

## APPENDIX IV

## REGULATIONS FOR POWER LINE CROSSINGS OF RAILWAY TRACKS

(ISSUED BY RAILWAY BOARD IN 1987)

## GENERAL

## 1. Definitions

1.1 The following terms wherever occurring in the Regulations shall, unless excluded by or repugnant to the context, have the meaning attributed thereto as under: -

"Chief Electrical Engineer" means the officer designated as such by the Zonal Railway or his successors in office or on whom his duties devolve.

"Power line crossing" means an electrical overhead line or under-ground cable placed across railway track(s) for the transmission and/or distribution of electrical energy. It may also be referred to as a "Crossing" in these Regulations.

"Electrical Inspector" means the officer appointed by the appropriate Government under Section 36 of the Indian Electricity Act, 1910, to exercise the powers and perform the functions under the said Act. On the Zonal Railway, the Chief Electrical Engineer is the Electrical Inspector.

"Owner" means the owner of an electrical crossing.

"Railway" means the Zonal Railway administration in whose territorial jurisdiction the electrical crossing is located or proposed to be located and includes the Chief Electrical Engineer, the **Divisional Railway Manager (Electrical)** of the Zonal Railway Administration.

"Writing" includes all matters written, typewritten or printed either in whole or in part.

## 2. Scope

2.1 The regulations apply to electrical overhead lines and/or underground cables crossing railway tracks operated by the Indian Railways, Railway Companies and Port Commissioner's Railways, including assisted and private sidings on which rolling stock of Indian Railways may work, unless any special section or railway tracks are exempted from these Regulations by specific written orders of the Electrical Inspector.

**Notes:**

(i) if any existing crossing infringes the provisions of the Regulations at the time of its issue, the infringement(s) shall be treated as permissible infringement(s) provided that necessary relaxation has been granted in respect of the clearances under clause 21 thereof.

(ii) The Regulations do not apply to crossing(s) of railway track(s) laid underground/inside tubes and tunnels.

(iii) The Regulations do not also apply to Railway Traction systems (1500 V d.c. and 25 kV, 50 Hz a.c. Single phase) whose feeders/conductors/wires run along or across the tracks for traction purposes.

(iv) On sections proposed to be electrified on or to be converted to suit 25 kV, 50 Hz ac single phase traction system", the crossing existing at the time of electrification/conversion proposed shall be specially studied with a view to avoiding modifications to the extent possible without jeopardising safety. If any modifications are considered essential to obtain the minimum clearances, specified in clause 21 thereof, they shall be carried out.

(v) In special cases, where the Electrical Inspector has specifically permitted reduction in clearances under clause 21 thereof, a clear declaration to this effect shall be recorded in the CERTIFICATE OF COMPLIANCE (in the form at Annexure II) to these regulations.

## 3. Approval of Works by the Railway:

## 3.1 (i) Designs, Drawings etc. :

Before the Owner commences any work on a crossing, he shall obtain the approval in writing, of the Railway for the proposed location, the detailed design and the method of execution of the crossing. For this purpose, the data designs, calculations and drawing(s) relating to the crossing shall be furnished by the owner to the Railway as stipulated in Annexure A.4.01 to these Regulations. On receipt of

written approval from the Railway, the owner shall execute an Agreement in the Form at Annexure A.4.02 to these Regulations.

ii) Construction

The owner shall notify the Railway in writing at least 15 days in advance of the date on which he will commence the work of construction of the crossing. The Chief Electrical Engineer, or his representative, may, if he so desires, inspect the site/work of the crossing during its construction to ensure that it is being constructed in accordance with the approved designs and drawings. Only good quality of materials shall be used in the construction of the crossing which shall be executed in a workman-like manner.

iii) Bringing crossing into use:

Prior to bringing the crossing into use, the owner shall:

a) Notify the Railway in writing at least 15 days in advance of the date the crossing is intended to be brought into use.

b) Submit to the Railway a CERTIFICATE OF COMPLIANCE, (in the form at Annexure A.4.03 to the Regulations) to the effect that the works have been constructed in compliance with the Regulations and in conformity with the design(s) and drawing(s) approved by the Railway. Only on receipt of written approval from the Railway, the crossing shall be energized and brought into use.

**4. Compliance with Indian Electricity ACT, 1910 and Indian Railway ACT, 1890 and Rules made thereunder etc.**

4.1 Except as otherwise provided for in the Regulations the contents of relevant sections of the Indian Electricity Act, 1910 the Indian Railways Act, 1890 and the rules made under these Acts and as amended from time to time and the relevant provisions of Indian Railways Schedule of Dimensions for Broad Metre and Narrow gauges together with the latest amendments thereto shall apply to the crossing.

**5. Compliance with Indian Standard Specifications:**

5.1 All materials used in the construction of the crossing shall comply with the latest Indian Standard specification(s) relevant and where these are not available, with the latest British standard specification(s) relevant.

**6. Works to be executed by the Railway:**

6.1 The disturbance of any rail, road or ground or any attachment to any railway structure as may be necessary for the placing and/or maintenance of the crossing shall be effected by or under the direct supervision of the Railway and any conduit, culvert or similar work passing under Railway premises shall be constructed by the Railway in such manner and of such materials as it may approve of and the entire cost of such works shall be borne by the owner of the crossing.

**7. Method of Crossing - overhead line or underground cable:**

7.1 For tracks already electrified or to be electrified in the foreseeable future:

All low, medium and high voltage upto and including 11 kV crossing(s) shall normally be by means of underground cable(s). While for voltages higher than 11 kV, crossings may be by overhead lines or underground cables, the use of underground cable to the extent possible would be advantageous, particularly for 22 kV and 33 kV system.

**8. Protection of Communication Lines:**

8.1 The crossing shall in no way interfere with or endanger any Railway communication lines. Approval given by the Railway for placing of any crossing shall not be construed as affecting in any way the requirements of the Indian Post and Telegraphs Deptt. in regard to the protection of their communication lines.

8.2 The crossing shall also comply with the stipulations in the "Code of Practice for the protection of Telecommunication lines at crossings with overhead power lines other than Electric Traction Circuits" issued by Central Electricity Authority, Telecommunication Directorate, Power and Telecommunication Coordination Committee (PTCC Unit), Government of India, B-67/19 Safdarjung Enclave, New Delhi-29 and the latest amendments if any, thereto.

**9. Maintenance of Crossing:**

9.1 No, work, whatsoever, on any crossing shall be undertaken by the Owner without obtaining the consent in writing from the Railway. All such works shall be carried out under the direct supervision of the Railway.

9.2 The crossing shall always be maintained in a state of good repair so as to reduce hazards to life and property. It shall be inspected by the Owner at interval not exceeding 12 months in order to determine its fitness for service. Defects, if any, noticed or as pointed out by the Railway shall be rectified by the owner expeditiously. The decision of the Railway in regard to defects noticed and rectification(s), if any, to be done by the owner shall be final and binding on the owner.

9.3 The crossing span as well as two adjacent spans on either side of the overhead line crossing shall be kept free by the owner from any trees and branches which, if they fall on these spans, would foul with the overhead line. The growth of bushes and wild vegetables shall not be permitted on either side of the overhead line for the same reason.

9.4 Where galvanised steel structures support the crossing span, they shall be maintained free of rust, corrosion, etc.

9.5 If at the instance of the Railway, the crossing is to be shifted or modified or dismantled, the work shall be carried out by the owner at the cost of the Railway. However, in those cases where the need for such works on account of Railway's anticipated developments/requirements was foreseen in time and the owner had agreed in writing prior to the construction of the crossing to meet the cost of such works. Such works shall be carried out on a priority basis by the owner within a fixed schedule, as mutually agreed upon between the owner and the railway and to the satisfaction of the electrical Inspector. The Railways shall have the right to claim compensation for any loss and/or inconvenience caused if there is avoidable delay in completing the works.

#### **10. Defects and Failures :**

10.1 (i) All defects/failures like snapping of conductors in the crossing span, breaking of insulator string in the overhead line crossing or any defect that is likely to affect the safe movement of the railway traffic or the safety of the railway property or personnel shall be reported forthwith by the owner to the Station Master on duty at the railway station on both sides of the crossing as well as to the Chief Electrical Engineer, the Divisional Railway Manager(Electrical), the Electrical Inspector and the Director (Transmission), Central Electricity Board, S.907, Seva Bhavan, R.K. Puram, New Delhi - 66. A detailed report of the failure or defect shall also be sent to the Chief Electrical Engineer, the Divisional Railway Manager, the Divisional Railway Manager (Electrical), the Electrical Inspector and the Director (Transmission), Central Electricity Board, New Delhi as soon as possible - preferably within 48 hours of the first report.

(ii) In the event of an accident to Railway's tracks/rolling stock in the vicinity of an overhead line crossing, the owner shall, if required by any official acting on behalf of the Railway, expeditiously switch off the overhead line and effectively connect the conductors to earth as long as is necessary to enable Railway's cranes if any, to work safely in the area.

### **II OVERHEAD LINE CROSSINGS**

#### **11. Angle of crossing**

11.1 An overhead line crossing shall normally be at right angles" to the railway track. In special cases a deviation of upto 30 degree may be permitted. Deviations larger than 30 degree shall have to be specifically authorised by the Electrical Inspector of the Railway.

#### **12. Structures**

12.1 Steel poles/masts fabricated steel structures or reinforced or pre-stressed concrete poles either of the self-supporting type or guyed type conforming in all respects to the Indian electricity Rules, 1956 (as amended, upto November 1984) and complying with the latest editions of Codes of Practice, IS:800-1962 for "Code of Practice for use of structural steel in general building construction, IS:875-1964 for "Code of Practice for structural safety of buildings; loading standards" and IS:456-1978 for "Code of Practice for plain and reinforced concrete" shall be used on either side of the track to support the crossing span. These structures shall be of the terminal type. For arriving at the crippling load, the wind loads as detailed in the latest edition of IS.802 (Part-I)-1977 for "Loads and permissible stresses" shall be adopted. The steel structures shall normally be galvanised in accordance with IS:2629-1966 for "Recommended practice for hot-dip galvanising of iron and steel."

12. 2 The minimum distance of the structures (supporting the crossing span) from the center of the nearest railway track shall be equal to the height of the structure in metres above normal ground level plus 6 metres. In special circumstances, the Electrical Inspector may permit a lesser distance being adopted subject to any conditions he deems fit to impose.

12.3 The crossing span shall be restricted to 300 m or to 80% of the normal span for which the structures are designed, whichever is less.

### 13. Wind pressure

13.1 The maximum wind pressure for design of the structure shall be as prescribed in IS:802 (Part-1)-1977 for load and permissible stresses.

### 14. Temperature

14.1 The maximum and minimum temperatures for design of the conductors and other wires shall be as prescribed in the latest edition of IS:802 (Part-1, Clause-4) with necessary correction for conductor maximum temperature.

### 15. Provision for Ice/Snow Loading:

15.1 Where provision has to be made for ice and/or snow loading, it shall be determined in the light of local conditions with the approval of the Railway.

### 16. Factor of Safety

16.1 The factor of safety of all structures, conductors, guards", guys and ground wires used in the crossing shall be as stipulated in the Indian Electricity Rules, 1956 (as amended in November 1984) and the relevant Codes of Practice.

### 17. Clearance between the overhead line & railway track:

17.1 An overhead line crossing over railway track already electrified shall be located at the middle of overhead equipment span supported by two adjacent traction masts/structures. The distance between any of the crossing conductors and the nearest traction mast or structure under the most adverse conditions shall not be less than 6m.

Note: If, in unavoidable circumstances, the crossing span cannot be so located, the minimum clearance between any of the crossing conductors of the crossing and the nearest traction mast or structure shall be not less than that specified for buildings in Rule 80 of the Indian Electricity Rules, 1956 (as amended upto November 1984).

17.2 No overhead line crossing shall be located over a booster transformer, traction switching station, traction sub-station or a track cabin location in an electrified area.

#### 17.3 Vertical Clearance:

The minimum height above rail level of the lowest portion of any conductor of a crossing, including guard wire, under conditions of maximum sag shall be as follows:-

| S.No. | Voltage                      | Broad, Metre & Narrow Gauges |
|-------|------------------------------|------------------------------|
| 1.    | Upto and including 11 kV     | Normally by cable            |
| 2.    | Above 11 kV and upto 66 kV   | 14.10 m                      |
| 3.    | Above 66 kV and upto 132 kV  | 14.60 m                      |
| 4.    | Above 132 kV and upto 220 kV | 15.40 m                      |
| 5.    | Above 220 kV and upto 400 kV | 17.90 m                      |
| 6.    | Above 400 kV and upto 500 kV | 19.30 m                      |
| 7.    | Above 500 kV and upto 800 kV | 23.40 m                      |

Note: (i) While calculating the above clearances, Railways high tension lines running over the 1500 V DC traction structure in some sections have not been taken into consideration. Where such high tension lines exist, the height above the rail level of the highest high tension line shall be taken into account for calculating the clearances.

Note: (ii) If, for special reason, it is not practical to have an underground cable crossing for systems upto and including 11 kV on sections not likely to be electrified in future, the Chief Electrical Engineer of the Railway may permit the electrical crossing to be an overhead one. In such a case, the clearance(s) specified in clause 21.4 shall be maintained.

Note: (iii) The working of a Railway crane under an overhead line crossing shall normally be avoided. If it becomes absolutely essential for a crane to work under such a crossing, the minimum clearance required to be maintained between the highest working point of the jib and the lower crossing conductor shall be as under:-

| Normal System Voltage (kV) | Min. Safe clearance (In metre) |
|----------------------------|--------------------------------|
| 33                         | 1.50                           |
| 66                         | 2.00                           |
| 110                        | 2.25                           |
| 132                        | 2.50                           |
| 220                        | 3.50                           |
| 400                        | 6.00                           |
| 500                        | 7.25                           |
| 800                        | 11.50                          |

The crane driver/supervisor shall be guided in this regard by the senior most official of the electrical engineering department at site.

## **18. Minimum clearances between crossing conductors and any railway structure**

18.1 The minimum vertical and horizontal clearances to be maintained between any of the crossing conductors and any railway building and/or structure, other than traction masts and structures and overhead equipment, under the most adverse conditions shall be as specified in Rule 80 of the Indian Electricity Rules, 1956 (as amended upto Nov.'84).

## **19. Minimum vertical clearance between power line crossings**

19.1 The minimum vertical clearances to be maintained between any of the power line crossings at the same or at different voltages shall be as specified in Rule 87 of the Indian Electricity, 1956 (as amended upto November 1984.)

19.2 Separate guarding shall be provided above the lower power line in all cases except when the voltage of the higher line is 33 kV and above. Where such guarding is provided, the clearance from the guard wires to the lower power line shall be not less than 2m and to the upper power line not less than 1.5m.

## **20. Clearance between power line & communication line**

20.1 The minimum clearance to be maintained between a power line and a communication line shall be as prescribed in the "Code of Practice for the Protection of telecommunication lines at crossings with overhead power lines other than Electrical Traction Circuits" (latest edition) issued by Central electricity Authority, Telecommunication Directorate, Power and Tele-communication Coordination Committee (PTCC Unit), Govt. of India.

## **21. Relaxation by the electrical inspector**

21.1 In special cases, the Electrical Inspector of the Railway may permit reduction in the clearance specified in clause 18, subject to the following minimum clearance being maintained between the highest traction conductor and the lowest crossing conductor:

| Voltage                                 | Broad, Metre & Narrow gauge (in metre) |
|-----------------------------------------|----------------------------------------|
| Upto & including 33 kV                  | 4.44                                   |
| Above 33 W and upto and including 66 kV | 4.44                                   |
| Above 66 kV and upto 110 kV             | 4.75                                   |
| For 110 kV and 132 kV                   | 5.05                                   |
| For 220 kV                              | 6.58                                   |
| For 400 kV                              | 9.71                                   |
| For 500 kV                              | 11.45                                  |
| For 800 kV                              | 16.67                                  |

21.2 If the crossing is provided with a guarding, a minimum clearance of 2m shall be maintained between the bottom of the guard wire and the highest traction conductor.

21.3 The Railway may evolve, wherever feasible, special design(s) for traction overhead equipment, return conductor, 25kV feeder or other power line on traction masts/structure keeping in view the need for economy and other requirements, if any.

21.4 In section where the track(s) is/are not likely to be electrified in future, the Electrical Inspector of the Railway may, in special circumstances, permit crossing of systems upto and including 11 kV by overhead lines with the minimum height above rail level of the lowest portion of any conductor including guard wire under conditions of maximum sag being not less than 10.95 metres above highest rail level provided that the owner of the crossing gives an undertaking in writing in the 'COMPLIANCE CERTIFICATE' (as at Annexure A.4.03 to the Regulations) to the effect that whenever the Railway requires the crossing to be converted from an overhead one to an underground one, the owner will carry out the work at his own cost.

Note: (i) The minimum clearances have been derived with an allowance of 2.0 m for maintenance. This allowance may also be reduced by the Electrical Inspector of the Railway, keeping in view the yard remodeling, shifting of structures etc.

## **22. Insulators**

22.1 A double set of strain insulator strings shall be used in crossing span in conjunction with a yoke plate where necessary as illustrated in sketch No. 1 attached to these Regulations. Each string of such strain insulators shall have one insulator more than the number used in a normal span of the overhead line. The factor of safety of each string of insulators under the worst conditions shall not be less than 2. The arrangements of power line crossing shall generally be as shown in sketch Nos. 1, 2 & 3 attached to the Regulations.

## **23. Guarding**

23.1 All overhead power line crossings upto and including 33 kV - provided with guarding under the power line. Guarding need not necessarily be provided for overhead- power line crossings of voltages above 33 kV if the transmission/distribution line is protected by circuit breakers of modern design with total tripping times of 0.20 seconds for voltages below 220 kV and 0.10 seconds for voltages of 220 kV and above, from the time of occurrence of the fault to its clearance. Wherever guarding is adopted for the crossing span, cradle guards shall also be provided.

23.2 The minimum height above the rail level to the lowest level of any cradle guard or guard wires under conditions of maximum sag shall not be less than the values specified in clause 18. In special cases, however, the Electrical Inspector of the Railway may permit lower heights under the provisions of clause 22 of the Regulations.

23.3 The minimum height between any guard wire and a live crossing conductor under the most adverse conditions shall not be less than 1.5m.

## **24. Anti-Climbing Devices and Warning Notices**

24.1 Where the voltage exceeds 650V, the supporting structures, (of the overhead line crossing) on railway land shall be provided with anti-climbing devices. Besides, suitable caution/warning notices shall be erected on all such structures, in the languages as may be prescribed for the purpose. The anti-climbing devices and the caution/warning notices shall be approved by the Railway.

## **25. Protection from Moving Road Vehicles**

25.1 Supporting structures, (of the overhead line crossing) including guys, adjacent to roadways shall be so located that the danger of their being struck by moving road vehicles is avoided or reduced to the minimum. Wherever required, guard rails, suitably painted to make them conspicuous, shall be provided for the purpose.

## **26. Communications Lines**

26.1 The owner of a communication line shall provide adequate safety devices so that no damage is caused in the event of snapping of conductors of a power line crossing. In addition to the safety devices, the owner shall also provide necessary surge absorbers in the system to guard against the effects of surges caused during switching operations or system faults.

26.2 Overhead communication lines may be permitted to be supported on the structures used for the crossing span of a power line crossing, provided the owner of both lines is the same. The factors of safety for conductors and insulators the clearances above rail level and the method of supporting such crossings shall be not less than those specified for power line crossing.

## **27. Earthing**

27.1 (i) Each structure on either side of the crossing span supporting the transmission/distribution line conductors shall be earthed effectively by two separate and distinct earths and connections. Atleast one separate earth electrode shall be provided for each earth connection.

(ii) All guard and stay wires shall be properly clamped to the structures connected to earth so as to maintain proper electrical continuity to earth.

(iii) Where struts are provided, they shall also be effectively connected to earth separately as well as to the main structure earths.

(iv) Where the earth resistance of the independent tower/structure is higher than 10 ohms, the owner shall take necessary steps to improve the earth resistance either by providing multiple earth electrodes or by suitably treating the soil surrounding the earth electrode or by resorting to counterpoise earthing. The method of earthing the transmission/distribution line structures etc. for the crossing span shall be approved by the Railway.

(v) The earths shall be inspected and tested annually on a hot dry day and results thereof furnished to the Railway for verification and record. If the earth resistance is found to be high, i.e. above 10 ohms, steps shall be taken to reduce it and an advice given to the Railway.

(vi) The cross-section of the earth conductor/connections for the earthing system shall be adequate for the application. They shall not be damaged or overheated or melt while carrying the short circuit current.

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## **28. Fire Hazards**

28.1 Structures supporting the crossing span shall be so placed, guarded and maintained as to be least posed to bush, grass, rubbish and building fires as is possible.

### **III CABLE CROSSINGS**

#### **Cable Crossing**

As far as possible cable crossings shall make use of any existing culverts, sub-ways etc. where track(s) already equipped for electric traction on 25 kV Hz single phase ac system, the crossing shall be provided -itions at least 5 metres away from any traction sub-station or switching station or mast or structure -ed or proposed to be erected by the Railway for the purpose of supply and distribution of power to the on overhead equipment. The exact locations of such traction sub-station or switching station or mast or -ure in any particular area shall be obtained by the owner from the Railway.

#### **Type of Cables**

The owner shall specify and obtain prior approval of the Railway for the type of cable he intends to for the crossing. It shall preferably be armoured. Where cables are suspended from supports and not laid - protective pipe, they shall be of the armoured and sheathed type.

#### **1. Cathodic Protection**

1 Cathodic protection of the cables shall not be adopted without the specific prior approval of the - i.way.

#### **Method of Laying**

1 Where the cable is laid under railway track(s) it shall be laid through cast iron pipes or spun concrete - es of suitable diameter and strength. In order to avoid disturbance to the railway track/formation in case become necessary to lay additional cable(s) in future, it would be advantageous to provide protective pipes idequate (larger) diameter initially to cater for additional cables. The specifications for the pipes to be used will be submitted to the Railway for approval. The pipe shall be laid at not less than one metre below the nation level. It shall be possible to withdraw the cable(s) for repairs or replacement without disturbing the way track or formation. Long lengths of pipe shall be laid with a gradient to facilitate drainage of water -ny. The pipe shall be laid upto the railway boundary at both ends or upto the point as prescribed by the railway. The laying of the cable in the Railway premises shall be in accordance with the latest edition of - 255-1967 "Code of Practice for Installation and Maintenance of Power Cables".

#### **Works Carried out under or near Railway Track**

Where the cable is to be laid under a railway track(s) the use of cast iron or spun concrete pipe for protection of the cable is obligatory and such pipe shall be laid in accordance with the contents of clause-7.

The armouring and sheathing of the underground cable laid across or near any electrified railway track be earthed by independent earths at the two sealing ends of the cable. No further earthing of the -ring and sheathing of the cable shall be done within 500m. of the electrified track. The scheme and method of earthing shall specifically be approved by the Railway.

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### **34. Structures on which cable ends are supported and terminated**

34. 1 Where the ends of a cable of an underground crossing are terminated on structures for connection to an overhead line, such structures shall comply with the Regulations in so far as they are applicable to overhead line crossings in respect of structures.

### **35. Marking of Crossings**

35. 1 Each cable crossing shall be indicated by at least two cast iron cable markers, one at each end of the crossing, within the railway boundaries. The cable marker shall be fixed at both ends of the underground crossings. They shall be of a design approved by the Railway. The following information shall be clearly marked on the markers:

|                  |                                                                   |
|------------------|-------------------------------------------------------------------|
| ELECTRICAL CABLE | - Volts                                                           |
| NUMBER           | - Cables                                                          |
| DANGER           | - In English, Hindi and the vernacular of the district.           |
| DEPTH OF CABLE   | - Below track level.                                              |
| DEPTH OF CABLE   | - Below ground level between the toe of bank and railway fencing. |

## **Annexure**

### **A.4.01**

#### **DATA, DESIGNS, CALCULATIONS AND DRAWINGS TO BE FURNISHED BY OWNER**

The following data, designs, calculations and drawings together with the application for the proposed power line crossing incorporating the particulars as detailed below - all in duplicate shall be furnished by the owner to the Divisional Railway Manager (Electrical) for approval by the Electrical Inspector of the Railway.

#### **I. Overhead line crossings**

##### **a) Data and designs**

1. Location of the proposed crossing, the names of railway stations on either side of the crossing, the distance of the crossing from the nearest railway station, the painted numbers of Telegraph poles and or traction mast or structures between which the crossing is proposed to be located and the exact location in relation to such poles or masts or structures.

Note: The alignment of the crossing should, as far as possible be at the mid-point of the span between adjacent traction masts or structures in the case of electrified tracks. (See CI.18.1 of the Regulations).

2. Particulars of the overhead line, including voltage, frequency, number of phases, size of conductors etc. and whether the neutral is earthed or not and if earthed, the type of earthing.

3. Wind pressure adopted.

4. Temperature data adopted.

5. Particulars of ice/snow loading, if any, adopted.

6. Factors of safety adopted in the designs, for conductors, structures, guard wires/cross wires if provided, earth-wire, stay wire, insulator-strings, etc.

7. Design calculations of structures and foundations for the crossing span, communication lines or

guarding, if any.

Note: If the structures and foundations are of standard type used for the transmission/distribution line concerned, the detailed design calculations shall be furnished.

8. Calculations leading to the minimum values under worst conditions of the following:

- i) Vertical clearance between the lowest crossing conductor, communication lines and/or guarding and the different railway tracks in the crossing span.
- ii) Vertical clearance between the lowest crossing conductor, Communication lines and/or guarding and railway's conductors of the traction system or other conductors if any.
- iii) Horizontal clearance to railway mast/structure /building, if any.
- iv) Lateral clearance to the nearest Railway mast/structure/building, if any.

Note: Full particulars of the number, size, material and characteristics of various wires and conductors shall be furnished. .

9. Particulars of insulators, bridling of the conductors.

10. Details of guarding, size of guard and cross wires and their characteristics. A (detailed drawing showing the guarding arrangement, if provided, shall be given.

11. Size and characteristics of guy wire, if provided, and the number of supports.

12. Details of earthing indicating the earth electrode, size of earthing connection, method of connection to the support and the method of artificial soil treatment if proposed. Details of counterpoise earthing, if contemplated, shall be furnished.

13. Details of protection against moving road vehicles.

14. Particulars of anti-climbing devices, if provided, and warning and caution notices.

15. Detailed scheme of protection for the transmission/distribution line including particulars of relays, operating times etc. and particulars of circuit breakers, if any.

#### b) Drawings

1. Layout and site plan of the proposed crossing indicating railways boundaries.

2. Longitudinal elevation of the crossing. The drawing shall indicate full particulars of one span on either side of the crossing span with various clearances with respect to the Railway track(s). The drawing shall show the cross-section of the railway formation and tracks.

3. Drawing for warning and caution notices.

Note:

i) All drawings shall be in standard sizes as prescribed in the latest edition of IS:696-1972 "Code of practice for General Engineering Drawings".

ii) All drawings are to be endorsed with a certificate as given below:

"I hereby certify that the details of the equipment provided are designed with the object of minimising danger in the event of breakage/fault and in accordance with recognised modern Engineering Practice", and signed by the owner.

## II. Underground cables

a) Data and designs:

1. Location of the proposed cable crossing, the names of the railway stations on either side of the crossing the distance of the crossing from the nearest railway station, the painted numbers of telegraph poles or traction

masts or structures between which the crossing is proposed to be located and the exact location in relation to such poles or masts or structures.

2. Supply system particulars, particulars of cables, their number, size and number of cores, voltage,

type of insulation, armouring etc.

3. Full particulars of the protective pipe for the crossing.

4. Method of earthing of the cable armouring and sheathing, if any.

5. Method of making the cable crossing for identification.

6. Design calculation for masts/structures for supporting and terminating cable (s), and drawings to show that the masts/structures would not foul the railway track(s) in the event of their failure in so far as movement or railway vehicles is concerned.

b) Drawings

1. Layout and site plan including route, location of structures, if any, for supporting and terminating the cable and railways boundaries.

Note: Earths in the vicinity (upto 100m all round) of the crossing shall be distinctly indicated.

2. Drawings Showing cable/crossing marker.

Note: i) All drawings shall be in standard size as prescribed in the latest edition of IS:696-1972 "Code of practice for General Engineering Drawings".

ii) All drawings are to be endorsed with a certificate as given below:

"I hereby certify that the details of the equipment provided are designed with the object of minimising danger in the event of breakage/fault and in accordance with recognised modern Engineering Practice".

### **III. Overhead line crossings and underground cables**

Along with a reproducible print, eight copies of the drawings showing the completed power line crossing shall be furnished to the Railway along with the "Certificate of Compliance (as at Annexure A.4.03 to the Regulations).

# HIGH TENSION CROSSING WITH TERMINAL STRAIN INSULATORS

## HIGH TENSION CROSSING WITH TERMINAL STRAIN INSULATORS

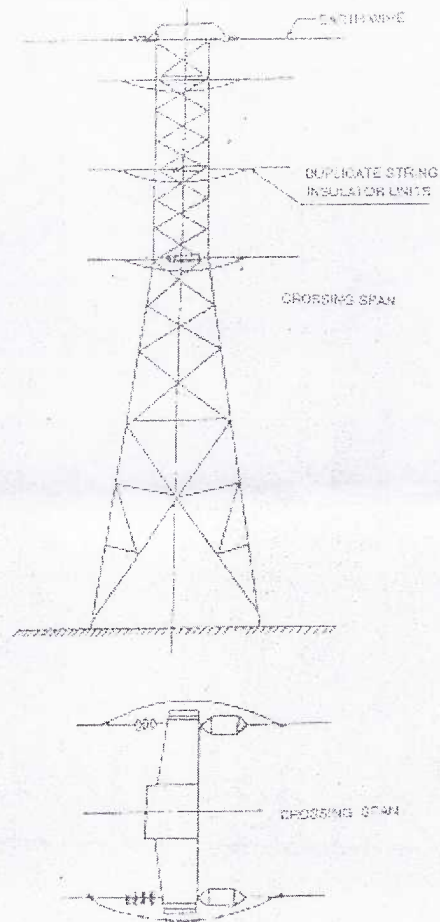


**FIG. A 4.01**

# HIGH TENSION CROSSING WITH SUSPENSION INSULATORS

## HIGH TENSION CROSSING WITH SUSPENSION INSULATORS

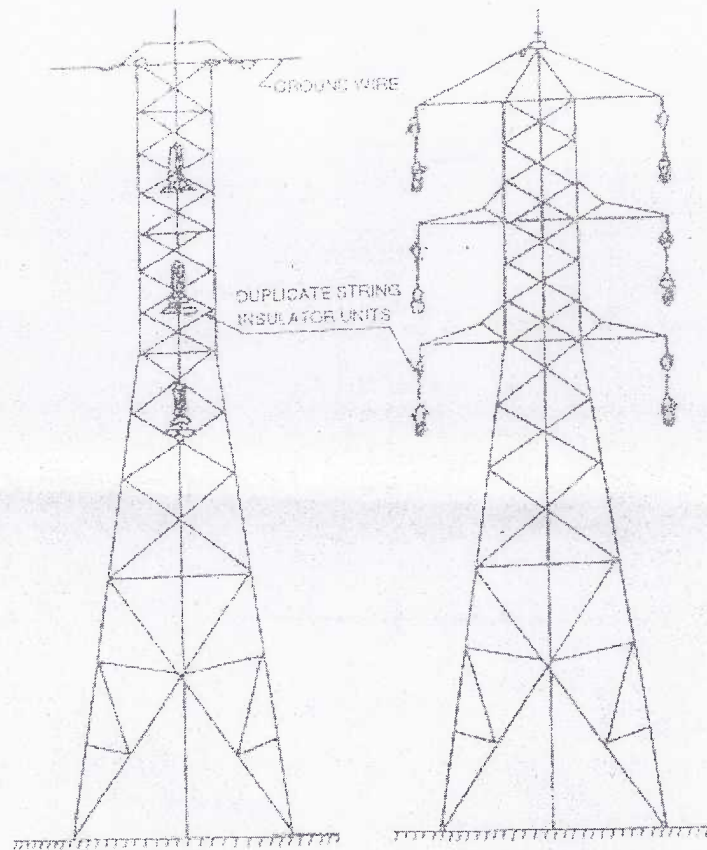


FIG. A 4.02

## OVERHEAD LINE CROSSING WITH PIN INSULATOR

OVERHEAD LINE CROSSING WITH PIN INSULATOR

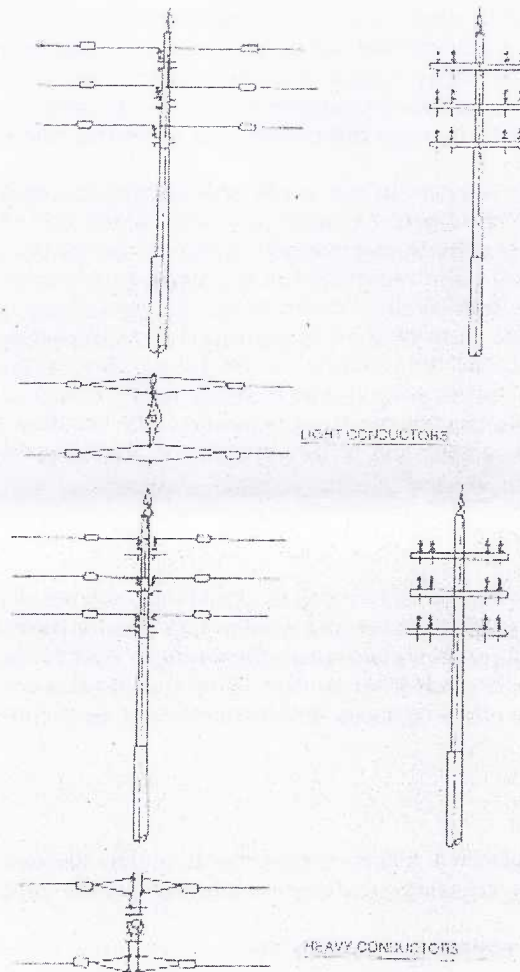


FIG. A 4.03

Annexure A.4.02

### AGREEMENT FOR ERECTING AND MAINTAINING AN OVERHEAD POWER LINE CROSSING OVER AND ACROSS RAILWAY TRACKS.

AN AGREEMENT made this-----day of-----one thousand nine hundred and-----  
-----♦ BETWEEN THE PRESIDENT OF INDIA acting through the Chief Electrical  
Engineer/Divisional Railway Manager/Divisional Railway Manager (Electrical) of the-----  
Railway administration (hereafter called "the Railway") of the one part and-----  
(hereinafter referred to as "the owner" of the other part.

WHEREAS the owner wishes to erect an electric overhead line and carry out the works connected  
therewith for transmission of distribution of electrical energy over and across the railway tracks and/or  
land at kilometrage-----in the section-----at-----railway station, of the Railway, the  
said overhead line where it crosses the railway tracks and/or land works connected therewith  
hereinafter referred to as the "crossing". Now IT IS HEREBY AGREED AS follows:

1. General: The Railway will permit the owner as from the-----day of-----19, to lay the  
crossings as  
per Drg. No.-----approved by the Railway hereunto attached as Annexures, and in  
compliance with Regulations for Power line crossing of Railway tracks hereunto attached as Annexures  
hereinafter referred to as the Regulations, for the purposes hereinbefore mentioned subject to the  
terms and conditions hereinafter contained.

2. Permission to erect and maintain the crossing:- The Railway will, subject to the provisions of clause  
3 hereinafter contained, permit the owner to erect and maintain in accordance with the Regulations  
the crossing over and across the Railway tracks and/or land at the place(s) shown on the said drawing  
and to execute all repairs in connection therewith when necessary from time to time and all such

In the event of the Railway giving notice under Clause 7 hereof for special maintenance, repairs, modification, shifting or removal of the crossing and the owner failing within the time stipulated to carry out the said works except such position thereof as the Railway may propose to carry out under the provisions of clause 3 hereof or in the event of the owner committing any other breach of this Agreement or any part thereof, the Railway shall be entitled in its absolute discretion (notwithstanding the provisions of clause 8 hereof) to terminate this Agreement and all and any of the privileges hereby granted upon the expiration of six months' notice in writing of its intentions to do so being given in the manner provided in clause 7.

#### **11. Removal of crossing:**

Prior to the termination of this Agreement and subject to the provisions of clause 3 hereof the owner will at his own cost remove the crossing from the property of the Railway and restore the land to its original condition to the satisfaction of the Railway in all respects. In the event of the owner failing to remove the said crossing and restore the land to its original condition in the manner hereinbefore provided the Railway will be entitled at its option immediately after the termination of this Agreement to carry out the work of removal of the crossing and restoration of the land without being responsible for any loss or damage whatsoever to the said crossing or any part thereof. In such an event the owner will pay to the Railway on demand all costs incurred by the Railway in connection with such work including supervision charges, the amount which will be determined by the Railway in its absolute discretion. The said crossing and the materials used in connection therewith and belonging to the owner will be and remain the property of the owner but the Railway will be entitled to retain the same but without any liability therefore until the amount of such costs as aforesaid have been paid by the owner to the Railway.

#### **12. Indemnity**

The said crossing will be used at the sole risk and responsibility of the owner. If at any time owing directly or indirectly to such use or to the existence of the said crossing or to the carrying out of the work of erection and/or repair and/or removal of the said crossing and restoring the land to its original condition or to the exercise by the owner of any privileges hereby granted or to any other cause arising out of the operation of the Agreement any damage will be caused to the Railway or to the permanent way and works, Rolling Stock or any other property of the Railway or if in consequence of any of the matters aforesaid or of any default in fulfilling any of the conditions of this Agreement or of any negligence on the part of the owner or any person connected with him, any claim or damage or loss be substantiated by any person or persons against the Railway the Owner will upon demand pay forthwith and make good the same and shall also make good to the Railway all costs and expenses which it may incur in regard to any such claim or damage or loss as aforesaid. In the event of there being any dispute as to what specific loss and/or damage has been caused by reason of any of the matters aforesaid such dispute will be referred to the Chief Electrical Engineer of the Railway, whose decision thereon shall be final and binding.

#### **13. Railway Accidents**

The Railway shall not be responsible for any damage to the crossing and other property of the owner due to any accident in the working of the Railway due to any cause whatsoever.

#### **14. Sub-letting**

The owner will not sub-let, transfer or assign this Agreement or any of the privileges hereby granted without the previous consent in writing of the Railway.

#### **15. Limitation of rights**

Nothing herein contained will be construed as conferring upon the owner or his permitted assignee any rights over the property of the Railway.

#### **16. Cost of Agreement**

All costs and expenses incidental to the preparation and completion of these presents including Stamp duty will be borne and paid by the owner.

In witness whereof the parties have hereunto set and subscribed their respective hands and seals the day, month and years respectively mentioned against their respective signatures.

(Seal of the Owner)

(Signature)

Signed at-----by Shri-----

for and on behalf of the Owner in the presence of:

1. Name

Address

1. Name

Address.

(Signature of Witness)

(Signature)

Signed at-----by Shri-----

for and on behalf of the Owner in the presence of:

1. Name

Address.

(Signature of Witness)

1. Name

Address.

(Signature of Witness)

Notes. 1. In the case of Railway Companies or Port Commissioners Railways, the term Chief Electrical Engineer wherever occurring In this Agreement may be replaced by the designation of the Officer on whom the duties of the Chief Electrical Engineer devolve.

2. The agreement should be signed on behalf of the President of India by an officer duly authorised under Article 299 (1) of the Constitution of India.

#### Annexure A.4.03

### AGREEMENT FOR ERECTING AND MAINTAINING AN UNDERGROUND POWER LINE

#### CROSSING ACROSS AND UNDER RAILWAY TRACKS.

AN AGREEMENT made this            day of            one thousand nine hundred and            BETWEEN

THE PRESIDENT OF INDIA, acting through the Chief Electrical Engineer/the Divisional Railway Manager/ Divisional Railway Manager (Electrical) of the Railway Administration (hereinafter called "the Railway") of the one part and (hereinafter referred to as "the owner" of the other part. WHEREAS the owner wishes to lay an underground cable and carry out works connected herewith for transmission or distribution of electrical energy across and under the railway tracks and/or land at kilometrage-----in the section-----at-----Railway station, of the Railway the said cable and works connected therewith hereinafter referred to as the "crossing". NOW IT IS HEREBY AGREED as follows:

1. General: The Railway will permit the owner as from the-----day of-----19 ,to lay the crossings as per Drg. No-----approved by the Railway, hereunto attached as Annexures and in compliance with Regulations, for power line crossings of Railway Tracks, hereunto attached as Annexure hereinafter referred to as the Regulations, for the purposes hereinbefore mentioned, subject to the terms and conditions hereinafter contained.

2. Permission to lay and maintain the crossing: The Railway, will, subject to the provisions of clause 3 hereinafter contained permit the owner to lay, keep and maintain in accordance with the Regulations the crossing under the Railway tracks and/or land at the place(s) shown on the said drawing and to execute all repairs in connection therewith when necessary from time to time and all such works shall be executed at the cost of the owner at such time as may be permitted and to the satisfaction of the Railway in all respects.

Provided that if shifting of or modifications to or dismantling of the crossing is required for the proper functioning of the Railway and is to be carried out by the owner as desired by the Railway, the costs of such works shall be borne by the Railway except in these cases where the need for such works on account of Railway's anticipated development/requirements was foreseen in time and the owner had agreed in writing prior to the construction of the crossing to meet the costs of such works.

3. Railway to carry out protection works; In the event of it being necessary in the opinion of the Railway to support or protect the railway tracks and/or land or works during the laying of the crossing or the execution of any removal thereof the work of supporting or protecting the railway tracks or land

and /or laying or removing the encasing protective pipe to carry the crossing cable and restoring the tracks and/or land to its original condition or such part of the said work as the Railway shall deem fit will be carried out by the Railway at the cost of the owner in all respects. The amount of such costs will be determined by the Railway in its absolute discretion and will be paid by the owner to the Railway on demand. The owner will, if so required, deposit with the Railway prior to the carrying out of the said work such sum of money as may be estimated by the Railway to be the cost of the work required to be done and the amount of the said deposit will be set off against the said cost to be determined as aforesaid and the balance paid as aforesaid

4. Method of laying: The cable shall be laid as indicated in the said drawing and shall be carried through an encasing pipe in such manner that the cable can be laid, withdrawn and/or maintained without interfering with or endangering the railway tracks and/or land. The costs of providing and laying such encasing pipe for the crossing shall be borne by the owner as aforesaid.

5. Cost of supervision of works: All works in connection with the matters referred to in clauses, 2,3,4,7 & 11 will be subject to such supervision by the Railway as may be considered necessary by the Railway and the owner will pay to the Railway on demand all costs of such supervision including the cost for the staff, required to look after the safety of the railway tracks and/or land while all or any of such works are/ work is in progress The costs of such supervision and other costs as aforesaid shall be determined by the Railway in its absolute discretion.

6. Access-. Neither the owner nor his employees will at any time enter upon the railway land for any purpose whatsoever in connection with the crossing as aforesaid without the consent in writing of the Railway.

7. Modification, shifting or removal of crossing: If for convenience of operation, unsatisfactory maintenance or for any reason whatsoever the Railway desires special maintenance, repairs, modification, shifting or removal of the crossing the owner will, subject to the provisions of clause 3 hereof carry out such works or such portion thereof from the date of notice issued by the Railway and to the satisfaction of the Railway within a reasonable period determined by the Railway in its absolute discretion as the Railway shall not under provision of clause 3 hereof proposed to carry out the work. If the owner so desires he may relay the same at his own expense but to the satisfaction of the Railway in all respects on such other land or track of the railway as it may in its absolute discretion consider suitable and available for the purpose. In the event of the crossing being so re-erected the land on which the same is re-erected will be used and occupied upon the terms of the Agreement mutatis mutandis, as if the same has originally been subject to this Agreement.

8. Termination of Agreement: The Railway may at any time (and from time to time) be at liberty in its absolute discretion to suspend temporarily and/or terminate this agreement and all or any of the privileges hereby granted upon the expiration of three month's notice in writing of its intention to do so being left at or sent to the registered office of the owner and notwithstanding that the owner may have executed any work of a permanent or temporary character and incurred expenses in the execution thereof. The owner shall not be entitled to any damages or compensation by the reason of such termination or suspension.

9. Same as otherwise provided in this contract, all notices to be given on behalf of the President of India and all other action to be taken on his behalf may be given or taken on his behalf by the Chief Electrical Engineer/Divisional Railway Manager/Divisional Railway Manager (Electrical) of the Railway or left at his office.

10. Termination of Agreement by the Owner The owner may on giving to the Railway one month's notice in writing terminate this Agreement and such notice shall be sufficiently served if sent by the registered post to the Chief Electrical Engineer/Divisional Railway Manager/Divisional Railway Manager (Electrical) of the Railway or left at his office.

11. Termination of Agreement for default: In the event of the Railway giving notice under clause 7 hereof for special maintenance, repairs, modification, shifting or removal of the crossing and the owner failing within the time stipulated to carry out the said works except such portion thereof as the Railway may propose to carry out under the provisions of clause 3 hereof or in the event of the owner committing any other breach of this Agreement or any part thereof, the Railway shall be entitled in its absolute discretion (notwithstanding the provisions of clause 8 hereof) to terminate this Agreement and all and any of the privileges hereby granted upon the expiration of six month's notice in writing of its Intentions so to do being given in the manner provided by clause 7.

12. Removal of crossing: Prior to the termination of this Agreement and subject to the provisions of clause 3 hereof the owner shall at his own cost remove the crossing from the property of the Railway and shall restore the land to its original condition to the satisfaction of the Railway in all respects. In the event of the owner failing to remove the said crossing and restore the land to its original condition in manner hereinbefore provided the Railway will be entitled at its option immediately after the termination of this Agreement to carry out such work of removal of the crossing and restoration of the land without being responsible for any loss or damage whatsoever to the said crossing or any part

thereof. In such an event the owner will pay to the Railway on demand all costs incurred by the Railway in connection with such work determined by the Railway in its absolute discretion. The said crossing and the materials used in connection therewith and belonging to the owner will be and remain the property of the owner but the Railway will be entitled to retain the same but without any liability therefor until the amount of such costs as aforesaid have been paid by the owner to the Railway.

13. Indemnify. The said crossing will be used at the sole risk and responsibility of the owner. If at any time owing directly or indirectly to such use or to the existence of the said crossing or to the carrying out of the work of erection and/or repair and/or removal of the said crossing and restoring the land to its original condition or to the exercise by the owner of any privileges hereby granted or to any other cause arising out of the operation of this Agreement any damage will be caused to the Railway or to the permanent way and works, Rolling stock or any other property of the Railway or if in consequence of any of the matters aforesaid or of any default in fulfilling any of the conditions of this Agreement or of any negligence on the part of the owner or any person connected with him, any claim or damage or loss be substantiated by any person or persons against the Railway, the owner will upon demand pay forthwith and make good the same and shall also make good to the Railway all costs and expenses which it may incur in regard to any such claim or damage or loss as aforesaid. In the event of there being any dispute as to what specific loss and/or damage has been caused by reason of any of the matters aforesaid such dispute will be preferred to the Chief Electrical Engineer of the Railway, whose decision thereon shall be final and binding.

14. Railway Accidents: The Railway shall not be responsible for any damage to the crossing and other property of the owner due to an accident in the working of the Railway due to any cause whatsoever.

15. Sub-letting: The owner will not sub-let, transfer or assign this Agreement or any of the privileges hereby granted without the previous consent in writing of the Railway.

16. Limitation of rights: Nothing herein contained will be construed as conferring upon the owner or his permitted assignee any rights over the property of the Railway.

17. Costs of Agreement: All the costs and expenses incidental to the preparation and completion of these presents including stamp duty will be borne and paid by the owner.

In witness whereof the parties have hereunto set and subscribed their respective hand and seals the day, month and year respectively mentioned against their respective signatures.

(Seal of the Owner)

(Signature)

Signed at-----by Shri-----for and on behalf of the owner in the presence of:

1. Name  
Address  
of witness) (Signature

2. Name  
Address  
of witness) (Signature

Signed at-----by Shn-----for and on behalf of the President of India, in the presence of:

1. Name  
Address  
witness) (Signature of

2. Name  
Address  
witness) (Signature of

Note: 1. In the case of Railway Companies or Port Commissioner's Railway, the term Chief electrical Engineer wherever occurring in this Agreement may be replaced by designation of the officer on whom the duties of the Chief Electrical Engineer devolve.

2. The agreement should be signed by and on behalf of the President of India by an officer duly authorised under Article 299(1) of the Constitution of India.

A.4.04

## CERTIFICATE OF COMPLIANCE

It is hereby certified that the electrical overhead line/underground cable crossing No .....at  
km ..... on the section ..... of the Division of  
the ..... at

Railway has been constructed in compliance with Indian Electricity Act, 1910 and Indian Railways Act, 1890, and the rules made thereunder and as amended from time to time and the Regulations for power line crossings of Railway Tracks, 1987. The crossing has also been constructed in accordance with the drawings approved by the ..... Railway and the Electrical Inspector of the ..... Railway, the reference of which are given below:

| SN | Drawing No. | Title of Drawing | Location of Crossing § | Reference under which drawing is approved | Approving authority |
|----|-------------|------------------|------------------------|-------------------------------------------|---------------------|
| 1  |             |                  |                        |                                           |                     |
| 2  |             |                  |                        |                                           |                     |
| 3  |             |                  |                        |                                           |                     |

2.\* It is also hereby certified that the overhead line crossing specially released as per clause 22.4 of the 'Regulations for Power Line Crossing of Railway Tracks, 1987' would be modified by the owner, on an approved design whenever Railway will require to modify such crossings due to introduction of electric traction on the section of the Railway.

Alongwith a reproducible print eight copies of the drawings showing the completed power line crossing is/ are enclosed.

(Seal of the owner)

Signature

owner)

(Name of the

Date

Place

\* Strike off, if not applicable.

§ The location of the overhead line crossing or underground cable will be identified by indicating the kilometrage with the painted number of the traction masts/structures and/or telegraph posts, as available, between which the overhead line or underground cable crossing is located.