GOVERNMENT OF INDIA

CENTRAL STANDING COMMITTEE

FOR

COORDINATION OF POWER & TELECOMMUNICATION SYSTEMS

(P.T.C.C.)

CODE OF PRACTICE FOR THE PROTECTION OF TELECOMMUNICATION LINES AT CROSSINGS WITH OVERHEAD POWER LINES OTHER THAN ELECTRIC TRACTION CIRCUITS

1965

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1965

FOREWORD (PROVISIONAL EDITION)

In India, current practices for the protection of open-wire communication lines involved in crossings with overhead power lines are governed by certain regulations laid down by the Indian Posts and Telegraphs Department. These practices, the P.T.C.C. felt, could be improved upon with a view to evolving simplified arrangements and effecting economy without, in any way, impairing the degree of protection offered to the exposed communication line. The P.T.C.C., therefore, appointed a Sub-Committee to make a detailed study of the subject and submit a report suggesting modifications to current regulations. After a comparative study of the prevalent practices in other countries of the world, particularly, the U.S.A. and Sweden and in the light of experience gained during the past few decades in this country and abroad, the Sub-Committee presented a report which forms the basis for this Code. A reprint of this Code which was published in 1955 is now being issued.

N. VENKATESAN
Joint Secretary (Power), P.T.C.C.

NEW DELHI,
December, 1956

J. R. SEN GUPTA
Joint Secretary (Tele.), P.T.C.C.

FOREWORD (FIRST EDITION)

Since the publication of the provisional issue of this Code, the Committee had the benefit of the experience of the field staff of the power and telecommunication wings. The Committee received suggestions from the field staff for modification of the Code to take into consideration the practical difficulties experienced in the field. The Committee considered these suggestions and approved certain alterations to the Code issued earlier. These have been incorporated in this edition. This edition supercedes the instructions contained in the previous (provisional) issue.

In the earlier provisional issue cantilever type of guarding was considered for high voltage lines of categories I and II. In the present issue an alternative to this arrangement is incorporated to take care of situations where the cantilever guarding is not possible due to field conditions.

Another important change in this edition is the extension of the exemption from guardings in respect of high voltage lines of 36 kV (33 kV nominal) and below, complying with standard of construction and operation on the same lines as Extra high voltage lines. Extra high voltage lines have been exempted from the special guardings on the consideration that such lines would have adequate electrical and mechanical standards of construction, with the result that failures of these lines would be rare. However, extension of the exemption to high voltage lines of 36 kV (33 kV nominal) and below would be subject to approval of PTCC.

This opportunity for revision of the Code has been availed of to adopt metric system of weight and measures with their equivalents in F.P.S. system shown in the brackets.

The nominal system voltages have been replaced by system highest voltages as has been adopted by I.S.I. in their document No. IS-585.

V. R. NARASIMHAN
Joint Secretary (Power)

NEW DELHI,
December, 1961

S. MUTHUSWAMY
Joint Secretary (Telecom.)

Provisional Edition

First Edition 700

Second Edition 3300

FOREWORD (SECOND EDITION)

Since the publication of the first edition of this Code, the Committee had the benefit of further experience of the field staff of the power and telecommunication wings. Sometimes 11, 22 and 33 kV power lines carry on the same supports a pair of wires beneath the power conductors for purposes of communication (operated by power authorities). The Committee examined situations where such power lines have to cross P. & T. communication circuits and additional paragraph (vide para 9) has been added in the present edition of the Code detailing crossing arrangements. Consequently, two figures 5A and 5B have been added in this edition of the Code of Practice. Figure 5A is applicable to 11 kV lines while Figure 5B is applicable to 22 and 33 kV lines.

2. The Committee felt that normally it would be difficult to realise a value of one ohm for earth resistance for power contact protectors. After detailed examination, necessary changes were incorporated in the appendix to the Code of Practice (detailing the installation of power contact protectors).

3. The Committee would appreciate if the field officers of the power and telecommunication systems in the country continue to cooperate as hitherto and communicate any special problems encountered.

V. R. NARASIMHAN
Joint Secretary (Power)

S. MUTHUSWAMY
Joint Secretary (Telecom.)

NEW DELHI,
January, 1965

CODE OF PRACTICE FOR THE PROTECTION OF TELECOMMUNICATION LINES AT CROSSINGS WITH OVERHEAD POWER LINES OTHER THAN ELECTRIC TRACTION CIRCUITS

0. Introduction :

0.1. The possibility of damage to telecommunication apparatus and injury to personnel due to accidental contacts between Eletricity supply lines and telecommunication lines is an important consideration necessitating proper protective arrangements. Such contacts between power and telecommunication lines may result from falling tree limbs, improper sag of conductors, damaging acts by the public, structural failures poor maintenance, wind storms, conductor failures due to lightning stroke, etc. Therefore, the crossings of the power and telecommunication lines require some consideration as they would be in the close proximity in such situations. The objective of this Code is to set out measures to be adopted at crossings to avoid or reduce danger to personnel and telecommunication lines.

0.2. While the arrangements described in this Code are expected to offer a high degree of protection at reasonable cost, it is always advisable to route all future power and telecommunication lines so as to keep the number of crossings to the minimum possible under the circumstances.

0.3. All new constructions at crossing locations shall conform to the practices laid down in this Code. The existing arrangements at crossings need not be dismantled but should continue to be maintained, till due for replacement.

0.4. Crossing situation not specifically covered by this Code should be referred to the P.T.C.C. for decision.

0.5. The principle that is followed by the P.T.C.C., in regard to the liability towards the cost of structural arrangements and the installation of necessary protective apparatus, etc. has been that it should fall on the party who enters the field at a later date irrespective of whether such work is carried out on the power or communication line. This is in conformity with the Indian Electricity Rules.

0.6. This Code does not cover the crossing of telecommunication lines with electric traction circuits.

1. Classification of power lines :

For the purpose of this Code, power lines are classified as below :

(*i*) Low and medium voltage distribution and service lines (voltage not exceeding 650 volts between phases).

(*ii*) High voltage lines, Category I (voltage exceeding 650 volts but not exceeding 12 kV between phases).

(*iii*) High voltage lines, Category II (voltage exceeding 12 kV but not exceeding 36 kV between phases).

(*iv*) Extra high voltage lines (voltage exceeding 36 kV between phases).

NOTE

Lines with voltages of 36 kV (between phases) and below also come within category (iv) provided they comply with the usual standards of construction and operation adopted for lines with voltages of 72·5 kV (between phases) and above. Such cases shall be referred to P.T.C.C.

2. Crossings between power and telecommunication lines :

2.1. *Disposition of Power and Telecommunication Wires*—Except in the case of electric traction circuits which are not covered by this Code, the power lines shall, cross over the telecommunication lines.

NOTE 1

This arrangement is advantageous as power wires are generally of a heavier gauge than telecommunication wires and hence have a lesser possibility of breakage. Further, as telecommunication lines generally require more frequent attention for maintenance operations and are subject to frequent reconstructions, it would be convenient and would afford greater safety in working, if they are taken below the power lines.

NOTE 2

In unusual situations where it is considered that the most appropriate method will be to take the telecommunication line above the power line, the specific approval for each case shall be obtained from the competent authority responsible for the telecommunication system.

2.2. *Angle of Crossing* The angle of crossing shall be as nearly a right angle as possible.

NOTE 1

If the angle of crossing were small, it would increase the extent of dangerous proximity of the telecommunication lines with the power lines, as a result of the possible whipping action of the broken power conductors.

NOTE 2

In exceptionally difficult situations, when the angle has to be below 60°, the matter should be reported to the competent authority in charge of the telecommunication system, who shall, if considered necessary, refer it to the P.T.C.C. for technical advice.

2.3. *Clearances*—Specific clearances to be provided between power lines, telecommunication lines, earth wires and earthed structures are indicated for each type of crossing under paragraphs 3, 5, 7 and 8.

NOTE

Clearances between telecommunication and power wires have an important bearing on the safety of persons working on the telecommunication lines and on the prevention of accidental cantacts between telecommunication and power wires. It is essential, therefore, to provide clearances as specified in this Code.

3. Joint use of poles at crossing locations :

3.1. In all new constructions, whether of power lines or telecommunication lines, the possibility (except in cases of unusual difficulty) of joint use of poles for crossings between telecommunication lines and (*a*) low and medium voltage distribution and service lines, and (*b*) high voltage lines, Category I, should be investigated and adopted.

NOTE 1

From the point of view of safety and structural considerations, the use of a common pole to support both the power lines and telecommunication lines for the crossing is an advantageous proposition.

NOTE 2

Where it becomes impracticable to adopt joint use of pole, the arrangements given in para 5 or 6 shall be adopted, as the case may be.

3.2. The design strength and other mechanical features of the common support and fittings shall be in accordance with the standards and requirements of the power supply authority or the telecommunication authority whichever is more rigorous.

3.3. Adequate clearance shall be provided on the common pole to enable employees of either party to carry out maintenance work on their respective lines. The clearance provided on the jointly used pole shall not be less than the figures given below:

	Low and Medium Voltage Lines	High Voltage Lines up to and including 7·2 k.V.	High Voltage Lines above 7·2 K.V. and up to and including 12 k.V.
Minimum vertical clearance between the bottom most power cross-arm and fittings and the topmost communication cross-arm and fittings.	1220 mm (4′ 0″)	1380 mm (4′ 6″)	1980 mm (6′ 6″)
Minimum vertical clearance between power and communication wires at the pole.	1380 mm (4′ 6″)	1525 mm (5′ 0″)	2130 mm (7′ 0″)
Minimum vertical clearance between communication wires and ground wire on the power line.	1070 mm (3′ 6″)	1070 mm (3′ 6″)	1070 mm (3′ 6″)

NOTE

Neutral wires on the power alignment shall be treated as power conductors for the purpose of this rule, except in the case of multiple-earthed neutrals that are not carried on insulators.

3.4. When the power lines carried on the jointly used pole are high voltage lines of voltage to earth 3,000 volts and over, power contact protectors (see appendix) shall be installed at the crossing on all the wires occupying the top bracket of the telecommunication line.

3.5. In order to minimise the maintenance work, a jointly used pole shall be used only for supporting the two crossing alignments. No apparatus or equipment such as switches, fuses, junction boxes, etc. shall be mounted on such a pole and no lines shall tee-off from it. There is, however, no objection to the installation on the pole of protectors or arrestors for the protection of telecommunication wires.

4. Guards:

4.1. Guarding arrangements shall always be provided as and where prescribed in this Code.

4.2. Guarding arrangements will, ordinarily, be carried out by the onwer of the pole on which they are to be made. The owner will also be responsible for their efficient maintenance, the cost being met as indicated in para 0·5.

4.3. Every guard shall be properly earthed at the terminal supports.

4.4. Guard wires shall have a breaking load of not less than 635 kgm. (1400 lbs.) and if made of iron or steel, shall be galvanized. Every guard wire, or cross-connected system of guard wires, shall have sufficient current-carrying capacity to avoid the risk of their fusing on coming into contact with any live power wire.

4.5. For the purpose of ensuring that any live wire coming in contact with the guard wires is rendered dead, the net resistance to earth of the guard shall be low enough to give rise to an earth fault current of a magnitude which is at least twice the minimum required to operate the protective system on the power circuit.

4.6. Warning boards should be provided on joint pole used for crossing as well as on telecommunication line supports near the point of crossing where insulated weather-proof power wires are used for crossing over telecommunication line.

5. Crossing with low and medium voltage distribution and service lines :

5.1. Where joint use of poles as laid down in para 3 is not feasible, either of the two methods of crossing recommended below shall be adopted :

(*a*) Insulated weather-proof wires carried on effectively earthed steel bearer wires may be used for the power lines. The vertical clearance from the insulated wires to the telephone wires shall not ordinarily be less than 915 mm. (3 ft.) and in specially difficult cases not less than 760 mm. (2 ft. 6 inches).

(*b*) Alternatively, a guard shall be provided between the telecommunication line and the power line as indicated in figures 1 and 2, as the case may be. The guard shall be fixed either to the power line supports or to the telecommunication line supports.

5.2. *Guards on power line supports*—The minimum vertical clearance between the guard wires and the telecommunication wires shall be 915 mm. (3 ft.). The guard shall be so arranged that lines drawn upwards from its outermost wires towards the centre, at an angle of 45° to the vertical, will totally enclose the power wires (see figure 1B). Cross lacings shall also be provided so as to cover a distance of at least 1830 mm. (6 ft.) on either side beyond the outermost crossing points of the wires of the telecommunication lines as shown in figure 1A.

5.3. *Guards on telecommunication line supports*—(See figures 2A and 2B). The minimum clearance between the power wires (including neutral wires of the power circuit) and the guard wires shall be 1220 mm. (4 ft.) (see figure 2A). In case the lowest wire on the power line is a ground wire, the minimum separation between the ground wire and the guard shall be 610 mm. (2 ft.). The minimum clearance between the guard wires and the telecommunication wires shall be 610 mm. (2 ft.). Cross lacings shall be provided as shown in figure 2B.

6. Crossing with high voltage lines, Category I :

Where joint use of poles as laid down under para 3 is not feasible, the arrangement in para 7 shall be adopted.

7. Crossing with high voltage lines, Category II :

7.1. For the crossing span, the telecommunication alignment shall be taken close to the power pole to obtain increased vertical clearance between wires.

7.2. A light cantilever framework shall be fixed to the power support as indicated in figures 3A and 3B. The framework will be designed for each case depending upon the type of support used for the power line and the type of brackets on the telecommunication line.

7.3. In deciding the structural details for these crossings, provision should be made for the possible erection of additional wires on the telecommunication line to meet future requirements. The clearances both horizontal and vertical, and between wires and supports shall conform to the standards shown in figures 3A and 3B.

7.4. In those cases where the poles of either of the lines cannot be or are not located near the crossing location, cradle guards on the power line shall be provided, the arrangement being similar to that in para 5.2, but with clearances indicated in figures 3A and 3B.

7.5. Power contact protectors shall be installed on all the wires carried by the topmost bracket of the telecommunication supports.

NOTE—

The technical details of power contact protectors are described in the Appendix.

8. Crossing with extra high voltage lines :

8.1. No guarding arrangements are considered necessary in such cases.

8.2. The telecommunication line shall cross the power line as close to the power line supports as practicable.

8.3. The minimum clearances between the power wires and telecommunication wires shall be :

For lines of voltage above 36 kV—up to and including 72.5 kV—2440 mm. (8′ 0″)
For lines of voltage above 72.5 kV—up to and including 145 kV—2740 mm. (9′ 0″)
For lines of voltage above 145 kV—up to and including 245 kV—3050 mm. (10′ 0″)

9. Crossing with power lines having below a pair of telecommunication wires on the power line support:

9.1. Crossing should be so arranged that the telecommunication line passes close to a power pole to obtain increased vertical clearance between the wires of the two alignments.

9.2. A guard shall be provided both on the power supports as well as on telecommunication line, as per arrangements indicated in Figures 5A and 5B.

APPENDIX

POWER CONTACT PROTECTORS

Operation—Power contact protectors (see figure 4) are air gap arrestors connected between overhead telecommunication wires and ground. The arrestor gaps are designed to breakdown at a voltage of 3,000 volts to ground, and upon breakdown, to possess a high current-carrying capacity.

When wires of a telecommunication line on which these protectors are installed come in contact with a power wire of voltage to ground exceeding 3,000 volts, the protector gaps breakdown and provide a low impedance path to the power system fault current. Rapid de-energisation of the power supply circuit, in the event of a power contact with the wires of the telecommunication line, is thus rendered possible.

Installation—Power contact protectors shall be provided on telecommunication lines involved in crossings with H.T. power lines referred to in paras 3, 6 and 7 of the Code. These protectors should be installed at the pole nearest to the crossing point on the exposed wires (*i.e.*, all the wires carried on the topmost bracket) of the telecommunication line.

Earthing of power contact protectors—To ensure maximum possible protection to the telecommunication line, the protector earth resistance shall be as low as possible. A figure of ten ohms or lower is recommended for this purpose and it is very essential that the protector earth should be periodically checked and maintained within this value, as far as possible.

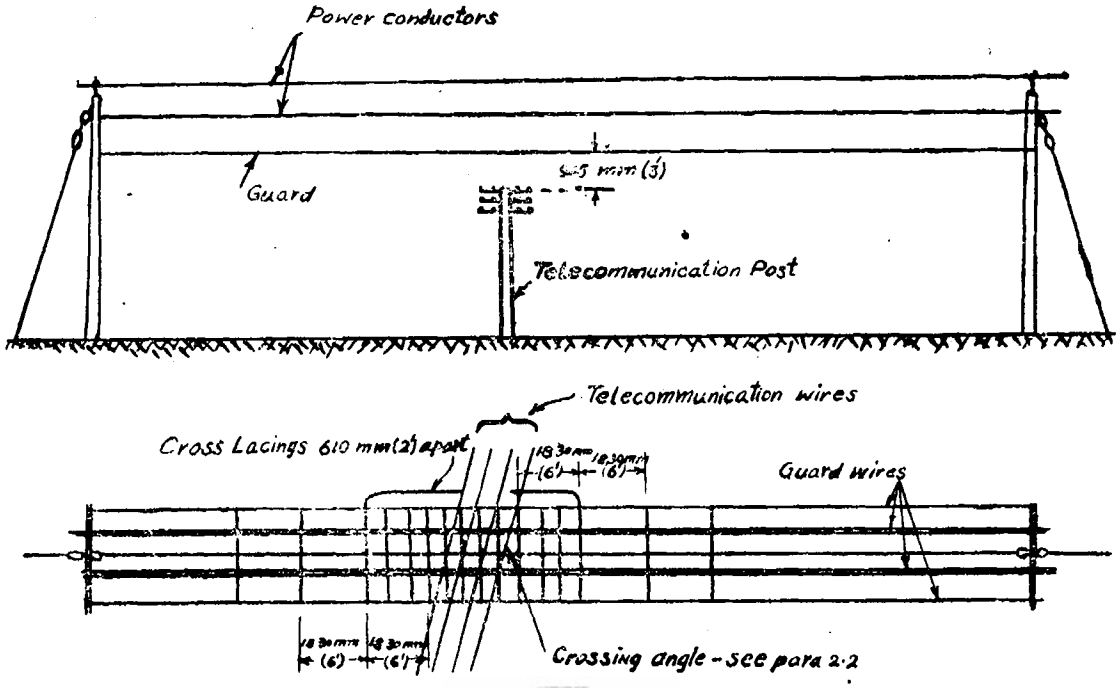


FIG 1A

TYPICAL CROSSING PROVIDED WITH A GUARD ON POWER LINE SUPPORTS (See para 5.2)

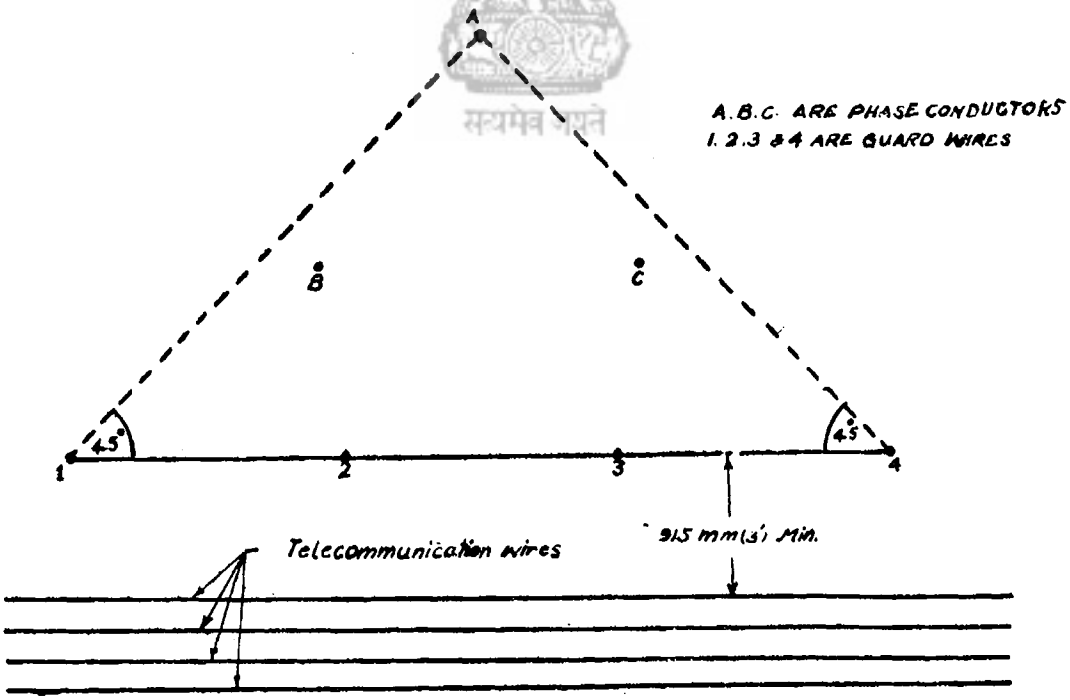


FIG. 1B

SECTIONAL VIEW

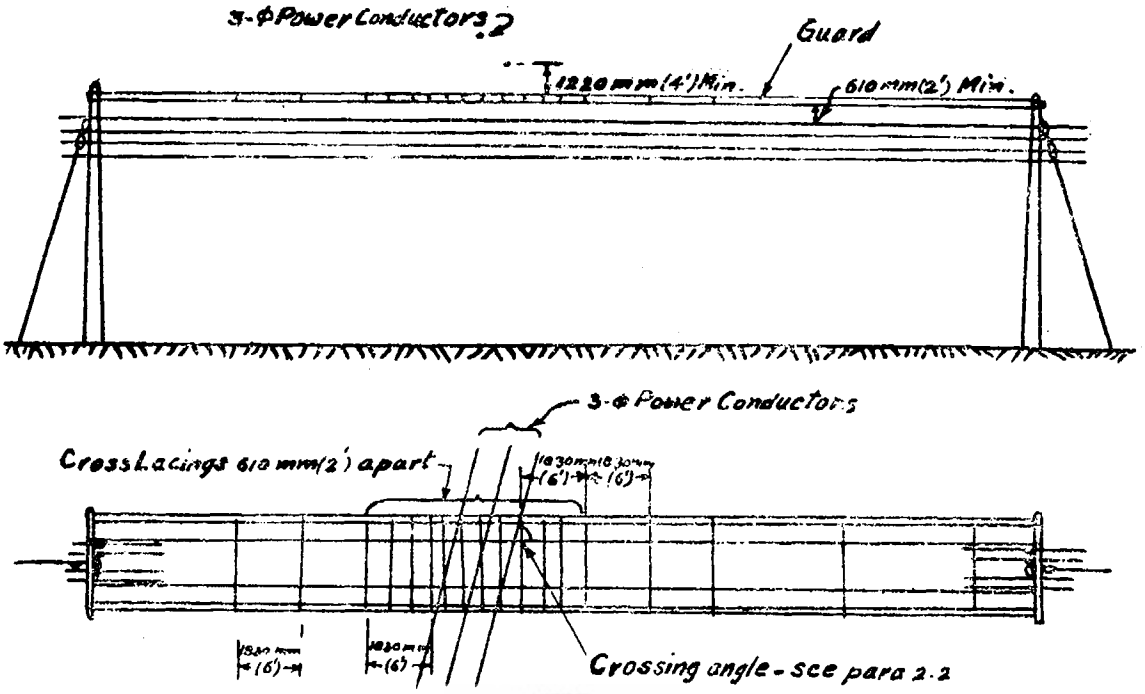


FIG. 2A.

TYPICAL CROSSING PROVIDED WITH A GUARD ON TELECOMMUNICATION LINE SUPPORTS

(See para 5-3)

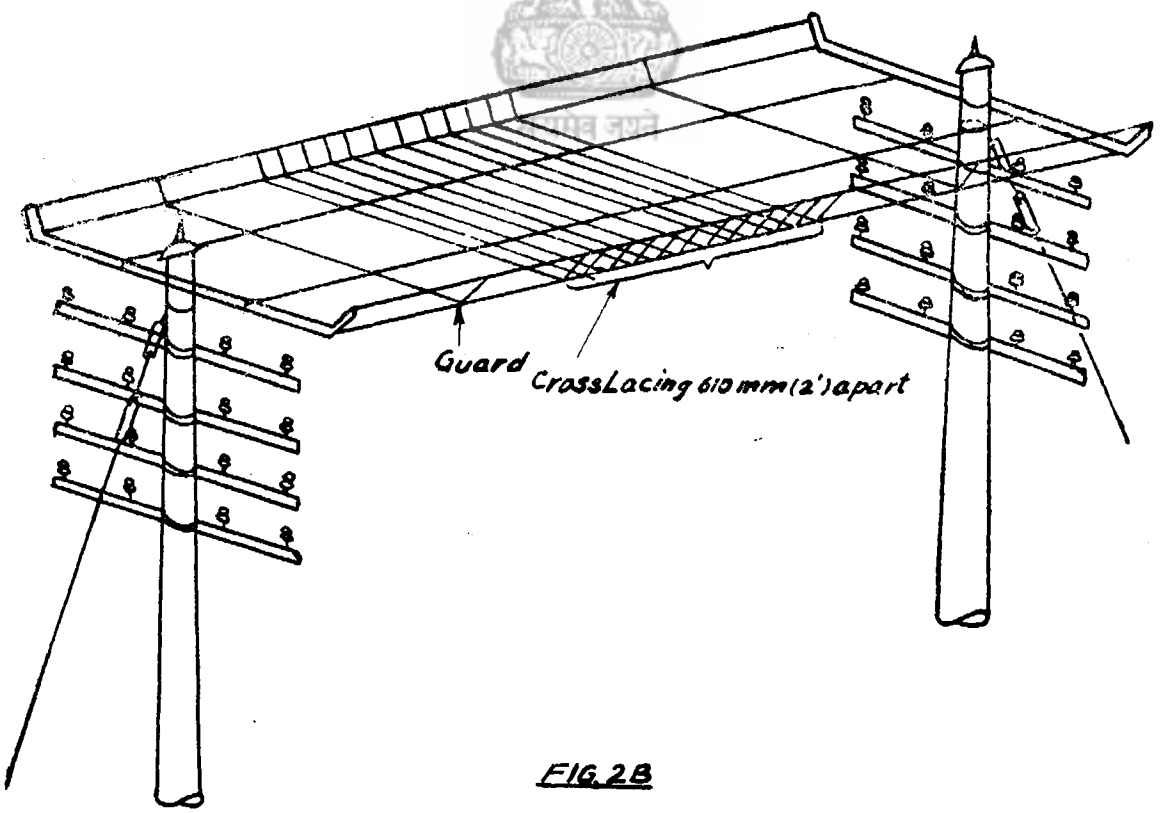


FIG. 2B

PICTORIAL VIEW

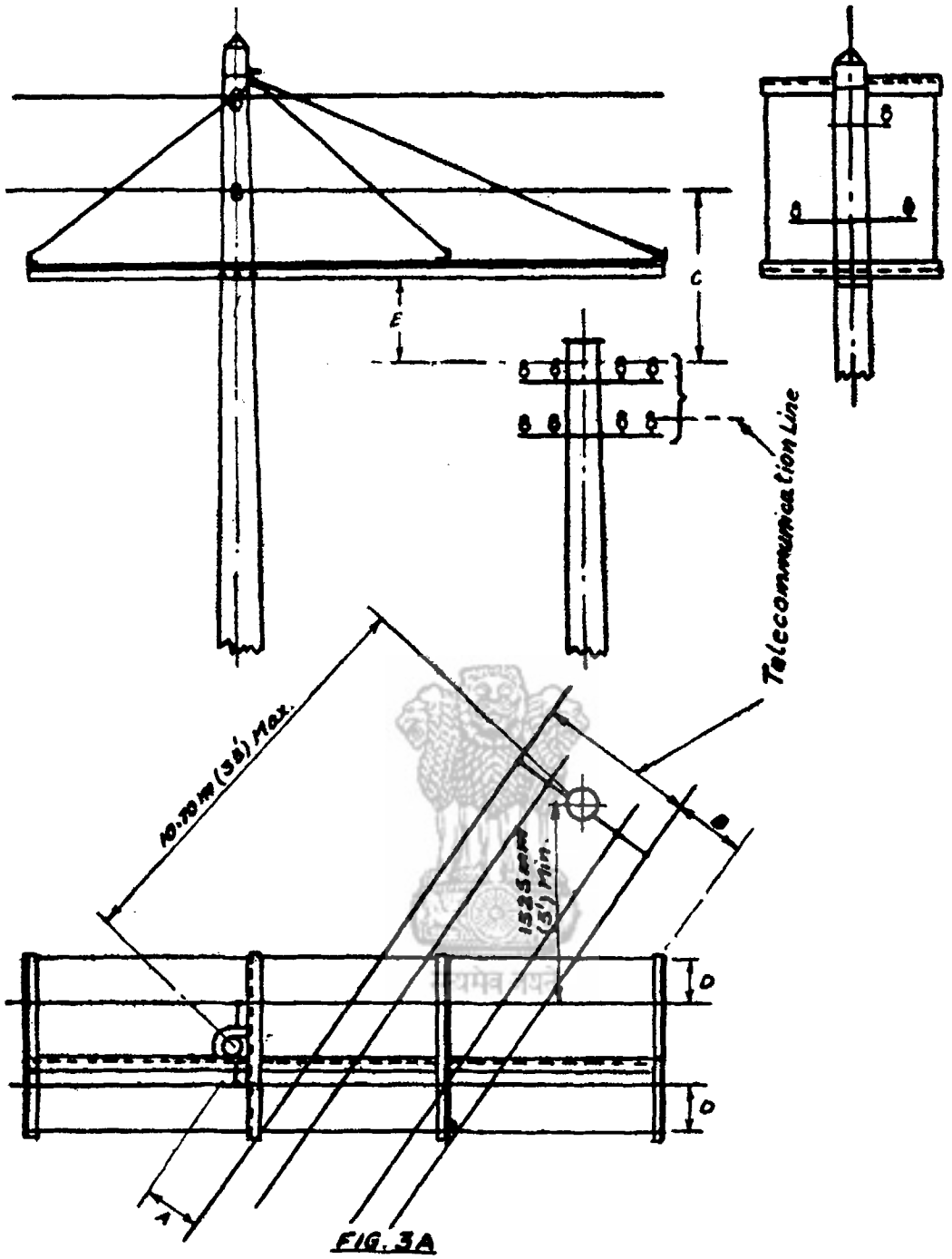


FIG. 3A

CANTILEVER GUARD AT OBLIQUE CROSSING

(See para 7)

← Minimum Clearances →

	A	B	C	D	E
7.2 KV & below	305 mm. (1 Ft)	915 mm (3 Ft)	1380 mm (4'-6")	305 mm (1 Ft)	1070 mm (3'-6")
12 KV.	305 mm (1 Ft)	915 mm (3 Ft)	1525 mm (5 Ft)	305 mm (1 Ft)	1220 mm (4 Ft)
24 KV	305 mm (1 Ft)	915 mm (3 Ft)	1680 mm (5'-6")	460 mm (1'-6")	1220 mm (4 Ft)
36 KV	305 mm (1 Ft)	915 mm (3 Ft)	1830 mm (6 Ft)	610 mm. (2 Ft)	1220 mm (4 Ft)

Note :- See also notes 1, 2, 3 & 4, Fig. 3B.

M/B(N)13 CW&PC(ww)—4

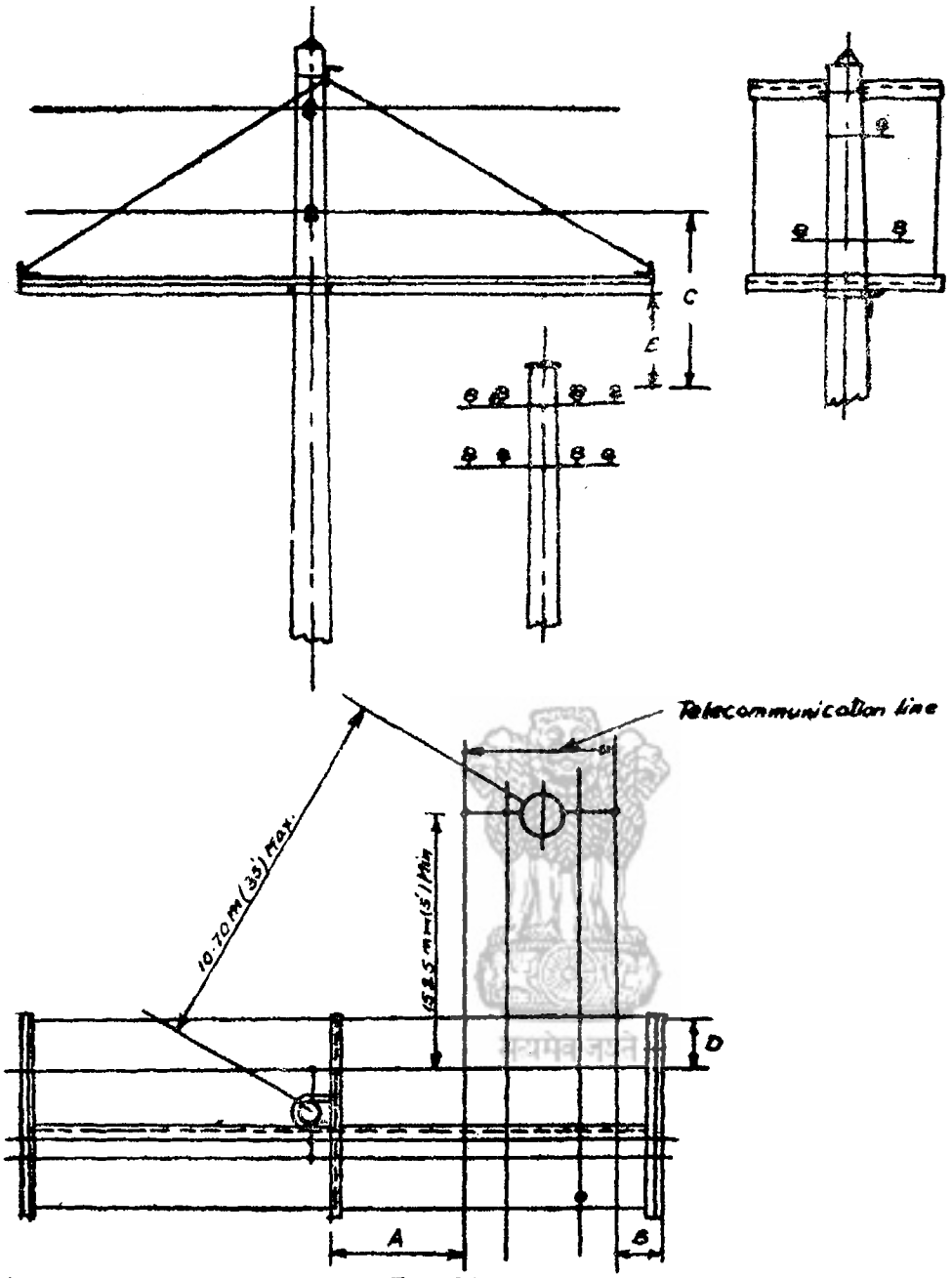


FIG. 3B

CANTILEVER GUARD RIGHT ANGLE CROSSING

(See para 7)

Note :-

1. Strain point of the H.T. line at the crossing pole should be avoided as far as possible.
2. At the crossing a 'catch arm' should be provided so that in the event of the pole falling down, the H.T. conductors will not touch the telephone wires.
3. The 'catch arm' should be connected to the ground wire, if any or it should be earthed properly by some separate arrangement
4. All iron should be galvanized.
5. For clearances A, B, C, D, & E See fig. 3A

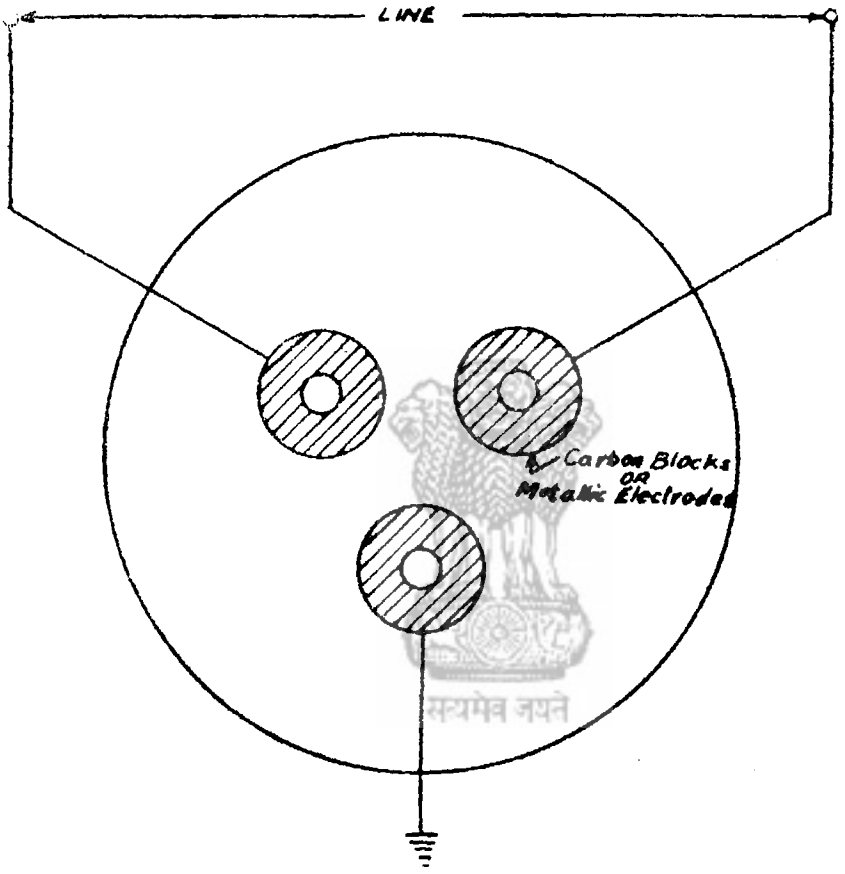
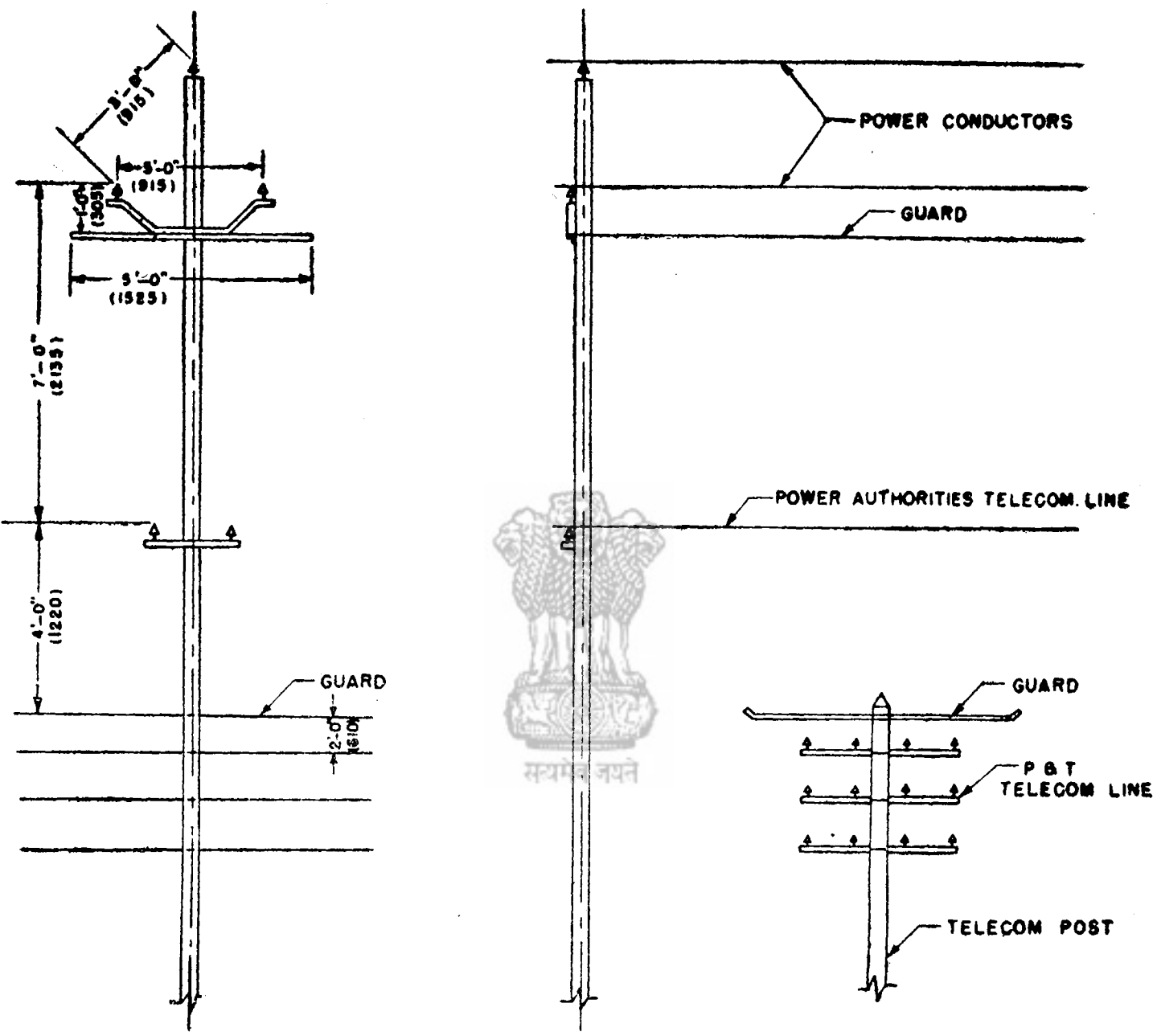


FIG 4

POWER CONTACT PROTECTOR (See Appendix)



11 kV. LINE

Fig. 5A :- TYPICAL CROSSING ARRANGEMENT OF POWER LINE HAVING A COMMUNICATION PAIR ON THE SAME SUPPORT AND P. & T. TELECOM. LINE.

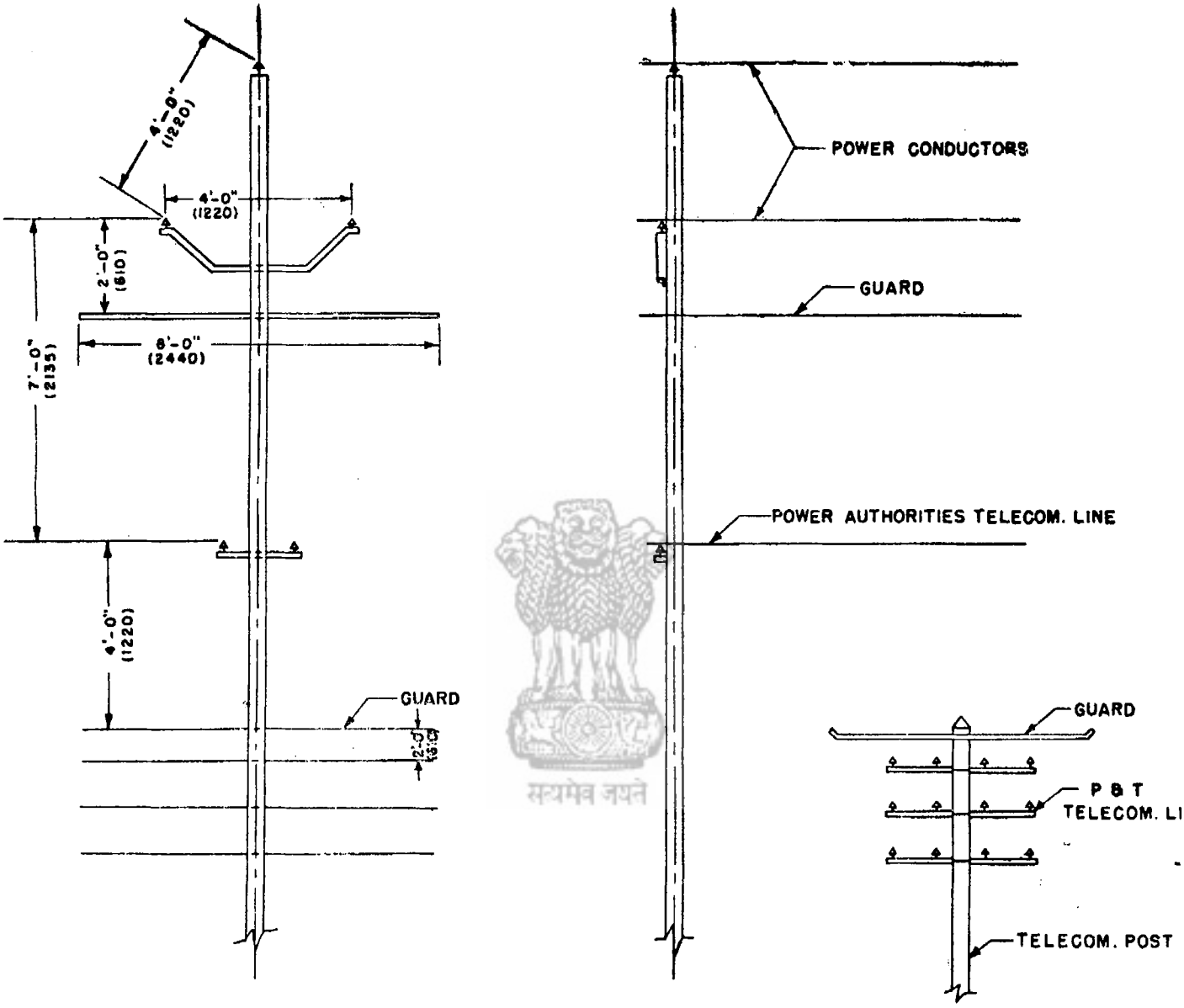


Fig. 5B :— TYPICAL CROSSING ARRANGEMENT OF POWER LINE HAVING A COMMUNICATION PAIR ON THE SAME SUPPORT AND P. & T. TELECOM. LINE.

M/B(N)13CW&PC(ww)—3,300—8-2-66—GIPS