

## 34. SUPPORTS FOR OVERHEAD LINE.

(a.) Every support for overhead electric lines shall be so located as to avoid unduly obstructing pedestrian or vehicular traffic.

(b.) Every support for overhead electric lines shall be of durable material, and of sufficient strength to withstand forces due to wind-pressure, change of direction of line, and unequal length of span. The factor of safety of each support shall be 2 in the case of iron, steel, or ferro-concrete, and 4 in the case of wood, calculated on the crippling load of the structure. In computing the applied moments, a wind-pressure of 30 lb. per square foot of plane surface and 18 lb. per square foot of diametral plane of a cylindrical surface shall be assumed. Where extra-high-pressure lines cross a road, approved earthing-bars shall be erected at each side of such road-crossing.

(c.) All overhead electric lines shall be attached to suitable insulators carried on cross-arms or brackets of suitable material and cross-section, and they shall be so attached to the insulators or guarded that they cannot fall away from the supports in case they become detached from the insulator, but will fall on the cross-arm or insulator support. Guard-hooks erected at angles shall be effectively earthed. Where electric lines are covered with insulating-material they shall be so attached to the insulators that their insulation shall not be impaired thereby, and no joint in an insulated conductor shall be made within 4 ft. of an insulator. Pins for pole-top insulators shall not be screwed into the pole-top, but attached to the side of the pole.

(d.) At terminal poles or pull-offs the cross-arm shall always be fixed on the opposite side of the pole to the pull-off.

(e.) Electric distribution-lines at low pressure may be carried on brackets attached to buildings, provided they are inaccessible from any portion of the building without the use of a ladder or other special appliance, and provided also that they are secured in such a manner that they cannot fall away from the insulator support or make contact with the building.

(f.) Where necessary, stay-wires or truss-rods may be employed. Within borough boundaries such stay-wires shall be attached at a point at least 9 ft. above the ground to a pole or suitable structure, provided that the height of stay-wires over roadways between the kerbs shall be not less than 18 ft. from the ground. When used to stay poles carrying high- or extra-high-pressure wires the stay-wire or truss-rod shall be effectively earthed. Outside borough boundaries stay-wires may be attached to a stub-pole or a log or other form of "deadman" buried at least 4 ft. in the ground, provided that if the stay-wire does not already go down alongside a substantial fence or hedge it shall be guarded by a substantial post-and-rail fence to be erected alongside it from the point where it enters the ground to the point at which it reaches a height of 9 ft. above the ground. The stay-wire shall in all cases be stranded and attached to the "deadman" by means of a galvanized-iron bolt at least  $\frac{3}{4}$  in. in diameter, and the wire itself shall not go below ground-level.

## 35. MAXIMUM LENGTH OF SPAN.

(a.) The distance between supports carrying electric lines within city or borough limits, or within such other limits as may be specified in the license, shall, notwithstanding the provisions of clauses 32 and 38 (f) hereof, not exceed  $2\frac{1}{2}$  chains (165 ft.).

(b.) The distance between supports carrying electric lines outside such limits shall be determined by the provisions of clauses 32, 33, and 38 (f).

## 36. ANGLE OF CROSSING THOROUGHFARES.

Where an overhead electric line crosses from one side of a street to the other the angle formed by the original alignment and the portion of the line crossing the street shall approximate as closely as practicable to a right angle, and shall not exceed  $135^\circ$ . The crossing-span shall be as short as possible.

## 37. COVERING OF OVERHEAD LINES.

Electric lines at low pressure within a city, borough, town district, or township forming part of a county, or within such other limits as may be specified in the license, shall be covered throughout with triple braiding, thoroughly impregnated with weatherproof compound.

Electric lines at high pressure within a city, borough, town district, or township forming part of a county, or within such other limits as may be specified in the license or from time to time, shall be insulated with vulcanized rubber of at least 600-megohm grade. All joints shall be effectively insulated with rubber and taped.

Electric lines at extra-high pressure shall be bare.

Electric lines at low pressure or high pressure erected outside the above limits may be bare except as provided in clause 40.

Earthed neutral or intermediate conductors may be bare.

Every pole or support carrying extra-high-pressure lines or high-pressure lines the conductors of which are bare shall have attached to it a durable and conspicuous plate of reasonable dimensions marked "Danger—Live Wires," or equivalent suitable warning.

Bare low-pressure and bare high-pressure electric lines shall be subject to the following conditions:—

- The electric lines upon which workmen are engaged shall be disconnected from the source of supply, but if a suitable raised insulated platform is used the electric lines need not be so disconnected.
- When in the opinion of the Minister it is necessary in the interests of the public safety that the use of bare electric lines shall be discontinued, the licensee shall, upon receiving notice from the Minister, and within such time as he may fix, substitute therefor electric lines covered in the manner prescribed in this clause.
- Where telegraph-lines are affected the bare electric lines shall also be subject to the conditions prescribed in clause 40, "Protection of Telegraph-wires, &c."
- Such further conditions as the Minister may see fit to prescribe.

## 38. CONDITIONS GOVERNING LOW PRESSURE, HIGH PRESSURE, AND EXTRA-HIGH PRESSURE ON SAME POLES.

Where low pressure and high pressure, or high and extra-high pressure, or all three systems are carried on the same poles and supports the following conditions shall apply:—

- The extra-high pressure shall not exceed 35,000 volts between phases.
- The neutral point of each system shall be effectively earthed at its source of supply, and in accordance with clause 24. Each connection shall consist of two independent wires to separate sets of earth-plates or pipes connected in parallel.
- Resistance to earth of each such individual earth connection shall not exceed 10 ohms. All such earths under this clause shall be tested at regular intervals (at least three times a year). Certified results of tests to be forwarded to the office of the Chief Electrical Engineer, Public Works Department, Wellington.
- The main high and extra-high pressure distribution circuits shall be protected on each phase by fuses, circuit-breakers, or trip-coils accurately adjusted to open circuit within three seconds on an overload not exceeding 100 per cent. in excess of the normal full-load current.
- The primary side of each pole transformer shall be suitably fused to open circuit with a current of 100 per cent. above normal full-load current. Special precautions must be taken in fusing for 11,000-volt transformers under 10 K.V.A. capacity.
- The lines of different pressures shall be separated by the undermentioned distances, measured horizontally or vertically at the pole:—

Between	Minimum Separation Distance.
(a.) 400 volts and 6,600 or 3,300 volts	2 ft. (if both sets insulated).
(b.) 400 volts and 6,600 or 3,300 volts	4 ft. (if one or both sets bare).
(c.) 400 volts and 11,000 volts . .	4 ft.
(d.) 400 volts and 35,000 volts . .	7 ft.
(e.) 3,300 volts and 11,000 volts	4 ft.
(f.) 3,300 volts and 35,000 volts	4 ft.
(g.) 11,000 volts and 35,000 volts	4 ft.

If climbing-space is necessary, see clause 33 (i).

Under the extreme conditions of wind-pressure and temperature-rise, as defined in clauses 32 and 33, the separation between wires at the centre of the span shall not be less than one-half of the above distances.

The pole-spacing in above cases shall not exceed 4 chains (264 ft.).

Notwithstanding the provisions of clause 31, the minimum sizes of conductor to be used in the above construction shall not be less than No. 10 S.W.G. or 7/044 in.

- No low-pressure wires shall be above the level of any high-pressure or extra-high-pressure wires, or on same level as any extra-high-pressure wires.
- Where electric lines being worked on are in proximity to the live high- or extra-high-pressure lines, care must be taken to effectively earth the lines after disconnection and before work commences, in order to discharge electrostatic induction.