arrangements shall be adopted to the approval of the Railway as will ensure the instantaneous isolation of any section of the transmission line in the event of any breakage or other fault occurring in that section of the said line.

(b) In case where the electrical protective arrangements do not ensure the instantaneous isolation of crossing, the conductors with the crossing span shall be protected by means of a guard cradle of such design as to efficiently earth any broken conductor and prevent its falling below the guard cradle.

(xx) *Fire Hazards*—Supporting structures shall be so placed, guarded and maintained as to be exposed as little as possible to brush, grass, rubbish and building fires.

(xxi) *Separate Paralleling Lines*—Two or more separate parallel lines, one of which is an electric supply line shall not, if practicable, be so located that the overturning (at the ground level) of one line will result in contact between its supports or conductors and the conductors of the other line assuming that no conductors are broken on either line.

Where owing to the narrowness of the way, on which paralleling lines are located, it is impossible to meet the above requirements, suitable methods shall be used at the crossings to avoid the overturning of one pole line into another or if this is impracticable, the parties concerned may arrive at a satisfactory arrangement so as to conform to the general intent of these requirements.

(xxii) *Rent*—The owner shall pay to the Railway a rent of rupee one per annum for each crossing. However, where regular use of Railway structure is involved the rent will be fixed by the Railway.

POLES

Drawing No.	Description
RE/G/2·01	Species of timbers under groups A, B and C and their weights.
RE/G/2·02	Classification of Wood Poles.
RE/G/2·03	Standard dimensions of Wood Poles in Group "A".
RE/G/2·04	Standard dimensions of Wood Poles in Group "B".
RE/G/2·05	Standard dimensions of Wood Poles in Group "C".
RE/G/2·06	Framing details of Wood Poles.
RE/G/2·07	Cubical contents of Wood Poles.

SECTION 2

POLES

This Section deals with wood poles. The classes and lengths of poles required for rural 11 KV and 400/230 Volt lines have been detailed in the various drawings and tables.

Brief details of the drawings included in this Section are given below:—

RE/G/2·01: Species of timber recommended in the Indian Standards No. 876—1957 for use as wood poles are classified into three groups, namely, A, B & C. This table gives a summary of the Indian Standards relating to the groups, species of timber, fibre stress and weights.

RE/G/2·02: The classification of wood poles as adopted in the Indian Standards 876—1957 is shown in this drawing. This is based on the mechanical strength of wood poles under static bending.

RE/G/2·03, RE/G/2·04 & RE/G/2·05: Minimum circumferences of wood poles at the top and at 6 ft. away from the butt-end together with the ground piece for various poles are indicated in these drawings.

RE/G/2·06: The drawing illustrates the framing and drilling details of wood poles before giving preservative treatment.

RE/G/2·07: Cubical contents of wood poles per foot length for different top and butt-end circumferences are given in this drawing. This will help in the calculation of the approximate weights of poles for transportation and handling.

The design of normal supports is based only on the transverse loads with suitable factors of safety. The transverse loads acting on a normal support consist of:

(*i*) Wind load on conductor,

(*ii*) Wind load on the support, and

(*iii*) The transverse components of the maximum conductor tension acting on the support due to line deviation, if any, at that position.

The wind load on conductors and supports depends upon:—

(*i*) the region in which the overhead line is being erected, and

(*ii*) the dimensions of conductors and poles.

'The Code of Practice as regards Wind Pressures and Temperature Variations for the Design of Overhead Power Lines' published by the C.W. & P.C. has recommended wind pressures and temperatures for different regions as shown in the map of India in Drawing Nos. RE/G/10·01 & 10·02 respectively. The wind pressure and temperature applicable for any Zone may be determined from these maps.

The height and class of pole required depends upon several important factors such as the requisite ground clearance, type of construction, maximum sag of the lowest conductor, the requisite depth to which the pole is to be set in the ground and finally the mechanical strength of the support.

An example has been worked out in Appendix 2-A, to indicate the method of application of the various graphs, charts and tables included in this Manual and to determine the class and height of wood pole required for 11 KV and 400/230 Volt lines on the same support.

GROUP "A" (Fibre Stress = 12,000 lbs./Square inch)

Sl. No. (1)	Botanical Name (2)	Trade Name (3)	Symbol (4)	*Weight (W) in lbs per cu. ft (5)
1.	Borassus flabellifer	palmyra palm	PAL	56
2.	Bruguiera sp.	bruguiera	BRU	56
3.	Hopea parviflora	hopea	HOP	58
4.	Mesua ferrea	mesua	MES	65
5.	Poeciloneuron indicum	ballagi	BAL	71
6.	Shorea robusta	Sal	SAL	55
	GROUP B (Fibre Stress=9,000 to 12,000 lbs/Square inch)			
1.	Acrocarpus fraxinifolius	mundani	MUN	43
2.	Calophyllum tomentosum	poon	POT	40
3.	Calophyllum wightianum	poon	POW	43
4.	Casuarina equisetifolia	casuarina	CAS	48
5.	Dalbergia sissoo	sissoo	SIS	49
6.	Dipterocarpus griffithii	gurjan	GUG	48
7.	Dipterocarpus indicus	gurjan	GUI	47
8.	Dipterocarpus macrocarpus	hollong	HOL	45
9.	Dipterocarpus turbinatus	gurjan	GUT	48
10.	Hardwickia pinnata	piney	PIN	38
11.	Heritiera minor	sundri	SUN	65
12.	Lagerstroemia lanceolata	nana (or benteak)	BEN	42
13.	Pterocarpus marsupium	bijasal	BIJ	50
14.	Tectona grandis	teak	TEA	42
15.	Terminalia bialata	white chuglum	WCH	43
16.	Terminalia manii	black chuglum	BCH	51
17.	Terminalia paniculata	kindal	KIN	48
18.	Terminalia tomentosa	laural	LAU	55
19.	Xylia xylocarpa	irul	IRU	52
	GROUP C (Fibre Stress=6,500 to 9,000 lbs/Square inch)			
1.	Cedrus deodara	deodar	DEO	35
2.	Garuga pinnata	garuga	GAR	36

(*Continued*)

*Weight of wood containing 12% moisture.

(1)	(2)	(3)	(4)	(5)
3.	Lagerstroemia flosreginae	jarul	JAR	40
4.	Lagerstroemia hypoleuca	pyinma	PYI	39
5.	Pinus longifolia	chir	CHI	36
6.	Shorea assamica	makal	MAK	34
7.	Terminalia arjuna	arjun	ARJ	50
8.	Terminalia myriocarpa	hollock	HOK	38
9.	Terminalia procera	white bombwe	WBO	40

For other moisture contents use the following formula:—

Weight of wood per c. ft. $= \frac{w \times (88 + \% \text{ moisture content})}{100}$

EXAMPLE:—

To find the approx. weight of a sal wood pole, of volume 9 c. ft. and containing 20% moisture.

{For cubical contents of wood poles, refer example in Drg. No. RE/G/2·07

Weight of sal wood per c. ft. at 20% moisture

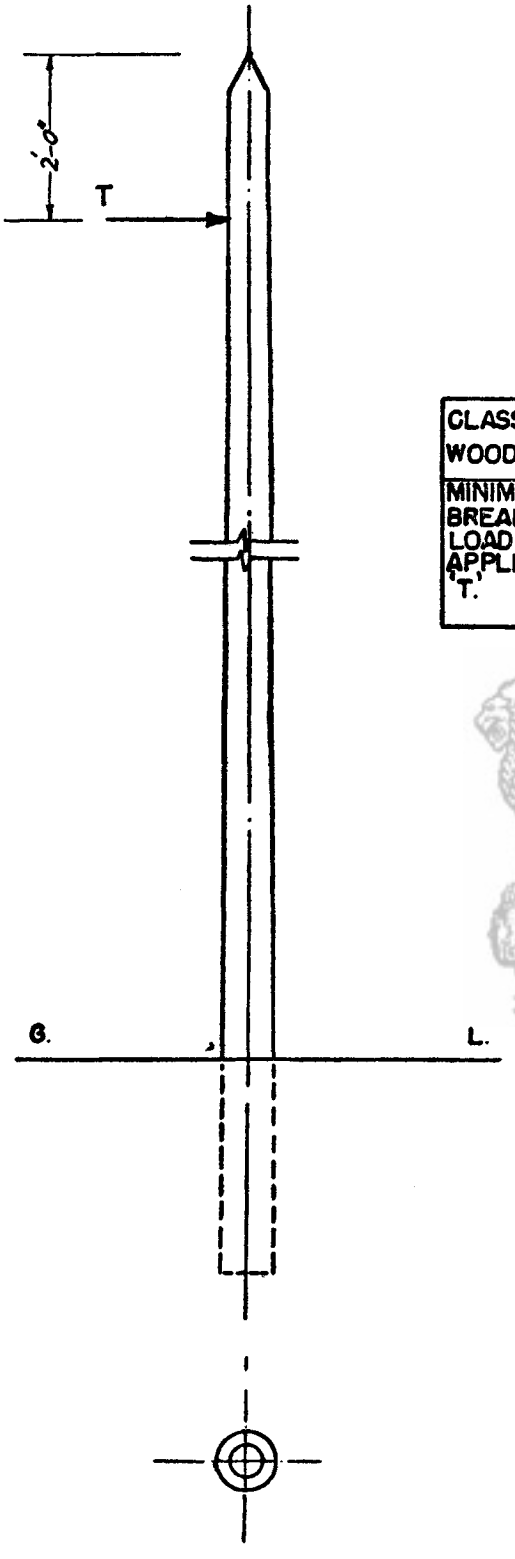
$$= \frac{55(88+20)}{100} = \frac{55 \times 108}{100} = 59{\cdot}4 \text{ lbs.}$$

Total approx. weight of pole $= 9 \times 59{\cdot}4 = 534{\cdot}6$ lbs.

Note:—*Add* 1·0 lb. and 8 lbs. per c. ft. for A. S. C. U. and creosoted treated poles respectively.

Refer I.S. 876—1957

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION RURAL LINE STANDARDS SPECIES OF TIMBERS UNDER GROUPS A, B & C AND THEIR WEIGHTS		
SCALE:	NEW DELHI 20-7-57.	RE/G/2.01



CLASS OF WOOD POLES	1	2	3	4	5
MINIMUM BREAKING LOAD IN Lbs. APPLIED AT 'T'	3000	2400	1900	1600	1200

Note :-

These classes shall apply to all species of timber specified in Drg. No. RE/G/2·01

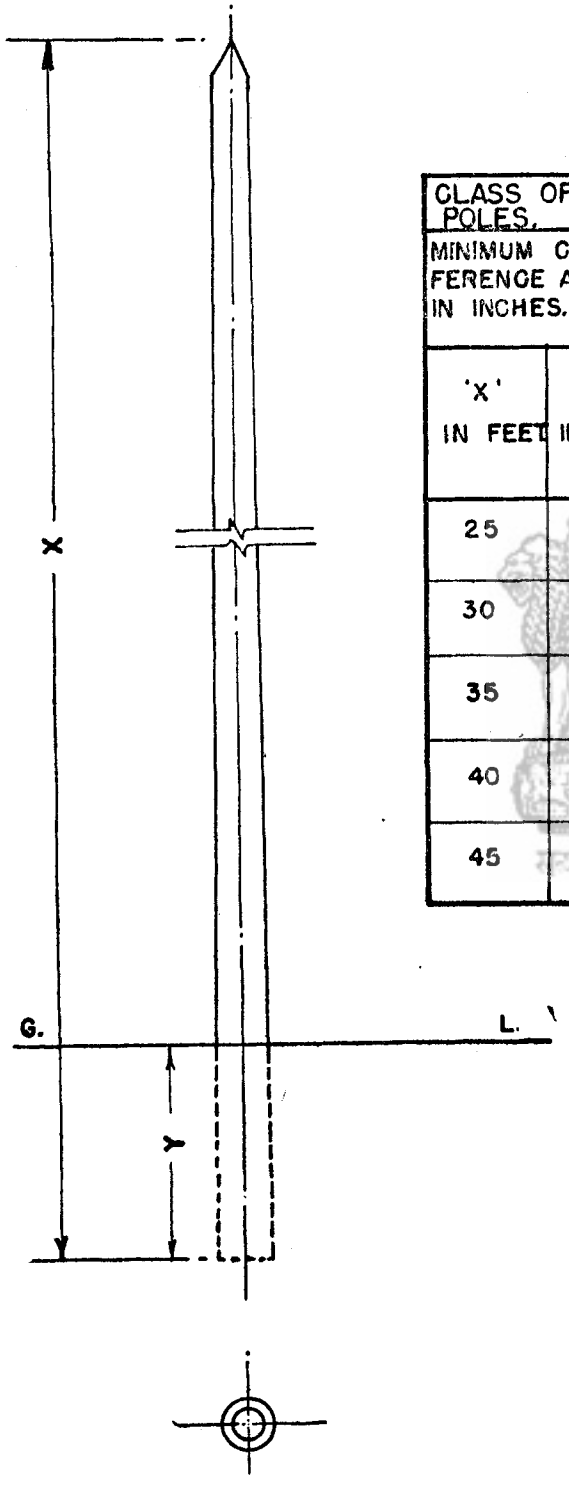
REFER I.S. 876-1957

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

CLASSIFICATION OF WOOD POLES

DRAWN / TRACED / CHECKED	RECOMMENDED / APPROVED	
SCALE :—	NEW DELHI 13.1.59	RE/G/2·02



CLASS OF WOOD POLES.		1	2	3	4	5
MINIMUM CIRCUMFERENCE AT TOP IN INCHES.		19	17	16	14	12
'X' IN FEET	'Y' IN FEET.	MINIMUM CIRCUMFERENCE IN INCHES, AT 6' FROM BUTT END.				
25	5	25	23	21	20	19
30	5	27	25	23	21	20
35	6	29	26	25	23	21
40	6	30	28	26	24	22
45	7	32	30	28	26	25

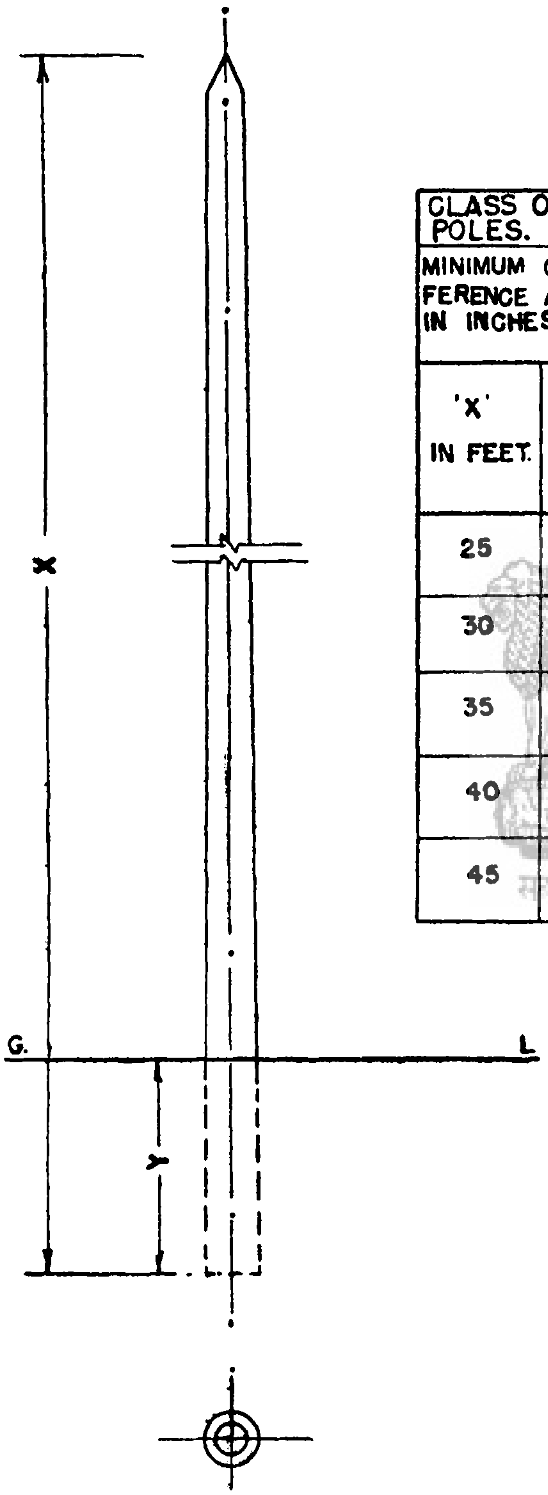
REFER I.S. 876-1957

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

STANDARD DIMENSIONS OF WOOD POLES IN GROUP "A."

DRAWN L TRACED L CHECKED Ws	RECOMMENDED APPROVED	
SCALE —	NEW DELHI 5.3.57	RE/G/2.03



CLASS OF WOOD POLES.		1	2	3	4	5
MINIMUM CIRCUMFERENCE AT TOP IN INCHES.		20	18	17	15	13
'X' IN FEET.	'Y' IN FEET.	MINIMUM CIRCUMFERENCE IN INCHES, AT 6' FROM BUTT END.				
25	5	27	25	23	22	20
30	5	29	27	25	23	22
35	6	31	28	27	25	23
40	6	32	30	28	26	24
45	7	35	32	30	28	27

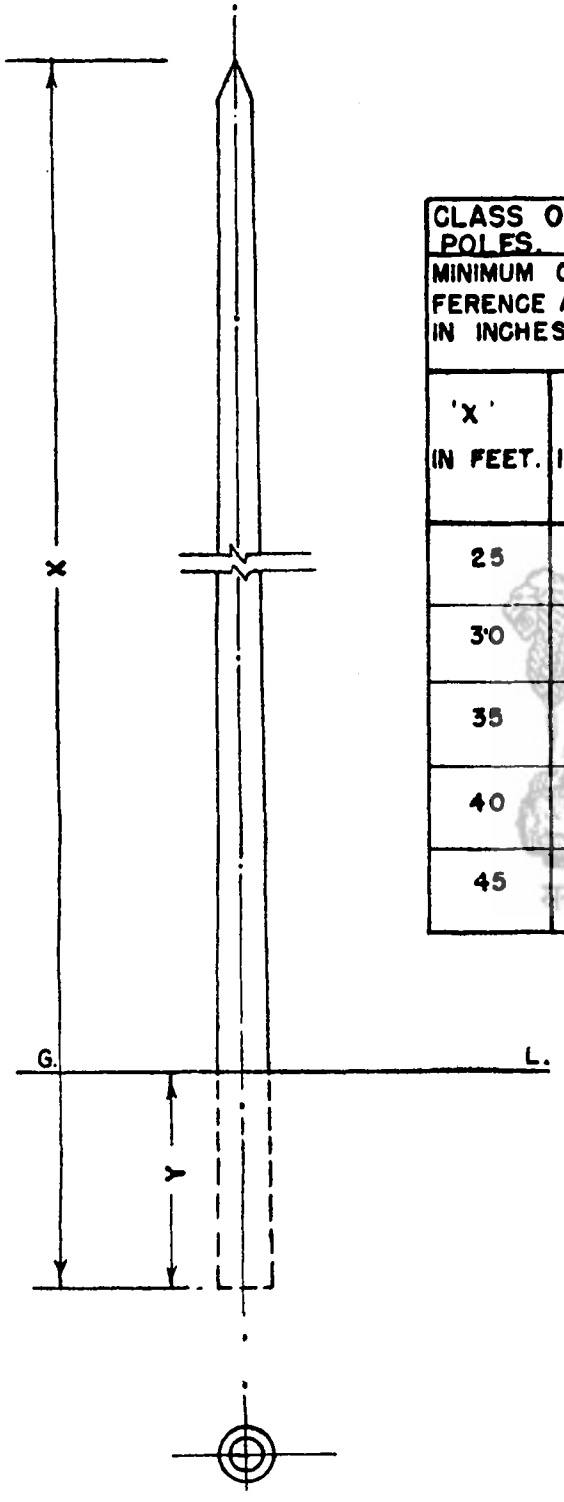
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION.

RURAL LINE STANDARDS

STANDARD DIMENSIONS OF WOOD POLES IN GROUP B

DRAWN TRACED CHECKED	RECOMMENDED APPROVED
SCALE —	NEW DELHI 7.3.57 — RE/G/2.04

REFER I.S. 876-1957



CLASS OF WOOD POLES.		1	2	3	4	5
MINIMUM CIRCUMFERENCE AT TOP IN INCHES.		23	21	19	17	15
'X' IN FEET.	'Y' IN FEET.	MINIMUM CIRCUMFERENCE IN INCHES, AT 6' FROM BUTT END.				
25	5	30	28	26	24	22
30	5	33	30	28	26	24
35	6	35	32	30	28	26
40	6	37	34	32	29	27
45	7	38	35	34	30	30

REFER I.S. 876-1957

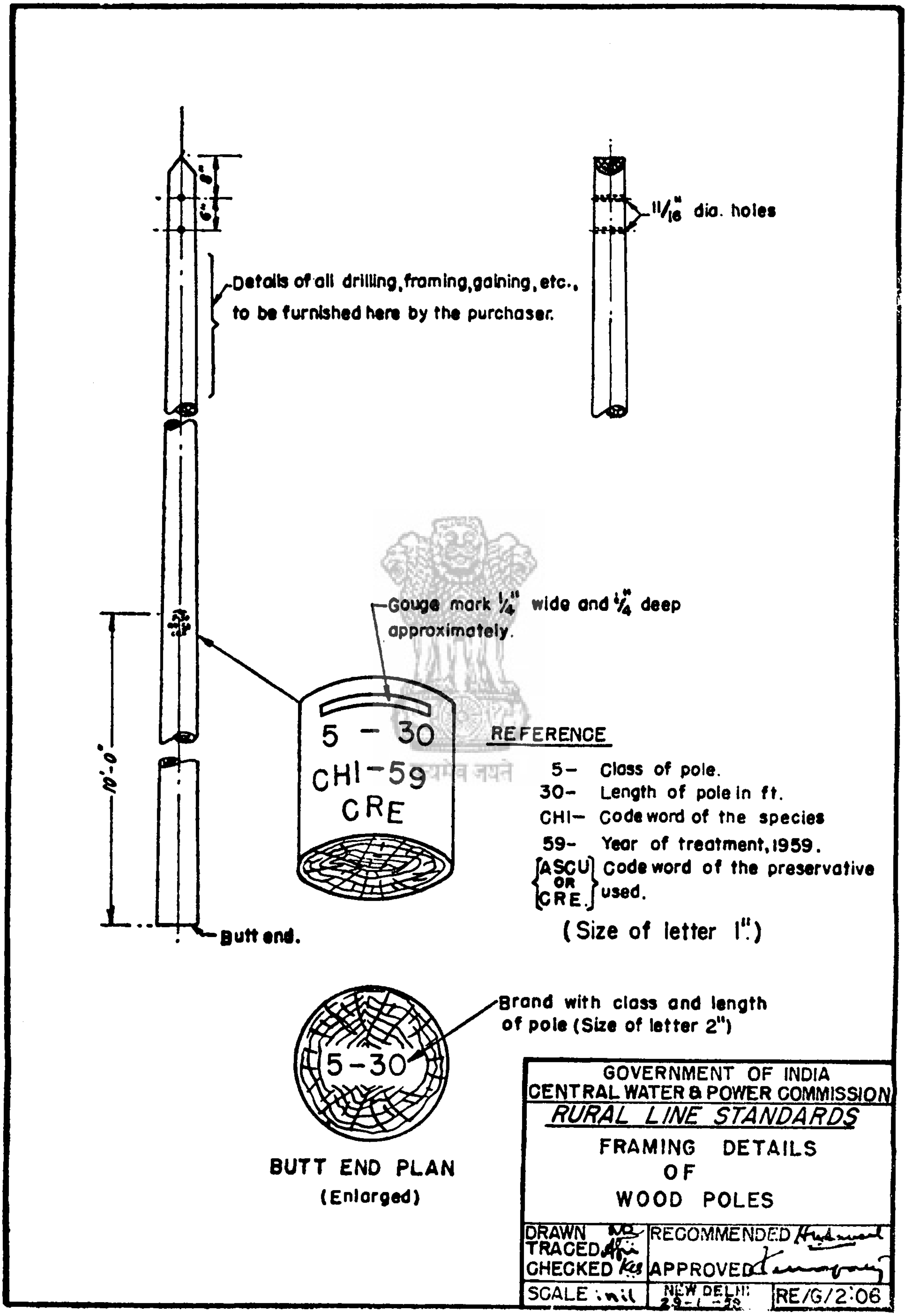
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

STANDARD DIMENSIONS OF WOOD POLES IN GROUP "C"

DRAWN / TRACED / CHECKED	RECOMMENDED / APPROVED
SCALE —	NEW DELHI 9.3.59

RE/G/2.05



11/16" dia. holes
Details of all drilling, framing, gaining, etc., to be furnished here by the purchaser.
Gouge mark 1/4" wide and 1/4" deep approximately.
5 - 30
CHI-59
CRE
10'-0"
Butt end.
REFERENCE
5- Class of pole.
30- Length of pole in ft.
CHI- Code word of the species
59- Year of treatment, 1959.
ASCU OR CRE. Code word of the preservative used.
(Size of letter 1")
Brand with class and length of pole (Size of letter 2")
5-30
BUTT END PLAN
(Enlarged)
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
FRAMING DETAILS OF WOOD POLES
DRAWN
TRACED
CHECKED
RECOMMENDED
APPROVED
SCALE : nil
NEW DELHI
RE/G/2:06

VOLUME OF WOOD POLE IN CUBIC FOOT PER FOOT LENGTH

BUTT END CIRCUMFERENCE IN INCHES	TOP END CIRCUMFERENCE IN INCHES												
	12	13	14	15	16	17	18	19	20	21	22	23	24
18	·126	·134	·142	·151									
19	·135	·143	·152	·160	·170								
20	·144	·153	·161	·170	·180	·190							
21	·154	·163	·172	·181	·190	·200	·211						
22	·164	·173	·182	·191	·201	·211	·222	·233					
23	·175	·184	·193	·202	·212	·223	·233	·244	·256				
24	·186	·195	·204	·214	·224	·235	·245	·257	·268	·280			
25	·197	·206	·216	·226	·236	·247	·258	·269	·281	·293	·306		
26	·209	·218	·228	·238	·248	·259	·270	·282	·294	·306	·319	·332	
27	·221	·230	·240	·250	·261	·272	·284	·295	·307	·320	·333	·346	·360
28	·233	·243	·253	·263	·274	·285	·297	·309	·321	·334	·347	·361	·374
29	·246	·256	·266	·277	·288	·299	·311	·323	·335	·348	·362	·375	·389
30	·259	·269	·279	·290	·301	·313	·325	·337	·350	·363	·377	·390	·405
31	·272	·282	·293	·304	·316	·327	·340	·352	·365	·378	·392	·406	·420
32	·286	·296	·307	·319	·330	·342	·354	·367	·380	·394	·408	·422	·436
33	·300	·311	·322	·333	·345	·357	·370	·383	·396	·410	·424	·438	·453
34	·315	·326	·337	·348	·360	·373	·385	·398	·412	·426	·440	·454	·469
35	·330	·341	·352	·364	·376	·389	·401	·415	·428	·442	·457	·471	·487
36	·345	·356	·368	·380	·392	·405	·418	·431	·445	·459	·474	·489	·504
37	·361	·372	·384	·396	·408	·421	·435	·448	·462	·477	·491	·506	·522

26 (continued)

BUTT END CIRCUMFERENCE IN INCHES	TOP END CIRCUMFERENCE IN INCHES												
	12	13	14	15	16	17	18	19	20	21	22	23	24
38	·377	·388	·400	·412	·425	·438	·452	·466	·480	·494	·509	·524	·540
39	·393	·405	·417	·429	·442	·456	·469	·483	·498	·512	·527	·543	·559
40	·410	·422	·434	·447	·460	·473	·487	·501	·516	·531	·546	·562	·578
41	·427	·439	·452	·464	·478	·491	·505	·520	·534	·550	·565	·581	·597
42	·444	·457	·469	·482	·496	·510	·524	·538	·553	·569	·584	·600	·617

EXAMPLE:—

To find the approx. cubic contents of a sal wood pole, 30 feet in length.
Circumference at the top end = 18 inches.
Circumference at the butt end = 30 inches.
Read vertical column under 18 inches against 30 inches, which gives ·325 cu. ft. per foot length.
Total approx. cubical contents for 30′ pole = ·325 × 30
= 9·75 c_s ft.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
CUBICAL CONTENTS
OF
WOOD POLES

SCALE	NEW DELHI	RE/G/2.07

APPENDIX 2-A

Example:

To decide the height and class of wood pole required for the construction of a composite rural line of the type shown in drawing no. RE/G/3·10.

Assumptions:

The wood pole support is to carry one 11 KV single circuit line with 6/1/·083″ A.C.S.R. and one 440 V, 3-phase, 5 wire distribution line with copper conductors, 6 S. W. G. for phases and 8 S. W. G. for street lighting. Protective guard wires shall be of G. S. S. 7/14 S. W. G., which will be also used for neutral. Construction of straight line type with a level span of 220 ft. maximum. Location being in 10 lbs. /sq. ft. wind region and along a street.

1. Calculations for determining the height of wood pole:

Distance from top of the pole to bottom 11 KV conductors (Refer. drg. no. RE/G/3·10)	1′—6″
Distance between 11 KV bottom conductors and L.T. line conductors (Refer. drg. no. RE/G/3·10)	4′—0″
Maximum sag at 140° F and still air for 6 S.W.G. L.T. phase (taking same for guard wire) (Refer drg. no. RE/10/7·07, sag and tension chart, curve no. 1)	2′—4″
Distance from L.T. line conductor to the bottom of the L.T. cradle wire attachment (Refer. drg. no. RE/G/3·10)	1′—0″ (app.)
Dip of the cross lacing (Refer. drg. no. RE/G/3·10)	0′—9″
Minimum ground clearance as per I.E. Rules, 1956, for L.T. line along street (Refer. drg. no. RE/G/1·01)	18′—0″
Length of pole required	27′—7″+ depth below ground.

Taking 6′—0″ as depth below ground (Refer. drg. no. RE/G/2·05) for 35′ pole, the total length of pole required =27′—7″+6′—0″
=33′—7″.

Hence 34 *feet pole is required.*

Referring to table no. RE/G/2·05, we see that the standard lengths of poles are either 30′ or 35′. Therefore, 35 ft. pole is to be used.

2. Calculations for determining the class of wood pole:

From Drawing No. RE/G/7·08,

Wind load per ft. run on 6/1/·083″ A. C. S. R.	0·1383 lb.
Wind load per ft. run on 6 S. W. G. copper conductor	0·1067 lb.
Wind load per ft. run on 8 S. W. G. copper conductor	0·0889 lb.
Wind load per ft. run on G. S. S. 7/14 S. W. G. conductor	0·1333 lb.

(*i*) *B. M. at G. L. due to wind on* 11 *KV conductors and* 11 *KV guard wires:* (*Refer drg. no. RE/G/* 3·10):

Height of top conductor above G. L. = 29·5′
" " 2 bottom conductors above G. L. = 27·5′
" " Guard wires above G.L. = 26·33′

Therefore, B. M. = (·1383 × 220 × 1 × 29·5)
+ (·1383 × 220 × 27·5 × 2)
+ (·1333 × 220 × 2 × 26·33)
= 898 + 1673 + 1544
= 4115 lbs. ft.

(*ii*) *B. M. at G.L. due to wind on L.T. conductors and L. T. guard wires* :

Height of attachment, h=23·5 ft, for all L.T. conductors & h=22·5 ft, for guard wires.

Therefore, B. M. = (·1067 × 220 × 3 × 23·5)
+ (·0889 × 220 × 1 × 23·5)
+ (·1333 × 220 × 2 × 22·5)
= 1655 + 460 + 1320
= 3435 lbs. ft.

Therefore, total B.M. at G.L. due to wind on both 11 KV & L.T. conductors and guard wires=4115+3435 =7550 lbs. ft.

Referring to Drawing No. RE/10/2·01 in 10 lbs. wind region a 35′ pole is to be chosen, with a minimum allowable B. M. of not less than 7550 lbs. ft.

Referring to Group C, a Class 5 pole has a strength of 7867 lbs. ft.

Hence Class 5 is sufficient.

11 KV LINE CONSTRUCTION—DESIGNS

Drawing No.	Description
RE/G/3·01	11 KV 3-Phase Construction, Span upto 350 feet.
RE/G/3·02	11 KV 3-Phase Construction, Span 350—500 feet.
RE/G/3·03	11 KV Double Cross Arm Construction for 10°—30° angle.
RE/G/3·04	11 KV 3-Phase Construction, 30°—60° angle, Vertical Configuration.
RE/G/3·05	11 KV 3-Phase Construction, 30°—60° angle, Horizontal to Vertical Configuration.
RE/G/3·06	11 KV 3-Phase Construction, 60°—90° angle, Vertical Configuration.
RE/G/3·07	11 KV 3-Phase Construction, Dead-End.
RE/G/3·08	Details of Cross Arms and Bracing for 11 KV lines.
RE/G/3·09	Common Wood Pole Construction for 11 KV & 400/230 Volt lines.
RE/G/3·10	Common Wood Pole Construction for 11 KV & 400/230 Volt lines.
RE/G/3·11	Tee-Off Construction for 11 KV lines with Cut-Outs.
RE/G/3·12	Tee-Off Construction for 11 KV lines without Cut-Outs.

SECTION 3

11 KV LINE CONSTRUCTION—DESIGNS

This Section deals with a few designs of single circuit 11 KV rural line construction on wood poles. Although it is possible to have various configurations of conductors, only the triangular configuration with a pole top pin has been considered, as this arrangement is more efficient in operation. No overhead earth wire is provided in these designs.

Brief details of the drawings included in this Section are given below:—

RE/G/3·01 & RE/G/3·02: With a view to take maximum advantage of the undulating character of the terrain, two types of triangular configurations, one for a span not exceeding 350 ft. with 3'—6" long cross arm and the other for a span of 350'—500' with 4'—6" long cross arm are illustrated in these drawings. The spacing of conductors has been determined after taking into consideration the practice followed in India and foreign countries. The construction of spans longer than 500 ft. would need special consideration and hence has not been considered in this Manual. A detailed list of line materials and quantities required at each pole is also indicated in the drawings.

RE/G/3·03, RE/G/3·04 & RE/G/3·06: The types of constructions as illustrated in these drawings with necessary guying arrangements are recommended for deviations. The table below indicates the permissible deviations in the route of transmission line of each type of construction and the type of insulator to be adopted. In Drawing No. RE/G/3.03, a packing piece between pole top bracket or pole top pin and the pole may be used, if necessary, to maintain requisite clearance between the insulators.

Sl. No.	Line deviation	Type of Construction	Insulators	Drg. ref.
(1)	(2)	(3)	(4)	(5)
1.	From 0° to 10°	.. Single cross arm.	Pin (steel) single.	RE/G/3·01 or 3·02.
2.	From 10° to 30°	.. Double cross arm.	Pins (Steel) in tandem.	RE/G/3·03.
3.	From 30° to 60°	.. Vertical construction.	Disc insulators with suspension clamps.	RE/G/3·04.
4.	From 60° to 90°	.. Vertical construction.	Disc insulators with strain clamps.	RE/G/3·06.

RE/G/3·05: This drawing illustrates the method of changing the position of conductors from horizontal to vertical configuration for taking an angle of 30° to 60°.

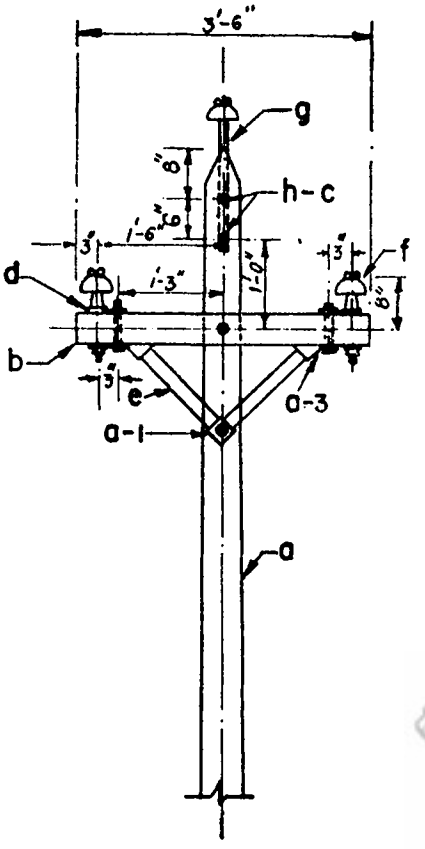
RE/G/3·07: This drawing shows a suitable arrangement for terminal points and section ends.

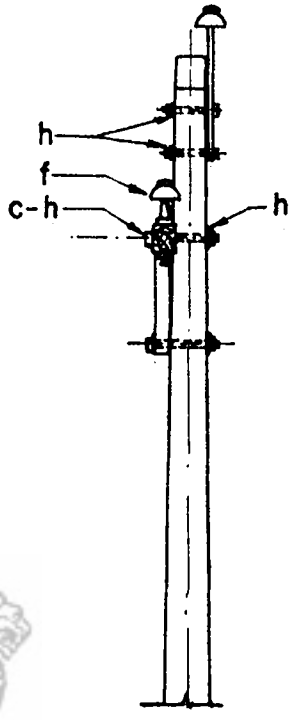
RE/G/3·08: The details of various cross arms and bracings required for the construction of 11 KV lines are given in this drawing. As far as practicable all framing of wood should be done before giving the preservative treatment. However, where this is not possible and drilling of holes is done at the time of erection, the drilled surface should be covered by a mixture of Creosote and Tar or Ascu solution.

RE/G/3·09 & RE/G/3·10: These drawings illustrate two types of composite construction of 11 KV and 400/230 Volt lines on a common pole, L.T. being in vertical and horizontal configurations respectively.

RE/G/3·11 & RE/G/3·12: Tee-off arrangement for tapping 11 KV feeder lines with and without cut-outs respectively have been shown in these drawings.

Protective guards are shown only in Drawing Nos. RE/G/3·09 and 3·10. For others, arrangements similar to those shown in Drawing No. RE/G/1·09 may be adopted.





ITEM	NO REQD	Material	ITEM	NO. REQD	Material
a	1	Pole, treated wood.	f	3	Insulators pin type, 11 kV.
b	1	Crossarm, treated wood 4"x3"x3'-6".	g	1	Pin, pole top.
c	6	Bolts, machine, 5/8"x required length.	h	7	Washers, m.s. 2"x2"x3/16", 11/16" hole.
d	2	Pins, crossarm type, 11 kV.	a-3	2	Sockets for bracing.
e	2	Bracings wood.			
a-1	2	Box-washers.			

Note:

Configuration is suitable for Sags upto 54".

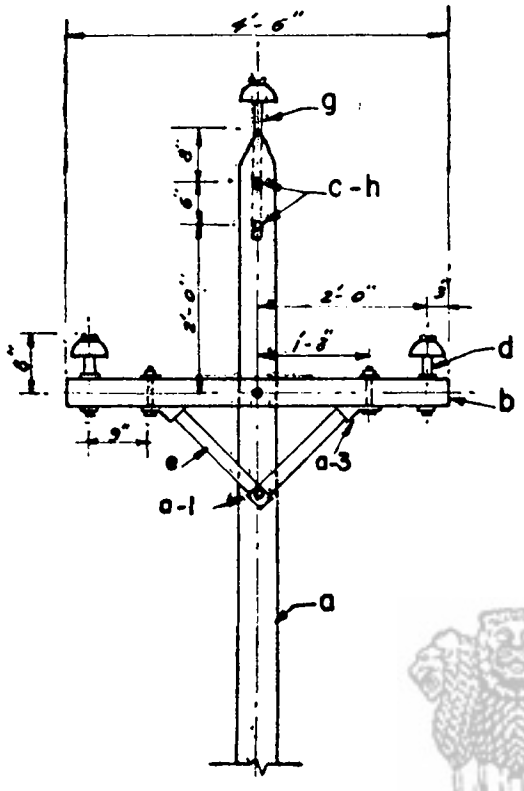
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

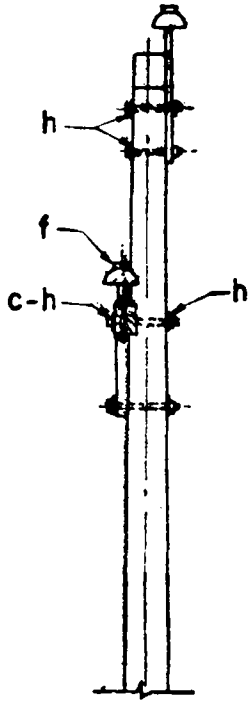
RURAL LINE STANDARDS

11 KV 3-PHASE CONSTRUCTION

SPAN UPTO 350 FEET

DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE:-1"=2'	NEW DELHI 25.1.59	RE/G/3·01





ITEMS	No. REQD.	Material	ITEMS	No. REQD.	Material
a	1	Pole, treated wood.	e	2	Bracings wood.
b	1	Crossarm treated wood 4"x3"x4'-6".	f	3	Insulators, pin type, 11 kV
c	6	Bolt machine, 5/8" x required length	g	1	Pin, pole top.
d	2	Pins cross arm type, 11 kV.	h	7	Washers, m.s. 2"x2"x3/16", 11/16" hole.
a-1	2	Box-washers.	a-3	2	Sockets for bracing.

Note :

Gontguration is suitable for Sags above 54" and upto90".

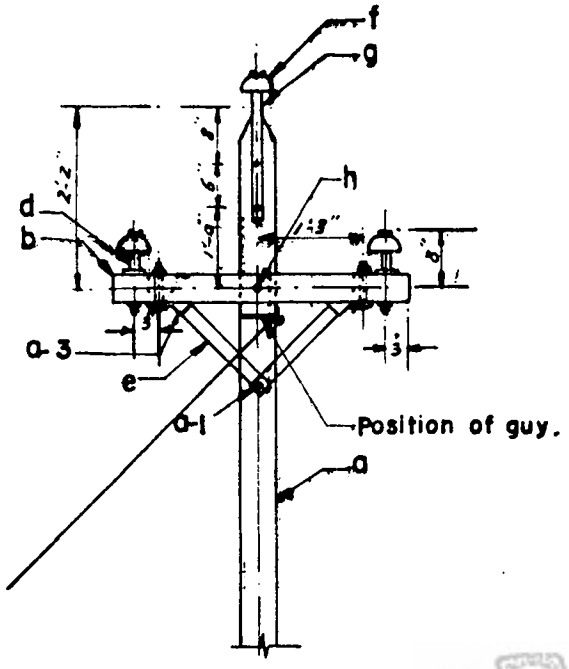
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

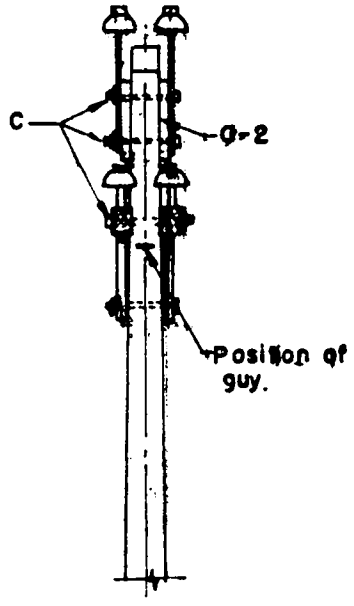
RURAL LINE STANDARDS

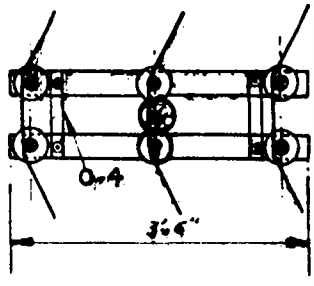
11 KV 3-PHASE CONSTRUCTION

SPAN 350 - 500 FEET.

DRAWN MA	RECOMMENDED
TRACED	
CHECKED MS	APPROVED
SCALE 1"=2'	NEW DELHI RE/G/3.02







Item	No. Reqd.	Material	Item	No. Reqd.	Material
a	1	Pole, treated wood.	f	6	Insulators, pin type, 11 kV.
b	2	Cross arms, treated wood, 4"x3"x3'-6" *	g	2	Pins, pole top.
c	8	Bolt, machine 5/8" x required length.	h	6	Washers, m.s. 2"x2"x3/16", 11/16" hole.
d	4	Pins, cross arm type, 11 kV.	a-1	4	Box washers.
e	4	Bracing wood.	a-2	2	Wooden packing pieces, 1 1/2"x2"x10".
a-4	2	Flat, m.s.	a-3	4	Sockets for bracing.

*Dimensions given for 350 feet Span.
For 350-500 feet Span alter dimensions according to Drawing No. RE/G/3.02.

Note:

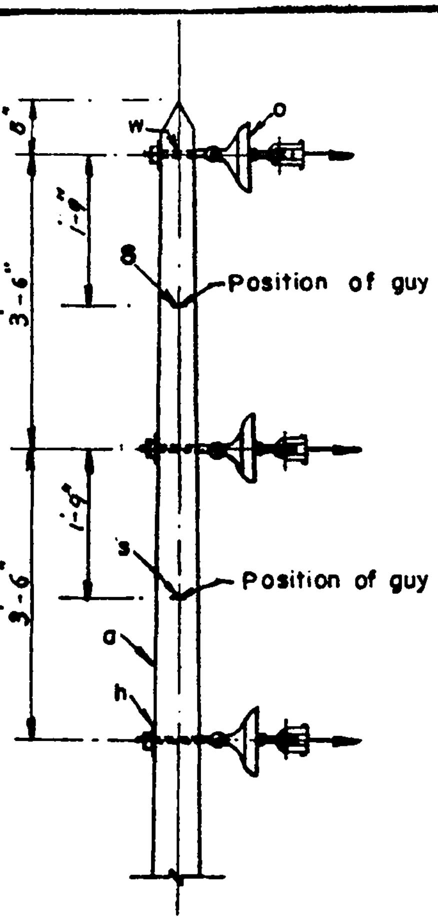
Configuration is suitable for Sags upto 54'.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

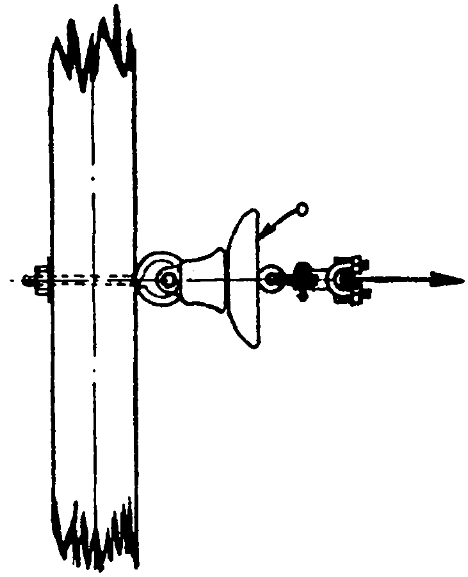
RURAL LINE STANDARDS

11 KV DOUBLE CROSSARM CONSTRUCTION FOR 10°-30° ANGLE

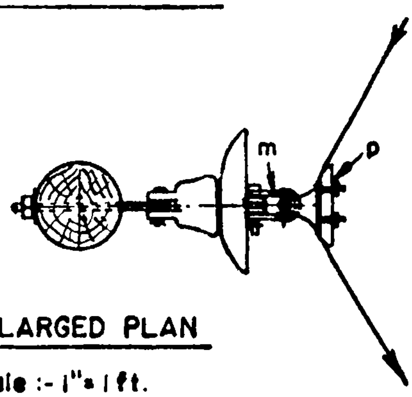
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE: 1"=2'	NEW DELHI 2.5.1957	RE/G/3.03



Scale: 1" = 2 ft.



ENLARGED ELEVATION.



ENLARGED PLAN

Scale :- 1" = 1 ft.

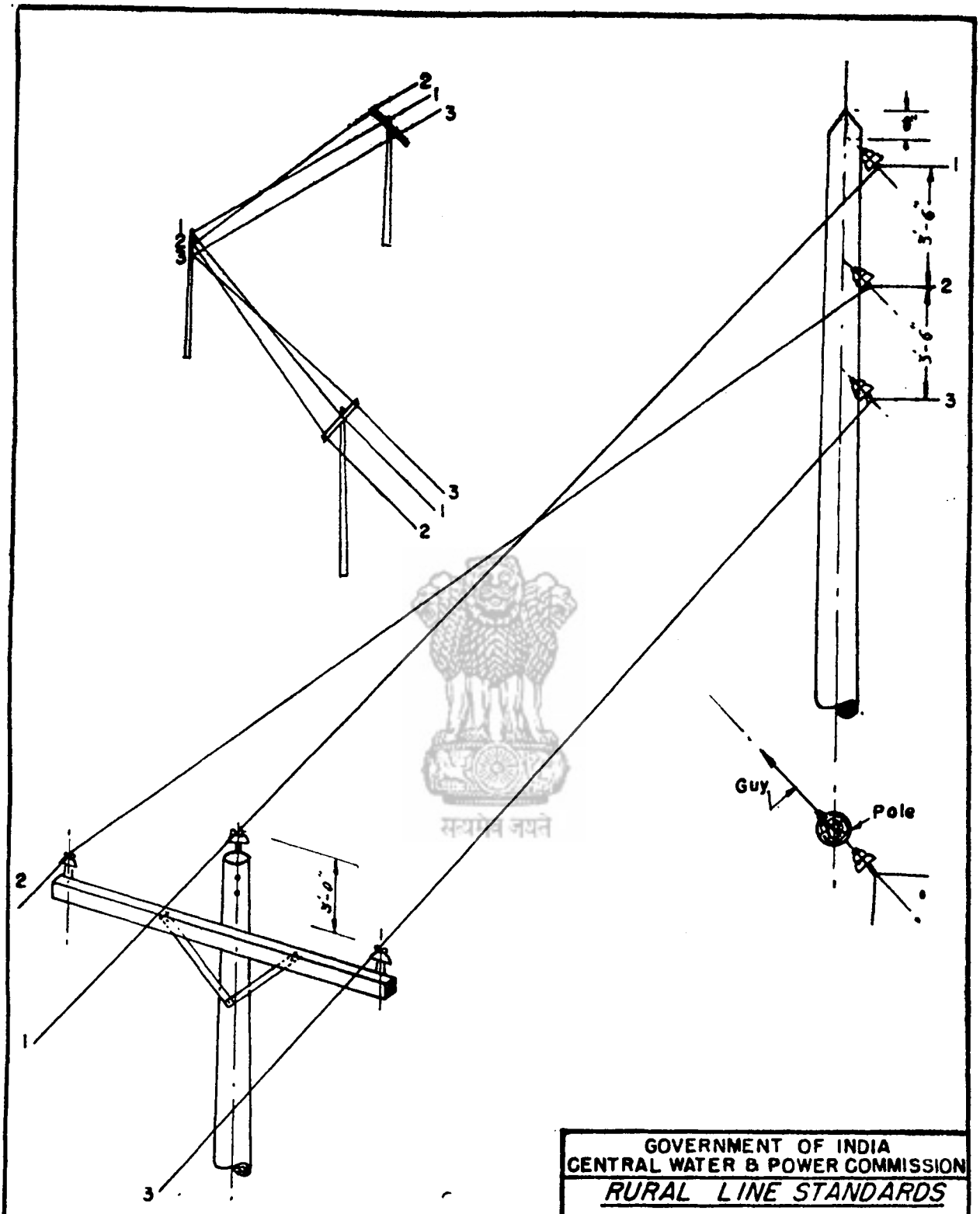
ITEM	No. REQD	Material	ITEM	No. REQD	Material
a	1	Pole, treated wood	p	3	Clamp, suspension, two bolt type.
h	3	Washers, m.s. 2"x2"x 3/16", 11/16" hole	s	—	Guy, assemblies as required.
m	3	Shackle, anchor	o	3	Insulators, disc, 10".
w	3	Bolts, eye, 5/8" x required length.			

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

11 KV 3 PHASE CONSTRUCTION
30°-60° ANGLE
VERTICAL CONFIGURATION.

DRAWN TRACED CHECKED	RECOMMENDED APPROVED
SCALE :—	NEW DELHI 6-6-1959
	RE/G/3.04



NOTE :-

For 60° to 90° use similar conductor arrangement as shown in Drg. No. RE/G/3.06

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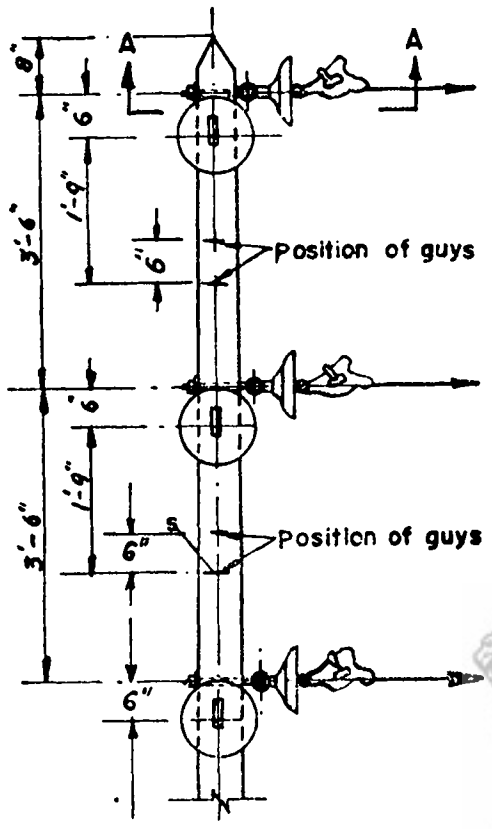
CENTRAL WATER & POWER COMMISSION

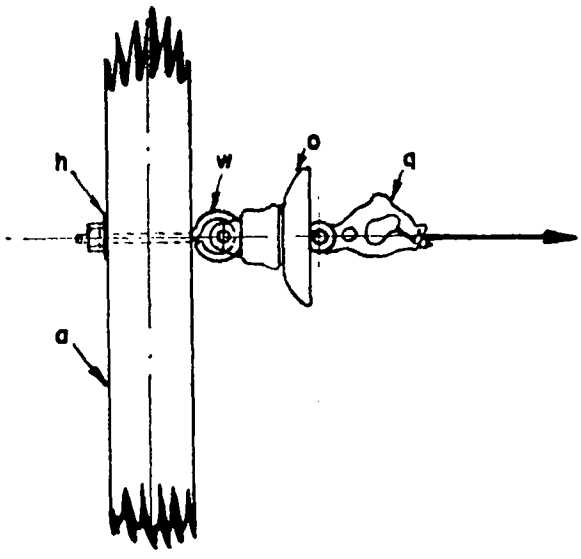
RURAL LINE STANDARDS

11 KV-3 PHASE CONSTRUCTION
30°-60° ANGLE, HORIZONTAL
TO VERTICAL CONFIGURATION.

DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE —	NEW DELHI 14-7-58	RE/G/3.05

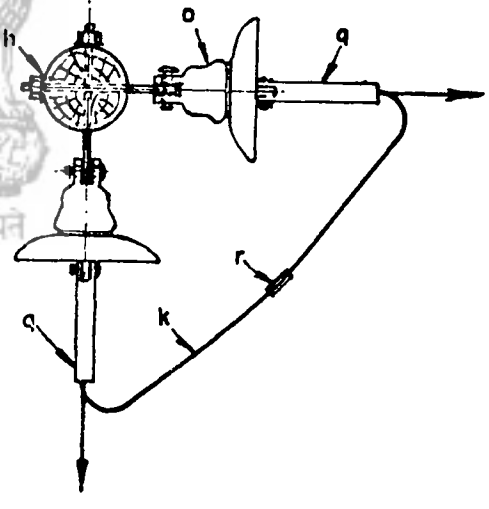


Scale: 1" = 2 ft.



ENLARGED ELEVATION

(DETAILS AT AA)



ENLARGED PLAN

Scale: 1" = 1 ft.

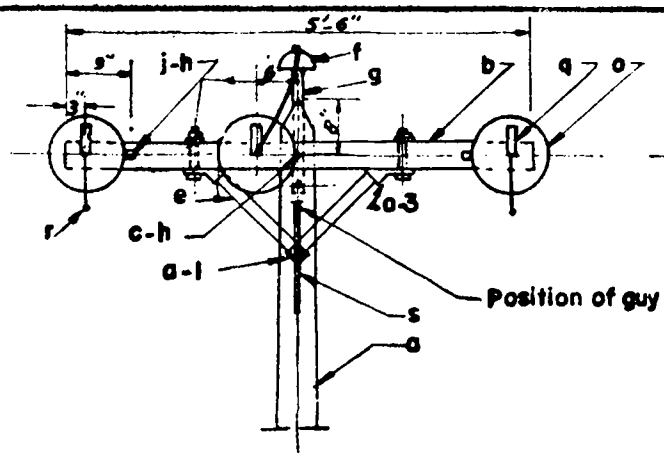
ITEM	No REQD	Material
a	1	Pole treated wood
h	6	Washers, m.s., 2"x2"x3/16", 11/16" hole.
k	–	Jumpers.
o	6	Insulators, disc, 10".
q	6	Clamps, strain type.
r	–	Connectors, as reqd.
s	–	Guy assemblies, as required.
w	6	Bolts, eye, 5/8"x reqd. length.

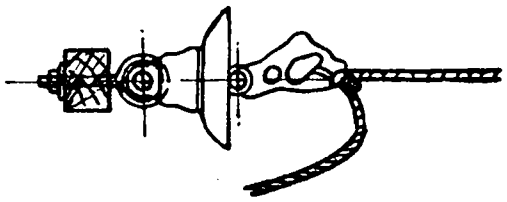
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

11 KV 3 PHASE CONSTRUCTION
60° – 90° ANGLE
VERTICAL CONFIGURATION.

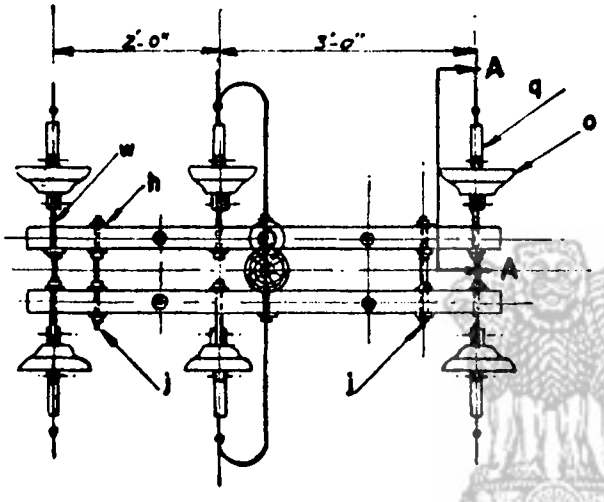
DRAWN NG	RECOMMENDED Hussain	
TRACED Arm		
CHECKED KLB	APPROVED	
SCALE :—	NEW DELHI 8-5-1959	RE/G/3.06





DETAILS AT A A

Scale:- 1"=1 Ft.



ITEMS	NO. REQD.	Material	ITEMS	NO. REQD.	Material
a	1	Pole, treated wood.	p	6	Insulators, disc, 10"
b	2	Cross arms, treated wood, 4"x3"x5'-6"	q	6	Clamps, strain type.
c	7	Bolts machine, 5/8" x required length.	r	3	Connectors.
g	1	Pole top bracket.	s	-	Guy assemblies, as required.
e	4	Bracings, wood.	w	6	Bolts, eye 5/8," required length.
f	1	Insulator, pin type.	a-3	4	Sockets for bracing.
h	13	Washers, m.s. 2½"x2"x3/16", 11/16" hole.			
j	2	Bolts, double arming, 5/8"x required length			
a-1	4	Box washers.			

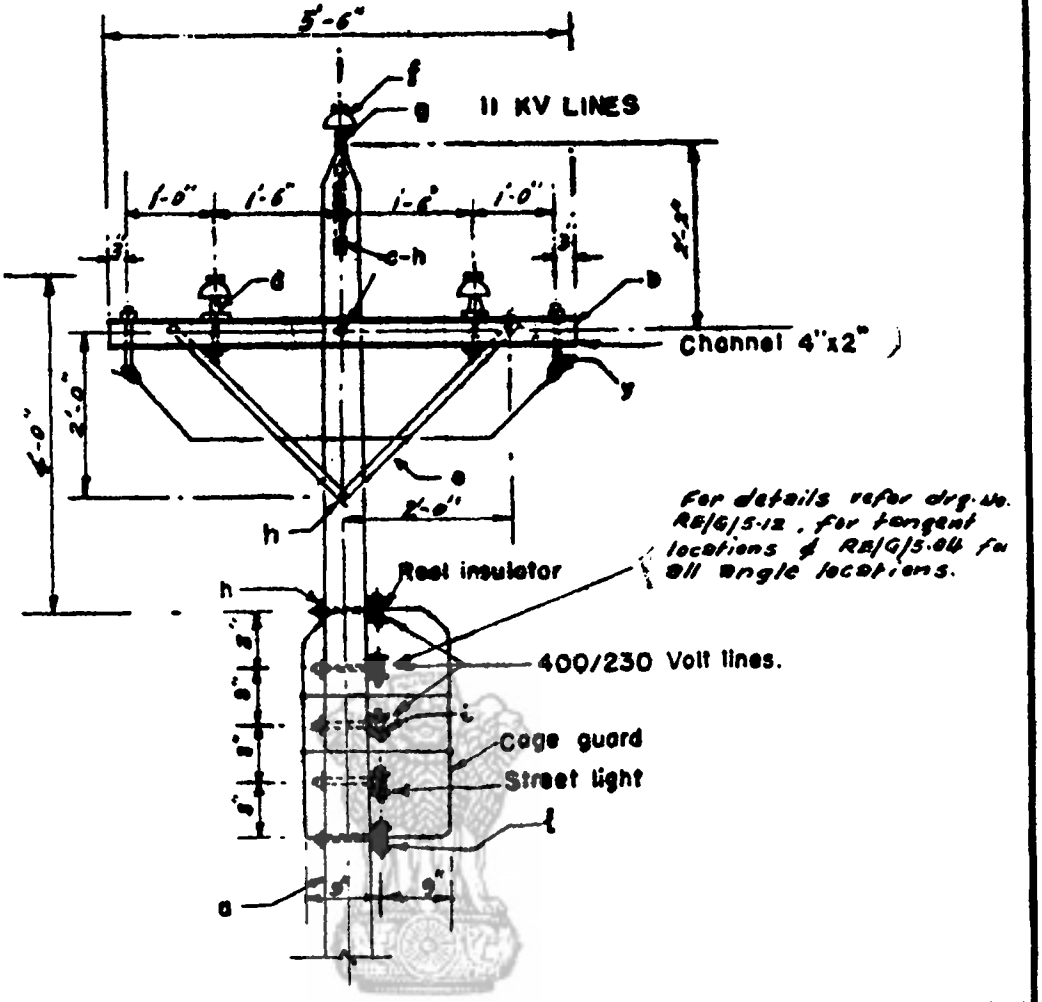
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

11 KV 3-PHASE CONSTRUCTION
DEAD-END

DRAWN MG	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
SCALE——	NEW DELHI 18.1.59	RE/G/3.07


सत्यमेव जयते



ITEM	NO. REQD.	Material	ITEM	NO. REQD.	Material
a	1	Pole, treated wood.	ℓ	1	Spool type C.I. knob for neutral.
b	1	Crossarm, 4"x2"x5'-6", 11 KV., steel.	y	2	Cradle wire attachment.
c	11	Bolts machine, 5/8" x required length.			
e	2	Bracing steel.			
f	3	Insulators, pin type, 11 KV.			
g	1	Pin, pole top.	h	9	Washers, m.s, 2½"x2"x3/16", 11/16" hole.
i	4	Insulators, L.T. shackle type.	d	2	Pins, crossarm type.

Note:—

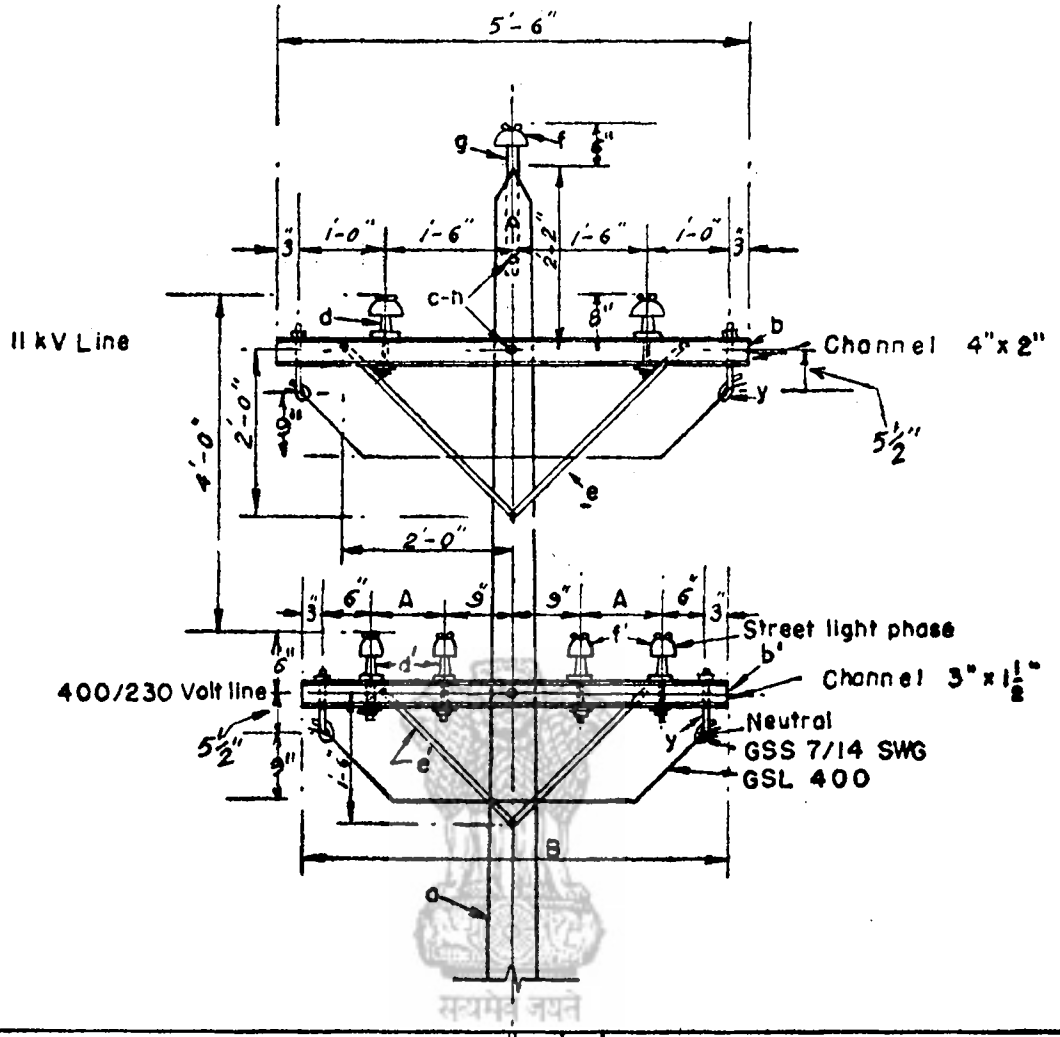
1. Maximum span to be limited to 220 feet as per Rule no.95 of I.E. Rules, 1956.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

COMMON WOOD POLE CONSTRUCTION FOR 11 KV & 400/230 VOLT LINES.

DRAWN WR TRACED CHECKED KLS	RECOMMENDED APPROVED	
SCALE 1"=2'	NEW DELHI 30.7.59.	RE/G/3.09



ITEM	NO REQD	Material	ITEM	NO REQD	Material
a	1	Pole, treated wood	g	1	Pin pole top
b	1	Cross arm, 4"x 2"x 5'-6" for 11 kV., steel	h	6	Washers m.s, 2"x2"x3/16", 11/16" hole.
c	10	Bolts, machine 5/8" x required length.	y	4	Cradle wire attachment.
d	2	Pins, cross arm type 11 k V	b'	1	Cross arm 3"x 1½"x 5' or 6', steel
e	2	Bracings, steel	d'	4	Pins cross arm type 400/230 Volt.
e'	2	Bracings, steel			
f	3	Insulators pin type 11 KV			
f'	4	Insulators pin type, 400/230 volt.			

Notes :-

1. For dimensions A and B refer drawing nos. RE/G/4·03 and RE/G/4·07 respectively.
2. Maximum span to be limited to 220 feet as per Rule no. 85 of I. E. Rules, 1956
3. Protective guarding for 400/230 volt, suitable for copper conductors only.
4. For All-aluminium conductors, refer drg No. RE/G/1·10.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION.

RURAL LINE STANDARDS

COMMON WOOD POLE CONSTRUCTION FOR 11KV AND 400/230 VOLT LINES.

DRAWN MP	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
SCALE : —	NEW DELHI 4-VIII-1958.	RE/G/3.10

Drawing No.	Description
RE/G/4·01	230 Volt Line Construction.
RE/G/4·02	230 Volt Construction for Narrow Streets.
RE/G/4·03	400/230 Volt Construction, Horizontal Configuration.
RE/G/4·04	400/230 Volt Line Construction, Vertical Configuration.
RE/G/4·05	400/230 Volt Construction, 4-Way Junction Pole.
RE/G/4·06	Dead End Construction, 400/230 Volt Lines.
RE/G/4·07	Details of Cross Arms and Bracings for 400/230 Volt Lines.

SECTION 4

400/230 VOLT LINE CONSTRUCTION—DESIGNS

This Section deals with the construction of rural feeders of 400 Volt three phase or 230 Volt single phase erected on wood poles. For supplying electric power to agricultural pumping sets, flour mills or rural industries, a three phase supply is necessary; while for domestic loads of lighting, fans and alike, single phase is needed. Brief details of the drawings included in this Section are given below:—

RE/G/4·01: This drawing illustrates single phase construction with additional provision for street lighting.

RE/G/4·02: This drawing presents a typical construction for narrow streets, where owing to the short width a side arm construction is preferable.

RE/G/4·03: In this drawing a horizontal configuration for 400/230 Volt, three phase line is shown. Street light phase may be provided at the top of the pole, if required. Horizontal type of construction is generally more economical than the vertical type for three phase feeders erected elsewhere than along or across any street.

RE/G/4·04: This drawing illustrates a vertical configuration for a three phase circuit. This type of construction may be adopted, where due to various reasons it is not possible to adopt a horizontal configuration. Vertical configuration is more convenient for tapping purposes.

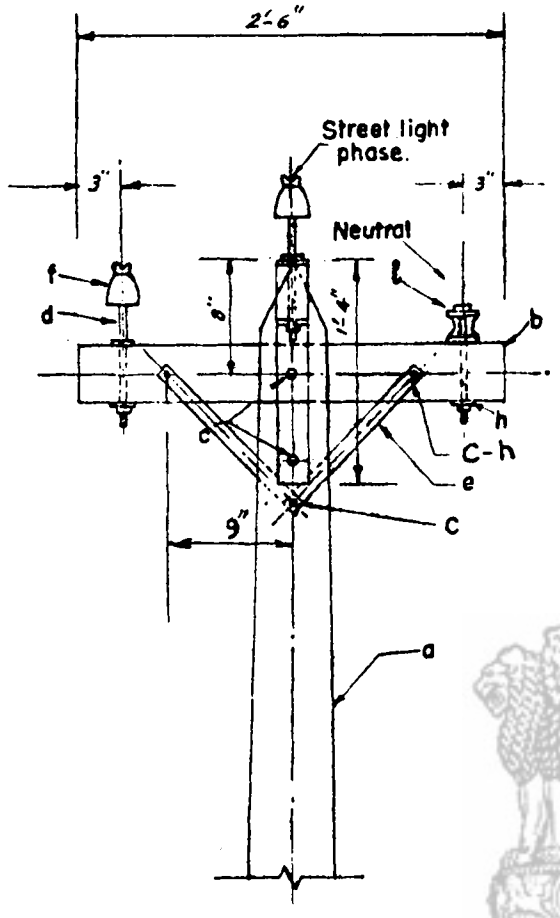
RE/G/4·05: This drawing illustrates a junction pole for 4-way 400/230 Volt lines with vertical configuration.

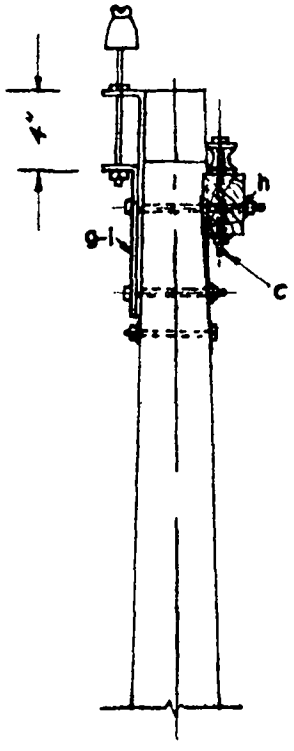
RE/G/4·06: This drawing illustrates the construction for dead-ending three phase 400/230 Volt feeder at terminal points or sectional ends with vertical configuration.

RE/G/4·07: The details of various cross arms and bracings required for the construction of 400/230 Volt lines are given in this drawing.

As far as practicable all framing of wood cross-arms should be done before giving the preservative treatment. However, where this is not possible and drilling of holes is done at the time of erection, the drilled surface is to be covered by a mixture of Creosote and Tar or Ascu solution.

In the above drawings no protective guards are shown. If they are required, arrangements as shown in Drawing Nos. RE/G/1·08 and RE/G/1·10 may be adopted.





ITEM	NO. REQD.	Material	ITEM	NO. REQD.	Material
a	1	Pole, treated wood.	ℓ	1	Spool type, C. I. Knob for neutral.
b	1	Cross arm, treated wood, 4"x3"x2'-6"	g-l	1	Bracket, pole top.
c	6	Bolts machine, 5/8"x required length.	e	2	Bracings, steel flat 1 1/4" x 1/4"
d	2	Pins, crossarm type.			
f	2	Insulators, pin type.			
h	6	Washers, m.s 2"x2"x3/16", 11/16" hole.			

NOTE :—

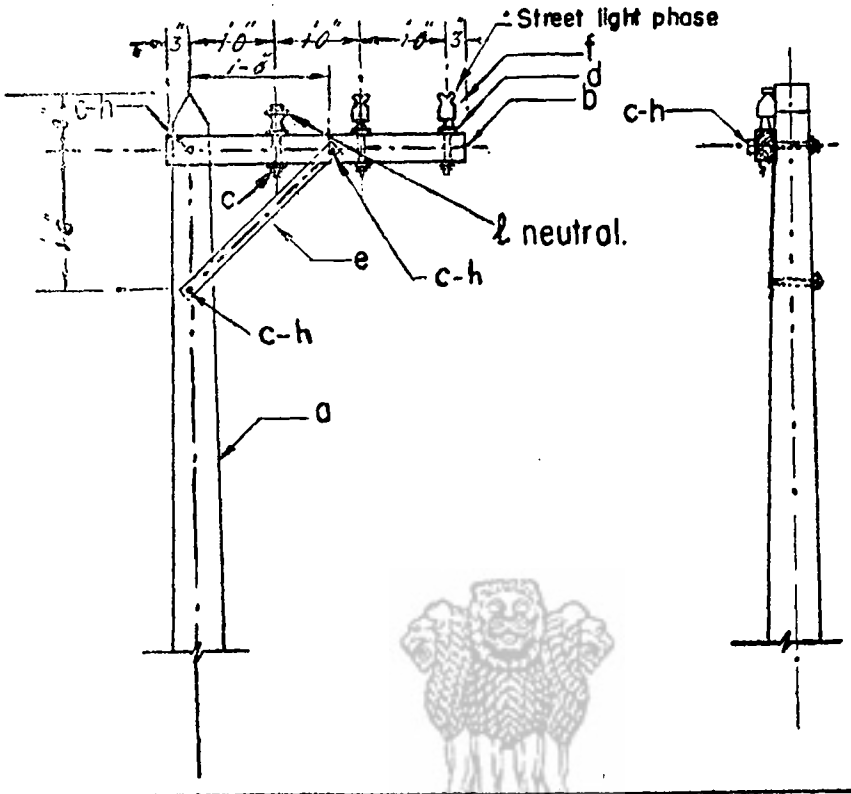
All metal parts and neutral to be earthed at each pole.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS

230 VOLT LINE

CONSTRUCTION

DRAWN MR TRACED VS CHECKED	RECOMMENDED APPROVED	
SCALE 1"=1ft.	NEW DELHI	RE/G/4-01

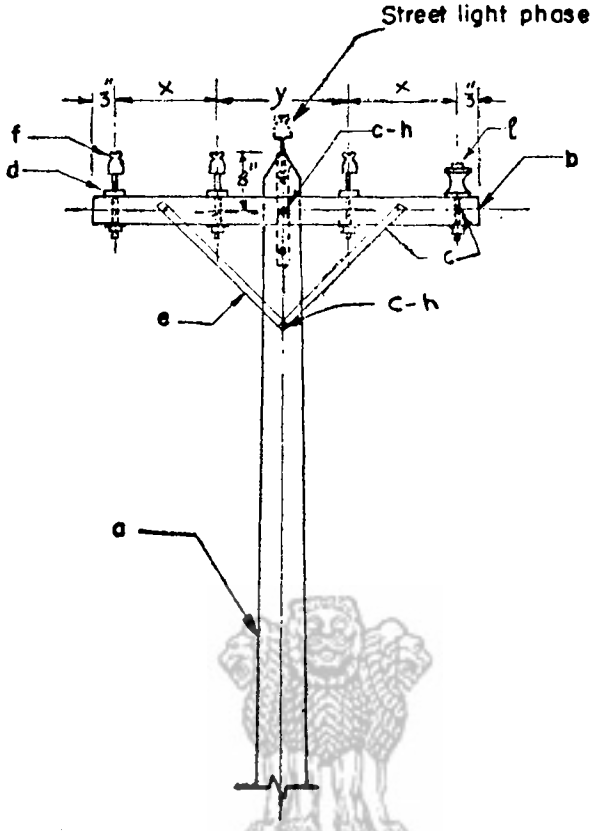


		Material			Material
a	1	Pole, treated wood.	ℓ	1	Spool type c.i. knob for neutral
b	1	Cross arm treated wood 4"x 3"x 3'-6"			
c	4	Bolts machine, 5/8" x required length			
d	2	Pin cross arm type.			
e	1	Bracings steel	f	2	Insulators, pin type.
h	5	Washers m.s. 2"x2"x 3/16", 11/16" hole.			

NOTE :-

All metal parts and neutral to be earthed at each pole.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS 230 VOLT CONSTRUCTION FOR NARROW STREETS.		
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE - 1"=2'	NEW DELHI 1-5-57.	RE/G/4.02



Item	No Reqd	Material	ITEM	No Reqd	Material
a	1	Pole, treated wood.	h	6	Washers, m.s. 2"x2"x3/16", 11/16" hole.
b	1	Crossarm, treated wood.	ℓ	1	Spool type, C.I. knob for neutral.
c	6	Bolt, machine 5/8"x required length.			
d	3	Pins, crossarm type.			
e	2	Bracings, as required.			
f	3	Insulators, pin type.			

Sag in inches	Horizontal Spacing	
	x	y
Upto 30	12"	18"
31–48	18"	18"
49–58	24"	24"

NOTE :-

All metal parts and neutral to be earthed at each pole.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

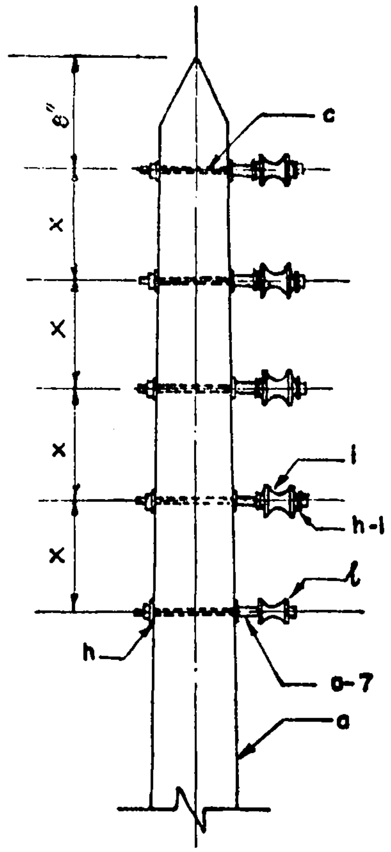
RURAL LINE STANDARDS

400/230 VOLT CONSTRUCTION

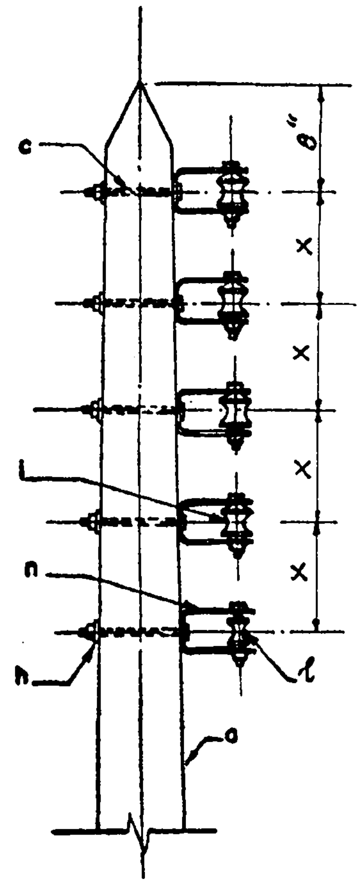
HORIZONTAL CONFIGURATION.

DRAWN MC TRACED CHECKED LS	RECOMMENDED APPROVED
SCALE :- 1"=2'	NEW DELHI 17.9.58

RE/G/4-03



TANGENT LOCATION



ALL ANGLE LOCATIONS

Item	No. reqd.	Material
a	1	Pole, treated wood.
c	5	Bolts, machine, 5/8"x required length.
i	4	Insulators, spool type.
h	10	Washers m.s, 2"x 2"x3/16", 11/16" hole.
ℓ	1	Spool type c.i. knob for neutral.
h-i	8	Washers m.s, 1¼" round, 11/16" hole.
a-7	5	G.I. pipe 3/4" dia, 1½" long.

Item	No. reqd.	Material
a	1	Pole, treated wood.
c	5	Bolts, machine, 5/8"x required length.
i	4	Insulators, spool type
h	5	Washers m.s, 2"x2"x3/16", 11/16" hole.
ℓ	1	Spool type c.i. knob for neutral
n	5	Shackle type assembly.

Spacing "x"	Ruling Span.
8"	Upto 220 feet.
12"	220 — 300 feet.

Note:-

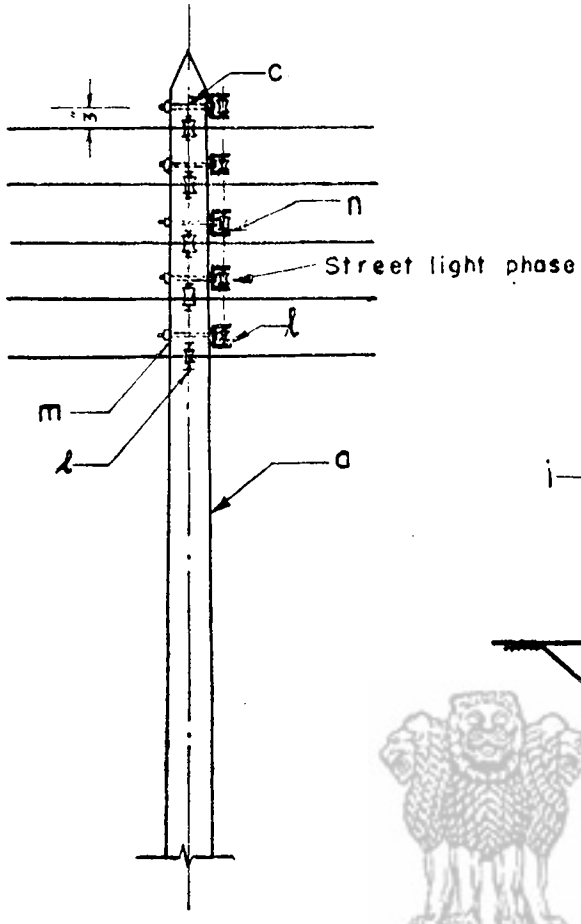
1. For details of bolt and shackle assembly, Refer Drg. Nos. RE/G/5·12 & 5·04 respectively.
2. All metal parts and neutral to be earthed at each pole.

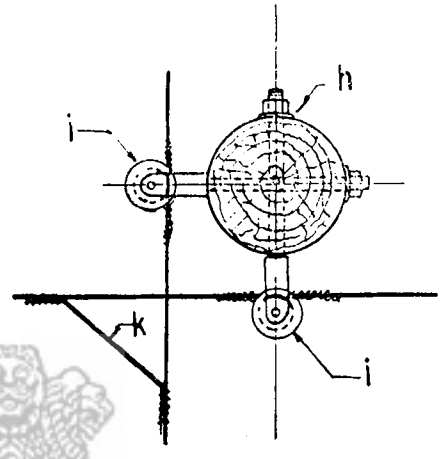
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

400/230 VOLT LINE CONSTRUCTION
VERTICAL CONFIGURATION

DRAWN	RECOMMENDED	
TRACED	APPROVED	
CHECKED		
SCALE:- 1"=1'	NEW DELHI 18.9.58.	RE/G/4·04





ENLARGED PLAN

		Material			Material
a	1	Pole treated wood.			
i	8	Insulators spool type.	l	2	Spool type c.i knob for neutral.
C	10	Bolts machine, 5/8"x required length	k	5	Jumpers
h	10	Washers m.s. 2"x2"x3/16",11/16" hole.			
n	10	Shackle type assemblies			

NOTES :-

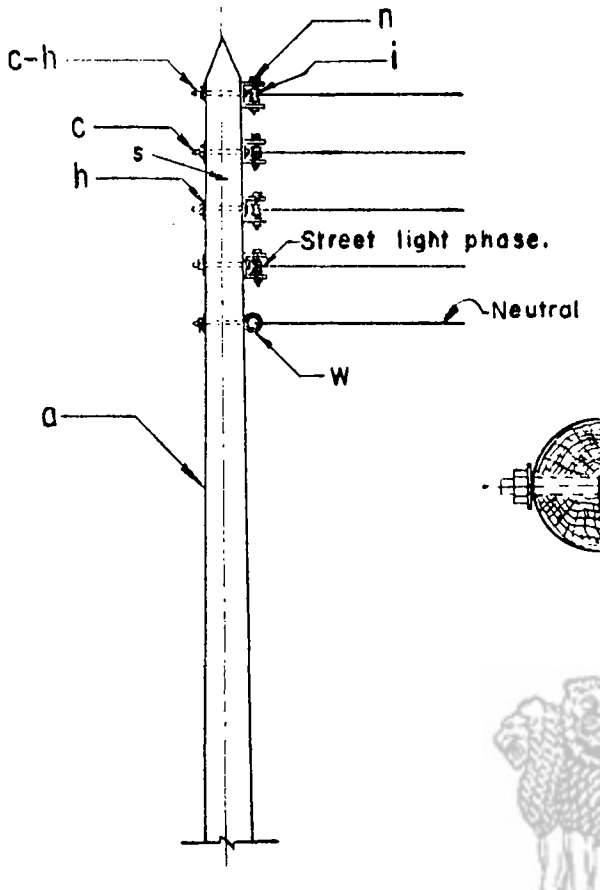
1. For vertical spacing between conductors, refer Drg.No. RE/G/4.04.
2. All metal parts and neutral to be earthed at each pole.

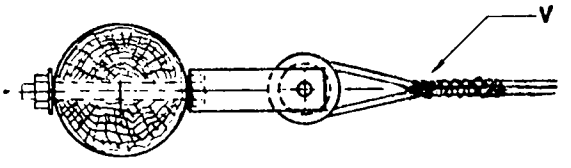
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

400/230 VOLT CONSTRUCTION
4-WAY JUNCTION POLE

DRAWN. V TRACED. [illegible] CHECKED. [illegible]	RECOMMENDED [illegible] APPROVED [illegible]	
SCALE - 1" = 2'	NEW DELHI 4-5-57	RE/G/4.05





ENLARGED PLAN.

		Material.			Material.
a	1	Pole, treated wood.	s	—	Guy assemblies as required.
i	4	Insulators, spool type.	n	4	Shackle type assemblies.
c	4	Bolts, machine 5/8" x required length.	w	1	Bolt, eye 5/8" x required length.
h	5	Washers, m.s. 2"x2"x3/16",11/16" hole.			

NOTES:-

1. For guys, refer Drg. No. RE/6/6.02.
2. For vertical spacing between conductors, refer Drg. No. RE/G/4.04.
3. All metal parts and neutral to be earthed at each pole.

GOVERNMENT OF INDIA.
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

DEAD END CONSTRUCTION

400/230 VOLT LINES.

DRAWN.	RECOMMENDED.	
TRACED.		
CHECKED.	APPROVED.	
SCALE 1" = 2'.	NEW DELHI. 3-5-1957.	RE/G/4.06


सत्यमेव जयते

Drawing No.	Description
RE/G/5·01	Pin Insulator for 11 KV Lines.
RE/G/5·02	Disc Insulator for 11 KV Lines.
RE/G/5·03	Pin Insulator for 400/230 Volt Lines.
RE/G/5·04	400/230 Volt Shackle Insulator Assembly.
RE/G/5·05	Details of 11 KV Cross Arm Type Pin.
RE/G/5·06	Details of 11 KV Pole Top Pin.
RE/G/5·07	Pole Top Bracket for 11 KV Lines.
RE/G/5·08	Cross Arm Type Pin for 400/230 Volt Lines.
RE/G/5·09	Pole Top Bracket for 400/230 Volt Lines.
RE/G/5·10	Suspension & Strain Clamp and Shackle Anchor—Details.
RE/G/5·11	Pole Hardware Details.
RE/G/5·12	400/230 Volt Spool Insulator with Bolt.

SECTION 5

INSULATORS AND FITTINGS

This Section deals with the detailed drawings of porcelain or toughened glass insulators and fittings required for 11 KV and 400/230 Volt rural lines.

RE/G/5·01 & RE/G/5·02: The former drawing deals with the shell for 11 KV pin insulator, while the latter gives details of the disc type insulators for 11 KV lines. Pin insulators are recommended for use on straight runs and up to maximum of 10° deviation; while pin insulators in tandem may be used up to maximum of 30°. The disc insulators are intended for use at pole positions having more than 30° angle or for dead-ending 11 KV lines. Standard discs of 10″×5½″ size, clevis type have been adopted.

The basic impulse level of the 11 KV lines and equipment and the switching surge at the peak value being 87 and 35·8 KV respectively, the following flash over values for the 11 KV insulators are recommended for normal use.

Flash over values	Type of Insulator	
	Pin	Disc Type
Dry flash over	70 KV	80 KV
Wet " "	40 KV	50 KV
Impulse flash over (positive)	110 KV	125 KV

These ratings for insulators may be used where conditions are favourable. For more onerous conditions, higher rating may be used. These insulators shall be in accordance with Indian Standard when the same are finalized and issued.

RE/G/5·03: This drawing gives complete details of a pin insulator suitable for 400/230 Volt lines for cross-arm type of constructions.

RE/G/5·04: This drawing illustrates shackle type L.T. insulator assembly with 'U' strap and cotter pin, which is required at angle and dead-end positions for 400/230 Volt lines, at all locations with vertical configuration.

RE/G/5·05: This drawing details a cross arm type galvanized steel pin suitable for 11 KV line pin insulators. The maximum working load for the pin shall be 400 lbs. based on a factor of safety of 2 on yield stress.

RE/G/5·06: This drawing illustrates a pole top pin for 11 KV lines made either from mild steel angle or channel sections. The pins are rated for 400 lbs. working strength.

RE/G/5·07: The design of a pole top bracket for 11 KV lines has been shown, which is an alternative design to that shown in Drawing No. RE/G/5·06.

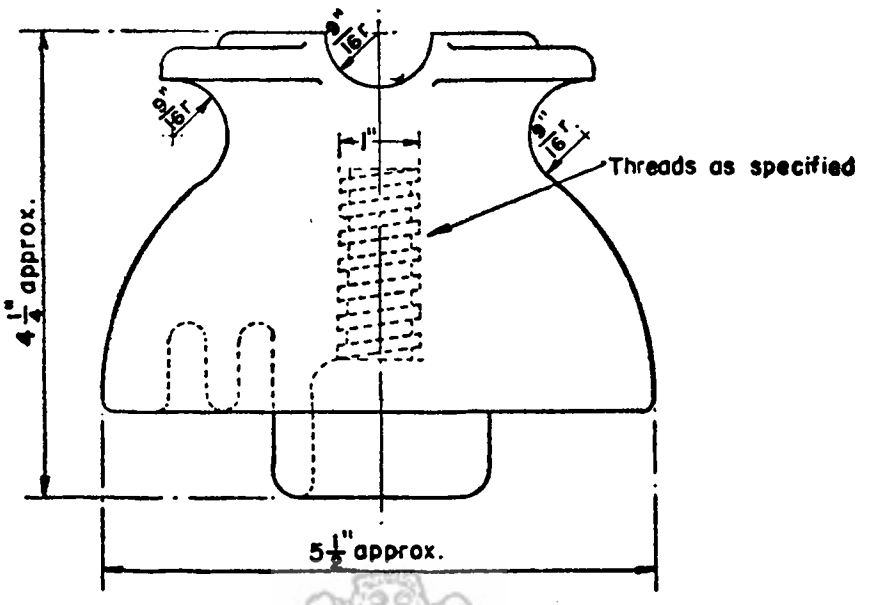
RE/G/5·08: This drawing details a cross arm type galvanized steel pin suitable for 400/230 Volt line pin insulators. The maximum working load for the pin shall be 400 lbs.

RE/G/5·09: The design of a pole top bracket for 400/230 Volt lines has been shown.

RE/G/5·10: The drawing details suspension and strain clamps and anchor shackle, suitable for 11 KV lines.

RE/G/5·11: The drawing illustrates different kinds of pole fittings, such as double arming bolts, eye bolts, machine bolts and curved and round washers, usually required for wood pole construction.

RE/G/5·12: This drawing illustrates the method of fixing a spool insulator to the pole with a bolt, instead of 'U' strap, for use at tangent locations with vertical configurations only. This is an alternate design to that shown in drawing No. RE/G/5·04 for tangent location.

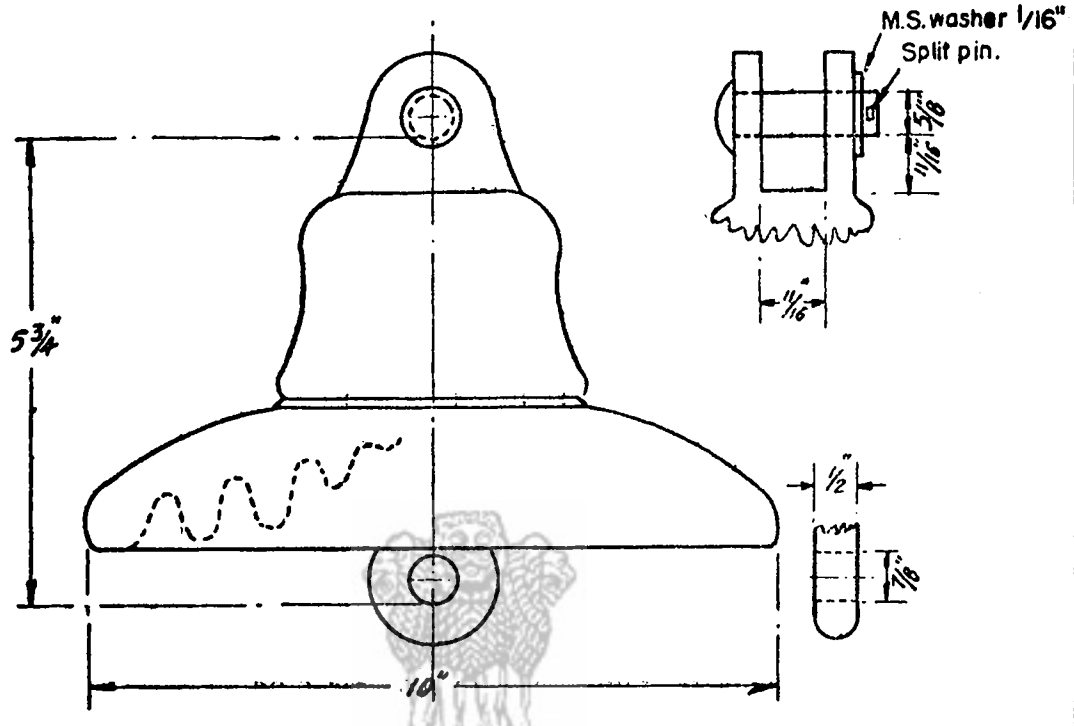


1. Material :- Porcelain or toughened glass.
2. For details of pin, refer Drg. Nos. RE/G/5.05 and 5.06 .
3. Minimum dry flash over = 70 kV.
   Minimum wet flash over = 40 kV.
   Impulse flash over +ve = 110 kV.
4. Minimum leakage distance = 9 inches.
5. Mechanical strength. = 3,000 Lbs.
   (Minimum guaranteed)
6. For other characteristics and particulars refer general specification for 11 kV pin type insulators.
   Insulator similar to EEI-NEMA Standard class 55-4 .

NOTES :-

1. This rating is recommended for use where conditions are favourable. For more onerous conditions, a higher rating is recommended.
2. All insulators to be in accordance with Indian Standards, when these are finalized and issued.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS PIN INSULATOR FOR 11 KV LINES.		
DRAWN M.S. TRACED CHECKED K.L.S.	RECOMMENDED APPROVED	
SCALE: —	NEW DELHI 23-9-58	RE/G/5.01



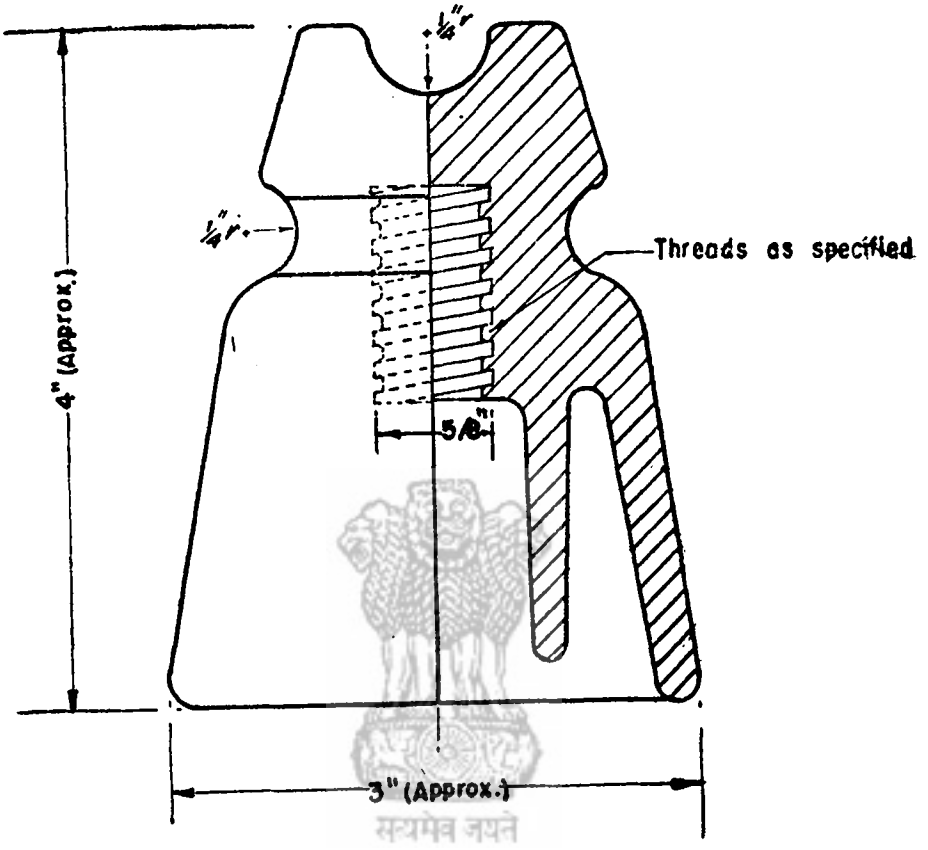
1. Type :-
   Cap and pin, clevis and eye.
2. Material :-
   Porcelain or toughened glass.
3. For hard ware details, refer Drg. Nos. RE/G/5·10 and 5·11
4. Minimum dry flash over = 80 kV
   Minimum wet flash over = 50 kV
   Impulse flash over +ve = 125 kV
5. Minimum leakage distance = 11 1/2 inches
6. Mechanical strength = 15,000 Lbs.
   (Minimum guaranteed)
7. For other characteristics and particulars refer general specification.
   Insulator similar to EEI – NEMA standard class – 52 – 4

NOTES :-

1. This rating is recommended for use where conditions are favourable. For more onerous conditions, a higher rating is recommended.
2. All insulators to be in accordance with Indian Standards, when these are finalized and issued.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
DISC INSULATOR FOR
11 kV LINES.

DRAWN	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
SCALE —	NEW DELHI 6-XII-58.	RE/G/5.02



1. Material:-

   Porcelain or toughened glass

2. For details of pin refer Drg. No. RE/G/5·08

3. Minimum dry flash over = 28 kV

   Minimum wet flash over = 14 kV

4. Mechanical strength = 800 Lbs

   (Minimum guaranteed)

5. For other characteristics and particulars refer general specification

NOTE:-

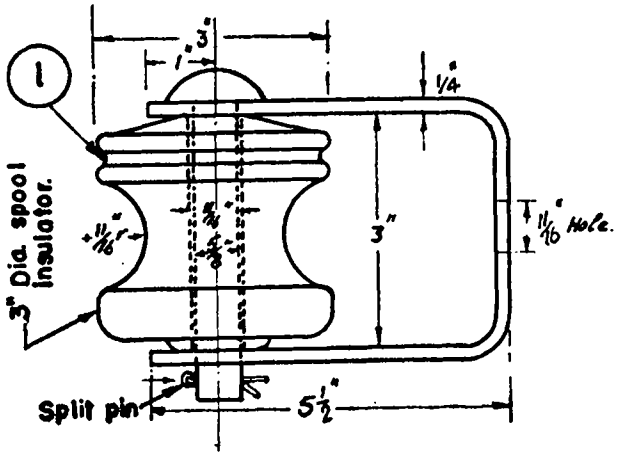
All insulators to be in accordance with Indian Standards, when these are finalized and issued.

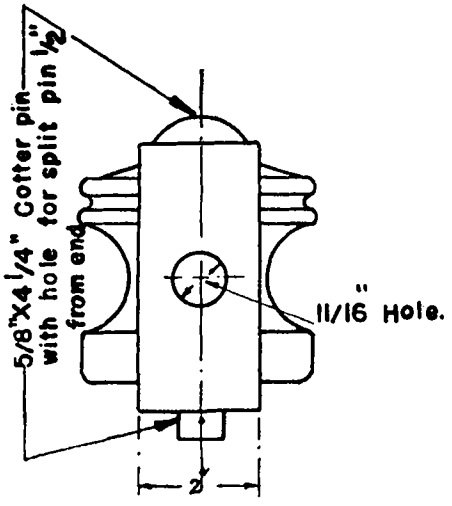
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

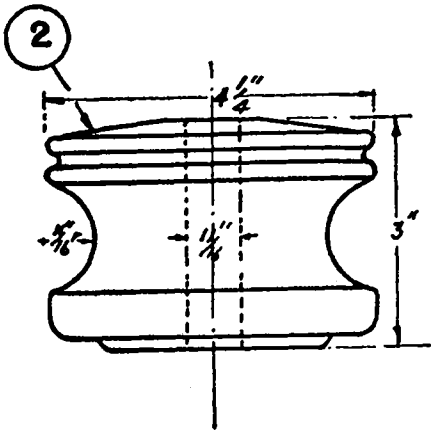
PIN INSULATOR FOR 400/230 VOLT LINES

DRAWN.	RECOMMENDED	
TRACED.	APPROVED	
CHECKED.	NEW DELHI 24-4-57.	RE/G/5·03
SCALE:- —		





Insulator No.1 is to be used for all locations for copper conductors and for tangent locations of A.C.S.R. and All-aluminium conductors.



Insulator No. 2 is preferable for A.C.S.R and all-Aluminium conductors at angles and dead end locations.

Material:-

1. Spool Insulator - - - Wet process porcelain. The assembled piece shall have an ultimate strength of not less than 3000 pounds.

   'U' Strap & Cotter pin - - - - Both hot dip galvanized.

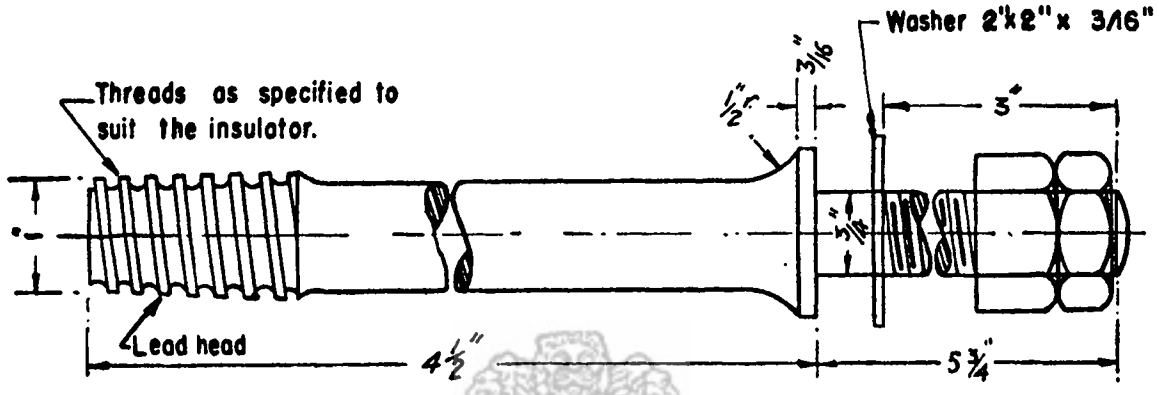
2. Minimum dry flash over = 28 kV

   Minimum wet flash over = 14 kV

NOTE:-

All insulators to be in accordance with Indian Standards, when these are finalized and issued.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS		
400/230 VOLT SHACKLE INSULATOR ASSEMBLY		
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE —	NEW DELHI 6.5.54	RE/G/5.04



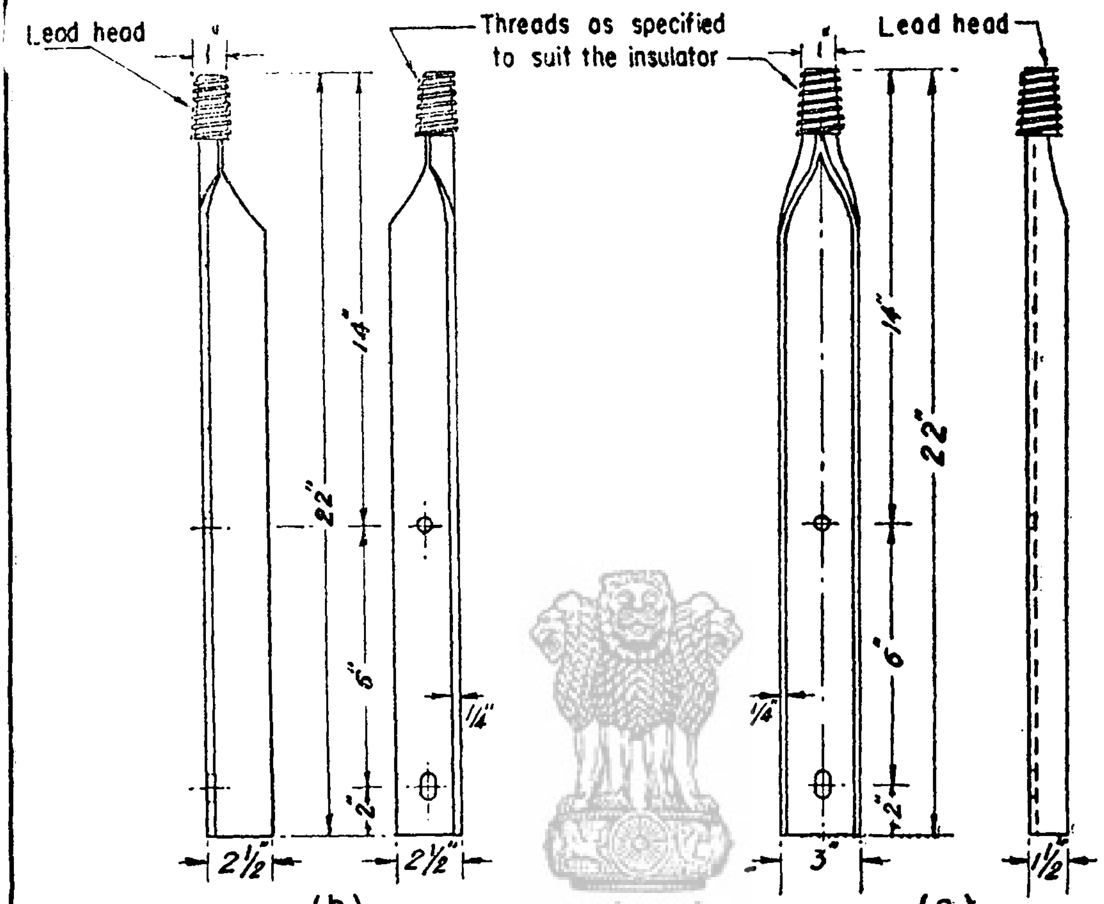
Type:- Pin with small lead head.

Maximum working load = 400 lbs.

Breaking strength = 800 Lbs. on yield stress.

Material :- Forged steel, galvanized.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS DETAILS OF 11kv CROSSARM TYPE PIN		
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE :—	NEW DELHI 27-4-57	RE/G/5·05



1. **MATERIAL.**

Pressed steel. Lead tip shall not be brittle and shall be perfectly bonded to steel.

(a) Size of channel = $3'' \times 1\frac{1}{2}'' \times \frac{1}{4}''$

(b) " " angle = $2\frac{1}{2}'' \times 2\frac{1}{2}'' \times \frac{1}{4}''$

2. Working load = 400 Lbs.

3. Breaking strength. = 800 Lbs. on yield stress

NOTE:-

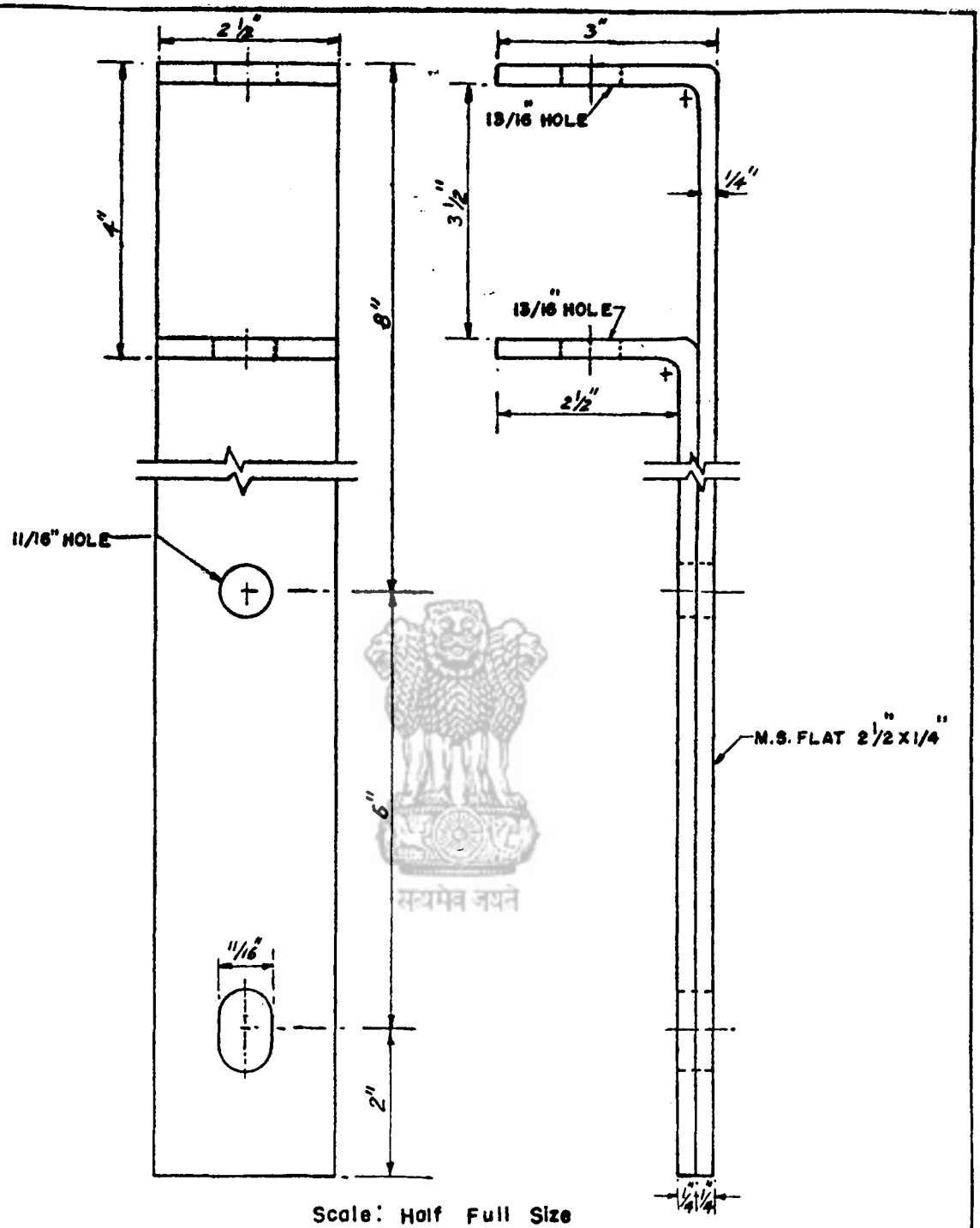
For alternate design refer Drg. No. RE/G/5·07

GOVERNMENT OF INDIA.
CENTRAL WATER & POWER COMMISSION.

RURAL LINE STANDARDS

DETAILS OF 11kV POLE TOP PIN.

DRAWN. TRACED. CHECKED	RECOMMENDED. APPROVED.
SCALE —	NEW DELHI. 24-4-57. RE/G/5·06

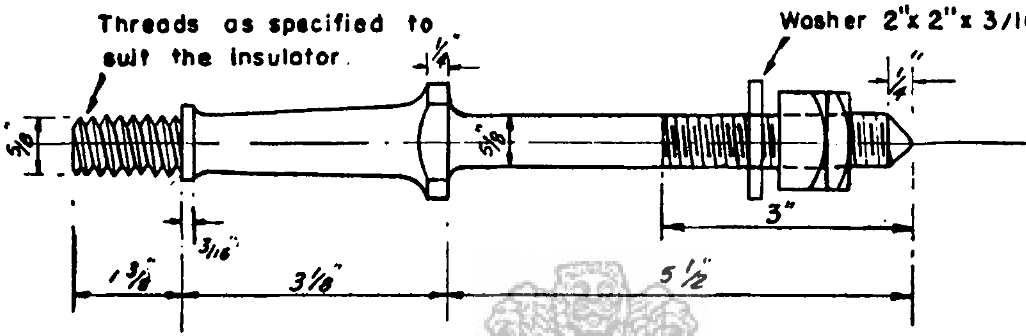


Scale: Half Full Size

NOTE:-

For alternate design refer Drg.No. RE/G/5-06

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION	
RURAL LINE STANDARDS POLE TOP BRACKET FOR 11 KV LINES	
DRAWN AR TRACED CHECKED KLS	RECOMMENDED APPROVED
SCALE ——	NEW DELHI RE/G/5-07



TYPE:-

Pin with steel head.

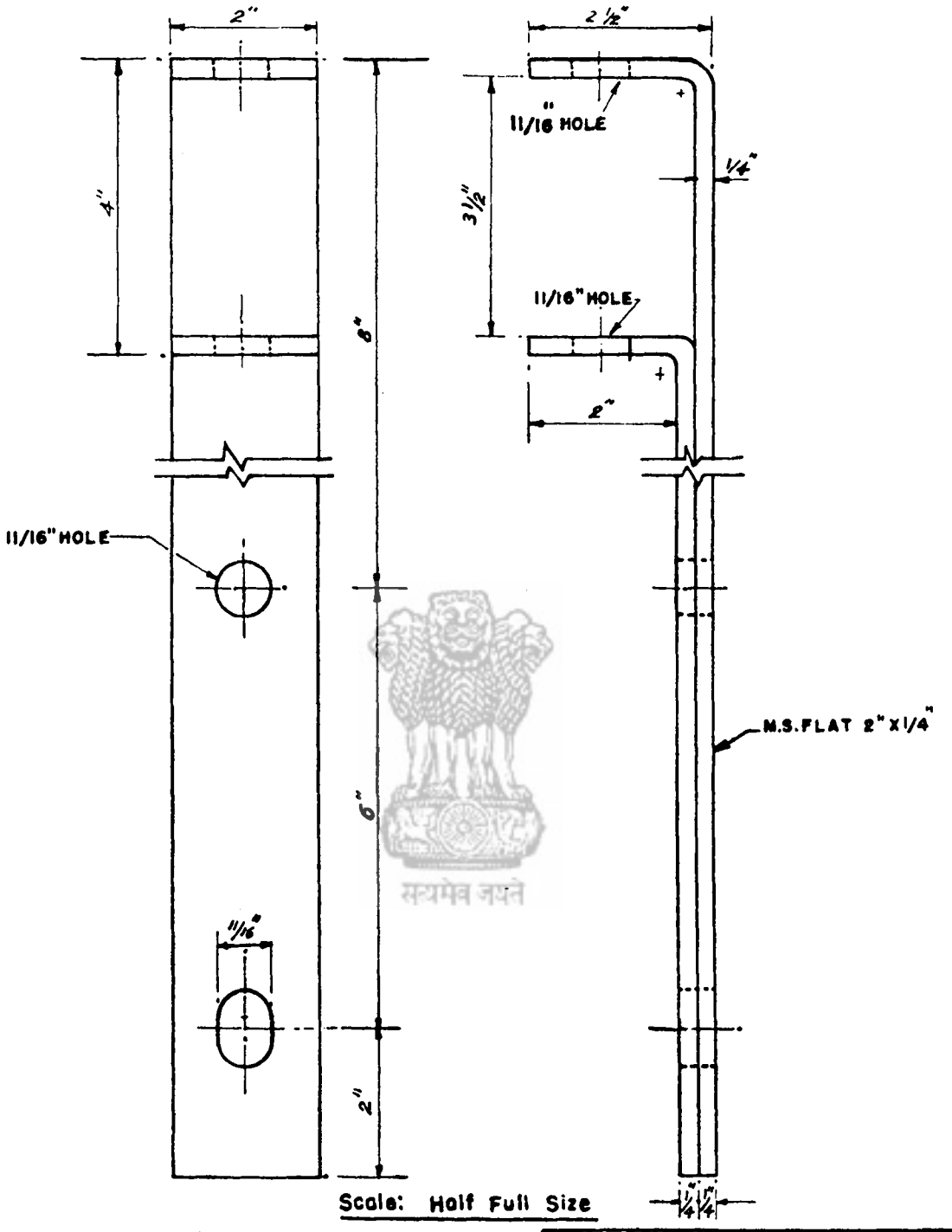
Maximum working load = 400 lbs.

Test load of 800 lbs. not to produce permanent set of deflection more than 1/8 inch.

Material.

Forged steel, galvanized.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION.		
RURAL LINE STANDARDS CROSS ARM TYPE PIN FOR 400/230 VOLT LINES.		
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE: 1/2 Full Size	New Delhi 3-6-57	RE/G/5-08



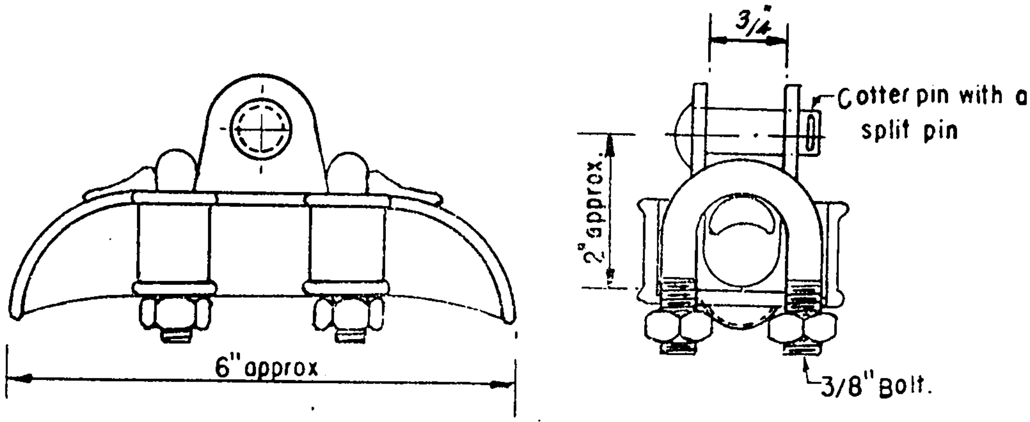
Scale: Half Full Size

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

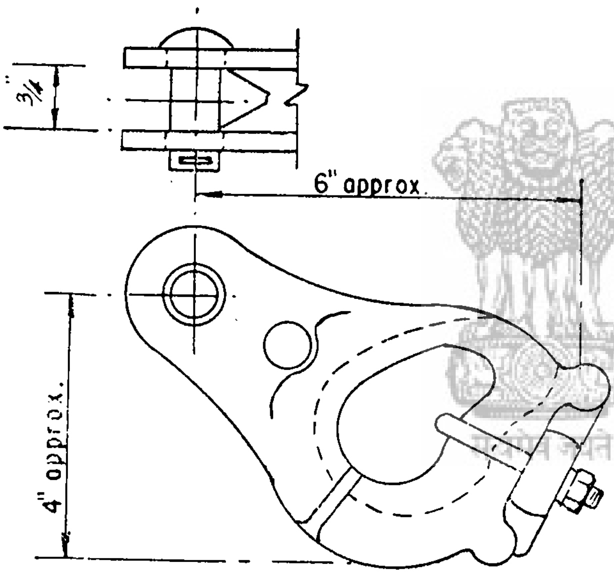
POLE TOP BRACKET
FOR
400/230 VOLT LINES

DRAWN	RECOMMENDED	
TRACED		
CHECKED	APPROVED	
SCALE——	NEW DELHI 21.8.58	RE/G/5·09



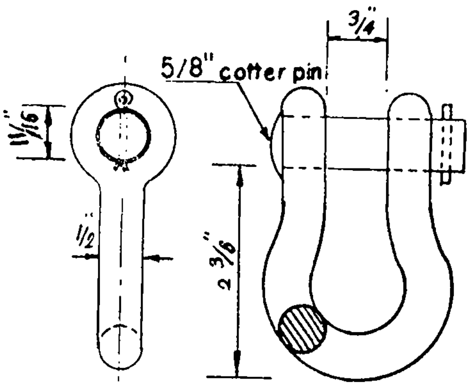
SUSPENSION CLAMP

*(Suitable for conductors of diameters from ·16 to ·40inch.)



STRAIN CLAMP

(Suitable for conductors of diameters from ·16 to ·40 inch.)
Add 0·15 inch for aluminium tape.

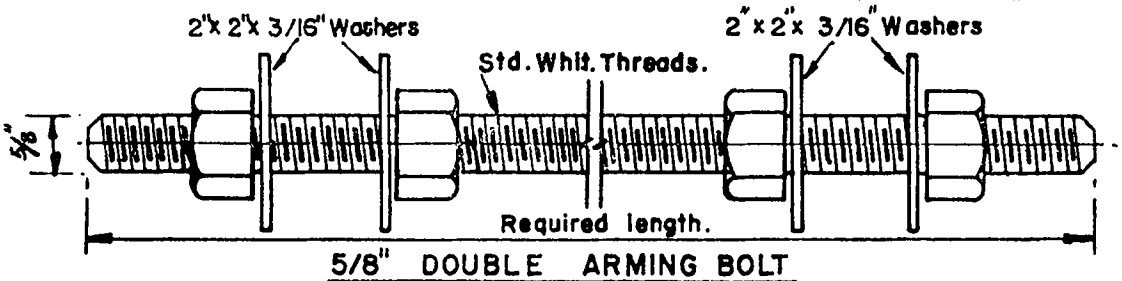


SHACKLE ANCHOR

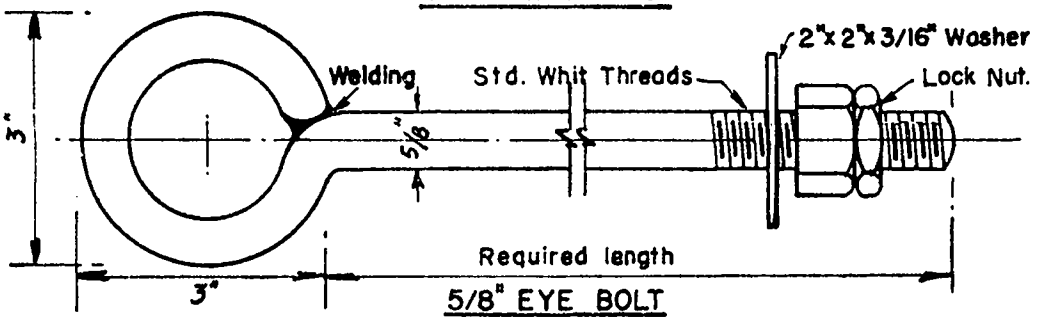
All parts to be designed for minimum ultimate strength of 15,000 lbs.

GOVERNMENT OF INDIA. CENTRAL WATER & POWER COMMISSION.	
RURAL LINE STANDARDS SUSPENSION & STRAIN CLAMP AND SHACKLE ANCHOR — DETAILS.	
DRAWN. TRACED. CHECKED	RECOMMENDED APPROVED
SCALE —	NEW DELHI 10-5-57. RE/G/5·10

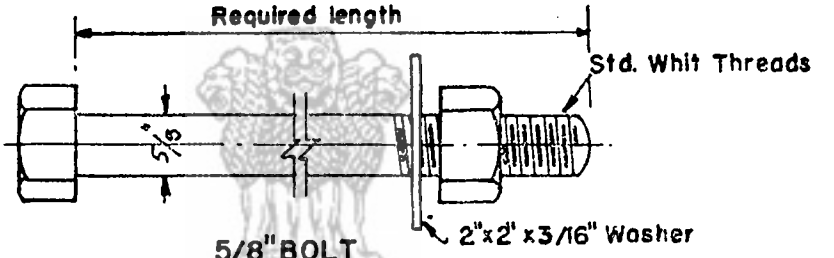
*Note. For copper and aluminium liners add 0·2 inch to conductor diameters.



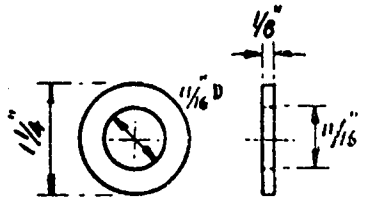
5/8" DOUBLE ARMING BOLT WITH WASHERS.



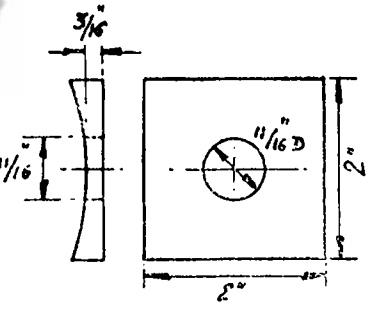
5/8" EYE BOLT



5/8" BOLT



1 1/4" ROUND WASHER



2" SQUARE WASHER*

Material :-

Mild steel galvanized, 28/33 ton quality, refer I.S. 226–1950

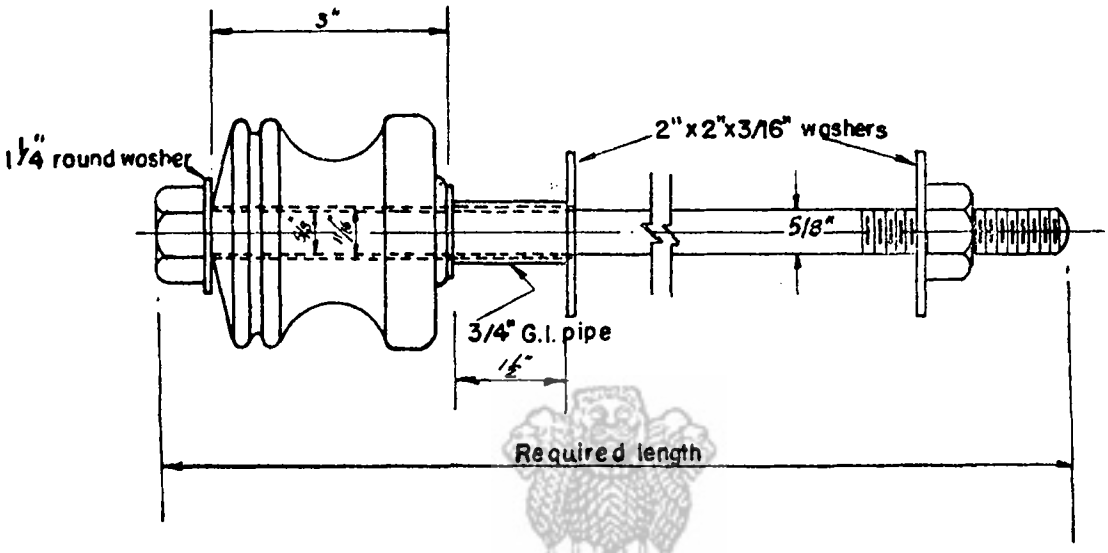
* Use flat washers where required.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

POLE HARDWARE DETAILS.

DRAWN MB TRACED CHECKED	RECOMMENDED APPROVED	RE/G/5·11
SCALE ½ FULL SIZE	NEW DELHI 19-1-59.	



Notes:-

1. Spool insulator with bolt to be used for tangent locations only.
2. For locations with a slight deviation, use shackle insulator assembly as shown in Drg. No. RE/G/5·04.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS 400/230 VOLT SPOOL INSULATOR WITH BOLT.		
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE: —	NEW DELHI 15-9-58	RE/G/5 12

Drawing No.	Description
RE/G/6·01	Guy Assembly—Details for 11 KV Lines.
RE/G/6·02	Guy Assembly—Details for 400/230 Volt Lines.
RE/G/6·03	Details of Guy Materials.
RE/G/6·04	Selection of Wood Poles for Guy Locations for 11 KV Lines.
RE/G/6·05	Selection of Wood Poles for Guy Locations for 400/230 Volt Lines.

SECTION 6

GUYING DETAILS

Drawings illustrating the details of guying arrangements are presented in this Section.

RE/G/6·01: In this drawing details of a guy assembly for rural 11 KV lines are illustrated. A wooden insulator has been provided in the guy, to protect human or animal life, that may come in contact accidentally with the guy during breakdowns or lightning disturbances. Anchor details for two types of soils which are generally met with in practice, are illustrated separately. An alternative design for wood log anchor is also given.

RE/G/6·02: Details of guying installations are illustrated for 400/230 Volt lines using vertical configuration. The position of guys when one, two or three guys are to be used, is also shown therein. The guys shall be earthed by connecting with the earthed neutral wire.

RE/G/6·03: This drawing gives details of turn-buckle and stay rod, wood insulator and guy hook which are required for a guy assembly.

RE/G/6·04 & RE/G/6·05: These ready made tables enable selection of suitable class of wood pole, at each guying location of 11 KV and 400/230 Volt lines respectively. The suitability is to be determined under two different stresses produced at each guying location, *viz.*, (*i*) bending, and (*ii*) buckling. The maximum allowable tension in the guy for each class of pole under the above mentioned stresses is indicated in these Tables.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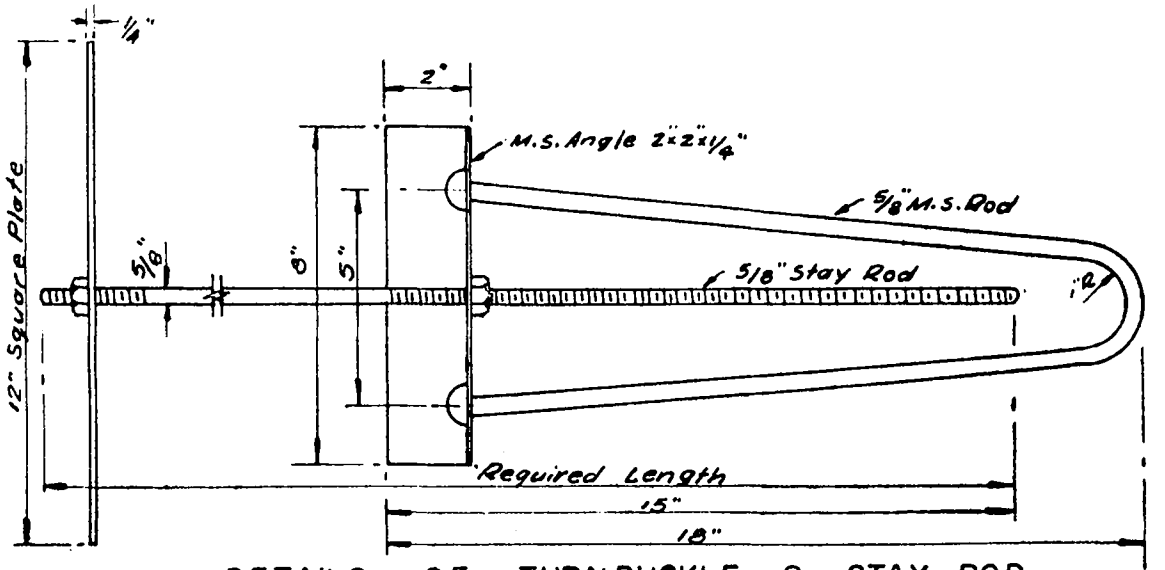
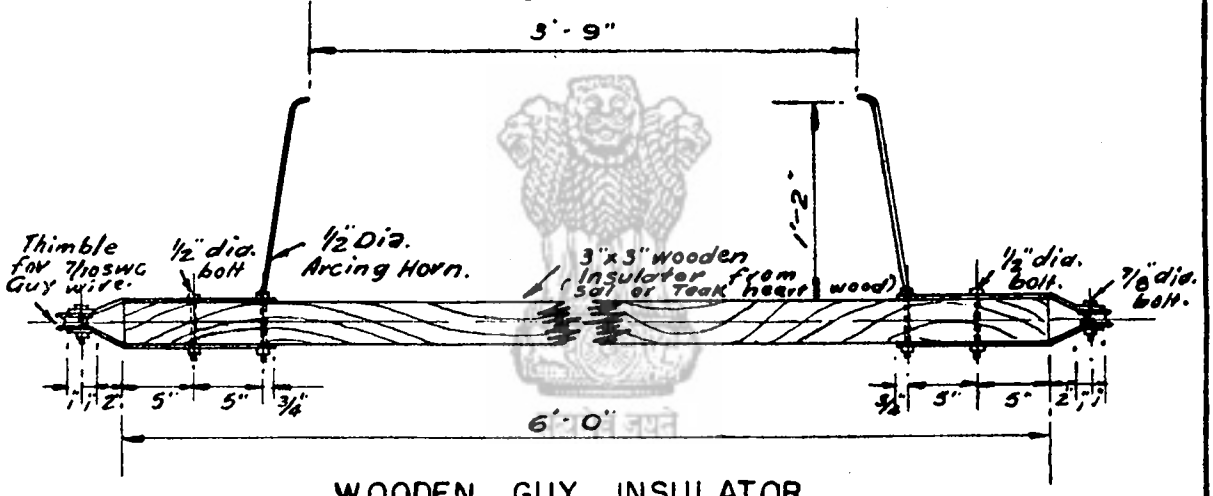


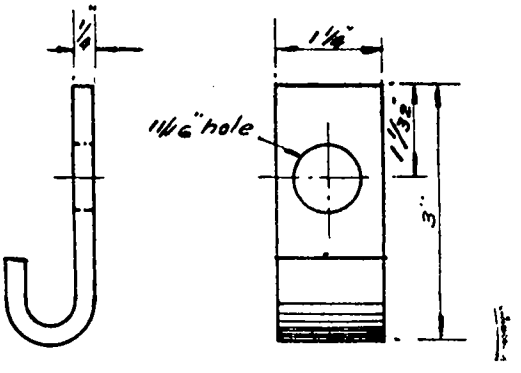
DETAILS OF TURNBUCKLE & STAY ROD.

Scale: 3" = 1 ft.



WOODEN GUY INSULATOR

Scale: 1" = 1 ft.



GUY HOOK

Scale: 1/2 Full size.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

DETAILS OF GUY MATERIALS.

DRAWN MS TRACED MS CHECKED LS	RECOMMENDED APPROVED
SCALE :-	NEW DELHI. 29.12.56 RE/G/6.03

TABLE No. 1

SUITABILITY OF WOOD POLES UNDER BENDING

Class of Pole	Angle of Guy 30°	Angle of Guy 45°
	Guy tension in lbs. up to	
5	2367	1673
4	3372	2383
3	4625	3269
2	6156	4352
1	8106	5731

TABLE No. 2

SUITABILITY OF WOOD POLES UNDER BUCKLING

Class of Pole	Pole 25 feet						Pole 30 feet					
	Group A		Group B		Group C		Group A		Group B		Group C	
	Angle of Guy 30°	Angle of Guy 45°	Angle of Guy 30°	Angle of Guy 45°	Angle of Guy 30°	Angle of Guy 45°	Angle of Guy 30°	Angle of Guy 45°	Angle of Guy 30°	Angle of Guy 45°	Angle of Guy 30°	Angle of Guy 45°
	Guy tension in lbs. up to		Guy tension in lbs. up to		Guy tension in lbs. up to		Guy tension in lbs. up to		Guy tension in lbs. up to		Guy tension in lbs. up to	
5	1,537	1,882	1,998	2,447	3,197	3,914	1,082	1,324	1,534	1,879	2,413	2,956
4	2,317	2,836	3,190	3,906	4,907	6,008	1,617	1,981	2,251	2,724	3,651	4,472
3	3,331	4,079	4,516	5,529	7,225	8,847	2,540	3,110	3,379	4,138	5,307	6,500
2	4,517	5,531	5,940	7,274	10,224	12,520	3,383	4,141	4,393	5,380	7,437	9,109
1	6,697	8,201	8,651	10,593	14,138	17,313	4,950	6,062	6,322	7,743	10,799	13,223

Notes—

For Selection of suitable class of wood poles, first obtain the tension in the guy for particular conductor by reference to appropriate table and then choose the class of pole for the required strength from the above two tables as follows :—

1. For horizontal configuration refer both the tables, selection to be based on the lower value.
2. For vertical configuration refer table No. 2 only.

GOVERNMENT OF INDIA

CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

SELECTION OF WOOD POLES FOR GUY LOCATIONS FOR 11 KV LINES.

SCALE	NEW DELHI 29-12-58	RE/G/6.04

TABLE No. 1

SUITABILITY OF WOOD POLES UNDER BENDING

Class of Pole	Angle of Guy 30°	Angle of Guy 45°
	Guy tension in lbs. upto	
5	3787	2677
4	5400	3818
3	7564	5348
2	10,149	7175
1	13,267	9380

TABLE No. 2

REGARDING SUITABILITY OF WOOD POLES UNDER BUCKLING—SAME AS IN DRG. NO. RE/G/6·04.

Notes—

For Selection of suitable class of wood poles, first obtain the tension in the guy for particular conductor by reference to appropriate table and then choose the class of pole for the required strength from the above two tables as follows :—

1. For horizontal configuration refer both the tables, selection to be based on the lower value.

2. For vertical configuration refer table No. 2 only.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION RURAL LINE STANDARDS SELECTION OF WOOD POLES FOR GUY LOCATIONS FOR 400/230V. LINES		
SCALE	NEW DELHI 15-1-59	RE/G/6.05

M2CWPC—10

Drawing No.	Description
RE/G/7·01	Physical Properties and Electrical Characteristics of A.C.S.R.
RE/G/7·02	Physical Properties and Electrical Characteristics of Copper Conductors.
RE/G/7·03	Physical Properties and Electrical Characteristics of all-Aluminium Conductors.
RE/G/7·04	Physical Properties and Electrical Characteristics of Galvd. Steel Conductors.
RE/G/7·05	Voltage Regulation, 11 KV Lines, A.C.S.R. & Steel Conductors.
RE/G/7·06	Voltage Regulation, 11 KV Lines, Copper Conductors.
RE/G/7·07	Voltage Regulation, 400/230 Volt Lines, Copper & all-Aluminium Conductors.
RE/G/7·08	Wind Load on Conductors in different Wind Regions.
RE/G/7·09	Checking Sag, Stop Watch Method.
RE/G/7·10	Sags for Stringing, Ruling Span 150 ft.
RE/G/7·11	Sags for Stringing, Ruling Span 175 ft.
RE/G/7·12	Sags for Stringing, Ruling Span 200 ft.
RE/G/7·13	Sags for Stringing, Ruling Span 220 ft.
RE/G/7·14	Sags for Stringing, Ruling Span 250 ft.
RE/G/7·15	Sags for Stringing, Ruling Span 300 ft.
RE/G/7·16	Sags for Stringing, Ruling Span 350 ft.
RE/G/7·17	Sags for Stringing, Ruling Span 400 ft.
RE/G/7·18	Sags for Stringing, Ruling Span 500 ft.

SECTION 7

CONDUCTORS

This Section presents tables and charts to be used for the selection and installation of conductors on rural lines.

Considering the amount of power transmitted, permissible voltage regulation and the amount of power losses economically desirable, the following conductors are recommended for 11 KV and 400/230 Volt lines.

11 KV Lines :

(*i*) *A.C.S.R.*
6/1/·093″ and 6/1/·132″
(6/1/·102″ and 6/1/·118″ may also be used, if necessary).

(*ii*) *Stranded Copper Conductors.*
3/·104″ and 3/·147″

11 KV Spur Lines :

(*i*) *A.C.S.R.*
6/1/·083″

(*ii*) *Hard Drawn Bare Copper Conductors.*
8 S.W.G. and 6 S.W.G.

(*iii*) *Steel Conductors.*
G.S.L. 400 and G.S.L. 600.
(G.S.S. 7/14 S.W.G. may also be used, if necessary).

400/230 Volt Lines :

(*i*) *Hard Drawn Bare Copper Conductors.*
8 S.W.G. and 6 S.W.G.
(4 and 2 S.W.G. may also be used, if necessary).

(*ii*) *All-Aluminium Conductors.*
3/·118″, 3/·132″ and 3/·144″.
(7/·110″ and 7/·122″ may also be used, if necessary).

It is specifically recommended that all-Aluminium conductors should be used in place of copper conductors as far as practicable for 400/230 Volt Lines.

RE/G/7·01 to RE/G/7·04 : Physical properties and electrical characteristics of the above conductors are given in these tables.

RE/G/7·05 & RE/G/7·06 : In these charts, KW-Miles at 80% and 100% power factors with 12½% voltage regulation are shown for 11 KV lines for A.C.S.R. & steel and copper conductors respectively.

RE/G/7·07 : In this chart KW-Miles at 80% and 100% power factors with 5% voltage regulation are shown for 400/230 Volt lines for copper and all-Aluminium conductors.

RE/G/7·08 : Wind loads per foot run on conductors in different wind pressure regions for A.C.S.R., copper (Solid and Stranded), all-Aluminium & steel conductors are given in this table.

RE/G/7·09 : Values for checking sag by stop-watch method are given in this table.

RE/G/7·10 to RE/G/7·18 : In these tables, sags are given for stringing conductors at any actual span having ruling Span of 150, 175, 200, 220, 250, 300, 350, 400 and 500 feet.

Ruling Span can be calculated from the following formula :

$$\text{Ruling Span in feet} = \sqrt{\frac{L_1^3+L_2^3+L_3^3+ \ldots\ldots\ldots +L_n^3}{L_1+L_2+L_3+ \ldots\ldots\ldots\ldots +L_n}}$$

Where L_1, L_2, L_3, and L_n etc. are actual span lengths in feet.
For practical purposes, exact determination of the ruling span is not necessary. The following empirical formula gives a fairly close estimate.
Ruling Span = Average Span + ⅓ (Maximum Span—Average Span).

PHYSICAL PROPERTIES

Standard Nominal Copper Eq. Area.	Stranding & Wire Diameter in inches.		Diameter of the Conductor		Weight		Ultimate Tensile Strength
Sq. inches	Aluminium	Steel	Inches	mm.	Lbs/mile	Kg/Km.	Lbs.
0·02	6/·083	1/·083	0·249	6·32	300·3	84·6	1720
0·025	6/·093	1/·093	0·279	7·09	377·0	106·0	2100
0·03	6/·102	1/·102	0·306	7·77	453·5	127·8	2500
0·04	6/·118	1/·118	0·354	8·99	606·0	170·7	3310
0·05	6/·132	1/·132	0·396	10·06	759·4	214·0	4110

ELECTRICAL CHARACTERISTICS

Standard Nominal Copper Eq. Area.	Resistance at 140°F.		Reactance in ohm per mile for equivalent spacings	
Sq. Inches	Ohms per Mile	Ohms per 100 Metres	32 In. / 81 Cm.	45 In. / 114 Cm.
0·02	2·568	1·596	·591	·622
0·025	2·046	1·271	·580	·611
0·03	1·701	1·057	·570	·601
0·04	1·271	0·790	·555	·587
0·05	1·016	0·631	·544	·575

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
PHYSICAL PROPERTIES AND ELECTRICAL CHARACTERISTICS OF A. C. S. R.

SCALE	NEW DELHI 7-10-58	RE/G/7.01

Refer I. S. 398-1953

PHYSICAL PROPERTIES

Size	Diameter		Nominal area	Weight		Ultimate Tensile Strength
	Inches	mm.	Sq. Inches	Lbs/mile	Kg/Km.	Lbs.
10 SWG	0·128	3·25	0·013	261·9	73·8	816
8 SWG	0·160	4·06	0·020	409·2	115·3	1237
6 SWG	0·192	4·88	0·029	589·2	166·0	1734
4 SWG	0·232	5·89	0·042	860·2	242·4	2469
2 SWG	0·276	7·01	0·060	1217·4	343·0	3381
3/·104″	0·224	5·69	0·025	522·8	147·3	1518
3/·147″	0·317	8·05	0·050	1044·0	294·2	2915

ELECTRICAL CHARACTERISTICS

Size	Resistance at 140°F.		Reactance in ohm per mile for equivalent spacings.						
	Ohms/ mile.	Ohms/ 1000 Metres	10·1 In. 26 Cm.	15·1 In. 38 Cm.	18·6 In. 47 Cm.	22·7 In. 58 Cm.	30·2 In. 77 Cm.	32·0 In. 81 Cm.	45·0 In. 114 Cm.
10 SWG	3·977	2·471	0·536	0·578	0·599	0·619	0·648	..	..
8 SWG	2·543	1·580	0·514	0·555	0·576	0·596	0·625	0·634	0·665
6 SWG	1·764	1·096	0·495	0·536	0·557	0·578	0·607	0·615	0·647
4 SWG	1·208	0·750	0·476	0·517	0·539	0·559	0·588	..	..
2 SWG	0·853	0·530	0·459	0·500	0·521	0·541	0·570	..	..
3/·104″	2·026	1·259	..	..	..	..	..	0·614	0·645
3/·147″	1·013	0·629	..	..	..	..	..	0·578	0·610

Refer I.S. 282—1951

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
PHYSICAL PROPERTIES AND ELECTRICAL CHARACTERISTICS OF COPPER CONDUCTORS.

SCALE	NEW DELHI 7-10-58	RE/G/7.02

PHYSICAL PROPERTIES

Standard Nominal Copper Eq. Area	Stranding & Wire Dia.	Over-all Diameter		Calculated Equivalent Area of Aluminium	Weight		Ultimate Tensile Strength
Sq. Inches	Inches	Inches	mm.	Sq. Inches	Lbs/mile	Kg/Km.	Lbs.
0·020	3/·118	0·254	6·45	0·0324	205·4	57·9	800
0·025	3/·132	0·284	7·21	0·0405	257·0	72·4	980
0·030	3/·144	0·310	7·87	0·0482	305·9	86·2	1150
0·040	7/·110	0·330	8·38	0·0658	415·7	117·1	1630
0·050	7/·122	0·366	9·30	0·0809	511·3	144·1	1960

ELECTRICAL CHARACTERISTICS

Stranding & Wire Dia.	Resistance at 140°F		Reactance in Ohm per mile for equivalent spacings				
	Ohms per	Ohms per 1000	10·1 In.	15·1 In.	18·6 In.	22·7 In.	30·2 In.
Inches	mile.	Metres	26 Cm.	38 Cm.	47 Cm.	58 Cm.	77 Cm.
3/·118	2·541	1·579	·481	·523	·544	·564	·593
3/·132	2·031	1·262	·470	·511	·532	·552	·581
3/·144	1·706	1·060	·461	·502	·524	·543	·573
7/·110	1·252	0·778	·448	·489	·510	·530	·559
7/·122	1·017	0·632	·438	·479	·500	·520	·549

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
PHYSICAL PROPERTIES AND ELECTRICAL CHARACTERISTICS OF ALL-ALUMINIUM CONDUCTORS

SCALE	NEW DELHI 8-10-58	RE/G/7.03

Refer I.S. 398—1953.

PHYSICAL PROPERTIES

Designation	Diameter of the conductor		Weight		Ultimate tensile strength in Lbs.
	Inches	mm.	Lbs. per mile	Kg/Km.	
*G.S.L. 400 ..	0·170	4·32	400	112·7	1200
*G.S.L. 600 ..	0·207	5·26	600	169·1	1800
†G.S.S. 7/14 S.W.G. ..	0·240	6·10	636	179·2	2450

ELECTRICAL CHARACTERISTICS

Designation	Resistance at 140°F		Reactance in Ohms per mile for equivalent spacings.	
	Ohms per mile	Ohms per 1000 Metres	32 In. 81 Cm.	45 In. 114 Cm.
G.S.L. 400	16·67	10·36	5·84	5·88
G.S.L. 600	11·11	6·90	4·81	4·84
G.S.S. 7/14 SW.G.	10·97	6·82	1·70	1·73

*Refer I. S. 279—1951.
Refer B. S. 183—1938.

GOVERNMENT OF INDIA		
CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS		
PHYSICAL PROPERTIES AND ELECTRICAL CHARACTERISTICS OF GALVD. STEEL CONDUCTORS		
SCALE	NEW DELHI 7-1-59	RE/G/7.04


सत्यमेव जयते

Conductor Particulars	Size of conductor	Diameter in inches	Wind load in Lb. per foot run on conductors in different wind regions			
			10 lbs. per sq. ft.	15 lbs. per sq. ft.	20 lbs. per sq. ft.	30 lbs. per sq. ft.
A.C.S.R. ..	6/1/·083″	0·249	0·1383	0·2075	0·2766	0·4149
	6/1/·093″	0·279	0·1550	0·2325	0·3100	0·4650
	6/1/·102″	0·306	0·1700	0·2550	0·3400	0·5100
	6/1/·118″	0·354	0·1967	0·2951	0·3934	0·5901
	6/1/·132″	0·396	0·2200	0·3300	0·4400	0·6600
Copper (Solid) ..	8 S.W.G.	0·160	0·0889	0·1334	0·1778	0·2667
	6 ,, ,,	0·192	0·1067	0·1601	0·2134	0·3201
	4 ,, ,,	0·232	0·1289	0·1934	0·2578	0·3867
	2 ,, ,,	0·276	0·1533	0·2300	0·3066	0·4599
Stranded copper ..	3/·104″	0·224	0·1244	0·1866	0·2488	0·3732
	3/·147″	0·317	0·1761	0·2642	0·3522	0·5283
Stranded Aluminium	3/·118″	0·254	0·1411	0·2117	0·2822	0·4233
	3/·132″	0·284	0·1579	0·2369	0·3158	0·4737
	3/·144″	0·310	0·1722	0·2583	0·3444	0·5166
	7/·110″	0·330	0·1833	0·2750	0·3666	0·5499
	7/·122″	0·366	0·2033	0·3050	0·4066	0·6099
Steel ..	G.S.L. 400	0·1688	0·0938	0·1407	0·1876	0·2814
	G.S.L. 600	0·207	0·1148	0·1722	0·2296	0·3444
	GSS 7/14 SWG	0·240	0·1333	0·2000	0·2666	0·3999

FORMULA—
Wind load on conductor = $2/3 \times d/12 \times P \times S$ lb.
Where d = dia. of conductor in inches.
P = Wind pressure in lbs. per sq. ft.
S = Span in ft.

For map of wind regions, refer Drg. No. RE/G/10·01.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
WIND LOAD ON CONDUCTORS IN DIFFERENT WIND REGIONS

SCALE	NEW DELHI 6-10-58	RE/G/7.08

Time in Seconds	Amount of Sag		Time in Seconds	Amount of Sag	
	Inches	Cms.		Inches	Cms.
2·0	5·3	13·5	5·8	45·1	114·6
2·2	6·5	16·5	6·0	48·3	122·7
2·4	7·7	19·6	6·2	51·6	131·1
2·6	9·1	23·1	6·4	54·9	139·4
2·8	10·5	26·7	6·6	58·4	148·3
3·0	12·1	30·7	6·8	62·0	157·5
3·2	13·7	34·8	7·0	65·7	166·9
3·4	15·5	39·4	7·2	69·5	176·5
3·6	17·4	44·2	7·4	73·5	186·7
3·8	19·3	49·0	7·6	77·5	196·9
4·0	21·4	54·4	7·8	81·6	207·3
4·2	23·7	60·2	8·0	86·0	218·4
4·4	26·0	66·0	8·2	90·0	228·6
4·6	28·4	72·1	8·4	94·0	238·8
4·8	30·8	78·2	8·6	99·0	251·5
5·0	33·6	85·3	8·8	104·0	264·2
5·2	36·3	92·2	9·0	109·0	276·9
5·4	39·1	99·3	9·2	113·0	287·0
5·6	42·2	107·2	9·4	118·0	299·7

METHOD OF CHECKING SAG BY STOP WATCH:

Strike the conductor a sharp blow close to the support and simultaneously start the stop watch.
When the vibration wave has returned to the support the third time, stop the watch and note the elapsed time.

Then refer to the above table for the sag.
Check the actual sag from the appropriate sag and tension chart.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSIO
RURAL LINE STANDARDS
CHECKING SAG
STOP WATCH METHOD

SCALE	NEW DELHI 6-7-57	RE/G/7.0

TUAL SPAN IN FEET		SAG IN INCHES																
100	..	2	2	3	3	4	4	4	5	5	6	6	7	7	8	8	8	9	9
110	..	2	3	3	4	4	5	5	6	6	7	8	8	9	9	10	10	11	11
120	..	3	3	4	4	5	6	6	7	8	8	9	10	10	11	12	12	13	13
130	..	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14	15	16
140	..	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	17	18
150	..	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
160	..	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	22	23	24
170	..	5	6	8	9	10	12	13	14	15	17	18	19	21	22	23	24	26	27
180	..	6	7	9	10	12	13	14	16	17	19	20	22	23	24	26	27	29	30
190	..	6	8	10	11	13	14	16	18	19	21	22	24	26	27	29	30	32	34
200	..	7	9	11	12	14	16	18	20	21	23	25	27	28	30	32	34	36	37

e :—

Standard ruling spans as adopted here are 150, 175, 200, 220, 250, 300, 350, 400 & 500 Ft.

For any other ruling span, the sag for actual span may be calculated as follows :—

(*i*) Read sag (S) for the desired ruling span for the particular conductor of the stringing temperature, from the respective sag and tension chart

(*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}}\right)^2 \times S.$

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SAGS FOR STRINGING
RULING SPAN 150 Ft.

SCALE	NEW DELHI 6-6-57	RE/G/

ACTUAL SPAN IN FEET	SAG IN INCHES																			
125	3	4	4	4	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12
135	4	4	5	5	6	7	7	8	8	9	10	10	11	11	12	12	13	14	14
145	4	5	5	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16
155	5	5	6	7	8	9	9	10	11	12	13	13	14	15	16	16	17	18	19
165	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	20	21
175	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
185	7	8	9	10	11	12	13	15	16	17	18	19	20	21	22	23	25	26	27
195	7	9	10	11	12	14	15	16	17	19	20	21	22	24	25	26	27	29	30
205	8	10	11	12	14	15	16	18	19	20	22	23	25	26	27	29	30	32	33
215	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36
225	10	12	13	15	17	18	20	21	23	25	26	28	30	31	33	35	36	38	40

Note—

1. Standard ruling spans, as adopted here are 150, 175, 200, 220, 250,300, 350,400 &500 Ft.
2. For any other ruling span, the sag for the actual span may be calculated as follows :—
   (*i*) Read sag (S) for the desired ruling span for the particular conductor, at the stringing temperature from the respective sag & tension chart.
   (*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}} \right)^2 \times S.$

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION **RURAL LINE STANDARDS** SAGS FOR STRINGING RULING SPAN 175FT.		
SCALE	NEW DELHI 8-6-57	RE/G/7.11

ACTUAL SPAN IN FEET	SAG IN INCHES																				
150	5	6	6	7	7	8	8	9	10	10	11	11	12	12	13	14	14	15	15	16
160	6	6	7	8	8	9	10	10	11	12	12	13	13	14	15	15	16	17	17	18
170	7	7	8	9	9	10	11	12	12	13	14	14	15	16	17	17	18	19	20	20
180	7	8	9	10	11	11	12	13	14	15	15	16	17	18	19	19	20	21	22	23
190	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	23	24	25
200	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
210	10	11	12	13	14	15	17	18	19	20	21	22	23	24	25	26	28	29	30	31
220	11	12	13	15	16	17	18	19	21	22	23	24	25	27	28	29	30	31	33	34
230	12	13	15	16	17	19	20	21	22	24	25	26	28	29	30	32	33	34	36	37
240	13	14	16	17	19	20	22	23	24	26	27	29	30	32	33	35	36	37	39	40
250	14	16	17	19	20	22	23	25	27	28	30	31	33	34	36	38	39	41	42	44

Note:—

1. Standard ruling spans as adopted here are 150, 175, 200, 220, 250, 300, 350, 400 & 500 Ft.

2. For any other ruling span, the sag for actual span may be calculated as follows :—

   (*i*) Read Sag (S) for the desired ruling span for the particular conductor at the stringing temperature from the respective sag & tension chart.

   (*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}}\right)^2 \times S.$

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SAGS FOR STRINGING
RULING SPAN 200 FT.

SCALE	NEW DELHI 8-6-57	RE/G/7.12

ACTUAL SPAN IN FEET	SAG IN INCHES																											
170	5	6	7	7	8	8	9	10	10	11	11	12	13	13	14	14	15	16	16	17	17	18	19	19	20	20		
180	6	7	7	8	9	9	10	11	11	12	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	23		
190	7	7	8	9	10	10	11	12	13	13	14	15	16	16	17	18	19	19	20	21	22	22	23	24	25	25		
200	7	8	9	10	11	12	12	13	14	15	16	17	17	18	19	20	21	21	22	23	24	25	26	26	27	28		
210	8	9	10	11	12	13	14	15	15	16	17	18	19	20	21	22	23	24	25	26	26	27	28	29	30	31		
220	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34		
230	10	11	12	13	14	15	16	17	19	20	21	22	23	24	25	26	27	28	30	31	32	33	34	35	36	37		
240	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	29	30	31	32	33	35	36	37	38	39	40		
250	12	13	14	15	17	18	19	21	22	23	25	26	27	28	30	31	32	34	35	36	37	39	40	41	43	44		
260	13	14	15	17	18	20	21	22	24	25	27	28	29	31	32	34	35	36	38	39	41	42	43	45	46	47		
270	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38	39	41	42	44	45	47	48	50	51		

Note—

1. Standard ruling spans as adopted here are 150, 175, 200, 220, 250, 300, 350, 400 & 500 Ft.

2. For any other ruling span, the sag for actual span may be calculated as follows :—

   (*i*) Read sag (S) for the desired ruling span for the particular conductor, at the stringing temperature, from the respective sag & tension chart.

   (*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}}\right)^2 \times S.$

GOVERNMENT OF INDIA
GENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SAGS FOR STRINGING
RULING SPAN 220 FT.

SCALE	NEW DELHI 7-6-57	RE/G/7.13

ACTUAL SPAN IN FEET	SAG IN INCHES
200	7 8 8 9 10 10 11 12 12 13 13 14 15 15 16 17 17 18 19 19 20 20 21 22 22 23
210	8 8 9 10 11 11 12 13 13 14 15 16 16 17 18 18 19 20 20 21 22 23 23 24 25 25
220	9 9 10 11 12 12 13 14 15 15 16 17 18 19 19 20 21 22 22 23 24 25 26 26 27 28
230	9 10 11 12 13 14 14 15 16 17 18 19 19 20 21 22 23 24 25 25 26 27 28 29 30 30
240	10 11 12 13 14 15 16 17 18 18 19 20 21 22 23 24 25 26 27 28 29 29 30 31 32 33
250	11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 - 29 30 31 32 33 34 35 36
260	12 13 14 15 16 17 18 19 21 21 22 24 25 26 27 28 29 30 31 32 34 35 36 37 38 39
270	13 14 15 16 17 19 20 21 22 23 24 26 27 28 29 30 31 33 34 35 36 37 38 40 41 42
280	14 15 16 18 19 20 21 23 24 25 26 28 29 30 31 33 34 35 36 38 39 40 41 43 44 45
290	15 16 17 19 20 22 23 24 26 27 28 30 31 32 34 35 36 38 39 40 42 43 44 46 47 48
300	16 17 19 20 22 23 24 26 27 29 30 32 33 35 36 37 39 40 42 43 45 46 48 49 50 52

Note—

1. Standard ruling spans as adopted here are 150, 175, 200, 220, 250, 300, 350, 400 & 500Ft.

2. For any other ruling span, the sag for actual span may be calculated as follows :—

   (*i*) Read sag (S) for the desired ruling span for the particular conductor, at the stringing temperature, from the respective sag & tension chart.

   (*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}}\right)^2 \times S.$

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SAGS FOR STRINGING
RULING SPAN 250 FT.

SCALE	NEW DELHI 7-6-57	RE/G/7·14

ACTUAL SPAN IN FEET	SAG IN INCHES																						
250	10	11	12	12	13	14	15	15	16	17	17	18	19	19	20	21	22	22	23	24	24	25
260	11	12	13	14	14	15	16	17	17	18	19	20	20	21	22	23	23	24	25	26	26	27
270	12	13	14	15	15	16	17	18	19	19	20	21	22	23	23	24	25	26	27	28	28	29
280	13	14	15	16	17	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	30	31
290	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34
300	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
310	16	17	18	19	20	21	22	23	25	26	27	28	29	30	31	32	33	34	35	36	37	38
320	17	18	19	20	22	23	24	25	26	27	28	30	31	32	33	34	35	36	38	39	40	41
330	18	19	21	22	23	24	25	27	28	29	30	31	33	34	35	36	38	39	40	41	42	44
340	19	21	22	23	24	26	27	28	30	31	32	33	35	36	37	39	40	41	42	44	45	46
350	20	22	23	24	26	27	29	30	31	33	34	35	37	38	39	41	42	44	45	46	48	49

Note —

1. Standard ruling spans as adopted here are 150, 175, 200, 220, 250, 300, 350, 400 & 500 Ft.

2. For any other ruling span, the sag for actual span may be calculated as follows :—

   (*i*) Read sag (S) for the desired ruling span for the particular conductor, at the stringing temperature, from the respective sag & tension chart.

   (*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}}\right)^2 \times S.$

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SAGS FOR STRINGING
RULING SPAN 300 FT.

SCALE	NEW DELHI 7-6-57	RE/G/7·15

ACTUAL SPAN IN FEET	SAG IN INCHES																												
300 ..	16	17	18	18	19	20	21	21	22	23	24	24	25	26	26	27	28	29	29	30	31	32	32	33	34	35	35		
310 ..	17	18	19	20	20	21	22	23	24	24	25	26	27	27	28	29	30	31	31	32	33	34	35	35	36	37	38		
320 ..	18	19	20	21	22	23	23	24	25	26	27	28	28	29	30	31	32	33	33	34	35	36	37	38	38	39	40		
330 ..	20	20	21	22	23	24	25	26	27	28	28	29	30	31	32	33	34	35	36	36	37	38	39	40	41	42	43		
340 ..	21	22	23	24	25	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	42	43	44	45		
350 ..	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		
360 ..	23	24	25	26	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	47	48	49	50	51		
370 ..	25	26	27	28	29	30	31	32	34	35	36	37	38	39	40	41	42	44	45	46	47	48	49	50	51	53	54		
380 ..	26	27	28	29	31	32	33	34	35	37	38	39	40	41	42	44	45	46	47	48	50	51	52	53	54	55	57		
390 ..	27	29	30	31	32	34	35	36	37	38	40	41	42	43	45	46	47	48	50	51	52	53	55	56	57	58	60		
400 ..	29	30	31	33	34	35	37	38	39	40	42	43	44	46	47	48	50	51	52	54	55	56	57	59	60	61	63		

Note—

1. Standard ruling spans as adopted here are 150, 175, 200, 220, 250, 300, 350, 400, & 500Ft.

2. For any other ruling span, the sag for actual span may be calculated as follows :—

   (*i*) Read sag (S) for the desired ruling span for the particular conductor, at the stringing temperature from the respective sag & tension chart.

   (*ii*) Then, sag for the actual span $= \left(\frac{\text{Actual span}}{\text{Ruling span}}\right)^2 \times S.$

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SAGS FOR STRINGING
RULING SPAN 350 Ft.

SCALE	NEW DELHI 8-6-57	RE/G/7.16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SECTION 8

TRANSFORMER INSTALLATIONS

Drawing No.	Description
RE/G/8·01	Single phase Transformer Installation for isolated loads.
RE/G/8·02	Pole mounted Transformer with Cut-Outs (11/·4 KV and up to 100 KVA).
RE/G/8·03	Pole mounted Transformer with Gang-operated Switch and bare fuses (11/·4 KV and up to 100 KVA).

SECTION 8

TRANSFORMER INSTALLATIONS

This Section deals with the transformer installations for supplying loads in the rural areas.

The most economical and suitable type is the pole-mounted outdoor bushing type transformer sub-station.

Considering the nature and extent of loads to be supplied in rural areas, the normal transformer sizes required will be of 15, 25, 50 and 100 KVA of three-phase and 5, 10 and 15 KVA of single-phase. The designs for mounting the above transformers have been given in the following drawings :—

RE/G/8·01 : In case of small single-phase irrigation pumps located in isolated areas or small villages where only domestic load is to be supplied, use of single-phase 11 KV/230 Volt step down distribution transformer is recommended, provided there is no likelihood of development of load requiring three-phase supply for a long time Such a transfomer can be erected on the nearest pole of 11 KV line, as shown in this Drawing.

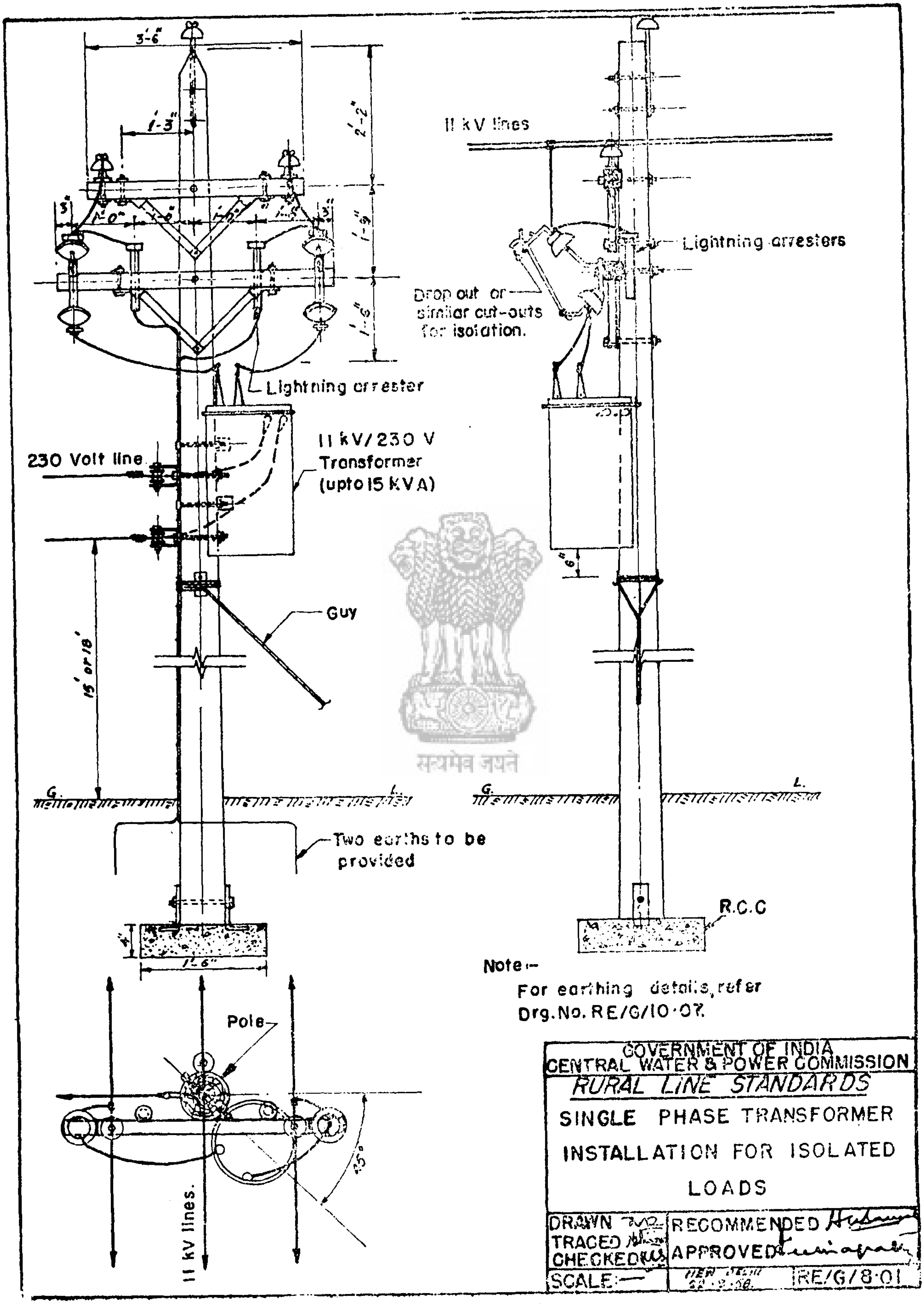
RE/G/8·02 : This drawing illustrates the details of the double pole structure for mounting three-phase transformer of capacity up to 100 KVA.

To economize on the cost of rural sub-stations, gang-operated switches on the primary side are eliminated as permitted under the Indian Electricity Rules (1956) and instead, cut-outs are provided. Although protection by lightning arrestors is indicated in this drawing, it may be omitted in such cases where the incidence of lightning is small and operation experience is in favour of such omission. Provision of one set of lightning arrestors for protection of a group of small transformers (say 4 or 5) situated closely may be considered in areas where lightning incidence is small.

Low Tension side is protected with triple pole-fuse-switches of adequate capacity on each feeder. These are fitted in distribution boxes mounted at convenient heights on the same structure to facilitate easy operation. Wherever it is necessary, separate main fuses mounted on the transformer have to be used. The location has been indicated.

Two independent grounds, as required by the I.E. Rules, are provided to earth the neutral of the secondary of the transformer, lightning arrestors, all the metallic parts of structure, switches and transformer. These grounds are to be installed in accordance with the Drawing No. RE/G/10·07 and be so maintained that at all times, the earth resistance shall not exceed 10 ohms.

RE/G/8·03 : This is a slightly costlier arrangement but has certain advantages in operational facilities. This construction is alternative to Drawing No. RE/G/8·02 showing gang-operated switch and horn-gap fuses in place of drop-out or other cut-outs.


3'-6"
1'-3"
2'-2"
1'-9"
1'-6"
11 kV lines
Lightning arresters
Drop out or
similar cut-outs
for isolation.
Lightning arrester
11 kV/230 V
Transformer
(upto 15 KVA)
230 Volt line
6"
Guy
15' or 18'
G.
L.
Two earths to be
provided
R.C.C
4"
1'-6"
Note:-
For earthing details, refer
Drg. No. RE/G/10-07.
Pole
11 kV lines.
45°
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
SINGLE PHASE TRANSFORMER
INSTALLATION FOR ISOLATED
LOADS
DRAWN
TRACED
CHECKED
SCALE:—
RECOMMENDED
APPROVED
RE/G/8-01

SECTION 9

SERVICES

Drawing No.	Description.
RE/G/9·01	Single Phase Service Short Lead.
RE/G/9·02	Single Phase Service.
RE/G/9·03	Single Phase Service Meter and Fuse-Board.
RE/G/9·04	Single Phase Service Meter and Fuse-Board.
RE/G/9·05	3—Phase Service Connection for Small Industries.
RE/G/9·06	3—Phase Service Connection for Small Industries.
RE/G/9·07	3—Phase Service Connection for Irrigation Pumps.
RE/G/9·08	3—Phase Service Meter and Fuse-Board.
RE/G/9·09	3—Phase Service Meter and Fuse-Board.
RE/G/9·10	Swinging Bracket for Services—Details.
RE/G/9·11	Particulars of Weather-proof Service Wires.
RE/G/9·12	Fuse Size Chart.

SECTION 9

SERVICES

This Section deals with different types of service connections. The details cover 400 Volt, three-phase and 230 Volt, single-phase supplies, the normal loads in the rural areas being agricultural pumps, small industries and domestic lighting.

RE/G/9·01 : .Single-phase service connection to a residential house located very near the pole is shown in this drawing. Supply is given by a twin core weather-proof V.I.R. cable attached to a galvanized steel wire, with wire clips and lead tape.

RE/G/9·02 : This drawing shows a single-phase service connection by means of a twin core weather-proof V.I.R. cable supported by a galvanized steel wire.

RE/G/9·03 : Single-phase service meter and fuse-board are detailed in this drawing, showing m.s. cover for the fuse and meter terminals.

RE/G/9·04 : An alternative to the Drawing No. RE/G/9·03, showing a complete hinged wooden box for the meter and fuse.

RE/G/9·05 : The drawing shows a three-phase service connection for small industrial loads by means of two twin-core weather-proof V.I.R. cables supported by a galvanized steel wire.

RE/G/9·06 : An alternative arrangement is shown to the Drawing No. RE/G/9·05, using one 4-core weather-proof V.I.R. cable.

RE/G/9·07 : The drawing shows a three-phase service connection for an agricultural pump set.

RE/G/9·08 : Three-phase service meter and fuse-board are detailed in this drawing showing m.s. cover for the fuses and meter terminals.

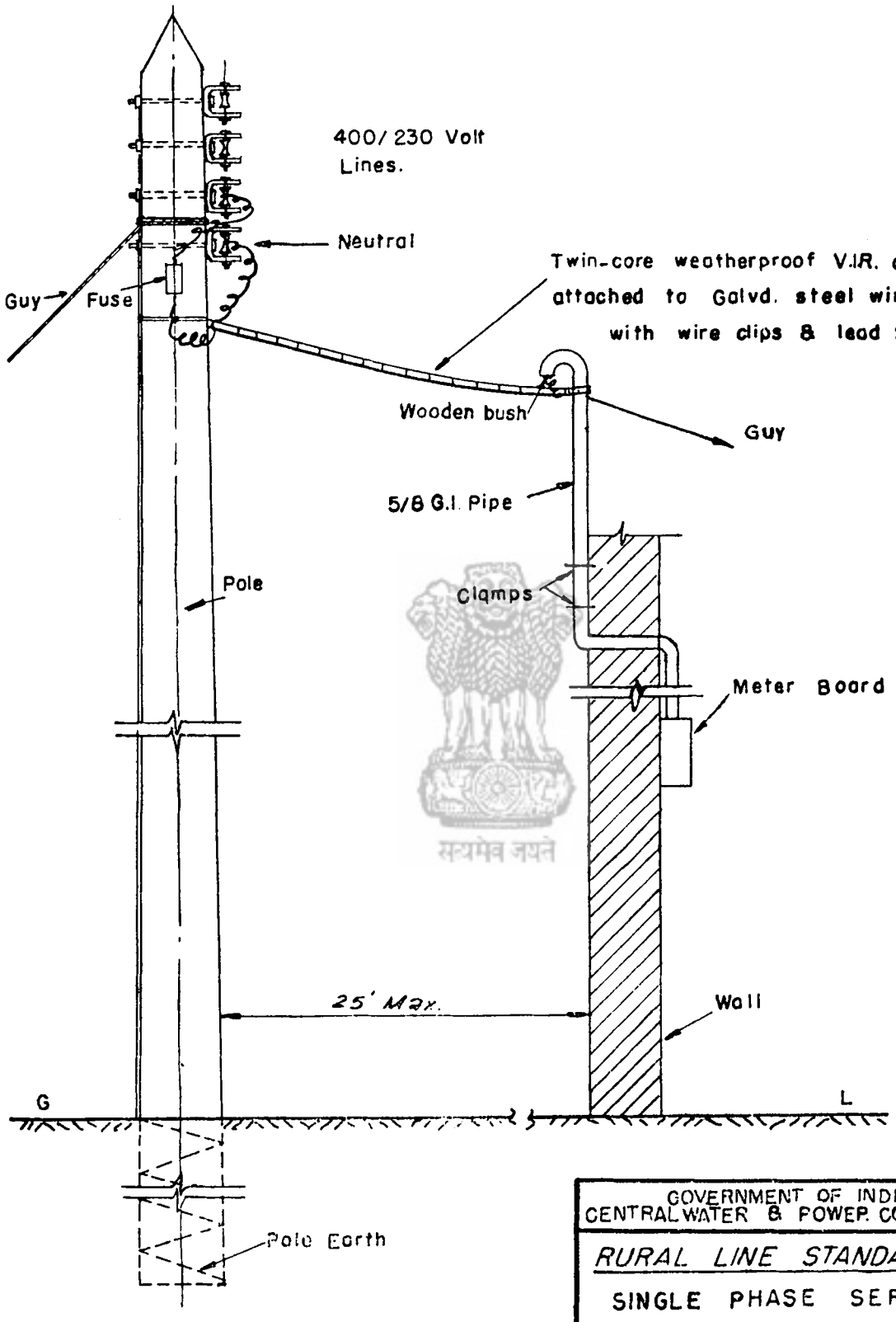
M2C.W.P.C.—12

RE/G/9·09 : An alternative to the drawing No. RE/G/9·08, showing a complete hinged wooden box for the meter and fuses.

RE/G/9·10 : This drawing gives the details of a swinging bracket which is commonly used for connecting services.

RE/G/9·11 : Particulars like resistance, current rating etc. of weather-proof wires required for connecting various services are given in a tabular form.

RE/G/9·12 : Sizes of fuse wires required for various ratings, usually adopted for service connections have been detailed in a tabular form.

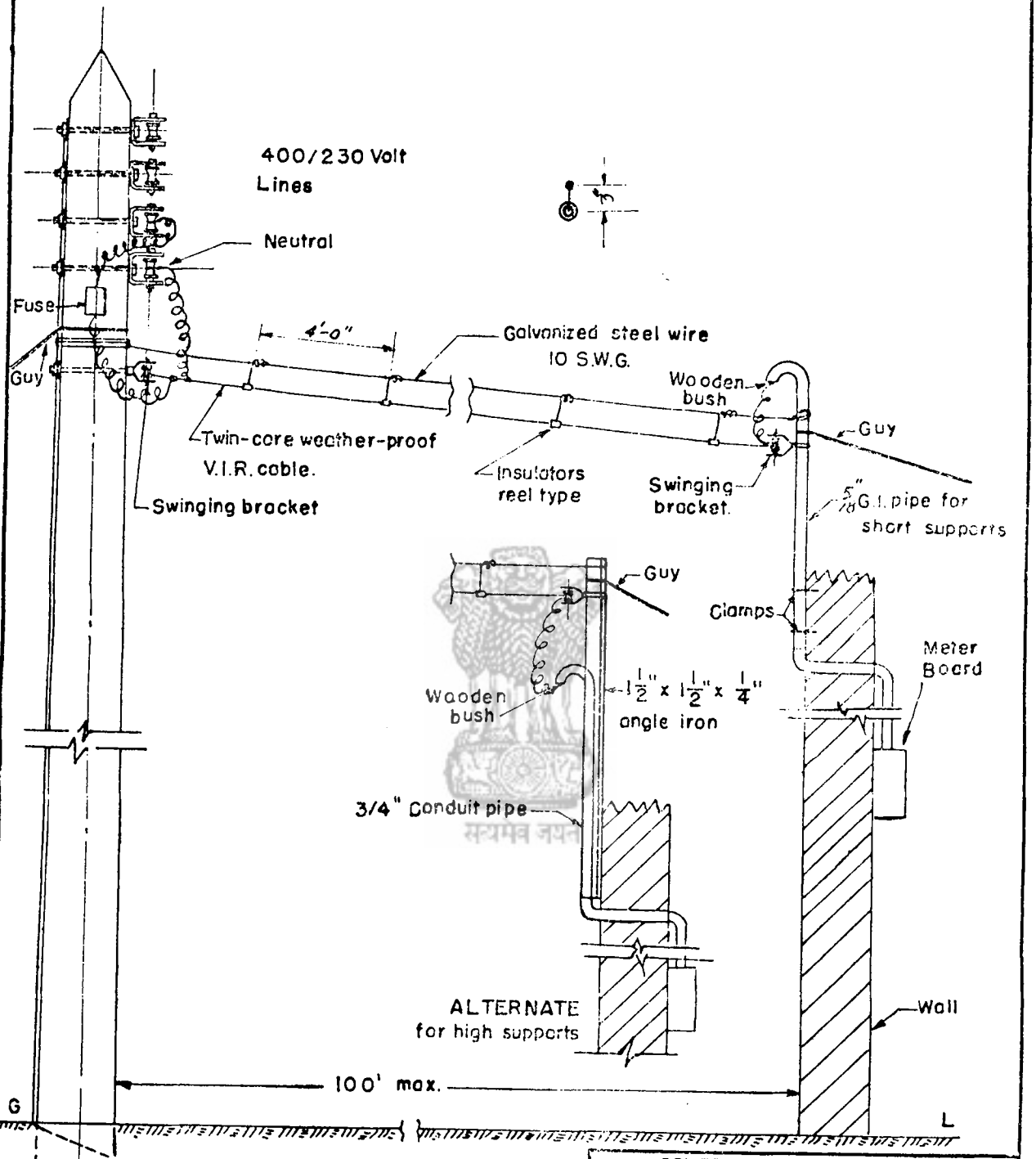


GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

SINGLE PHASE SERVICE
SHORT LEAD

DRAWN / TRACED / CHECKED	RECOMMENDED / APPROVED	
Scale: –	NEW DELHI	RE/G/9.01

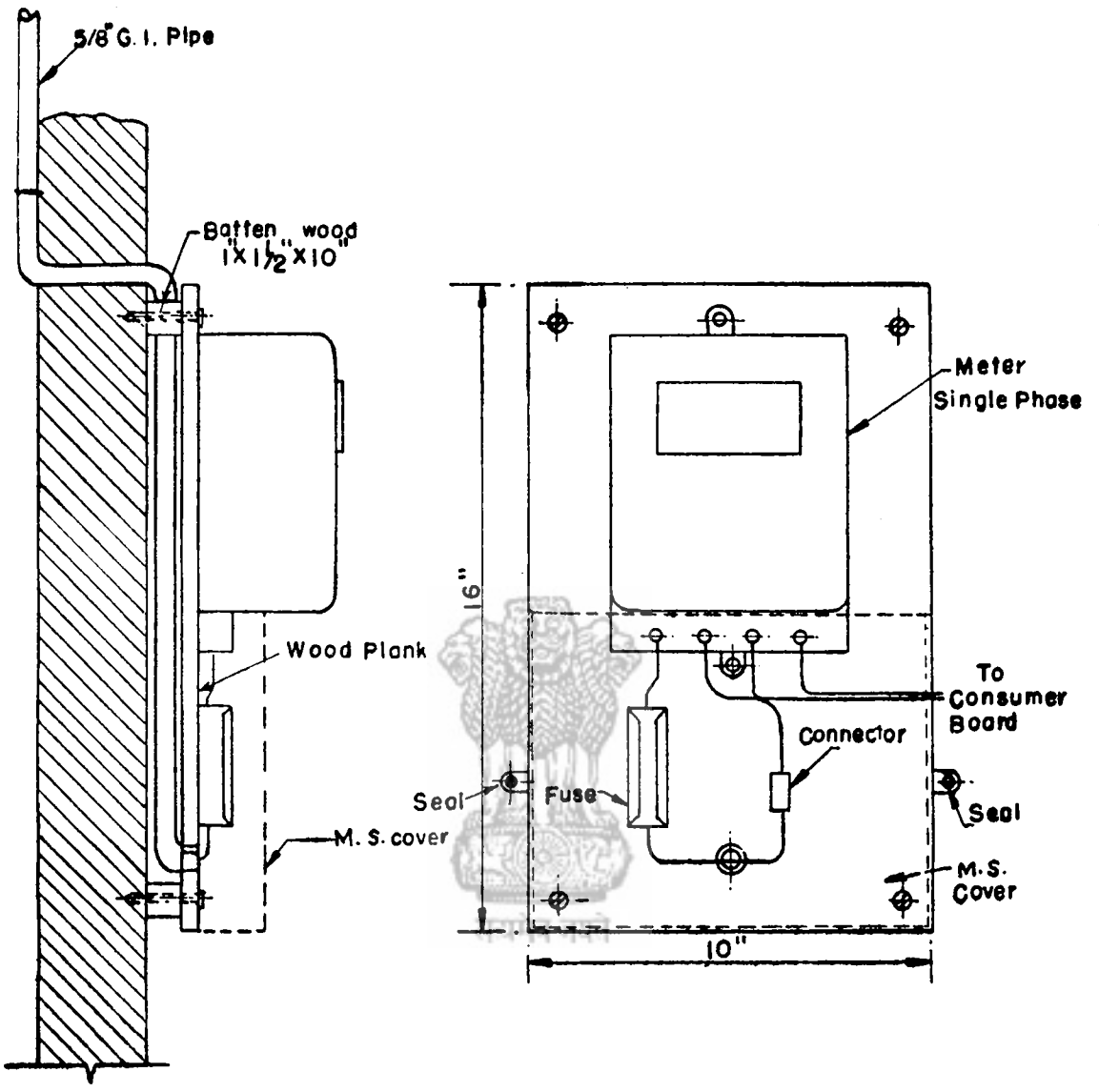


GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

SINGLE PHASE
SERVICE

DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE	NEW DELHI 21.1.52	RE/G/9·02



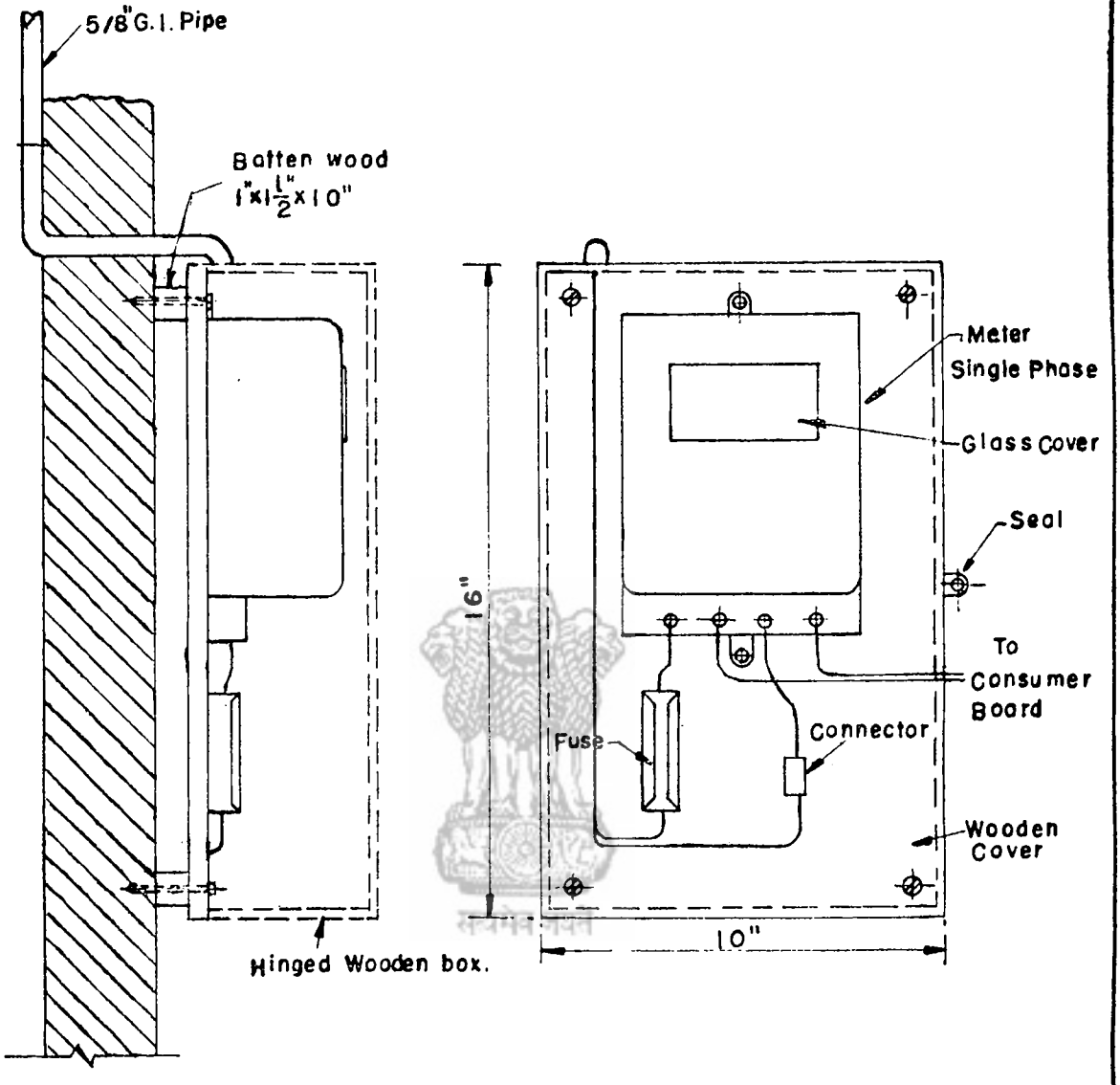
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

SINGLE PHASE SERVICE

METER AND FUSE-BOARD

DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE——	NEW DELHI 17. 1. 59	RE/G/9.03



GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

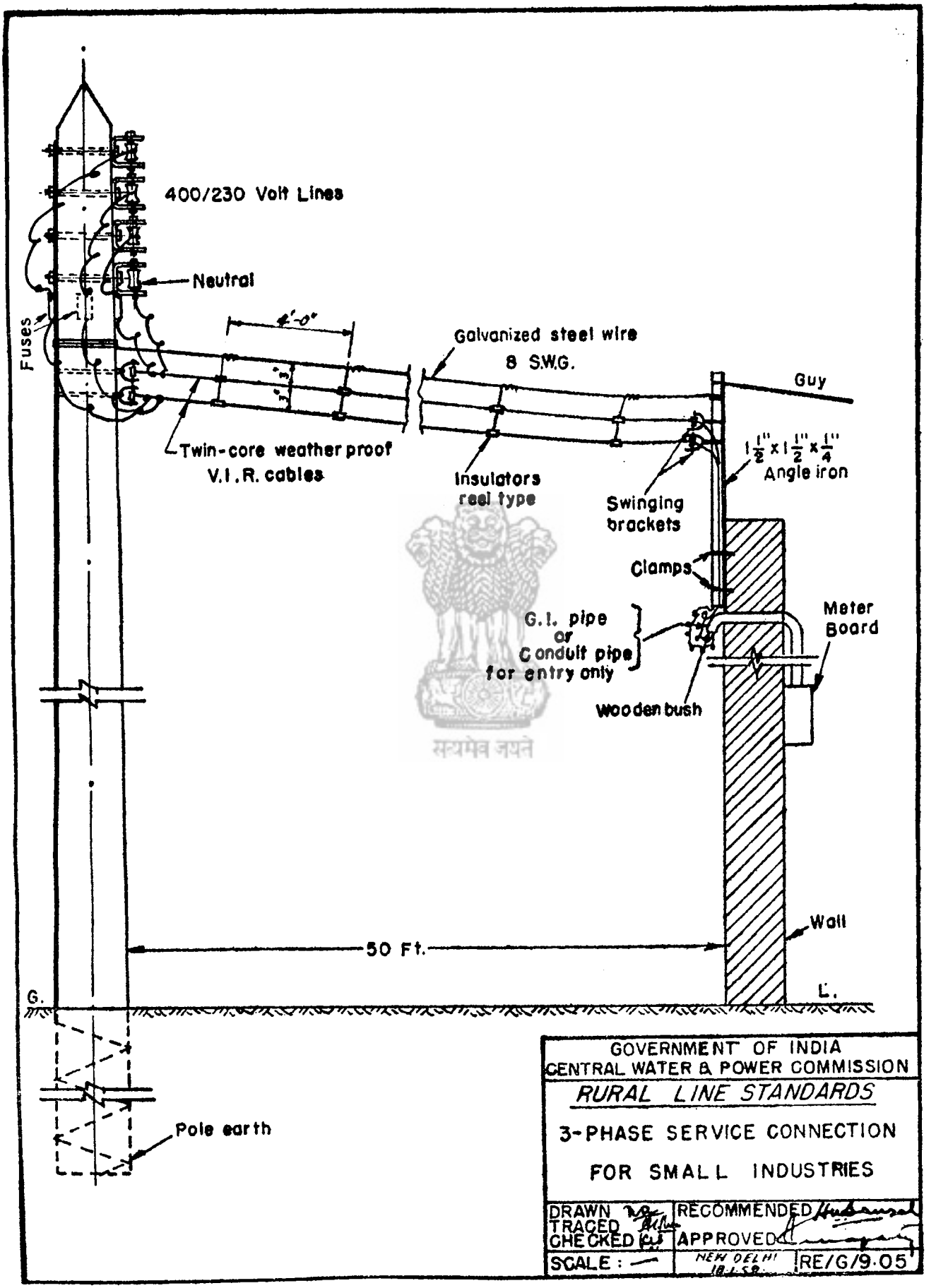
RURAL LINE STANDARDS

SINGLE PHASE SERVICE

METER AND FUSE - BOARD

DRAWN / TRACED / CHECKED	RECOMMENDED / APPROVED
SCALE —	NEW DELHI 10.1.59

RE/G/9.04



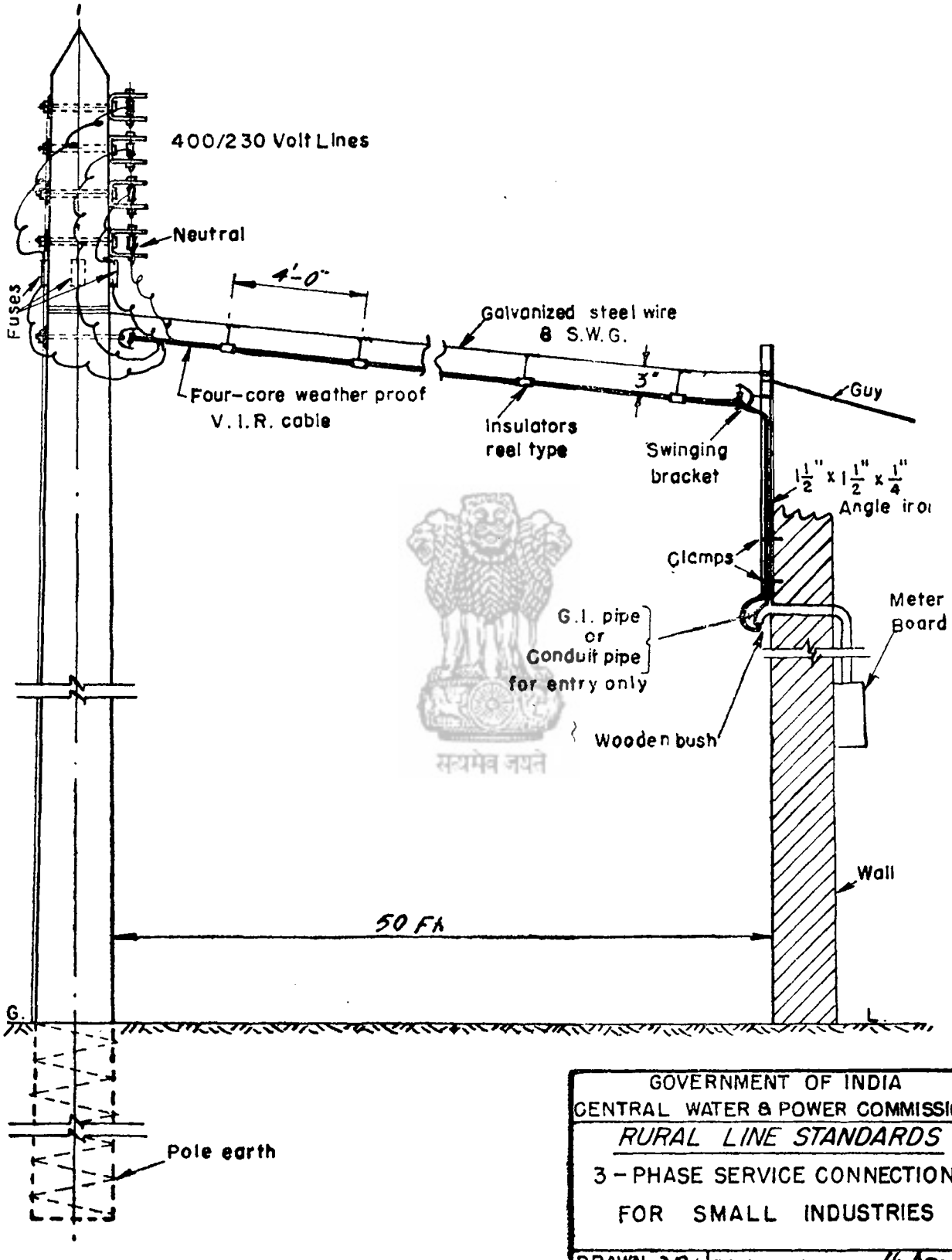
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

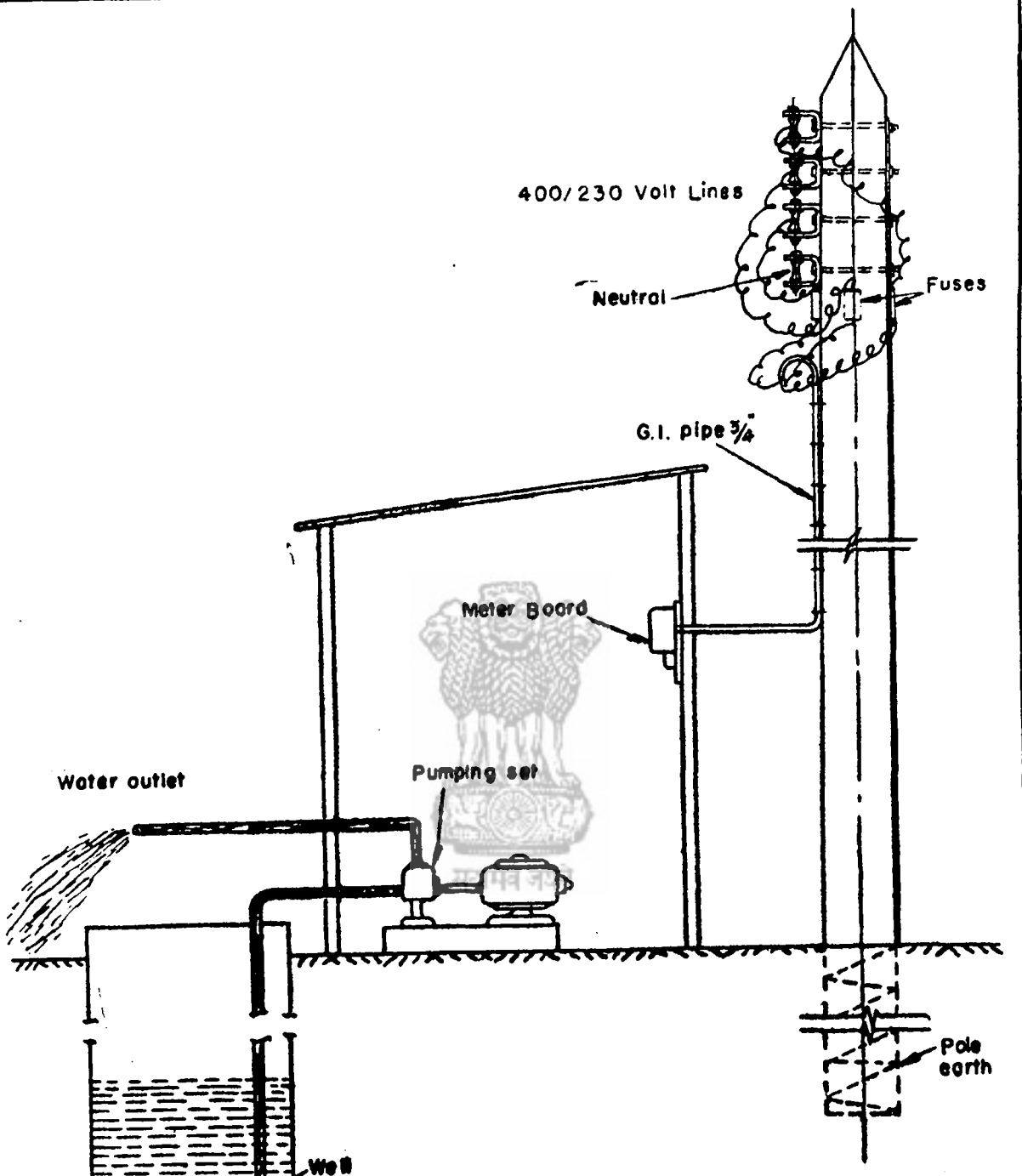
3-PHASE SERVICE CONNECTION
FOR SMALL INDUSTRIES

DRAWN TRACED CHECKED	RECOMMENDED APPROVED
SCALE : —	NEW DELHI 18.1.58

RE/G/9.05



GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION		
RURAL LINE STANDARDS 3 – PHASE SERVICE CONNECTION FOR SMALL INDUSTRIES		
DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE:-	NEW DELHI 23 1 59	RE/G/9·06

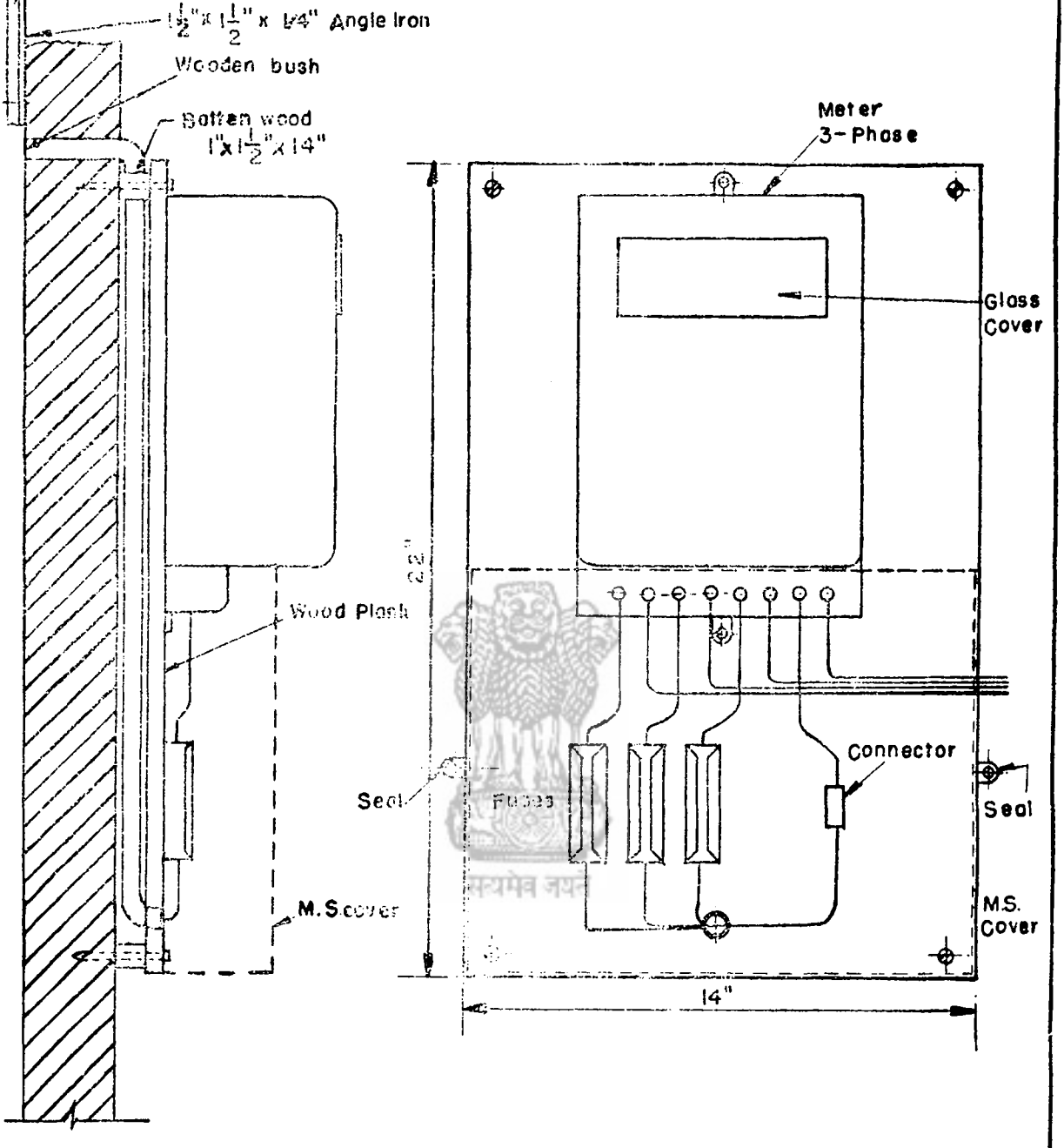


GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

3-PHASE SERVICE CONNECTION FOR IRRIGATION PUMPS

DRAWN TRACED CHECKED	RECOMMENDED APPROVED	
SCALE:-	NEW DELHI 23.1.59	RE/G/9·07



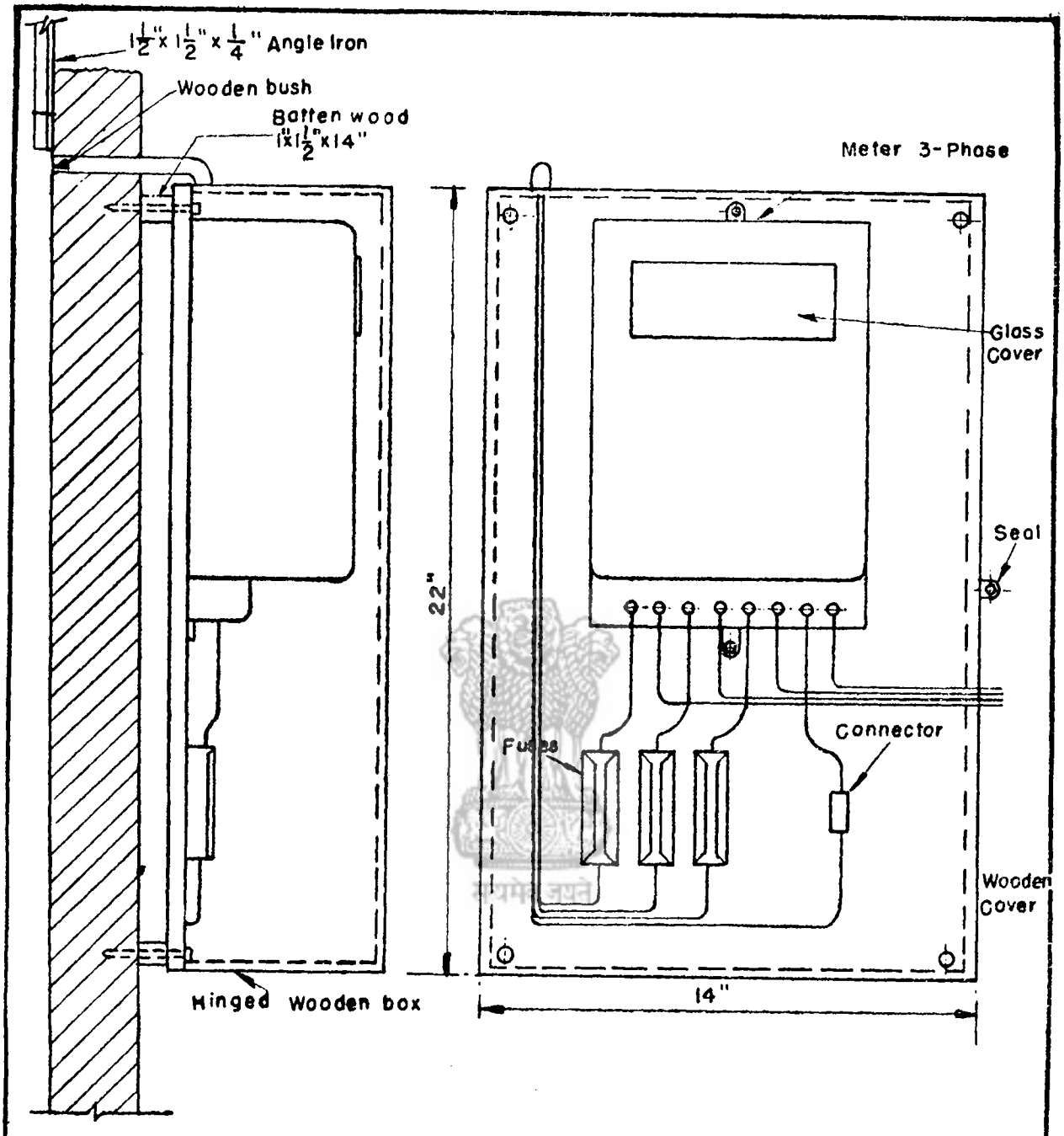
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

3-PHASE SERVICE

METER AND FUSE - BOARD

DRAWN MB TRACED CHECKED GS	RECOMMENDED APPROVED	
SCALE:-	NEW DELHI 22.1.59	RE/G/9-08

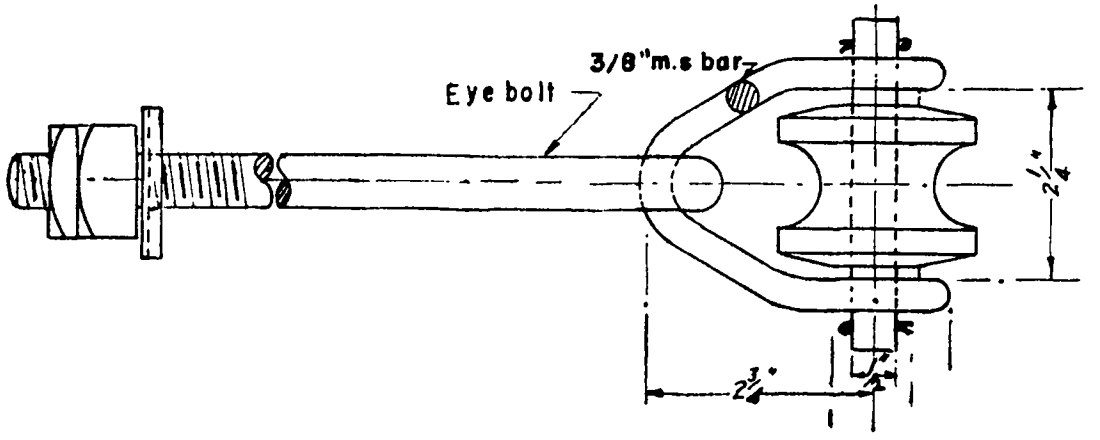


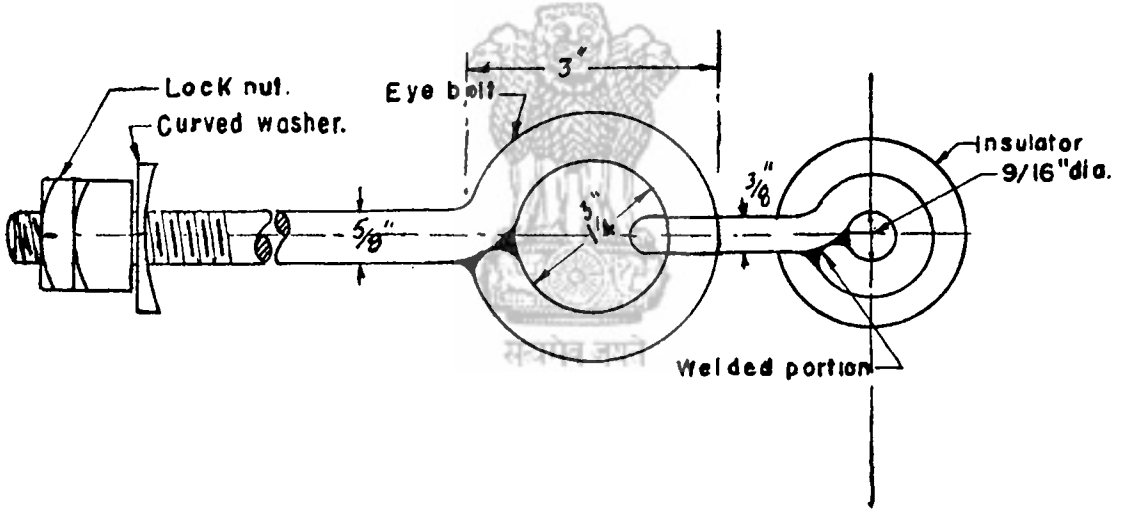
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

3- PHASE SERVICE METER AND FUSE - BOARD

DRAWN TRACED CHECKED	RECOMMENDED APPROVED
SCALE: —	NEW DELHI 25.1.59	RE/S/19-09





GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

SWINGING BRACKET FOR SERVICES-DETAILS.

DRAWN M.R.K. TRACED. CHECKED. M.S.	RECOMMENDED. APPROVED.	
SCALE:-1/2"	NEW DELHI 10-8-57.	RE/G/9-10

V.I.R. INSULATED WEATHERPROOF WIRES FOR SERVICE CONNECTIONS

Nominal area	Number and Diameter of wires	Approximate Diameter of strand	Standard Resistance	Current rating
Square inch	Inch	Inch	Ohms per mile at 20°C	Amps
·002	3/·029	·062	22·14	5
·003	3/·036	·078	14·36	10
·007	7/·036	·108	6·139	29

Note —

Current rating based on I.E.E. Regulations.

GOVERNMENT OF INDIA CENTRAL WATER & POWER COMMISSION RURAL LINE STANDARDS PARTICULARS OF WEATHER-PROOF SERVICE WIRES.		
SCALE	NEW DELHI 24-7-57	RE/G/9.11

M2C.W.P.C.—14

SINGLE PHASE				THREE PHASE		
B. H. P. of motor	230 volt full load current	Fuse Rating	Fuse size tin-cu. wire	400 volt full load current	Fuse Rating	Fuse size tin-cu. wire.
Domestic Supply	5 Amps.	5 Amps.	35 S.W.G.			
	10 ,,	10 ,,	29 ,,			
	15 ,,	15 ,,	25 ,,			
¼ H. P.	1·0 ,,	3 ,,	38 ,,	0·3 Amp.	3 Amp.	38 S.W.G.
½ ,,	1·8 ,,	3 ,,	38 ,,	0·7 ,,	3 ,,	38 ,,
¾ ,,	3·5 ,,	5 ,,	35 ,,	1·2 ,,	3 ,,	38 ,,
1 ,,	4·8 ,,	5 ,,	35 ,,	1·7 ,,	3 ,,	38 ,,
1·0 ,,	6·2 ,,	8·5 ,,	30 ,,	2·0 ,,	3 ,,	38 ,,
1½ ,,	8·7 ,,	10·0 ,,	29 ,,	2·8 ,,	3 ,,	38 ,,
2·0 ,,	11·8 ,,	15·0 ,,	25 ,,	3·5 ,,	5·0 ,,	35 ,,
3·0 ,,	17·5 ,,	20 ,,	23 ,,	5·0 ,,	8·5 ,,	30 ,,
5·0 ,,	24·0 ,,	29 ,,	21 ,,	8·0 ,,	10·0 ,,	29 ,,
7½ ,,				12·0 ,,	15·0 ,,	25 ,,
10 ,,				15·0 ,,	20·0 ,,	23 ,,
15 ,,				22·0 ,,	29·0 ,,	21 ,,
20 ,,				29·0 ,,	38·0 ,,	19 ,,
30 ,,				42·0 ,,	53·0 ,,	18 ,,
40 ,,				56·0 ,,	65·0 ,,	17 ,,
50 ,,				71·0 ,,	78·0 ,,	15 ,,

Based on Information given in the I. E. E. Regulation, 12th Edition, 1950, Table 21.

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
FUSE SIZE CHART

SCALE	NEW DELHI 25-7-57	RE/G/9.12

SECTION 10

MISCELLANEOUS

Drawing No.	Description
RE/G/10·01	Map of India showing recommended max. wind pressures.
RE/G/10·02	Map of India showing recommended temperature variations.
RE/G/10·03	Method of Jointing or Splicing Wood Poles.
RE/G/10·04	Method of Binding A. C. S. R. using Flat Armour Tape.
RE/G/10·05	Splicing Guide for A. C. S. R.
RE/G/10·06	Details of Foundation with Kicking Blocks.
RE/G/10·07	Earthing Arrangements for Special Locations.
RE/G/10·08	Conversion Table—Inches to Centimetres.

SECTION 10

MISCELLANEOUS

Drawings of a miscellaneous nature which could not find an appropriate place in any of the earlier nine Sections in this Manual, have been included here.

Brief details of the drawings included in this Section are given below:—

RE/G/10.01 .. The Map of India shows recommended wind pressures for adoption in the design of overhead power lines. India has been divided into three wind pressure regions of 15,20 and 30 lbs./sq.ft., but it has been recommended that for a major portion of the area falling in 15 lbs. region marked on the map, the rural lines upto and including 11 KV may be designed on the basis of 10 lbs./ sq. ft. only.

RE/G/10.02 .. The Map of India shows recommended temperature variations for the design of overhead power lines. India has been divided into three zones of maximum and minimum temperatures of 130°F to 50°F; 140°F to 40°F and 150°F to 30°F. Appropriate maximum and minimum temperature limits for a particular area may be adopted for calculation of sags and tensions for conductors according to the zone in which it falls.

RE/G/10.03 .. This drawing depicts the recommended method of jointing or splicing wood poles. This is considered to be quite a cheap and efficient method for jointing wood poles. This type of joint has been tested for satisfactory strength at the Forest Research Institute, Dehra Dun.

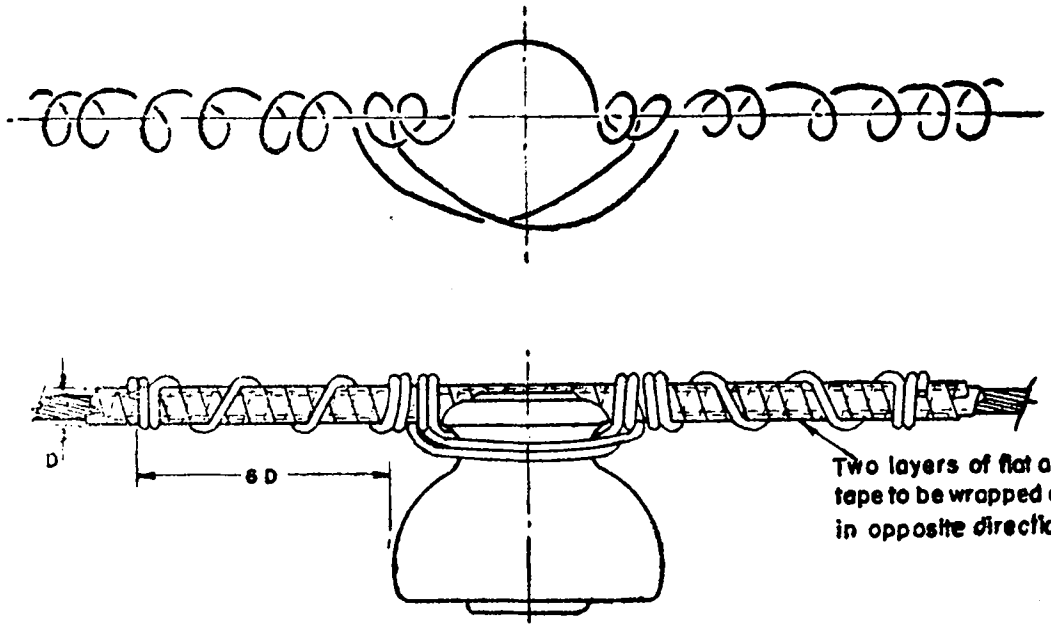
RE/G/10.04 . This drawing details the method of binding A. C. S. R. using flat armour tape on a pin insulator. Both side-groove and top-groove bindings have been shown. A table indicating the sizes of armour tape and tie wire together with their lengths required for various A. C. S. R. sizes is also given.

RE/G/10.05 .. This drawing shows the method of splicing A. C. S. R. with metal sleeves.

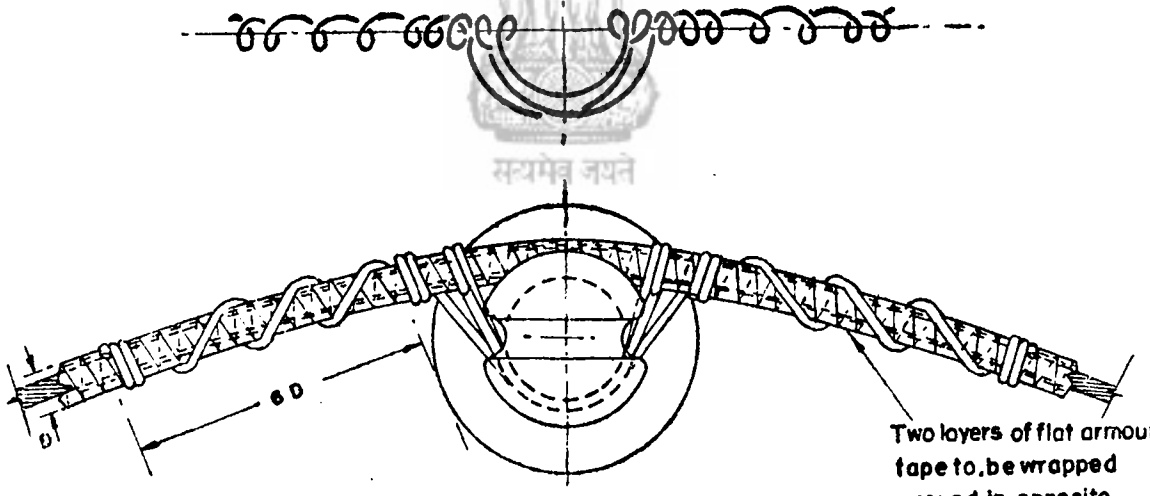
RE/G/10.06 .. This drawing gives details of the foundations with kicking blocks, where required, for ordinary and loose soils.

RE/G/10.07 .. If the resistance of earth is high and if it is desired to have a better earthing for any special location, the arrangement shown in this drawing is recommended.

RE/G/10.08 .. A conversion table from inches to centimetres has been provided for ready use so that conversion to metric system is facilitated.



TOP GROOVE BINDING.



SIDE GROOVE BINDING

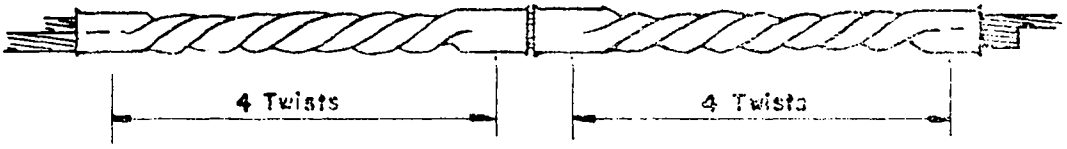
Size of the Conucter.	Cond. Dia.	Size of Armour Tape.	Size of Tie wire.	Approximate length for 11kV lines.	
				Armour Tape (All)	Tie wire (All)
	Inches	Inches	S.W.G.	Feet	Feet
6/1/.083"	.249	.05 x .30	8	6.0	4.5
6/1/.093"	.279	.05 x .30	8	6.0	4.5
6/1/.102"	.306	.05 x .30	6	7.0	5.0
6/1/.118"	.354	.05 x .30	6	8.0	5.0
6/1/.132"	.396	.05 x .30	6	9.0	5.0

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

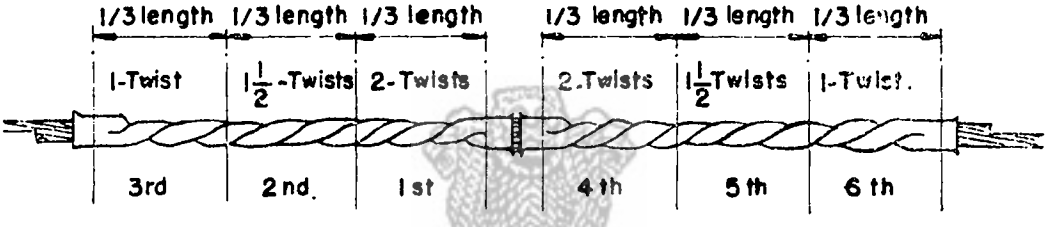
METHOD OF BINDING A. C. S. R.
USING
FLAT ARMOUR TAPE.

DRAWN NB | RECOMMENDED
TRACED
CHECKED | APPROVED
SCALE :— | NEW DELHI 28-8-58. | RE/G/10.04



For A.C.S.R up to 6/1/.118" size.

FIG. 'A'



For sizes of 6/1/.132" and larger A.C.S.R.

FIG. 'B'

Note:-

Give each sleeve 4 or 4½ complete twists distributed as shown in fig.'B'. This requires three different settings of the twisting wrenches. Make these in the order shown in the sketch.

At the end of the joint the wrenches should not be placed closer than 1/4" to the end of the sleeve.

Before making joint be sure that inside of tubes and ends of cable to be inserted in tubes, are free from dirt and oxide etc. in other words- perfectly clean.

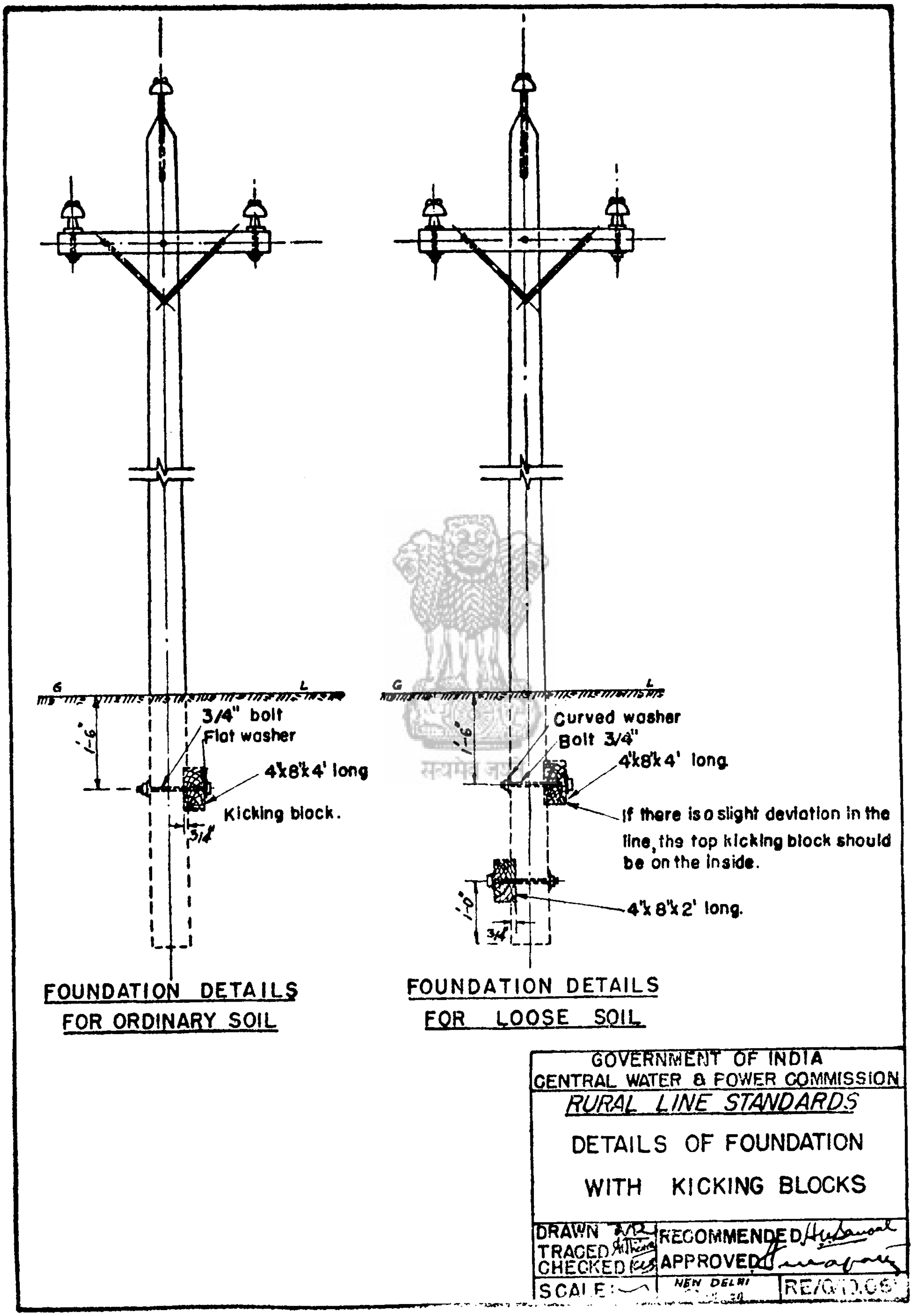
SPLICE SHALL NOT BE WITH-IN 10 FEET FROM INSULATOR OR 25 FT. FROM DEAD END.

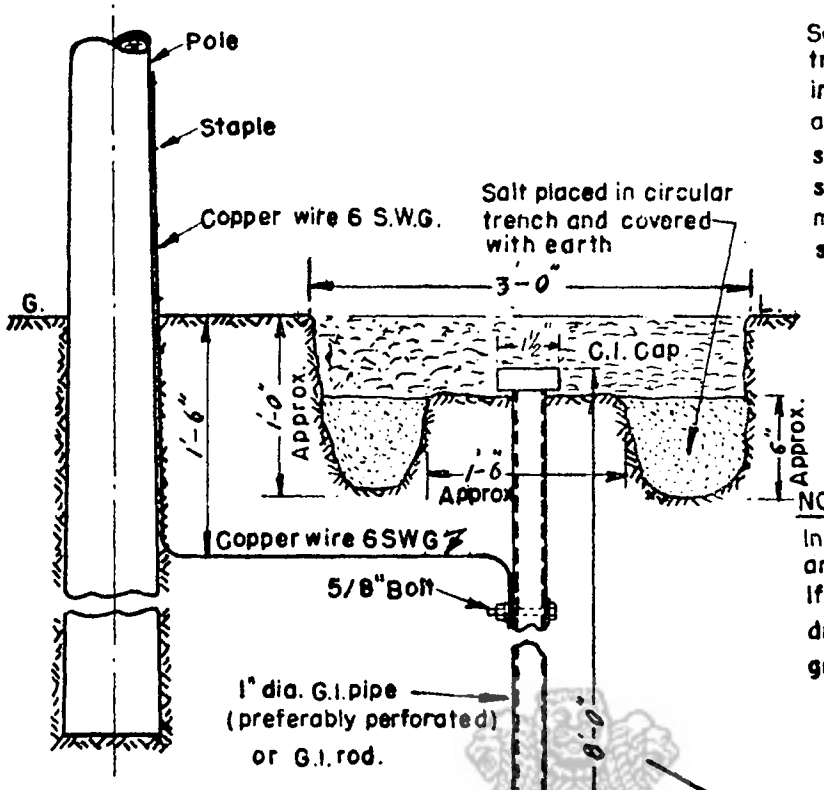
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

SPLICING GUIDE
FOR
A. C. S. R.

DRAWN / TRACED / CHECKED	RECOMMENDED / APPROVED	
SCALE:—	NEW DELHI 15. 1. 59	RE/G/1005


G
L
1'-6"
3/4" bolt
Flat washer
4"x8"x4' long
Kicking block.
3/4"
FOUNDATION DETAILS
FOR ORDINARY SOIL
G
L
1'-6"
Curved washer
Bolt 3/4"
4"x8"x4' long
If there is a slight deviation in the line, the top kicking block should be on the inside.
1'-0"
3/4"
4"x 8"x 2' long.
FOUNDATION DETAILS
FOR LOOSE SOIL
GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
DETAILS OF FOUNDATION
WITH KICKING BLOCKS
DRAWN
TRACED
CHECKED
RECOMMENDED
APPROVED
SCALE:
NEW DELHI

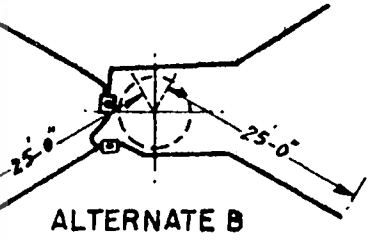


Salt is placed in a circular trench about the rod but not in direct contact. The crystals are gradually dissolved by surface waters and the solution is carried into the most useful area of earth surrounding the electrode.

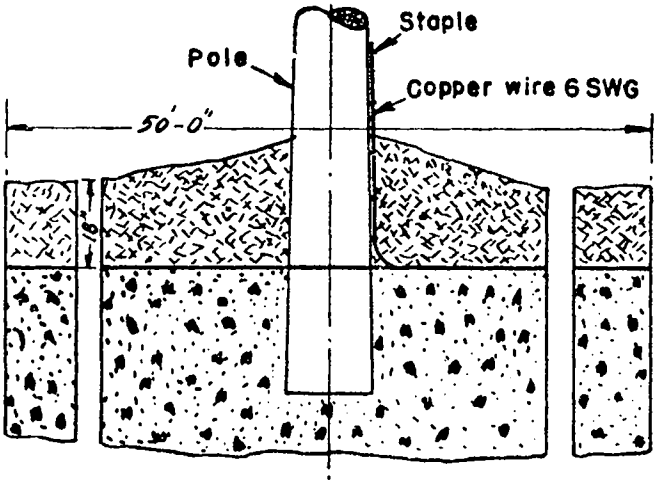
NOTE :-

In all cases the earthing resistance shall not exceed 25 ohms. If this is not obtained by one driven ground, two or more grounds may be installed.

ORDINARY SOIL

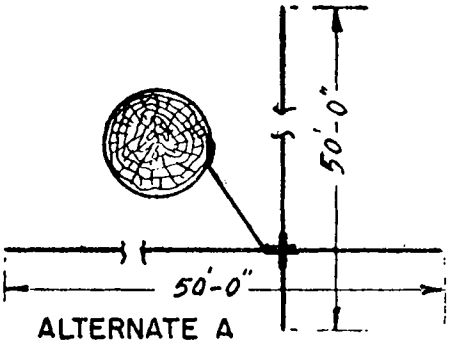


ALTERNATE B



Two 50 feet long G.I. wires buried in 18" deep trenches crosswise (Size 4 S.W.G.)

ROCKY OR HARD SOIL



ALTERNATE A

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION

RURAL LINE STANDARDS

EARTHING ARRANGEMENTS FOR SPECIAL LOCATIONS.

DRAWN TRACED AR CHECKED KRS	RECOMMENDED APPROVED
SCALE-NIL	NEW DELHI 14.1.59 RE/G/10-07

1		2		3		4		5		6	
In.	Cms.	In.	Cms.	In.	Cms.	In.	Cms.	In.	Cms.	In.	Cms.
1/4	·64	19	48·26	40	101·60	61	154·94	82	208·28	103	261·62
1/2	1·27	20	50·80	41	104·14	62	157·48	83	210·82	104	264·16
3/4	1·91	21	53·34	42	106·68	63	160·02	84	213·36	105	266·70
1	2·54	22	55·88	43	109·22	64	162·56	85	215·90	106	269·24
2	5·08	23	58·42	44	111·76	65	165·10	86	218·44	107	271·78
3	7·62	24	60·96	45	114·30	66	167·64	87	220·98	108	274·32
4	10·16	25	63·50	46	116·84	67	170·18	88	223·52	109	276·86
5	12·70	26	66·04	47	119·38	68	172·72	89	226·06	110	279·40
6	15·24	27	68·58	48	121·92	69	175·26	90	228·60	111	281·94
7	17·78	28	71·12	49	124·46	70	177·80	91	231·14	112	284·48
8	20·32	29	73·66	50	127·00	71	180·34	92	233·68	113	287·02
9	22·86	30	76·20	51	129·54	72	182·88	93	236·22	114	289·56
10	25·40	31	78·74	52	132·08	73	185·42	94	238·76	115	292·10
11	27·94	32	81·28	53	134·62	74	187·96	95	241·30	116	294·64
12	30·48	33	83·82	54	137·16	75	190·50	96	243·84	117	297·18
13	33·02	34	86·36	55	139·70	76	193·04	97	246·38	118	299·72
14	35·56	35	88·90	56	142·24	77	195·58	98	248·92	119	302·26
15	38·10	36	91·44	57	144·78	78	198·12	99	251·46	120	304·80
16	40·64	37	93·98	58	147·32	79	200·66	100	254·00	121	307·34
17	43·18	38	96·52	59	149·86	80	203·20	101	256·54	122	309·88
18	45.72	39	99·06	60	152·40	81	205·74	102	259·08	123	312·42

GOVERNMENT OF INDIA
CENTRAL WATER & POWER COMMISSION
RURAL LINE STANDARDS
CONVERSION TABLE
INCHES TO
CENTIMETRES

SCALE	NEW DELHI 2-7-57	RE/G/10.08

M2CWPC—400—31-5-60—(Sec. I)—GIPF.


सत्यमेव जयते