CHAPTER VIII

[1][OVER-HEAD LINES, UNDERGROUND CABLES & GENERATING STATIONS]

74. Material and strength

(1) All conductors of overhead lines other than those specified in sub-rule (1) of rule 86 shall have a breaking strength of not less than 350 kg.

(2) Where the voltage is low and the span is of less than 15 metres and is on the owner's or consumer's premises, a conductor having an actual breaking strength of not less than 150 kg. may be used.

75. Joints

Joints between conductors of overhead lines shall be mechanically and electrically secured under the conditions of operation. The ultimate strength of the joint shall not be less than 95 per cent of that of the conductor, and the electrical conductivity not less than that of the conductor:

[2][PROVIDED that no conductor of an overhead line shall have more than two joints in a span.]

[3][**76. Maximum stresses, factors of safety**

(1) The load and permissible stresses on the Structural members, conductors and ground wire of self supporting steel lattice towers for overhead transmission lines shall be in accordance with the specifications laid down, from time to time, by the Bureau of Indian Standards.

(2) Overhead lines not covered in sub-rule (1) shall have the following minimum factors of safety:

(i) for metal supports	1.5;
(ii) for mechanically processed concrete supports	2.0;
(iii) for hand moulded concrete supports	2.5;
(iv) for wood supports	3.0

Explanation I : The minimum factors of safety shall be based on such load as may (sic) cause failure of the supports to perform its function (assuming that the foundation and other components of the structure are intact).

Explanation II : The load shall be equivalent to the yield point stress or the moulds of rupture, as the case may be, for supports subject to bending and vertical loads and the crippling load for support used as struts.

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1 Substituted by GSR 466, dt. 18-7-1991, w.e.f. 17-8-1991.
2 Inserted by GSR 730, dt. 7-9-1989, w.e.f. 30-9-1989.
3 Substituted vide GSR 274, dt. 10-7-2002, w.e.f. 20-7-2002.

Explanation III : The strength of the supports of the overhead lines in the direction of the line shall not be less than one-fourth of the strength required in the direction transverse to the line.

Explanation IV : The minimum factor of safety for the stay wires, guard wires or bearer wires shall be 2.5 based on the ultimate tensile strength of the wire.

Explanation V : The minimum factor of safety for conductors shall be 2 based on their ultimate tensile strengh. In addition, the conductor tension at 32°C, without external load shall not exceed the following percentages of the ultimate tensile strength of the Conductor:

Initial unloaded tension	35 per cent
Final unloaded tension	25 per cent

PROVIDED that the conductors having a cross section of a generally triangular shape, such as conductors composed of 3 wires the final unloaded tension at 32°C, shall not exceed 30 per cent of the ultimate tensile strength of such conductor.

(3) For the purpose of calculating the factors of safety specified under sub-rule (2):

(a) The maximum wind pressure shall be as specified in the relevant Indian Standards;

(b) For cylindrical bodies, the effective area shall be taken as full projected area exposed to wind pressure; and

(c) The maximum and minimum temperature shall be as specified in the relevant Indian Standard.

(4) Notwithstanding anything contained in sub-rules (2) and (3), in localities where overhead lines are liable to accumulations of ice or snow the appropriate Government may, by order in writing specify the loading conditions for the purpose of calculating the factor of safety.]

77. Clearance above ground of the lowest conductor

(1) No conductor of an overhead line, including service lines, erected across a street shall at any part thereof be at a height less than—

(a) for low and medium voltage lines	5.8 metres
(b) for high voltage lines	6.1 metres

(2) No conductor of an overhead line, including service, lines, erected along any street shall at any part thereof be at a height less than—

(a) for low and medium voltage lines	5.5 metres
(b) for high voltage lines	5.8 metres

(3) No conductor of an overhead line including service lines, erected elsewhere than along or across any street shall be at a height less than—

(a) for low, medium and high voltage lines up to and including 11,000 volts, if bare	4.6 metres

(b) for low, medium and high voltage lines up to and including 11,000 volts, if insulated — 4.0 metres

(c) for high voltage lines above 11,000 volts — 5.2 metres

(4) For extra-high voltage lines the clearance above ground shall not be less than 5.2 metres plus 0.3 metre for every 33, 000 volts or part thereof by which the voltage of the line exceeds 33,000 volts:

PROVIDED that the minimum clearance along or across any street shall not be less than 6.1 metres.

78. Clearance between conductors and trolley wires

[1][(1)] No conductor of an over-head line crossing a tramway or trolley-bus route using trolley wires shall have less than the following clearances above any trolley wire:

(a) low and medium voltage lines — 1.2 metres

PROVIDED that where an insulated conductor suspended from a bearer wire crosses over a trolley wire the minimum clearance for such insulated conductor shall be 0.6 metre.

(b) high voltage lines up to and including 11,000 volts — 1.8 metres

(c) high voltage lines above 11,000 volts — 2.5 metres

(d) extra-high voltage lines — 3.0 metres

[2][(2) In any case of a crossing referred to in sub-rule (1), whoever lays his line later in time, shall provide the clearance between his own lines and the line which will be crossed in accordance with the provisions of said sub-rule:

PROVIDED that if the later entrant is the owner of the lower line and is not able to provide adequate clearance, he should bear the cost for modification of the upper line so as to comply with this rule.]

79. Clearance from buildings of low and medium voltage lines and service lines

(1) Where a low or medium voltage over-head line passes above or adjacent to or terminates on any building, the following minimum clearances from any accessible point, on the basis of maximum sag, shall be observed:—

(a) for any flat roof, open balcony, verandah roof and lean-to-roof—

(i) when the line passes above the building a vertical clearance of 2.5 metres from the highest point; and

(ii) when the line passes adjacent to the building a horizontal clearance of 1.2 metres from the nearest point, and

(b) for pitched roof—

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1 Renumbered by GSR 528, dt. 11-7-1986, w.e.f. 19-7-1986.

2 Inserted by GSR 528, dt. 11-7-1986, w.e.f. 19-7-1986.

(i) when the line passes above the building a vertical clearance of 2.5 metres immediately under the lines, and

(ii) when the line passes adjacent to the building a horizontal clearance of 1.2 metres.

(2) Any conductor so situated as to have a clearance less than that specified in sub-rule (1) shall be adequately insulated and shall be attached [1][* * *] at suitable intervals to a bare earthed bearer wire having a breaking strength of not less than 350 kg.

(3) The horizontal clearance shall be measured when the line is at a maximum deflection from the vertical due to wind pressure.

[2][*Explanation*—For the purpose of this rule, expression "building" shall be deemed to include any structure, whether permanent or temporary.]

80. Clearance from buildings of high and extra-high voltage lines

(1) Where a high or extra-high voltage over-head line passes above or adjacent to any building or part of a building it shall have on the basis of maximum sag a vertical clearance above the highest part of the building immediately under such line, of not less than—

(a) for high voltage lines up to and including 33,000 volts	3.7 metres
(b) for extra-high voltage lines	3.7 metres plus 0.3 metre for every additional 33,000 volts or part thereof.

(2) The horizontal clearance between the nearest conductor and any part of such building shall, on the basis of maximum deflection due to wind pressure, be not less than—

(a) for high voltage lines up to and including 11,000 volts	1.2 metres
(b) For high voltage lines above 11,000 volts and up to and including 33,000 volts	2.0 metres
(c) for extra-high voltage lines	2.0 metres plus 0.3 metre for every additional 33,000 volts or part thereof.

[1][*Explanation*—For the purpose of this rule expression "building" shall be deemed to include any structure, whether permanent or temporary. [3][Various clearances such as vertical, horizontal and ground clearance shall be considered as per the sketch in Annexure XVI.]]

81. Conductors at different voltages on same supports

Where conductors forming parts of systems at different voltages are erected on the same supports, the owner shall make adequate provision to guard against danger to linesmen and others from the lower voltage system being charged above its

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1 Words "by means clips" omitted by GSR, dt. 28-3-1966, w.e.f. 9-4-1966.
2 Added by GSR 844, dt. 31-7-1985, w.e.f. 7-9-1985.
3 Inserted vide GSR 793(E), w.e.f. 4-12-2002.

hold area, without the written permission of the Chief Inspector of Mines or the Electrical Inspector of Mines.]

84. Routes—proximity to aerodromes

Over-head lines shall not be erected in the vicinity of aerodromes until the aerodromes authorities have approved in writing the route of the proposed lines.

85. Maximum intervals between supports

All conductors shall be attached to supports at intervals not exceeding the safe limits based on the ultimate tensile strength of the conductors and the factor of safety prescribed in rule 76:

PROVIDED that in the case of over-head lines carrying low or medium voltage conductors, when erected in, over, along or across any street, the interval shall not, without the consent in writing of the Inspector, exceed 65 metres.

86. Conditions to apply where telecommunication lines and power lines are carried on same supports

(1) Every overhead telecommunication line erected on supports carrying a power line shall consist of conductors each having a breaking strength of not less than 270 kg.

(2) Every telephone used on a telecommunication line erected on supports carrying a power line shall be suitably guarded against lightning and shall be provided by cut-outs.

(3) Where a telecommunication line is erected on supports carrying a high or extra-high voltage power line arrangement shall be made to safeguard any person using the telephone against injury resulting from contact, leakage or induction between such power and telecommunication lines.

87. Lines crossing or approaching each other

(1) Where an over-head line crosses or is in proximity to any telecommunication line, either the owner of the over-head line or the telecommunication line, whoever lays his line later, shall arrange to provide for protective devices or guarding arrangement, in a manner laid down in the Code of Practice or the guideline prepared by the Power and Telecommunication Co-ordination Committee and subject to the provisions of the following sub-rules.

(2) When it is intended to erect a telecommunication line or an over-head line which will cross or be in proximity to an over-head line or a telecommunication line, as the case may be, the person proposing to erect such line shall give one month's notice of his intention so to do along with the relevant details of protection and drawings to the owner of the existing line.

[1][(3) Where an over-head line crosses or is in proximity to another overhead line, guarding arrangements shall be provided so as to guard against the possibility of their coming into contact with each other.

Where an over-head line crosses another over-head line, clearances shall be as under :

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1 Substituted by GSR 256, dt. 28-2-1983, w.e.f. 26-3-1983.

[1][Minimum clearances in metres between lines when crossing each other

S.No.	Nominal System Voltage	11-66 KV	110-132KV	220KV	400KV	800KV
1.	Low and medium	2.44	3.05	4.58	5.49	7.94
2.	11-66KV	2.44	3.05	4.58	5.49	7.94
3.	110-132KV	3.05	3.05	4.58	5.49	7.94
4.	220KV	4.58	4.58	4.58	5.49	7.94
5.	400KV	5.49	5.49	5.49	5.49	7.94
6.	800KV	7.94	7.94	7.94	7.94	7.94]

PROVIDED that no guardings are required when an extra-high voltage line crosses over another extra-high voltage, high voltage, medium or low voltage line or a road or a tram subject to the condition that adequate clearances are provided between the lowest conductor of the extra-high voltage line and the topmost conductor of the overhead line crossing underneath the extra-high voltage line and the clearances as stipulated in rule 77 from the topmost surface of the road is maintained.]

(4) A person erecting or proposing to erect a line which may cross or be in proximity with an existing line, may normally provide guarding arrangements on his own line or require the owner of the other over-head line to provide guarding arrangements as referred to in sub-rule (3).

(5) In all cases referred to in the preceding sub-rules the expenses of providing the guarding arrangements or protective devices shall be borne by the person whose line was last erected.]

(6) Where two lines cross, the crossing shall be made as nearly at right angles as the nature of the case admits and as near the support of the line as practicable and the support of the lower line shall not be erected below the upper line:

[2][PROVIDED that the angle of crossing of power lines shall not be less than 60^{o}.]

(7) The guarding arrangements shall ordinarily be carried out by the owner of the supports on which it is made and he shall be responsible for its efficient maintenance.

(8) All work required to be done by or under this rule shall be carried out to the satisfaction of the Inspector.

88. Guarding

(1) Where guarding is required under these rules the provisions of sub-rules (2) to (4) shall apply.

(2) Every guard-wire shall be connected with earth at each point at which its electrical continuity is broken.

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1 Substituted by GSR 466, dt. 18-7-1991, w.e.f. 17-8-1991.

2 Inserted vide GSR 274, dt. 10-7-2002, w.e.f. 20-7-2002.